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GRIFFISS AIR FORCE BASE INTEGRATED RESOURCE ASSESSMENT
VOLUME 3: ELECTRIC RESOURCE ASSESSMENT

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ABSTRACT

The U.S. Air Force Air Combat Command (ACC) has tasked the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) to identify, evaluate, and assist in acquiring all cost-effective energy projects at Griffiss Air Force Base (AFB). FEMP, with support from the Pacific Northwest Laboratory (PNL),^(a) is designing this model program for federal customers served by the Niagara Mohawk Power Company (Niagara Mohawk). The program with Griffiss AFB will 1) identify and evaluate all cost-effective electric energy projects; 2) develop a schedule for project acquisition considering project type, size, timing, capital requirements, as well as energy and dollar savings; and 3) secure 100% of the financing required to implement electric energy efficiency projects from Niagara Mohawk and have Niagara Mohawk procure the necessary contractors to perform detailed audits and install the technologies.

This report provides the results of the electric energy resource opportunity (ERO) assessments performed by PNL at one of Niagara Mohawk's primary federal facilities, the ACC Griffiss AFB facility located near Rome, New York. It is a companion report to Volume 2, Electric Baseline Detail.

The results of the analyses of EROs are presented in seven common energy end-use categories. A narrative description of each ERO provides information on the initial cost, energy and dollar savings; impacts on operations and maintenance (O&M); and, when applicable, a discussion of energy supply and demand, energy security, and environmental issues. The evaluation methodology and technical and cost assumptions are also described for each ERO. Summary tables present the operational performance of energy end-use equipment before and after the implementation of each ERO and the results of the life-cycle cost analysis indicating the net present value (NPV) and savings-to-investment ratio (SIR) of each ERO.

(a) Pacific Northwest Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

Individual EROs were generally evaluated as mutually exclusive measures. Exceptions are occupancy sensors, which were evaluated with both the existing and recommended efficient lighting configurations, and variable-speed drives, which were evaluated with and without the ERO to replace an existing motor with a high-efficiency motor. This approach allows individual EROs to be ranked or rated based on parameters such as initial cost, energy savings, and changes in O&M requirements in addition to NPV and SIR. Economic analyses reflect current actual energy cost and government projections both of fuel price escalation and general inflation rate.

SUMMARY

The U.S. Air Force Air Combat Command (ACC) has tasked the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP), supported by the Pacific Northwest Laboratory (PNL), to identify, evaluate, and assist in acquiring all cost-effective electric energy projects at Griffiss Air Force Base (AFB). This is a model program FEMP is designing for federal customers served by the Niagara Mohawk Power Company (Niagara Mohawk). This report describes the methodology used to identify and evaluate the electric energy resource opportunities (EROs) at Griffiss AFB, provides a life-cycle cost (LCC) analysis for each ERO, and prioritizes the EROs based on their net present value (NPV) and savings-to-investment ratio (SIR). Analysis results are presented in seven common energy end-use categories (e.g., lighting, motors, refrigeration).

As illustrated in Table S.1, the present value of the installed cost of all cost-effective electric EROs at Griffiss AFB is nearly \$9.2 million. The present value of the savings associated with this investment is approximately \$24.6 million, for an overall NPV of \$15.4 million. By implementing all the cost-effective EROs identified in this study, Griffiss AFB will reduce annual electrical energy use by 19.9 million kWh (24%). Annual electrical energy expenditures will decrease by over \$1.2 million (23%). The peak shaving ERO will reduce annual demand charges by \$0.2 million but will increase annual diesel fuel purchases by \$0.1 million.

Table S.2 provides a complete breakdown and summary of the electric efficiency resource at Griffiss AFB.

TABLE S.1. Total Savings, Cost, and NPV (1993 \$)

<u>Total Present Value of Installed Cost</u>	<u>Total Present Value of Energy Savings</u>	<u>Total Present Value of Demand Savings</u>	<u>Total Present Value of O&M Savings</u>	<u>Total Present Value of All Savings</u>	<u>Total Present Value of Replacement Savings</u>	<u>Total Net Present Value</u>
\$9,204,794	\$14,141,787	\$6,393,271	\$2,663,917	\$24,554,865	\$1,355,890	\$15,350,072

TABLE S.2. Summary of the Electric Efficiency Resource at Griffiss AFB

Energy Resource Opportunity Category	Present Value of Installed Cost ^(a) (1993 \$)	Annual Energy Savings (kWh)	Value of Annual Energy Savings (1993 \$)	Annual Demand Savings (kW-mo)	Value of Annual Demand Savings (1993 \$)	Total Net Present Value (1993 \$)
Air-Conditioning	955,427	1,819,754	14,403	9,023	5,754	138,521
Lighting	6,866,701	15,405,153	783,891	34,599	185,855	11,488,000
Motors	1,037,081	2,164,992	116,278	5,195	30,100	1,668,305
Peak-Shave ^(b)	173,327	-9,117,023	-56,067	32,220	173,069	1,138,673
Trans. & Dist.	172,258	485,512	46,738	890	14,467	916,572
Total	\$9,204,794	10,758,388	\$905,244	81,827	\$409,246	\$15,350,072

(a) Analysis assumes no utility cost-sharing.

(b) The Peak-Shave calculations include fossil fuel costs and energy usage.

The Lighting ERO category has the greatest potential at Griffiss AFB. Lighting EROs alone represent over 75% of the potential reduction in electricity use identified in this study and include the replacement/retrofit of existing lighting equipment with T-8 bulbs, electronic ballasts, optical reflectors, high-pressure sodium and compact fluorescent fixtures, and occupancy sensors.

The use of energy-efficient motors and variable speed drives accounts for 11% of the kWh savings, and transmission and distribution EROs such as power factor correction and conservation voltage reduction account for 2.5% of total electrical savings.

Demand charges constitute approximately 20% of Griffiss AFB's monthly electric bill. These charges can be reduced by using existing emergency service diesel generators to carry part of the electric load whenever demand approaches the monthly peak. The most reliable and cost-effective way to accomplish this is to modify selected generators so that they can be used as a power source that can feed into Griffiss AFB's electrical distribution system. The Peak Shaving with Existing Diesel Generators ERO has a high NPV given the fuel oil prices (FY 1993) and electricity rates used in this analysis. However, the optimal amount of peak-shaving capacity is very sensitive to the price of fuel oil, which has been volatile in the past. In addition to closely monitoring fuel oil costs, cooperation with Niagra Mohawk is advised

when considering the implementation of this ERO. Currently, Niagara Mohawk does not offer inducements for customer-owned and operated "back-up" power sources; however, as a result of the least-cost planning approach being advocated by regulatory commissions, this load management alternative is becoming more common. It is possible that Niagara Mohawk may offer rate incentives for peak shaving with diesel generators in the future.

Table S.3 provides a breakdown and summary of the electric efficiency resource in the Rome Labs Buildings at Griffiss AFB. These buildings will likely remain Air Force property and retain Air Force tenants when the rest of the buildings are deactivated or put to other uses with base realignment. For this reason, the Rome Labs buildings and equipment were extracted from the whole base study.

TABLE S.3. Summary of the Electric Efficiency Resource in Rome Labs Buildings

<u>Energy Resource Opportunity Category</u>	<u>Present Value of Installed Cost (1993 \$)</u>	<u>Annual Energy Savings (kWh)</u>	<u>Value of Annual Energy Savings (1993 \$)</u>	<u>Annual Demand Savings (kW-mo)</u>	<u>Value of Annual Demand Savings (1993 \$)</u>	<u>Total Net Present Value (1993 \$)</u>
Air-Conditioning	498,236	1,300,250	4,276	6,936	2,352	68,293
Lighting	1,473,843	3,353,477	172,836	7,795	41,872	2,438,366
Motors	180,914	442,906	22,529	1,421	7,226	319,009
Trans. & Dist.	37,496	145,061	9,959	267	4,228	212,156
Total	\$2,190,489	5,241,685	\$209,627	16,420	\$55,679	\$3,037,824

(a) Analysis assumes no utility cost-sharing.

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1.0 SELECTION OF ENERGY RESOURCE OPPORTUNITIES

The number of conceivable energy conservation measures, fuel-switching opportunities, and renewable energy projects at a federal site is very large. A three-step process has been developed by PNL to make energy resource opportunity (ERO) selection, evaluation, and prioritization manageable. The steps are the following:

- Preliminary Screening. Select promising EROs from the master list, considering the site's mission, building stock, end-use equipment characteristics, utility characteristics, climate, energy costs, and other local conditions that affect ERO viability.
- Cost and Performance Analysis. Establish, with a reasonable degree of accuracy, the technical and economic feasibility of each ERO that passed the preliminary screening. An analysis is performed comparing the operating and economic performance of the existing equipment and the ERO. Where applicable, impacts on energy security and the environment are included in the analysis.
- Life-Cycle Cost Analysis and Prioritization. Perform a life-cycle cost analysis and rank EROs by net present value (NPV), so that a package with the optimal return on site and utility investment can be defined. Utility- and technology-specific incentives are accounted for in this evaluation step.

The third step, life-cycle cost (LCC) analysis and prioritization of EROs, is required by federal law (CFR 436, Part 10). Federal agencies are required to evaluate the life-cycle cost of potential energy investments. An LCC evaluation computes the long-term costs of a number of potential actions, and selects the action that minimizes the long-term costs and maximizes the NPV of the energy investment. Section 3.1 details the process by which LCCs are calculated, explains how these calculations are used in the selection of projects, and introduces the method for prioritizing a list of candidate EROs.

The remainder of Section 1 describes the process used for preliminary selection of EROs and presents the master list of screened and selected EROs. Section 2 covers the technical characteristics of each conservation and

fuel-switching^(a) measure considered and analyzes its cost and performance, and Section 3 provides the results of the life-cycle cost analysis and ERO prioritization process. Section 4 lists the references used in this study.

1.1 ERO PRELIMINARY SELECTION CRITERIA

The ERO selection process tests the applicability of a long list of EROs (see the master list of EROs in Table 1.1) using a set of criteria that can be applied with relatively little "hard data." This step filters out EROs that are unlikely to be economically feasible, are unlikely to have significant, persistent energy impact at the site, or that will be unduly expensive or difficult to analyze. The eight basic criteria used to characterize and select possible EROs are listed below.

- **Low Incidence.** EROs that apply to end-use equipment representing a very small fraction of site energy use may be eliminated. However, such EROs may be retained in cases where the end use is concentrated rather than diffuse, or where it has been previously identified in a detailed audit, and the ERO passes the other criteria without difficulty.
- **Economic Feasibility.** A preliminary assessment of economic feasibility can often be made if the utility will commit to an incentive or cost-sharing level in advance. Energy resource opportunities whose costs and performance are well established and fairly uniform across applications can then be screened with respect to the utility's marginal cost of energy supply.
- **Technical Feasibility.** In some cases, conditions at the site will preclude implementation of a certain ERO. Conditions that make retrofit difficult or use patterns that complicate operations or maintenance of the end-use equipment in question may result in elimination of an ERO prior to formal analysis.
- **Primarily Operations and Maintenance (O&M).** A measure that is a no- or low-cost change in O&M activity will usually be rejected as inappropriate to the integrated resource acquisition program. The measures of interest to the program are capital-intensive measures that are difficult, programmatically, for the site to implement on

(a) Fuel-switching measures are normally considered in the FEDS IRP process but were not considered at Griffiss AFB because the scope of the assessment was limited in the original statement of work to electric conservation and efficiency measures. Peak shaving by diesel generators is the only ERO that involves fuel-switching.

its own. Cases where there is a significant cost to develop new O&M procedures or to procure special instruments and tools may be considered.

- **Mission-Critical.** End-use equipment that serves critical mission functions may not be accessible for retrofit or replacement, or its operation may be so important to critical mission objectives that any reduction or change in the service is not tolerable.
- **Site Preference.** The site may have particular objections to certain EROs, based on O&M or other infrastructure support requirements, or based on unfavorable past experience with similar measures. In cases where the ERO appears to be very attractive in other respects, it may be analyzed in the belief that the savings might support a reevaluation of arguments against the measure.
- **Insufficient Data.** In some cases, the performance or operational characteristics of existing end-use equipment is unknown, and the cost for an outside consultant to determine these characteristics cannot be justified. This is not a technical- or implementation-cost grounded rejection and should not deter the resident site energy and O&M staff or local energy service company personnel from further analysis and, if appropriate, implementation of the ERO concerned.
- **Complexity.** In some cases the complexity of analysis eliminates an ERO as part of a high-level, comprehensive site assessment program.
- **Immature Technology.** Some retrofits require equipment that has not achieved sufficient market acceptance or penetration in the federal sector to be considered reliable and effective in the field. The persistence of savings and the sensitivity of savings to O&M, and the propensity for equipment to degrade in energy performance while continuing to provide service, are factors that could disqualify a technology. Such measures will usually not be considered.
- **Other ERO-Dependent Measures.** A measure may be rejected because it depends on other EROs that have been rejected or whose feasibility is too uncertain. It may also be rejected because it has already been implemented in most or all of the existing end-use opportunities.

1.2 MASTER LIST OF SCREENED AND SELECTED EROs

A master list of generic conservation measures, compiled from a variety of sources,^(a) was the starting point in the identification of energy resource opportunities at Griffiss AFB. This master list is presented in Table 1.1. For each ERO listed there is an indication of whether or not it passed the preliminary selection process. If the ERO did not pass, a brief explanation is provided.

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- (a) Institutional Conservation Program Workshop Manual, Energy Analysis and Diagnostic Center Directory of Industrial Energy Conservation Opportunities (ECOs), Competek Information Service, Pacific Gas & Electric Application Notes, Association of Energy Engineers boiler and motor books, American Council for an Energy Efficient Economy motor book, the Architect's and Engineer's Guide to Energy Conservation in Existing Buildings - Volume 2 (1990), and in-house expertise.

TABLE 1.1. Master List of Energy Resource Opportunities at Griffiss AFB

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
<u>FANS AND FAN MOTORS</u>			
Align sheaves	Align sheaves and shafts; replace belt with high efficiency belt(s)	N	This is primarily an O&M measure
Reduce hours	Install clock, EMCS switch or other control means to reduce operating hours	N	Use alternate ERO: CO ₂ sensors
Reduce speed	Reduce fan speed by adjusting sheave diameter and reduce motor size accordingly	N	Insufficient data
Efficient motor	Replace existing motor with high efficiency model and reduce size if appropriate	Y	
Two-speed motor	Replace existing motor with two-speed motor and controller	N	Use variable-speed drive instead
Variable inlet vane	Install variable inlet vanes and control to provide reduced air flow when appropriate	N	Most fans are single zone
Variable speed drive	Install variable frequency motor drive and control to modulate airflow; also reduce motor size if appropriate.	Y	
Variable-speed electronically commutated motor	Replace existing motor with variable speed electronically commutated permanent magnet motor and control; also reduce motor size if appropriate.	N	Use conventional variable-speed drive instead
CO ₂ sensor	Install CO ₂ sensors for ventilation control reduce heating of outside air and average (over time) air volume moved by fans.	N	Use generator peak-shaving instead
Duct transitions	Redesign duct transitions to reduce friction loss by using turning vanes, long radius turns and gradual changes in cross-sectional area.	N	No high SP systems; insufficient data on low SP systems
Duct cross-section	Increase duct cross-section to reduce friction loss	N	No high SP systems; insufficient data on low SP systems
Face velocity	Redesign filters, coils, etc. to reduce friction loss by operating at lower face velocities	N	No high SP systems; insufficient data on low SP systems
<u>PUMPS AND PUMP MOTORS</u>			
Align shafts	Align shafts and replace coupling with high efficiency coupling	N	This is primarily an O&M measure
Reduce hours	Install clock, EMCS switch or other control means to reduce operating hours	N	Most pumps operate on demand
Efficient motor	Replace motor with high efficiency model	Y	
Trim impeller	Replace (or trim) impeller and reduce motor size to match actual load	N	Insufficient data

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
Two-speed motor	Replace existing motor with two-speed motor and controller	N	Use variable-speed drive instead
Variable-speed drive	Install variable frequency motor drive and control to modulate fluid flow; also reduce motor size if appropriate.	Y	
Variable-speed, electronically commutated motor	Replace existing motor with variable speed electronically commutated permanent magnet (VS ECM) motor and control; also reduce motor size if appropriate.	N	Use conventional variable-speed drive instead
Adjust VSD setpoint	Adjust VSD control setpoint for lower speed operation	N	This is primarily an O&M measure
Pipe transitions	Redesign system with long radius elbows and other low-loss type fittings to reduce friction loss	N	Insufficient data
Pipe size	Redesign system with increased pipe diameter to reduce friction loss	N	Insufficient data
Fittings	Redesign filters, heat exchangers, valves, etc. to reduce friction loss by operating at lower velocity	N	Insufficient data
<u>REFRIGERATION (residential/barracks)</u>			
Efficient refrigerator (1993)	Replace existing refrigerator with high efficiency model meeting DOE 1993 Appliance Efficiency Standard	Y	
Efficient refrigerator (1996)	Replace existing refrigerator with high efficiency model meeting BPA proposed 1996 refrigerator efficiency standard	N	Technology not yet cost-effective
<u>AIR CONDITIONING (chiller or package units)</u>			
Efficient air-conditioner	Replace chiller or package air conditioner with high efficiency model	Y	
Reduce A/C hours	Install clock, EMCS switch or other control means to reduce operating hours and peak coincident load of air conditioner	N	Little data on wasteful (unoccupied) oprt'n
<u>LIFT STATION heating/ventilation</u>			
Thermostat	Replace on/off control of electric resistance heater control with thermostatic control	N	Insufficient resource
Ventilation heat recovery	Install air-to-air heat exchanger to preheat ventilation air by recovering sensible and latent heat from exhaust	N	Insufficient resource
Methane sensor control	Provide methane sensor to operate ventilation fan only when needed to prevent excess methane concentrations	N	Insufficient resource ERO

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
Insulate walls	Install moisture resistant insulation to above-grade walls and roof (consider this ERO only after thermostat and ventilation heat recovery or methane sensor)	N	Insufficient resource
<u>RESIDENTIAL LIGHTING (interior and exterior)</u>			
Upgrade incandescent to PCF fixture	Upgrade incandescent fixture to permanent compact fluorescent fixture	Y	
Replace incandescent with PCF fixture	Replace incandescent fixture with new compact fluorescent fixture	Y	
Upgrade fluorescent to T8	Upgrade fluorescent to high efficiency T8 or similar system	Y	
Replace fluorescent with new fixture	Replace fluorescent fixture with new high efficiency T8 (or comparable) fixture	Y	
<u>COMMERCIAL LIGHTING</u>			
Upgrade fluorescent to T8	Upgrade fluorescent fixture to high efficiency T8 or similar system	Y	
Replace fluorescent with new fixture	Replace fluorescent fixture with new high efficiency T8 (or comparable) fixture	Y	
De-lamp	Replace, modify or move/remove fixtures to reduce lighting density to level that provides correct illumination	N	Insufficient data
Upgrade incandescent to PCF fixture	Upgrade incandescent fixture to permanent compact fluorescent fixture	Y	
Replace incandescent with PCF fixture	Replace incandescent fixture with new compact fluorescent fixture	Y	
Upgrade mercury to HP sodium	Replace mercury vapor lamps and ballasts with high pressure sodium lamp and ballast (or replace entire fixture)	Y	
Upgrade incandescent exit signs	Upgrade incandescent exit signs with LED or fluorescent exit signs	N	More economical to replace whole unit
Replace incandescent exit signs	Replace incandescent exit signs with LED or fluorescent exit signs	Y	
Occupancy sensors	Install occupancy sensors to control lights	Y	
Time clocks or photocells	Install time clocks or photocells to control lights	N	Occupancy sensors preferred
EMCS control	Install EMCS or add field panel and necessary relays to control lights via EMCS system	N	Occupancy sensors preferred

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
<u>EXTERIOR LIGHTING</u>			
De-lamp	Remove or disconnect bulbs or ballasts to reduce lighting density to level that provides reduced but satisfactory illumination	N	High illumination needed for security
Install time clocks	Install programmable time clock to turn off or reduce light level at low traffic hours	N	Circuit made too costly
Series incandescent to HP sodium	Replace series incandescent street lamps with high pressure sodium lamp and ballast (or replace entire fixture)		
Mercury to HP sodium	Replace mercury vapor lamps and ballasts with high pressure sodium lamp and ballast (or replace entire fixture)	Y	
Incandescent to HP sodium	Replace incandescent fixture with high pressure sodium fixture	Y	
<u>OCCUPANCY BASED CONTROLS (see also FAN, HVAC)</u>			
Occupancy sensor, restroom	Install occupancy sensor to control lights and exhaust fan in restroom	Y	
Occupancy sensor, other	Install occupancy sensor to control lights in hallway, lunchroom, office, conference room, or other intermittently occupied area	Y	
Daylight sensor	Install daylight sensor to control lights in hall, foyer, or other area that has windows and low ambient light requirement	N	Areas too small
Daylight sensor, security	Install daylight sensor to control security light(s) in area that has windows	N	Resource too small
Night setback	Install timeclock to schedule fan, thermostat setpoint, and air-conditioner operation	N	Existing EMCS controls
CO ₂ sensor control	Install CO ₂ sensor to control air-handler and ventilation fans	N	Insufficient data
Countdown timer	Install countdown timer to control air-handler and ventilation fans during normally unoccupied hours; typical scheme allows up to 2 hours fan operation, then has to be set again if occupant is still present	N	Occupants on fixed schedules
Occupied mode via EMCS	Implement unoccupied schedules for fans and air-conditioning via EMCS; override during normally unoccupied hours by, e.g., phoned in code	N	Existing EMCS control

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
<u>ELECTRIC DEMAND CONTROL</u>			
Water heater control	Install controls to shed electric water heater loads in rotating blocks during peak demand periods	N	Few units at site
Shed A/C loads	Install controls to shed air-conditioning loads in rotating blocks during peak demand periods	N	Use generators to peak-shave instead
Well pump control	Transfer lift station and well pumps to emergency generators during peak	N	Insufficient resource
Run motors at low speed	Install controls to operate existing variable speed pumps and fans at low speed during peak demand periods	N	Insufficient data
Peak shave generator loads	Install controls to automatically transfer existing diesel generator loads to generator power during peak demand periods	N	Loads tolerant to frequent switchover are small
Feed grid from generators	Install controls and switches to feed existing generator output to grid; operate during high demand periods to reduce peak demand	Y	
<u>DOMESTIC WATER HEATING</u>			
Efficient heater	Replace water heater with high efficiency (well insulated) model	N	Few electric units
Tank insulation	Add insulating blanket to provide additional tank insulation	N	Insufficient resource
Tankless heater	Replace tank type electric resistance heater with instant/tankless unit	N	Insufficient resource
Low-flow shower heads	Low-flow shower head restricts the volume of water passing through	N	Not Applicable
Lower hot water temperature	Reduced water temperature reduces energy lost in various hot water consuming processes including showers, dishwashers, laundries, etc.	N	No specific application identified during site assessment
A/C desuperheater	Recover heat from air conditioner by installing water cooled desuperheater and controls	N	Efficient A/C ERO instead
Refrigeration desuperheater	Recover heat from refrigerators by installing water cooled desuperheater and controls	N	Too few units
<u>TRANSMISSION AND DISTRIBUTION</u>			
Phase balance	Improve phase balance of feeders and main transformers by moving loads among phases	N	Phase imbalance being corrected in system upgrade
Efficient transformers	Replace transformers with high efficiency models and reduce size when appropriate	Y	

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
Reduce transformer size	Reduce transformer size to match load thus reducing standby loss and reactive power	N	Insufficient data
Baseload transformer	Add smaller high efficiency baseload transformer and automatic switching equipment to switch out existing substation transformer except under heavy load	N	Insufficient experience with ERO
Conservation voltage reduction	Reduce set-point on auto-tap-changing transformer to just maintain minimum acceptable voltage at end of worst-case feeder	Y	
CVR with remote sensing	Add voltage transducers at end of worst-case feeder(s) to control voltage more accurately to minimum acceptable level	N	Insufficient data
Passive power factor correction	Install capacitor banks to provide passive power factor correction	N	Reconsider after lighting & motor retrofits
Switched power factor correction	Install capacitor banks, power factor transducers and automatic switches to provide active power factor correction	N	Reconsider after lighting & motor retrofits
<u>RESIDENTIAL HVAC</u>			
Efficient furnace motor	Replace furnace fan motor with high efficiency motor	N	Insufficient resource
2-speed furnace motor	Replace furnace fan motor w/2-speed motor	N	Insufficient resource
Efficient air-conditioner	Replace air-conditioner with high efficiency unit	Y	
Efficient heat pump	Replace heat pump with high efficiency unit	N	No existing units
Heat pump	Replace electric resistance heat with heat pump	N	No existing units
<u>RESIDENTIAL APPLIANCES</u>			
Efficient washer	Replace clothes washer with high efficiency (water miser) unit	N	Tenant owned
Efficient dryer	Replace clothes dryer with high efficiency unit	N	Tenant owned
Efficient dishwasher	Replace dishwasher with high efficiency (water miser) dishwasher	N	Technology in flux
Microwave oven	Provide microwave oven to reduce use of convection oven	N	Insufficient data on cooking end-use

TABLE 1.1. (contd)

<u>ERO Name</u>	<u>ERO Description</u>	<u>Evaluated (Y/N)</u>	<u>Comment</u>
<u>FREEZE PROTECTION BY HEAT TAPE</u>			
Thermostat	Provide thermostatic control (especially water storage tanks) of resistance heaters to eliminate continuous operation	N	Insufficient data
Insulate	Add insulation to pipes and tanks that have thermostatically controlled resistance heaters	N	Temperature set point too low
<u>CHILLERS</u>			
Repair check valves	Repair leaking check valves in lead-lag pumps	N	Insufficient data
Condenser water reset	Add controls to reset condenser water temperature on outdoor temperature	N	Efficient pkg chillers instead
Chilled water reset	Add controls to reset chilled water temperature on chiller load	N	Efficient pkg chillers instead
Parallel compressors	Add smaller, efficient compressor to obtain efficient operation under light to moderate load	N	
Efficient chiller	Replace chiller with high efficiency unit	Y	
<u>PACKAGE HVAC (including split units)</u>			
Expansion valve control	Install improved expansion valve control; Replace capillary tube if necessary	N	Efficient A/C ERO instead
Improve liquid return	Replace liquid return with larger line or install hermetic pump ("liquid pressure amplification")	N	insufficient data on split systems
Parallel compressors	Add smaller, efficient compressor to obtain efficient operation under light to moderate load	N	light cooling loads/few units
Efficient new unit	Replace package or split unit with high efficiency unit	Y	
Precooling/reheating heat pipe for latent load	Install heat pipe to reduce coil load while maintaining latent capacity by precooling mixed air and reheating supply air	N	Latent loads are moderate
<u>SWIMMING POOLS</u>			
Heat pump dehumidification	Install dehumidifying heat pump to reduce ventilation load of enclosed pool	N	ventilation air required to support roof

2.0 ENERGY RESOURCE OPPORTUNITY EVALUATIONS

The results of the analyses of EROs are presented within seven common energy end-use categories. A narrative description of each ERO is provided, including information on the initial cost, energy and dollar savings, impacts on operations and maintenance and, when applicable, a discussion of energy supply and demand, energy security, and environmental issues. A brief description of the evaluation methodology, including technical and cost assumptions, is given and reference is made, when appropriate, to details of the evaluation methodology contained in an appendix or other FEMP report.

At the end of each section the basic physical, performance and operational characteristics of energy end-use equipment associated with each ERO are compiled in a table. The characteristics of both existing and post-retrofit equipment are presented. The ERO table also provides the results of a life-cycle cost analysis, including the net present value (NPV) and savings to investment ratio (SIR), for each ERO. The NPV of an ERO is the present value of future savings^(a) with respect to the existing situation minus the initial cost of the ERO. Any ERO that has a positive NPV is said to be life-cycle cost effective, i.e., the benefits of implementing the ERO exceed the costs. The SIR of an ERO is the present value of future savings with respect to the existing situation divided by the initial cost of the ERO. By this definition,^(b) an ERO with an SIR greater than one is life-cycle cost effective and has an NPV greater than zero. The SIR indicates return on investment and is thus an appropriate metric for ranking EROs.

Individual EROs were generally evaluated as mutually exclusive measures. Exceptions include occupancy sensors, a measure that was evaluated with both current and recommended lighting configurations, and variable-speed drives, which were evaluated with both existing and premium efficiency motors. This

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- (a) The PV of future savings with respect to the existing situation is equal to the PV of all future costs associated with an ERO minus the present value of all future costs of the existing situation.
 - (b) An equally useful alternate definition is net SIR = NPV/initial cost; an ERO is LCC effective when its NSIR is greater than zero. Note that NSIR = SIR - 1.

approach allows individual EROs to be ranked or rated based on parameters such as SIR, initial cost, NPV, energy savings, and changes in operations and maintenance (O&M) requirements. In addition, this evaluation approach permits direct economic comparison of competing EROs.

2.1 AIR CONDITIONER AND CHILLER EROs

2.1.1 Replace Air Conditioners and Chillers with New Efficient Units

The characteristics of existing air conditioners and chillers are based on information gathered from the Recurring Work Program (RWP) database and the Real Property List. The method for developing an air conditioning equipment inventory and the primary cooling energy consumption estimates is presented in Volume 2, Appendix A, along with the resulting inventory and consumption estimates. The energy and demand savings developed here are based on the difference in coefficient of performance (COP) between new, high-efficiency replacement equipment and the existing equipment.

Description

Seventy-nine buildings with significant air conditioning loads have been identified at Griffiss AFB. Energy and demand savings can be realized by replacing the existing air conditioning equipment with new high-efficiency equipment. In addition, Air Force regulations require the elimination of CFC refrigerants in the future. New equipment is available with non-CFC refrigerants to meet these regulations with efficiencies comparable to the best CFC based models. New equipment efficiency and cost estimates are based on the results of a survey of manufacturers and equipment conducted as part of the FEDS Level 1 software (Dirks 1993) development.

Assumptions

Technical assumptions are as follows:

- Existing units have efficiencies based on equipment type and age as described in Volume 2, Appendix A.
- New unit efficiencies are as follows:

<u>Equipment Type</u>	<u>Description</u>	<u>COP</u>
1	Small Centrifugal (200-500 ton)	5.86
2	Large Centrifugal (500-1200 ton)	5.17
3	Small Reciprocating (20-75 ton)	2.85
4	Large Reciprocating (75-200 ton)	3.63
6	Small Package (1.5-20 ton)	2.45
7	Large Package (20-150 ton)	2.63
8	Room/Window (0.5-5 ton)	2.4

- Equipment operating hours are based on the full load equivalent operating hours as defined in Volume 2, Appendix A. Commercial buildings with 800 or less FLE hours were assumed to consume 5/7 (weekdays) of their energy during peak periods and 2/7 (weekends) during off peak periods. Buildings that operate 7 days a week (DG/RETAIL, GROCERY, BARRACK, etc.) or have extended FLE hours (COMCATN(f6), SIMULTR, R&D, etc.) were assumed to have 65% on-peak hours and 35% off-peak hours to account for additional usage on weekends and nights. Identical operating hours were assumed for existing and replacement equipment. Note that when other EROs are implemented the required capacities of many of the units will be reduced. This will result in lower energy costs and lower first costs.
- Replacement equipment will have the same O&M requirements as the existing equipment.
- The service life of the replacement equipment is twenty years; the average remaining service life of existing equipment is ten years.

Cost to implement the ERO are as follows:

- First cost of replacing equipment, including material and installation, is given in terms of capacity (in MBtu) as shown in the following table (Dirks 1993).

<u>Equipment Type</u>	<u>First Cost Equation</u>
1	$52404.9 * (\text{Cap.})^{0.673846}$
2	$52404.9 * (\text{Cap.})^{0.673846}$
3	$13130.72e^{1.469094 * (\text{Cap.})}$
4	$2346.001 + 49563.57 * (\text{Cap.})$
6	$272.6239 + 68357.43 * (\text{Cap.})$
7	$92082.77 * (\text{Cap.})^{0.514841}$
8	$151731.1 * (\text{Cap.})^{0.698877}$

Results

Qualitative results of the ERO analysis appear in Table 2.1. The table contains specific energy, cost, and economic data for each piece of A/C equipment considered for replacement. Some of the equipment listed in Volume 2, Appendix A, is not shown here since it is too new for cost-effective replacement. The ID number in the table is the building number containing the listed equipment type.

Budget Implications. The estimated initial cost of replacing all of the air conditioning equipment with a positive NPV is \$955,427.

Energy and Cost Savings. It is estimated that this ERO will result in an annual energy savings of 1,819,754 kWh at a value of \$97,226. Demand savings will be 9,023 kW at a value of \$49,715. These estimates are based on 100% implementation of all equipment with a positive NPV for a typical operating year.

Operations and Maintenance Impacts. The new equipment is assumed to require the same O&M as the existing equipment. Therefore, there is no change in the O&M budget due to this ERO.

Energy Security. The security of energy supply and distribution to Griffiss AFB will not be affected by implementation of this ERO.

Environmental Issues. Implementation of this ERO should remove a majority of the air conditioning-based CFCs from the base. This is in accordance with Air Force regulations. Disposal of these CFCs will need to be addressed before implementation.

TABLE 2.1. Efficient Air Conditioner/Chiller EROs

Existing A/C characteristics and operating parameters

ID	Existing Equipment			Operating Schedule			Equiv months on-peak	Energy Consumption		Sum of 12 Monthly Coincident Demands (kW-mo)	
	A/C Type	COP	Rating Ton	Total FLE hrs	Hrs on-peak	Hrs off-peak		on-peak	off-peak	on-peak	off-peak
1	1	3.82	132	800	571	229	4.5	69,443	27,777	547	NA
1	1	3.82	185	800	571	229	4.5	97,325	38,930	766	NA
1	4	2.30	75	800	571	229	4.5	65,531	26,213	516	NA
1	6	2.18	3	800	571	229	4.5	2,766	1,106	22	NA
1	6	2.37	10	800	571	229	4.5	8,479	3,392	67	NA
1	6	2.39	10	800	571	229	4.5	8,406	3,363	66	NA
1	6	2.37	15	800	571	229	4.5	12,719	5,088	100	NA
1	6	2.39	15	800	571	229	4.5	12,613	5,045	99	NA
1	6	2.37	10	800	571	229	4.5	8,479	3,392	67	NA
1	7	2.33	23	800	571	229	4.5	19,406	7,763	153	NA
2	4	2.72	100	800	571	229	4.5	73,974	29,590	583	NA
2	4	2.30	100	800	571	229	4.5	87,375	34,950	688	NA
2	6	2.18	35	800	571	229	4.5	32,265	12,906	254	NA
2	6	2.37	15	800	571	229	4.5	12,733	5,093	100	NA
3	2	2.93	1,420	1,500	975	525	8	1,661,804	894,817	13,635	NA
3	4	2.72	220	1,500	975	525	8	277,680	149,520	2,278	NA
3	4	2.66	155	1,500	975	525	8	198,666	106,985	1,630	NA
3	6	2.31	6	1,500	975	525	8	8,926	4,806	73	NA
3	6	2.30	2	1,500	975	525	8	2,976	1,604	24	NA
14	3	2.00	40	800	571	229	4.5	40,193	16,077	317	NA
14	6	2.18	15	800	571	229	4.5	13,828	5,531	109	NA
14	6	2.04	16	800	571	229	4.5	15,743	6,297	124	NA
19	6	2.18	5	800	571	229	4.5	4,609	1,844	36	NA
40	3	2.00	60	800	571	229	4.5	60,289	24,116	475	NA
42	6	2.18	5	800	571	229	4.5	4,609	1,844	36	NA
44	3	2.45	25	800	520	280	4.5	18,661	10,048	161	NA
45	6	2.32	20	800	520	280	4.5	15,762	8,496	137	NA
100	6	2.18	40	800	571	229	4.5	36,674	14,750	290	NA
100	6	2.18	4	800	571	229	4.5	3,667	1,475	29	NA
101	6	2.19	53	800	571	229	4.5	48,579	19,432	363	NA
102	3	2.50	40	800	571	229	4.5	32,154	12,662	253	NA
104	4	2.30	100	800	571	229	4.5	87,375	34,950	688	NA
104	6	2.18	18	800	571	229	4.5	16,593	6,637	131	NA
106	4	2.30	400	800	571	229	4.5	349,501	139,800	2,752	NA
106	6	2.18	115	800	571	229	4.5	106,013	42,405	635	NA
106	6	1.75	14	800	571	229	4.5	16,077	6,431	127	NA
112	4	2.72	115	800	571	229	4.5	85,070	34,028	670	NA
112	4	2.30	120	800	571	229	4.5	104,850	41,940	826	NA
112	6	2.18	174	800	571	229	4.5	160,402	64,161	1,263	NA
112	6	2.18	3	800	571	229	4.5	2,766	1,106	22	NA
112	6	2.08	1	800	571	229	4.5	966	387	6	NA
115	3	2.60	25	800	571	229	4.5	17,943	7,177	141	NA
119	3	2.00	60	800	520	280	4.5	54,863	29,542	475	NA
119	6	2.22	17	800	520	280	4.5	14,020	7,549	121	NA
119	6	2.18	5	800	520	280	4.5	4,194	2,259	36	NA
120	6	2.21	3	500	357	143	4.5	1,709	684	22	NA
123	4	2.30	100	800	571	229	4.5	87,375	34,950	688	NA
131	6	2.18	3	800	571	229	4.5	2,766	1,106	22	NA
133	3	2.75	40	3,000	1,950	1,050	8	99,751	53,712	409	NA
133	6	2.42	17	3,000	1,950	1,050	8	46,720	25,157	182	NA
133	6	2.42	17	3,000	1,950	1,050	8	46,135	25,919	197	NA
143	6	2.18	35	800	520	280	4.5	29,361	15,610	254	NA
144	6	2.18	25	600	429	171	4.5	17,265	6,914	181	NA
150	3	2.55	20	800	571	229	4.5	15,762	6,305	124	NA
212	3	2.00	40	800	429	171	4.5	30,144	12,056	317	NA
240	1	3.82	325	1,500	975	525	8	291,729	157,085	2,394	NA
240	4	2.72	220	1,500	975	525	8	277,680	149,520	2,278	NA
240	6	2.18	309	1,500	975	525	8	486,028	261,707	3,968	NA
240	6	2.23	18	1,500	975	525	8	27,677	14,903	227	NA
240	6	1.75	37	1,500	975	525	8	72,497	39,037	595	NA
247	4	2.30	226	800	571	229	4.5	199,216	79,666	1,569	NA
247	6	2.18	45	800	571	229	4.5	41,483	16,593	327	NA

TABLE 2.1. (contd)

Existing A/C characteristics and operating parameters

ID	Existing Equipment			Operating Schedule			Equiv months on-peak	Energy Consumption		Sum of 12 Monthly Coincident Demands (kW-mo)	
	A/C Type	COP	Rating Ton	Total FLE hrs	Hrs on-peak	Hrs off-peak		on-peak	off-peak	on-peak	off-peak
272	6	2.18	25	800	520	280	4.5	20,972	11,293	181	NA
272	8	1.75	9	800	520	280	4.5	9,405	5,084	81	NA
301	4	3.50	80	800	571	229	4.5	45,934	18,374	362	NA
301	6	2.18	3	800	571	229	4.5	2,766	1,106	22	NA
301	6	2.18	10	800	571	229	4.5	9,218	3,667	73	NA
301	6	2.39	10	800	571	229	4.5	8,397	3,359	66	NA
302	6	2.18	67	800	571	229	4.5	61,784	24,706	486	NA
311	6	2.39	4	800	571	229	4.5	3,383	1,345	26	NA
311	6	2.35	4	800	571	229	4.5	3,421	1,368	27	NA
311	7	2.51	40	800	571	229	4.5	31,684	12,793	252	NA
324	3	2.00	40	2,000	1,300	700	12	91,438	49,236	844	NA
324	6	2.19	10	2,000	1,300	700	12	20,972	11,293	194	NA
329	6	2.33	10	800	520	280	4.5	7,849	4,226	66	NA
346	4	2.55	100	800	520	280	4.5	71,716	36,616	621	NA
400	6	2.18	35	800	571	229	4.5	32,265	12,906	254	NA
428	6	2.23	25	800	571	229	4.5	22,529	9,012	177	NA
428	8	1.75	1	800	571	229	4.5	1,146	459	9	NA
439	3	2.07	39	800	571	229	4.5	37,924	15,169	299	NA
439	6	2.21	11	800	571	229	4.5	10,025	4,010	79	NA
443	4	3.30	100	800	520	280	4.5	55,417	29,840	480	NA
446	6	2.28	4	1,000	650	350	8	4,010	2,159	49	NA
447	6	2.28	4	1,000	650	350	8	4,010	2,159	49	NA
482	3	2.17	25	800	571	229	4.5	23,188	9,275	183	NA
504	4	2.30	80	800	571	229	4.5	69,900	27,960	550	NA
504	6	2.32	13	800	571	229	4.5	11,273	4,509	89	NA
510	1	3.91	325	1,000	650	350	8	190,009	102,313	2,339	NA
510	7	2.40	235	1,000	650	350	8	224,144	120,693	2,759	NA
520	6	2.18	20	800	571	229	4.5	18,437	7,375	145	NA
700	4	2.80	266	3,000	1,950	1,050	8	651,497	350,806	2,673	NA
700	6	2.35	5	3,000	1,950	1,050	8	14,591	7,857	60	NA
704	6	2.40	3	800	520	280	4.5	2,286	1,231	20	NA
712	6	2.39	6	800	520	280	4.5	4,565	2,489	40	NA
712	6	2.39	2	800	520	280	4.5	1,528	823	13	NA
724	6	2.23	57	800	520	280	4.5	46,744	25,170	405	NA
745	6	2.18	10	800	520	280	4.5	8,389	4,517	73	NA
750	6	2.42	5	800	571	229	4.5	4,149	1,859	33	NA
767	6	2.32	1	800	520	280	4.5	769	425	7	NA
770	6	2.18	35	800	571	229	4.5	32,265	12,906	254	NA
774	3	2.00	40	800	571	229	4.5	40,193	16,077	317	NA
774	6	2.18	34	800	571	229	4.5	31,343	12,537	247	NA
774	6	2.33	3	800	571	229	4.5	2,586	1,035	20	NA
776	6	2.37	10	800	571	229	4.5	8,479	3,392	67	NA
776	7	2.33	200	800	571	229	4.5	172,501	69,000	1,356	NA
776	6	2.18	10	800	571	229	4.5	9,218	3,667	73	NA
778	8	1.91	26	800	571	229	4.5	27,320	10,928	215	NA
780	6	2.18	50	800	571	229	4.5	46,092	18,437	363	NA
780	6	2.33	5	800	571	229	4.5	4,313	1,725	34	NA
789	3	2.00	30	800	571	229	4.5	30,144	12,058	237	NA
789	4	2.30	200	800	571	229	4.5	174,751	69,900	1,376	NA
789	6	2.18	15	800	571	229	4.5	13,828	5,531	109	NA
793	4	2.30	150	800	520	280	4.5	119,267	64,221	1,032	NA
796	4	2.80	150	3,000	1,950	1,050	8	367,366	197,823	1,507	NA
799	8	1.98	2	800	520	280	4.5	1,850	996	16	NA
814	6	2.18	7	800	571	229	4.5	6,453	2,581	51	NA
817	6	2.18	21	800	429	171	4.5	14,519	5,808	152	NA
819	8	1.75	1	500	357	143	4.5	718	287	9	NA
820	6	2.32	5	800	520	280	4.5	3,946	2,125	34	NA
821	4	2.30	75	800	429	171	4.5	49,149	19,659	516	NA
823	6	2.28	13	800	429	171	4.5	6,594	3,436	90	NA
829	6	2.22	15	800	429	171	4.5	10,195	4,076	107	NA
866	6	2.40	5	800	571	229	4.5	4,193	1,677	33	NA
917	4	2.30	160	800	429	171	4.5	104,850	41,940	1,101	NA
917	7	2.51	120	800	429	171	4.5	71,963	28,765	756	NA

TABLE 2.1. (contd)

Efficient A/C characteristics and operating parameters

ID	Energy Resource Opportunity			Operating Schedule			Equiv months on-peak	Energy Consumption		Sum of 12 Monthly Coincident Demands (kW-mo)	
	A/C Type	COP	Rating Ton	Total FLE hrs	Hrs on-peak	Hrs off-peak		on-peak	off-peak	on-peak	off-peak
1	1	5.86	132	800	571	229	4.5	45,266	18,107	356	NA
1	1	5.86	185	800	571	229	4.5	63,444	25,378	500	NA
1	4	3.63	75	800	571	229	4.5	41,521	16,609	327	NA
1	6	2.45	3	800	571	229	4.5	2,461	984	19	NA
1	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
1	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
1	6	2.45	15	800	571	229	4.5	12,294	4,918	97	NA
1	6	2.45	15	800	571	229	4.5	12,294	4,918	97	NA
1	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
1	7	2.63	23	800	571	229	4.5	17,193	6,677	135	NA
2	4	3.63	100	800	571	229	4.5	55,377	22,151	436	NA
2	4	3.63	100	800	571	229	4.5	55,377	22,151	436	NA
2	6	2.45	38	800	571	229	4.5	28,709	11,484	226	NA
2	6	2.40	15	800	571	229	4.5	12,560	5,024	99	NA
3	2	5.17	1,420	1500	975	525	8	941,796	507,121	7,728	NA
3	4	3.63	220	1500	975	525	8	207,814	111,900	1,705	NA
3	4	3.63	155	1500	975	525	8	146,455	76,660	1,202	NA
3	6	2.45	8	1500	975	525	8	8,397	4,522	89	NA
3	6	2.40	2	1500	975	525	8	2,857	1,539	23	NA
14	3	2.85	40	800	571	229	4.5	28,176	11,270	222	NA
14	6	2.45	15	800	571	229	4.5	12,294	4,918	97	NA
14	6	2.40	18	800	571	229	4.5	13,398	5,359	108	NA
19	6	2.45	5	800	571	229	4.5	4,098	1,639	32	NA
40	3	2.85	60	800	571	229	4.5	42,264	16,905	333	NA
42	6	2.45	5	800	571	229	4.5	4,098	1,639	32	NA
44	3	2.85	25	800	520	280	4.5	16,025	6,629	139	NA
45	6	2.45	20	800	520	280	4.5	14,917	6,032	129	NA
100	6	2.45	40	800	571	229	4.5	32,810	13,124	258	NA
100	6	2.45	4	800	571	229	4.5	3,278	1,311	26	NA
101	6	2.45	53	800	571	229	4.5	43,474	17,389	342	NA
102	3	2.85	40	800	571	229	4.5	28,176	11,270	222	NA
104	4	3.63	100	800	571	229	4.5	55,362	22,145	436	NA
104	6	2.45	18	800	571	229	4.5	14,765	5,908	116	NA
106	4	3.63	400	800	571	229	4.5	221,447	88,579	1,744	NA
106	6	2.45	115	800	571	229	4.5	94,330	37,732	743	NA
106	6	2.40	14	800	571	229	4.5	11,723	4,689	92	NA
112	4	3.63	115	800	571	229	4.5	63,684	25,473	502	NA
112	4	3.63	120	800	571	229	4.5	66,452	26,581	523	NA
112	6	2.45	174	800	571	229	4.5	142,725	57,090	1,124	NA
112	6	2.45	3	800	571	229	4.5	2,459	984	19	NA
112	6	2.40	1	800	571	229	4.5	837	335	7	NA
115	3	2.85	25	800	571	229	4.5	17,610	7,044	139	NA
119	3	2.85	60	800	520	280	4.5	38,500	20,731	333	NA
119	6	2.45	17	800	520	280	4.5	12,689	6,833	110	NA
119	6	2.45	5	800	520	280	4.5	3,729	2,008	32	NA
120	6	2.40	3	800	357	143	4.5	1,570	628	20	NA
123	4	3.63	100	800	571	229	4.5	55,362	22,145	436	NA
131	6	2.45	3	800	571	229	4.5	2,459	984	19	NA
133	3	2.85	40	3000	1,950	1,050	8	96,150	51,773	394	NA
133	6	2.45	17	3000	1,950	1,050	8	48,186	24,869	189	NA
133	6	2.45	17	3000	1,950	1,050	8	47,546	25,602	195	NA
143	6	2.45	35	800	520	280	4.5	26,104	14,056	226	NA
144	6	2.45	25	800	429	171	4.5	15,367	6,147	161	NA
150	3	2.85	20	800	571	229	4.5	14,103	5,641	111	NA
212	3	2.85	40	800	429	171	4.5	21,154	8,482	222	NA
240	1	5.86	325	1500	975	525	8	190,171	102,400	1,560	NA
240	4	3.63	220	1500	975	525	8	207,814	111,900	1,705	NA
240	6	2.45	309	1500	975	525	8	432,485	232,866	3,548	NA
240	6	2.45	18	1500	975	525	8	25,172	13,554	207	NA
240	6	2.40	37	1500	975	525	8	52,863	26,465	434	NA
247	4	3.63	228	800	571	229	4.5	126,280	50,504	994	NA
247	6	2.45	45	800	571	229	4.5	36,881	14,753	290	NA

TABLE 2.1. (contd)

Efficient A/C characteristics and operating parameters

ID	Energy Resource Opportunity			Operating Schedule			Equiv months on-peak	Energy Consumption		Sum of 12 Monthly Coincident Demands (kW-mo)	
	A/C Type	COP	Rating Ton	Total FLE hrs	Hrs on-peak	Hrs off-peak		on-peak	off-peak	on-peak	off-peak
272	6	2.45	25	800	520	280	4.5	18,648	10,040	181	NA
272	8	2.40	9	800	520	280	4.5	8,858	3,893	59	NA
301	4	3.63	80	800	571	229	4.5	44,302	17,721	349	NA
301	6	2.45	3	800	571	229	4.5	2,459	984	19	NA
301	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
301	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
302	6	2.45	67	800	571	229	4.5	54,912	21,865	432	NA
311	6	2.45	4	800	571	229	4.5	3,278	1,311	26	NA
311	6	2.45	4	800	571	229	4.5	3,278	1,311	26	NA
311	7	2.63	40	800	571	229	4.5	30,611	12,245	241	NA
324	3	2.85	40	2000	1,300	700	12	84,187	34,552	582	NA
324	6	2.45	10	2000	1,300	700	12	18,661	10,048	172	NA
329	6	2.45	10	800	520	280	4.5	7,458	4,018	65	NA
346	4	3.63	100	800	520	280	4.5	50,383	27,135	436	NA
400	6	2.45	35	800	571	229	4.5	28,709	11,484	226	NA
428	6	2.45	25	800	571	229	4.5	20,480	8,196	161	NA
428	8	2.40	1	800	571	229	4.5	837	335	7	NA
439	3	2.85	39	800	571	229	4.5	27,600	11,000	217	NA
439	6	2.45	11	800	571	229	4.5	9,023	3,609	71	NA
443	4	3.63	100	800	520	280	4.5	50,383	27,135	436	NA
446	6	2.45	4	1000	650	350	8	3,732	2,010	46	NA
447	6	2.45	4	1000	650	350	8	3,732	2,010	46	NA
482	3	2.85	25	800	571	229	4.5	17,628	7,051	139	NA
504	4	3.63	80	800	571	229	4.5	44,302	17,721	349	NA
504	6	2.45	13	800	571	229	4.5	10,655	4,282	84	NA
510	1	5.86	325	1000	650	350	8	126,781	68,267	1,560	NA
510	7	2.63	235	1000	650	350	8	204,256	109,985	2,514	NA
520	6	2.45	20	800	571	229	4.5	16,405	6,562	129	NA
700	4	3.63	266	3000	1,950	1,050	8	502,671	270,669	2,062	NA
700	6	3.63	5	3000	1,950	1,050	8	9,446	5,066	39	NA
704	6	2.45	3	800	520	280	4.5	2,237	1,205	19	NA
712	6	2.45	6	800	520	280	4.5	4,475	2,410	39	NA
712	6	2.45	2	800	520	280	4.5	1,492	803	13	NA
724	6	2.45	57	800	520	280	4.5	42,512	22,891	368	NA
745	6	2.45	10	800	520	280	4.5	7,458	4,018	65	NA
750	6	2.45	5	800	571	229	4.5	4,096	1,639	32	NA
767	6	2.45	1	800	520	280	4.5	746	402	6	NA
770	6	2.45	35	800	571	229	4.5	28,686	11,474	226	NA
774	3	2.85	40	800	571	229	4.5	28,205	11,282	222	NA
774	6	2.45	34	800	571	229	4.5	27,889	11,156	220	NA
774	6	2.45	3	800	571	229	4.5	2,459	984	19	NA
776	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
778	7	2.63	200	800	571	229	4.5	153,056	61,223	1,205	NA
778	6	2.45	10	800	571	229	4.5	8,196	3,278	65	NA
778	6	2.40	26	800	571	229	4.5	21,771	8,708	171	NA
780	6	2.45	50	800	571	229	4.5	40,979	16,392	323	NA
780	6	2.45	5	800	571	229	4.5	4,096	1,639	32	NA
789	3	2.85	30	800	571	229	4.5	21,154	8,462	167	NA
789	4	3.63	200	800	571	229	4.5	110,723	44,269	872	NA
789	6	2.45	15	800	571	229	4.5	12,304	4,922	97	NA
793	4	3.63	150	800	520	280	4.5	75,590	40,702	654	NA
796	4	3.63	150	3000	1,950	1,050	8	283,481	152,633	1,163	NA
799	6	2.40	2	800	520	280	4.5	1,524	821	13	NA
814	6	2.45	7	800	571	229	4.5	6,737	2,295	45	NA
817	6	2.45	21	800	429	171	4.5	12,919	5,168	136	NA
819	6	2.40	1	500	357	143	4.5	523	209	7	NA
820	6	2.45	5	800	520	280	4.5	3,732	2,010	32	NA
821	4	3.63	75	800	429	171	4.5	31,141	12,456	327	NA
823	6	2.45	13	800	429	171	4.5	7,991	3,196	64	NA
829	6	2.45	15	800	429	171	4.5	9,220	3,666	97	NA
866	6	2.45	5	800	571	229	4.5	4,096	1,639	32	NA
917	4	3.63	180	800	429	171	4.5	66,434	26,574	698	NA
917	7	2.63	120	800	429	171	4.5	66,771	27,508	722	NA

TABLE 2.1. (contd)

Efficient A/C ERO economics

ID	A/C Type	First Cost (\$)	Non-Energy O&M		Life (yr)	Salvage (\$)	First Year Energy & Demand Savings					Life Cycle Cost	
			Before (\$/yr)	After (\$/yr)			Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV \$	SIR
1	1	71,448	NA	NA	20	0	33,844	180	1,840	1,049	2,889	(2,277)	0.97
1	1	89,983	NA	NA	20	0	47,434	267	2,879	1,470	4,049	(2,483)	0.97
1	4	46,963	NA	NA	20	0	33,814	180	1,828	1,042	2,869	(563)	0.99
1	6	2,733	NA	NA	20	0	427	2	23	13	36	(158)	0.94
1	6	8,478	NA	NA	20	0	387	2	22	12	34	(1,637)	0.81
1	6	8,478	NA	NA	20	0	298	2	18	9	28	(2,173)	0.74
1	6	12,577	NA	NA	20	0	585	3	32	18	81	(2,428)	0.81
1	6	12,577	NA	NA	20	0	448	3	24	14	38	(3,223)	0.74
1	6	8,478	NA	NA	20	0	387	2	22	12	34	(1,637)	0.81
1	7	46,927	NA	NA	20	0	3,089	17	188	86	285	(3,088)	0.83
2	4	61,822	NA	NA	20	0	26,036	148	1,418	807	2,223	(14,283)	0.77
2	4	61,822	NA	NA	20	0	44,788	252	2,438	1,388	3,824	(887)	0.99
2	6	28,983	NA	NA	20	0	4,978	28	271	154	428	(1,842)	0.84
2	8	4,577	NA	NA	20	0	241	1	13	7	21	(2,132)	0.83
3	2	354,184	NA	NA	20	0	1,107,704	8,808	88,174	32,852	91,728	83,141	1.18
3	4	133,194	NA	NA	20	0	107,487	573	5,742	3,189	8,901	(8,580)	0.96
3	4	94,534	NA	NA	20	0	80,385	429	4,283	2,381	6,664	(2,248)	0.98
3	6	5,194	NA	NA	20	0	813	4	43	24	87	(303)	0.94
3	8	1,120	NA	NA	20	0	186	1	10	6	15	(363)	0.88
14	3	26,579	NA	NA	20	0	16,824	95	918	521	1,438	(500)	0.98
14	6	12,577	NA	NA	20	0	2,147	12	117	87	183	(714)	0.84
14	8	4,788	NA	NA	20	0	3,283	18	178	102	280	(89)	0.99
19	6	4,374	NA	NA	20	0	716	4	39	22	81	(251)	0.84
40	3	37,815	NA	NA	20	0	25,236	142	1,372	782	2,184	(804)	0.98
42	6	4,374	NA	NA	20	0	716	4	39	22	81	(251)	0.84
44	3	20,403	NA	NA	20	0	4,055	23	217	126	342	(9,474)	0.84
46	6	16,878	NA	NA	20	0	1,332	7	71	41	112	337	1.02
100	6	33,084	NA	NA	20	0	5,888	32	308	176	486	(1,874)	0.84
100	6	3,584	NA	NA	20	0	573	3	31	18	49	(204)	0.94
101	6	43,748	NA	NA	20	0	7,148	40	389	222	610	(2,509)	0.84
102	3	26,579	NA	NA	20	0	5,570	31	303	173	475	(13,085)	0.81
104	4	61,822	NA	NA	20	0	44,819	252	2,437	1,389	3,826	(895)	0.99
104	6	16,038	NA	NA	20	0	2,680	14	139	79	219	(884)	0.84
106	4	240,251	NA	NA	20	0	179,276	1,008	9,747	5,556	15,304	(2,283)	0.99
106	6	94,806	NA	NA	20	0	16,356	92	889	507	1,396	(5,351)	0.84
106	8	4,382	NA	NA	20	0	6,086	34	331	189	520	192	1.04
112	4	70,744	NA	NA	20	0	29,841	166	1,628	828	2,556	(18,235)	0.77
112	4	73,718	NA	NA	20	0	53,757	302	2,823	1,688	4,589	(803)	0.99
112	6	143,003	NA	NA	20	0	24,748	138	1,348	787	2,113	(8,088)	0.84
112	6	2,733	NA	NA	20	0	429	2	23	13	37	(158)	0.94
112	8	680	NA	NA	20	0	184	1	10	6	18	(34)	0.95
115	3	20,403	NA	NA	20	0	487	3	25	14	40	(17,785)	0.13
119	3	37,815	NA	NA	20	0	25,173	142	1,345	780	2,125	(832)	0.98
119	6	14,218	NA	NA	20	0	2,047	12	109	63	173	(840)	0.84
119	6	4,374	NA	NA	20	0	716	4	38	22	80	(251)	0.84
120	8	1,486	NA	NA	20	0	184	2	11	10	20	(248)	0.83
123	4	61,822	NA	NA	20	0	44,819	252	2,437	1,389	3,826	(895)	0.99
131	6	2,733	NA	NA	20	0	429	2	23	13	37	(158)	0.94
133	3	26,579	NA	NA	20	0	5,540	15	298	81	377	(18,531)	0.30
133	6	13,807	NA	NA	20	0	821	2	44	12	56	(6,472)	0.53
133	6	14,218	NA	NA	20	0	808	2	48	13	62	(6,638)	0.53
143	6	28,983	NA	NA	20	0	5,011	28	268	155	423	(1,844)	0.84
144	6	20,780	NA	NA	20	0	2,884	20	146	111	257	(1,223)	0.84
150	3	18,682	NA	NA	20	0	2,323	13	126	72	198	(11,095)	0.41
212	3	26,579	NA	NA	20	0	12,587	84	684	520	1,204	(722)	0.97
240	1	131,117	NA	NA	20	0	156,242	833	8,347	4,591	12,938	3,164	1.02
240	4	133,194	NA	NA	20	0	107,487	573	5,742	3,189	8,901	(6,580)	0.96
240	6	253,742	NA	NA	20	0	82,403	439	4,402	2,422	6,824	(11,392)	0.98
240	6	15,038	NA	NA	20	0	3,855	21	208	113	319	(757)	0.95
240	8	6,603	NA	NA	20	0	30,207	181	1,814	885	2,501	1,797	1.21
247	4	137,952	NA	NA	20	0	102,138	575	5,553	3,188	8,719	(1,377)	0.99
247	6	37,186	NA	NA	20	0	6,442	36	360	200	550	(2,102)	0.84

TABLE 2.1. (contd)

Efficient A/C ERO economics

ID	A/C Type	First Cost (\$)	Non-Energy O&M		Life (yr)	Salvage (\$)	First Year Energy & Demand Savings				Total (1992 \$)	Life Cycle Cost	
			Before (\$/yr)	After (\$/yr)			Energy (kWh)	Demand (kW-me)	Energy (1992 \$)	Demand (1992 \$)		NPV \$	IRR
272	8	20,780	NA	NA	20	0	3,879	20	181	111	302	(1,180)	0.84
272	8	3,203	NA	NA	20	0	3,919	22	208	121	331	91	1.03
301	4	48,827	NA	NA	20	0	2,288	13	124	71	188	(40,806)	0.19
301	8	2,733	NA	NA	20	0	429	2	23	13	37	(158)	0.84
301	8	8,478	NA	NA	20	0	1,432	8	78	44	122	(482)	0.84
301	8	8,478	NA	NA	20	0	281	2	18	9	24	(2,871)	0.88
302	8	55,232	NA	NA	20	0	8,882	84	822	297	818	(3,120)	0.84
311	8	3,584	NA	NA	20	0	119	1	8	4	10	(813)	0.74
311	8	3,584	NA	NA	20	0	189	1	11	6	17	(481)	0.87
311	7	83,108	NA	NA	20	0	1,821	11	104	80	184	(8,448)	0.87
324	3	28,878	NA	NA	20	0	41,888	282	2,241	1,387	3,628	1,808	1.08
324	8	8,478	NA	NA	20	0	3,888	21	180	118	307	(304)	0.88
328	8	8,478	NA	NA	20	0	801	3	32	19	81	(581)	0.84
348	4	81,822	NA	NA	20	0	32,808	188	1,782	1,017	2,798	(4,888)	0.82
400	8	28,883	NA	NA	20	0	4,878	28	271	184	428	(1,842)	0.84
428	8	20,780	NA	NA	20	0	2,888	18	188	88	244	(1,238)	0.84
428	8	880	NA	NA	20	0	438	2	24	13	37	(13)	0.88
438	3	28,114	NA	NA	20	0	14,883	82	783	482	1,248	(880)	0.88
438	8	8,288	NA	NA	20	0	1,404	8	78	44	120	(542)	0.84
443	4	81,822	NA	NA	20	0	7,728	43	413	240	882	(41,372)	0.33
448	8	3,584	NA	NA	20	0	428	3	23	12	42	(211)	0.84
447	8	3,584	NA	NA	20	0	428	3	23	19	42	(211)	0.84
482	3	20,403	NA	NA	20	0	7,784	44	423	241	884	(1,578)	0.82
504	4	48,827	NA	NA	20	0	35,838	202	1,848	1,111	3,088	(881)	0.88
504	8	10,838	NA	NA	20	0	888	5	47	27	74	222	1.02
510	1	131,117	NA	NA	20	0	87,274	778	8,188	4,288	9,484	28,483	1.22
510	7	187,031	NA	NA	20	0	30,884	248	1,834	1,348	2,883	(8,242)	0.88
520	8	18,878	NA	NA	20	0	2,848	18	188	88	243	(847)	0.84
700	4	180,883	NA	NA	20	0	228,884	811	12,231	3,384	15,888	28,188	1.18
700	8	4,374	NA	NA	20	0	7,818	21	423	118	538	410	1.08
704	8	2,733	NA	NA	20	0	78	0	4	2	8	(1,170)	0.87
712	8	5,184	NA	NA	20	0	188	1	9	5	14	(1,838)	0.88
712	8	1,813	NA	NA	20	0	88	0	3	2	8	(808)	0.88
724	8	47,028	NA	NA	20	0	8,511	37	348	202	588	(2,788)	0.84
748	8	8,478	NA	NA	20	0	1,432	8	78	44	121	(483)	0.84
780	8	4,374	NA	NA	20	0	71	0	4	2	8	(2,127)	0.81
787	8	1,083	NA	NA	20	0	87	0	4	2	8	17	1.02
770	8	28,883	NA	NA	20	0	5,011	28	272	188	428	(1,838)	0.84
774	3	28,878	NA	NA	20	0	18,782	84	812	520	1,433	(503)	0.88
774	8	28,182	NA	NA	20	0	4,838	27	283	180	413	(1,888)	0.84
774	8	2,733	NA	NA	20	0	180	1	10	8	18	(178)	0.83
778	8	8,478	NA	NA	20	0	387	2	22	12	34	(1,837)	0.81
778	7	144,820	NA	NA	20	0	27,222	153	1,480	844	2,324	(7,881)	0.84
778	8	8,478	NA	NA	20	0	1,432	8	78	44	122	(482)	0.84
778	8	8,723	NA	NA	20	0	7,788	44	422	241	883	182	1.02
780	8	41,287	NA	NA	20	0	7,188	40	388	222	811	(2,334)	0.84
780	8	4,374	NA	NA	20	0	300	2	18	9	28	(288)	0.83
788	3	22,283	NA	NA	20	0	12,887	71	884	380	1,074	(843)	0.88
788	4	121,288	NA	NA	20	0	88,838	804	4,874	2,778	7,682	(1,228)	0.88
788	8	12,577	NA	NA	20	0	2,133	12	118	88	182	(718)	0.84
783	4	81,880	NA	NA	20	0	87,188	378	3,880	2,083	5,872	(1,024)	0.88
788	4	81,880	NA	NA	20	0	128,118	344	8,887	1,887	8,788	13,848	1.18
788	8	1,120	NA	NA	20	0	801	3	27	18	42	(38)	0.87
4	8	8,018	NA	NA	20	0	1,002	8	54	31	88	(343)	0.84
8	8	17,488	NA	NA	20	0	2,240	17	122	83	214	(1,032)	0.84
8	8	880	NA	NA	20	0	272	2	18	13	28	(22)	0.87
8	8	4,374	NA	NA	20	0	328	2	18	10	28	83	1.02
8	8	48,883	NA	NA	20	0	25,211	188	1,371	1,042	2,413	(1,002)	0.88
8	8	10,838	NA	NA	20	0	844	8	48	35	81	(888)	0.84
8	8	12,577	NA	NA	20	0	1,388	10	74	58	131	(784)	0.84
8	8	4,374	NA	NA	20	0	132	1	7	4	11	(1,828)	0.83
8	8	808	NA	NA	20	0	83,783	403	2,824	2,223	5,147	(1,880)	0.88
8	8	11,088	NA	NA	20	0	4,488	34	243	188	428	(14,812)	0.87
958,427							1,818,784	8,023	87,228	48,718	148,841	138,821	

2.2 BUILDING LIGHTING EROs

About 34% of the electrical energy supplied to Griffiss AFB is used for lighting in and around buildings. Few of the existing lamps, ballasts, and light fixtures are as efficient as currently available cost-effective lamps, ballasts, and fixtures. A number of fixture retrofit and fixture replacement EROs are therefore evaluated in this section. In some cases, energy can also be saved by installing occupancy sensors.

Nine groups of EROs for building interior lighting are discussed in this section. Streetlighting and building exterior lighting EROs are discussed in Section 2.3.

Data and Assumptions Common to All Lighting EROs

Data and assumptions that pertain to individual lighting EROs are presented in the ERO analysis subsections (Sections 2.2.1 through 2.2.9). Data and assumptions that apply to most or all of the EROs are presented here for convenient reference.

- **Occupancy Schedules.** The building types defined in Volume 2, Baseline Detail, were combined into eight groups. The building types within each group have similar occupancy schedules. The groups are defined by building type below, and the buildings assigned to each building type are listed in Appendix A.

Group A: Barracks and Chapels.^(a)

Group B: Administration, Communications, Medical Facilities, Shops, Security, Training, and Warehouses.

Group C: Recreation, Grocery, and Dry Goods/Retail.

Group D: Dining, Clubs, and Restaurants.

Group G: Family Housing.

Group H: Bldg. 700 and Flight Simulators.

Group I: R&D (except Bldg. 112).

(a) Chapels have a unique occupancy schedule but because the aggregate energy use of chapels is relatively small, they were grouped with barracks--which have similar on- and off-peak annual operating hours--to keep the number of categories manageable.

Group J: Hangars.

- **Operating Hours.** The hours of operation of interior lights were determined by building type group based on information gathered from the site and summarized in the following table. The "percent on" numbers indicate the average fraction of lights turned on during occupied and unoccupied hours.

Operation Parameter	Building Type Group							
	A	B	C	D	E	H	I	J
Hours On-Peak Occupied	2,038	3,057	3,566	3,057	1,528	3,566	3,057	3,566
Hours Off-Peak Occupied	2,232	916	1,544	2,053	2,487	5,194	1,137	4,852
Percent on (occupied)	40%	63%	69%	73%	40%	90%	85%	79%
Hours On-Peak Unoccupied	1,528	509	0	509	2,038	0	509	0
Hours Off-Peak Unoccupied	2,962	4,278	3,650	3,141	2,707	0	4,057	342
Percent on (unoccupied)	5%	18%	12%	10%	5%	0%	18%	0%

- **PNL Lighting Matrix.** The first costs of fixture upgrades (either replacement or retrofit) that are feasible for a given type of existing fixture are determined using data from the PNL Lighting Technology Screening Matrix computer program (Dirks et al. 1992). The per-fixture wattage and maintenance requirements for each existing and post-retrofit configuration are also determined using the PNL Lighting Matrix database.
- **Fixture Modification versus Fixture Replacement.** Fixtures can be upgraded by replacing selected parts (ballast, lamp, reflector, or lens) or by replacing the entire fixture. The former approach (replacement of selected parts) will be referred to as "retrofit," the latter as "replacement," and both as a fixture "upgrade." The best route for a given upgrade is generally determined by the relative costs in the PNL Lighting Matrix except when site-specific (usually implementation labor or maintenance related) conditions dictate otherwise.
- **Fixture Type and Quantity.** The existing fixture inventory was estimated for each building type. The lighting in the majority of the buildings could not be rigorously established within the scope of this project. Estimates of the existing lighting stock were therefore developed in the following manner. Lamp counts were estimated from the lamp replacement records (see Volume 2, Appendix B) using the lamp count, average lamp life, and the estimated operating hours for each building type group. The number of lamps in each group and the breakdown of fixtures for each lamp type were calculated from ratios developed by walk-through audits of similar

buildings at Griffiss AFB. The results of the breakdown were compared to the lighting EUI and adjustments were made to equate the lighting EUI total and the lamp/fixture breakdown total.

With this information, prototypical fixture counts for each building type were calculated and extrapolated to the aggregate floor area of all buildings of each type. This approach assumes that all of the buildings of a given type have the same fixture types, distribution, and use. Several building types were not included because no information was available. It is believed that the omitted buildings, as a group, represent a relatively small fraction of the total lighting energy. Thus, the numbers in the accompanying tables are not exact but are believed to reasonably characterize existing lighting on the site and the potential for efficiency improvements with available technologies.

- Existing Ballasts. The ballasts used in all existing fluorescent fixtures are standard 60-Hz inductive ballasts.
- Light Levels. Existing light levels are adequate or more than adequate for the visual activities conducted in a space unless otherwise noted. The retrofit fixtures will provide the same lighting level, or slightly less, and are, in all cases, intended to meet or exceed minimum applicable federal standards. The lumen equivalence of replacement fixtures or retrofit packages cannot be determined exactly from the nominal fixture characteristics due to variations in fixture design and the lighting environment and task requirements. The ability of a given upgrade to provide adequate level and quality of light should be field-checked in typical applications before proceeding with a large-scale retrofit.
- Salvage Value. The salvage value for used fixtures is small at best and has been assumed to be zero. Actual salvage value will be reflected in the cost proposals of competitive energy services contractor (ESCO) bidders. It is essential to the project's long-term success that the old fixtures be removed from the site to prevent their being re-installed for any reason and the inefficient use of electric power that would result.
- Maintenance Costs. Maintenance cost savings are expressed as annualized values. Relamping costs that might occur every 5 years in the 25-year life of an ERO are converted to a present value, and the present value is then converted to a uniform series of yearly costs. Maintenance savings are due chiefly to longer lamp lives (e.g., HPS and fluorescent lamps have a much longer life than standard incandescent) that result in lower annual lamp replacement costs. In cases where the retrofit maintenance cost is only slightly less than the existing maintenance cost, the savings are taken to be zero. This results in a slightly conservative assessment of NPV and resource potential.

- Penetration of EROs. Unless otherwise stated, all feasible retrofits (100% penetration) are assumed to be implemented in the resource assessments for each ERO.

Non-Energy Effects Common to All ERO Implementations

Except in the few cases where additional impacts will be explicitly mentioned, the following statements of maintenance, energy security, and environmental impact apply.

- Operations and Maintenance. The replacement or retrofit of incandescent fixtures results in reduced maintenance. All other fixture upgrades result in post-retrofit maintenance requirements that are identical or nearly identical to existing maintenance requirements. Non-energy O&M costs are reported as annualized values based on all expected maintenance costs over the analysis period of 25 years.

The operation of lighting systems generally will not be affected in any way by implementation of any of the EROs.

An additional unmeasured benefit of the fixture replacement and retrofit EROs is that conversion to standard lighting systems over the entire site eliminates the need to have multiple types of tubes, ballasts, etc., on hand for repair or replacement. For example, it is recommended that T-8 retrofit parts and replacement fixtures be stocked in sufficient quantity to replace the existing fixtures of the type covered in this ERO- but not upgraded in this implementation--as their lamps, ballasts or other hardware fail. This will eliminate the need to stock the variety of lamps and ballasts used in the older systems and will result in all fixtures eventually being upgraded with minimal administrative effort.

- Annualized O&M costs reported in tables depend on the operating characteristics (hours of operation) of the lights in question. Thus the same fixture type may have a different annualized O&M cost from one table to the next, based on its hours of operation.
- Energy Security. None of the lighting EROs have significant impact on energy security.
- Environmental Impact. There are no negative environmental impacts associated with any of the lighting EROs, with the possible exception of the fluorescent fixture upgrades that will involve ballast disposal. In general, implementing lighting EROs will decrease the need for electricity that may be produced from sources that have environmental impacts. All lighting EROs are environmentally beneficial in this respect.

The disposal of PCB-bearing ballasts may have to be addressed. It is not known how many, if any, PCB-bearing ballasts exist at Griffiss AFB.

If virtually all fluorescent ballasts are targeted for replacement as recommended in this ERO, a beneficial side effect will be that proper disposal of ballasts can be assured as part of the implementation program. Disposal cost for a PCB bearing ballast is about \$6 per ballast in quantities of 100.

ERO Table Formats

The results of the energy and economic analysis are presented in Tables 2.2 through 2.9. The results for occupancy sensors, Table 2.10, have been presented differently because of the sensitivity of the outcome to 1) connected load per sensor and 2) cost uncertainties. The occupancy sensor zones have been enumerated by fixture type and number of fixtures to reduce errors due to the first sensitivity and facilitate reassessment (to reduce errors due to the second sensitivity) by ESCOs based on their costs. Only one outcome is reported per fixture type and number-per-zone enumeration, because there is only one best combination of fixture retrofit and occupancy sensor for each enumeration.

2.2.1 Upgrade Lighting in Barracks and Assembly (Group A) Buildings

Description

This ERO consists of replacing or retrofitting lighting fixtures in Barracks and Assembly Buildings. In some cases the existing fixture can be modified to accept the new tubes, ballast, and reflector. In other cases, due to fixture type, age, etc., the entire fixture must be replaced.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following assumptions apply:

Cost estimates are based on the following standard costs taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 4x50W PAR	Retrofit	4xCFL 11 INTEGRAL w/ REF	84.00	12.92
INC 60W CEIL	Replace	CFL 15 CEIL FIXT.	57.63	3.08
INC 2x60W CEIL	Replace	CFL 2x15 CEIL FIXT.	66.10	7.84
INC 75 W CEIL	Replace	CFL 2x11W CEIL FIXT.	66.10	4.83
INC 2x75W CEIL	Replace	CFL 2x15W CEIL FIXT.	66.10	7.84
INC wY CEIL	Replace	CFL 2x11W CEIL FIXT.	66.10	4.83
INC 100W CEIL	Replace	CFL 2x15W CEIL FIXT.	66.10	7.84
INC 150W CEIL	Replace	CFL 2x15W CEIL FIXT.	66.10	7.84
INC 150W FLD	Replace	HPS 50W FLD	111.00	7.14
INC 150W SPOT	Replace	HPS 50W	111.00	7.14
FL 24" T-12 20W	No Retrofit			
FL 22W CIRC	No Retrofit			
FL 2x4 1-40 STD	No Retrofit			
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	0.72
FL 2x4 3-40 STD	Retrofit	FL 2x4 2-T8 ELC REF	147.73	0.72
FL 2x4 4-40 STD	Retrofit	FL 2x4 4-T8 ELC	113.65	1.45
FL 1x8 2-96 STD	Retrofit	FL 1x8 2-96 ELC	89.62	2.48
INC 2x25W EXIT	Replace	LED	151.93	0.00

Results

The quantitative results of this lighting ERO assessment appear in Table 2.2. The table contains specific energy, cost, and economic evaluation information for each fixture type included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$458,850. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 762,713 kWh per year at a cost savings of \$38,609. Demand savings are estimated to be 1,879 kW per year with a cost savings of \$10,356. These estimates are based on 100% implementation of the ERO for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$13,381 per year.

2.2.2 Upgrade Lighting Fixtures in Commercial Buildings (Group B)

Description

The majority of the fixtures in commercial buildings are combinations of 4 foot, 40W fluorescents. There are a number of incandescent in lobbies,

mechanical spaces, and older buildings. Also, there are some large (200W-300W) incandescent in some of the warehouse areas.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following cost data for this ERO are as follows:

Cost estimates are based on the following standard costs taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 2X50W CEIL	Retrofit	2xCFL 11 INTEG. w/REF	42.00	12.58
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	9.31
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	9.31
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	14.72
INC 150W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	14.72
INC 150W FLD	Replace	HPS 50 FLD	111.00	15.04
INC 150W SPOT	Replace	HPS 50 FLD	111.00	15.04
INC 200W PEND	Replace	HPS 50 PEND	153.00	5.24
INC 300W PEND	Replace	HPS 70 PEND	153.00	5.24
INC 60W T-8	No Retrofit			
FL 18" T-8	No Retrofit			
FL 15" 1-12	No Retrofit			
FL 2x4 1-40 STD	Retrofit	FL 2x4 1-T8 ELC	63.83	1.71
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	2.54
FL 2x4 3-40 STD	Retrofit	FL 2x4 2-T8 ELC	147.73	2.54
FL 2x4 4-40 STD	Retrofit	FL 2x4 3-T8 ELC	184.52	3.87
FL 2x4 6-40 STD	Retrofit	FL 2x4 4-T8 ELC	191.04	4.70
FL 1x8 2-96 STD	Retrofit	FL 1x8 2-96 ELC	89.62	5.85
INC 2x25W EXIT	Replace	LED	151.93	0.00

Results

The quantitative results of this lighting ERO assessment appear in Table 2.3. The table contains specific energy, cost, and economic evaluation information for each fixture type included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$3,176,575. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 6,206,539 kWh per year at a cost

savings of \$326,903. Demand savings are estimated to be 13,934 kW per year with a cost savings of \$76,778. These estimates are based on 100% implementation.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$82,163 per year.

2.2.3 Upgrade Fixtures in DG/Retail, Grocery, Recreation (Group C) Buildings

Description

The majority of the lighting in Group C buildings was determined to be two tube 40W fluorescents and 75W incandescent (track lighting in BX).

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following data pertain to the analysis of this ERO:

Cost estimates are based on the following standard costs taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 60W CEIL	Replace	CFL 15 CEIL FIXT.	57.63	9.45
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	14.31
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	14.31
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	22.41
INC 150W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	22.41
INC 150W FLD	Replace	HPS 50 FLD	111.00	24.00
INC 150W SPOT	Replace	HPS 50 FLD	111.00	24.00
FL 2x4 1-40 STD	Retrofit	FL 2x4 1-T8 ELC	63.83	3.77
FL 2x4 4-40 STD	Retrofit	FL 2x4 3-T8 ELC REF	184.52	7.82
FL 1x8 2-96 STD	Retrofit	FL 1x8 2-96 ELC	185.01	10.60
INC 2x25 EXIT	Replace	LED	151.93	0.00

Results

Quantitative results of the analysis of this lighting ERO are presented in Table 2.4. The table contains specific energy and cost estimates for each fixture type or lighting consumption area included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$676,356. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 1,825,739 kWh per year at a cost savings of \$97,156. Demand savings are estimated to be 3,908 kW per year with a cost savings of \$21,533. These estimates are based on 100% implementation of the ERO for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$24,099 per year.

2.2.4 Upgrade Fixtures in Clubs, Restaurants and Dining Halls (Group D)

Description

The existing light fixtures are mostly 75W incandescent and two tube 40W fluorescent.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following assumptions apply.

Cost estimates are based on the following standard costs taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	11.57
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	11.57
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	18.19
INC 150W FLD	Replace	HPS 50 FLD	111.00	19.07
INC 150W SPOT	Replace	HPS 50 FLD	111.00	19.07
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	3.73
FL 2x4 3-40 STD	Retrofit	FL 2x4 2-T8 ELC REF	147.73	3.73
FL 2x4 4-40 STD	Retrofit	FL 2x4 3-T8 ELC REF	184.52	5.64
FL 1x8 2-96 STD	Retrofit	FL 1x8 2-60 ELC REF	185.01	7.94
INC 2x25 EXIT	Replace	LED	151.93	0.00

Results

The quantitative results of this lighting ERO assessment appear in Table 2.5. The table contains specific energy, cost, and economic evaluation information for each fixture type or lighting consumption area included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$314,914. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 726,007 kWh per year at a cost savings of \$37,784. Demand savings are estimated to be 1,551 kW per year with a cost savings of \$8,546. These estimates are based on 100% implementation of the ERO for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$9,960 per year.

2.2.5 Upgrade Light Fixtures in Family Housing (Group G)

Description

This ERO consists of retrofitting or replacing most of the interior incandescent fixtures in family housing units with compact fluorescent fixtures. Compact fluorescent systems offer similar light quality (IES 1981) at substantial energy savings. A variety of compact fluorescent systems exist on the market today. A retrofit kit that uses a "hard-wired" ballast/socket element is preferable to a screw-in ballast/socket because it eliminates the old incandescent lamp socket, reducing material costs and ensuring the continued use (and savings) of compact fluorescent technology at lamp replacement time; it may also reduce the incidence of theft.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the technical data pertaining to this ERO are as follows:

- The existing lighting stock consists primarily of ceiling fixtures. The compact fluorescent replacements are one- or two-lamp kits using 9- or 13-watt lamps.

Cost estimates are based on the following standard costs taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 2x40W CEIL	Replace	CFL 15 CEIL FIXT.	57.63	2.86
INC 2x50W FLD	Retrofit	2xCFL 11 INTEG. W/REF	42.00	6.08
INC 60W CEIL	Replace	CFL 15 CEIL FIXT.	57.63	2.86
INC 2x60W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	7.33
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	4.49
INC 2x75W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	7.33
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	4.49
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	7.33
INC 150W FLD	Replace	HPS 50 FLD	111.00	6.65
INC 150W SPOT	Replace	HPS 50 FLD	111.00	6.65
FL 18" T-8	No Retrofit			
FL 24" T-12	No Retrofit			
FL 2x4 1-40 STD	Retrofit	FL 2x4 1-T8 ELC	63.83	0.33
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	0.67
FL 2x4 4-40 STD	Retrofit	FL 2x4 4-T8 ELC	113.65	1.34

Results

The quantitative result of this lighting ERO assessment appears in Table 2.6. The table contains specific energy, cost, and economic evaluation information for each fixture type or lighting consumption area included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$423,402. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 810,606 kWh per year at a cost savings of \$40,153. Demand savings are estimated to be 2,111 kW per year with a cost savings of \$11,631. These estimates are based on 100% implementation of the ERO for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$16,720 per year. This value represents savings if the lamps are replaced by Base personnel and not occupants.

2.2.6 Upgrade Fixtures in Building 700 and Simulators (Group H)

Description

Building 700 and the flight simulators are characterized by 24 hr/day operation and are therefore treated separately in this ERO. Distribution of fixture types is similar to Group B buildings.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following data are also pertinent to this ERO:

Cost elements from the PNL Lighting Matrix are given below.

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	23.06
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	23.06
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	35.94
INC 80W T-8	No Retrofit			
FL 2x4 1-40 STD	Retrofit	FL 2x4 1-T8 ELC	63.83	7.55
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	9.88
FL 2x4 3-40 STD	Retrofit	FL 2x4 2-T8 ELC REF	147.73	9.88
FL 2x4 4-40 STD	Retrofit	FL 2x4 3-T8 ELC REF	184.52	14.97
INC 2x25W EXIT	Replace	LED	151.93	0.00

Results

Quantitative results of the analysis of this lighting ERO are presented in Table 2.7. The table contains specific energy, cost, and economic evaluation information for each fixture type included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$149,659. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The energy savings from the ERO are estimated to be 686,950 kWh per year at a cost savings of \$34,232. Demand savings are estimated to be 941 kW per year with a cost savings of \$5,185. Estimates are based on 100% implementation.

Operations and Maintenance. Maintenance cost savings for this ERO are \$4,032 per year due to the reduced lamp replacement rate.

2.2.7 Upgrade Light Fixtures in R&D Building Types (Group I)

Description

Research and development buildings are characterized by high light levels and extended operating hours compared with other commercial building types. The R&D buildings were therefore segregated into a separate ERO group.

Assumptions

In addition to the general assumptions stated at the beginning of Section 2.2, the following assumptions apply.

Cost estimates are based on the following standard cost elements taken from the PNL Lighting Technology Screening Matrix (Dirks et al. 1992):

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 75W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	12.38
INC 90W CEIL	Replace	CFL 2-11 CEIL FIXT.	66.10	12.38
INC 100W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	19.45
INC 150W CEIL	Replace	CFL 2-15 CEIL FIXT.	66.10	19.45
INC 150W FLD	Replace	HPS 50 FLD	111.00	20.69
INC 150W SPOT	Replace	HPS 50 FLD	111.00	20.69
INC 200W PEND	Replace	HPS 50 PEND	153.00	7.88
INC 300W PEND	Replace	HPS 70 PEND	153.00	7.88
FL 18" T-8	No Retrofit			
FL 15" T-12	No Retrofit			
FL 2x4 1-40 STD	Retrofit	FL 2x4 1-T8 ELC	63.83	3.03
FL 2x4 2-40 STD	Retrofit	FL 2x4 2-T8 ELC	70.34	4.20
FL 2x4 3-40 STD	Retrofit	FL 2x4 2-T8 ELC REF	147.73	4.20
FL 2x4 4-40 STD	Retrofit	FL 2x4 3-T8 ELC REF	184.52	6.36
FL 1x8 2-96 STD	Retrofit	FL 1x8 2-60 ELC REF	185.01	8.82
INC 2x25 EXIT	Replace	LED	151.93	0.00

Results

The quantitative results of this lighting ERO assessment appear in Table 2.8. The table contains specific energy and cost data for each fixture type or lighting consumption area included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$1,473,843. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the ERO are estimated to be 3,353,328 kWh per year at a cost savings of \$177,307. Demand savings are estimated to be 7,795 kW per year with a cost savings of \$42,948. These estimates are based on 100% implementation of the ERO for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$35,682 per year.

2.2.8 Upgrade Light Fixtures in Hangars (Group J)

Description

Hangar buildings are lit mainly by High Intensity Discharge (HID) fixtures. These include high- and low-pressure sodium, mercury vapor and metal halide. Before HID fixtures were widely available, the hangars were lit by large (750 W) incandescent fixtures. The remaining incandescents should be upgrade to HPS. Of the HID fixtures, mercury vapor is the most inefficient. HPS fixtures with comparable light output are about 50% more efficient than mercury vapor. This makes a mercury vapor to HPS fixture retrofit attractive.

Assumptions

- Fixture counts were taken from blueprints of building 101 and lighting design data provided by R. Petkovsek on building 100.
- Cost data were derived from manufacturers' and distributors' data and Means (1992). Cost elements used in the analysis follow:

<u>Existing Fixture</u>	<u>Action</u>	<u>ERO Item Description</u>	<u>Installation Material and Labor (\$)</u>	<u>Annualized O&M Cost (\$/yr)</u>
INC 750W PEND	Replace	HPS 200 PEND	159.00	16.82
MERC 400 PEND	Replace	HPS 200 PEND	159.00	16.82

Results

The quantitative results of this lighting ERO assessment appear in Table 2.9. The table contains specific energy, cost, and economic evaluation information for each fixture type are included in the ERO.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$23,055. This includes the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. Energy savings for the ERO are estimated to be 308,570 kWh per year at a cost savings of \$15,452. Demand savings are estimated to be 440 kW per year with a cost savings of \$2,424. Estimates are based on 100% implementation.

Operations and Maintenance Impacts. Maintenance cost savings for this ERO are estimated to be \$9,933 per year due to reduced lamp replacement.

2.2.9 Occupancy Sensors in Small Offices and Restrooms

In many work spaces (offices, stock rooms, work bays, etc.), lights are left on all day. Often lights are left on by occupants who plan on being gone only for a few minutes or want to assure others that they are "in." It is well established that a net savings will accrue any time that incandescent or fluorescent lights can be turned off for more than a fraction of a minute.^(a) The long-term costs of reduced lamp, ballast, and switch life are more than offset by the accumulated energy savings.

Description

The control of interior lighting by occupancy sensors will reduce energy consumption in the buildings analyzed here. One-of-a-kind buildings may also represent a significant potential for savings by occupancy sensors but are not included in the analysis due to lack of data.

Wall (switch plate) or ceiling-mounted sensors are considered, depending on the type, size, and application of the room or space. Occupancy-sensing switches are designed to detect occupant motion typical of the office environment but they can be adjusted for sensitivity and turn-off delay time to ensure proper performance in almost any work area.

(a) NCEL, "Turn off the lights," (energy) Tech Data Sheet 80-01 by William Pierpoint, Naval Civil Engineering Laboratory, Port Hueneme, CA 93043 (Jan. 1980).

This ERO consists of installing occupancy sensors in small offices and restrooms. These rooms typically have one or two fixtures with 2 to 4 tubes each.

Assumptions

- Occupancy sensors will be wall-mounted replacements for the existing wall switch in offices. In restrooms, ceiling mounted sensors will be used to ensure adequate coverage of the area, and wall switches will be removed or disconnected.
- The following tables describe the assumptions for the hours of operation for both the existing and retrofit calculations. These numbers assume a 25% savings on both energy and aggregate site-coincident demand. These savings assume the use of sensors with Auto-Off switches rather than On-Auto-Off switches.

<u>Small Offices</u>	<u>Existing</u>	<u>ERO</u>
Hours per Day (On-Peak)	12.2	9.2
Days per Week	5	5
Weeks per Year	50	50
-----	-----	-----

Annual On-Peak Hours	3,057	2,293
Annual Off-Peak Hours	916	733

<u>Restrooms</u>	<u>Existing</u>	<u>ERO</u>
Hours per Day (On-Peak)	13	10.4
Hours per Day (Off-Peak)	1	0.75
Days per Week	5	5
Weeks per Year	50	50
Nights per Year Lights Left On	12	0
Weekends per Year Lights Left On	6	0
-----	-----	-----

Annual On-Peak Hours	3,250	2,600
Annual Off-Peak Hours	658	250

- Fixture Counts: The number of rooms and fixtures was estimated based on counts from Ft. Drum. The number and floor areas of similar buildings of each type were determined. The fixture and

room counts were multiplied by this number to estimate the total fixtures controlled and the total number of sensors to be installed in each building type.

- Other building types were not considered because the aggregate floor area of rooms that serve office and restroom functions in the other types is relatively small.
- The existing fixtures targeted by this ERO are distributed as shown in the following table.

<u>ID</u>	<u>Fixture Type</u>	<u>No. Rooms/ Sensors</u>	<u>No. of Fixtures</u>	<u>Room Type</u>
22a	FL 2X4 2-40 STD	30	45	Office
22b	FL 2X4 2-40 STD	47	94	Restroom
23a	FL 2X4 3-40 STD	28	28	Restroom
23b	FL 2X4 3-40 STD	339	724	Office
24a	FL 2X4 4-40 STD	13	13	Restroom
24b	FL 2X4 4-40 STD	133	272	Office

- Demand savings are based on an assumed 25% reduction in on-peak demand.

Results

The quantitative results of this lighting ERO assessment appear in Table 2.10. This table contains specific energy, cost, and economic evaluation information for each fixture type or lighting consumption area included in the ERO. Two possible retrofits are covered: adding an occupancy sensor to the existing fixture, and adding an occupancy sensor as well as upgrading the existing fixture. Many of the fixtures targeted for occupancy sensors are also included in Sections 2.2.1 - 2.2.8, which cover upgrading the existing fluorescent fixtures to a T-8 system fixtures.

Budget Implications. The total first cost of implementing the occupancy sensor only option is estimated to be \$40,120. The total first cost for the occupancy sensor and fixture upgrade option is estimated to be \$209,362. These estimates include the installation and/or replacement of all necessary equipment and materials and associated labor.

Energy, Demand, and Cost Savings. The electric energy savings associated with the sensor only option are estimated to be 127,970 kWh per year at a cost savings of \$7,567. Demand savings are estimated to be 540 kW-months at a cost savings of \$2,976.

The energy savings associated with the sensor and fixture upgrade option are estimated to be 440,171 kWh per year at a cost savings of 24,788. Demand savings are estimated to be 1,472 kW-months at a cost savings of \$8,113. These estimates are based on 100% implementation of the EROs for a typical operating year.

Operations and Maintenance Impacts. Maintenance cost savings are estimated to be \$2,648 per year for the sensor only option, and \$6,929 per year for the sensor and fixture upgrade option. These savings are due to reduced lamp and ballast replacement.

TABLE 2.2. Lighting EROs for Barracks and Assembly Building Types

Existing lighting operating parameters

Existing Equipment Fixture Type	Watts Each	No of Units	Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
			On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
4x50W INC PAR	200	126	22,413	NA	26,167	121	NA	NA
60W INC	60	1,399	74,854	NA	87,389	403	NA	NA
5 2x60W INC	120	1,399	149,709	NA	174,777	806	NA	NA
6 75W INC	75	477	31,876	NA	37,214	172	NA	NA
7 2x75W INC	150	238	31,876	NA	37,214	172	NA	NA
8 90W INC	90	534	42,823	NA	49,994	231	NA	NA
9 100W INC	100	584	52,084	NA	60,805	280	NA	NA
10 150W INC	150	59	7,837	NA	9,149	42	NA	NA
11 150W PAR FLOOD	150	143	19,126	NA	22,328	103	NA	NA
12 150W PAR SPOT	150	34	4,490	NA	5,242	24	NA	NA
19 24" T-12 20W	24	3,990	85,390	NA	99,689	460	NA	NA
20 22W CIRC	26.4	224	5,262	NA	6,143	28	NA	NA
21 1x40 T-12	48	164	7,019	NA	8,195	38	NA	NA
22 2x40 T-12	98	909	79,411	NA	92,709	428	NA	NA
23 3x40 T-12	147	6	784	NA	916	4	NA	NA
24 4x40 T-12	196	446	77,920	NA	90,967	419	NA	NA
26 2x96 T-12 75W	175	110	17,179	NA	20,056	92	NA	NA
15 2x25W INC EXIT	50	34	6,087	NA	8,866	20	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity New Fixture and/or Control		Watts Each	No of Units	Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
					On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
3 4-CFL 11 INTEGRAL W./REF			56	126	6,276	NA	7,327	34	NA	NA
4 CFL 15 CEIL FIXT			20	1,399	24,951	NA	29,130	134	NA	NA
5 CFL 2-15 CEIL FIXT			40	1,399	49,903	NA	58,259	269	NA	NA
6 CFL 2-11 CEIL FIXT			30	477	12,750	NA	14,886	69	NA	NA
7 CFL 2-15 CEIL FIXT			40	238	8,500	NA	9,924	46	NA	NA
8 CFL 2-11 CEIL FIXT			30	534	14,274	NA	16,665	77	NA	NA
9 CFL 2-15 CEIL FIXT			40	584	20,834	NA	24,322	112	NA	NA
10 CFL 2-15 CEIL FIXT			40	59	2,090	NA	2,440	11	NA	NA
11 HPS 50 FLD			79	143	10,073	NA	11,760	54	NA	NA
12 HPS 50 FLD			79	34	2,365	NA	2,761	13	NA	NA
22 FL 2X4 2-T8 ELC			65	909	52,680	NA	61,502	284	NA	NA
23 FL 2X4 2-T8 ELC REF			65	6	348	NA	406	2	NA	NA
24 FL 2X4 4-T8 ELC			122	446	48,514	NA	56,637	261	NA	NA
26 FL 1X8 2-96 ELC			134	110	13,142	NA	15,343	71	NA	NA
15 LED			5	34	606	NA	883	2	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs			Fixture Life, yr	First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exist O&M, \$/y	Retrofit O&M, \$/y		Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
3	10,558	1,787	1,624	NA	34,978	87	1,771	479	2,250	105,034	3.49
4	80,639	7,066	4,310	NA	108,162	269	5,477	1,480	6,957	68,379	1.85
5	92,490	14,146	10,970	NA	216,324	537	10,953	2,961	13,914	169,041	2.83
6	31,509	3,218	2,302	NA	41,454	103	2,099	567	2,666	23,397	1.74
7	15,755	3,218	1,869	NA	50,666	126	2,565	693	3,259	54,952	4.49
8	35,275	3,602	2,578	NA	61,878	154	3,133	847	3,980	41,348	2.17
9	38,613	3,943	4,580	NA	67,734	168	3,430	927	4,357	17,792	1.46
10	3,873	476	459	NA	12,456	31	631	170	801	8,594	3.22
11	15,874	2,219	1,021	NA	19,622	49	994	269	1,262	22,069	2.39
12	3,726	521	240	NA	4,606	11	233	63	296	5,181	2.39
22	63,939	2,091	654	NA	57,938	144	2,934	793	3,727	15,282	1.24
23	886	19	4	NA	946	2	48	13	61	277	1.31
24	50,688	1,708	647	NA	63,736	158	3,227	872	4,099	28,366	1.56
26	9,858	460	273	NA	8,750	22	443	120	563	1,602	1.16
15	5,166	437	0	NA	13,464	18	671	102	773	13,427	3.59
Totals	458,850	44,912	31,531		762,713	1,879	38,609	10,356	48,965		

TABLE 2.3. Lighting EROs for Commercial Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
2	2x50W INC PAR	100	7	1,371	NA	915	5	NA	NA
6	75W INC	75	49	7,364	NA	4,917	28	NA	NA
8	90W INC	90	502	91,099	NA	60,828	341	NA	NA
9	100W INC	100	549	110,799	NA	73,982	415	NA	NA
10	150W INC	150	525	158,859	NA	106,071	595	NA	NA
11	150W PAR FLOOD	150	134	40,686	NA	27,167	152	NA	NA
12	150W PAR SPOT	150	32	9,551	NA	6,377	36	NA	NA
13	200W INC	200	835	337,089	NA	225,077	1,263	NA	NA
14	300W INC	300	200	121,225	NA	80,943	454	NA	NA
21	1xF40 T-12	48	61	5,939	NA	3,965	22	NA	NA
22	2xF40 T-12	98	3,619	715,521	NA	477,759	2,681	NA	NA
23	3xF40 T-12	147	5,246	1,555,903	NA	1,038,888	5,830	NA	NA
24	4xF40 T-12	196	8,022	3,172,251	NA	2,118,136	11,887	NA	NA
25	6xF40 T-12	294	589	349,192	NA	233,158	1,308	NA	NA
26	2xF96 T-12 75W	175	2,908	1,026,883	NA	685,657	3,848	NA	NA
15	2x25W INC EXIT	50	32	5,723	NA	8,335	19	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
2	2-CFL 11 INTEG. W/REF.	14	14	395	NA	264	1	NA	NA
6	CFL 2-11 CEIL FIXT	30	49	2,946	NA	1,967	11	NA	NA
8	CFL 2-11 CEIL FIXT	30	502	30,366	NA	20,276	114	NA	NA
9	CFL 2-15 CEIL FIXT	40	549	44,320	NA	29,593	166	NA	NA
10	CFL 2-15 CEIL FIXT	40	525	42,362	NA	28,286	159	NA	NA
11	HPS 50 FLD	79	134	21,428	NA	14,308	80	NA	NA
12	HPS 50 FLD	79	32	5,030	NA	3,359	19	NA	NA
13	HPS 50 PEND	79	835	133,150	NA	88,905	499	NA	NA
14	HPS 70 PEND	105	200	42,429	NA	28,330	159	NA	NA
21	FL 1X4 1-T8 ELC	29	61	3,588	NA	2,396	13	NA	NA
22	FL 2X4 2-T8 ELC	65	3,619	474,580	NA	316,881	1,778	NA	NA
23	FL 2X4 2-T8 ELC REF	65	5,246	687,984	NA	459,372	2,578	NA	NA
24	FL 2X4 3-T8 ELC REF	97	8,022	1,569,940	NA	1,048,261	5,883	NA	NA
25	FL 2X4 4-T8 ELC REF	122	589	144,903	NA	96,753	543	NA	NA
26	FL 1X8 2-96 ELC	134	2,908	786,299	NA	525,018	2,946	NA	NA
15	LED	5	32	571	NA	831	2	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs			Fixture Life, yr	First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exist. O&M, \$/yr	Retrofit O&M, \$/yr		Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
2	588	174	176	NA	1,626	4	86	20	106	2,740	5.66
6	3,217	573	453	NA	7,368	17	388	91	479	5,954	2.85
8	33,163	5,905	4,671	NA	101,284	228	5,335	1,254	6,589	86,472	3.61
9	36,301	6,464	8,084	NA	110,868	249	5,840	1,373	7,213	48,240	2.33
10	34,898	7,444	7,727	NA	194,282	437	10,234	2,405	12,639	153,372	5.42
11	14,923	3,638	2,022	NA	32,117	72	1,692	398	2,089	42,144	3.82
12	3,503	854	475	NA	7,539	17	397	93	490	9,893	3.82
13	127,816	9,457	4,377	NA	340,110	764	17,916	4,211	22,126	288,518	3.26
14	30,644	3,052	1,050	NA	131,410	295	6,922	1,627	8,549	130,848	5.27
21	3,914	217	105	NA	3,920	9	207	49	255	1,928	1.49
22	254,553	17,335	9,192	NA	401,819	903	21,166	4,975	26,141	260,378	2.06
23	775,022	34,835	13,325	NA	1,447,435	3,252	76,246	17,920	94,166	852,496	2.28
24	1,480,249	63,295	31,046	NA	2,672,185	6,004	140,761	33,083	173,844	1,611,819	2.13
25	112,466	6,970	2,767	NA	340,695	766	17,947	4,218	22,165	290,765	3.59
26	260,656	24,024	17,014	NA	401,224	902	21,135	4,967	26,102	246,384	1.95
15	4,862	411	0	NA	12,656	17	631	96	726	12,623	3.59
Totals	3,176,575	184,647	102,484		6,206,539	13,934	326,903	76,778	403,681		

TABLE 2.4. Lighting EROs for DG/Retail, Grocery, and Recreation Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
4	60W INC	60	346	65,917	NA	37,637	222	NA	NA
6	75W INC	75	4,094	974,497	NA	556,424	3,279	NA	NA
8	90W INC	90	146	41,772	NA	23,851	141	NA	NA
9	100W INC	100	160	50,805	NA	29,009	171	NA	NA
10	150W INC	150	23	10,811	NA	6,173	36	NA	NA
11	150W PAR FLOOD	150	39	18,656	NA	10,652	63	NA	NA
12	150W PAR SPOT	150	9	4,379	NA	2,501	15	NA	NA
21	1x40 T-12	48	3,107	473,363	NA	270,284	1,593	NA	NA
24	4x40 T-12	196	818	509,117	NA	290,698	1,713	NA	NA
26	2x40 T-12 75W	175	43	23,700	NA	13,533	80	NA	NA
15	2x25W INC EXIT	50	9	1,668	NA	2,430	6	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
4	CFL 15 CEIL FIXT	20	346	21,972	NA	12,546	74	68,049	4.41
6	CFL 2-11 CEIL FIXT	30	4,094	389,799	NA	222,569	1,312	839,873	4.10
8	CFL 2-11 CEIL FIXT	30	146	13,924	NA	7,950	47	40,832	5.22
9	CFL 2-15 CEIL FIXT	40	160	20,322	NA	11,604	68	24,440	3.31
10	CFL 2-15 CEIL FIXT	40	23	2,883	NA	1,646	10	10,344	7.89
11	HPS 50 FLD	79	39	9,825	NA	5,610	33	19,263	5.43
12	HPS 50 FLD	79	9	2,307	NA	1,317	8	4,522	5.43
15	FL 1X4 1-T8 ELC	29	3,107	285,990	NA	163,296	962	197,833	2.00
21	FL 2X4 3-T8 ELC REF	97	818	251,961	NA	143,866	848	305,955	3.03
24	FL 1X8 2-60 ELC REF	105	43	14,220	NA	8,120	48	8,321	2.05
26	LED	5	9	167	NA	243	1	3,679	3.59

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs				First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exst. O&M, \$/y	Retrofit O&M, \$/y	Fixture Life, yr	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
4	19,949	4,528	3,271	NA	69,036	148	3,674	815	4,489	68,049	4.41
6	270,613	71,440	58,585	NA	918,552	1,968	48,887	10,841	59,728	839,873	4.10
8	9,667	2,552	2,093	NA	43,748	94	2,328	516	2,845	40,832	5.22
9	10,581	2,793	3,587	NA	47,888	103	2,549	565	3,114	24,440	3.31
10	1,501	478	509	NA	12,455	27	663	147	810	10,344	7.89
11	4,350	1,573	941	NA	13,873	30	738	164	902	19,263	5.43
12	1,021	369	221	NA	3,257	7	173	38	212	4,522	5.43
15	198,338	17,432	11,714	NA	294,360	631	15,666	3,474	19,141	197,833	2.00
21	151,020	10,042	6,400	NA	403,988	865	21,501	4,768	26,269	305,955	3.03
24	7,895	546	452	NA	14,893	32	793	176	968	8,321	2.05
26	1,421	120	0	NA	3,688	5	184	28	212	3,679	3.59
Totals:	676,356	111,873	87,774		1,825,739	3,908	97,156	21,533	118,689		

TABLE 2.5. Lighting EROs for Club, Restaurant, and Dining Hall Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6	75W INC	75	1,000	171,188	NA	135,959	657	NA	NA
8	90W INC	90	94	18,248	NA	15,287	74	NA	NA
9	100W INC	100	103	23,410	NA	18,592	90	NA	NA
11	150W PAR FLOOD	150	25	8,596	NA	6,827	33	NA	NA
12	150W PAR SPOT	150	6	2,018	NA	1,803	8	NA	NA
22	2x40 T-12	98	1,415	318,539	NA	251,398	1,215	NA	NA
23	3x40 T-12	147	627	210,313	NA	167,032	807	NA	NA
24	4x40 T-12	196	161	72,107	NA	57,268	277	NA	NA
26	2x40 T-12 75W	175	52	20,752	NA	16,481	80	NA	NA
15	2x25W INC EXIT	50	6	1,069	NA	1,557	4	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6	CFL 2-11 CEIL FIXT	30	1,000	68,475	NA	54,384	263	NA	NA
8	CFL 2-11 CEIL FIXT	30	94	6,416	NA	5,096	25	NA	NA
9	CFL 2-15 CEIL FIXT	40	103	9,364	NA	7,437	36	NA	NA
11	HPS 50 FLD	79	25	4,527	NA	3,596	17	NA	NA
12	HPS 50 FLD	79	6	1,063	NA	844	4	NA	NA
22	FL 2X4 2-T8 ELC	65	1,415	209,949	NA	166,744	806	NA	NA
23	FL 2X4 2-T8 ELC REF	65	627	92,995	NA	73,858	357	NA	NA
24	FL 2X4 3-T8 ELC REF	97	161	35,686	NA	28,342	137	NA	NA
26	FL 1X8 2-60 ELC REF	105	52	12,451	NA	9,889	48	NA	NA
15	LED	5	6	68	NA	54	0	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs			Fixture Life, yr	First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exst. O&M \$/yr	Retrofit O&M \$/yr		Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
6	66,100	14,330	11,570	NA	184,289	394	9,593	2,172	11,765	156,192	3.36
8	6,193	1,343	1,084	NA	23,023	49	1,198	271	1,470	20,231	4.27
9	6,779	1,470	1,866	NA	25,201	54	1,312	297	1,609	11,538	2.70
11	2,787	827	479	NA	7,301	16	380	86	466	9,755	4.50
12	654	194	112	NA	1,714	4	89	20	109	2,290	4.50
22	99,539	8,462	5,278	NA	191,244	409	9,955	2,254	12,209	136,140	2.37
23	92,599	5,190	2,338	NA	210,492	450	10,957	2,481	13,437	156,607	2.69
24	29,741	1,584	909	NA	65,348	140	3,401	770	4,172	44,344	2.49
26	9,612	531	413	NA	14,893	32	775	176	951	6,727	1.70
15	911	77	0	NA	2,503	3	124	18	143	2,357	3.59
Totals:	314,914	34,009	24,049		726,007	1,551	37,784	8,546	46,330		

TABLE 2.6. Lighting EROs for Family Housing Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
1	2x40W INC	80	823	46,948	NA	74,402	316	NA	NA
2	2x50W INC PAR	100	31	2,240	NA	3,550	15	NA	NA
4	60W INC	60	1,518	64,935	NA	102,912	437	NA	NA
5	2x60W INC	120	3,035	259,740	NA	411,847	1,748	NA	NA
6	75W INC	75	200	10,697	NA	16,952	72	NA	NA
7	2x75W INC	150	400	42,786	NA	67,809	288	NA	NA
8	90W INC	90	144	9,218	NA	14,608	62	NA	NA
11	150W PAR FLOOD	150	38	4,117	NA	6,524	28	NA	NA
12	150W PAR SPOT	150	9	966	NA	1,532	7	NA	NA
22	2xF40 T-12	98	103	7,171	NA	11,364	48	NA	NA
24	4xF40 T-12	196	219	30,638	NA	48,556	206	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
1	CFL 15 CEIL FIXT	20	823	11,737	NA	18,601	79	NA	NA
2	2-CFL 11 INTEG. W./REF.	28	31	627	NA	994	4	NA	NA
4	CFL 15 CEIL FIXT	20	1,518	21,645	NA	34,304	146	NA	NA
5	CFL 2-15 CEIL FIXT	40	3,035	86,580	NA	137,216	583	NA	NA
6	CFL 2-11 CEIL FIXT	30	200	4,279	NA	6,781	29	NA	NA
7	CFL 2-15 CEIL FIXT	40	400	11,410	NA	18,082	77	NA	NA
8	CFL 2-11 CEIL FIXT	30	144	3,073	NA	4,869	21	NA	NA
11	HPS 50 FLD	79	38	2,168	NA	3,436	15	NA	NA
12	HPS 50 FLD	79	9	509	NA	807	3	NA	NA
22	FL 2X4 2-T8 ELC	65	103	4,756	NA	7,538	32	NA	NA
24	FL 2X4 4-T8 ELC	122	219	19,071	NA	30,224	128	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs				First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exist. O&M, \$/yr	Retrofit O&M, \$/yr	Fixture Life, yr	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
1	47,425	5,349	2,354	NA	91,011	237	4,508	1,306	5,814	87,918	2.85
2	1,319	213	191	NA	4,168	11	206	60	266	520	1.20
4	87,463	7,285	4,341	NA	111,898	291	5,543	1,606	7,148	67,402	1.77
5	200,636	29,139	22,249	NA	447,591	1,166	22,171	6,422	28,593	342,480	2.71
6	13,220	1,282	898	NA	16,589	43	822	238	1,060	8,919	1.67
7	26,440	5,128	2,932	NA	81,103	211	4,017	1,164	5,181	86,774	4.28
8	9,493	921	645	NA	15,884	41	787	228	1,015	10,268	2.08
11	4,272	569	256	NA	5,037	13	249	72	322	5,523	2.29
12	1,003	134	60	NA	1,182	3	59	17	76	1,296	2.29
22	7,217	215	69	NA	6,241	16	309	90	399	1,147	1.16
24	24,913	772	294	NA	29,900	78	1,481	429	1,910	11,643	1.47
Totals:	423,402	51,007	34,287		810,606	2,111	40,153	11,631	51,784		

TABLE 2.7. Lighting EROs for B/700 and Flight Simulator

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6	75W INC	75	26	8,250	NA	9,103	21	NA	NA
8	90W INC	90	137	39,704	NA	57,830	134	NA	NA
9	100W INC	100	150	48,290	NA	70,336	163	NA	NA
21	1x F40 T-12	48	3	459	NA	669	2	NA	NA
22	2x F40 T-12	98	176	55,330	NA	80,590	186	NA	NA
23	3x F40 T-12	147	255	120,316	NA	175,244	405	NA	NA
24	4x F40 T-12	196	419	263,538	NA	383,852	887	NA	NA
15	2x 25W INC EXIT	50	9	1,568	NA	2,284	5	NA	NA

Efficient lighting operating parameters

Electrical Lighting Operating Parameters									
Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6 CFL 2-11 CEIL FIXT		30	26	2,500	NA	3,641	8	NA	NA
8 CFL 2-11 CEIL FIXT		30	137	13,235	NA	19,277	45	NA	NA
9 CFL 2-15 CEIL FIXT		40	150	19,316	NA	28,134	65	NA	NA
21 FL 1X4 1-T8 ELC		29	3	277	NA	404	1	NA	NA
22 FL 2X4 2-T8 ELC		65	176	36,699	NA	53,453	123	NA	NA
23 FL 2X4 2-T8 ELC REF		65	255	53,201	NA	77,489	179	NA	NA
24 FL 2X4 3-T8 ELC REF		97	419	130,424	NA	189,968	439	NA	NA
15 LED		5	9	160	NA	234	1	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs				First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exist. O&M, \$/yr	Retrofit O&M, \$/yr	Fixture Life, yr	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
6	1,716	715	599	NA	9,212	13	459	70	529	8,147	5.75
8	9,086	3,784	3,170	NA	65,023	89	3,240	491	3,731	57,336	7.31
9	9,946	4,142	5,408	NA	71,175	98	3,547	537	4,084	32,487	4.27
21	190	27	23	NA	447	1	22	3	26	297	2.56
22	12,374	2,169	1,738	NA	45,769	63	2,281	345	2,626	34,357	3.78
23	37,675	4,348	2,520	NA	164,870	226	8,216	1,244	9,460	134,971	4.58
24	77,305	8,459	6,272	NA	326,998	448	16,295	2,468	18,763	242,625	4.14
15	1,367	116	0	NA	3,457	5	172	26	198	3,458	3.59
Totals:	149,659	23,760	19,728		686,950	941	34,232	5,185	39,418		

TABLE 2.8. Lighting EROs for R&D Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6	75W INC	75	9	1,683	NA	1,188	7	NA	NA
8	90W INC	90	103	24,851	NA	15,874	94	NA	NA
9	100W INC	100	112	30,225	NA	19,084	115	NA	NA
10	150W INC	150	62	25,001	NA	15,789	95	NA	NA
11	150W PAR FLOOD	150	28	11,099	NA	7,000	42	NA	NA
12	150W PAR SPOT	150	6	2,605	NA	1,643	10	NA	NA
13	200W INC	200	113	60,852	NA	38,381	231	NA	NA
14	300W INC	300	27	21,884	NA	13,803	83	NA	NA
21	1x40 T-12	48	27	3,501	NA	2,208	13	NA	NA
22	2x40 T-12	98	1,800	421,822	NA	268,056	1,599	NA	NA
23	3x40 T-12	147	2,320	917,254	NA	578,541	3,478	NA	NA
24	4x40 T-12	196	3,807	2,007,370	NA	1,268,110	7,611	NA	NA
26	2x40 T-12 75W	175	1,455	685,085	NA	432,104	2,598	NA	NA
15	2x25W INC EXIT	50	7	1,171	NA	1,705	4	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
6	CFL 2-11 CEIL FIXT	30	9	753	NA	475	3	NA	NA
8	CFL 2-11 CEIL FIXT	30	103	8,284	NA	5,225	31	NA	NA
9	CFL 2-15 CEIL FIXT	40	112	12,090	NA	7,626	46	NA	NA
10	CFL 2-15 CEIL FIXT	40	62	6,687	NA	4,205	25	NA	NA
11	HPS 50 FLD	79	28	5,848	NA	3,687	22	NA	NA
12	HPS 50 FLD	79	6	1,372	NA	865	5	NA	NA
13	HPS 50 PEND	79	113	24,037	NA	15,181	91	NA	NA
14	HPS 70 PEND	105	27	7,659	NA	4,831	29	NA	NA
21	FL 1X4 1-T8 ELC	29	27	2,115	NA	1,334	8	NA	NA
22	FL 2X4 2-T8 ELC	65	1,800	279,780	NA	176,466	1,061	NA	NA
23	FL 2X4 2-T8 ELC REF	65	2,320	405,589	NA	255,817	1,538	NA	NA
24	FL 2X4 3-T8 ELC REF	97	3,807	993,443	NA	626,595	3,767	NA	NA
26	FL 1X8 2-60 ELC REF	105	1,455	411,051	NA	259,262	1,559	NA	NA
15	LED	5	7	117	NA	171	0	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs			First Year Energy & Demand Savings					Life Cycle Cost		
	First Cost (\$)	Exist. O&M, \$/yr	Retrofit O&M, \$/yr	Fixture Life, yr	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
6	617	143	116	NA	1,843	4	97	24	121	1,654	3.68
8	6,785	1,571	1,281	NA	27,017	63	1,429	348	1,775	24,942	4.68
9	7,427	1,720	2,185	NA	29,573	69	1,564	379	1,943	14,893	3.01
10	4,095	1,143	1,205	NA	29,898	70	1,581	383	1,964	24,838	7.06
11	3,053	971	569	NA	8,567	20	453	110	563	11,795	4.86
12	717	228	134	NA	2,011	5	106	26	132	2,769	4.86
13	17,305	1,669	891	NA	60,036	140	3,175	789	3,944	54,914	4.17
14	4,149	539	214	NA	23,196	54	1,227	297	1,524	24,141	6.82
21	1,731	130	82	NA	2,260	5	119	29	148	1,399	1.81
22	112,549	10,352	6,720	NA	231,633	539	12,248	2,968	15,216	175,928	2.56
23	342,671	20,783	9,742	NA	834,389	1,940	44,120	10,690	54,810	684,574	2.94
24	702,508	40,471	24,214	NA	1,653,441	3,845	87,429	21,183	108,613	1,205,631	2.72
26	269,239	16,066	12,835	NA	446,875	1,039	23,630	5,725	29,355	228,305	1.85
15	998	84	0	NA	2,588	4	129	20	149	2,583	3.59
Totals:	1,473,843	95,872	60,190		3,353,328	7,795	177,307	42,948	220,255		

TABLE 2.9. Lighting EROs for Hangar Building Types

Existing lighting operating parameters

Fixture Code	Existing Equipment			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
27	750W INC	750	50	105,643	NA	143,741	356	NA	NA
31	400W Merc. Vapor	480	95	123,109	NA	167,506	414	NA	NA

Efficient lighting operating parameters

Fixture Code	Energy Resource Opportunity			Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	New Fixture and/or Control	Watts Each	No. of Units	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
27	HPS 200 PEND	240	50	33,808	NA	45,997	114	NA	NA
31	HPS 200 PEND	240	95	64,231	NA	87,394	216	NA	NA

Efficient lighting ERO economics

Fixture Code	Non-Energy Costs			Fixture Life, yr	First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost (\$)	Exst. O&M, \$/yr	Retrofit O&M, \$/yr		Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
27	7,950	11,740	841	NA	169,581	242	8,492	1,332	9,824	40.24	0.83
31	15,105	632	1,598	NA	138,990	198	6,980	1,092	8,052	7.12	1.92
Totals:	23,055	12,372	2,439		308,570	440	15,452	2,424	17,876		

TABLE 2.10. Occupancy Sensors ERO

Existing lighting operating parameters

Fixture Code	Existing Equipment				Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	No. Controlled	Watts Each	No. of Rooms	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
22a	FL 2X4 2-40 STD	46	96	30	13,461	NA	4,040	63	NA	NA
22b	FL 2X4 2-40 STD	94	96	47	26,161	NA	6,061	111	NA	NA
23a	FL 2X4 3-40 STD	26	147	26	12,563	NA	2,706	49	NA	NA
23b	FL 2X4 3-40 STD	724	147	339	325,360	NA	70,030	1,277	NA	NA
24a	FL 2X4 4-40 STD	13	196	13	7,769	NA	1,677	31	NA	NA
24b	FL 2X4 4-40 STD	272	196	133	162,975	NA	35,079	640	NA	NA

Occupancy sensor operating parameters

Fixture Code	Energy Resource Opportunity				Energy Consumption (kWh)			Sum of 12 Monthly Coincident Demands (kW-mo)		
	Fixture Type	No. Controlled	Watts Each	No. of Rooms	On-Peak	Mid-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
Occupancy Sensor Only:										
22a	FL 2X4 2-40 STD	46	96	30	10,112	NA	3,233	40	NA	NA
22b	FL 2X4 2-40 STD	94	96	47	23,961	NA	2,303	63	NA	NA
23a	FL 2X4 3-40 STD	26	147	26	10,702	NA	1,029	37	NA	NA
23b	FL 2X4 3-40 STD	724	147	339	244,039	NA	78,012	966	NA	NA
24a	FL 2X4 4-40 STD	13	196	13	6,625	NA	637	23	NA	NA
24b	FL 2X4 4-40 STD	272	196	133	122,244	NA	36,076	460	NA	NA
Fixture and Sensor:										
22a	FL 2X4 2-T8 ELC	46	65	30	6,707	NA	2,144	26	NA	NA
22b	FL 2X4 2-T8 ELC REF	94	65	47	15,866	NA	1,526	55	NA	NA
23a	FL 2X4 2-T8 ELC REF	26	65	26	4,732	NA	455	16	NA	NA
23b	FL 2X4 2-T8 ELC REF	724	65	339	107,909	NA	34,496	424	NA	NA
24a	FL 2X4 2-T8 ELC	13	65	13	2,197	NA	211	8	NA	NA
24b	FL 2X4 2-T8 ELC REF	272	65	133	40,540	NA	12,959	159	NA	NA

Occupancy sensor ERO economics

Fixture Code	Non-Energy Costs				First Year Energy & Demand Savings				Life Cycle Cost	
	First Cost (\$)	Exist. O&M \$/yr	Retrofit O&M \$/yr	Fixture Life, yr	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)
Occupancy Sensor Only:										
22a	2,040	260	187	NA	4,176	13	233	73	306	2,637
22b	3,196	751	542	NA	7,966	26	411	152	564	67,611
23a	1,904	224	162	NA	3,560	12	184	66	252	44,945
23b	23,052	5,785	4,177	NA	73,329	319	4,414	1,759	6,173	7,299
24a	684	74	50	NA	2,204	8	114	42	156	2,689
24b	9,044	2,132	1,456	NA	36,732	160	2,211	661	3,092	1,663
Totals:	40,120	9,225	6,577		127,970	540	7,567	2,976	10,543	
Fixture and Sensor:										
22a	5,206	260	91	NA	6,670	27	480	147	627	6,236
22b	17,083	751	190	NA	16,609	56	916	306	1,224	233,366
23a	6,040	224	57	NA	10,104	33	559	162	741	106,374
23b	130,009	5,785	1,462	NA	252,976	854	14,297	4,703	19,000	14,636
24a	1,798	74	23	NA	7,056	23	392	127	518	6,156
24b	49,227	2,132	473	NA	144,554	481	8,143	2,648	10,791	4,744
Totals:	209,362	9,225	2,296		440,171	1,472	24,766	6,113	32,901	

2.3 STREET AND EXTERIOR LIGHTING EROs

Street and exterior lighting energy efficiency opportunities involve replacement of four fixture types: 150 W incandescent flood, 250 W mercury vapor, 1500 W quartz, and 6.6 amp series incandescent; all with high-pressure sodium (HPS). The majority of the remaining exterior light fixtures are HPS for which no retrofit of higher-efficiency is commercially available.

There are no EROs that apply to delamping any areas of the base. The only areas where there is potential for delamping (alert aprons, weapon storage areas) are mission and security sensitive, and reduced illumination in these areas will not be considered.

Lamp and fixture counts were obtained from base electrical distribution maps and night-time site inspections. Since it is difficult to determine the wattage of exterior lighting in a walk-through audit, estimates were made based on a partially annotated copy of the electrical distribution maps. An estimate of all of the exterior and streetlighting at Griffiss AFB, including type, quantity, and location, is presented in Table 1.9 of Volume 2.

2.3.1 Replace Exterior Lighting with High Pressure Sodium

Description

There are twelve locations where replacement of inefficient lighting should be considered. The following table shows the existing fixture type, quantity, location, and replacement fixture for each location.

<u>Existing Fixture Type</u>	<u>Quantity</u>	<u>Location</u>	<u>Replacement Fixture</u>
Merc. Vapor	40	On Bldgs. 1 & 2	100 W HPS
Merc. Vapor	11	Pole Mounted, in Storage Yard So. of Bldg. 10	100 W HPS
1500 W Quartz	13	So. East of Bldg. 826	400 W HPS
1500 W Quartz	50	WSA	400 W HPS
Merc. Vapor	16	On Bldg. 101	100 W HPS
Series Incand.	16	Streets	100 W HPS
Merc. Vapor	7	Streets	100 W HPS
150 W Incand. Flood	10	On Bldg. 23	50 W HPS
150 W Incand. Flood	10	On Bldg. 741	50 W HPS
Merc. Vapor	16	4 Each on Bldgs 782-786	100 W HPS
Series Incand.	48	Skyline Housing Area Streets	100 W HPS
Merc. Vapor	31	Woodhaven Hsg. Area Streets	100 W HPS

Assumptions

The technical data and assumptions used in the analysis are as follows:

- Exterior hours of operation were calculated based on an on-cycle starting 15 minutes after sunset and ending 15 minutes before sunrise. This results in an year-round average 12 hours per day; more hours per day in winter, less in summer.
- The streetlighting fixture count is from the electric distribution system drawings and on-site inspection. The fixture counts obtained in the site inspection confirmed that the engineering drawings are complete and accurate. The distribution of light fixtures by circuit and transformer is as tabulated in Volume 2.
- 50 W HPS ballasts dissipate 29 W per lamp, 100 W HPS ballasts dissipate 30 W per lamp, 400 W HPS ballasts dissipate 65 W per lamp, and mercury vapor ballasts dissipate 44 W per lamp.
- 9,400 feet of 2 x 14 gage wire must be pulled to rewire the 51 series incandescent fixtures on the streets around buildings 1, 2, 3, 105, 112, and 115.
- 10,500 feet of 2 x 14 gage wire must be pulled to rewire the 48 series incandescent fixtures in the Skyline housing area.
- The quartz lights are currently used in high security weapon storage areas for the ability to instantly come back on in the event of a power interruption. Normal HPS lamps require some time to restrike and return to full output. For this reason, the replacement HPS fixtures would use instant re-strike lamps which fit in normal HPS fixtures and use normal HPS ballasts.
- Replacement lamps supply equal, if not higher, light output than the existing lamps.

Cost assumptions are as follows:

- The only additional cost for the 400W HPS instant re-strike lamps is the lamps themselves. The cost of the fixture remains constant.
- Fixture replacement costs, from the PNL Lighting Matrix, follow:

<u>Replacement Fixture</u>	<u>Material Cost</u>	<u>Labor Cost</u>
50 W HPS	\$102	\$53
100 W HPS	\$118	\$75
400 W HPS	\$200	\$90

- O&M costs include \$6.30 labor to replace a lamp plus the cost of a lamp, as follows [Source: Defense General Supply Center]:

<u>Lamp Type</u>	<u>Lamp Cost</u>
50 W HPS	\$13
100 W HPS	\$15
400 W HPS	\$37

Lamps will be replaced every 5.5 years under the current operating schedule.

- Cost to rewire the series incandescent fixtures is \$0.94 per foot, for a total of \$18,706 for both areas.

Results

Quantitative results of the ERO analysis are presented in Table 2.11. The results are discussed below.

Budget Implications. Streetlight EROs represent a large energy conservation potential for a small investment. The estimated first cost is \$86,731.

Energy Demand and Cost Savings. The electric energy savings estimated to result from implementation of this ERO are 447,466 kWh per year at a cost savings of \$20,256 per year. Demand savings are estimated to be 1,281 kW-months per year with a cost savings of \$7,058 per year.

Operations and Maintenance. Maintenance is reduced by replacing the short-life incandescent, series incandescent, and quartz lamps with long-life HPS lamps. Mercury vapor lamps have an average lamp life comparable to that of HPS lamps. The O&M savings is estimated to be \$6,498.

Energy Security. This ERO has little impact on energy security.

Environmental Issues. There are no environmental impacts beyond the generally beneficial effects of reduced energy consumption and demand.

TABLE 2.11. Street/Exterior Lighting EROs

Existing Street/Exterior Light Parameters/Operation

ID	Existing Equipment			No of Units	Operating Hours		Avg. Load (kW/unit)	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Equip Code	Lamp Type	Size (kW)		On-Pk	Off-Pk		On-Peak	Off-Peak	On-Peak	Off-Peak
1	SLinc-1	Series Incand	0.30	99	844	3,348	0.300	26,080	99,436	356	NA
2	Hg-1	Merc Vapor	0.29	142	844	3,348	0.294	35,235	139,772	501	NA
3	Qlz-1	Quartz	1.50	63	844	3,348	1.500	79,758	316,386	1,134	NA
4	Inc-1	Inc Flood	0.15	20	844	3,348	0.150	2,532	10,044	36	NA

HPS Retrofit Parameters/Operation

ID	Energy Resource Opportunity			No of Units	Operating Hours		Avg. Load (kW/unit)	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Equip Code	ERO Description	Size (kW)		On-Pk	Off-Pk		On-Peak	Off-Peak	On-Peak	Off-Peak
1	SLHPS-1	Upgrade to HPS-100	0.130	99	844	3,348	0.130	10,668	43,089	154	NA
2	SLHPS-2	Upgrade to HPS-100	0.130	142	844	3,348	0.130	15,569	61,804	222	NA
3	SLHPS-3	Add HPS-400	0.465	63	844	3,348	0.465	24,725	98,080	352	NA
4	SLHPS-4	Upgrade to HPS-50	0.079	20	844	3,348	0.079	1,334	5,290	19	NA

HPS Retrofit ERO Economics

ID	Economic Parameters					First Year Energy & Demand Savings					Life Cycle Cost	
	Equip Code	No of Units	First Cost	Before O&M \$	After O&M	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV \$	SIR
1	SLHPS-1	99	37,813	2,925	529	70,559	202	3,302	1,113	4,415	66,858	2.77
2	SLHPS-2	142	27,548	684	758	97,615	279	3,885	1,540	5,425	64,465	3.35
3	SLHPS-3	63	18,270	4,126	523	273,339	782	12,791	4,311	17,102	298,458	17.34
4	SLHPS-4	20	3,100	675	101	5,953	17	279	94	372	11,527	4.72
Totals			86,731			447,466	1,281	20,256	7,058	27,314		

2.4 FAN, PUMP, AND COMPRESSOR MOTOR EROs

Motor EROs at Griffiss AFB fall into two main categories. The first involves the replacement of a single-speed standard-efficiency motor with a high-efficiency model. The second involves the addition of a variable speed drive and controls. The efficient motor ERO is applicable to all fan, pump and air compressor motors associated with HVAC and compressed air systems. The variable speed drive ERO is applicable to certain fan and pump motors.

The replacement of currently installed standard efficiency motors with high-efficiency models was evaluated on both a replace-immediately (RI) and replace-on-failure (ROF) basis. A variable-speed drive was considered in any application where reduced pump or fan flow rate is acceptable for a significant fraction of the motor's operating time.

An inventory of motors was developed using the Recurring Work Program (RWP) and estimates of connected load based on building floor area. Motor size, function, and quantity were catalogued by building type.

2.4.1 Energy-Efficient Motors

Energy-efficient, three-phase motors are manufactured with predominantly open drip proof (ODP) or total enclosed fan cooled (TEFC) enclosures. Motors up to 200 hp can be obtained in either 1200, 1800, or 3600 rpm. They are particularly attractive in duty-cycling applications because they suffer less thermal stress than standard efficient motors due to lower losses overall. There are some applications, however, in which energy-efficient motors (EEMs) would not be a good alternative; namely, in situations where high starting torque is needed. This is because EEMs are optimized for low slip operation, which generally results in lower starting torque than for standard efficiency motors. For most HVAC fan and pump applications the starting torque is not an issue. However, the starting characteristics should be kept in mind in preparing retrofit specifications for such things as the compressor motors.

Description

This ERO considers the replacement of existing single-speed motors by the best currently available energy-efficient models.

Assumptions

Technical assumptions are as follows:

- There are fourteen(14) different types of equipment with electric motors considered in this ERO. Motor type and size range are detailed in the following table.

<u>Motor Type</u>	<u>Size Range (hp)</u>
Air Handling Unit (AHU)	1/4 - 30
Air Compressor	1 - 30
Blast Heater	1 - 10
Cabinet Heater	1/4 - 1/2
Chilled Water Pump	1/3 - 50
Circulating Pump	1/16 - 5
Condensate Pump	1/4 - 2
Condenser Fan	1/6 - 40
Condenser Water Pump	1/3 - 40
Cooling Tower Fan	1/3 - 40
Exhaust Fans	1
Furnace Fans	1/20 - 5
Liquid Transfer Pumps	1 - 40
Power Ventilators	1/8 - 3

- The motor inventory was developed using the Recurring Work Program (RWP) and estimates of connected load based on building floor area or aggregate chiller tonnage (See Volume 2, Appendix A, for chiller tonnage listing). The estimated connected load factors (hp per ton or hp per ft²) are enumerated by motor type in the following table. An indication of whether or not a given motor type is listed in the RWP is also provided. For some motor types, only the motors listed in the RWP were used. These are denoted by NA in the connected load factor column.

<u>Motor Type</u>	<u>Listed in RWP?</u>	<u>Connected Load Factor (hp/ton or hp/ft²)</u>
Air Handling Unit (AHU)	Y	0.3 hp/ton
Air Compressor	Y	NA
Blast Heater	Y	NA
Cabinet Heater	Y	NA
Chilled Water Pump	N	0.12 hp/ton
Circulating Pump	Y	NA
Condensate Pump	Y	NA

<u>Motor Type</u>	<u>Listed in RWP?</u>	<u>Connected Load Factor (hp/ton or hp/ft²)</u>
Condenser Fan	N	0.15 hp/ton
Condenser Water Pump	N	0.1 hp/ton
Cooling Tower Fan	N	0.1 hp/ton
Exhaust Fans	Y	NA
Furnace Fans	N	0.0002 hp/ft ²
Liquid Transfer Pumps	Y	NA
Power Ventilators	Y	NA

Note that AHU motors are listed in the RWP but have also been assigned a connected load factor. This was done so that, for each building, aggregate AHU motor horsepower could be developed from aggregate A/C tonnage indicated by the real property list and compared to aggregate AHU motor horsepower indicated by the RWP database.^(a) The higher of the two values was assumed to be the correct connected load for AHU motors.

Buildings without air conditioners listed in the RWP were assumed to be heated with warm air furnaces. The RWP was checked for the presence of blast and cabinet heaters in these buildings, and the aggregate connected load of these equipment types was compared to the connected load calculated by the above table values. If the RWP heaters did not meet the calculated capacity, additional furnace fans were added to match the calculated capacity.

Both the RWP and the calculated connected loads were often not in standard motor sizes. The total load was broken down into standard sizes using building and equipment factors such as: building area, building type, number and size of existing A/C equipment, number of units per building for housing, etc.

- The operation schedule for each building type was estimated based on reconciliation with the Fan/Vent EUI given in Volume 2. Some equipment types with sharply different operating hours were assigned appropriate schedules. On- and off-peak hours were estimated by considering the operating schedule and time distribution of HVAC loads for each building type. The following table gives the operating hours by building and/or equipment type.

(a) AHUs were listed in the RWP by nominal fan motor power (hp) in some cases and by nominal cooling capacity (ton) in others; in the latter cases a connected load factor of 0.25 hp/ton was applied to estimate nominal fan motor power.

Total Hrs.	On-Peak Hrs.	Off-Peak Hrs.	Equipment Type	Building Type
800	571	229	Air Compressors	HSG-FAM, HSG-FAM(F8), PRDCTN
1,000	714	286	Liq. Transfer Pumps	HSG-FAM(F9), LAB-MED, SECURTY
1,650	1,179	471		ADMIN, ADMIN(F3&5), WHS(F3&5)
2,100	1,500	600		CHAPEL, CLUB, COMCATN, COMCATN(F1), DGR, DINING, HANGAR, R&D, R&D(F1), RESTRNT, SHOP-AIR, SHOP-ELC, SHOP-WPN
3,200	2,286	914		MWR, SHOP, SHOP-HVY, SHOP-MV, SIMULTR, STOR-HZ, WHS
4,000	2,857	1,143		HANGAR(F3), HOSPITL
4,000	3,640	360	Exhaust Fans and Power Vents.	
5,000	3,571	1,429		BARRACK, REC, HOTEL
6,000	2,520	3,480	Circ. Pumps	COMCATN(F6), WHS-CLD
8,760	3,640	5,120		GROCERY, HUT KENNEL, PLT-BLD, POOL-IN, PUMP, TRAING

- Existing motors were considered to be sized correctly for current operations. However, significant additional savings can probably be obtained by evaluating the size of each motor in relation to its load at the time of replacement. It is particularly important to check for fans and pumps that are producing higher flow rates than necessary or that have been throttled with dampers, valves or flow regulators.
- Existing, new standard, and new energy efficient motor efficiencies, based on data from Motor Master (Washington State Energy Office, 1992) for hp>1 and Grainger (1992) for hp<1, are shown in the following table. Existing motors were assumed to have an average 2% lower efficiency compared to new standard replacements to account for age and wear.

Motor Rating, (hp)	Existing Eff.	New Std. Eff.	New EEM Eff.
1/4	65.0%	67.0%	77.0%
1/3	67.0%	69.0%	78.0%
1/2	74.0%	76.0%	81.0%
3/4	73.0%	75.0%	82.0%
1	74.2%	76.2%	86.0%
2	77.6%	79.6%	86.3%
3	81.1%	83.1%	90.2%
5	82.5%	84.5%	90.0%

<u>Motor Rating, (hp)</u>	<u>Existing Eff.</u>	<u>New Std. Eff.</u>	<u>New EEM Eff.</u>
7.5	84.0%	86.0%	92.0%
10	85.1%	87.1%	91.7%
15	86.6%	88.6%	93.0%
20	87.8%	89.8%	93.6%
25	87.8%	89.8%	94.1%
30	87.8%	89.8%	94.1%
40	88.4%	90.4%	95.0%
50	89.1%	91.1%	95.0%

Cost estimating data are as follows:

- Maintenance costs for standard and high-efficiency motors are the same.
- Motor costs are based on the energy-efficient ODP motor costs reported in Motor Master (Washington State Energy Office, 1992) for hp >1, and Grainger (1992) for hp <1, as shown in the following table. The list price is shown; substantial (~25-50%) discounts should be available for volume purchases.

<u>Motor Rating (hp)</u>	<u>High Efficiency Motor Cost</u>
1/4	\$138
1/3	\$144
1/2	\$163
3/4	\$174
1	\$211
2	\$254
3	\$316
5	\$370
7.5	\$538
10	\$633
15	\$864
20	\$1,055
25	\$1,226
30	\$1,425
40	\$1,772
50	\$2,066

- The cost of installation labor, based on data from *Electrical Cost Data* (Means 1992), are given below. The labor cost is double what is reported in Means to cover removal of the existing motor.

<u>Motor Rating (hp)</u>	<u>Installa- tion Cost</u>
<= 5	\$86
7.5	\$94
10	\$98
15	\$122
20	\$150
25	\$158
30	\$164
40	\$198
50	\$246

- Motor life expectancy is 15 years.
- Salvage value of still-functional motors is 20% of a standard single-speed motor's new cost.

Results

Detailed quantitative results of the energy-efficient motor ERO analysis are presented in Tables 2.12 through 2.20. The results are discussed in general terms below.

Budget Implications. The first cost of all cost-effective energy-efficient motor retrofits is \$827,323, consisting of the immediate replacement implementations at \$477,951 and the replacement on failure measures at \$349,372. The following table breaks out the results by operating hour group.

<u>Operating Hours</u>	<u>RI First Cost</u>	<u>ROF First Cost</u>	<u>Total First Cost</u>
800	0	107,395	107,395
1000	0	114,783	114,783
1650	35,788	32,135	64,270
2100	187,406	42,461	84,922
3200	89,297	14,445	28,890
4000	74,126	10,766	21,532
5000	49,777	3,187	6,374
6000	27,465	24,200	48,400
8760	14,092	0	14,092
Totals:	477,951	349,372	827,323

Energy, Demand, and Cost Savings. The electric energy savings associated with all cost-effective implementations of this ERO are estimated to be 1,301,728 kWh per year at a cost savings of \$70,405 per year. Demand savings are estimated to be 3,910 kW-months per year with a cost savings of over \$20,231 per year. Results are presented by operating hour group in the following table.

<u>Operating Hours</u>	<u>Energy kWh</u>	<u>Energy Cost</u>	<u>Demand kW-months</u>	<u>Demand Cost</u>
800	21,488	1,168	229	1,262
1000	45,989	2,500	458	2,526
1650	82,613	4,492	368	715
2100	398,282	21,654	1,380	7,602
3200	255,447	13,889	538	2,961
4000	223,876	12,472	543	2,989
5000	93,099	5,109	154	845
6000	125,597	6,356	193	1,069
8760	55,337	2,765	47	262
Totals:	1,301,728	70,405	3,910	20,231

The results are broken out by motor size as well as total operating hours in the ERO tables. Each table consists of three sub-tables. The energy and demand numbers for the existing equipment are tabulated in the first sub-

table. The energy and demand numbers for the replacement technology appear in the second sub-table and the savings numbers appear in the third sub-table.

Energy or Operations Security. This ERO has no impact on energy or operations security. The recommended motor replacements are one-for-one retrofits that do not affect operations or energy supply.

Operations and Maintenance. The impact of this ERO on maintenance is considered to be negligible. Newer, higher-efficiency motors should have no increased maintenance costs. In practice they may even require less maintenance.

Environmental Implications. This ERO has no direct environmental impact.

2.4.2 Variable Speed Drives

Variable speed drives (VSD) can be added to many HVAC motor applications to reduce energy consumption without compromising system performance. Fans and pumps are sized to at least meet the maximum load, even though this may occur only a few hours a year. Furthermore, most motors are generously oversized to account for uncertainties in duct, coil and register pressure losses, as well as to provide additional capacity in the event of future remodeling. The VSD varies motor speed to just meet the load, practically eliminating the energy waste that results from oversizing. In fixed-speed applications, the VSD controlled motor is not as efficient as a correctly sized line-powered motor, but the VSD controlled motor is often easier to implement because of uncertainty in existing and future conditions.

The VSD offers several other advantages over the line-powered single-speed motor. The VSD provides "soft-starting", ramping up to speed rather than an abrupt step up to full power. This will decrease wear on the motor, drive train, and fan, as well as allow for instant restart in the event of momentary power interruption. Longer equipment life and lower noise levels will occur due to lower average operating speed.

Description

Single-speed motors larger than 1 hp used in air handling units, blast heaters, chilled and condenser water pumps, cooling tower fans, and power ventilators have been considered for replacement. Because of their relatively low energy consumption and high per-hp cost, application of VSDs to motors of less than 1 hp are not considered in this analysis.

Assumptions

Technical assumptions are as follows:

- The operation schedules are the same as those for the single speed motor ERO.
- The highest savings for VSDs in AHUs is achieved by converting the distribution system to a variable air volume (VAV) system. For this analysis, 1/3 of the existing systems were assumed to be constant volume and easily converted to VAV, 1/3 were assumed to be VAV inlet-vane systems, and the remaining 1/3 were assumed to be unsuitable for VSD application. The VSD will save approximately 71% of the existing constant volume fan motor energy, and 58% of existing inlet vane VAV motor energy (Moses, Scott A., et al., 1989). These are general estimates, since individual motor load profile data is required to fully analyze the savings for each VSD application.
- Chilled water pumps were considered to be directly related to the AHU's and therefore have similar percentage savings.
- Blast heaters, condenser water pumps, and cooling tower fans with VSDs were assumed to use 50% less energy than the existing conditions.
- Power ventilators with VSDs were also assumed to have 50% savings, but only 25% of the power ventilators were assumed to be retrofittable. The remainder were assumed to be used for exhaust systems requiring full power for health or safety reasons.

Cost estimating parameters are as follows:

- Annual maintenance costs for the VSD retrofit were assumed to be \$10 per motor more than for the existing single-speed motors; this additional cost is for the maintenance of additional controls associated with the VSD operation.
- VSD controller costs (installed) are shown in the following table. Where available (from transformer records) the actual voltage of the motor was used, other motor voltages were assumed as follows:

1-3 hp, 5% 460 V, 5-10 hp, 25% 460 V, 15-30 hp, 50% 460 V, 40+ hp, 100% 460 V. VSD costs were obtained from several manufacturers. These costs are approximate for a wide range of sizes and system types, actual costs may be higher or lower depending on individual circumstances.

Motor Rating, hp	208V Equip. Cost, \$	460V Equip. Cost, \$
1	1,061	1,358
2	1,188	1,358
3	1,368	1,358
5	1,368	1,503
7.5	1,600	1,752
10	2,168	1,772
15	2,769	2,495
20	3,481	2,550
25	4,420	3,110
30	4,645	4,217
40	7,150	5,610
50		6,985

- Additional costs for individual motor types are given in the following table.

Motor Type	Additional Cost	Description
AHU and chilled water pumps	\$2400/hp for AHU \$600/hp for pump	For 1/3 of motors requiring CV to VAV retrofit.
Blast Heater	\$200 each	Proportional thermostat.
Condenser water pump and cooling tower fans	\$100 each	Proportional aquastat.
Power ventilators	\$200 each	Either bldg. static pressure sensor or tie into existing outside air (OA) control system.

- VSD life expectancy is 15 years.

Results

Quantitative results of the VSD ERO analysis are presented in Tables 2.21 through 2.29. All motors larger than 1 hp that are considered for

VSD retrofit are listed in the first block of each table. Two cases are analyzed: adding VSD to the existing motor and motor replacement^(a) in conjunction with adding VSD.

Budget Implications. The first cost of all cost-effective motor VSD retrofits is \$833,322, consisting of the immediate VSD only measures at \$3,757 and energy-efficient motor plus VSD measures at \$829,565. The following table breaks down the results by operating hour group.

<u>Operating Hours</u>	<u>VSD Only First Cost</u>	<u>VSD & EEM First Cost</u>	<u>Total First Cost</u>
800	1,480	0	1,480
1000	2,277	0	2,277
1650	0	20,319	20,319
2100	0	277,026	277,026
3200	0	160,097	160,097
4000	0	197,985	197,985
5000	0	40,068	40,068
6000	0	86,595	86,595
8760	<u>0</u>	<u>47,475</u>	<u>47,475</u>
Totals:	3,757	829,565	833,322

Energy, Demand, and Cost Savings. The electric energy savings associated with all cost-effective implementations of this ERO are estimated to be 2,177,191 kWh per year at a cost savings of \$139,902 per year. Demand savings are estimated to be 5,076 kW-months per year with a cost savings of over \$27,962 per year. Results are presented by operating hour group in the following table.

<u>Operating Hours</u>	<u>Energy kWh</u>	<u>Energy Cost</u>	<u>Demand kW-months</u>	<u>Demand Cost</u>
800	7,753	516	58	320
1000	9,966	664	60	329
1650	69,804	4,541	254	1,399
2100	674,863	43,954	1,928	10,624
3200	527,918	34,209	990	5,454

(a) with the higher efficiency motor used in Section 2.4.1.

<u>Operating Hours</u>	<u>Energy kWh</u>	<u>Energy Cost</u>	<u>Demand kW-months</u>	<u>Demand Cost</u>
4000	520,036	30,624	1,437	7,917
5000	59,727	3,891	72	395
6000	210,597	14,730	211	1,160
8760	<u>96,527</u>	<u>6,773</u>	<u>66</u>	<u>364</u>
Totals:	2,177,191	139,902	5,076	27,962

The results are broken out by motor size as well as total operating hours in the ERO tables. Each table consists of three sub-tables. The energy and demand numbers for the existing equipment are tabulated in the first sub-table. The energy and demand numbers for the replacement technology appear in the second sub-table and the savings numbers appear in the third sub-table. The second and third sub-tables are further divided to show the parameters and economics for each VSD application alone and for each VSD application in combination with the efficient motor upgrade.

Energy and Operations Security. This ERO has no impact on energy security.

Operations and Maintenance. Additional maintenance associated with this ERO is small but not negligible. Controls for the replacement VSDs will have a finite failure rate that is reflected in the estimated maintenance costs.

Environmental Implications. This ERO has no direct environmental impact.

TABLE 2.12. Efficient Motor ERO: Motors with 800 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Motrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	Furnace Fans	1/4	39	571	229	6	4,792	1,922	50	NA
2	Condensate Pump	1/2	1	571	229	6	216	87	2	NA
3	Condenser Fan	1/2	2	571	229	6	432	173	5	NA
4	Furnace Fans	1/2	277	571	229	6	59,794	23,980	626	NA
5	Furnace Fans	3/4	2	571	229	6	656	263	7	NA
6	AHU	1	6	571	229	9	2,563	1,036	41	NA
7	Air Compressor	1	31	571	229	12	13,347	5,353	281	NA
8	Condenser Fan	2	2	571	229	6	1,647	660	17	NA
9	AHU	3	1	571	229	9	1,182	474	19	NA
10	Air Compressor	4	1	571	229	12	1,576	632	33	NA
11	Air Compressor	5	3	571	229	12	5,809	2,330	122	NA
12	Air Compressor	8	1	571	229	12	2,852	1,144	60	NA
13a	AHU	10	2	571	229	9	7,505	3,010	116	NA
13b	AHU	10	5	571	229	9	18,763	7,525	296	NA
14	Air Compressor	10	2	571	229	12	7,506	3,011	158	NA
15	Condenser Wtr Pump	15	1	571	229	6	5,534	2,219	58	NA
16	Cooling Twr Fan	15	1	571	229	6	5,534	2,219	58	NA
17	Chilled Water Pump	20	1	571	229	6	7,277	2,919	76	NA
18	Condenser Fan	20	1	571	229	6	7,277	2,919	76	NA
19	Air Compressor	30	3	571	229	12	32,748	13,134	668	NA

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Motrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	Furnace Fans	1/4	39	571	229	6	4,045	1,622	43	NA
2	Condensate Pump	1/2	1	571	229	6	197	79	2	NA
3	Condenser Fan	1/2	2	571	229	6	394	156	4	NA
4	Furnace Fans	1/2	277	571	229	6	54,626	21,900	574	NA
5	Furnace Fans	3/4	2	571	229	6	584	234	6	NA
6	AHU	1	6	571	229	9	2,229	894	35	NA
7	Air Compressor	1	31	571	229	12	11,516	4,618	242	NA
8	Condenser Fan	2	2	571	229	6	1,481	594	16	NA
9	AHU	3	1	571	229	9	1,063	426	17	NA
10	Air Compressor	4	1	571	229	12	1,417	568	30	NA
11	Air Compressor	5	3	571	229	12	5,325	2,135	112	NA
12	Air Compressor	8	1	571	229	12	2,604	1,045	55	NA
13a	AHU	10	2	571	229	9	6,965	2,793	110	NA
13b	AHU	10	5	571	229	9	17,413	6,963	274	NA
14	Air Compressor	10	2	571	229	12	6,968	2,794	146	NA
15	Condenser Wtr Pump	15	1	571	229	6	5,153	2,067	54	NA
16	Cooling Twr Fan	15	1	571	229	6	5,153	2,067	54	NA
17	Chilled Water Pump	20	1	571	229	6	6,626	2,738	72	NA
18	Condenser Fan	20	1	571	229	6	6,626	2,738	72	NA
19	Air Compressor	30	3	571	229	12	30,555	12,254	642	NA

TABLE 2.12. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
1	8,736	15	952	1,046	8	57	43	100	ROF	473	1.07
2	249	15	29	26	0	1	1	3	ROF	8	1.03
3	498	15	57	52	0	3	2	5	ROF	12	1.03
4	68,973	15	7,922	7,240	54	394	299	693	ROF	1,729	1.03
5	520	15	64	101	1	5	4	10	ROF	59	1.16
6	1,782	15	187	497	6	27	31	58	ROF	(215)	0.83
7	9,207	15	967	2,566	38	139	212	352	ROF	2,147	1.25
8	680	15	110	233	2	13	10	22	ROF	213	1.43
9	402	15	58	167	2	9	10	19	ROF	129	1.44
10	402	15	58	223	3	12	18	31	ROF	315	1.85
11	1,368	15	198	678	10	37	58	93	ROF	551	1.55
12	632	15	95	348	5	17	29	48	ROF	435	1.74
13a	1,462	15	767	757	9	41	47	88	ROF	457	1.43
13b	3,655	15	219	1,892	21	103	117	220	ROF	1,142	1.43
14	1,462	15	219	757	11	41	63	104	ROF	556	1.52
15	986	15	147	534	4	29	22	51	ROF	239	1.33
16	986	15	147	534	4	29	22	51	ROF	239	1.33
17	1,205	15	183	632	5	34	26	60	ROF	277	1.31
18	1,205	15	183	632	5	34	26	60	ROF	277	1.31
19	4,767	15	753	3,072	46	167	254	421	ROF	3,510	1.80
Totals											
ROF	107,395		13,128	21,488	229	1,168	1,262	2,430		12,767	
RI	0		0	0	0	0	0	0		0	

TABLE 2.13. Efficient Motor ERO: Motors with 1000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
2	AHU	1/4	1	714	286	9	154	62	2	NA
3	CABINET HEATER	1/4	6	714	286	6	922	369	6	NA
4	Furnace Fans	1/4	158	714	286	6	24,267	9,720	204	NA
5	Condenser Fan	1/3	1	714	286	6	187	79	2	NA
6	Furnace Fans	1/3	111	714	286	6	21,832	8,745	183	NA
7	AHU	1/2	4	714	286	9	1,079	432	14	NA
8	CABINET HEATER	1/2	2	714	286	6	540	216	5	NA
9	Condensate Pump	1/2	5	714	286	6	1,349	540	11	NA
10	Condenser Fan	1/2	1	714	286	6	270	108	2	NA
11	AHU	3/4	1	714	286	9	410	164	5	NA
12	Condenser Fan	3/4	2	714	286	6	821	329	7	NA
13a	AHU	1	1	714	286	9	538	216	7	NA
13b	AHU	1	1	714	286	9	538	216	7	NA
14a	BLAST HEATER	1	1	714	286	6	538	216	5	NA
14b	BLAST HEATER	1	1	714	286	6	538	216	5	NA
15	Chilled Water Pump	1	1	714	286	6	538	216	5	NA
16	Condenser Water Pump	1	1	714	286	6	538	216	5	NA
17	Cooling Twr Fan	1	1	714	286	6	538	216	5	NA
18	Furnace Fans	1	2	714	286	6	1,078	431	9	NA
19	Liq. Transfer Pump	1	10	714	286	12	5,382	2,156	90	NA
20	AHU	3	1	714	286	9	1,477	592	19	NA
21	Condenser Fan	3	2	714	286	6	2,954	1,183	25	NA
22a	AHU	5	2	714	286	9	4,840	1,939	61	NA
22b	AHU	5	3	714	286	9	7,260	2,908	92	NA
23	Condenser Water Pump	5	1	714	286	6	2,420	969	20	NA
24	Cooling Twr Fan	5	1	714	286	6	2,420	969	20	NA
25	Liq. Transfer Pump	5	10	714	286	12	24,201	9,694	407	NA
26	AHU	7.5	1	714	286	9	3,565	1,428	45	NA
27	Chilled Water Pump	7.5	1	714	286	6	3,565	1,428	30	NA
28	Chilled Water Pump	10	1	714	286	6	4,692	1,880	39	NA
29	Condenser Water Pump	10	1	714	286	6	4,692	1,880	39	NA
30	Cooling Twr Fan	10	1	714	286	6	4,692	1,880	39	NA
31	AHU	25	1	714	286	9	11,370	4,554	143	NA
32	Liq. Transfer Pump	30	7	714	286	12	95,510	38,257	1,605	NA
33	Liq. Transfer Pump	40	9	714	286	12	162,620	65,139	2,733	NA

TABLE 2.13. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
2	AHU	0.25	1	714	286	9	130	52	2	NA
3	CABINET HEATER	0.25	6	714	286	6	778	312	7	NA
4	Furnace Fans	0.25	158	714	286	6	20,485	8,205	172	NA
5	Condenser Fan	0.33	1	714	286	6	169	68	1	NA
6	Furnace Fans	0.33	111	714	286	6	18,753	7,512	158	NA
7	AHU	0.5	4	714	286	9	986	395	12	NA
8	CABINET HEATER	0.5	2	714	286	6	493	197	4	NA
9	Condensate Pump	0.5	5	714	286	6	1,232	494	10	NA
10	Condenser Fan	0.5	1	714	286	6	246	99	2	NA
11	AHU	0.75	1	714	286	9	365	146	5	NA
12	Condenser Fan	0.75	2	714	286	6	730	293	6	NA
13a	AHU	1	1	714	286	9	464	186	6	NA
13b	AHU	1	1	714	286	9	464	186	6	NA
14a	BLAST HEATER	1	1	714	286	6	464	186	4	NA
14b	BLAST HEATER	1	1	714	286	6	464	186	4	NA
15	Chilled Water Pump	1	1	714	286	6	464	186	4	NA
16	Condenser Water Pump	1	1	714	286	6	464	186	4	NA
17	Cooling Twr Fan	1	1	714	286	6	464	186	4	NA
18	Furnace Fans	1	2	714	286	6	929	372	8	NA
19	Liq. Transfer Pump	1	10	714	286	12	4,643	1,860	78	NA
20	AHU	3	1	714	286	9	1,328	532	17	NA
21	Condenser Fan	3	2	714	286	6	2,656	1,064	22	NA
22a	AHU	5	2	714	286	9	4,437	1,777	56	NA
22b	AHU	5	3	714	286	9	6,655	2,666	84	NA
23	Condenser Water Pump	5	1	714	286	6	2,218	889	19	NA
24	Cooling Twr Fan	5	1	714	286	6	2,218	889	19	NA
25	Liq. Transfer Pump	5	10	714	286	12	22,185	8,886	373	NA
26	AHU	7.5	1	714	286	9	3,255	1,304	41	NA
27	Chilled Water Pump	7.5	1	714	286	6	3,255	1,304	27	NA
28	Chilled Water Pump	10	1	714	286	6	4,355	1,744	37	NA
29	Condenser Water Pump	10	1	714	286	6	4,355	1,744	37	NA
30	Cooling Twr Fan	10	1	714	286	6	4,355	1,744	37	NA
31	AHU	25	1	714	286	9	10,609	4,250	134	NA
32	Liq. Transfer Pump	30	7	714	286	12	89,116	35,696	1,498	NA
33	Liq. Transfer Pump	40	9	714	286	12	151,322	60,614	2,543	NA

TABLE 2.13. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
2	224	15	24	34	0	2	2	3	ROF	126	1.10
3	1,344	15	146	201	1	11	7	18	ROF	2,350	1.09
4	35,392	15	3,855	5,297	32	288	175	463	ROF	17	1.10
5	230	15	25	39	0	2	1	3	ROF	1,916	1.10
6	25,530	15	2,819	4,312	26	234	143	377	ROF	48	1.07
7	996	15	114	131	1	7	6	14	ROF	18	1.05
8	498	15	57	65	0	4	2	6	ROF	56	1.05
9	1,245	15	143	163	1	9	5	14	ROF	9	1.05
10	249	15	29	33	0	2	1	3	ROF	42	1.22
11	260	15	32	63	1	3	3	7	ROF	69	1.18
12	520	15	64	126	1	7	4	11	ROF	42	1.20
13a	297	15	31	103	1	6	5	11	ROF	42	1.20
13b	297	15	31	103	1	6	5	11	ROF	43	1.16
14a	297	15	31	103	1	6	3	9	ROF	43	1.16
14b	297	15	31	103	1	6	3	9	ROF	30	1.14
15	297	15	31	103	1	6	3	9	ROF	30	1.14
16	297	15	31	103	1	6	3	9	ROF	30	1.14
17	297	15	31	103	1	6	3	9	ROF	59	1.14
18	594	15	62	207	1	11	7	18	ROF	3,510	1.80
19	2,970	15	312	1,034	12	56	68	125	ROF	822	1.30
20	402	15	58	209	2	11	10	22	ROF	146	1.50
21	804	15	117	417	3	23	14	36	ROF	242	1.41
22a	912	15	131	565	5	31	28	59	ROF	346	1.52
22b	1,368	15	196	847	8	46	42	88	ROF	519	1.52
23	456	15	65	282	2	15	9	25	ROF	142	1.42
24	456	15	65	282	2	15	9	25	ROF	142	1.42
25	4,560	15	654	2,825	34	154	187	340	ROF	3,078	1.73
26	632	15	95	434	4	24	22	45	ROF	409	1.70
27	632	15	95	434	3	24	14	38	ROF	222	1.48
28	731	15	110	473	3	26	16	41	ROF	211	1.40
29	731	15	110	473	3	26	16	41	ROF	211	1.40
30	731	15	110	473	3	26	16	41	ROF	211	1.40
31	1,384	15	217	1,066	10	58	53	111	ROF	919	1.72
32	11,123	15	1,757	8,956	107	487	592	1,079	ROF	9,116	1.89
33	17,730	15	2,790	15,823	190	860	1,046	1,906	ROF	16,560	2.01
Totals:											
ROF:	114,783		14,472	45,989	458	2,500	2,526	5,026		41,776	
RI:	0		0	0	0	0	0	0		0	

TABLE 2.14. Efficient Motor ERO: Motors with 1650 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
2	CABINET HEATER	1/4	13	1179	471	6	3,297	1,317	17	NA
3	Condensate Pump	1/4	4	1179	471	6	1,014	405	5	NA
4	Chilled Water Pump	1/3	1	1179	471	6	325	130	2	NA
5	Condenser Water Pump	1/3	1	1179	471	6	325	130	2	NA
6	Cooling Twr Fan	1/3	1	1179	471	6	325	130	2	NA
7	CABINET HEATER	1/2	1	1179	471	6	446	178	2	NA
8	Chilled Water Pump	1/2	2	1179	471	6	891	356	5	NA
9	Condensate Pump	1/2	26	1179	471	6	11,584	4,628	59	NA
10	Condenser Fan	1/2	1	1179	471	6	446	178	2	NA
11	Condenser Water Pump	1/2	2	1179	471	6	891	356	5	NA
12	Cooling Twr Fan	1/2	2	1179	471	6	891	356	5	NA
13	Furnace Fans	1/2	1	1179	471	6	446	178	2	NA
14	AHU	3/4	4	1179	471	9	2,710	1,083	21	NA
15	Condenser Fan	3/4	3	1179	471	6	2,032	812	10	NA
16a	AHU	1	2	1179	471	9	1,777	710	14	NA
16b	AHU	1	3	1179	471	9	2,666	1,065	20	NA
17	BLAST HEATER	1	1	1179	471	6	889	355	5	NA
18	Chilled Water Pump	1	1	1179	471	6	889	355	5	NA
19	Condenser Fan	1	2	1179	471	6	1,777	710	9	NA
20	Condenser Water Pump	1	1	1179	471	6	889	355	5	NA
21	Cooling Twr Fan	1	1	1179	471	6	889	355	5	NA
22	Furnace Fans	1	13	1179	471	6	11,553	4,615	59	NA
23a	AHU	2	7	1179	471	9	3,399	1,358	26	NA
23b	AHU	2	1	1179	471	9	8,497	3,395	65	NA
24	Condenser Fan	2	1	1179	471	6	1,699	679	9	NA
25	Condenser Water Pump	2	1	1179	471	6	1,699	679	9	NA
26	Cooling Twr Fan	2	1	1179	471	6	1,699	679	9	NA
27a	AHU	3	10	1179	471	9	7,317	2,923	56	NA
27b	AHU	3	1	1179	471	9	17,074	6,821	130	NA
28a	Chilled Water Pump	3	2	1179	471	6	2,439	974	12	NA
28b	Chilled Water Pump	3	1	1179	471	6	2,439	974	12	NA
29	Condenser Fan	3	1	1179	471	6	2,439	974	12	NA
30	Condenser Water Pump	3	1	1179	471	6	2,439	974	12	NA
31	Cooling Twr Fan	3	1	1179	471	6	2,439	974	12	NA
32a	Cooling Twr Fan	4	2	1179	471	6	3,252	1,299	17	NA
32b	Cooling Twr Fan	4	1	1179	471	6	3,252	1,299	17	NA
33a	AHU	5	4	1179	471	9	7,993	3,193	61	NA
33b	AHU	5	1	1179	471	9	7,993	3,193	61	NA
34a	Chilled Water Pump	5	2	1179	471	6	3,996	1,596	20	NA
34b	Chilled Water Pump	5	1	1179	471	6	3,996	1,596	20	NA
35	Condenser Fan	5	3	1179	471	6	11,989	4,789	61	NA
36a	Condenser Water Pump	5	3	1179	471	6	3,996	1,596	20	NA
36b	Condenser Water Pump	5	1	1179	471	6	7,993	3,193	41	NA
37	Cooling Twr Fan	5	1	1179	471	6	3,996	1,596	20	NA
38a	AHU	7.5	4	1179	471	9	5,887	2,352	45	NA
38b	AHU	7.5	1	1179	471	9	17,662	7,056	135	NA
39a	Chilled Water Pump	7.5	2	1179	471	6	5,887	2,352	30	NA
39b	Chilled Water Pump	7.5	1	1179	471	6	5,887	2,352	30	NA
40	Condenser Fan	7.5	3	1179	471	6	17,662	7,056	90	NA
41a	AHU	10	12	1179	471	9	30,993	12,382	237	NA
41b	AHU	10	1	1179	471	9	61,987	24,763	473	NA
42a	BLAST HEATER	10	4	1179	471	6	15,497	6,191	79	NA
42b	BLAST HEATER	10	1	1179	471	6	15,497	6,191	79	NA
43	Chilled Water Pump	10	1	1179	471	6	7,748	3,095	39	NA
44	Condenser Water Pump	10	1	1179	471	6	7,748	3,095	39	NA
45a	Cooling Twr Fan	10	3	1179	471	6	7,748	3,095	39	NA
45b	Cooling Twr Fan	10	1	1179	471	6	15,497	6,191	79	NA
46	AHU	20	1	1179	471	9	15,020	6,000	115	NA
47	Condenser Water Pump	20	1	1179	471	6	15,020	6,000	76	NA
48	Chilled Water Pump	25	1	1179	471	6	18,775	7,501	96	NA
49a	AHU	30	2	1179	471	9	22,530	9,001	172	NA
49b	AHU	30	1	1179	471	9	22,530	9,001	172	NA
50	Condenser Fan	30	1	1179	471	6	22,530	9,001	115	NA

TABLE 2.14. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
2	CABINET HEATER	1/4	13	1179	471	6	2,256	901	11	NA
3	Condensate Pump	1/4	4	1179	471	6	694	277	4	NA
4	Chilled Water Pump	1/3	1	1179	471	6	229	92	1	NA
5	Condenser Water Pump	1/3	1	1179	471	6	229	92	1	NA
6	Cooling Twr Fan	1/3	1	1179	471	6	229	92	1	NA
7	CABINET HEATER	1/2	1	1179	471	6	347	139	2	NA
8	Chilled Water Pump	1/2	2	1179	471	6	694	277	4	NA
9	Condensate Pump	1/2	26	1179	471	6	9,023	3,605	46	NA
10	Condenser Fan	1/2	1	1179	471	6	347	139	2	NA
11	Condenser Water Pump	1/2	2	1179	471	6	694	277	4	NA
12	Cooling Twr Fan	1/2	2	1179	471	6	694	277	4	NA
13	Furnace Fans	1/2	1	1179	471	6	347	139	2	NA
14	AHU	3/4	4	1179	471	9	2,082	832	16	NA
15	Condenser Fan	3/4	3	1179	471	6	1,562	624	8	NA
16a AHU	1	5	1179	471	9	1,388	555	11	NA	
16b AHU	1	1	1179	471	9	2,082	832	16	NA	
17	BLAST HEATER	1	1	1179	471	6	694	277	4	NA
18	Chilled Water Pump	1	1	1179	471	6	694	277	4	NA
19	Condenser Fan	1	2	1179	471	6	1,388	555	7	NA
20	Condenser Water Pump	1	1	1179	471	6	694	277	4	NA
21	Cooling Twr Fan	1	1	1179	471	6	694	277	4	NA
22	Furnace Fans	1	13	1179	471	6	9,023	3,605	46	NA
23a AHU	2	7	1179	471	9	2,776	1,109	21	NA	
23b AHU	2	1	1179	471	9	6,941	2,773	53	NA	
24	Condenser Fan	2	1	1179	471	6	1,388	555	7	NA
25	Condenser Water Pump	2	1	1179	471	6	1,388	555	7	NA
26	Cooling Twr Fan	2	1	1179	471	6	1,388	555	7	NA
27a AHU	3	10	1179	471	9	6,247	2,496	48	NA	
27b AHU	3	1	1179	471	9	14,576	5,823	111	NA	
28a	Chilled Water Pump	3	2	1179	471	6	2,082	832	11	NA
28b	Chilled Water Pump	3	1	1179	471	6	2,082	832	11	NA
29	Condenser Fan	3	1	1179	471	6	2,082	832	11	NA
30	Condenser Water Pump	3	1	1179	471	6	2,082	832	11	NA
31	Cooling Twr Fan	3	1	1179	471	6	2,082	832	11	NA
32a	Cooling Twr Fan	4	2	1179	471	6	2,776	1,109	14	NA
32b	Cooling Twr Fan	4	1	1179	471	6	2,776	1,109	14	NA
33a AHU	5	4	1179	471	9	6,941	2,773	53	NA	
33b AHU	5	1	1179	471	9	6,941	2,773	53	NA	
34a	Chilled Water Pump	5	2	1179	471	6	3,470	1,386	18	NA
34b	Chilled Water Pump	5	1	1179	471	6	3,470	1,386	18	NA
35	Condenser Fan	5	3	1179	471	6	10,411	4,159	53	NA
36a	Condenser Water Pump	5	3	1179	471	6	3,470	1,386	18	NA
36b	Condenser Water Pump	5	1	1179	471	6	6,941	2,773	35	NA
37	Cooling Twr Fan	5	1	1179	471	6	3,470	1,386	18	NA
38a AHU	7.5	4	1179	471	9	5,206	2,080	40	NA	
38b AHU	7.5	1	1179	471	9	15,617	6,239	119	NA	
39a	Chilled Water Pump	7.5	2	1179	471	6	5,206	2,080	26	NA
39b	Chilled Water Pump	7.5	1	1179	471	6	5,206	2,080	26	NA
40	Condenser Fan	7.5	3	1179	471	6	15,617	6,239	79	NA
41a AHU	10	12	1179	471	9	27,764	11,091	212	NA	
41b AHU	10	1	1179	471	9	55,527	22,183	424	NA	
42a	BLAST HEATER	10	4	1179	471	6	13,882	5,546	71	NA
42b	BLAST HEATER	10	1	1179	471	6	13,882	5,546	71	NA
43	Chilled Water Pump	10	1	1179	471	6	6,941	2,773	35	NA
44	Condenser Water Pump	10	1	1179	471	6	6,941	2,773	35	NA
45a	Cooling Twr Fan	10	3	1179	471	6	6,941	2,773	35	NA
45b	Cooling Twr Fan	10	1	1179	471	6	13,882	5,546	71	NA
46	AHU	20	1	1179	471	9	13,882	5,546	106	NA
47	Condenser Water Pump	20	1	1179	471	6	13,882	5,546	71	NA
48	Chilled Water Pump	25	1	1179	471	6	17,352	6,932	88	NA
49a AHU	30	2	1179	471	9	20,823	8,318	159	NA	
49b AHU	30	1	1179	471	9	20,823	8,318	159	NA	
50	Condenser Fan	30	1	1179	471	6	20,823	8,318	106	NA

TABLE 2.14. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
2	2,912	15	317	1,457	5	79	11	90	ROF	1,234	1.46
3	896	15	98	448	2	24	7	32	ROF	380	1.46
4	230	15	25	134	0	7	6	13	ROF	76	1.45
5	230	15	25	134	0	7	6	13	ROF	76	1.45
6	230	15	25	134	0	7	6	13	ROF	76	1.45
7	249	15	29	138	1	7	6	14	ROF	112	1.49
8	498	15	57	276	1	15	7	22	ROF	149	1.41
9	6,474	15	744	3,584	13	195	19	213	ROF	2,905	1.49
10	249	15	29	138	1	7	6	14	ROF	75	1.41
11	498	15	57	276	1	15	7	22	ROF	149	1.41
12	498	15	57	276	1	15	7	22	ROF	149	1.41
13	249	15	29	138	1	7	6	14	ROF	75	1.41
14	1,040	15	128	878	5	48	10	58	ROF	901	1.94
15	780	15	96	659	2	36	8	44	ROF	392	1.69
16a	594	15	62	545	3	30	8	38	ROF	301	1.69
16b	891	15	94	817	4	44	10	54	ROF	451	1.69
17	297	15	31	272	1	15	7	21	ROF	193	1.70
18	297	15	31	272	1	15	7	21	ROF	128	1.59
19	594	15	62	545	2	30	7	37	ROF	256	1.59
20	297	15	31	272	1	15	7	21	ROF	128	1.59
21	297	15	31	272	1	15	7	21	ROF	128	1.59
22	3,861	15	406	3,540	13	192	18	211	ROF	1,684	1.59
23a	680	15	110	871	5	47	10	58	RI	695	2.02
23b	1,700	15	275	2,178	12	118	17	136	RI	1,738	2.02
24	340	15	55	436	2	24	7	31	ROF	290	2.17
25	340	15	55	436	2	24	7	31	ROF	290	2.17
26	340	15	55	436	2	24	7	31	ROF	290	2.17
27a	1,206	15	175	1,498	8	81	14	95	ROF	1,458	2.31
27b	2,814	15	409	3,498	19	190	25	215	ROF	3,401	2.31
28a	402	15	58	499	2	27	7	34	ROF	282	1.96
28b	402	15	58	499	2	27	7	34	ROF	282	1.96
29	402	15	58	499	2	27	7	34	ROF	282	1.96
30	402	15	58	499	2	27	7	34	ROF	282	1.96
31	402	15	58	499	2	27	7	34	ROF	282	1.96
32a	402	15	58	666	2	36	8	44	RI	441	2.10
32b	402	15	58	666	2	36	8	44	RI	441	2.10
33a	912	15	131	1,472	8	80	14	94	RI	1,381	2.51
33b	912	15	131	1,472	8	80	14	94	RI	1,381	2.51
34a	456	15	65	736	3	40	8	48	RI	458	2.01
34b	456	15	65	736	3	40	8	48	RI	458	2.01
35	1,368	15	196	2,208	8	120	14	134	RI	1,375	2.01
36a	456	15	65	736	3	40	8	48	RI	458	2.01
36b	912	15	131	1,472	5	80	11	91	RI	917	2.01
37	456	15	65	736	3	40	8	48	RI	458	2.01
38a	632	15	95	954	5	52	11	63	RI	678	2.07
38b	1,896	15	284	2,862	16	156	21	177	RI	2,034	2.07
39a	632	15	95	954	3	52	9	61	RI	447	1.71
39b	632	15	95	954	3	52	9	61	RI	447	1.71
40	1,896	15	284	2,862	10	156	16	172	RI	1,651	1.87
41a	2,924	15	438	4,520	25	246	30	276	RI	3,774	2.29
41b	5,848	15	877	9,040	49	492	55	546	RI	7,548	2.29
42a	1,462	15	219	2,260	8	123	14	137	ROF	1,701	2.26
42b	1,462	15	219	2,260	8	123	14	137	ROF	1,701	2.26
43	731	15	110	1,130	4	61	10	71	RI	639	1.87
44	731	15	110	1,130	4	61	10	71	RI	639	1.87
45a	731	15	110	1,130	4	61	10	71	RI	639	1.87
45b	1,462	15	219	2,260	8	123	14	137	RI	1,278	1.87
46	1,205	15	183	1,593	9	87	14	101	RI	908	1.75
47	1,205	15	183	1,593	6	87	11	98	RI	709	1.59
48	1,384	15	217	1,991	7	108	13	121	RI	979	1.71
49a	1,589	15	251	2,390	13	130	19	148	RI	1,513	1.95
49b	1,589	15	251	2,390	13	130	19	148	RI	1,513	1.95
50	1,589	15	251	2,390	9	130	14	144	RI	1,214	1.76
Totals:											
ROF:	32,135		3,944	28,522	117	1,551	304	1,855		20,534	
RI:	35,788		5,403	54,091	251	2,941	411	3,352		36,811	

TABLE 2.15. Efficient Motor ERO: Motors with 2100 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
5	AHU	1/4	2	1500	600	9	645	258	4	NA
6	CABINET HEATER	1/4	25	1500	600	6	8,066	3,227	32	NA
7	Condensate Pump	1/4	6	1500	600	6	1,936	774	8	NA
8	Condenser Water Pump	1/3	1	1500	600	6	413	165	2	NA
9	Cooling Twr Fan	1/3	1	1500	600	6	413	165	2	NA
10	Furnace Fans	1/3	3	1500	600	6	1,240	496	5	NA
11	CABINET HEATER	1/2	7	1500	600	6	3,968	1,587	16	NA
12	Chilled Water Pump	1/2	1	1500	600	6	567	227	2	NA
13	Condensate Pump	1/2	34	1500	600	6	19,272	7,709	77	NA
14	Condenser Fan	1/2	4	1500	600	6	2,267	907	9	NA
15	Furnace Fans	1/2	3	1500	600	6	1,700	680	7	NA
16	AHU	3/4	12	1500	600	9	10,343	4,137	62	NA
17	Condenser Fan	3/4	1	1500	600	6	862	345	3	NA
18	Furnace Fans	3/4	3	1500	600	6	2,586	1,034	10	NA
19a	AHU	1	3	1500	600	9	3,392	1,357	20	NA
19b	AHU	1	5	1500	600	9	5,653	2,261	34	NA
20a	BLAST HEATER	1	10	1500	600	6	11,306	4,522	45	NA
20b	BLAST HEATER	1	19	1500	600	6	21,482	8,593	86	NA
21	Chilled Water Pump	1	1	1500	600	6	1,131	452	5	NA
22	Condenser Fan	1	4	1500	600	6	4,522	1,809	18	NA
23a	Condenser Water Pump	1	1	1500	600	6	1,131	452	5	NA
23b	Condenser Water Pump	1	1	1500	600	6	1,131	452	5	NA
24a	Cooling Twr Fan	1	1	1500	600	6	1,131	452	5	NA
24b	Cooling Twr Fan	1	1	1500	600	6	1,131	452	5	NA
25	AHU	2	1	1500	600	9	2,162	865	13	NA
26a	Chilled Water Pump	2	1	1500	600	6	2,162	865	9	NA
26b	Chilled Water Pump	2	1	1500	600	6	2,162	865	9	NA
27	Condensate Pump	2	2	1500	600	6	4,324	1,730	17	NA
28	Condenser Fan	2	1	1500	600	6	2,162	865	9	NA
29	Condenser Water Pump	2	1	1500	600	6	2,162	865	9	NA
30	Cooling Twr Fan	2	1	1500	600	6	2,162	865	9	NA
31a	AHU	3	1	1500	600	9	3,103	1,241	19	NA
31b	AHU	3	1	1500	600	9	3,103	1,241	19	NA
32a	BLAST HEATER	3	3	1500	600	6	9,310	3,724	37	NA
32b	BLAST HEATER	3	5	1500	600	6	15,516	6,207	62	NA
33	Condenser Fan	3	8	1500	600	6	24,826	9,930	99	NA
34a	Cooling Twr Fan	3	1	1500	600	6	3,103	1,241	12	NA
34b	Cooling Twr Fan	3	1	1500	600	6	3,103	1,241	12	NA
35	AHU	5	20	1500	600	9	101,686	40,675	610	NA
36a	Chilled Water Pump	5	40	1500	600	6	203,373	81,349	1,220	NA
36b	Chilled Water Pump	5	1	1500	600	6	5,084	2,034	20	NA
37	Condenser Fan	5	11	1500	600	6	55,928	22,371	224	NA
38	Condenser Water Pump	5	1	1500	600	6	5,084	2,034	20	NA
39a	Cooling Twr Fan	5	1	1500	600	6	5,084	2,034	20	NA
39b	Cooling Twr Fan	5	2	1500	600	6	10,169	4,067	41	NA
40	Furnace Fans	5	3	1500	600	6	15,253	6,101	61	NA
41a	AHU	7.5	12	1500	600	9	89,883	35,953	539	NA
41b	AHU	7.5	25	1500	600	9	187,257	74,903	1,124	NA
42a	Condenser Water Pump	7.5	1	1500	600	6	7,490	2,996	30	NA
42b	Condenser Water Pump	7.5	1	1500	600	6	7,490	2,996	30	NA
43a	Cooling Twr Fan	7.5	1	1500	600	6	7,490	2,996	30	NA
43b	Cooling Twr Fan	7.5	2	1500	600	6	14,981	5,992	60	NA
44a	AHU	10	3	1500	600	9	29,574	11,830	177	NA
44b	AHU	10	5	1500	600	9	49,290	19,716	296	NA
45a	BLAST HEATER	10	4	1500	600	6	39,432	15,773	158	NA
45b	BLAST HEATER	10	9	1500	600	6	88,722	35,489	355	NA
46a	Chilled Water Pump	10	1	1500	600	6	9,858	3,943	39	NA
46b	Chilled Water Pump	10	3	1500	600	6	29,574	11,830	118	NA
47	Condenser Fan	10	8	1500	600	6	78,864	31,545	315	NA
48a	Condenser Water Pump	10	3	1500	600	6	29,574	11,830	118	NA
48b	Condenser Water Pump	10	7	1500	600	6	69,006	27,602	276	NA
49a	Cooling Twr Fan	10	4	1500	600	6	39,432	15,773	158	NA
49b	Cooling Twr Fan	10	8	1500	600	6	78,864	31,545	315	NA

TABLE 2.15. (contd)

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
50a AHU		15	2	1500	600	9	29,062	11,625	174	NA
50b AHU		15	4	1500	600	9	58,123	23,249	349	NA
51a Chilled Water Pump		15	3	1500	600	6	43,592	17,437	174	NA
51b Chilled Water Pump		15	6	1500	600	6	87,185	34,874	349	NA
52 Condenser Water Pump		15	1	1500	600	6	14,531	5,812	58	NA
53 Cooling Twr Fan		15	2	1500	600	6	29,062	11,625	116	NA
54a AHU		20	1	1500	600	9	19,110	7,644	115	NA
54b AHU		20	4	1500	600	9	76,438	30,575	459	NA
55 Chilled Water Pump		20	1	1500	600	6	19,110	7,644	76	NA
56a Condenser Water Pump		20	1	1500	600	6	19,110	7,644	76	NA
56b Condenser Water Pump		20	2	1500	600	6	38,219	15,288	153	NA
57 Cooling Twr Fan		20	1	1500	600	6	19,110	7,644	76	NA
58a AHU		25	2	1500	600	9	47,774	19,110	287	NA
58b AHU		25	4	1500	600	9	95,548	38,219	573	NA
59 Chilled Water Pump		25	1	1500	600	6	23,887	9,555	96	NA
60a AHU		30	2	1500	600	9	57,329	22,932	344	NA
60b AHU		30	2	1500	600	9	57,329	22,932	344	NA
61 Condenser Water Pump		30	1	1500	600	6	28,664	11,466	115	NA
62a Cooling Twr Fan		30	2	1500	600	6	57,329	22,932	229	NA
62b Cooling Twr Fan		30	2	1500	600	6	57,329	22,932	229	NA
63a Chilled Water Pump		40	2	1500	600	6	75,920	30,368	304	NA
63b Chilled Water Pump		40	3	1500	600	6	113,880	45,552	456	NA
64a Condenser Water Pump		40	2	1500	600	6	75,920	30,368	304	NA
64b Condenser Water Pump		40	3	1500	600	6	113,880	45,552	456	NA
65 Cooling Twr Fan		40	1	1500	600	6	37,960	15,184	152	NA
66 Chilled Water Pump		50	1	1500	600	6	47,077	18,831	188	NA

TABLE 2.15. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
5	AHU	1/4	2	1500	600	9	442	177	3	NA
6	CABINET HEATER	1/4	25	1500	600	6	5,519	2,208	22	NA
7	Condensate Pump	1/4	6	1500	600	6	1,325	530	5	NA
8	Condenser Water Pump	1/3	1	1500	600	6	291	117	1	NA
9	Cooling Twr Fan	1/3	1	1500	600	6	291	117	1	NA
10	Furnace Fans	1/3	3	1500	600	6	874	350	3	NA
11	CABINET HEATER	1/2	7	1500	600	6	3,091	1,236	12	NA
12	Chilled Water Pump	1/2	1	1500	600	6	442	177	2	NA
13	Condensate Pump	1/2	34	1500	600	6	15,012	6,005	60	NA
14	Condenser Fan	1/2	4	1500	600	6	1,766	706	7	NA
15	Furnace Fans	1/2	3	1500	600	6	1,325	530	5	NA
16	AHU	3/4	12	1500	600	9	7,948	3,179	48	NA
17	Condenser Fan	3/4	1	1500	600	6	662	265	3	NA
18	Furnace Fans	3/4	3	1500	600	6	1,987	795	8	NA
19a	AHU	1	3	1500	600	9	2,649	1,060	16	NA
19b	AHU	1	5	1500	600	9	4,415	1,766	26	NA
20a	BLAST HEATER	1	10	1500	600	6	8,831	3,532	35	NA
20b	BLAST HEATER	1	19	1500	600	6	16,778	6,711	67	NA
21	Chilled Water Pump	1	1	1500	600	6	883	353	4	NA
22	Condenser Fan	1	4	1500	600	6	3,532	1,413	14	NA
23a	Condenser Water Pump	1	1	1500	600	6	883	353	4	NA
23b	Condenser Water Pump	1	1	1500	600	6	883	353	4	NA
24a	Cooling Twr Fan	1	1	1500	600	6	883	353	4	NA
24b	Cooling Twr Fan	1	1	1500	600	6	883	353	4	NA
25	AHU	2	1	1500	600	9	1,766	706	11	NA
26a	Chilled Water Pump	2	1	1500	600	6	1,766	706	7	NA
26b	Chilled Water Pump	2	1	1500	600	6	1,766	706	7	NA
27	Condensate Pump	2	2	1500	600	6	3,532	1,413	14	NA
28	Condenser Fan	2	1	1500	600	6	1,766	706	7	NA
29	Condenser Water Pump	2	1	1500	600	6	1,766	706	7	NA
30	Cooling Twr Fan	2	1	1500	600	6	1,766	706	7	NA
31a	AHU	3	1	1500	600	9	2,649	1,060	16	NA
31b	AHU	3	1	1500	600	9	2,649	1,060	16	NA
32a	BLAST HEATER	3	3	1500	600	6	7,948	3,179	32	NA
32b	BLAST HEATER	3	5	1500	600	6	13,246	5,298	53	NA
33	Condenser Fan	3	8	1500	600	6	21,194	8,477	85	NA
34a	Cooling Twr Fan	3	1	1500	600	6	2,649	1,060	11	NA
34b	Cooling Twr Fan	3	1	1500	600	6	2,649	1,060	11	NA
35	AHU	5	20	1500	600	9	88,307	35,323	530	NA
36a	Chilled Water Pump	5	40	1500	600	6	176,613	70,645	1,060	NA
36b	Chilled Water Pump	5	1	1500	600	6	4,415	1,766	18	NA
37	Condenser Fan	5	11	1500	600	6	48,569	19,427	194	NA
38	Condenser Water Pump	5	1	1500	600	6	4,415	1,766	18	NA
39a	Cooling Twr Fan	5	1	1500	600	6	4,415	1,766	18	NA
39b	Cooling Twr Fan	5	2	1500	600	6	8,831	3,532	35	NA
40	Furnace Fans	5	3	1500	600	6	13,246	5,298	53	NA
41a	AHU	7.5	12	1500	600	9	79,476	31,790	477	NA
41b	AHU	7.5	25	1500	600	9	165,575	66,230	993	NA
42a	Condenser Water Pump	7.5	1	1500	600	6	6,623	2,649	26	NA
42b	Condenser Water Pump	7.5	1	1500	600	6	6,623	2,649	26	NA
43a	Cooling Twr Fan	7.5	1	1500	600	6	6,623	2,649	26	NA
43b	Cooling Twr Fan	7.5	2	1500	600	6	13,246	5,298	53	NA
44a	AHU	10	3	1500	600	9	26,492	10,597	159	NA
44b	AHU	10	5	1500	600	9	44,153	17,661	265	NA
45a	BLAST HEATER	10	4	1500	600	6	35,323	14,129	141	NA
45b	BLAST HEATER	10	9	1500	600	6	79,476	31,790	318	NA
46a	Chilled Water Pump	10	1	1500	600	6	8,831	3,532	35	NA
46b	Chilled Water Pump	10	3	1500	600	6	26,492	10,597	106	NA
47	Condenser Fan	10	8	1500	600	6	70,645	28,258	283	NA
48a	Condenser Water Pump	10	3	1500	600	6	26,492	10,597	106	NA
48b	Condenser Water Pump	10	7	1500	600	6	61,815	24,726	247	NA
49a	Cooling Twr Fan	10	4	1500	600	6	35,323	14,129	141	NA
49b	Cooling Twr Fan	10	8	1500	600	6	70,645	28,258	283	NA

TABLE 2.15. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours			# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	On-Peak		Off-Peak	On-Peak	Off-Peak	
50a	AHU	15	2	1500	600	9	26,492	10,597	159	NA	
50b	AHU	15	4	1500	600	9	52,984	21,194	318	NA	
51a	Chilled Water Pump	15	3	1500	600	6	39,738	15,896	159	NA	
51b	Chilled Water Pump	15	6	1500	600	6	79,476	31,790	318	NA	
52	Condenser Water Pump	15	1	1500	600	6	13,246	5,298	53	NA	
53	Cooling Twr Fan	15	2	1500	600	6	26,492	10,597	106	NA	
54a	AHU	20	1	1500	600	9	17,661	7,065	106	NA	
54b	AHU	20	4	1500	600	9	70,645	28,258	424	NA	
55	Chilled Water Pump	20	1	1500	600	6	17,661	7,065	71	NA	
56a	Condenser Water Pump	20	1	1500	600	6	17,661	7,065	71	NA	
56b	Condenser Water Pump	20	2	1500	600	6	35,323	14,129	141	NA	
57	Cooling Twr Fan	20	1	1500	600	6	17,661	7,065	71	NA	
58a	AHU	25	2	1500	600	9	44,153	17,661	265	NA	
58b	AHU	25	4	1500	600	9	88,307	35,323	530	NA	
59	Chilled Water Pump	25	1	1500	600	6	22,077	8,831	88	NA	
60a	AHU	30	2	1500	600	9	52,984	21,194	318	NA	
60b	AHU	30	2	1500	600	9	52,984	21,194	318	NA	
61	Condenser Water Pump	30	1	1500	600	6	26,492	10,597	106	NA	
62a	Cooling Twr Fan	30	2	1500	600	6	52,984	21,194	212	NA	
62b	Cooling Twr Fan	30	2	1500	600	6	52,984	21,194	212	NA	
63a	Chilled Water Pump	40	2	1500	600	6	70,645	28,258	283	NA	
63b	Chilled Water Pump	40	3	1500	600	6	105,968	42,387	424	NA	
64a	Condenser Water Pump	40	2	1500	600	6	70,645	28,258	283	NA	
64b	Condenser Water Pump	40	3	1500	600	6	105,968	42,387	424	NA	
65	Cooling Twr Fan	40	1	1500	600	6	35,323	14,129	141	NA	
66	Chilled Water Pump	50	1	1500	600	6	44,153	17,661	177	NA	

TABLE 2.15. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
5	448	15	49	285	1	18	7	22	ROF	174	1.53
6	5,800	15	610	3,588	10	194	56	250	ROF	2,910	1.56
7	1,344	15	146	858	2	47	13	60	ROF	698	1.56
8	230	15	25	170	0	9	3	12	ROF	93	1.55
9	230	15	25	170	0	9	3	12	ROF	93	1.55
10	690	15	76	511	1	28	8	36	ROF	279	1.55
11	1,743	15	200	1,228	4	67	19	86	ROF	962	1.60
12	249	15	29	175	1	10	3	12	ROF	91	1.50
13	8,466	15	972	5,964	17	324	94	418	ROF	4,673	1.60
14	996	15	114	702	2	38	11	49	ROF	365	1.50
15	747	15	86	528	2	29	8	37	ROF	274	1.50
16	3,120	15	384	3,353	14	162	79	261	ROF	3,195	2.11
17	260	15	32	279	1	15	4	20	ROF	158	1.83
18	780	15	96	838	2	46	13	59	ROF	473	1.83
19a	891	15	94	1,040	4	57	25	81	ROF	834	2.01
19b	1,485	15	156	1,733	7	94	41	135	ROF	1,389	2.01
20a	2,970	15	312	3,466	10	188	55	243	ROF	2,436	1.89
20b	5,843	15	592.8	6,585	19	358	104	462	ROF	4,628	1.89
21	297	15	31	347	1	19	5	24	ROF	161	1.74
22	1,188	15	125	1,386	4	75	22	97	ROF	645	1.74
23a	297	15	31	347	1	19	5	24	ROF	161	1.74
23b	297	15	31.2	347	1	19	5	24	ROF	161	1.74
24a	297	15	31	347	1	19	5	24	ROF	161	1.74
24b	297	15	31.2	347	1	19	5	24	ROF	161	1.74
25	340	15	55	554	2	30	13	43	RI	438	2.29
26a	340	15	55	554	2	30	9	39	RI	377	2.11
26b	340	15	55	554	2	30	9	39	RI	377	2.11
27	680	15	110	1,109	3	60	17	78	ROF	1,038	2.65
28	340	15	55	554	2	30	9	39	RI	377	2.11
29	340	15	55	554	2	30	9	39	RI	377	2.11
30	340	15	55	554	2	30	9	39	RI	377	2.11
31a	402	15	58	636	3	35	15	50	RI	441	2.10
31b	402	15	58.4	636	3	35	15	50	RI	441	2.10
32a	1,206	15	175	1,907	5	104	30	134	ROF	1,544	2.38
32b	2,010	15	292	3,178	9	173	50	223	ROF	2,573	2.38
33	3,216	15	467	5,085	15	276	80	357	RI	2,979	1.93
34a	402	15	58	636	2	35	10	45	RI	372	1.93
34b	402	15	58.4	636	2	35	10	45	RI	372	1.93
35	9,120	15	1,308	18,732	80	1,018	442	1,461	RI	16,575	2.82
36a	18,240	15	2616	37,463	161	2,037	865	2,922	RI	33,150	2.82
36b	456	15	65	937	3	51	15	66	RI	608	2.33
37	5,016	15	719	10,302	29	560	162	722	RI	6,668	2.33
38	456	15	65	937	3	51	15	66	RI	608	2.33
39a	456	15	65	937	3	51	15	66	RI	608	2.33
39b	912	15	130.8	1,873	5	102	29	131	RI	1,212	2.33
40	1,368	15	196	2,810	8	153	44	197	RI	1,818	2.33
41a	7,584	15	1,135	14,571	62	792	344	1,136	RI	12,961	2.71
41b	15,800	15	2365	30,355	130	1,650	717	2,367	RI	27,003	2.71
42a	632	15	95	1,214	3	66	19	85	RI	739	2.17
42b	632	15	94.6	1,214	3	66	19	85	RI	739	2.17
43a	632	15	95	1,214	3	66	19	85	RI	739	2.17
43b	1,264	15	189.2	2,426	7	132	38	170	RI	1,478	2.17
44a	2,193	15	329	4,315	18	235	102	336	RI	3,026	2.38
44b	3,655	15	548	7,191	31	391	170	561	RI	5,043	2.38
45a	2,924	15	438	5,753	16	313	91	403	RI	4,174	2.43
45b	6,579	15	986.4	12,944	37	704	204	908	RI	9,390	2.43
46a	731	15	110	1,438	4	78	23	101	RI	860	2.18
46b	2,193	15	328.8	4,315	12	235	68	303	RI	2,579	2.18
47	5,848	15	877	11,506	33	626	181	807	RI	6,877	2.18
48a	2,193	15	329	4,315	12	235	68	303	RI	2,579	2.18
48b	5,117	15	767.2	10,068	29	547	158	706	RI	6,017	2.18
49a	2,924	15	438	5,753	16	313	91	403	RI	3,439	2.18
49b	5,848	15	876.8	11,506	33	626	181	807	RI	6,877	2.18

TABLE 2.15. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
50a	1,972	15	294.4	3,596	15	196	85	281	RI	2,316	2.17
50b	3,944	15	589	7,196	31	391	170	561	RI	4,633	2.17
51a	2,958	15	442	5,396	15	293	85	378	RI	2,929	1.99
51b	5,916	15	883.2	10,793	31	587	170	757	RI	5,658	1.99
52	986	15	147	1,799	5	98	28	126	RI	976	1.99
53	1,972	15	294	3,596	10	196	57	252	RI	1,953	1.99
54a	1,205	15	183	2,028	9	110	48	158	RI	1,203	2.00
54b	4,820	15	732.8	8,111	35	441	192	632	RI	4,810	2.00
55	1,205	15	183	2,028	6	110	32	142	RI	1,003	1.83
56a	1,205	15	183	2,028	6	110	32	142	RI	1,003	1.83
56b	2,410	15	366.4	4,055	12	220	64	284	RI	2,007	1.83
57	1,205	15	183	2,028	6	110	32	142	RI	1,003	1.83
58a	2,768	15	434	5,069	22	276	120	396	RI	3,193	2.15
58b	5,536	15	867.2	10,138	43	551	239	791	RI	6,367	2.15
59	1,384	15	217	2,535	7	138	40	178	RI	1,348	1.97
60a	3,178	15	502	6,083	26	331	144	474	RI	3,910	2.23
60b	3,178	15	502	6,083	26	331	144	474	RI	3,910	2.23
61	1,589	15	251	3,041	9	165	48	213	RI	1,656	2.04
62a	3,178	15	502	6,083	17	331	96	426	RI	3,313	2.04
62b	3,178	15	502	6,083	17	331	96	426	RI	3,313	2.04
63a	3,940	15	620	7,384	21	401	116	518	RI	3,831	1.97
63b	5,910	15	930	11,076	32	602	174	777	RI	5,746	1.97
64a	3,940	15	620	7,384	21	401	116	518	RI	3,831	1.97
64b	5,910	15	930	11,076	32	602	174	777	RI	5,746	1.97
65	1,970	15	310	3,692	11	201	58	259	RI	1,915	1.97
66	2,312	15	326	4,093	12	223	64	287	RI	1,798	1.78
Totals:											
ROF	42,481		4,858	40,783	126	2,216	692	2,908		30,330	
RI:	187,406		28,193	357,519	1,254	19,438	6,910	26,348		242,281	

TABLE 2.16. Efficient Motor ERO: Motors with 3200 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Condensate Pump	1/4	3	2286	914	6	1,475	590	4	NA
4	CABINET HEATER	1/2	2	2286	914	6	1,728	691	5	NA
5	Condensate Pump	1/2	29	2286	914	6	25,052	10,016	66	NA
6	Furnace Fans	1/2	10	2286	914	6	8,639	3,454	23	NA
7	Furnace Fans	3/4	9	2286	914	6	11,822	4,727	31	NA
8a	BLAST HEATER	1	3	2286	914	6	5,169	2,067	14	NA
8b	BLAST HEATER	1	8	2286	914	6	13,784	5,511	36	NA
9	Condensate Pump	1	1	2286	914	6	1,723	689	5	NA
10	Furnace Fans	1	13	2286	914	6	22,400	8,955	59	NA
11a	AHU	2	1	2286	914	9	3,295	1,317	13	NA
11b	AHU	2	2	2286	914	9	6,590	2,635	26	NA
12	Condensate Pump	2	1	2286	914	6	3,295	1,317	9	NA
13	Condenser Fan	2	3	2286	914	6	9,885	3,952	26	NA
14	Condenser Water Pump	2	1	2286	914	6	3,295	1,317	9	NA
15	Cooling Twr Fan	2	1	2286	914	6	3,295	1,317	9	NA
16	Furnace Fans	2	6	2286	914	6	19,771	7,905	52	NA
17a	AHU	3	1	2286	914	9	4,729	1,891	19	NA
17b	AHU	3	2	2286	914	9	9,459	3,782	37	NA
18a	BLAST HEATER	3	21	2286	914	6	99,316	39,709	261	NA
18b	BLAST HEATER	3	40	2286	914	6	189,174	75,637	497	NA
19a	Chilled Water Pump	3	1	2286	914	6	4,729	1,891	12	NA
19b	Chilled Water Pump	3	1	2286	914	6	4,729	1,891	12	NA
20	Condenser Fan	3	3	2286	914	6	14,188	5,673	37	NA
21a	Condenser Water Pump	3	1	2286	914	6	4,729	1,891	12	NA
21b	Condenser Water Pump	3	1	2286	914	6	4,729	1,891	12	NA
22a	Cooling Twr Fan	3	1	2286	914	6	4,729	1,891	12	NA
22b	Cooling Twr Fan	3	1	2286	914	6	4,729	1,891	12	NA
23	Furnace Fans	3	6	2286	914	6	37,835	15,127	99	NA
24a	AHU	5	3	2286	914	9	23,246	9,294	92	NA
24b	AHU	5	5	2286	914	9	36,743	15,460	153	NA
25a	BLAST HEATER	5	7	2286	914	6	54,240	21,686	142	NA
25b	BLAST HEATER	5	14	2286	914	6	108,479	43,373	285	NA
26a	Chilled Water Pump	5	1	2286	914	6	7,749	3,098	20	NA
26b	Chilled Water Pump	5	2	2286	914	6	15,497	6,196	41	NA
27	Condenser Fan	5	1	2286	914	6	7,749	3,098	20	NA
28a	Condenser Water Pump	5	1	2286	914	6	7,749	3,098	20	NA
28b	Condenser Water Pump	5	1	2286	914	6	7,749	3,098	20	NA
29a	Cooling Twr Fan	5	1	2286	914	6	7,749	3,098	20	NA
29b	Cooling Twr Fan	5	1	2286	914	6	7,749	3,098	20	NA
30a	AHU	7.5	1	2286	914	9	11,415	4,564	45	NA
30b	AHU	7.5	3	2286	914	9	34,246	13,692	135	NA
31	Condenser Water Pump	7.5	1	2286	914	6	11,415	4,564	30	NA
32	Cooling Twr Fan	7.5	1	2286	914	6	11,415	4,564	30	NA
33a	AHU	10	5	2286	914	9	75,118	30,034	296	NA
33b	AHU	10	11	2286	914	9	165,259	66,075	651	NA
34a	Chilled Water Pump	10	1	2286	914	6	15,024	6,007	39	NA
34b	Chilled Water Pump	10	2	2286	914	6	30,047	12,014	79	NA
35	Condenser Water Pump	10	2	2286	914	6	30,047	12,014	79	NA
36a	Cooling Twr Fan	10	1	2286	914	6	15,024	6,007	39	NA
36b	Cooling Twr Fan	10	1	2286	914	6	15,024	6,007	39	NA
37	Chilled Water Pump	15	1	2286	914	6	22,145	8,854	58	NA
38	Condenser Water Pump	15	1	2286	914	6	22,145	8,854	58	NA
39	Cooling Twr Fan	15	1	2286	914	6	22,145	8,854	58	NA
40	AHU	20	1	2286	914	9	29,123	11,644	115	NA
41	Condenser Water Pump	20	1	2286	914	6	29,123	11,644	76	NA
42	Cooling Twr Fan	20	1	2286	914	6	29,123	11,644	76	NA
43	Chilled Water Pump	25	1	2286	914	6	36,404	14,555	96	NA

TABLE 2.16. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Condensate Pump	1/4	3	2286	914	6	1,009	404	3	NA
4	CABINET HEATER	1/2	2	2286	914	6	1,346	538	4	NA
5	Condensate Pump	1/2	29	2286	914	6	18,614	7,802	61	NA
6	Furnace Fans	1/2	10	2286	914	6	6,729	2,690	18	NA
7	Furnace Fans	3/4	9	2286	914	6	9,084	3,632	24	NA
8a	BLAST HEATER	1	3	2286	914	6	4,037	1,614	11	NA
8b	BLAST HEATER	1	8	2286	914	6	10,766	4,306	28	NA
9	Condensate Pump	1	1	2286	914	6	1,346	538	4	NA
10	Furnace Fans	1	13	2286	914	6	17,495	6,995	46	NA
11a	AHU	2	1	2286	914	9	2,692	1,076	11	NA
11b	AHU	2	2	2286	914	9	5,383	2,152	21	NA
12	Condensate Pump	2	1	2286	914	6	2,692	1,076	7	NA
13	Condenser Fan	2	3	2286	914	6	8,075	3,228	21	NA
14	Condenser Water Pump	2	1	2286	914	6	2,692	1,076	7	NA
15	Cooling Twr Fan	2	1	2286	914	6	2,692	1,076	7	NA
16	Furnace Fans	2	6	2286	914	6	16,150	6,457	42	NA
17a	AHU	3	1	2286	914	9	4,037	1,614	11	NA
17b	AHU	3	2	2286	914	9	8,075	3,228	32	NA
18a	BLAST HEATER	3	21	2286	914	6	84,785	33,899	223	NA
18b	BLAST HEATER	3	40	2286	914	6	161,466	64,570	424	NA
19a	Chilled Water Pump	3	1	2286	914	6	4,037	1,614	11	NA
19b	Chilled Water Pump	3	1	2286	914	6	4,037	1,614	11	NA
20	Condenser Fan	3	3	2286	914	6	12,112	4,843	32	NA
21a	Condenser Water Pump	3	1	2286	914	6	4,037	1,614	11	NA
21b	Condenser Water Pump	3	1	2286	914	6	4,037	1,614	11	NA
22a	Cooling Twr Fan	3	1	2286	914	6	4,037	1,614	11	NA
22b	Cooling Twr Fan	3	1	2286	914	6	4,037	1,614	11	NA
23	Furnace Fans	3	8	2286	914	6	32,299	12,914	85	NA
24a	AHU	5	3	2286	914	9	20,187	8,071	79	NA
24b	AHU	5	5	2286	914	9	33,645	13,452	132	NA
25a	BLAST HEATER	5	7	2286	914	6	47,103	18,833	124	NA
25b	BLAST HEATER	5	14	2286	914	6	94,206	37,666	247	NA
26a	Chilled Water Pump	5	1	2286	914	6	6,729	2,690	18	NA
26b	Chilled Water Pump	5	2	2286	914	6	13,458	5,381	35	NA
27	Condenser Fan	5	1	2286	914	6	6,729	2,690	18	NA
28a	Condenser Water Pump	5	1	2286	914	6	6,729	2,690	18	NA
28b	Condenser Water Pump	5	1	2286	914	6	6,729	2,690	18	NA
29a	Cooling Twr Fan	5	1	2286	914	6	6,729	2,690	18	NA
29b	Cooling Twr Fan	5	1	2286	914	6	6,729	2,690	18	NA
30a	AHU	7.5	1	2286	914	9	10,093	4,036	40	NA
30b	AHU	7.5	3	2286	914	9	30,280	12,107	119	NA
31	Condenser Water Pump	7.5	1	2286	914	6	10,093	4,036	26	NA
32	Cooling Twr Fan	7.5	1	2286	914	6	10,093	4,036	26	NA
33a	AHU	10	5	2286	914	9	67,290	26,904	265	NA
33b	AHU	10	11	2286	914	9	148,037	59,189	583	NA
34a	Chilled Water Pump	10	1	2286	914	6	13,458	5,381	35	NA
34b	Chilled Water Pump	10	2	2286	914	6	26,916	10,762	71	NA
35	Condenser Water Pump	10	2	2286	914	6	26,916	10,762	71	NA
36a	Cooling Twr Fan	10	1	2286	914	6	13,458	5,381	35	NA
36b	Cooling Twr Fan	10	1	2286	914	6	13,458	5,381	35	NA
37	Chilled Water Pump	15	1	2286	914	6	20,187	8,071	53	NA
38	Condenser Water Pump	15	1	2286	914	6	20,187	8,071	53	NA
39	Cooling Twr Fan	15	1	2286	914	6	20,187	8,071	53	NA
40	AHU	20	1	2286	914	9	26,916	10,762	106	NA
41	Condenser Water Pump	20	1	2286	914	6	26,916	10,762	71	NA
42	Cooling Twr Fan	20	1	2286	914	6	26,916	10,762	71	NA
43	Chilled Water Pump	25	1	2286	914	6	33,645	13,452	88	NA

TABLE 2.16. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
3	672	15	73	652	1	35	7	42	ROF	507	1.82
4	498	15	57	535	1	29	6	35	ROF	400	1.87
5	7,221	15	829	7,752	15	421	80	502	ROF	5,807	1.87
6	2,490	15	288	2,673	5	145	28	173	ROF	1,325	1.73
7	2,340	15	268	3,832	7	208	40	248	RI	2,137	1.91
8a	891	15	94	1,584	3	88	16	103	ROF	1,103	2.34
8b	2,376	15	250	4,225	8	230	44	273	ROF	2,940	2.34
9	297	15	31	528	1	29	5	34	ROF	368	2.34
10	3,861	15	408	6,865	13	373	71	444	RI	3,564	1.92
11a	340	15	55	845	2	46	13	59	RI	782	3.30
11b	680	15	110	1,690	5	92	26	118	RI	1,563	3.30
12	340	15	55	845	2	46	9	55	RI	724	3.13
13	1,020	15	165	2,534	5	138	26	164	RI	1,791	2.76
14	340	15	55	845	2	46	9	55	RI	597	2.76
15	340	15	55	845	2	46	9	55	RI	597	2.76
16	2,040	15	330	5,069	10	276	52	328	RI	3,582	2.76
17a	402	15	58	969	3	53	15	68	RI	659	2.71
17b	804	15	117	1,937	5	105	30	135	RI	1,377	2.71
18a	8,442	15	1,226	20,342	38	1,108	210	1,316	RI	15,561	2.84
18b	16,080	15	2,336	38,746	73	2,107	400	2,507	RI	29,639	2.84
19a	402	15	58	969	2	53	10	63	RI	620	2.54
19b	402	15	58	969	2	53	10	63	RI	620	2.54
20	1,206	15	175	2,906	5	158	30	188	RI	1,861	2.54
21a	402	15	58	969	2	53	10	63	RI	620	2.54
21b	402	15	58	969	2	53	10	63	RI	620	2.54
22a	402	15	58	969	2	53	10	63	RI	620	2.54
22b	402	15	58	969	2	53	10	63	RI	620	2.54
23	3,216	15	467	7,749	15	421	80	501	RI	4,982	2.84
24a	1,368	15	196	4,282	12	233	66	299	RI	3,500	3.56
24b	2,280	15	327	7,136	20	368	111	499	RI	5,833	3.56
25a	3,192	15	458	9,990	19	543	103	646	RI	7,512	3.35
25b	6,384	15	916	19,980	37	1,086	206	1,293	RI	15,024	3.35
26a	456	15	65	1,427	3	78	15	92	RI	968	3.12
26b	912	15	131	2,854	5	155	29	185	RI	1,935	3.12
27	456	15	65	1,427	3	78	15	92	RI	968	3.12
28a	456	15	65	1,427	3	78	15	92	RI	968	3.12
28b	456	15	65	1,427	3	78	15	92	RI	968	3.12
29a	456	15	65	1,427	3	78	15	92	RI	968	3.12
29b	456	15	65	1,427	3	78	15	92	RI	968	3.12
30a	632	15	95	1,850	5	101	29	129	RI	1,328	3.10
30b	1,896	15	284	5,551	16	302	86	388	RI	3,985	3.10
31	632	15	95	1,850	3	101	19	120	RI	1,201	2.90
32	632	15	95	1,850	3	101	19	120	RI	1,201	2.90
33a	3,655	15	548	10,958	31	596	170	766	RI	8,376	3.29
33b	8,041	15	1,206	24,107	68	1,311	374	1,684	RI	18,426	3.29
34a	731	15	110	2,192	4	119	23	142	RI	1,399	2.91
34b	1,462	15	219	4,383	8	238	45	284	RI	2,798	2.91
35	1,462	15	219	4,383	8	238	45	284	RI	2,798	2.91
36a	731	15	110	2,192	4	119	23	142	RI	1,399	2.91
36b	731	15	110	2,192	4	119	23	142	RI	1,399	2.91
37	986	15	147	2,741	5	149	28	177	RI	1,634	2.66
38	986	15	147	2,741	5	149	28	177	RI	1,634	2.66
39	986	15	147	2,741	5	149	28	177	RI	1,634	2.66
40	1,206	15	183	3,090	9	168	48	216	RI	1,923	2.60
41	1,206	15	183	3,090	8	168	32	200	RI	1,724	2.43
42	1,206	15	183	3,090	6	168	32	200	RI	1,724	2.43
43	1,384	15	217	3,862	7	210	40	250	RI	2,249	2.62
Totals:											
ROF	14,445		1,620	17,949	34	976	185	1,161		12,450	
RI	89,297		12,965	237,498	504	12,913	2,776	15,689		169,590

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TABLE 2.17. Efficient Motor ERO: Motors with 4000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	CABINET HEATER	1/4	2	3640	360	6	1,229	492	3	NA
2	Condenser Fan	1/3	1	3640	360	6	787	315	2	NA
3	AHU	1/2	1	3640	360	9	1,080	432	3	NA
4	CABINET HEATER	1/2	6	3640	360	6	6,478	2,592	14	NA
5	Condensate Pump	1/2	6	3640	360	6	6,478	2,592	14	NA
6a	AHU	1	2	3640	360	9	4,307	1,723	14	NA
6b	AHU	1	4	3640	360	9	8,614	3,446	27	NA
7a	BLAST HEATER	1	8	3640	360	6	17,227	6,892	36	NA
7b	BLAST HEATER	1	16	3640	360	6	34,455	13,784	72	NA
8	Condensate Pump	1	2	3640	360	6	4,307	1,723	9	NA
9a	AHU	2	2	3640	360	9	8,236	3,295	26	NA
9b	AHU	2	4	3640	360	9	16,473	6,590	52	NA
10a	AHU	5	3	3640	360	9	29,052	11,623	92	NA
10b	AHU	5	5	3640	360	9	48,420	19,371	153	NA
11a	AHU	7.5	2	3640	360	9	28,533	11,415	90	NA
11b	AHU	7.5	4	3640	360	9	57,066	22,830	180	NA
12	Condenser Fan	7.5	1	3640	360	6	14,267	5,708	30	NA
13	Condenser Fan	10	3	3640	360	6	56,328	22,535	118	NA
14	Cooling Twr Fan	15	2	3640	360	6	55,353	22,145	116	NA
15a	AHU	20	1	3640	360	9	36,397	14,562	115	NA
15b	AHU	20	2	3640	360	9	72,795	29,123	229	NA
16a	AHU	30	1	3640	360	9	54,596	21,842	172	NA
16b	AHU	30	2	3640	360	9	109,192	43,685	344	NA
17	Condenser Water Pump	30	1	3640	360	6	54,596	21,842	115	NA
18	Chilled Water Pump	40	1	3640	360	6	72,301	28,925	152	NA
21	POWER VENT.	1/4	24	3640	360	12	18,792	1,859	62	NA
22	POWER VENT.	1/3	1	3640	360	12	1,003	99	3	NA
23	POWER VENT.	1/2	5	3640	360	12	6,878	680	23	NA
24	POWER VENT.	3/4	11	3640	360	12	23,007	2,275	76	NA
25	EXH. FAN	1	12	3640	360	12	32,923	3,256	109	NA
26a	POWER VENT.	1	12	3640	360	12	32,923	3,256	109	NA
26b	POWER VENT.	1	33	3640	360	12	90,539	8,954	298	NA
27a	POWER VENT.	2	3	3640	360	12	15,740	1,557	52	NA
27b	POWER VENT.	2	6	3640	360	12	31,481	3,113	104	NA
28a	POWER VENT.	3	12	3640	360	12	90,367	8,937	298	NA
28b	POWER VENT.	3	23	3640	360	12	173,203	17,130	571	NA

TABLE 2.17. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	CABINET HEATER	1/4	2	3640	360	6	841	336	2	NA
2	Condenser Fan	1/3	1	3640	360	6	555	222	1	NA
3	AHU	1/2	1	3640	360	9	841	336	3	NA
4	CABINET HEATER	1/2	6	3640	360	6	5,046	2,019	11	NA
5	Condensate Pump	1/2	6	3640	360	6	5,046	2,019	11	NA
6a	AHU	1	2	3640	360	9	3,364	1,346	11	NA
6b	AHU	1	4	3640	360	9	6,728	2,692	21	NA
7a	BLAST HEATER	1	8	3640	360	6	13,456	5,383	28	NA
7b	BLAST HEATER	1	16	3640	360	6	26,911	10,766	57	NA
8	Condensate Pump	1	2	3640	360	6	3,364	1,346	7	NA
9a	AHU	2	2	3640	360	9	6,728	2,692	21	NA
9b	AHU	2	4	3640	360	9	13,456	5,383	42	NA
10a	AHU	5	3	3640	360	9	25,229	10,093	79	NA
10b	AHU	5	5	3640	360	9	42,049	16,822	132	NA
11a	AHU	7.5	2	3640	360	9	25,229	10,093	79	NA
11b	AHU	7.5	4	3640	360	9	50,458	20,187	159	NA
12	Condenser Fan	7.5	1	3640	360	6	12,615	5,047	26	NA
13	Condenser Fan	10	3	3640	360	6	50,458	20,187	106	NA
14	Cooling Twr Fan	15	2	3640	360	6	50,458	20,187	106	NA
15a	AHU	20	1	3640	360	9	33,639	13,458	106	NA
15b	AHU	20	2	3640	360	9	67,278	26,916	212	NA
16a	AHU	30	1	3640	360	9	50,458	20,187	159	NA
16b	AHU	30	2	3640	360	9	100,917	40,374	318	NA
17	Condenser Water Pump	30	1	3640	360	6	50,458	20,187	106	NA
18	Chilled Water Pump	40	1	3640	360	6	67,278	26,916	141	NA
21	POWER VENT.	1/4	24	3640	360	12	12,857	1,272	42	NA
22	POWER VENT.	1/3	1	3640	360	12	707	70	2	NA
23	POWER VENT.	1/2	5	3640	360	12	5,357	530	18	NA
24	POWER VENT.	3/4	11	3640	360	12	17,679	1,748	58	NA
25	EXH. FAN	1	12	3640	360	12	25,715	2,543	85	NA
26a	POWER VENT.	1	12	3640	360	12	25,715	2,543	85	NA
26b	POWER VENT.	1	33	3640	360	12	70,716	6,994	233	NA
27a	POWER VENT.	2	3	3640	360	12	12,857	1,272	42	NA
27b	POWER VENT.	2	6	3640	360	12	25,715	2,543	85	NA
28a	POWER VENT.	3	12	3640	360	12	77,145	7,630	254	NA
28b	POWER VENT.	3	23	3640	360	12	147,861	14,624	487	NA

TABLE 2.17. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
1	448	15	49	543	1	30	4	34	ROF	414	2.00
2	230	15	25	325	0	18	3	20	ROF	164	1.97
3	249	15	29	334	1	18	4	22	ROF	174	1.96
4	1,494	15	172	2,005	3	109	17	126	ROF	1,475	2.07
5	1,494	15	172	2,005	3	109	17	126	ROF	1,475	2.07
6a	594	15	62	1,320	3	72	16	88	RI	828	2.39
6b	1,188	15	125	2,640	6	144	33	176	RI	1,655	2.39
7a	2,376	15	250	5,281	8	287	44	331	RI	3,686	2.55
7b	4,752	15	499	10,562	16	574	87	662	RI	7,372	2.55
8	594	15	62	1,320	2	72	11	83	RI	922	2.55
9a	680	15	110	2,112	5	115	26	141	RI	1,636	3.41
9b	1,360	15	220	4,224	10	230	52	282	RI	3,272	3.41
10a	1,368	15	196	5,352	12	291	66	357	RI	3,990	3.92
10b	2,280	15	327	8,920	20	485	111	596	RI	6,651	3.92
11a	1,264	15	189	4,626	10	251	57	309	RI	3,328	3.63
11b	2,528	15	378	9,251	21	503	115	618	RI	6,656	3.63
12	632	15	95	2,313	3	126	19	145	RI	1,536	3.43
13	2,193	15	329	8,218	12	447	68	515	RI	5,374	3.45
14	1,972	15	294	6,852	10	373	57	429	RI	4,225	3.14
15a	1,205	15	183	3,862	9	210	48	258	RI	2,540	3.11
15b	2,410	15	366	7,724	17	420	96	516	RI	5,080	3.11
16a	1,589	15	251	5,793	13	315	72	387	RI	3,894	3.45
16b	3,178	15	502	11,586	26	630	144	774	RI	7,789	3.45
17	1,589	15	251	5,793	9	315	48	363	RI	3,523	3.22
18	1,970	15	310	7,033	11	382	58	440	RI	4,140	3.10
21	5,376	15	586	6,521	20	373	108	481	ROF	5,909	2.19
22	230	15	25	325	1	19	5	24	ROF	294	2.38
23	1,245	15	143	1,671	5	96	28	123	ROF	1,484	2.27
24	2,860	15	352	5,855	18	335	97	432	RI	5,419	2.89
25	3,564	15	374	7,921	24	454	131	585	RI	5,342	2.50
26a	5,049	15	530	7,921	24	454	131	585	RI	6,233	2.23
26b	9,801	15	1,030	21,784	65	1,247	360	1,607	RI	18,490	2.89
27a	1,020	15	165	3,168	10	181	52	234	RI	3,098	4.04
27b	2,040	15	330	6,336	19	363	105	468	RI	6,195	4.04
28a	4,824	15	701	14,530	44	832	240	1,072	RI	13,015	3.70
28b	9,246	15	1,343	27,849	84	1,595	460	2,055	RI	24,946	3.70
Totals:											
RO	10,766		1,200	13,728	34	771	185	956		11,370	
RI:	74,126		9,826	210,148	509	11,701	2,804	14,505		160,835	

TABLE 2.18. Efficient Motor ERO: Motors with 5000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours			Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	# Month On-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak
1	CABINET HEATER	1/4	27	3,571	1,429	6	20,748	8,303	35	NA
2	Condensate Pump	1/4	2	3,571	1,429	6	1,537	615	3	NA
3	Condenser Fan	1/3	1	3,571	1,429	6	984	394	2	NA
4	AHU	1	4	3,571	1,429	9	5,400	2,161	14	NA
5	CABINET HEATER	1	35	3,571	1,429	6	47,249	18,908	79	NA
6	Condensate Pump	1	11	3,571	1,429	6	14,850	5,942	25	NA
7	Condenser Fan	1	1	3,571	1,429	6	1,350	540	2	NA
8	Condenser Water Pump	1	1	3,571	1,429	6	1,350	540	2	NA
9	Cooling Twr Fan	1	1	3,571	1,429	6	1,350	540	2	NA
10	Furnace Fans	1	8	3,571	1,429	6	10,800	4,322	18	NA
11	AHU	1	32	3,571	1,429	9	65,687	26,286	166	NA
12	Chilled Water Pump	1	1	3,571	1,429	6	2,053	821	3	NA
13	Furnace Fans	1	1	3,571	1,429	6	2,053	821	3	NA
14a	AHU	1	12	3,571	1,429	9	32,299	12,925	81	NA
14b	AHU	1	22	3,571	1,429	9	59,215	23,696	149	NA
15	Condensate Pump	1	1	3,571	1,429	6	2,693	1,078	5	NA
16	Furnace Fans	1	6	3,571	1,429	6	16,156	6,465	27	NA
17a	AHU	2	2	3,571	1,429	9	10,295	4,120	26	NA
17b	AHU	2	3	3,571	1,429	9	15,442	6,179	39	NA
18	Condenser Water Pump	2	1	3,571	1,429	6	5,149	2,061	9	NA
19	Cooling Twr Fan	2	1	3,571	1,429	6	5,149	2,061	9	NA
20	Chilled Water Pump	3	1	3,571	1,429	6	7,391	2,958	12	NA
21a	AHU	5	1	3,571	1,429	9	12,104	4,846	31	NA
21b	AHU	5	1	3,571	1,429	9	12,104	4,846	31	NA
22	Condenser Fan	5	1	3,571	1,429	6	12,109	4,846	20	NA
23a	AHU	10	1	3,571	1,429	9	23,469	9,391	59	NA
23b	AHU	10	3	3,571	1,429	9	70,406	28,174	177	NA
24	Chilled Water Pump	15	1	3,571	1,429	6	34,607	13,849	58	NA
25	Condenser Water Pump	15	1	3,571	1,429	6	34,607	13,849	58	NA
26	Cooling Twr Fan	15	1	3,571	1,429	6	34,607	13,849	58	NA

TABLE 2.18. (contd)

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	CABINET HEATER	1/4	27	3,571	1,429	6	17,515	7,009	29	NA
2	Condensate Pump	1/4	2	3,571	1,429	6	1,297	519	2	NA
3	Condenser Fan	1/3	1	3,571	1,429	6	845	338	1	NA
4	AHU	1	4	3,571	1,429	9	4,933	1,974	12	NA
5	CABINET HEATER	1	35	3,571	1,429	6	43,166	17,274	73	NA
6	Condensate Pump	1	11	3,571	1,429	6	13,566	5,429	23	NA
7	Condenser Fan	1	1	3,571	1,429	6	1,233	494	2	NA
8	Condenser Water Pump	1	1	3,571	1,429	6	1,233	494	2	NA
9	Cooling Twr Fan	1	1	3,571	1,429	6	1,233	494	2	NA
10	Furnace Fans	1	8	3,571	1,429	6	9,867	3,948	17	NA
11	AHU	1	32	3,571	1,429	9	58,477	23,401	147	NA
12	Chilled Water Pump	1	1	3,571	1,429	6	1,827	731	3	NA
13	Furnace Fans	1	1	3,571	1,429	6	1,827	731	3	NA
14a	AHU	1	12	3,571	1,429	9	25,227	10,095	64	NA
14b	AHU	1	22	3,571	1,429	9	49,250	18,508	117	NA
15	Condensate Pump	1	1	3,571	1,429	6	2,323	930	4	NA
16	Furnace Fans	1	6	3,571	1,429	6	13,939	5,578	23	NA
17a	AHU	2	2	3,571	1,429	9	8,409	3,365	21	NA
17b	AHU	2	3	3,571	1,429	9	12,614	5,048	32	NA
18	Condenser Water Pump	2	1	3,571	1,429	6	4,630	1,853	8	NA
19	Cooling Twr Fan	2	1	3,571	1,429	6	4,630	1,853	8	NA
20	Chilled Water Pump	3	1	3,571	1,429	6	6,645	2,659	11	NA
21a	AHU	5	1	3,571	1,429	9	10,511	4,206	26	NA
21b	AHU	5	1	3,571	1,429	9	10,511	4,206	26	NA
22	Condenser Fan	5	1	3,571	1,429	6	11,100	4,442	19	NA
23a	AHU	10	1	3,571	1,429	9	21,023	8,413	53	NA
23b	AHU	10	3	3,571	1,429	9	63,069	25,238	159	NA
24	Chilled Water Pump	15	1	3,571	1,429	6	32,225	12,896	54	NA
25	Condenser Water Pump	15	1	3,571	1,429	6	32,225	12,896	54	NA
26	Cooling Twr Fan	15	1	3,571	1,429	6	32,225	12,896	54	NA

TABLE 2.18. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
1	6,048	15	659	4,527	5	246	30	276	RI	7,157	2.18
2	448	15	49	335	0	18	2	20	ROF	510	2.23
3	230	15	25	194	0	11	1	12	RI	215	1.94
4	996	15	114	653	1	36	6	42	RI	1,075	2.08
5	8,715	15	1,001	5,717	7	311	38	349	RI	7,743	1.89
6	2,739	15	315	1,797	2	98	12	110	ROF	3,333	2.32
7	249	15	29	163	0	9	1	10	RI	208	1.83
8	249	15	29	163	0	9	1	10	RI	208	1.83
9	249	15	29	163	0	9	1	10	RI	208	1.83
10	1,992	15	229	1,307	2	71	9	80	RI	1,662	1.83
11	8,320	15	1,024	10,095	18	549	100	649	RI	17,285	3.08
12	260	15	32	315	0	17	2	19	RI	422	2.62
13	260	15	32	315	0	17	2	19	RI	422	2.62
14a	3,564	15	374	9,902	17	538	94	632	RI	6,485	2.82
14b	6,534	15	686	15,153	32	811	176	988	RI	11,890	2.82
15	297	15	31	517	1	28	3	32	RI	582	2.96
16	1,782	15	187	3,104	4	169	21	189	RI	3,012	2.69
17a	680	15	110	2,641	5	144	28	171	RI	2,036	3.99
17b	1,020	15	165	3,959	7	215	39	254	RI	3,054	3.99
18	340	15	55	727	1	40	5	44	RI	957	3.82
19	340	15	55	727	1	40	5	44	RI	957	3.82
20	402	15	58	1,044	1	57	7	64	RI	1,026	3.55
21a	456	15	65	2,233	5	121	28	149	RI	1,678	4.68
21b	456	15	65	2,233	5	121	28	149	RI	1,678	4.68
22	456	15	65	1,413	2	77	9	86	RI	1,559	4.42
23a	731	15	110	3,424	6	186	33	219	RI	2,448	4.35
23b	2,193	15	329	10,273	18	559	99	658	RI	7,345	4.35
24	986	15	147	3,335	4	181	22	203	RI	2,710	3.75
25	986	15	147	3,335	4	181	22	203	RI	2,710	3.75
26	986	15	147	3,335	4	181	22	203	RI	2,710	3.75
Totals:											
ROF	3,187		363	2,132	3	116	14	130		3,842	
RI	49,777		6,000	90,967	151	4,933	831	5,764		89,444	

TABLE 2.19. Efficient Motor ERO: Motors with 6000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Circ. Pump	1/4	28	2,520	3,480	12	15,184	20,968	72	NA
4	Furnace Fans	1/3	1	2,520	3,480	6	694	959	2	NA
5	Circ. Pump	1	72	2,520	3,480	12	68,592	94,722	327	NA
6	Circ. Pump	1	2	2,520	3,480	12	2,897	4,001	14	NA
7	Condenser Fan	1	1	2,520	3,480	6	1,449	2,000	3	NA
8	AHU	1	1	2,520	3,480	9	1,900	2,624	7	NA
9	Chilled Water Pump	1	1	2,520	3,480	6	1,900	2,624	5	NA
10	Circ. Pump	1	24	2,520	3,480	12	45,605	62,978	217	NA
11	Condenser Wtr Pump	1	1	2,520	3,480	6	1,900	2,624	5	NA
12	Cooling Twr Fan	1	1	2,520	3,480	6	1,900	2,624	5	NA
13	Circ. Pump	2	3	2,520	3,480	12	10,902	15,055	52	NA
14	AHU	3	1	2,520	3,480	9	5,216	7,202	19	NA
15a	AHU	5	1	2,520	3,480	9	17,090	11,798	31	NA
15b	AHU	5	1	2,520	3,480	9	8,542	11,798	31	NA
16	Chilled Water Pump	5	1	2,520	3,480	6	8,545	11,800	20	NA
17	Circ. Pump	5	13	2,520	3,480	12	111,086	153,405	529	NA
18	Condenser Wtr Pump	5	1	2,520	3,480	6	8,545	11,800	20	NA
19	Cooling Twr Fan	5	1	2,520	3,480	6	8,545	11,800	20	NA
20a	AHU	25	1	2,520	3,480	9	40,130	55,418	143	NA
20b	AHU	25	2	2,520	3,480	9	80,260	110,836	287	NA
21	Condenser Wtr Pump	25	1	2,520	3,480	6	40,146	55,440	96	NA
22	Cooling Twr Fan	25	1	2,520	3,480	6	40,146	55,440	96	NA
23	Chilled Water Pump	30	1	2,520	3,480	6	48,176	66,528	115	NA

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Circ. Pump	1/4	28	2,520	3,480	12	12,818	17,701	61	NA
4	Furnace Fans	1/3	1	2,520	3,480	6	597	824	1	NA
5	Circ. Pump	1	72	2,520	3,480	12	62,664	86,536	298	NA
6	Circ. Pump	1	2	2,520	3,480	12	2,579	3,562	12	NA
7	Condenser Fan	1	1	2,520	3,480	6	1,290	1,781	3	NA
8	AHU	1	1	2,520	3,480	9	1,639	2,264	6	NA
9	Chilled Water Pump	1	1	2,520	3,480	6	1,639	2,264	4	NA
10	Circ. Pump	1	24	2,520	3,480	12	39,347	54,337	187	NA
11	Condenser Wtr Pump	1	1	2,520	3,480	6	1,639	2,264	4	NA
12	Cooling Twr Fan	1	1	2,520	3,480	6	1,639	2,264	4	NA
13	Circ. Pump	2	3	2,520	3,480	12	9,803	13,537	47	NA
14	AHU	3	1	2,520	3,480	9	4,669	6,476	17	NA
15a	AHU	5	1	2,520	3,480	9	7,418	10,244	26	NA
15b	AHU	5	1	2,520	3,480	9	7,418	10,244	26	NA
16	Chilled Water Pump	5	1	2,520	3,480	6	7,833	10,817	19	NA
17	Circ. Pump	5	13	2,520	3,480	12	101,829	140,621	485	NA
18	Condenser Wtr Pump	5	1	2,520	3,480	6	7,833	10,817	19	NA
19	Cooling Twr Fan	5	1	2,520	3,480	6	7,833	10,817	19	NA
20a	AHU	25	1	2,520	3,480	9	37,089	51,218	132	NA
20b	AHU	25	2	2,520	3,480	9	74,178	102,436	265	NA
21	Condenser Wtr Pump	25	1	2,520	3,480	6	37,459	51,728	89	NA
22	Cooling Twr Fan	25	1	2,520	3,480	6	37,459	51,728	89	NA
23	Chilled Water Pump	30	1	2,520	3,480	6	44,950	62,074	107	NA

TABLE 2.19. (contd)

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
3	6,272	15	683	5,634	11	282	62	344	ROF	8,641	2.49
4	230	15	25	233	0	12	1	13	RI	248	2.08
5	17,928	15	2,059	14,114	28	706	156	862	ROF	26,452	2.60
6	520	15	64	757	2	38	8	46	RI	1,242	3.39
7	260	15	32	379	0	19	2	21	RI	475	2.83
8	297	15	31	621	1	31	5	36	RI	682	3.30
9	297	15	31	621	1	31	3	34	RI	568	2.91
10	7,128	15	743	14,898	30	745	164	909	RI	17,254	3.42
11	297	15	31	621	1	31	3	34	RI	568	2.91
12	297	15	31	621	1	31	3	34	RI	568	2.91
13	1,020	15	165	2,617	5	131	29	160	RI	3,845	4.77
14	402	15	58	1,253	2	63	10	73	RI	1,297	4.23
15a	456	15	65	11,224	5	635	28	662	RI	1,830	5.01
15b	456	15	65	2,676	5	134	28	161	RI	1,830	5.01
16	456	15	65	1,695	2	85	9	94	RI	1,730	4.79
17	5,928	15	650	22,041	44	1,103	243	1,345	RI	25,640	5.33
18	456	15	65	1,695	2	85	9	94	RI	1,730	4.79
19	456	15	65	1,695	2	85	9	94	RI	1,730	4.79
20a	1,384	15	217	7,241	11	362	61	423	RI	4,398	4.18
20b	2,768	15	434	14,482	22	724	121	846	RI	8,795	4.18
21	1,384	15	217	6,400	6	320	35	355	RI	4,149	4.00
22	1,384	15	217	6,400	6	320	35	355	RI	4,149	4.00
23	1,589	15	251	7,679	8	384	42	426	RI	5,017	4.16
Totals:											
ROF	24,200		2,742	19,748	39	988	218	1,205		35,093	
RI	27,465		3,730	105,849	154	5,368	851	6,219		87,744	

TABLE 2.20. Efficient Motor ERO: Motors with 8760 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Furnace Fans	1/4	7	3,640	5,120	6	5,483	7,712	9	NA
4	Furnace Fans	1/3	5	3,640	5,120	6	5,015	7,055	8	NA
5	CABINET HEATER	1	2	3,640	5,120	6	2,752	3,871	5	NA
6	Condenser Fan	1	2	3,640	5,120	6	2,752	3,871	5	NA
7	Furnace Fans	1	2	3,640	5,120	6	2,752	3,871	5	NA
8	Furnace Fans	1	3	3,640	5,120	6	6,277	8,829	10	NA
9a	AHU	1	1	3,640	5,120	9	2,744	3,859	7	NA
9b	AHU	1	1	3,640	5,120	9	2,744	3,859	7	NA
10	Furnace Fans	1	9	3,640	5,120	6	24,702	34,746	41	NA
11	Furnace Fans	2	4	3,640	5,120	6	20,998	29,532	35	NA
12a	AHU	5	2	3,640	5,120	9	24,787	34,709	61	NA
12b	AHU	5	3	3,640	5,120	9	37,014	52,063	92	NA
13	Chilled Water Pump	10	1	3,640	5,120	6	23,932	33,662	39	NA
14	Condenser Water Pump	10	1	3,640	5,120	6	23,932	33,662	39	NA
15	Cooling Twr Fan	10	1	3,640	5,120	6	23,932	33,662	39	NA

Energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
3	Furnace Fans	1/4	7	3,640	5,120	6	4,629	6,511	8	NA
4	Furnace Fans	1/3	5	3,640	5,120	6	4,308	6,060	7	NA
5	CABINET HEATER	1	2	3,640	5,120	6	2,514	3,537	4	NA
6	Condenser Fan	1	2	3,640	5,120	6	2,514	3,537	4	NA
7	Furnace Fans	1	2	3,640	5,120	6	2,514	3,537	4	NA
8	Furnace Fans	1	3	3,640	5,120	6	5,588	7,860	9	NA
9a	AHU	1	1	3,640	5,120	9	2,143	3,014	5	NA
9b	AHU	1	1	3,640	5,120	9	2,143	3,014	5	NA
10	Furnace Fans	1	9	3,640	5,120	6	21,313	29,979	35	NA
11	Furnace Fans	2	4	3,640	5,120	6	18,879	26,555	31	NA
12a	AHU	5	2	3,640	5,120	9	21,429	30,142	53	NA
12b	AHU	5	3	3,640	5,120	9	32,144	45,213	79	NA
13	Chilled Water Pump	10	1	3,640	5,120	6	22,209	31,239	37	NA
14	Condenser Water Pump	10	1	3,640	5,120	6	22,209	31,239	37	NA
15	Cooling Twr Fan	10	1	3,640	5,120	6	22,209	31,239	37	NA

Energy-efficient motor ERO economics

ID	Economic Parameters			First Year Savings					Life Cycle Cost		
	First Cost \$ RI	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	When	NPV \$	SIR
3	1,568	15	171	2,056	1	103	8	110	RI	2,267	2.45
4	1,150	15	127	1,702	1	85	6	91	RI	2,040	2.77
5	498	15	57	572	0	29	2	31	RI	831	2.87
6	498	15	57	572	0	29	2	31	RI	807	2.62
7	498	15	57	572	0	29	2	31	RI	807	2.62
8	780	15	96	1,658	1	83	6	89	RI	2,202	3.82
9a	297	15	31	1,446	2	72	11	83	RI	926	4.12
9b	297	15	31	1,446	2	72	11	83	RI	926	4.12
10	2,673	15	281	8,157	6	407	31	438	RI	7,991	3.99
11	1,360	15	220	5,094	3	254	19	274	RI	6,270	5.61
12a	912	15	131	7,905	8	396	44	440	RI	5,320	6.83
12b	1,368	15	196	11,720	13	586	72	657	RI	7,980	6.83
13	731	15	110	4,145	3	207	16	223	RI	3,776	6.17
14	731	15	110	4,145	3	207	16	223	RI	3,776	6.17
15	731	15	110	4,145	3	207	16	223	RI	3,776	6.17
Totals:											
ROF	0		0	0	0	0	0	0		0	
RI	14,092		1,784	55,337	47	2,765	262	3,027		49,697	

TABLE 2.21. VSD ERO: Motors with 800 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
6	AHU	1	6	571	229	9	2,563	1,036	41	NA
9	AHU	3	1	571	229	9	1,182	474	19	NA
13	AHU	10	7	571	229	9	26,279	10,539	414	NA
15	Condenser Wtr Pum	15	1	571	229	6	5,534	2,219	58	NA
16	Cooling Twr Fan	15	1	571	229	6	5,534	2,219	58	NA
17	Chilled Water Pump	20	1	571	229	6	7,277	2,919	76	NA

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours			Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	# Month On-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
6	AHU	1	6	571	229	9	1,102	442	17	NA
9	AHU	3	1	571	229	9	504	202	8	NA
13	AHU	10	7	571	229	9	11,213	4,497	177	NA
15	Condenser Wtr Pum	15	1	571	229	6	2,767	1,110	29	NA
16	Cooling Twr Fan	15	1	571	229	6	2,767	1,110	29	NA
17	Chilled Water Pump	20	1	571	229	6	3,105	1,245	33	NA
Add VSD and Replace Motor:										
6	AHU	1	6	571	229	9	951	381	15	NA
9	AHU	3	1	571	229	9	453	182	7	NA
13	AHU	10	7	571	229	9	10,406	4,173	164	NA
15	Condenser Wtr Pum	15	1	571	229	6	2,576	1,033	27	NA
16	Cooling Twr Fan	15	1	571	229	6	2,576	1,033	27	NA
17	Chilled Water Pump	20	1	571	229	6	2,913	1,168	31	NA

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings				Life Cycle Cost		
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
6	13,802	0	60	15	187	2,075	23	131	129	260	(50,843)	(0.33)
9	3,303	0	10	15	58	949	11	60	59	119	(11,097)	(0.25)
13	22,016	0	70	15	767	21,108	237	1,337	1,308	2,645	(167,735)	(0.26)
15	2,869	0	10	15	147	3,876	29	258	160	418	1,480	1.41
16	2,869	0	10	15	147	3,876	29	258	160	418	1,480	1.41
17	2,897	0	10	15	183	5,845	44	371	242	612	(16,583)	(0.01)
Totals:	5,738	0	20		294	7,753	58	516	320	837	2,960	
Add VSD and Replace Motor:												
6	13,998	0	60	15	187	2,287	26	140	142	282	(51,306)	(0.34)
9	3,568	0	10	15	58	1,021	11	63	63	126	(11,257)	(0.25)
13	22,499	0	70	15	767	22,239	250	1,385	1,379	2,763	(169,136)	(0.26)
15	3,755	0	10	15	147	4,143	31	269	171	441	1,048	1.27
16	3,755	0	10	15	147	4,143	31	269	171	441	1,048	1.27
17	3,489	0	10	15	183	6,115	46	392	253	635	(17,086)	(0.02)
Totals:	7,510	0	20		294	8,286	62	539	342	881	2,097	

TABLE 2.22. VSD ERO: Motors with 1000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
13	AHU	1	2	714	286	9	1,077	431	14	NA
14	BLAST HEATER	1	2	714	286	6	1,077	431	9	NA
15	Chilled Water Pump	1	1	714	286	6	538	216	5	NA
16	Condenser Water Pump	1	1	714	286	6	538	216	5	NA
17	Cooling Twr Fan	1	1	714	286	6	538	216	5	NA
20	AHU	3	1	714	286	9	1,478	592	19	NA
22	AHU	5	5	714	286	9	12,106	4,649	153	NA
23	Condenser Water Pump	5	1	714	286	6	2,421	970	20	NA
24	Cooling Twr Fan	5	1	714	286	6	2,421	970	20	NA
26	AHU	8	1	714	286	9	3,567	1,429	45	NA
27	Chilled Water Pump	8	1	714	286	6	3,567	1,429	30	NA
28	Chilled Water Pump	10	1	714	286	6	4,694	1,880	39	NA
29	Condenser Water Pump	10	1	714	286	6	4,694	1,880	39	NA
30	Cooling Twr Fan	10	1	714	286	6	4,694	1,880	39	NA
31	AHU	25	1	714	286	9	11,375	4,556	143	NA

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
13	AHU	1	2	714	286	9	459	184	6	NA
14	BLAST HEATER	1	2	714	286	6	538	216	5	NA
15	Chilled Water Pump	1	1	714	286	6	230	92	2	NA
16	Condenser Water Pump	1	1	714	286	6	269	108	2	NA
17	Cooling Twr Fan	1	1	714	286	6	269	108	2	NA
20	AHU	3	1	714	286	9	631	253	8	NA
22	AHU	5	5	714	286	9	5,165	2,069	65	NA
23	Condenser Water Pump	5	1	714	286	6	1,211	485	10	NA
24	Cooling Twr Fan	5	1	714	286	6	1,211	485	10	NA
26	AHU	8	1	714	286	9	1,522	610	19	NA
27	Chilled Water Pump	8	1	714	286	6	1,522	610	13	NA
28	Chilled Water Pump	10	1	714	286	6	2,003	802	17	NA
29	Condenser Water Pump	10	1	714	286	6	2,347	940	20	NA
30	Cooling Twr Fan	10	1	714	286	6	2,347	940	20	NA
31	AHU	25	1	714	286	9	4,854	1,944	61	NA
Add VSD and Replace Motor:										
13	AHU	1	2	714	236	9	396	159	5	NA
14	BLAST HEATER	1	2	714	286	6	465	186	4	NA
15	Chilled Water Pump	1	1	714	286	6	198	79	2	NA
16	Condenser Water Pump	1	1	714	286	6	232	93	2	NA
17	Cooling Twr Fan	1	1	714	286	6	232	93	2	NA
20	AHU	3	1	714	286	9	567	227	7	NA
22	AHU	5	5	714	286	9	4,735	1,897	60	NA
23	Condenser Water Pump	5	1	714	286	6	1,110	444	9	NA
24	Cooling Twr Fan	5	1	714	286	6	1,110	444	9	NA
26	AHU	8	1	714	286	9	1,390	557	18	NA
27	Chilled Water Pump	8	1	714	286	6	1,390	557	12	NA
28	Chilled Water Pump	10	1	714	286	6	1,859	745	16	NA
29	Condenser Water Pump	10	1	714	286	6	2,178	873	18	NA
30	Cooling Twr Fan	10	1	714	286	6	2,178	873	18	NA
31	AHU	25	1	714	286	9	4,529	1,814	57	NA

TABLE 2.22. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings					Life Cycle Cost	
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
13	3,801	0	20	15	62	865	8	55	43	98	(4,595)	(0.25)
14	2,522	0	20	15	62	754	5	50	25	75	(2,131)	(0.05)
15	1,300	0	10	15	31	432	3	27	14	42	(2,141)	(0.13)
16	1,161	0	10	15	31	377	2	25	12	38	(1,302)	0.06
17	1,161	0	10	15	31	377	2	25	12	38	(1,302)	0.06
20	3,303	0	10	15	58	1,187	11	75	59	134	(10,966)	(0.24)
22	11,714	0	50	15	327	9,720	87	616	482	1,098	(50,897)	(0.24)
23	1,468	0	10	15	65	1,695	10	113	56	169	71	1.04
24	1,468	0	10	15	65	1,695	10	113	56	169	71	1.04
26	3,456	0	10	15	95	2,864	26	182	142	324	(24,760)	(0.23)
27	1,656	0	10	15	95	2,864	17	182	95	277	(6,282)	0.05
28	2,031	0	10	15	110	3,769	23	239	125	364	(8,465)	0.03
29	2,268	0	10	15	110	3,287	20	219	109	328	1,067	1.38
30	2,268	0	10	15	110	3,287	20	219	109	328	1,067	1.38
31	4,453	0	10	15	217	9,133	82	579	453	1,032	(79,668)	(0.24)
Totals:	7,472	0	40		350	9,966	60	664	329	994	2,277	
Add VSD and Replace Motor:												
13	4,765	0	20	15	62	953	9	59	47	106	(4,722)	(0.26)
14	2,716	0	20	15	62	858	5	55	28	83	(2,179)	(0.06)
15	1,498	0	10	15	31	476	3	29	16	45	(2,273)	(0.16)
16	1,358	0	10	15	31	429	3	27	14	41	(1,441)	0.01
17	1,358	0	10	15	31	429	3	27	14	41	(1,441)	0.01
20	3,588	0	10	15	58	1,276	11	79	63	142	(11,120)	(0.24)
22	12,735	0	50	15	327	10,323	93	642	512	1,154	(51,395)	(0.24)
23	1,824	0	10	15	65	1,837	11	119	61	180	(123)	0.94
24	1,824	0	10	15	65	1,837	11	119	61	180	(123)	0.94
26	3,873	0	10	15	95	3,049	27	189	151	341	(24,794)	(0.23)
27	1,869	0	10	15	95	3,049	18	190	101	290	(6,517)	0.03
28	2,309	0	10	15	110	3,971	24	248	131	379	(8,752)	0.02
29	2,899	0	10	15	110	3,524	21	229	117	346	755	1.25
30	2,899	0	10	15	110	3,524	21	229	117	346	755	1.25
31	4,550	0	10	15	217	9,589	86	598	475	1,074	(79,742)	(0.24)
Totals:	5,798	0	20		219	7,048	42	458	233	691	1,511	

TABLE 2.23. VSD ERO: Motors with 1650 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
16	AHU	1	5	1179	471	9	4,445	1,776	34	NA
17	BLAST HEATER	1	1	1179	471	6	889	355	5	NA
18	Chilled Water Pump	1	1	1179	471	6	889	355	5	NA
20	Condenser Wtr Pum	1	1	1179	471	6	889	355	5	NA
21	Cooling Twr Fan	1	1	1179	471	6	889	355	5	NA
23	AHU	2	7	1179	471	9	11,901	4,754	91	NA
25	Condenser Wtr Pum	2	1	1179	471	6	1,700	679	9	NA
26	Cooling Twr Fan	2	1	1179	471	6	1,700	679	9	NA
27	AHU	3	10	1179	471	9	22,775	9,098	174	NA
28	Chilled Water Pump	3	2	1179	471	6	4,880	1,950	25	NA
30	Condenser Wtr Pum	3	1	1179	471	6	2,440	975	12	NA
31	Cooling Twr Fan	3	1	1179	471	6	2,440	975	12	NA
32	Cooling Twr Fan	4	2	1179	471	6	6,507	2,600	33	NA
33	AHU	5	4	1179	471	9	15,992	6,388	122	NA
34	Chilled Water Pump	5	2	1179	471	6	7,996	3,194	41	NA
36	Condenser Wtr Pum	5	3	1179	471	6	11,994	4,791	61	NA
37	Cooling Twr Fan	5	1	1179	471	6	3,998	1,597	20	NA
38	AHU	7.5	4	1179	471	9	23,559	9,412	180	NA
39	Chilled Water Pump	7.5	2	1179	471	6	11,779	4,706	60	NA
41	AHU	10	12	1179	471	9	93,018	37,160	710	NA
42	BLAST HEATER	10	4	1179	471	6	31,006	12,387	158	NA
43	Chilled Water Pump	10	1	1179	471	6	7,751	3,097	39	NA
44	Condenser Wtr Pum	10	1	1179	471	6	7,751	3,097	39	NA
45	Cooling Twr Fan	10	3	1179	471	6	23,254	9,290	118	NA
46	AHU	20	1	1179	471	9	15,026	6,003	115	NA
47	Condenser Wtr Pum	20	1	1179	471	6	15,026	6,003	76	NA
48	Chilled Water Pump	25	1	1179	471	6	18,783	7,504	96	NA
49	AHU	30	2	1179	471	9	45,079	18,009	344	NA

TABLE 2.23. (contd)

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
16 AHU		1	5	1179	471	9	1,897	758	14	NA
17 BLAST HEATER		1	1	1179	471	6	445	178	2	NA
18 Chilled Water Pump		1	1	1179	471	6	379	152	2	NA
20 Condenser Wtr Pum		1	1	1179	471	6	445	178	2	NA
21 Cooling Twr Fan		1	1	1179	471	6	445	178	2	NA
23 AHU		2	7	1179	471	9	5,078	2,029	39	NA
25 Condenser Wtr Pum		2	1	1179	471	6	850	340	4	NA
26 Cooling Twr Fan		2	1	1179	471	6	850	340	4	NA
27 AHU		3	10	1179	471	9	9,718	3,882	74	NA
28 Chilled Water Pump		3	2	1179	471	6	2,082	832	11	NA
30 Condenser Wtr Pum		3	1	1179	471	6	1,220	487	6	NA
31 Cooling Twr Fan		3	1	1179	471	6	1,220	487	6	NA
32 Cooling Twr Fan		4	2	1179	471	6	3,254	1,300	17	NA
33 AHU		5	4	1179	471	9	6,823	2,726	52	NA
34 Chilled Water Pump		5	2	1179	471	6	3,412	1,363	17	NA
36 Condenser Wtr Pum		5	3	1179	471	6	5,997	2,396	31	NA
37 Cooling Twr Fan		5	1	1179	471	6	1,999	799	10	NA
38 AHU		7.5	4	1179	471	9	10,052	4,016	77	NA
39 Chilled Water Pump		7.5	2	1179	471	6	5,026	2,008	26	NA
41 AHU		10	12	1179	471	9	39,690	15,856	303	NA
42 BLAST HEATER		10	4	1179	471	6	15,503	6,193	79	NA
43 Chilled Water Pump		10	1	1179	471	6	3,307	1,321	17	NA
44 Condenser Wtr Pum		10	1	1179	471	6	3,876	1,548	20	NA
45 Cooling Twr Fan		10	3	1179	471	6	11,627	4,645	59	NA
46 AHU		20	1	1179	471	9	6,412	2,561	49	NA
47 Condenser Wtr Pum		20	1	1179	471	6	7,513	3,001	38	NA
48 Chilled Water Pump		25	1	1179	471	6	8,014	3,202	41	NA
49 AHU		30	2	1179	471	9	19,235	7,684	147	NA
Add VSD and Replace Motor:										
16 AHU		1	5	1179	471	9	1,636	654	12	NA
17 BLAST HEATER		1	1	1179	471	6	384	153	2	NA
18 Chilled Water Pump		1	1	1179	471	6	327	131	2	NA
20 Condenser Wtr Pum		1	1	1179	471	6	384	153	2	NA
21 Cooling Twr Fan		1	1	1179	471	6	384	153	2	NA
23 AHU		2	7	1179	471	9	4,566	1,824	35	NA
25 Condenser Wtr Pum		2	1	1179	471	6	764	305	4	NA
26 Cooling Twr Fan		2	1	1179	471	6	764	305	4	NA
27 AHU		3	10	1179	471	9	8,737	3,490	67	NA
28 Chilled Water Pump		3	2	1179	471	6	1,872	748	10	NA
30 Condenser Wtr Pum		3	1	1179	471	6	1,097	438	6	NA
31 Cooling Twr Fan		3	1	1179	471	6	1,097	438	6	NA
32 Cooling Twr Fan		4	2	1179	471	6	2,925	1,169	15	NA
33 AHU		5	4	1179	471	9	6,255	2,499	48	NA
34 Chilled Water Pump		5	2	1179	471	6	3,127	1,249	16	NA
36 Condenser Wtr Pum		5	3	1179	471	6	5,497	2,196	28	NA
37 Cooling Twr Fan		5	1	1179	471	6	1,832	732	9	NA
38 AHU		7.5	4	1179	471	9	9,178	3,667	70	NA
39 Chilled Water Pump		7.5	2	1179	471	6	4,589	1,833	23	NA
41 AHU		10	12	1179	471	9	36,833	14,714	281	NA
42 BLAST HEATER		10	4	1179	471	6	14,387	5,748	73	NA
43 Chilled Water Pump		10	1	1179	471	6	3,069	1,226	16	NA
44 Condenser Wtr Pum		10	1	1179	471	6	3,597	1,437	18	NA
45 Cooling Twr Fan		10	3	1179	471	6	10,790	4,311	55	NA
46 AHU		20	1	1179	471	9	6,014	2,403	46	NA
47 Condenser Wtr Pum		20	1	1179	471	6	7,048	2,815	36	NA
48 Chilled Water Pump		25	1	1179	471	6	7,478	2,987	38	NA
49 AHU		30	2	1179	471	9	17,947	7,170	137	NA

TABLE 2.23. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings					Life Cycle Cost	
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
16	10,701	0	50	15	156	3,566	19	226	107	334	(13,304)	(0.20)
17	1,261	0	10	15	31	622	2	42	12	54	(1,239)	0.20
18	1,300	0	10	15	31	713	3	45	14	60	(1,981)	(0.05)
20	1,161	0	10	15	31	622	2	42	12	54	(1,087)	0.22
21	1,161	0	10	15	31	622	2	42	12	54	(1,087)	0.22
23	17,489	0	70	15	385	6,549	52	606	287	893	(36,978)	(0.18)
25	1,288	0	10	15	55	1,190	4	79	24	103	(552)	0.64
26	1,288	0	10	15	55	1,190	4	79	24	103	(552)	0.64
27	25,822	0	100	15	584	18,273	100	1,160	549	1,710	(73,593)	(0.17)
28	2,406	0	20	15	117	3,916	14	249	78	327	(3,152)	0.09
30	1,468	0	10	15	58	1,707	6	114	34	148	(225)	0.87
31	1,468	0	10	15	58	1,707	6	114	34	148	(225)	0.87
32	2,936	0	20	15	117	4,553	17	304	91	395	(225)	0.87
33	10,990	0	40	15	262	12,831	70	815	386	1,200	(50,185)	(0.25)
34	2,406	0	20	15	131	6,415	23	408	129	536	(3,956)	0.16
36	4,539	0	30	15	196	8,393	31	560	168	728	1,834	1.49
37	1,468	0	10	15	65	2,798	10	187	56	243	1,012	1.56
38	11,524	0	40	15	378	18,902	103	1,200	568	1,769	(71,510)	(0.18)
39	2,712	0	20	15	189	9,451	34	601	189	790	(5,263)	0.19
41	35,064	0	120	15	1,315	74,632	407	4,740	2,243	6,983	(252,989)	(0.18)
42	8,680	0	40	15	438	21,696	79	1,448	435	1,882	3,482	1.46
43	2,031	0	10	15	110	6,219	23	395	125	520	(7,155)	0.18
44	2,268	0	10	15	110	5,424	20	362	109	471	2,880	2.02
45	6,408	0	30	15	329	16,272	59	1,086	326	1,412	6,317	2.20
46	4,697	0	10	15	183	12,056	66	766	362	1,128	(62,701)	(0.20)
47	3,581	0	10	15	183	10,515	38	702	211	912	6,832	2.52
48	3,517	0	10	15	217	15,070	55	958	302	1,260	(16,589)	0.19
49	5,183	0	20	15	502	36,168	197	2,297	1,087	3,384	(92,448)	(0.19)
Totals:	26,944	0	130		1,322	65,097	237	4,343	1,304	5,648	22,358	
Add VSD and Replace Motor:												
16	11,617	0	50	15	156	3,931	21	242	116	360	(13,652)	(0.21)
17	1,358	0	10	15	31	707	3	45	14	59	(1,260)	0.19
18	1,496	0	10	15	31	786	3	48	16	64	(2,102)	(0.07)
20	1,359	0	10	15	31	707	3	45	14	59	(1,217)	0.17
21	1,358	0	10	15	31	707	3	45	14	59	(1,217)	0.17
23	17,713	0	70	15	385	10,265	56	637	309	945	(37,558)	(0.19)
25	1,528	0	10	15	55	1,310	5	84	26	111	(689)	0.58
26	1,528	0	10	15	55	1,310	5	84	26	111	(689)	0.58
27	26,088	0	100	15	584	19,845	107	1,218	590	1,809	(73,739)	(0.17)
28	2,863	0	20	15	117	4,210	15	261	84	346	(3,295)	0.08
30	1,770	0	10	15	58	1,880	7	121	38	159	(385)	0.79
31	1,770	0	10	15	58	1,880	7	121	38	159	(385)	0.79
32	3,540	0	20	15	117	5,013	18	323	100	424	(385)	0.79
33	11,291	0	40	15	262	13,626	74	848	410	1,258	(50,268)	(0.25)
34	2,899	0	20	15	131	6,813	25	425	137	561	(4,108)	0.15
36	5,807	0	30	15	196	9,092	33	589	182	772	1,487	1.37
37	1,824	0	10	15	65	3,031	11	196	61	257	839	1.44
38	11,941	0	40	15	378	20,126	110	1,252	605	1,857	(72,026)	(0.18)
39	3,321	0	20	15	189	10,063	37	626	202	828	(5,565)	0.17
41	35,354	0	120	15	1,315	78,630	429	4,908	2,363	7,271	(253,541)	(0.18)
42	11,604	0	40	15	438	23,258	85	1,513	466	1,979	3,267	1.43
43	2,309	0	10	15	110	6,552	24	409	131	541	(7,399)	0.17
44	2,899	0	10	15	110	5,814	21	378	117	495	2,602	1.87
45	8,501	0	30	15	329	17,443	63	1,135	350	1,484	5,760	2.03
46	5,493	0	10	15	183	12,612	69	789	379	1,168	(63,083)	(0.20)
47	4,686	0	10	15	183	11,166	41	729	224	953	6,364	2.33
48	4,227	0	10	15	217	15,821	58	989	317	1,306	(17,003)	0.18
49	5,416	0	20	15	502	37,971	207	2,373	1,141	3,514	(92,852)	(0.19)
Totals:	35,321	0	130		1,322	69,604	254	4,541	1,399	5,940	20,319	

TABLE 2.24. VSD ERO: Motors with 2100 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
19	AHU	1	8	1500	600	9	9,049	3,619	54	NA
20	BLAST HEATER	1	29	1500	600	6	32,801	13,120	131	NA
21	Chilled Water Pump	1	1	1500	600	6	1,131	452	5	NA
23	Condenser Wtr Pum	1	2	1500	600	6	2,262	905	9	NA
24	Cooling Twr Fan	1	2	1500	600	6	2,262	905	9	NA
25	AHU	2	1	1500	600	9	2,163	865	13	NA
26	Chilled Water Pump	2	2	1500	600	6	4,326	1,730	17	NA
29	Condenser Wtr Pum	2	1	1500	600	6	2,163	865	9	NA
30	Cooling Twr Fan	2	1	1500	600	6	2,163	865	9	NA
31	AHU	3	2	1500	600	9	6,209	2,484	37	NA
32	BLAST HEATER	3	8	1500	600	6	24,836	9,934	99	NA
34	Cooling Twr Fan	3	2	1500	600	6	6,209	2,484	25	NA
35	AHU	5	60	1500	600	9	305,182	122,073	1,831	NA
36	Chilled Water Pump	5	1	1500	600	6	5,086	2,035	20	NA
38	Condenser Wtr Pum	5	1	1500	600	6	5,086	2,035	20	NA
39	Cooling Twr Fan	5	3	1500	600	6	15,259	6,104	61	NA
41	AHU	7.5	37	1500	600	9	277,252	110,901	1,664	NA
42	Condenser Wtr Pum	7.5	2	1500	600	6	14,987	5,995	60	NA
43	Cooling Twr Fan	7.5	3	1500	600	6	22,480	8,992	90	NA
44	AHU	10	8	1500	600	9	78,895	31,558	473	NA
45	BLAST HEATER	10	13	1500	600	6	128,205	51,282	513	NA
46	Chilled Water Pump	10	4	1500	600	6	39,448	15,779	158	NA
48	Condenser Wtr Pum	10	10	1500	600	6	98,619	39,448	394	NA
49	Cooling Twr Fan	10	12	1500	600	6	118,343	47,337	473	NA
50	AHU	15	6	1500	600	9	87,220	34,888	523	NA
51	Chilled Water Pump	15	9	1500	600	6	130,830	52,332	523	NA
52	Condenser Wtr Pum	15	1	1500	600	6	14,537	5,815	58	NA
53	Cooling Twr Fan	15	2	1500	600	6	29,073	11,629	116	NA
54	AHU	20	5	1500	600	9	95,587	38,235	574	NA
55	Chilled Water Pump	20	1	1500	600	6	19,117	7,647	76	NA
56	Condenser Wtr Pum	20	3	1500	600	6	57,352	22,941	229	NA
57	Cooling Twr Fan	20	1	1500	600	6	19,117	7,647	76	NA
58	AHU	25	6	1500	600	9	143,380	57,352	860	NA
59	Chilled Water Pump	25	1	1500	600	6	23,897	9,559	96	NA
60	AHU	30	4	1500	600	9	114,704	45,882	688	NA
61	Condenser Wtr Pum	30	1	1500	600	6	28,676	11,470	115	NA
62	Cooling Twr Fan	30	4	1500	600	6	114,704	45,882	459	NA
63	Chilled Water Pump	40	5	1500	600	6	189,876	75,950	760	NA
64	Condenser Wtr Pum	40	5	1500	600	6	189,876	75,950	760	NA
65	Cooling Twr Fan	40	1	1500	600	6	37,975	15,190	152	NA
66	Chilled Water Pump	50	1	1500	600	6	47,096	18,838	188	NA

TABLE 2.24. (contd)

VSD & existing motor operating parameters

ID	Existing Equipment		Operating Hours			# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
19	AHU	1	8	1500	800	9	3,861	1,544	23	NA
20	BLAST HEATER	1	29	1500	800	8	16,400	6,560	66	NA
21	Chilled Water Pump	1	1	1500	800	6	483	193	2	NA
23	Condenser Wtr Pum	1	2	1500	800	6	1,131	452	5	NA
24	Cooling Twr Fan	1	2	1500	800	6	1,131	452	5	NA
25	AHU	2	1	1500	800	9	923	369	6	NA
26	Chilled Water Pump	2	2	1500	800	6	1,846	738	7	NA
29	Condenser Wtr Pum	2	1	1500	800	6	1,082	433	4	NA
30	Cooling Twr Fan	2	1	1500	800	6	1,082	433	4	NA
31	AHU	3	2	1500	800	9	2,649	1,060	16	NA
32	BLAST HEATER	3	8	1500	800	6	12,418	4,967	50	NA
34	Cooling Twr Fan	3	2	1500	800	6	3,105	1,242	12	NA
35	AHU	5	60	1500	800	9	130,216	52,067	781	NA
36	Chilled Water Pump	5	1	1500	800	6	2,170	868	9	NA
38	Condenser Wtr Pum	5	1	1500	800	6	2,543	1,017	10	NA
39	Cooling Twr Fan	5	3	1500	800	6	7,630	3,052	31	NA
41	AHU	7.5	37	1500	800	9	118,301	47,320	710	NA
42	Condenser Wtr Pum	7.5	2	1500	800	6	7,493	2,997	30	NA
43	Cooling Twr Fan	7.5	3	1500	800	6	11,240	4,496	45	NA
44	AHU	10	8	1500	800	9	33,664	13,466	202	NA
45	BLAST HEATER	10	13	1500	800	6	64,103	25,641	256	NA
46	Chilled Water Pump	10	4	1500	800	6	16,632	6,733	67	NA
48	Condenser Wtr Pum	10	10	1500	800	6	49,310	19,724	197	NA
49	Cooling Twr Fan	10	12	1500	800	6	59,172	23,669	237	NA
50	AHU	15	6	1500	800	9	37,216	14,886	223	NA
51	Chilled Water Pump	15	9	1500	800	6	55,824	22,330	223	NA
52	Condenser Wtr Pum	15	1	1500	800	6	7,266	2,907	29	NA
53	Cooling Twr Fan	15	2	1500	800	6	14,537	5,815	58	NA
54	AHU	20	5	1500	800	9	40,766	16,314	245	NA
55	Chilled Water Pump	20	1	1500	800	6	8,157	3,263	33	NA
56	Condenser Wtr Pum	20	3	1500	800	6	28,676	11,470	115	NA
57	Cooling Twr Fan	20	1	1500	800	6	9,559	3,823	38	NA
58	AHU	25	6	1500	800	9	61,179	24,471	367	NA
59	Chilled Water Pump	25	1	1500	800	6	10,196	4,079	41	NA
60	AHU	30	4	1500	800	9	48,943	19,577	294	NA
61	Condenser Wtr Pum	30	1	1500	800	6	14,336	5,735	57	NA
62	Cooling Twr Fan	30	4	1500	800	6	57,352	22,941	229	NA
63	Chilled Water Pump	40	5	1500	800	6	81,018	32,407	324	NA
64	Condenser Wtr Pum	40	5	1500	800	6	94,938	37,975	380	NA
65	Cooling Twr Fan	40	1	1500	800	6	18,968	7,595	76	NA
66	Chilled Water Pump	50	1	1500	800	6	20,095	8,038	80	NA

TABLE 2.24. (contd)

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours			# Month On-Peak	Energy Consumption (kVh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	On-Peak		Off-Peak	On-Peak	Off-Peak	
Add VSD and Replace Motor											
19	AHU	1	8	1500	600	9	3,331	1,332	20	NA	
20	BLAST HEATER	1	29	1500	600	6	14,150	5,600	57	NA	
21	Chilled Water Pump	1	1	1500	600	6	416	167	2	NA	
23	Condenser Wtr Pum	1	2	1500	600	6	976	390	4	NA	
24	Cooling Twr Fan	1	2	1500	600	6	976	390	4	NA	
25	AHU	2	1	1500	600	9	830	332	5	NA	
26	Chilled Water Pump	2	2	1500	600	6	1,660	664	7	NA	
29	Condenser Wtr Pum	2	1	1500	600	6	972	389	4	NA	
30	Cooling Twr Fan	2	1	1500	600	6	972	389	4	NA	
31	AHU	3	2	1500	600	9	2,382	953	14	NA	
32	BLAST HEATER	3	8	1500	600	6	11,185	4,466	45	NA	
34	Cooling Twr Fan	3	2	1500	600	6	2,791	1,117	11	NA	
35	AHU	5	60	1500	600	9	119,367	47,747	718	NA	
36	Chilled Water Pump	5	1	1500	600	6	1,989	796	8	NA	
38	Condenser Wtr Pum	5	1	1500	600	6	2,331	933	9	NA	
39	Cooling Twr Fan	5	3	1500	600	6	6,994	2,796	28	NA	
41	AHU	7.5	37	1500	600	9	108,014	43,205	648	NA	
42	Condenser Wtr Pum	7.5	2	1500	600	6	6,842	2,737	27	NA	
43	Cooling Twr Fan	7.5	3	1500	600	6	10,263	4,105	41	NA	
44	AHU	10	8	1500	600	9	31,241	12,496	187	NA	
45	BLAST HEATER	10	13	1500	600	6	59,489	23,796	238	NA	
46	Chilled Water Pump	10	4	1500	600	6	15,620	6,248	62	NA	
48	Condenser Wtr Pum	10	10	1500	600	6	45,761	18,304	183	NA	
49	Cooling Twr Fan	10	12	1500	600	6	54,913	21,965	220	NA	
50	AHU	15	6	1500	600	9	34,855	13,862	208	NA	
51	Chilled Water Pump	15	9	1500	600	6	51,982	20,793	208	NA	
52	Condenser Wtr Pum	15	1	1500	600	6	6,768	2,707	27	NA	
53	Cooling Twr Fan	15	2	1500	600	6	13,536	5,415	54	NA	
54	AHU	20	5	1500	600	9	38,259	15,303	230	NA	
55	Chilled Water Pump	20	1	1500	600	6	7,652	3,061	31	NA	
56	Condenser Wtr Pum	20	3	1500	600	6	26,899	10,760	108	NA	
57	Cooling Twr Fan	20	1	1500	600	6	8,966	3,587	36	NA	
58	AHU	25	6	1500	600	9	57,083	22,833	342	NA	
59	Chilled Water Pump	25	1	1500	600	6	9,514	3,806	38	NA	
60	AHU	30	4	1500	600	9	45,666	18,267	274	NA	
61	Condenser Wtr Pum	30	1	1500	600	6	13,378	5,351	54	NA	
62	Cooling Twr Fan	30	4	1500	600	6	53,512	21,405	214	NA	
63	Chilled Water Pump	40	5	1500	600	6	75,389	30,156	302	NA	
64	Condenser Wtr Pum	40	5	1500	600	6	88,342	35,337	353	NA	
65	Cooling Twr Fan	40	1	1500	600	6	17,668	7,067	71	NA	
66	Chilled Water Pump	50	1	1500	600	6	18,847	7,539	75	NA	

TABLE 2.24. (contd)

VSD & existing motor ERO economics

ID	Economic Parameters					First Year Savings					Life Cycle Cost	
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SiR
Add VSD to Existing Motor:												
19	17,994	0	80	15	250	7,263	31	462	172	633	(22,022)	(0.16)
20	37,163	0	290	15	905	22,981	66	1,533	361	1,894	(27,797)	0.20
21	1,300	0	10	15	31	908	3	58	14	72	(1,870)	0.01
23	2,322	0	20	15	62	1,583	5	106	25	131	(937)	0.32
24	2,322	0	20	15	62	1,583	5	106	25	131	(937)	0.32
25	3,184	0	10	15	55	1,736	7	110	41	151	(7,193)	(0.15)
26	2,168	0	20	15	110	3,472	10	221	55	275	(2,272)	0.14
29	1,288	0	10	15	55	1,514	4	101	24	125	(274)	0.62
30	1,288	0	10	15	55	1,514	4	101	24	125	(274)	0.62
31	4,206	0	20	15	117	4,984	21	317	118	434	(10,247)	(0.15)
32	12,544	0	80	15	457	17,385	50	1,161	274	1,434	(2,200)	0.61
34	2,936	0	20	15	117	4,346	12	290	66	356	177	1.10
35	151,509	0	600	15	3,924	244,949	1,050	15,566	5,784	21,350	(633,368)	(0.14)
36	1,503	0	10	15	65	4,082	12	260	64	324	(3,483)	0.26
38	1,468	0	10	15	65	3,560	10	236	56	294	1,663	1.92
39	4,539	0	30	15	196	10,681	31	713	166	881	3,136	1.63
41	97,374	0	370	15	3,500	222,532	954	14,142	5,255	19,396	(550,600)	(0.13)
42	3,400	0	20	15	189	10,461	30	700	165	866	3,187	2.46
43	5,252	0	30	15	284	15,736	45	1,051	246	1,296	6,160	2.37
44	22,924	0	80	15	677	63,324	271	4,024	1,495	5,519	(154,078)	(0.16)
45	28,406	0	130	15	1,425	89,744	256	5,992	1,413	7,405	32,915	2.11
46	7,262	0	40	15	436	31,662	90	2,014	498	2,512	(18,188)	0.29
48	21,492	0	100	15	1,096	69,033	197	4,609	1,087	5,696	30,058	2.58
49	26,028	0	120	15	1,315	82,840	237	5,531	1,304	6,835	34,193	2.57
50	20,023	0	60	15	663	70,006	300	4,449	1,653	6,102	(182,503)	(0.16)
51	19,325	0	90	15	1,325	105,009	300	6,678	1,653	8,331	(51,537)	0.31
52	2,669	0	10	15	147	10,176	29	679	160	840	6,815	2.68
53	5,464	0	20	15	294	20,351	58	1,359	320	1,679	15,009	3.46
54	16,229	0	50	15	916	76,721	329	4,875	1,812	6,687	(171,434)	(0.09)
55	2,897	0	10	15	183	15,344	44	976	242	1,217	(11,554)	0.30
56	9,812	0	30	15	550	40,146	115	2,680	632	3,312	19,810	3.46
57	3,581	0	10	15	183	13,382	38	883	211	1,104	9,251	3.06
58	23,645	0	60	15	1,301	115,082	493	7,313	2,718	10,031	(299,087)	(0.16)
59	3,517	0	10	15	217	19,180	55	1,220	302	1,522	(14,402)	0.30
60	18,898	0	40	15	1,004	92,065	395	5,851	2,174	8,025	(282,789)	(0.24)
61	4,745	0	10	15	251	20,073	57	1,340	316	1,656	14,934	3.51
62	18,124	0	40	15	1,004	80,293	229	5,361	1,264	6,625	28,953	3.26
63	20,313	0	50	15	1,550	152,401	435	9,692	2,399	12,091	(62,921)	0.33
64	28,550	0	50	15	1,550	132,913	380	8,874	2,092	10,966	62,060	3.67
65	5,710	0	10	15	310	26,583	76	1,775	418	2,193	20,683	3.67
66	5,210	0	10	15	326	37,801	106	2,404	595	2,999	(26,684)	0.31
Totals:	172,378	0	640		8,977	630,349	1,801	42,085	9,923	52,008	288,993	

TABLE 2.24. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings					Life Cycle Cost	
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD and Replace Motor												
19	18,862	0	80	15	250	8,004	34	493	189	682	(22,107)	(0.18)
20	50,776	0	290	15	905	26,111	75	1,665	411	2,076	(28,429)	0.18
21	1,498	0	10	15	31	1,001	3	62	16	77	(1,983)	(0.01)
23	2,716	0	20	15	62	1,801	5	115	28	143	(1,062)	0.27
24	2,716	0	20	15	62	1,801	5	115	28	143	(1,062)	0.27
25	3,408	0	10	15	55	1,866	8	116	44	160	(7,297)	(0.15)
26	2,585	0	20	15	110	3,733	11	232	59	291	(2,384)	0.13
29	1,528	0	10	15	55	1,667	5	107	26	134	(402)	0.75
30	1,528	0	10	15	55	1,667	5	107	26	134	(402)	0.75
31	5,239	0	20	15	117	6,358	23	332	127	459	(10,365)	(0.16)
32	14,160	0	80	15	487	19,139	55	1,234	301	1,536	(2,422)	0.79
34	3,840	0	20	15	117	4,785	14	309	75	384	28	1.02
35	151,810	0	600	15	3,624	290,141	1,115	16,205	6,143	22,348	(634,138)	(0.14)
36	1,600	0	10	15	65	4,336	12	270	68	338	(3,618)	0.25
38	1,824	0	10	15	65	3,857	11	250	61	311	1,504	1.78
39	8,807	0	30	15	196	11,571	33	751	182	933	2,819	1.71
41	98,799	0	370	15	3,500	236,934	1,015	14,747	5,595	20,342	(549,753)	(0.13)
42	4,464	0	20	15	189	11,403	33	739	180	918	2,983	2.28
43	7,048	0	30	15	284	17,104	49	1,108	269	1,377	5,753	2.19
44	24,079	0	80	15	877	66,716	286	4,167	1,575	5,742	(155,043)	(0.16)
45	43,711	0	130	15	1,425	96,203	275	6,263	1,515	7,777	32,299	2.08
46	7,529	0	40	15	438	33,358	95	2,085	525	2,610	(18,629)	0.28
48	29,902	0	100	15	1,096	74,002	211	4,818	1,165	5,983	26,270	2.40
49	36,300	0	120	15	1,315	88,803	254	5,781	1,398	7,179	32,150	2.39
50	20,577	0	60	15	883	73,591	315	4,599	1,736	6,337	(183,512)	(0.16)
51	19,939	0	90	15	1,325	110,387	315	6,904	1,736	8,642	(53,220)	0.30
52	3,755	0	10	15	147	10,876	31	709	171	880	6,477	2.68
53	7,336	0	20	15	294	21,752	62	1,418	342	1,760	14,864	3.34
54	17,745	0	50	15	916	60,259	344	5,024	1,895	6,919	(172,121)	(0.08)
55	3,489	0	10	15	183	16,052	46	1,006	253	1,258	(11,821)	0.29
56	13,327	0	30	15	550	42,634	122	2,785	671	3,456	18,946	3.19
57	4,686	0	10	15	183	14,211	41	928	224	1,152	8,819	2.84
58	24,482	0	60	15	1,301	120,816	518	7,554	2,853	10,407	(300,297)	(0.16)
59	4,227	0	10	15	217	20,136	58	1,260	317	1,577	(14,749)	0.29
60	19,083	0	40	15	1,004	96,653	414	6,043	2,282	8,326	(284,295)	(0.24)
61	6,234	0	10	15	251	21,417	61	1,397	337	1,734	14,445	3.28
62	24,480	0	40	15	1,004	85,666	245	5,586	1,349	6,935	27,118	2.95
63	21,793	0	50	15	1,550	160,281	458	10,023	2,523	12,546	(64,091)	0.32
64	37,900	0	50	15	1,550	142,147	406	9,281	2,238	11,499	60,414	3.62
65	7,580	0	10	15	310	28,429	81	1,852	448	2,300	20,136	3.62
66	6,532	0	10	15	326	39,548	113	2,477	623	3,100	(27,223)	0.31
Totals:	237,894	0	640		8,977	674,863	1,928	43,964	10,624	54,578	277,026	

TABLE 2.25. VSD ERO: Motors with 3200 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours			Energy Consumption		Sum of Monthly Peak	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	# Month On-Peak	(kWh)		Demands (kW-mo)	
							On-Peak	Off-Peak	On-Peak	Off-Peak
8	BLAST HEATER	1	11	2288	914	6	18,981	7,581	50	NA
11	AHU	2	3	2288	914	9	9,889	3,954	39	NA
14	Condenser Wtr Pump	2	1	2288	914	6	3,296	1,318	9	NA
15	Cooling Twr Fan	2	1	2288	914	6	3,296	1,318	9	NA
17	AHU	3	3	2288	914	9	14,194	5,675	56	NA
18	BLAST HEATER	3	61	2288	914	6	288,607	115,392	757	NA
19	Chilled Water Pump	3	2	2288	914	6	9,463	3,783	25	NA
21	Condenser Wtr Pump	3	2	2288	914	6	9,463	3,783	25	NA
22	Cooling Twr Fan	3	2	2288	914	6	9,463	3,783	25	NA
24	AHU	5	8	2288	914	9	62,013	24,794	244	NA
25	BLAST HEATER	5	21	2288	914	6	182,784	65,085	427	NA
26	Chilled Water Pump	5	3	2288	914	6	23,265	9,298	61	NA
28	Condenser Wtr Pump	5	2	2288	914	6	15,503	6,199	41	NA
29	Cooling Twr Fan	5	2	2288	914	6	15,503	6,199	41	NA
30	AHU	7.5	4	2288	914	9	45,679	18,264	180	NA
31	Condenser Wtr Pump	7.5	1	2288	914	6	11,420	4,566	30	NA
32	Cooling Twr Fan	7.5	1	2288	914	6	11,420	4,566	30	NA
33	AHU	10	16	2288	914	9	240,473	96,147	947	NA
34	Chilled Water Pump	10	3	2288	914	6	45,089	18,028	118	NA
35	Condenser Wtr Pump	10	2	2288	914	6	30,059	12,018	79	NA
36	Cooling Twr Fan	10	2	2288	914	6	30,059	12,018	79	NA
37	Chilled Water Pump	15	1	2288	914	6	22,154	8,858	58	NA
38	Condenser Wtr Pump	15	1	2288	914	6	22,154	8,858	58	NA
39	Cooling Twr Fan	15	1	2288	914	6	22,154	8,858	58	NA
40	AHU	20	1	2288	914	9	29,135	11,649	115	NA
41	Condenser Wtr Pump	20	1	2288	914	6	29,135	11,649	76	NA
42	Cooling Twr Fan	20	1	2288	914	6	29,135	11,649	76	NA
43	Chilled Water Pump	25	1	2288	914	6	36,418	14,561	96	NA

TABLE 2.25. (contd)

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor										
8 BLAST HEATER		1	11	2286	914	6	9,481	3,791	25	NA
11 AHU		2	3	2286	914	9	4,220	1,687	17	NA
14 Condenser Wtr Pump		2	1	2286	914	6	1,648	659	4	NA
15 Cooling Twr Fan		2	1	2286	914	6	1,648	659	4	NA
17 AHU		3	3	2286	914	9	6,066	2,421	24	NA
18 BLAST HEATER		3	61	2286	914	6	144,303	57,696	379	NA
19 Chilled Water Pump		3	2	2286	914	6	4,036	1,614	11	NA
21 Condenser Wtr Pump		3	2	2286	914	6	4,731	1,892	12	NA
22 Cooling Twr Fan		3	2	2286	914	6	4,731	1,892	12	NA
24 AHU		5	6	2286	914	9	26,480	10,579	104	NA
25 BLAST HEATER		5	21	2286	914	6	81,392	32,543	214	NA
26 Chilled Water Pump		5	3	2286	914	6	9,923	3,987	26	NA
28 Condenser Wtr Pump		5	2	2286	914	6	7,752	3,099	20	NA
29 Cooling Twr Fan		5	2	2286	914	6	7,752	3,099	20	NA
30 AHU		7.5	4	2286	914	9	19,491	7,793	77	NA
31 Condenser Wtr Pump		7.5	1	2286	914	6	8,710	2,283	15	NA
32 Cooling Twr Fan		7.5	1	2286	914	6	8,710	2,283	15	NA
33 AHU		10	16	2286	914	9	102,608	41,026	404	NA
34 Chilled Water Pump		10	3	2286	914	6	19,239	7,692	50	NA
35 Condenser Wtr Pump		10	2	2286	914	6	15,030	6,009	39	NA
36 Cooling Twr Fan		10	2	2286	914	6	15,030	6,009	39	NA
37 Chilled Water Pump		15	1	2286	914	6	9,453	3,779	25	NA
38 Condenser Wtr Pump		15	1	2286	914	6	11,077	4,429	29	NA
39 Cooling Twr Fan		15	1	2286	914	6	11,077	4,429	29	NA
40 AHU		20	1	2286	914	9	12,432	4,970	49	NA
41 Condenser Wtr Pump		20	1	2286	914	6	14,567	5,824	38	NA
42 Cooling Twr Fan		20	1	2286	914	6	14,567	5,824	38	NA
43 Chilled Water Pump		25	1	2286	914	6	15,539	6,213	41	NA
Add VSD and Replace Motor										
8 BLAST HEATER		1	11	2286	914	6	8,180	3,270	21	NA
11 AHU		2	3	2286	914	9	3,794	1,517	15	NA
14 Condenser Wtr Pump		2	1	2286	914	6	1,482	593	4	NA
15 Cooling Twr Fan		2	1	2286	914	6	1,482	593	4	NA
17 AHU		3	3	2286	914	9	5,445	2,177	21	NA
18 BLAST HEATER		3	61	2286	914	6	129,745	51,875	341	NA
19 Chilled Water Pump		3	2	2286	914	6	3,630	1,451	10	NA
21 Condenser Wtr Pump		3	2	2286	914	6	4,254	1,701	11	NA
22 Cooling Twr Fan		3	2	2286	914	6	4,254	1,701	11	NA
24 AHU		5	6	2286	914	9	24,255	9,696	95	NA
25 BLAST HEATER		5	21	2286	914	6	74,609	29,631	196	NA
26 Chilled Water Pump		5	3	2286	914	6	9,096	3,637	24	NA
28 Condenser Wtr Pump		5	2	2286	914	6	7,106	2,841	19	NA
29 Cooling Twr Fan		5	2	2286	914	6	7,106	2,841	19	NA
30 AHU		7.5	4	2286	914	9	17,796	7,115	70	NA
31 Condenser Wtr Pump		7.5	1	2286	914	6	5,213	2,084	14	NA
32 Cooling Twr Fan		7.5	1	2286	914	6	5,213	2,084	14	NA
33 AHU		10	16	2286	914	9	95,222	38,072	375	NA
34 Chilled Water Pump		10	3	2286	914	6	17,854	7,139	47	NA
35 Condenser Wtr Pump		10	2	2286	914	6	13,948	5,577	37	NA
36 Cooling Twr Fan		10	2	2286	914	6	13,948	5,577	37	NA
37 Chilled Water Pump		15	1	2286	914	6	8,602	3,519	23	NA
38 Condenser Wtr Pump		15	1	2286	914	6	10,315	4,124	27	NA
39 Cooling Twr Fan		15	1	2286	914	6	10,315	4,124	27	NA
40 AHU		20	1	2286	914	9	11,661	4,662	46	NA
41 Condenser Wtr Pump		20	1	2286	914	6	13,665	5,463	36	NA
42 Cooling Twr Fan		20	1	2286	914	6	13,665	5,463	36	NA
43 Chilled Water Pump		25	1	2286	914	6	14,499	5,797	38	NA

TABLE 2.25. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings					Life Cycle Cost	
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
8	14,168	0	110	15	343	13,271	25	887	137	1,024	(8,162)	0.42
11	7,152	0	30	15	165	7,937	22	505	123	628	(13,272)	(0.05)
14	1,288	0	10	15	55	2,307	4	154	24	178	407	1.26
15	1,288	0	10	15	55	2,307	4	154	24	178	407	1.26
17	7,509	0	30	15	175	11,391	32	724	177	901	(19,056)	(0.07)
18	95,618	0	610	15	3,562	202,000	379	13,495	2,067	15,562	24,471	1.27
19	2,406	0	20	15	117	7,594	14	483	78	562	(2,139)	0.36
21	2,936	0	20	15	117	6,623	12	442	68	511	1,158	1.65
22	2,936	0	20	15	117	6,623	12	442	68	511	1,158	1.65
24	19,401	0	80	15	523	49,767	140	3,165	771	3,936	(73,267)	(0.06)
25	33,603	0	210	15	1,373	113,935	214	7,611	1,177	8,789	36,881	2.12
26	3,998	0	30	15	196	18,663	35	1,187	193	1,380	(4,842)	0.49
28	2,936	0	20	15	131	10,651	20	725	112	837	3,265	2.79
29	2,936	0	20	15	131	10,651	20	725	112	837	3,265	2.79
30	11,424	0	40	15	378	36,659	103	2,331	588	2,899	(84,063)	(0.08)
31	1,700	0	10	15	95	7,993	15	534	83	617	5,538	3.54
32	1,700	0	10	15	95	7,993	15	534	83	617	5,538	3.54
33	47,726	0	180	15	1,754	192,968	543	12,273	2,991	15,264	(313,294)	(0.07)
34	5,231	0	30	15	329	36,185	66	2,302	374	2,676	(7,505)	0.56
35	4,140	0	20	15	219	21,039	39	1,406	217	1,623	15,734	4.42
36	4,538	0	20	15	219	21,039	39	1,406	217	1,623	7,203	3.55
37	2,428	0	10	15	147	17,779	33	1,131	184	1,315	(5,523)	0.56
38	2,669	0	10	15	147	15,506	29	1,036	160	1,196	11,330	4.13
39	2,669	0	10	15	147	15,506	29	1,036	160	1,196	11,330	4.13
40	4,063	0	10	15	183	23,382	66	1,487	362	1,849	(55,398)	(0.06)
41	3,561	0	10	15	183	20,392	38	1,362	211	1,573	15,165	4.37
42	3,561	0	10	15	183	20,392	38	1,362	211	1,573	15,165	4.37
43	3,517	0	10	15	217	29,227	55	1,860	302	2,162	(9,055)	0.56
Totals:	166,517	0	1,020		6,629	465,355	910	32,424	5,014	37,439	157,993	
Add VSD and Replace Motor:												
8	17,235	0	110	15	343	15,092	28	963	156	1,119	(8,378)	0.41
11	7,329	0	30	15	165	8,532	24	530	132	662	(13,295)	(0.05)
14	1,528	0	10	15	55	2,540	5	184	26	190	300	1.18
15	1,528	0	10	15	55	2,540	5	184	26	190	300	1.18
17	7,726	0	30	15	175	12,246	34	760	190	950	(19,219)	(0.07)
18	142,740	0	610	15	3,562	222,379	417	14,349	2,297	16,647	22,983	1.25
19	2,863	0	20	15	117	8,184	15	507	84	591	(2,231)	0.36
21	3,540	0	20	15	117	7,291	14	470	75	546	1,038	1.55
22	3,540	0	20	15	117	7,291	14	470	75	546	1,038	1.55
24	20,374	0	80	15	523	52,654	149	3,295	819	4,114	(73,323)	(0.06)
25	54,979	0	210	15	1,373	123,429	231	8,010	1,275	9,285	36,334	2.09
26	4,287	0	30	15	196	19,820	37	1,236	205	1,441	(5,015)	0.49
28	3,648	0	20	15	131	11,755	22	763	121	684	3,132	2.63
29	3,648	0	20	15	131	11,755	22	763	121	684	3,132	2.63
30	11,841	0	40	15	378	39,032	110	2,431	605	3,036	(64,272)	(0.06)
31	2,232	0	10	15	95	8,688	16	563	90	653	5,390	3.31
32	2,232	0	10	15	95	8,688	16	563	90	653	5,390	3.31
33	48,206	0	180	15	1,754	203,326	572	12,707	3,151	15,858	(313,494)	(0.07)
34	5,702	0	30	15	329	38,124	71	2,384	394	2,777	(7,785)	0.55
35	5,502	0	20	15	219	22,553	42	1,489	233	1,702	15,731	4.30
36	5,798	0	20	15	219	22,553	42	1,489	233	1,702	7,004	3.34
37	2,874	0	10	15	147	18,690	35	1,169	193	1,362	(5,702)	0.55
38	3,755	0	10	15	147	16,573	31	1,081	171	1,252	11,070	3.87
39	3,755	0	10	15	147	16,573	31	1,081	171	1,252	13,988	4.63
40	4,878	0	10	15	183	24,460	69	1,532	379	1,911	(55,617)	(0.07)
41	4,686	0	10	15	183	21,655	41	1,415	224	1,639	14,822	4.10
42	4,686	0	10	15	183	21,655	41	1,415	224	1,639	16,445	4.65
43	4,227	0	10	15	217	30,683	58	1,921	317	2,238	(9,240)	0.56
Totals:	247,797	0	1,020		6,829	527,918	990	34,209	5,454	39,663	160,097	

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TABLE 2.26. VSD ERO: Motors with 4000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
6 AHU		1	6	3640	360	9	12,926	5,171	41	NA
7 BLAST HEATER		1	24	3640	360	6	51,703	20,665	109	NA
9 AHU		2	6	3640	360	9	24,719	9,689	78	NA
10 AHU		5	6	3640	360	9	77,503	31,006	244	NA
11 AHU		7.5	6	3640	360	9	85,633	34,259	270	NA
14 Cooling Twr Fan		15	2	3640	360	6	65,375	22,154	116	NA
15 AHU		20	3	3640	360	9	109,236	43,702	344	NA
16 AHU		30	3	3640	360	9	163,85	65,553	516	NA
17 Condenser Wtr Pum		30	1	3640	360	6	54,618	21,851	115	NA
18 Chilled Water Pump		40	1	3640	360	6	72,330	28,937	152	NA
26 POWER VENT.		1	50	3640	360	12	137,236	13,573	452	NA
27 POWER VENT.		2	9	3640	360	12	47,240	4,672	156	NA
28 POWER VENT.		3	35	3640	360	12	263,676	26,076	869	NA

VSD & energy-efficient motor operating parameters

Total Energy, Demand, Motor Operating Parameters										
ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
6 AHU		1	6	3640	360	9	5,515	2,207	17	NA
7 BLAST HEATER		1	24	3640	360	6	25,852	10,342	54	NA
9 AHU		2	6	3640	360	9	10,547	4,220	33	NA
10 AHU		5	6	3640	360	9	33,070	13,230	104	NA
11 AHU		7.5	6	3640	360	9	36,539	14,618	115	NA
14 Cooling Twr Fan		15	2	3640	360	6	27,687	11,077	58	NA
15 AHU		20	3	3640	360	9	46,610	18,647	147	NA
16 AHU		30	3	3640	360	9	69,915	27,971	220	NA
17 Condenser Wtr Pum		30	1	3640	360	6	27,309	10,926	57	NA
18 Chilled Water Pump		40	1	3640	360	6	30,652	12,347	65	NA
26 POWER VENT.		1	50	3640	360	12	17,154	1,697	57	NA
27 POWER VENT.		2	9	3640	360	12	5,905	584	19	NA
28 POWER VENT.		3	35	3640	360	12	32,959	3,260	109	NA
Add VSD and Replace Motor:										
6 AHU		1	6	3640	360	9	4,759	1,904	15	NA
7 BLAST HEATER		1	24	3640	360	6	22,305	8,923	47	NA
9 AHU		2	6	3640	360	9	9,484	3,794	30	NA
10 AHU		5	6	3640	360	9	30,314	12,128	96	NA
11 AHU		7.5	6	3640	360	9	33,362	13,347	105	NA
14 Cooling Twr Fan		15	2	3640	360	6	25,782	10,315	54	NA
15 AHU		20	3	3640	360	9	43,722	17,492	138	NA
16 AHU		30	3	3640	360	9	65,234	26,098	205	NA
17 Condenser Wtr Pum		30	1	3640	360	6	25,461	10,194	54	NA
18 Chilled Water Pump		40	1	3640	360	6	26,718	11,489	60	NA
26 POWER VENT.		1	50	3640	360	12	14,801	1,464	49	NA
27 POWER VENT.		2	9	3640	360	12	5,310	525	18	NA
28 POWER VENT.		3	35	3640	360	12	29,634	2,931	98	NA

TABLE 2.26. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings				Life Cycle Cost		
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
6	13,996	0	60	15	167	10,375	23	660	129	789	(15,837)	(0.05)
7	30,561	0	240	15	749	36,194	54	2,419	299	2,718	(12,935)	0.55
9	14,417	0	60	15	330	19,841	45	1,262	246	1,506	(25,561)	(0.02)
10	19,936	0	80	15	523	62,209	140	3,957	771	4,729	(70,004)	(0.01)
11	16,137	0	60	15	568	66,736	155	4,373	852	5,225	(60,653)	(0.00)
14	5,464	0	20	15	294	36,764	58	2,590	320	2,911	30,604	6.01
15	11,692	0	30	15	550	87,661	197	5,578	1,067	6,665	(107,232)	(0.02)
16	13,997	0	30	15	753	131,522	296	8,367	1,631	9,997	(158,536)	(0.01)
17	4,745	0	10	15	251	36,235	57	2,555	316	2,871	30,301	6.09
18	4,303	0	10	15	310	56,057	87	3,695	480	4,175	(6,255)	0.60
26	16,065	0	500	15	1,560	131,958	396	7,628	2,181	9,809	31,105	2.25
27	3,073	0	90	15	495	45,423	136	2,626	751	3,377	15,414	4.12
28	13,765	0	350	15	2,044	253,534	761	14,656	4,191	18,847	90,562	5.24
Totals:	43,132	0	970		4,644	507,914	1,408	30,055	7,759	37,814	197,965	
Add VSD and Replace Motor:												
6	14,096	0	60	15	187	11,435	26	704	142	846	(16,136)	(0.05)
7	37,489	0	240	15	749	41,160	62	2,627	340	2,967	(13,391)	0.54
9	14,545	0	60	15	330	21,330	48	1,325	264	1,589	(26,797)	(0.01)
10	20,909	0	80	15	523	66,068	149	4,119	819	4,938	(70,204)	(0.01)
11	16,456	0	60	15	568	73,184	165	4,559	907	5,467	(60,720)	0.00
14	7,336	0	20	15	294	41,432	62	2,702	342	3,045	30,730	5.84
15	12,440	0	30	15	550	91,725	206	5,747	1,137	6,885	(107,310)	(0.02)
16	14,996	0	30	15	753	136,075	311	8,642	1,712	10,353	(158,516)	(0.01)
17	6,234	0	10	15	251	40,794	61	2,662	337	2,999	30,072	5.75
18	5,399	0	10	15	310	61,059	92	3,821	505	4,325	(6,173)	0.60
26	19,946	0	500	15	1,560	134,544	404	7,766	2,224	9,990	30,649	2.21
27	3,753	0	90	15	495	46,077	136	2,661	762	3,422	15,345	4.06
28	17,383	0	350	15	2,044	257,166	772	14,851	4,251	19,102	90,281	5.16
Totals:	54,652	0	970		4,644	520,036	1,437	30,642	7,917	38,559	197,077	

TABLE 2.27. VSD ERO: Motors with 5000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
14	AHU	1	34	3571	1429	9	91,551	36,636	231	NA
17	AHU	2	5	3571	1429	9	25,747	10,303	65	NA
18	Condenser Wtr Pum	2	1	3571	1429	6	5,149	2,061	9	NA
19	Cooling Twr Fan	2	1	3571	1429	6	5,149	2,061	9	NA
20	Chilled Water Pump	3	1	3571	1429	6	7,391	2,958	12	NA
21	AHU	5	2	3571	1429	9	24,218	9,691	61	NA
23	AHU	10	4	3571	1429	9	93,912	37,581	237	NA
24	Chilled Water Pump	15	1	3571	1429	6	34,607	13,849	58	NA
25	Condenser Wtr Pum	15	1	3571	1429	6	34,607	13,849	58	NA
26	Cooling Twr Fan	15	1	3571	1429	6	34,607	13,849	58	NA

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours			Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF	# Month On-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
14	AHU	1	34	3571	1429	9	39,064	15,632	98	NA
17	AHU	2	5	3571	1429	9	10,986	4,396	28	NA
18	Condenser Wtr Pum	2	1	3571	1429	6	2,575	1,030	4	NA
19	Cooling Twr Fan	2	1	3571	1429	6	2,575	1,030	4	NA
20	Chilled Water Pump	3	1	3571	1429	6	3,154	1,262	5	NA
21	AHU	5	2	3571	1429	9	10,334	4,135	26	NA
23	AHU	10	4	3571	1429	9	40,071	16,035	101	NA
24	Chilled Water Pump	15	1	3571	1429	6	14,766	5,909	25	NA
25	Condenser Wtr Pum	15	1	3571	1429	6	17,303	6,924	29	NA
26	Cooling Twr Fan	15	1	3571	1429	6	17,303	6,924	29	NA
Add VSD and Replace Motor:										
14	AHU	1	34	3571	1429	9	33,704	13,487	85	NA
17	AHU	2	5	3571	1429	9	9,879	3,953	25	NA
18	Condenser Wtr Pum	2	1	3571	1429	6	2,315	926	4	NA
19	Cooling Twr Fan	2	1	3571	1429	6	2,315	926	4	NA
20	Chilled Water Pump	3	1	3571	1429	6	2,835	1,135	5	NA
21	AHU	5	2	3571	1429	9	9,472	3,791	24	NA
23	AHU	10	4	3571	1429	9	37,187	14,881	94	NA
24	Chilled Water Pump	15	1	3571	1429	6	13,750	5,502	23	NA
25	Condenser Wtr Pum	15	1	3571	1429	6	16,113	6,448	27	NA
26	Cooling Twr Fan	15	1	3571	1429	6	16,113	6,448	27	NA

TABLE 2.27. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings				Life Cycle Cost		
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
14	76,609	0	340	15	1,061	73,491	132	4,676	729	5,405	(79,384)	0.02
17	11,120	0	50	15	275	20,668	37	1,315	205	1,520	(17,653)	0.06
18	1,288	0	10	15	55	3,805	4	241	24	265	1,519	1.98
19	1,288	0	10	15	55	3,805	4	241	24	265	1,519	1.88
20	1,503	0	10	15	58	5,933	7	378	39	417	(963)	0.72
21	4,208	0	20	15	131	19,440	35	1,237	193	1,430	(12,741)	0.07
23	12,924	0	40	15	438	75,386	136	4,797	748	5,545	(75,196)	0.06
24	2,428	0	10	15	147	27,780	33	1,768	184	1,952	(192)	0.98
25	2,869	0	10	15	147	24,228	29	1,619	160	1,780	18,716	6.17
26	2,869	0	10	15	147	24,228	29	1,619	160	1,780	18,716	6.17
Totals:	8,314	0	40		404	55,666	67	3,721	368	4,089	40,470	
Add VSD and Replace Motor:												
14	77,861	0	340	15	1,061	80,996	146	4,991	803	5,794	(80,654)	0.02
17	12,065	0	50	15	275	22,219	40	1,380	220	1,600	(17,736)	0.07
18	1,528	0	10	15	55	3,968	5	256	26	282	1,449	1.89
19	1,528	0	10	15	55	3,968	5	256	26	282	1,449	1.89
20	1,564	0	10	15	58	6,378	8	396	42	438	(995)	0.72
21	5,275	0	20	15	131	20,646	37	1,288	205	1,492	(12,738)	0.08
23	13,406	0	40	15	438	79,424	143	4,966	788	5,754	(75,189)	0.07
24	2,874	0	10	15	147	29,203	35	1,828	193	2,021	(203)	0.98
25	3,755	0	10	15	147	25,895	31	1,689	171	1,860	18,585	5.82
26	3,755	0	10	15	147	25,895	31	1,689	171	1,860	18,585	5.82
Totals:	10,566	0	40		404	59,727	72	3,891	395	4,286	40,068	

TABLE 2.28. VSD ERO: Motors with 6000 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
8	AHU	1	1	2520	3480	9	1,900	2,624	7	NA
9	Chilled Water Pump	1	1	2520	3480	6	1,900	2,624	5	NA
11	Condenser Wtr Pump	1	1	2520	3480	6	1,900	2,624	5	NA
12	Cooling Twr Fan	1	1	2520	3480	6	1,900	2,624	5	NA
14	AHU	3	1	2520	3480	9	5,216	7,202	19	NA
15	AHU	5	2	2520	3480	9	17,090	23,601	61	NA
16	Chilled Water Pump	5	1	2520	3480	6	8,545	11,800	20	NA
18	Condenser Wtr Pump	5	1	2520	3480	6	8,545	11,800	20	NA
19	Cooling Twr Fan	5	1	2520	3480	6	8,545	11,800	20	NA
20	AHU	25	3	2520	3480	9	120,439	166,321	430	NA
21	Condenser Wtr Pump	25	1	2520	3480	6	40,146	55,440	96	NA
22	Cooling Twr Fan	25	1	2520	3480	6	40,146	55,440	96	NA
23	Chilled Water Pump	30	1	2520	3480	6	48,176	66,528	115	NA

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
Add VSD to Existing Motor:										
8	AHU	1	1	2520	3480	9	811	1,120	3	NA
9	Chilled Water Pump	1	1	2520	3480	6	811	1,120	2	NA
11	Condenser Wtr Pump	1	1	2520	3480	6	950	1,312	2	NA
12	Cooling Twr Fan	1	1	2520	3480	6	950	1,312	2	NA
14	AHU	3	1	2520	3480	9	2,225	3,073	8	NA
15	AHU	5	2	2520	3480	9	7,292	10,070	26	NA
16	Chilled Water Pump	5	1	2520	3480	6	3,646	5,035	9	NA
18	Condenser Wtr Pump	5	1	2520	3480	6	4,273	5,900	10	NA
19	Cooling Twr Fan	5	1	2520	3480	6	4,273	5,900	10	NA
20	AHU	25	3	2520	3480	9	51,390	70,967	184	NA
21	Condenser Wtr Pump	25	1	2520	3480	6	20,073	27,720	48	NA
22	Cooling Twr Fan	25	1	2520	3480	6	20,073	27,720	48	NA
23	Chilled Water Pump	30	1	2520	3480	6	20,556	28,387	49	NA
Add VSD and Replace Motor:										
8	AHU	1	1	2520	3480	9	700	966	2	NA
9	Chilled Water Pump	1	1	2520	3480	6	700	966	2	NA
11	Condenser Wtr Pump	1	1	2520	3480	6	820	1,132	2	NA
12	Cooling Twr Fan	1	1	2520	3480	6	820	1,132	2	NA
14	AHU	3	1	2520	3480	9	2,001	2,763	7	NA
15	AHU	5	2	2520	3480	9	6,685	9,231	24	NA
16	Chilled Water Pump	5	1	2520	3480	6	3,342	4,616	8	NA
18	Condenser Wtr Pump	5	1	2520	3480	6	3,917	5,409	9	NA
19	Cooling Twr Fan	5	1	2520	3480	6	3,917	5,409	9	NA
20	AHU	25	3	2520	3480	9	47,950	66,216	171	NA
21	Condenser Wtr Pump	25	1	2520	3480	6	18,729	25,864	45	NA
22	Cooling Twr Fan	25	1	2520	3480	6	18,729	25,864	45	NA
23	Chilled Water Pump	30	1	2520	3480	6	19,180	26,486	46	NA

TABLE 2.28. (contd)

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings				Life Cycle Cost		
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR
Add VSD to Existing Motor:												
8	3,100	0	10	15	31	2,594	4	179	21	200	(3,446)	0.08
9	1,300	0	10	15	31	2,594	3	179	14	193	(1,026)	0.46
11	1,161	0	10	15	31	2,262	2	171	12	183	196	1.14
12	1,161	0	10	15	31	2,262	2	171	12	183	196	1.14
14	3,303	0	10	15	56	7,119	11	490	59	549	(7,930)	0.11
15	4,206	0	20	15	131	23,329	35	1,607	193	1,800	(12,212)	0.11
16	1,503	0	10	15	65	11,664	12	804	64	868	114	1.02
18	1,468	0	10	15	65	10,173	10	767	56	823	6,613	4.64
19	1,468	0	10	15	65	10,173	10	767	56	823	6,613	4.64
20	12,687	0	30	15	650	184,402	247	11,326	1,359	12,684	(117,213)	0.10
21	4,520	0	10	15	217	47,793	48	3,603	263	3,867	34,678	7.22
22	4,520	0	10	15	217	47,793	48	3,603	263	3,867	34,678	7.22
23	3,666	0	10	15	251	65,761	66	4,531	362	4,894	3,626	1.15
Totals:	19,467	0	80		943	197,861	198	14,417	1,090	15,507	66,712	
Add VSD and Replace Motor:												
8	3,296	0	10	15	31	2,859	4	185	24	209	(3,453)	0.08
9	1,496	0	10	15	31	2,859	3	185	16	201	(1,080)	0.46
11	1,358	0	10	15	31	2,573	3	178	14	192	118	1.08
12	1,358	0	10	15	31	2,573	3	178	14	192	118	1.08
14	3,568	0	10	15	56	7,654	11	504	63	567	(7,930)	0.12
15	5,275	0	20	15	131	24,775	37	1,643	205	1,848	(12,189)	0.12
16	1,600	0	10	15	65	12,368	12	822	66	890	125	1.03
18	1,824	0	10	15	65	11,020	11	788	61	849	6,564	4.41
19	1,824	0	10	15	65	11,020	11	788	61	849	6,564	4.41
20	13,552	0	30	15	650	172,594	259	11,528	1,426	12,954	(116,606)	0.10
21	5,804	0	10	15	217	50,993	51	3,682	261	3,963	34,627	6.66
22	5,804	0	10	15	217	50,993	51	3,682	261	3,963	34,627	6.66
23	4,510	0	10	15	251	69,038	69	4,612	360	4,993	3,854	1.16
Totals:	24,082	0	80		943	210,597	211	14,730	1,160	15,891	66,595	

TABLE 2.29. VSD ERO: Motors with 8760 Annual Operating Hours

Existing motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
9 AHU		1	2	3640	5120	9	5,489	7,721	14	NA
12 AHU		5	5	3640	5120	9	61,715	66,807	153	NA
13 Chilled Water Pump		10	1	3640	5120	6	23,932	33,662	39	NA
14 Condenser Wtr Pum		10	1	3640	5120	6	23,932	33,662	39	NA
15 Cooling Twr Fan		10	1	3640	5120	6	23,932	33,662	39	NA

VSD & energy-efficient motor operating parameters

ID	Existing Equipment			Operating Hours		# Month On-Peak	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
	Type of Motor	Rating HP	# of Mtrs	Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak

Add VSD to Existing Motor:

9 AHU	1	2	3640	5120	9	2,342	3,295	6	NA
12 AHU	5	5	3640	5120	9	26,333	37,040	65	NA
13 Chilled Water Pump	10	1	3640	5120	6	10,211	14,363	17	NA
14 Condenser Wtr Pum	10	1	3640	5120	6	11,968	16,831	20	NA
15 Cooling Twr Fan	10	1	3640	5120	6	11,968	16,831	20	NA

Add VSD and Replace Motor:

9 AHU	1	2	3640	5120	9	2,021	2,843	5	NA
12 AHU	5	5	3640	5120	9	24,139	33,953	60	NA
13 Chilled Water Pump	10	1	3640	5120	6	9,476	13,329	16	NA
14 Condenser Wtr Pum	10	1	3640	5120	6	11,105	15,620	18	NA
15 Cooling Twr Fan	10	1	3640	5120	6	11,105	15,620	18	NA

VSD & energy-efficient motor ERO economics

ID	Economic Parameters					First Year Savings				Life Cycle Cost		
	First Cost \$ RI	Before O&M \$	After O&M \$	Life Yr	Salvage \$ RI	Energy kWh	Demand kW-mos	Energy \$	Demand \$	Total \$	NPV \$	SIR

Add VSD to Existing Motor:

9	3,801	0	20	15	62	7,574	8	522	43	565	(2,556)	0.23
12	11,714	0	50	15	327	85,149	87	5,874	482	6,356	(28,660)	0.30
13	2,031	0	10	15	110	33,019	23	2,278	125	2,403	5,743	1.66
14	2,268	0	10	15	110	28,797	20	2,175	109	2,284	20,724	8.34
15	2,268	0	10	15	110	28,797	20	2,175	109	2,284	20,724	8.34
Totals:	6,567	0	30		329	90,613	62	6,629	342	6,971	47,190	

Add VSD and Replace Motor:

9	4,765	0	20	15	62	8,347	9	541	47	589	(2,661)	0.24
12	12,735	0	50	15	327	90,430	93	6,003	512	6,515	(28,270)	0.32
13	2,309	0	10	15	110	34,788	24	2,321	131	2,453	5,927	1.67
14	2,899	0	10	15	110	30,869	21	2,226	117	2,342	20,774	7.93
15	2,899	0	10	15	110	30,869	21	2,226	117	2,342	20,774	7.93
Totals:	8,107	0	30		329	96,527	66	6,773	364	7,137		

2.5 REFRIGERATION EROs

2.5.1 Replace Domestic Refrigerators with High-Efficiency Models

Description

New appliance standards that came into effect on January 1, 1990, eliminated the most inefficient refrigerator models from the market (Turiel 1990). New standards which took effect on January 1, 1993, made the least efficient 1993 models 26% to 28% more efficient than the average 1989 model. A replace-on-failure implementation of this ERO is not considered because there is no choice but to replace failed units with units meeting the new standard.

This ERO involves 735 full-sized units in family housing and 400 units in commercial building breakrooms. Compact units in barracks rooms were not considered because existing units meet the 1993 standard.

Assumptions

The following technical data and assumptions pertain to the ERO evaluation:

- The distribution of energy use between on-peak and off-peak periods is assumed to be midway between a distribution based on constant consumption (41% on-peak and 59% off-peak) and the distribution of electric consumption for all electric loads on the site (46% on-peak and 54% off-peak). This is equivalent to a unit with constant demand operating 3,804 hours on-peak and 4,956 hours off-peak.
- Non-energy operations and maintenance (O&M) costs are the same for the retrofit models as for the current models. Refrigerator O&M includes replacement if the refrigeration system fails and repair of shelves and cleaning of coils, drip pans and finished surfaces.
- Each family housing unit contains one full-size refrigerator with a DOE energy rating of 1000 kWh/yr; actual consumption is 1300 kWh/yr and the average peak coincident demand is 0.20 kW.
- There are an additional 400 full-size residential-type refrigerators in breakrooms in commercial buildings around the base. The number of refrigerators was determined from estimated breakroom/floor area estimates for each building type and is consistent with the refrigeration EUI given in Volume 2, Baseline Detail. That is, the aggregate refrigeration kWh for all buildings without commercial refrigeration (i.e., non-food service-related

buildings) can be divided by the assumed 1300 kWh/yr unit consumption to see that the Volume 2 EUIs imply a site total of about 400 breakroom refrigerators.

- Existing units are assumed to be 5% less efficient than the 1990 standard. A 17 cu. ft. model was chosen from the GSA "catalog" as a replacement. Energy consumption for this model is 709 kWh/yr.

Results

Quantitative results of the ERO analysis are presented in Table 2.30. The results are discussed below.

Budget Implications. The first cost to all family housing refrigerators is \$292,995. The first cost to replace all breakroom refrigerators is \$153,200. However neither of these measures is life-cycle cost effective.

Energy, Demand, and Cost Savings. The electric energy savings in the family housing units are estimated to be 112,028 kWh per year at a cost savings of \$30,197 per year. Demand savings are estimated to be 459 kW-month per year with a cost savings of \$2,531 per year.

The electric energy savings in the breakroom units are estimated to be 60,967 kWh per year at a cost savings of \$16,434 per year. Demand savings are estimated to be 250 kW-month per year with a cost savings of \$1,378 per year.

Energy Security. This ERO has no impact on energy security.

Operations and Maintenance. There is no additional maintenance requirement for efficient refrigerators.

Environmental Issues. Freon from the replaced refrigerators will have to be properly recycled.

TABLE 2.30. Energy-Efficient Domestic Refrigerator EROs (1993 Replacement)

Existing refrigerator operation/characteristics

ID	Equip Code	Existing Equipment		# of units	Operating Schedule			Peak Factor	Average Load (kW/unit)	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
		Application	Size (cu.ft.)		Hrs on-peak	Hrs mid-peak	Hrs off-peak			on-pk	off-pk	on-pk	off-pk
1	RF-1	On-Peak Housing	18	735	3,804	NA	4,956	1.3	0.148	414,917	840,571	1,702	NA
2	RF-2	Breakrooms	18	400	3,804	NA	4,956	1.3	0.148	225,805	294,188	926	NA

Efficient refrigerator operation/characteristics

ID	Equip Code	Existing Equipment		# of units	Operating Schedule			Peak Factor	Average Load (kW/unit)	Energy Consumption (kWh)		Sum of Monthly Peak Demands (kW-mo)	
		Application	Size (cu.ft.)		Hrs on-peak	Hrs mid-peak	Hrs off-peak			on-pk	off-pk	on-pk	off-pk
1	RF-1	On-Peak Housing	18	735	3,804	NA	4,956	1.3	0.108	302,880	384,617	1,242	NA
2	RF-2	Breakrooms	18	400	3,804	NA	4,956	1.3	0.108	164,638	214,757	576	NA

Efficient refrigerator ERO economics

ID	Economic Parameters						First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost ROFS	First Cost R1\$ (1993)	Before O&M	After O&M	Life (yr)	Salvage (\$)	Energy (kWh)	Demand (kW-mo)	Energy (1992 \$)	Demand (1992 \$)	Total (1992 \$)	NPV (\$)	SIR
1	NA	292,995	NA	NA	10	0	112,028	488	30,187	2,831	32,728	(92,806)	0.68
2	NA	183,200	NA	NA	10	0	60,967	260	16,434	1,378	17,811	(47,130)	0.69
Totals:		446,195					172,995	708	46,631	3,809	50,540		

2.6 PEAK SHAVING EROs

2.6.1 Peak Shaving with Existing Diesel Generators

Description

About 20% of Griffiss AFB's typical monthly electric bill is the charge for peak 15-minute demand. These demand costs can be reduced by using existing generators to carry part of the site's electric load whenever demand approaches the monthly peak. The most reliable and effective way to accomplish this is to convert a given generator from emergency service synchronized peak-shaving service so that it can feed back into the 13.2 kV distribution system. A generator in a building or other facility served by 480 V 3-phase power is generally a good candidate for conversion if the capacity (kVA) of the existing transformer serving the facility is at least 1.25 times the generator capacity.

The cost per unit energy generated on site is generally higher than the electric utility's on-peak price per unit energy. However, savings can be realized if the average increase in monthly energy cost due to on-site power generation is outweighed by the average reduction in monthly demand charge.

A mix of generator sizes from 30 to 1000 kVA exists at the site. This diversity is useful because it facilitates modulation of the on-site power resource to just maintain the monthly peak demand target that the outside utility sees. It also helps in spreading the load (in terms of annual full-load-equivalent operating hours) equally among the generators.

A frequency synchronizer, capacity control, power factor control, and contactor must be added to convert a generator from emergency service to a power source that can feed back into the 13.2 kV distribution system. Additional components, including larger circuit breakers for the generator and other equipment and distribution panels connected to the transformer secondary, must be added in cases where the generator is capable of producing larger fault currents than the existing electric service. The throttle actuator may also have to be replaced to be compatible with the new capacity control system.

Control of generators has to be centrally coordinated by a dedicated network or as part of an EMCS system. The demand at the revenue meter must be monitored, a monthly peak limit predicted, and a strategy for starting, stopping, and modulating the output of each generator in the system implemented. A simple strategy that tends to equalize the full-load equivalent run times follows. The smallest generator will be started whenever demand exceeds a monthly target threshold. When aggregate capacity of the currently running generators is reached, a larger generator will be started and the generator with the largest cumulative full-load-equivalent run time will be shut off or put on idle standby. This sequence continues as the load increases until the largest generator has come on line. If the load continues to increase, smaller units are brought back on line by selecting the unit with the smallest cumulative full-load-equivalent run time. The process is reversed as the load drops. If the aggregate capacity of the generators is exceeded, the target threshold is adjusted upwards.

Assumptions

The technical parameters and assumed conditions are as follows:

- The generators available for peak shaving are a subset of those listed in Table 2.2 of Volume 2. The manual start, mobile, and gasoline-fueled generators are not included.
- Generators will be controlled to operate at unity power factor. This maximizes the capacity of the generating resource and minimizes fuel needed to prevent the peak demand at the utility meter from exceeding a given target demand. Reductions in reactive power crossing the utility meter are probably best achieved by fixed or switched capacitors, as indicated in section 2.12, rather than by power factor control of the diesel generators.
- The generators operating at any given time can be modulated to just meet the target demand. This assumption is not very realistic for a one-generator system but is very reasonable for a system consisting of three or more different (by factors of 1.3 to 2) size generators.
- Target demand (monthly peak minus aggregate generator capacity) is correctly predicted each month.
- The full nominal aggregate capacity is always available when needed.

- Optimum operation may be realized by not using all of the available capacity every month, however in this analysis we assume that the total aggregate capacity is used every month. This results in conservative assessment of the ERO's cost-effectiveness but over-prediction of the reduction in kWh purchased from the utility.

The second two assumptions are reasonable because the near optimum region is fairly flat and because the target threshold is adjusted whenever it is exceeded. In months when it is known in advance that a unit will be out of service the target peak demand can be adjusted accordingly with relatively small impact on net savings.

Costs of the ERO are based on the following cost elements:

- The first-year fuel price is \$0.69 per gallon (#2 fuel oil). The fuel price in future years will vary according to the NIST schedules that apply to DoD facilities. The engine-generator efficiency is 32% resulting in a conversion factor of 12.9 kWh per gallon based on 139,000 HHV Btu/gallon. This yields a fuel cost of \$0.054/kWh.
- The cost of controls, switches, sensors, and communications for a 600 kVA one-generator system are tabulated below.

Description	Material (\$)	Labor (\$)	Cost (\$) basis	Source
Fused PT (2)	1,200	250	2/KVA	Means (1991)
Current Transformer (3)	1,200	150	2/KVA	Means (1991)
Switch	1,900	250	3/KVA	Means (1991)
Speed Control	3,200	600	generator	Woodward Governor
Load and PF Control	2,600	500	generator	Woodward Governor
Actuator	1,100	250	generator	Woodward Governor
Field Panel	2,000	500	site	Novar Controls
Phone Line (3 mi)	3,000	0 ^(a)	site	Means (1991) ^(b)
Substn Monitor	8,000	2,000	system	Nuvar Controls

(a) Material estimate includes labor.

(b) Cost estimate is very approximate due to unknown conditions.

The foregoing costs can be partially aggregated so that total implementation cost can be expressed as \$5,500 per generator site plus \$9,000

per generator plus \$7 per (480 V 3-phase) generator kVA. Note that the cost of converting the first (1025 kW unit in Bldg. 29) generator includes an additional cost of \$10,000 for the system controller.

- Maintenance costs include routine service required every 200 to 300 hours of full-load equivalent operation and engine rebuilding every 10,000 to 15,000 hours of full-load equivalent operation. Routine maintenance includes valve lash adjustment and replacement of fluids, filters and belts.

Maintenance costs for a typical (four-generator) system running 1300 full-load-equivalent hours per year (110 hours/month) are given below. The nominal engine overhaul interval is 10,000/1300 = 7.5 years for this system. The costs shown are the rebuilding costs averaged over the expected 7.5 year interval between rebuilds. This simple annualization is conservative because overhauling is a deferred cost that escalates at a lower rate than the site's discount rate.

Cost per Engine-Generator Set			Cost per kWh
Size (kW)	Routine (\$/yr)	Engine Rebuild (\$/yr)	Routine + Rebuild (\$/kWh)
1000	1,712	2,865	0.00740
600	1,108	1,854	0.00798
450	930	1,630	0.00805
350	645	1,090	0.00826
kW weighted average:			0.00779

- When full-load equivalent operating hours exceed about 100 hr/yr the fuel tank refill frequency with many of the existing tanks becomes excessive. For tank sizes of 2000 gallons or more a one-month refill interval and corresponding storage capacity of 0.0065 gallons per annual kWh is assumed. For tank sizes under 2000 gallons a two-month refill interval and corresponding storage capacity of 0.013 gallons per annual kWh is assumed. This results in average tank costs of about 2.25/gallon for units under 100 kW and \$1.50/gallon for units of 100 kW and larger capacity.

Results

Quantitative results of the ERO analysis are presented in Table 2.31. The economics of twenty-one systems, ranging in peak shaving capacity from

1025 to 5115 kW, are presented. Note that this measure does not involve a change in efficiency of existing end-use equipment. The results are therefore presented in terms of costs and savings due to the generator system as configured and operated after the retrofit. (The relatively small energy and O&M costs associated with the existing generators as operated--i.e. during occasional power outages and tests--are considered to be zero.) The results are discussed below.

Budget Implications. The first cost for the smallest viable system is \$31,675. Enlarging the system costs about \$15,000 plus the cost of additional fuel tanks, if needed, per generator conversion. Note that this ERO cannot be implemented in small increments. The first cost for the highest NPV system is \$173,327.

Also note that the economic attractiveness varies considerably with system capacity. This is because the fuel consumption (directly proportional to annual kWh production) and operating hours per year are both extremely sensitive to the system's total peak shaving capacity. These numbers increase rapidly after the first increment of 1025 kW. For all larger systems, the need for periodic engine rebuilding becomes a budgetary concern. The cost of rebuilding ranges from \$6,000 to \$45,000 per engine. There may be institutional barriers that make it difficult to invest part of the savings that result from this ERO into a fund set up to finance the periodic engine rebuilding and, eventually, replacement that will be required.

Energy, Demand and Cost Savings. The main concern in this resource assessment was how many units should be modified for peak shaving service to maximize NPV of the peak shaving measure. To answer this we considered a system with one generator, a system with two generators, and so on, up to a system with twenty-one generators. The one-generator system uses the largest generator on site; the two-generator system consists of the one-generator system plus the next largest generator on the site, and so on. This scheme was expected to result in the set of highest NPV systems over the range of capacities possible with the existing generators.

The aggregate capacity of each system appears in the third column of the first block of Table 2.31. The NPV of a system is highly sensitive to the

energy (kWh) that must be produced to realize its peak shaving capacity. (The energy required is the time-integral of site demand taken between the monthly peak and the monthly peak minus the peak shaving capacity. The integrals were evaluated at a series of values of peak shaving capacity from the demands monitored at Griffiss AFB between July 1991 and January 1992.) Plots of monthly energy versus peak shaving capacity were presented in Volume 2. The energy that must be supplied annually by each system appears in the performance characteristics table under the column headed "Energy Saved." The difference between the change in annual energy and demand costs and the annual fuel costs in the economics table under the column headed "Net Energy Savings."

The results show that 2,680 kW of 15-minute peak demand can be economically avoided each month. This represents about 20% of the average billed demand and the percentage is likely to increase as other electric EROs are implemented. Annual electrical energy consumption will be reduced by 4,192 MWh per year, or about 5%, while fossil fuel consumption will increase by 45,406 MBtu per year.

Energy Security. This ERO has a very positive impact on energy security because it provides an emergency power source that can, in principle, be used anywhere on the existing distribution system. The procedure for an extended power outage would be to have building monitors shut off all but essential, predetermined circuits and to have utility crews shut down streetlights and water utility pumps that don't have backup generators. Well and lift stations equipped with generators that have not been converted to feed the grid would be disconnected from the grid but continue to function on generator power. This scheme can be readily automated by 1) installing an emergency circuit panel in each building that has critical power needs, and 2) installing a manual-reset automatic disconnect in every building (whether it has an emergency circuit panel or not) to cut power to non-emergency circuits on a low voltage condition.

Operation and Maintenance. The control system will track operating hours of each generator and alert the operator when refueling and maintenance are due. Maintenance is dominated by oil and filter changes and is roughly proportional to kWh produced. Maintenance costs are offset to some extent by

the labor for testing the converted generators, which is no longer needed since all units will run at least once a month. The O&M costs presented in the table do not account for this and are therefore conservative.

Note that energy (kWh) output and operating hours per year are both extremely sensitive to the system's total peak shaving capacity. These numbers increase rapidly after the first increment of 1025 kW. The resulting fuel costs and maintenance impacts may make it desirable to use a mix of the 100-350 kVA units and not go as far as the large system that maximizes NPV.

Environmental Issues. Extensive operation of the generators may be environmentally objectionable. Use of natural gas fired generators would reduce emissions and also reduce O&M costs.

TABLE 2.31. Peak Shaving by Existing Generators

Existing System Operating Parameters

ID	Config Code	Next Generator		Density #/SqFt	Total SqFt	No. of Units	Operating Schedule (Full-Load Equiv. Hrs)		Energy Consumption (MWh)		Sum of Monthly Peak Demands (MW-mo)		Fuel (MBtu)
		Location	KW				On-Peak	Off-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak	
0	NA	NA	0	NA	NA	0	0	NA	40,400	43,930	181	NA	0

Peak-Shaving System Operating Parameters

ID	Config Code	Next Generator		Density #/SqFt	Total SqFt	No. of Units	Operating Schedule (Full-Load Equiv. Hrs)		Energy Consumption (MWh)		Sum of Monthly Peak Demands (MW-mo)		Fuel (MBtu)
		Location	KW				On-Peak	Off-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak	
1	DGEN-1	B/29	1025	NA	NA	1	542	NA	39,844	43,930	148	NA	6,020
2	DGEN-2	B/510	800	NA	NA	2	1,002	NA	38,771	43,930	141	NA	17,650
3	DGEN-3	B/860	530	NA	NA	3	1,303	NA	37,592	43,930	135	NA	30,426
4	DGEN-4	B/748	530	NA	NA	4	1,561	NA	36,209	43,930	128	NA	45,406
5	DGEN-5	B/100	350	NA	NA	5	1,736	NA	35,132	43,930	124	NA	57,077
6	DGEN-6	B/930	250	NA	NA	6	1,854	NA	34,309	43,930	121	NA	65,994
7	DGEN-7	B/443	200	NA	NA	7	1,934	NA	33,680	43,930	119	NA	73,029
8	DGEN-8	B/779	200	NA	NA	8	2,005	NA	33,010	43,930	116	NA	80,065
9	DGEN-9	B/773	200	NA	NA	9	2,069	NA	32,361	43,930	114	NA	87,101
10	DGEN-10	B/842	150	NA	NA	10	2,113	NA	31,874	43,930	112	NA	92,377
11	DGEN-11	B/842	150	NA	NA	11	2,154	NA	31,387	43,930	110	NA	97,654
12	DGEN-12	B/793	150	NA	NA	12	2,191	NA	30,900	43,930	109	NA	102,931
13	DGEN-13	B/21	150	NA	NA	13	2,227	NA	30,413	43,930	107	NA	108,208
14	DGEN-14	B/301	125	NA	NA	14	2,254	NA	30,007	43,930	105	NA	112,605
15	DGEN-15	B/510	100	NA	NA	15	2,275	NA	29,683	43,930	104	NA	116,123
16	DGEN-16	B/220	100	NA	NA	16	2,296	NA	29,358	43,930	103	NA	119,640
17	DGEN-17	B/769	75	NA	NA	17	2,310	NA	29,114	43,930	102	NA	122,279
18	DGEN-18	B/2645	60	NA	NA	18	2,322	NA	28,920	43,930	101	NA	124,390
19	DGEN-19	B/866	60	NA	NA	19	2,333	NA	28,725	43,930	101	NA	126,500
20	DGEN-20	B/654	60	NA	NA	20	2,344	NA	28,530	43,930	100	NA	128,611
21	DGEN-21	B/3	50	NA	NA	21	2,352	NA	28,368	43,930	99	NA	130,370

Peak-Shaving System Economics

Peak Shaving System Economics													
ID	First Cost (\$)		Life (Yr)	Add'l O&M Cost (\$)	First Year Energy Savings (Costs)						Life Cycle Cost		
	Incremental	Aggregate			Energy (MWh)	Demand (MW-m)	Fuel (MBtu)	Energy (1992 \$)	Demand (1992 \$)	Fuel (1992 \$)	Net (1992 \$)	NPV \$	SIR
1	31,675	31,675	25	4,209	556	12	(6,020)	32,551	87,773	(31,001)	69,323	818,551	26.84
2	18,700	66,176	25	12,586	1,629	20	(17,650)	95,444	107,445	(90,899)	111,990	1,033,073	16.61
3	32,282	109,896	25	21,963	2,808	26	(30,426)	164,528	142,489	(156,893)	150,323	1,130,061	11.28
4	50,021	173,327	25	33,018	4,191	32	(45,406)	245,534	177,532	(233,842)	189,224	1,138,673	7.57
5	63,268	247,043	25	41,995	5,268	36	(57,077)	308,643	200,674	(293,946)	215,371	1,051,996	5.26
6	71,912	326,939	25	49,199	6,091	39	(65,994)	356,861	217,204	(339,868)	234,198	939,276	3.87
7	81,115	414,352	25	55,169	6,740	42	(73,029)	394,907	230,428	(376,102)	249,233	824,348	2.99
8	90,668	511,319	25	61,192	7,390	44	(80,065)	432,952	243,652	(412,335)	264,269	698,931	2.37
9	100,221	617,838	25	67,260	8,039	47	(87,101)	470,998	256,876	(448,569)	279,305	563,257	1.91
10	105,916	737,926	25	72,148	8,526	48	(92,377)	499,532	266,794	(475,744)	290,581	416,136	1.56
11	111,961	864,059	25	77,067	9,013	50	(97,654)	528,066	276,712	(502,920)	301,858	262,380	1.30
12	119,131	997,362	25	82,015	9,500	52	(102,931)	556,600	286,630	(530,095)	313,135	101,015	1.10
13	126,226	1,137,761	25	86,988	9,987	54	(108,208)	585,134	296,548	(557,270)	324,412	(67,839)	0.94
14	131,704	1,281,275	25	91,371	10,393	55	(112,605)	608,912	304,813	(579,916)	333,809	(238,752)	0.81
15	135,237	1,425,960	25	95,160	10,717	57	(116,123)	627,935	311,425	(598,033)	341,327	(409,813)	0.71
16	140,017	1,575,424	25	98,966	11,042	58	(119,640)	646,958	318,037	(616,150)	348,845	(585,812)	0.63
17	142,879	1,725,390	25	102,171	11,286	59	(122,279)	661,225	322,996	(629,738)	354,483	(761,290)	0.56
18	145,171	1,876,230	25	105,019	11,480	59	(124,390)	672,638	326,963	(640,808)	358,994	(936,940)	0.50
19	148,034	2,029,932	25	107,876	11,675	60	(126,500)	684,052	330,931	(651,478)	363,505	(1,115,513)	0.45
20	150,896	2,186,497	25	110,744	11,870	61	(128,611)	695,466	334,898	(662,348)	368,015	(1,297,206)	0.41
21	152,811	2,344,031	25	113,373	12,032	61	(130,370)	704,977	338,204	(671,407)	371,774	(1,479,392)	0.37

2.7 TRANSMISSION AND DISTRIBUTION EROs

2.7.1 Energy-Efficient Transformers

There are over 600 electric utility transformers that provide power to buildings, streetlights and other utilities. Transformer loss can be reduced by replacing existing units with low-loss transformers. Low-loss transformers use improved magnetic circuit materials and design to reduce stand-by (no-load) losses and improved winding design to reduce losses that are primarily a function of load current. Analysis at other sites indicates that it may be cost-effective, as a conservation measure alone, to replace transformers with properly sized low-loss transformer when replacing a failed transformer.

Description

Replacement of all 5 kVA and larger distribution transformers by low-loss transformers has been analyzed. Replacement of low-voltage (480 to 240/120 volt) transformers has not been assessed because data on the quantity, size and loading were not available and because replacement of such transformers is generally not cost-effective, as a conservation measure alone, due to their small (usually 10 kVA or less) size. Replacement of the main (115 kV primary, 13 kV secondary) substation transformers has not been analyzed given the poor economics demonstrated previous assessments.

Amorphous core transformer no-load loss is approximately 30% that of a conventional unit, with an estimated cost 1.4 times that of a conventional unit (Brooks et al. 1986). Since amorphous cores are not available for large transformers, it is assumed in this analysis that the amorphous core option is only available for sizes of 1000 kVA or smaller. Improved silicon steel transformers have approximately 75% of a conventional unit's no-load loss, and have an estimated capital cost of 1.2 times the present cost of a conventional distribution transformer (Brooks et al. 1986). For both of the above technologies, it is assumed that the load loss can be reduced by 20% with a 10% increase in the capital cost as compared to a conventional transformer, which is based calculations based on Westinghouse Electric Corporation technical data (1981).

Data and Assumptions

The technical assumptions are as follows:

- Load is distributed equally according to transformer size. This assumption is used to estimate average and peak load for each transformer.
- Each transformer is assumed to have a peak load of 75% of the nameplate capacity, and an average power factor of 0.85.
- Annual energy loss, peak power demand, and peak reactive demand are calculated based on the methodology given in Appendix B.

Cost estimates are based on the following:

Transformer costs are based on Means data for dry transformers and a correction factor based on Means data for large oil-filled and dry transformers. The Means data was used to create scaling relationships between transformer size and cost. The material cost data was separated into two categories: transformers with capacity less than or equal to 100 kVA, and transformers with capacity greater than 100 kVA. A curve fit of the data was performed for each, with the resulting equations used to estimate the cost of all transformers within that category:

$$\text{Material cost} = 175 S^{0.608} \text{ (dollars) for } S \leq 100 \text{ kVA}$$

where S = Transformer capacity, kVA,

$$\text{Material cost} = 639 S^{0.477} \text{ (dollars) for } S > 100 \text{ kVA, and}$$

$$\text{Labor cost} = 209 S^{0.457} \text{ (dollars).}$$

The old transformer removed has some salvage value, albeit mainly as scrap material for transformers which are near the end-of-life. However, the Means labor cost estimate is only to install new transformers, not remove the old one. This analysis assumes that these antithetical costs and values are approximately equal and consequently ignored (i.e., any salvage value will be absorbed by the demolition labor cost).

Results

Quantitative results of the ERO analysis are presented in Table 2.32. The results are discussed below.

Budget Implications. The initial cost for this ERO is \$3,554,576 for the site. The corresponding replace-on-failure costs are \$2,680,383.

Energy, Demand and Cost Savings. Annual site energy savings are estimated to be 1,155,980 kWh per year, with a cost savings of \$57,760 per year. Demand savings are estimated to be 534 kW-mo per year corresponding to a cost savings of \$2,940 per year.

Energy Security. This ERO has no impact on energy security.

Operation and Maintenance. This ERO will not result in any significant change in maintenance activity.

Environmental Issues. Some of the existing transformers contain PCB bearing oils. These transformers have to be replaced regardless of whether or not the ERO is implemented. Most of the other materials (copper and steel) present in the existing transformers can be recycled.

2.7.2 Power Factor Correction

Power factor correction reduces losses in the transmission system and generators of the supplying utility and reduces or eliminates excess reactive load charges that a large customer typically incurs each month. The more aggressive power factor correction measures can also reduce losses in a site's distribution lines and transformers.

Low power factors are usually due to current lagging voltage-- i.e., to net inductance of load. Inductance is a significant part of any motor, transformer or inductive ballast load. The current associated with the inductive component does not contribute to the service provided by the load and does not result directly in a power demand. However, indirect power consumption due to resistance (I^2R) loss occurs in the T&D system.

A lagging power factor can be corrected (brought closer to unity power factor) by installing capacitors. Power factor correcting capacitors are most effective when installed at each load that has a net inductive component. Power-factor corrected inductive ballasts are the most common implementation of this approach. However, it is generally not economical to retrofit capacitors to each load because of the high cost per load. The practical alternative implementations are 1) service entrance capacitors (advantage: reduced transformer loss) 2) capacitors on primary and secondary of each distribution transformer (eliminates most of the excitation current with fixed capacitors)

3) at the substation (most economical place to install switched banks or modulating reactors), and 4) distributed along feeder lines.

Description

Only the simplest implementations are considered here because the site's reactive loads are expected to change significantly with implementation of other electric EROs. Power correction by fixed capacitors at the substation will reduce losses in the main transformers that result from lagging power factor but will not affect the corresponding losses in the rest of the site's distribution system. More importantly, these implementations will reduce losses in Niagara Mohawk's transmission and generation system and eliminate the excess reactive load charges that Griffiss AFB has been paying monthly.

There are two options analyzed for power factor correction: 1) size the capacitors to correct the power factor to 1 (unity), or 2) size the capacitors to correct the average (based on monthly kW-hr and kVAR-hr) power factor to 0.95 (the point at which Niagara Mohawk starts charging for excess KVAR). Both options will remove the monthly excess reactive load charge, the first by just meeting the Niagara Mohawk requirements, the second goes one step further by correcting the average power factor to 1.0, and thus provides additional savings due to lower losses in the main transformers. The second option has a slightly higher first cost, but will cover any future reactive load growth due to base expansion or other reasons.

Data and Assumptions

The technical assumptions are as follows:

- The ratio of reactive baseload to reactive peak load is taken to be 0.5; i.e., equal to the ratio of real power baseload to peak load that has been observed in a year of continuous power monitoring at the site.
- The largest monthly peak reactive and excess reactive loads from FY91 and FY92 Niagara Mohawk billings are 6.1 MVAR and 1.3 MVAR respectively.
- Losses at the main transformers due to poor power factor, calculated as part of a similar study for Ft. Drum, NY, are as follows: 0.2172 kWh saved per actual KVAR and 0.000388 kW per actual KVAR. It is assumed that these losses (when weighted for

actual KVARs) provide reasonable estimates of the losses that occur in substation transformers of the type typically found on military bases.

Cost estimates are based on the following data.

- Labor and material costs of the ERO [Means, manufacturers] are as follows:

<u>ERO Item Description</u>	<u>Material (\$/MVA)</u>	<u>Labor (\$/MVA)</u>	<u>Total (\$/MVA)</u>	<u>Annualized O&M Cost (\$/yr)</u>
13 kV static	2,815	695	3,510	0.2%

Results

Quantitative results of the ERO analysis are presented in Table 2.33. The results are discussed below.

Budget Implications. The total first cost of implementing option 1 of the ERO is estimated to be \$4,564. First cost for option 2 is \$21,412.

Energy, Demand and Cost Savings. For option 1, annual energy savings of 4,602 kWh, a cost savings of \$236 per year. Demand savings are estimated to be 4 kW-mo and 10,594 excess KVAR-mo per year, corresponding to a cost savings of \$8,816 per year.

For option 2, annual energy savings of 27,649 kWh, a cost savings of \$1,416 per year. Demand savings are estimated to be 25 kW-mo and 10,594 excess KVAR-mo per year, corresponding to a cost savings of \$8,929 per year.

Energy Security. This ERO has no effect on energy security.

Operation and Maintenance. There is a finite probability of equipment failure during the nominal life of the power factor correction equipment. The product of failure probability and replacement cost is reflected in the O&M cost estimate. The switched capacitor unit requires periodic instrument calibration that will add to the cost of the existing annual or bi-annual substation calibration/preventive maintenance program as indicated.

Environmental Issues. This ERO will have no environmental effect beyond the generally beneficial effects of reduced power generation in the region.

2.7.3 Conservation Voltage Reduction

Energy can be saved by reducing Griffiss AFB's distribution voltage (nominally 13.2 kV) by a small amount. This approach to energy conservation is known as conservation voltage reduction (CVR). The magnitude of the voltage reduction is constrained by the requirement that service entrance voltage be maintained above the standard minimum (5% below nominal) at all buildings and other loads on the distribution system.

How a given piece of end-use equipment responds to CVR can be described in terms of input (energy savings), output (service provided), and service life. The most common loads (lights, fans and pumps) respond with input and output reductions approximately proportional to the voltage reduction and a small (but hard to quantify) increase in service life. Loads controlled by feedback (refrigeration, air-conditioning, most electric heaters, and computers or others that involve dc power supplies) respond, on the average, with practically no change in service, energy consumption, or service life.

An aggressive CVR implementation will use feedback from the most heavily loaded transformer near the end of each feeder to regulate substation voltage. A milder implementation will involve simply reducing the main transformer setpoints or tap points at each substation by a small (typically 0.5 to 2%) fixed amount. An intermediate implementation is possible using an open loop control scheme in which the setpoint is varied with load.

Description

The ERO evaluated here consists of changing the voltage tap points of the main (115 kV to 13.2 kV) transformers. A fixed voltage reduction of 1% is appropriate for Griffiss AFB because the distribution system is not heavily loaded and the simple change in setpoint does not involve any increase in maintenance activity. Open- or closed-loop control schemes are probably not necessary at Griffiss AFB because the distribution lines and transformers are not heavily loaded.

Assumptions

Technical assumptions are as follows:

- The feeders are linked to the three transformers and the ratio bank at the main substation as described in the following table.

<u>Transformer</u>	<u>Feeders</u>
Xfmr-1	12 & 13
Xfmr-2	3 & 4
Xfmr-3	6 - 11
Ratio Bank	1, 2, & 5

- Worst-case building service entrance voltages are currently at least 1% above the minimum acceptable voltage; i.e., a 1% voltage tap point reduction is feasible.
- The average building service voltage is 3% above the minimum except for the new club (B/890), which is on feeder one. Since feeders 1,2 and 5 are all grouped together on the ratio bank, this eliminates the possibility for CVR on all three of these feeders.
- A load-to-voltage reduction factor of 0.85 is assumed based on factors of 0.76 for residential, 0.85 for industrial and, 1.00 for commercial (Lovins et al. 1989, p. 296).

Costs to implement the ERO are based on the following assumptions:

- A semi-annual check of distribution voltage is assumed to be a part of the existing preventive maintenance program.
- The labor to change the tap points initially will cost \$200 per transformer; there are three transformers at the main substation.

Results

Quantitative results of the ERO analysis are presented in Table 2.34. The results are discussed below.

Budget Implications. The total first cost of implementing the ERO is estimated to be \$600.

Energy, Demand, and Cost Savings. Annual energy savings of 457,834 kWh, and cost savings of \$23,302 per year will result from this ERO. Demand savings are estimated to be 865 kW-month per year with a cost savings of \$4,768 per year.

Energy Security. This ERO has no effect on energy security.

Operations and Maintenance. There will be little or no net effect on maintenance of distribution system or of end-use equipment.

Environmental Issues. This ERO will have no environmental effect beyond the generally beneficial effects of reduced power generation in the region.

TABLE 2.32. Efficient Transformer EROs (Part 1/2)

Existing transformer losses

ID	Phs	Size (kVA)	Qty	Energy		Demand	
				On-Pk (kWh)	Off-Pk (kWh)	True (kW-me)	Reactive (kVAR-me)
1	1-Phs	8	3	883	788	1	2
2	1-Phs	7.5	1	288	340	1	1
3	1-Phs	10	21	6,688	8,867	13	18
4	1-Phs	18	32	12,401	16,163	27	36
5	1-Phs	28	211	118,829	180,327	284	417
6	1-Phs	37.5	83	40,246	82,878	88	144
7	1-Phs	80	81	71,011	91,861	182	281
8	1-Phs	75	88	77,808	101,413	171	301
9	1-Phs	100	20	32,837	42,787	72	182
10	1-Phs	180	12	27,849	38,788	68	143
11	1-Phs	187	7	17,031	21,873	41	88
12	1-Phs	200	3	8,404	10,832	22	82
13	1-Phs	280	3	8,844	12,318	27	87
14	1-Phs	333	3	13,000	18,438	34	103
15	1-Phs	800	8	34,884	44,218	88	313
16	3-Phs	20	4	2,478	3,248	5	10
17	3-Phs	28	1	710	824	2	3
18	3-Phs	48	8	6,482	8,378	14	21
19	3-Phs	75	8	10,088	13,078	22	37
20	3-Phs	113	3	7,188	9,432	18	19
21	3-Phs	180	17	48,270	68,808	104	187
22	3-Phs	228	8	24,880	31,884	84	84
23	3-Phs	300	14	70,318	90,731	183	278
24	3-Phs	480	2	14,132	18,187	33	82
25	3-Phs	800	23	178,122	229,081	421	788
26	3-Phs	750	8	77,171	98,848	211	388

Efficient transformer losses

ID	Phs	Size (kVA)	Qty	Energy		Demand	
				On-Pk (kWh)	Off-Pk (kWh)	True (kW-me)	Reactive (kVAR-me)
1A	1-Phs	8	3	281	308	1	2
2A	1-Phs	7.5	1	110	132	0	1
3A	1-Phs	10	21	2,771	3,373	9	18
4A	1-Phs	18	32	8,833	8,848	18	38
5A	1-Phs	28	211	81,814	81,267	183	417
6A	1-Phs	37.5	83	17,787	21,108	81	144
7A	1-Phs	80	81	32,724	38,280	120	281
8A	1-Phs	75	88	34,842	41,288	123	301
9A	1-Phs	100	20	14,888	17,370	82	182
10A	1-Phs	180	12	13,184	18,271	80	143
11A	1-Phs	187	7	8,088	9,383	31	88
12A	1-Phs	200	3	4,234	4,788	17	82
13A	1-Phs	280	3	8,188	8,770	22	87
14A	1-Phs	333	3	8,881	7,428	27	103
15A	1-Phs	800	8	17,378	19,781	70	313
16A	3-Phs	20	4	1,078	1,288	4	10
17A	3-Phs	28	1	320	377	1	3
18A	3-Phs	48	8	2,828	3,442	10	21
19A	3-Phs	75	8	4,841	8,380	18	37
20A	3-Phs	112.5	3	3,138	3,748	11	19
21A	3-Phs	180	17	20,848	24,483	77	187
22A	3-Phs	228	8	11,088	13,077	38	84
23A	3-Phs	300	14	32,780	38,148	121	278
24A	3-Phs	480	2	8,888	7,720	28	82
25A	3-Phs	800	23	84,088	97,487	317	788
26A	3-Phs	750	8	40,378	48,138	170	388

TABLE 2.32. (contd)

Efficient transformer ERO economics

ID	Total First Cost, RI (\$)	Life (yr)	First Year Savings							ROF Life Cycle Cost	
			Energy (kWh)	Demand (kW-me)	XSR Dmd (kVAR-me)	Energy (1992\$)	Demand (1992\$)	XSR Dmd (1992\$)	Total (1992\$)	NPV (\$)	SIR
1A	3,264	25	773	0	(0)	39	2	(0)	41	200	1.31
2A	1,369	25	356	0	(0)	18	1	(0)	19	52	1.06
3A	33,434	25	9,400	4	(1)	470	24	(1)	492	2,941	4.06
4A	63,735	25	16,483	8	(2)	824	42	(2)	864	5,182	5.34
5A	867,822	25	182,675	70	(17)	7,629	368	(14)	8,003	48,889	31.77
6A	175,666	25	53,949	25	(7)	2,899	137	(6)	2,927	17,139	9.61
7A	315,276	25	91,888	42	(11)	4,591	234	(9)	4,816	29,284	13.53
8A	288,247	25	103,110	48	(9)	5,152	262	(7)	5,407	32,842	12.19
9A	114,866	25	43,537	20	(4)	2,175	111	(3)	2,283	13,659	4.96
10A	141,930	25	35,173	16	(3)	1,757	89	(3)	1,844	10,462	2.47
11A	87,110	25	21,462	10	(2)	1,072	55	(2)	1,125	6,017	1.81
12A	40,861	25	10,007	5	(1)	500	25	(1)	525	2,262	1.28
13A	45,192	25	11,222	5	(1)	551	29	(1)	589	2,545	1.28
14A	51,764	25	15,453	7	(1)	772	39	(1)	810	3,748	1.36
15A	125,502	25	41,943	19	(3)	2,096	107	(2)	2,200	11,896	1.95
16A	9,344	25	3,350	2	(0)	168	9	(0)	178	982	1.69
17A	2,644	25	838	0	(0)	47	2	(0)	49	167	1.11
18A	22,017	25	8,462	4	(1)	423	22	(1)	444	2,521	2.14
19A	29,313	25	13,245	6	(1)	662	34	(1)	694	3,984	2.36
20A	30,984	25	9,750	5	(1)	487	25	(1)	511	2,404	1.39
21A	201,067	25	58,377	27	(7)	2,917	148	(6)	3,080	17,906	3.52
22A	65,986	25	32,377	15	(4)	1,618	82	(3)	1,697	9,363	2.09
23A	229,915	25	90,140	42	(10)	4,504	229	(8)	4,725	27,778	3.82
24A	39,798	25	17,942	8	(2)	897	46	(1)	941	4,357	1.36
25A	481,091	25	225,558	104	(22)	11,275	574	(19)	11,831	70,989	6.65
26A	202,781	25	88,301	41	(6)	4,412	225	(5)	4,631	25,586	2.75
Totals	3,380,619		1,155,960	534	(117)	57,760	2,940	(97)	60,604		

TABLE 2.33. Power Factor Correction EROs

Existing power factor characteristics

ID	Equip Code	Application	Size (MVAR)	Density #/SqFt	Total SqFt	# of units	Energy Consumption (kWh)		Sum of 12 Monthly Peak Demand (kW-mo)		Excess kVAR
							On-Peak	Off-Peak	On-Peak	Off-Peak	
A	NA	SubStn1	0	NA	NA	NA	40,721,841	44,278,159	180,668	NA	10,594
B	NA	SubStn1	0	NA	NA	NA	40,721,841	44,278,159	180,668	NA	10,594

Corrected power factor characteristics

ID	Equip Code	Application	Size (MVAR)	Density #/SqFt	Total SqFt	# of units	Energy Consumption (kWh)		Sum of 12 Monthly Peak Demand (kW-mo)		Excess kVAR
							On-Peak	Off-Peak	On-Peak	Off-Peak	
A	PFC-1300	SubStn1	1.3	NA	NA	NA	40,719,540	44,275,858	180,664	NA	0
B	PFC-6100	SubStn1	6.1	NA	NA	NA	40,708,017	44,264,335	180,643	NA	0

Power factor correction economics

ID	First Cost \$	Before O&M \$	After O&M \$	Life Yr	First Year Savings					Life Cycle Cost		
					Energy (kWh)	Demand (kW-mo)	X&R Dmd (kVAR-mo)	Energy (\$)	Demand (\$)	Total \$	NPV \$	SIR
A	4,564	0	9	25	4,802	4	10,594	236	8,816	9,051	(720)	0.84
B	21,412	0	43	25	27,649	25	10,594	1,416	8,929	10,345	1,575	1.07

TABLE 2.34. Conservation Voltage Reduction EROs

Existing operation/characteristics

ID	Equip Code	Application	X/mr Sz (MVA)	Density #/SqFt	Total SqFt	Operating Schedule		# Month On-Peak	Energy Consumption (kWh)		Sum of 12 Monthly Peak Demands (kW)	
						Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	MX/mr-1	SubStn1	5	NA	NA	NA	NA	NA	1,411,429	1,534,571	5,569	NA
2	MX/mr-2	SubStn1	5	NA	NA	NA	NA	NA	7,698,081	8,369,894	30,371	NA
3	MX/mr-3	SubStn1	5	NA	NA	NA	NA	NA	16,696,180	18,152,871	65,872	NA

Reduced voltage operation/characteristics

ID	Equip Code	Application	Size (CVR %)	Density #/SqFt	Total SqFt	Operating Schedule		# Month On-Peak	Energy Consumption (kWh)		Sum of 12 Monthly Peak Demands (kW)	
						Hrs ON	Hrs OFF		On-Peak	Off-Peak	On-Peak	Off-Peak
1	CVR1-1	SubStn1	1.0%	NA	NA	NA	NA	NA	1,399,432	1,521,527	5,522	NA
2	CVR2-1	SubStn1	1.0%	NA	NA	NA	NA	NA	7,632,627	8,298,552	30,113	NA
3	CVR3-1	SubStn1	1.0%	NA	NA	NA	NA	NA	16,554,262	17,998,572	65,312	NA

Reduced voltage ERO economics

ID	First Cost ROF	First Cost RI	Before O&M \$	After O&M \$	Life Yr	First Year Savings					Life Cycle Cost	
						Energy (kWh/yr)	Demand (kW-m/yr)	Energy (\$/yr)	Demand (\$/yr)	Total (\$/yr)	NPV \$	SIR
1	NA	200	0	0	25	25,041	47	1,274	261	1,535	23,154	116.77
2	NA	200	0	0	25	136,576	258	6,951	1,422	8,374	127,332	637.66
3	NA	200	0	0	25	296,217	560	15,076	3,065	18,141	410,307	2,052.54
Totals		600				457,834	865	23,302	4,748	28,050		

3.0 ENERGY RESOURCE OPPORTUNITY IMPACT STUDY

All energy resource opportunities (EROs) identified in Section 2 of this report are subjected to economic analysis to determine their cost-effectiveness. The economic analysis is part of the FEDS (Facility Energy Decision Screening) process for developing fuel-neutral assessments of facilities to identify and quantify major efficiency resources, supply alternatives, and fuel-switching opportunities. The intent of the assessment is to identify the major resource alternatives available to decision makers. The economic analysis provides an estimate of the magnitude of the cost-effective resource available at a facility using the most realistic assumptions possible. Individual projects should be examined more thoroughly at a project level at the implementation stage.

Section 3.1 discusses the methodology and assumptions used in the economic analysis, and Section 3.2 defines the analysis metrics. Section 3.3 describes the life-cycle cost evaluation method. Section 3.4 presents the results of the evaluation for all of Griffiss AFB, and Section 3.5 presents the results for Rome Laboratories.

3.1 ECONOMIC ANALYSIS METHODOLOGY AND ASSUMPTIONS

According to the provisions of 10 CFR Part 436, federal agencies are required to analyze all potential energy investments using a life-cycle cost (LCC) methodology developed by the National Institute of Standards and Technology (NIST). The NIST LCC methodology calculates all relevant costs of a project and discounts them to result in present dollars, and then subtracts that sum from a similarly constructed LCC of baseline, current conditions or technology. This difference is called the net present value (NPV) of the action being considered. Actions are cost-effective if the NPV is positive and greater than the NPV of alternative actions. Following this methodology results in minimizing the LCC of energy services at a site.

This economic analysis is central to the Federal Energy Management Program (FEMP) model approach for facility energy efficiency using the FEDS

system to develop a fuel-neutral assessment of facilities to identify and quantify energy efficiency resources, supply alternatives, and fuel-switching opportunities.

All EROs identified by the FEDS assessment and described in this report are therefore subjected to the LCC economic analysis to determine their cost-effectiveness. The purpose of the FEDS assessment is to identify the facility energy efficiency resource alternatives available to decision makers; the economic analysis provides an estimate of the installed cost and energy savings of the cost-effective resource available at a facility using the most current and realistic assumptions possible. Individual projects and actions considered for implementation should be examined and analyzed more thoroughly at a project level prior to design and implementation.

Under the NIST methodology, energy prices are escalated and costs and benefits are discounted using factors taken from the current edition of "Energy Prices and Discount Factors for Life-Cycle Cost Analysis." Costs and benefits are analyzed over a 25-year period, reflecting the average expected remaining life of a typical building. Other key assumptions in the methodology are:

- Prices for all goods and services (e.g., installed cost of a technology) will vary at the same rate as the inflation rate; therefore, the "real" rate of inflation is zero.
- Energy or fuel prices vary at a rate different than that of the inflation rate. NIST reports the value by which the energy prices vary from the real rate of inflation (the escalation rate).
- All costs and benefits are discounted using the current federal discount rate (4.0% real for CY 1993).
- All EROs are analyzed for a 25-year period. This does not mean that a 25-year life is assumed for all installed equipment: actual estimates of equipment life are used, and the costs of replacing wornout equipment over a 25-year period are incorporated. The 25-year analysis period also does not mean that all streams of savings from EROs are assumed to endure 25 years: many are assumed to disappear as the existing equipment is replaced with more efficient equipment as part of the baseline.

- The analysis assumes that upfront unconstrained federal financing (at the federal discount rate) is available for all potential energy efficiency improvements and actions.

The last assumption, unconstrained (unlimited) federal financing, is incorporated into the LCC analysis to determine the total cost-effective energy efficiency resource at a site. Therefore, the analysis (under the unconstrained funding assumption) results in a menu of all identified energy project opportunities whose benefits exceed their costs.

In the presence of constraints on the funding available to implement these projects, some method of prioritizing the projects is needed. It is for this reason that a savings to investment ratio (SIR) is calculated to rank order projects starting with the project with the highest SIR. This ranking allows available capital to be allocated to those cost-effective projects in an order that results in the greatest savings per dollar of investment.

For most agencies or facilities, the entire list of cost-effective projects from the LCC analysis is significant and cannot be financed from a single source. Rather, all available funding sources need to be determined. Funding sources include federal funds (MILCON, ECIP, Federal Energy Efficiency Fund); utility financing including utility offered rebates or other financial assistance; and energy services industry-financed projects. Each of these funding sources has its own requirements and its own costs, and therefore the cost-effectiveness of individual projects needs to be evaluated using the LCC analysis adjusted for each potential funding source's costs and constraints.

Many assumptions in addition to those listed above are required in the course of a FEDS assessment. In every case, the analysis team attempts to make the most realistic and defensible assumption. Where uncertainty exists, the team attempts to err on the side of conservatism. Therefore, the resulting estimate of the total cost-effective energy efficiency resource is a minimum estimate of the total potential resource, given the above assumptions. A more exact estimate and/or the development and design of projects may require a detailed facility audit, which is beyond the scope of a FEDS assessment.

3.2 ECONOMIC ANALYSIS METRICS USED

The EROs described in Section 2 were analyzed in a number of ways, with the intent of presenting a variety of analysis metrics. An analysis metric is a numerical measure of the attractiveness of an ERO as an investment. Different analysis metrics are used for different purposes. Some economic metrics commonly used to evaluate measure effectiveness include net present value, and the savings to investment ratio.

3.2.1 Net Present Value

The most useful analysis metric is the net present value, expressed in dollars. The NPV, as described earlier, is the difference between the LCCs of a project and its baseline. This is equivalent to saying that the NPV is the present value of all of the benefits associated with an ERO, less the present value of all of the costs of the ERO. The concept of present value is discussed in more detail in the following paragraphs. The NPV is used to define the cost-effectiveness of an ERO: a negative NPV means that the costs of an ERO outweigh its benefits, while a positive NPV means that the benefits are greater than the costs. The higher the NPV, the better.

The costs and the benefits of an efficiency investment occur at different periods of time, which must be accounted for in the analysis. The timing of the streams of costs and benefits is accounted for in an LCC analysis by converting all streams to present values. Present values account for the fact that a dollar today is worth more than a dollar tomorrow, for two primary reasons: general price inflation and the time value of money. In the face of general price inflation, the purchasing power of a dollar declines over time, and since the true value of money lies in what it is capable of purchasing, inflation causes its value to decline. The time value of money refers to the fact that even in the absence of general price inflation, money received sooner is preferred to money received later.

It is this preference for consuming sooner rather than later that leads to the existence of positive rates of interest, even in the absence of price level inflation. Individuals and firms are willing to pay a premium to obtain goods and services sooner rather than later: the premium they are willing to

pay is the "real rate of interest." (Although interest rates are generally positive, negative rates can exist for short periods of time, but cannot persist.) The market rate of interest, or the "nominal" rate, is the real rate plus the rate of inflation (this is a slight simplification).

3.2.2 Savings to Investment Ratio

The savings to investment ratio is used to prioritize a group of minimum LCC EROs. For example, suppose a total of 100 EROs were evaluated. Of these, suppose 25 had negative NPVs, leaving 75 EROs to consider. Of these, say that there are 5 groups of mutually exclusive pairs, and that the highest NPV ERO of each group is selected. This results in the elimination of 5 EROs, for a grand total of 70 EROs to be implemented. Suppose the total cost of implementing all 70 is \$5 million, and the facility has an annual budget for energy modernization projects of \$1 million. The SIR would be used to determine which of the 70 EROs provide the greatest "return on investment," thereby deserving immediate implementation. It is important to note that selection of cost-effective EROs should not be done on the basis of the SIR. That would not minimize the LCC. Rather, it is necessary to select the cost-effective set of EROs on the basis of their NPVs. The SIR should only be used for prioritization.

3.2.3 Discounted Payback Period

The discounted payback period was calculated to illustrate the time frame over which an investment would pay for itself with savings in energy, demand, O&M, and replacement capital expenditures. The dollar streams used in the payback calculation are discounted to compensate for the time value of money, and annualized values are used to allow comparison of projects that have differing cost and savings time profiles. The discounted payback should not be used to select among mutually exclusive projects, as this will lead to a failure to acquire much of the cost-effective resource. Discounted payback can be used to prioritize among a set of selected projects. Discounted payback will sort projects in the same order as the SIR.

3.3 LIFE-CYCLE COST EVALUATION METHOD

Federal agencies are required to evaluate energy-related investments on the basis of minimum life-cycle costs (10 CFR Part 436). A life-cycle cost evaluation computes the total long-run costs of a number of potential actions, and selects the action that minimizes the long-run costs. The life-cycle cost (LCC) of a potential investment is the present value of all of the costs associated with the investment over time. The first step in calculating the LCC is the identification of the relevant costs: these are listed in Table 3.1.

3.3.1 Life-Cycle Cost Calculation

The LCC of an alternative is calculated by summing the present values of the installed cost, the annual energy cost, the annual O&M cost, and the replacement cost, as shown in Equation 3.1.

TABLE 3.1. Cost Elements in a Life-Cycle Cost Analysis

<u>Cost Element</u>	<u>Description</u>	<u>Example</u>
Installed Cost	Cost of materials purchased and the labor required to install them.	Price of an energy efficient lighting fixture, plus cost of labor to install it.
Energy Cost	Annual expenditures on energy to operate equipment.	A lighting fixture that draws 100 watts and operates 2,000 hours annually requires 200,000 watt-hours (200 kWh) annually. At an electricity price of \$0.10 per kWh, this fixture has an annual energy cost of \$20.
Nonfuel Operations and Maintenance	Annual expenditures on parts and activities required to operate equipment.	Replacing burned out light bulbs.
Replacement Costs	Expenditures to replace equipment upon failure.	Replacing an oil furnace when it is no longer usable.

$$LCC = PV(IC) + PV(EC) + PV(OM) + PV(REP) \quad (3.1)$$

where LCC = Life-Cycle Cost
 PV(IC) = Present value of installed cost
 PV(EC) = Present value of annual energy cost
 PV(OM) = Present value of annual O&M cost
 PV(REP) = Present value of future replacement cost

3.3.2 Installed Cost

The installed cost is the one-time, first cost of an ERO. Replacement of existing equipment in the baseline case is covered by the replacement cost category. The present value of installed cost is used because not all EROs are "Replace Immediately" (RI) actions. In those cases where the ERO is to be implemented immediately, the present value of the installed cost is equal to the installed cost. When implementation of an ERO is scheduled for some future time, however, as in the case of "Replace on Failure" (ROF) EROs, the installed cost paid at that time must be discounted back to the present. The calculation for the present value of installed cost is equal to:

$$PV(IC) = \frac{IC}{(1 + d)^N} \quad (3.2)$$

where PV(IC) = Present value of installed cost
 IC = Installed cost
 d = Discount rate
 N = Number of years until failure or removal of existing equipment

3.3.3 Energy Cost

The present value of the annual energy cost is composed of both energy and demand costs. Energy costs represent the recurring annual expenditures on energy to operate equipment. These costs include both the fuel costs for consumption and the demand charges. The estimated stream of annual energy and demand costs over the analysis period is adjusted to account for increasing real energy prices, and is discounted to determine the present value of the

future cost stream. This adjustment for price escalation and discounting is accomplished through the use of a modified uniform present worth factor (UPW*). The UPW* incorporates the discount rate and the projected energy price rates of change. For ROF measures, the existing stream of costs is assumed to continue until failure of the existing equipment, at which time the ERO cost stream replaces it. The UPW* is calculated using equation 3.3.

$$UPW^*_N = \sum_{n=1}^N \frac{I_{(1992+n)}}{(1+d)^n} \quad (3.3)$$

where UPW* = Modified uniform present worth factor
 n = Counter used to designate each year, with n=1 for the year 1993;
 N = Number of periods over which energy costs or savings accrue;
 I_(1992+n) = Projected average fuel price index, provided by NIST
 d = Discount rate

The present value of energy costs is then calculated using equation 3.4:

$$PV(EC) = AEC \times UPW^*_N \quad (3.4)$$

where PV(EC) = Present value of energy cost
 AEC = Annual energy and demand cost
 UPW*_N = Modified uniform present worth factor.

3.3.4 Operations and Maintenance Cost

The present value of the annual operations and maintenance (O&M) cost is the discounted stream of annual nonfuel expenditures on parts and activities required to operate the equipment. The present value of the stream of expenditures is calculated using the uniform present worth factor (UPW). As with energy costs, for ROF measures the existing stream of costs is assumed to continue until failure of the existing equipment, at which time the ERO cost stream replaces it. The UPW is calculated using equation 3.5.

$$UPW_N = \frac{(1 + d)^N - 1}{d (1 + d)^N} \quad (3.5)$$

where UPW = Uniform present worth factor
d = Discount rate
N = Number of periods over which the costs or savings accrue.

The present value of operations and maintenance savings is then given by equation 3.6.

$$PV(OM) = OM \times UPW_N \quad (3.6)$$

where PV(OM) = Present value of annual O&M costs
OM = Annual O&M expenditures
UPW_N = Uniform present worth factor.

3.3.5 Replacement Cost

Although the installed cost category covers the first cost of implementing an ERO, subsequent equipment installations fall into the replacement cost category, as do all equipment costs associated with the baseline case. Unlike energy and O&M expenditures, replacement costs are not regular, annual expenses. The present value of the replacement cost is the discounted stream of expenditures to replace equipment upon failure. While the cost to replace a piece of equipment is actually borne in the year in which the equipment is bought, the replacement costs are annualized for this analysis. Any part of the annualized cost that would be borne after the analysis period is then subtracted off of the total, in effect adding a salvage value. If the remaining time in the analysis period is less than the life of equipment installed for the ERO, the installed cost will overstate the true cost. The replacement cost calculation corrects for this overstatement. In this type of situation, the PV(Replacement Cost) is negative, corresponding to negative replacement costs (salvage value).

Existing equipment is assumed to have no salvage value or disposal cost. While these may not be entirely accurate assumptions, they partially offset

each other. If salvage value is to be included for existing equipment, a few requirements must be met. First, it must be likely that the base will actually carry out a salvage process rather than dispose of the equipment. Regardless of value, if the base does not carry out this process, no savings will be accrued. Second, the salvage value should be the actual value of the equipment in its existing condition, less all costs associated with preparing it for sale and selling it. If this resulting net value is not greater than the disposal cost, then it should be ignored for analysis purposes. The replacement cost is annualized as shown in Equation 3.7, and the PV(Replacement Cost) is calculated using Equation 3.8.

$$REP_A = REP \times \frac{d}{1 - (d + 1)^{-L}} \quad (3.7)$$

$$PV(REP) = REP_A \times UPW_{25-N} \quad (3.8)$$

where REP_A = Annualized replacement cost
 REP = Replacement cost
 d = Discount rate
 L = Life of ERO equipment
 N = Number of periods until replacement
 $PV(REP)$ = Present value of annualized replacement cost
 UPW_N = Uniform present worth factor, as discussed in section 3.3.5.

Equation 3.8 yields a present value at the time of replacement, rather than at the beginning of the analysis period. This value must be discounted to current dollars using the single present worth factor (SPW). While the UPW is used to calculate the present value of a stream of annual costs or savings, the SPW is used to find the present value of a single nonannual amount. The SPW is calculated using equation 3.9, and the present value of replacement costs in current dollars is represented by equation 3.10.

$$SPW_N = \frac{1}{(1 + d)^N} \quad (3.9)$$

$$PV_c(REP) = PV(REP) \times SPW_N \quad (3.10)$$

where $PV_c(REP)$ = Current dollar present value
 REP = Replacement cost
 d = discount rate
 N = number of periods until replacement
 SPW_N = Single present worth factor.

3.3.6 Net Present Value Calculation

Energy resource opportunities are selected for implementation on the basis of their net present value (NPV). The NPV of an ERO is the life-cycle savings of the ERO as compared to not implementing the ERO:

$$NPV = LCC - LCC' \quad (3.11)$$

where NPV = the net present value of the ERO,
 LCC = the life-cycle cost of the existing situation,
 LCC' = the life-cycle cost if the ERO is implemented.

Most EROs are selected according to a very simple rule: if the NPV is positive, then the project should be undertaken. If the NPV is zero or negative, then the ERO should not be implemented. A positive NPV means the long-run costs of the ERO are less than the long-run costs of the existing situation.

The selection criteria can be complicated by a number of factors. If the ERO is part of a set of mutually exclusive options, then only the option with the highest NPV is selected. For example, many of the motors at Griffiss AFB can be replaced with energy-efficient models, or a variable speed drive (VSD) can be added to the existing motor, or the existing motor can be replaced with an energy-efficient model with a VSD. The analysis would

proceed by calculating the LCC of the existing motors, the LCC of energy-efficient motors, and the LCC of VSDs added to both the existing and the energy-efficient motor. Any of the EROs might be chosen, or it may be optimal to do nothing. If the NPV of two or more EROs considered is positive, then the highest NPV ERO would be selected.

3.3.7 Savings to Investment Ratio Calculation

The savings to investment ratio (SIR) is equal to the total savings of an ERO divided by the installed cost of that ERO. Any ERO with an SIR greater than 1 indicates that the savings outweigh the costs. Thus, an SIR of 1 denotes an NPV of 0. As noted earlier, the SIR is only to be used as a prioritization measure, rather than a selection device. The following equation defines the SIR.

$$SIR = \frac{PV(ES) + PV(OMS) + PV(REPS)}{PV(IC)} \quad (3.12)$$

where SIR = Savings to investment ratio of an ERO,
PV(ES) = Present value of energy savings of an ERO,
PV(OMS) = Present value of O&M savings of an ERO,
PV(REPS) = Present value of replacement savings of an ERO, and
PV(IC) = Present value of the installed cost of an ERO.

3.4 SUMMARY OF ERO IMPACT STUDY

Table 3.2 defines the assumptions that are common to all of the EROs analyzed. The rates in effect are straightforward; however, mention should be made as to the calculation of the full cost of energy. In a forthcoming PNL report, "Determining Appropriate Energy Costs for Federal Residential Building Standards Analysis," by S.A. Shankle et al., the authors note that the appropriate cost of energy to use in determining the correct level of investment in energy-efficient construction should include the following elements:

TABLE 3.2. Assumptions Used in LCC Analysis

Discount Rate: 4.0% real
Analysis Period: 25 years
Current Fuel Prices and Conversion Factors:

<u>Fuel</u>	<u>Purchase Units</u>	<u>Price (1993 \$/Purchase/MBtu)</u>
Diesel (Fuel Oil #2)	Gallons	\$0.69
Electricity	kWh on-peak	\$0.05859
	kWh off-peak	\$0.04382
	kW	\$5.51

1. Energy rates paid to the supplier by the federal facility;
2. Avoidable demand charges;
3. Avoidable distribution system losses;
4. Avoidable distribution system capital costs;
5. Avoidable external costs of energy supply and distribution.

The incorporation of the above elements is referred to as the "full cost" of energy. Current federal life-cycle costing methods do not include the cost of environmental externalities unless they are reflected in some manner within the utility bill. The external cost of energy will increasingly become internalized within the LCC process, however, due to such factors as utility least-cost planning, the 1990 Amendments to the Clean Air Act, and emissions trading. As these costs become internalized, they will be reflected in the actual cost of energy paid by the facility, and will no longer need to receive separate consideration.

Table 3.3 defines the column headings used in the remaining tables in this section. One of the distinctions made is between first year energy savings and full implementation energy savings. First year energy savings are those savings that should be experienced after the first year of the analysis. These savings will be zero for EROs that will not be implemented immediately. Full implementation energy savings are those savings that should be experienced after the ERO has been fully implemented; either after the first year,

or sometime in the future. Differences in these numbers can be caused when an ERO is implemented in steps; for example, when a variable speed drive (VSD) is added immediately to an existing motor, there are immediate savings associated with that action (first year savings); however, the second part of the ERO is to replace the existing motor when it fails with an energy efficient motor. Once this has been done, the equipment should experience the full savings of the ERO action, that is the full implementation savings.

TABLE 3.3. Description of Column Headings

All Tables (Except Summaries)		
Column Heading	Description	Unit
ERO Category	Designates the general end-use of an ERO.	End Use
Equipment	Equipment that is affected by the ERO.	Equipment
Description of ERO	Describes the ERO. See Section 2 of this document for complete descriptions of each ERO.	Description
RI or ROF	Indicates whether the ERO is to be done now or in the future (Replace Immediately vs. Replace on Failure).	RI or ROF
ID	Descriptive field - designates the specific equipment or facility affected.	ID
ID2	Descriptive field - designates the specific equipment or facility affected.	ID2
Facility or Facility Number	Designates the specific equipment or facility affected.	Facility or Facility Number

Annual Energy and Demand Reduction Tables		
Column Heading	Description	Unit
First Year Energy Savings	Energy savings that will be realized in the first year.	kWh per year
First Year Demand Savings	Demand savings that will be realized in the first year.	kW-month per year
Full Implementation Energy Savings	Energy savings that will be realized once the ERO is fully implemented.	kWh per year
Full Implementation Demand Savings	Demand Savings that will be realized once the ERO is fully implemented.	kW-month per year
Net Present Value	Reduction in life-cycle cost due to ERO. Equals present value of total savings less present value of installed cost.	1993 Constant dollars
Savings to Investment Ratio	Present value of total savings divided by present value of installed cost.	None
Discounted Payback Period	Present value of installed cost divided by annualized value of total savings.	Years

TABLE 3.3. (contd)

Present Value of Costs and Savings Tables

Column Heading	Description	Unit
Present Value of Installed Cost	Present value of the labor and materials cost of implementing the ERO. Equals actual cost for immediate EROs, discounted cost for ROF EROs.	1993 Constant dollars
Present Value of Energy Savings	Present value of the energy cost savings that will be realized after implementation of ERO.	1993 Constant dollars
Present Value of Demand Savings	Present value of the electricity demand cost savings that will be realized after implementation of the ERO.	1993 Constant dollars
Present Value of O&M Savings	Present value of the stream of maintenance cost reductions attributable to the ERO. May be negative, indicating ERO has higher maintenance costs than the current equipment.	1993 Constant dollars
Present Value of Replacement Savings	Present value of the stream of replacement cost savings attributable to the ERO. May be negative, indicating that the ERO has higher replacement costs than the current equipment.	1993 Constant dollars
Present Value of Total Savings	Sum of energy, demand, O&M, and replacement savings associated with the ERO.	1993 Constant dollars
Net Present Value	Reduction in life-cycle cost due to ERO. Equals present value of total savings less present value of installed cost.	1993 Constant dollars
Savings to Investment Ratio	Present value of total savings divided by present value of installed cost.	None
Discounted Payback Period	Present value of installed cost divided by annualized value of total savings.	Years

Annualized Values of Costs and Savings Tables

Column Heading	Description	Unit
Annualized Installed Cost	Annualized value of the labor and materials cost of implementing the ERO. Equals actual cost for immediate EROs, discounted cost for ROF EROs. Calculated from the present value.	1993 Constant dollars
Annualized Energy Savings	Annualized value of the energy cost savings that will be realized after implementation of ERO. Calculated from the present value.	1993 Constant dollars
Annualized Demand Savings	Annualized value of the electricity demand cost savings that will be realized after implementation of the ERO. Calculated from the present value.	1993 Constant dollars
Annualized O&M Savings	Annualized value of the stream of maintenance cost reductions attributable to the ERO. May be negative, indicating ERO has higher maintenance costs than the current equipment. Calculated from the present value.	1993 Constant dollars

TABLE 3.3. (contd)

Column Heading	Description	Unit
Annualized Replacement Savings	Annualized value of the stream of replacement cost savings attributable to the ERO. May be negative, indicating that the ERO has higher replacement costs than the current equipment. Calculated from the present value.	1993 Constant dollars
Annualized Total Savings	Sum of energy, demand, O&M, and replacement savings associated with the ERO.	1993 Constant dollars
Annualized Net Savings	Annualized reduction in life-cycle cost due to ERO. Equals annualized total savings less annualized installed cost.	1993 Constant dollars
Savings to Investment Ratio	Annualized total savings divided by present value of installed cost.	None

Cumulative Annual Energy and Demand Reduction Tables

Column Heading	Description	Unit
Cumulative First Year Energy Savings	Energy savings that would be realized in the first year if all EROs with equal and higher SIRs were implemented.	kWh per year
Cumulative First Year Demand Savings	Demand savings that would be realized in the first year if all EROs with equal and higher SIRs were implemented.	kW-month per year
Cumulative Full Implementation Energy Savings	Energy savings that would be realized once the ERO is fully implemented, if all EROs with equal and higher SIRs were implemented.	kWh per year
Cumulative Full Implementation Demand Savings	Demand Savings that would be realized once the ERO is fully implemented, if all EROs with equal and higher SIRs were implemented.	kW-month per year
Cumulative Net Present Value	Reduction in life-cycle cost if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings less cumulative value of installed cost.	1993 Constant dollars
Cumulative Savings to Investment Ratio	SIR of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings divided by cumulative value of installed cost.	None
Cumulative Discounted Payback Period	Discounted payback of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of installed cost divided by annualized cumulative value of total savings.	Years.
Individual ERO Savings to Investment Ratio	Present value of total savings divided by present value of installed cost for individual ERO.	None

TABLE 3.3. (contd)

Cumulative Present Value of Costs and Savings Tables

Column Heading	Description	Unit
Cumulative Present Value of Installed Cost	Present value of the labor and materials cost of implementing entire project, if all EROs with equal and higher SIRs were implemented	1993 Constant dollars
Cumulative Present Value of Energy Savings	Present value of the energy cost savings that would be realized after implementation of ERO, if all EROs with equal and higher SIRs were implemented.	1993 Constant dollars
Cumulative Present Value of Demand Savings	Present value of the electricity demand cost savings that would be realized after implementation of the ERO, if all EROs with equal and higher SIRs were implemented.	1993 Constant dollars
Cumulative Present Value of O&M Savings	Present value of the stream of maintenance cost reductions, if all EROs with equal and higher SIRs were implemented.	1993 Constant dollars
Cumulative Present Value of Replacement Savings	Present value of the stream of replacement cost savings, if all EROs with equal and higher SIRs were implemented.	1993 Constant dollars
Cumulative Present Value of Total Savings	Sum of energy, demand, O&M, and replacement savings if all EROs with equal and higher SIRs were implemented	1993 Constant dollars
Cumulative Net Present Value	Reduction in life-cycle cost if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings less cumulative value of installed cost.	1993 Constant dollars
Cumulative SIR	SIR of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings divided by cumulative value of installed cost.	None
Cumulative Disc. Payback Period	Discounted payback of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of installed cost divided by annualized cumulative value of total savings.	Years.
Single ERO SIR	Present value of total savings divided by present value of installed cost for individual ERO.	None

The annual energy and demand reductions and the present values of costs and savings for all EROs are presented in Tables 3.4 and 3.5, respectively. Many EROs have negative NPVs, and so are not cost-effective. Many others are cost-effective, but are inferior to an alternative ERO. Tables 3.6 and 3.7 present the annual energy and demand reductions and the present values of costs and savings for all cost-effective EROs that are not excluded by an ERO with a higher NPV. The annualized values of the costs and savings for these

EROs are given in Table 3.8. Tables 3.9 and 3.10 present cumulative values for the energy and demand reductions and the costs and savings for the cost-effective EROs. The cumulative values are calculated by sorting the EROs by their SIRs, and then summing the values over the EROs. The resulting table allows the reader to compare the total energy, demand, and dollar savings available for any given level of total investment. A cumulative SIR is calculated as well. The cumulative SIR shows the SIR of all EROs up to that point, if all were implemented as a single project. The SIR of each individual ERO is shown as well, to illustrate how the EROs were sorted.

The total energy, demand, and dollar savings, as well as the overall NPV, SIR, and discounted payback period are presented in Table 3.11. The cost-effective efficiency resource at Griffiss AFB is estimated to be nearly 20,000 MWh the first year, rising to over 21,000 MWh after full implementation of all EROs. These energy savings would be offset by the implementation of peak-shaving EROs, which require the consumption of diesel fuel to produce electricity. The net energy savings, after converting the diesel fuel consumption into watt-hours, would be nearly 11,000 MWh the first year, rising to nearly 12,000 MWh after full implementation of all EROs. Electricity demand would be reduced by approximately 50 MW-months without the peak-shavings EROs, and nearly 83 MW-months with the peak-shaving. The net energy savings would be equivalent to 14% of typical annual electricity consumption, and 3% of typical annual total energy consumption (see Table S.2 in Volume 2 for annual totals).

The total cost-effective resource would require an investment with a present value of over \$9.2 million, would generate energy and demand savings with a present value of over \$20.5 million, and would generate overall savings with a present value of over \$24.5 million. The net present value of the investment would be over \$15.3 million, with an overall SIR of 2.67 and an overall discounted payback period of 5.86 years. The annualized value of the energy and demand savings would be over \$1.3 million, or 27% of annual electricity costs, and 17% of annual total energy costs (see Table S.2 in Volume 2 for total expenditures).

The cost-effective ERO results have been aggregated by ERO category. The ERO category results are presented in Table 3.12, and the annualized values are in Table 3.13. Lighting EROs account for nearly \$11.5 million of the total \$15.3 million NPV, and they account for nearly \$6.9 million of the total \$9.2 million installed cost. The remaining ERO categories have NPVs ranging from \$0.9 million to \$1.7 million, except for air-conditioning, which is only marginally cost-effective, with an NPV of \$0.1 million. The highest SIR is the peak-shaving EROs.

3.5 SUMMARY OF ERO IMPACT STUDY - ROME LABORATORIES

Griffiss AFB is currently scheduled for realignment. As of this writing, it is expected that Rome Laboratories will continue to operate. For this reason, the Rome lab buildings and equipment were extracted from the whole base study. The results of the analysis of this subset of EROs is discussed in this section.

The annual energy and demand reductions and the present values of costs and savings for all EROs are presented in Tables 3.14 and 3.15, respectively. Many EROs have negative NPVs, and so are not cost-effective. Many others are cost-effective, but are inferior to an alternative ERO. Tables 3.16 and 3.17 present the annual energy and demand reductions and the present values of costs and savings for all cost-effective EROs that are not excluded by an ERO with a higher NPV. The annualized values of the costs and savings for these EROs are given in Table 3.18. Tables 3.19 and 3.20 present cumulative values for the energy and demand reductions and the costs and savings for the cost-effective EROs. The cumulative values are calculated by sorting the EROs by their SIRs, and then summing the values over the EROs. The resulting table allows the reader to compare the total energy, demand, and dollar savings available for any given level of total investment. A cumulative SIR is calculated as well. The cumulative SIR shows the SIR of all EROs up to that point, if all were implemented as a single project. The SIR of each individual ERO is shown as well, to illustrate how the EROs were sorted.

The total energy, demand, and dollar savings, as well as the overall NPV, SIR, and discounted payback period, are presented in Table 3.21. The

cost-effective efficiency resource at Rome Labs is estimated to be over 5,200 MWh the first year, rising to nearly 5,400 MWh after full implementation of all EROs. There would be no peak-shaving EROs for Rome Labs. Electricity demand would be reduced by approximately 16 MW-months.

The total cost-effective resource would require an investment with a present value of over \$2.1 million, would generate energy and demand savings with a present value of over \$4.1 million, and would generate overall savings with a present value of over \$5.2 million. The net present value of the investment would be over \$3.0 million, with an overall SIR of 2.39 and an overall discounted payback period of 6.55 years. The annualized value of the energy and demand savings would be nearly \$0.3 million.

The cost-effective ERO results have been aggregated by ERO category. The ERO category results are presented in Table 3.22, and the annualized values are in Table 3.23. Lighting EROs account for \$2.4 million of the total \$3.0 million NPV, and they account for nearly \$1.5 million of the total \$2.2 million installed cost. The remaining ERO categories have NPVs under \$0.4 million. The highest SIR is the transmission and distribution EROs.

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Non-Generating EROs													
AC	Large Centrifugal	High Eff. AC/Chiller	Ri	15		3	1,107,704	5,908	1,107,704	5,908	63,141	1.18	13.26
AC	Large Package	High Eff. AC/Chiller	Ri	89		510	30,594	245	30,594	245	-8,242	0.95	16.49
AC	Large Package	High Eff. AC/Chiller	Ri	105		776	27,222	153	27,222	153	-7,991	0.94	16.54
AC	Large Package	High Eff. AC/Chiller	Ri	125		917	4,469	34	4,469	34	-14,612	0.87	17.99
AC	Large Package	High Eff. AC/Chiller	Ri	10		1	3,099	17	3,099	17	-3,066	0.93	16.71
AC	Large Package	High Eff. AC/Chiller	Ri	72		311	1,921	11	1,921	11	-8,449	0.87	18.04
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	17		3	80,355	429	80,355	429	-2,246	0.98	16.00
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	57		240	107,487	573	107,487	573	-6,560	0.95	16.43
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	88		504	35,838	202	35,838	202	-591	0.99	15.81
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	65		301	2,286	13	2,286	13	-40,605	0.19	83.67
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	37		112	29,941	168	29,941	168	-16,235	0.77	20.28
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	12		2	44,798	252	44,798	252	-697	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	47		123	44,819	252	44,819	252	-695	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	120		821	25,211	189	25,211	189	-1,002	0.98	15.96
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	38		112	53,757	302	53,757	302	-803	0.99	15.79
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	113		793	67,196	378	67,196	378	-1,024	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	34		106	179,276	1,008	179,276	1,008	-2,283	0.99	15.77
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	11		2	26,036	146	26,036	146	-14,253	0.77	20.30
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	111		789	89,638	504	89,638	504	-1,225	0.99	15.78
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	76		346	32,805	185	32,805	185	-4,968	0.92	16.99
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	16		3	107,487	573	107,487	573	-6,560	0.95	16.43
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	91		700	228,964	611	228,964	611	25,196	1.16	13.50
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	32		104	44,819	252	44,819	252	-695	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	114		796	129,115	344	129,115	344	13,649	1.15	13.60
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	124		917	53,783	403	53,783	403	-1,950	0.98	15.94
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	61		247	102,138	575	102,138	575	-1,377	0.99	15.78
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	82		443	7,729	43	7,729	43	-41,372	0.33	47.23
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	3		1	33,614	189	33,614	189	-563	0.99	15.81
AC	Room/Window	High Eff. AC/Chiller	Ri	64		272	3,919	22	3,919	22	91	1.03	15.19
AC	Room/Window	High Eff. AC/Chiller	Ri	46		120	194	2	194	2	-248	0.83	18.75
AC	Room/Window	High Eff. AC/Chiller	Ri	60		240	30,207	161	30,207	161	1,797	1.21	12.92
AC	Room/Window	High Eff. AC/Chiller	Ri	107		778	7,769	44	7,769	44	162	1.02	15.25
AC	Room/Window	High Eff. AC/Chiller	Ri	118		819	272	2	272	2	-22	0.97	16.13
AC	Room/Window	High Eff. AC/Chiller	Ri	79		428	435	2	435	2	-13	0.98	15.92
AC	Room/Window	High Eff. AC/Chiller	Ri	115		799	501	3	501	3	-39	0.97	16.18
AC	Room/Window	High Eff. AC/Chiller	Ri	19		3	186	1	186	1	-353	0.69	22.80
AC	Room/Window	High Eff. AC/Chiller	Ri	36		106	6,096	34	6,096	34	192	1.04	14.96
AC	Room/Window	High Eff. AC/Chiller	Ri	22		14	3,283	18	3,283	18	-69	0.99	15.85
AC	Room/Window	High Eff. AC/Chiller	Ri	14		2	241	1	241	1	-2,132	0.53	29.24
AC	Room/Window	High Eff. AC/Chiller	Ri	41		112	184	1	184	1	-34	0.95	16.43
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	56		243	156,242	833	156,242	833	3,164	1.02	15.25
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	2		1	47,434	267	47,434	267	-2,453	0.97	16.06
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	88		510	97,274	778	97,274	778	28,453	1.22	12.84
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	1		1	33,844	190	33,844	190	-2,277	0.97	16.14
AC	Small Package	High Eff. AC/Chiller	Ri	97		745	1,432	8	1,432	8	-483	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	48		131	429	2	429	2	-158	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	109		780	300	2	300	2	-285	0.93	16.71
AC	Small Package	High Eff. AC/Chiller	Ri	33		104	2,560	14	2,560	14	-854	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	Ri	121		823	844	6	844	6	-696	0.94	16.68
AC	Small Package	High Eff. AC/Chiller	Ri	40		112	429	2	429	2	-158	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	77		400	4,978	28	4,978	28	-1,642	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	Ri	18		3	813	4	813	4	-303	0.94	16.59
AC	Small Package	High Eff. AC/Chiller	Ri	98		750	71	0	71	0	-2,127	0.51	30.41
AC	Small Package	High Eff. AC/Chiller	Ri	122		829	1,365	10	1,365	10	-764	0.94	16.63
AC	Small Package	High Eff. AC/Chiller	Ri	59		240	3,855	21	3,855	21	-757	0.95	16.45
AC	Small Package	High Eff. AC/Chiller	Ri	62		247	6,442	36	6,442	36	-2,102	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	Ri	45		119	716	4	716	4	-251	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	51		133	906	2	906	2	-6,638	0.53	29.30
AC	Small Package	High Eff. AC/Chiller	Ri	69		302	9,592	54	9,592	54	-3,120	0.94	16.56

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-em)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-em)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
AC	Small Package	High Eff. AC/Chiller	RI	123		886	132	1	132	1	-1,629	0.63	24.89
AC	Small Package	High Eff. AC/Chiller	RI	103		774	180	1	180	1	-1,779	0.93	16.71
AC	Small Package	High Eff. AC/Chiller	RI	50		133	821	2	821	2	-6,472	0.53	29.41
AC	Small Package	High Eff. AC/Chiller	RI	84		447	428	3	428	3	-211	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	RI	83		446	428	3	428	3	-211	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	RI	90		520	2,845	16	2,845	16	-947	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	4		1	427	2	427	2	-158	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	RI	44		119	2,047	12	2,047	12	-840	0.94	16.60
AC	Small Package	High Eff. AC/Chiller	RI	94		712	169	1	169	1	-1,639	0.68	22.82
AC	Small Package	High Eff. AC/Chiller	RI	102		774	4,836	27	4,836	27	-1,596	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	71		311	199	1	199	1	-461	0.87	17.95
AC	Small Package	High Eff. AC/Chiller	RI	93		704	75	0	75	0	-1,170	0.57	27.32
AC	Small Package	High Eff. AC/Chiller	RI	28		100	5,689	32	5,689	32	-1,874	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	7		1	595	3	595	3	-2,428	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	96		724	6,511	37	6,511	37	-2,799	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	RI	99		767	67	0	67	0	17	1.02	15.38
AC	Small Package	High Eff. AC/Chiller	RI	6		1	298	2	298	2	-2,173	0.74	21.01
AC	Small Package	High Eff. AC/Chiller	RI	95		712	56	0	56	0	-606	0.68	22.86
AC	Small Package	High Eff. AC/Chiller	RI	70		311	119	1	119	1	-913	0.74	21.02
AC	Small Package	High Eff. AC/Chiller	RI	25		42	716	4	716	4	-251	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	106		778	1,432	8	1,432	8	-482	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	78		428	2,856	16	2,856	16	-1,236	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	RI	21		14	2,147	12	2,147	12	-714	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	108		780	7,158	40	7,158	40	-2,334	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	17		789	2,133	12	2,133	12	-715	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	-		1	397	2	397	2	-1,637	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	39		112	24,748	139	24,748	139	-8,086	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	68		301	281	2	281	2	-2,671	0.68	22.81
AC	Small Package	High Eff. AC/Chiller	RI	117		817	2,240	17	2,240	17	-1,032	0.94	16.60
AC	Small Package	High Eff. AC/Chiller	RI	116		814	1,002	6	1,002	6	-343	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	87		504	866	5	866	5	222	1.02	15.31
AC	Small Package	High Eff. AC/Chiller	RI	23		19	716	4	716	4	-251	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	66		301	429	2	429	2	-158	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	RI	13		2	4,978	28	4,978	28	-1,642	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	53		144	2,694	20	2,694	20	-1,223	0.94	16.60
AC	Small Package	High Eff. AC/Chiller	RI	75		329	601	3	601	3	-551	0.94	16.71
AC	Small Package	High Eff. AC/Chiller	RI	9		1	397	2	397	2	-1,637	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	35		106	16,356	92	16,356	92	-5,351	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	81		439	1,404	8	1,404	8	-542	0.94	16.59
AC	Small Package	High Eff. AC/Chiller	RI	74		324	3,556	21	3,556	21	-304	0.96	16.20
AC	Small Package	High Eff. AC/Chiller	RI	104		776	397	2	397	2	-1,637	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	29		100	573	3	573	3	-204	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	RI	119		820	328	2	328	2	83	1.02	15.33
AC	Small Package	High Eff. AC/Chiller	RI	52		143	5,011	28	5,011	28	-1,644	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	30		101	7,148	40	7,148	40	-2,509	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	8		1	446	3	446	3	-323	0.74	21.00
AC	Small Package	High Eff. AC/Chiller	RI	27		45	1,332	7	1,332	7	337	1.02	15.31
AC	Small Package	High Eff. AC/Chiller	RI	63		272	3,579	20	3,579	20	-1,180	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	67		301	1,432	8	1,432	8	-482	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	92		700	7,918	21	7,918	21	-410	1.09	14.28
AC	Small Package	High Eff. AC/Chiller	RI	100		770	5,011	28	5,011	28	-1,639	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	58		240	82,403	439	82,403	439	-11,382	0.96	16.38
AC	Small Reciprocating	High Eff. AC/Chiller	RI	49		133	5,540	15	5,540	15	-18,531	0.30	51.59
AC	Small Reciprocating	High Eff. AC/Chiller	RI	43		119	25,173	142	25,173	142	-632	0.98	15.89
AC	Small Reciprocating	High Eff. AC/Chiller	RI	20		14	16,824	95	16,824	95	-500	0.98	15.92
AC	Small Reciprocating	High Eff. AC/Chiller	RI	31		102	5,570	31	5,570	31	-13,085	0.51	30.77
AC	Small Reciprocating	High Eff. AC/Chiller	RI	80		439	14,593	82	14,593	82	-650	0.98	16.02
AC	Small Reciprocating	High Eff. AC/Chiller	RI	101		774	16,782	94	16,782	94	-503	0.98	15.92
AC	Small Reciprocating	High Eff. AC/Chiller	RI	42		115	467	3	467	3	-17,795	0.13	122.21
AC	Small Reciprocating	High Eff. AC/Chiller	RI	110		789	12,587	71	12,587	71	-543	0.96	16.01
AC	Small Reciprocating	High Eff. AC/Chiller	RI	26		44	4,055	23	4,055	23	-9,474	0.54	29.16

Table 3.4

AB EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Rt or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-yr)	Full Year Implement Energy Savings (kWh)	Full Year Implement Demand Savings (kW-yr)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
AC	Small Reciprocating	High Eff. AC/Chiller	R	85		482	7,784	44	7,784	44	-1,578	0.92	16.93
AC	Small Reciprocating	High Eff. AC/Chiller	R	54		150	2,323	13	2,323	13	-11,095	0.41	38.47
AC	Small Reciprocating	High Eff. AC/Chiller	R	55		212	12,587	94	12,587	94	722	0.97	16.06
AC	Small Reciprocating	High Eff. AC/Chiller	R	73		324	41,955	252	41,955	252	1,608	1.06	14.73
AC	Small Reciprocating	High Eff. AC/Chiller	R	24		40	25,236	142	25,236	142	-904	0.98	15.88
Lighting	100W INC	CFL 2-15 CEE FIXT	R	41		C	47,888	103	47,888	103	24,440	3.31	4.72
Lighting	100W INC	CFL 2-15 CEE FIXT	R	76		H	71,175	98	71,175	98	32,487	4.27	3.66
Lighting	100W INC	CFL 2-15 CEE FIXT	R	7		A	67,734	168	67,734	168	17,792	1.46	10.69
Lighting	100W INC	CFL 2-15 CEE FIXT	R	22		B	110,868	249	110,868	249	48,240	2.33	6.71
Lighting	100W INC	CFL 2-15 CEE FIXT	R	85		I	29,573	69	29,573	69	14,893	3.01	5.20
Lighting	100W INC	CFL 2-15 CEE FIXT	R	51		D	25,201	54	25,201	54	11,538	2.70	5.78
Lighting	100W INC	CFL 2-15 CEE FIXT	R	66		G	17,387	45	17,387	45	4,265	1.41	11.08
Lighting	150W QUARTZ	HPS 400 POLE	R	103		Str Ltg	273,339	782	273,339	782	298,458	17.34	0.90
Lighting	150W INC	CFL 2-15 CEE FIXT	R	42		C	12,455	27	12,455	27	10,344	7.89	1.98
Lighting	150W INC	CFL 2-15 CEE FIXT	R	23		B	194,282	437	194,282	437	153,372	5.42	2.88
Lighting	150W INC	CFL 2-15 CEE FIXT	R	86		I	29,898	70	29,898	70	24,838	7.06	2.21
Lighting	150W INC	CFL 2-15 CEE FIXT	R	8		A	12,456	31	12,456	31	8,594	3.22	4.85
Lighting	150W PAR FLOOD	HPS 50 FLD	R	104		Str Ltg	5,953	17	5,953	17	11,527	4.72	3.31
Lighting	150W PAR FLOOD	HPS 50 FLD	R	67		G	5,037	13	5,037	13	5,523	2.29	6.81
Lighting	150W PAR FLOOD	HPS 50 FLD	R	52		D	7,301	16	7,301	16	9,755	4.50	3.47
Lighting	150W PAR FLOOD	HPS 50 FLD	R	43		C	13,873	30	13,873	30	19,263	5.43	2.88
Lighting	150W PAR FLOOD	HPS 50 FLD	R	9		A	19,622	49	19,622	49	22,069	2.39	6.54
Lighting	150W PAR FLOOD	HPS 50 FLD	R	24		B	32,117	72	32,117	72	42,144	3.82	4.09
Lighting	150W PAR FLOOD	HPS 50 FLD	R	87		I	8,567	20	8,567	20	11,795	4.86	3.21
Lighting	150W PAR SPOT	HPS 50 FLD	R	68		G	1,182	3	1,182	3	1,296	2.29	6.81
Lighting	150W PAR SPOT	HPS 50 FLD	R	44		C	3,257	7	3,257	7	4,522	5.43	2.88
Lighting	150W PAR SPOT	HPS 50 FLD	R	53		D	1,714	4	1,714	4	2,290	4.50	3.47
Lighting	150W PAR SPOT	HPS 50 FLD	R	88		I	2,011	5	2,011	5	2,769	4.86	3.21
Lighting	150W PAR SPOT	HPS 50 FLD	R	10		A	4,606	11	4,606	11	5,181	2.39	6.54
Lighting	150W PAR SPOT	HPS 50 FLD	R	25		B	7,539	17	7,539	17	9,893	3.82	4.09
Lighting	150W PAR SPOT	HPS 50 FLD	R	78		H	470	1	470	1	297	2.56	6.10
Lighting	1x40 T-12	FL 1X4 1-18 ELC	R	45		C	309,853	664	309,853	664	197,833	2.00	7.82
Lighting	1x40 T-12	FL 1X4 1-18 ELC	R	31		B	4,127	9	4,127	9	1,928	1.49	10.47
Lighting	1x40 T-12	FL 1X4 1-18 ELC	R	93		I	2,379	6	2,379	6	1,399	1.81	8.64
Lighting	200W INC	HPS 50 PEND	R	26		B	340,110	764	340,110	764	288,518	3.26	4.80
Lighting	200W INC	HPS 50 PEND	R	89		I	60,036	140	60,036	140	54,914	4.17	3.74
Lighting	250W MERC	HPS 100 POLE	R	102		Str Ltg	97,623	279	97,623	279	64,465	3.35	4.66
Lighting	2x25W INC EXIT	LED	R	98		I	2,588	4	2,588	4	2,583	3.59	4.35
Lighting	2x25W INC EXIT	LED	R	58		D	2,363	3	2,363	3	2,357	3.59	4.35
Lighting	2x25W INC EXIT	LED	R	48		C	3,688	5	3,688	5	3,879	3.59	4.35
Lighting	2x25W INC EXIT	LED	R	37		B	12,652	17	12,652	17	12,623	3.59	4.35
Lighting	2x25W INC EXIT	LED	R	82		H	3,466	5	3,466	5	3,458	3.59	4.35
Lighting	2x25W INC EXIT	LED	R	18		A	13,458	18	13,458	18	13,427	3.59	4.35
Lighting	2x40W INC	CFL 15 CEE FIXT	R	59		G	91,011	237	91,011	237	87,918	2.85	5.47
Lighting	2x50W INC PAR	2-CFL 11 INT REF	R	60		G	2,514	7	2,514	7	520	1.20	13.02
Lighting	2x50W INC PAR	2-CFL 11 INT REF	R	19		B	3,392	8	3,392	8	2,740	5.66	2.76
Lighting	2x60W INC	CFL 2-15 CEE FIXT	R	3		A	216,324	537	216,324	537	169,041	2.83	5.52
Lighting	2x60W INC	CFL 2-15 CEE FIXT	R	62		G	447,591	1,168	447,591	1,168	342,480	2.71	5.77
Lighting	2x75W INC	CFL 2-15 CEE FIXT	R	64		G	81,103	211	81,103	211	86,774	4.28	3.65
Lighting	2x75W INC	CFL 2-15 CEE FIXT	R	5		A	50,666	126	50,666	126	54,952	4.49	3.48
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	72		G	6,241	16	6,241	16	1,167	1.16	13.48
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	32		B	386,365	868	386,365	868	260,378	2.06	7.57
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	54		D	191,244	409	191,244	409	136,140	2.37	6.00
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	94		I	231,633	539	231,633	539	175,928	2.56	6.09
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	79		H	57,959	144	57,959	144	15,262	1.24	12.61
Lighting	2x40 T-12	FL 2X4 2-18 ELC	R	97		I	45,769	63	45,769	63	34,357	3.78	4.14
Lighting	2x96 T-12 75W	FL 1X8 2-60 ELC REF	R	47		I	446,875	1,039	446,875	1,039	228,305	1.85	8.45
Lighting	2x96 T-12 75W	FL 1X8 2-60 ELC REF	R	97		C	14,893	32	14,893	32	8,321	2.05	7.81
Lighting	2x96 T-12 75W	FL 1X8 2-60 ELC REF	R	57		D	14,893	32	14,893	32	8,727	1.70	9.19
Lighting	2x96 T-12 75W	FL 1X8 2-60 ELC REF	R	17		A	8,724	22	8,724	22	1,602	1.16	13.44
Lighting	2x96 T-12 75W	FL 1X8 2-60 ELC REF	R	36		B	401,224	902	401,224	902	246,384	1.95	8.03

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (Btu/yr)	First Year Demand Savings (kW-mw)	Full Implement Energy Savings (Btu/yr)	Full Implement Demand Savings (kW-mw)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Lighting	300W INC	HPS 70 PEND	RI	27		B	131,410	295	131,410	295	130,848	5.27	2.96
Lighting	300W INC	HPS 70 PEND	RI	90		I	23,196	54	23,196	54	24,141	0.82	2.29
Lighting	34W 40 T 12	FL 2X4 2 T8 ELC REF	RI	33		B	1,239,957	2,786	1,239,957	2,786	852,496	2.28	6.84
Lighting	34W 40 T 12	FL 2X4 2 T8 ELC REF	RI	15		A	948	2	948	2	277	1.31	11.90
Lighting	34W 40 T 12	FL 2X4 2 T8 ELC REF	RI	55		D	210,492	450	210,492	450	156,807	2.69	5.80
Lighting	34W 40 T 12	FL 2X4 2 T8 ELC REF	RI	95		I	834,389	1,940	834,389	1,940	664,574	2.94	5.31
Lighting	34W 40 T 12	FL 2X4 2 T8 ELC REF	RI	80		H	184,870	226	184,870	226	134,971	4.58	3.41
Lighting	400W Merc Vapor	HPS 200 PEND	RI	100		J	138,990	198	138,990	198	92,432	7.12	2.19
Lighting	44W 40 INC PAR	4 CFL 11 INT REF	RI	1		A	139,910	348	139,910	348	105,034	3.49	4.48
Lighting	44W 40 T 12	FL 2X4 3 T8 ELC REF	RI	34		B	2,577,252	5,791	2,577,252	5,791	1,811,819	2.13	7.34
Lighting	44W 40 T 12	FL 2X4 3 T8 ELC REF	RI	96		I	1,653,441	3,845	1,653,441	3,845	1,205,831	2.72	5.75
Lighting	44W 40 T 12	FL 2X4 3 T8 ELC REF	RI	81		H	326,998	448	326,998	448	242,625	4.14	3.77
Lighting	44W 40 T 12	FL 2X4 3 T8 ELC REF	RI	56		D	65,348	140	65,348	140	44,344	2.49	6.27
Lighting	44W 40 T 12	FL 2X4 3 T8 ELC REF	RI	73		C	403,988	865	403,988	865	305,955	3.03	5.16
Lighting	44W 40 T 12	FL 2X4 4 T8 ELC	RI	16		A	29,900	78	29,900	78	11,643	1.47	10.65
Lighting	60W INC	CFL 15 CBL FIXT	RI	2		A	63,763	158	63,763	158	28,368	1.50	10.02
Lighting	60W INC	CFL 15 CBL FIXT	RI	38		C	108,162	269	108,162	269	98,379	1.85	8.45
Lighting	60W INC	CFL 15 CBL FIXT	RI	61		G	69,036	148	69,036	148	68,049	4.41	3.54
Lighting	64W 40 T 12	FL 2X4 4 T8 ELC REF	RI	35		B	111,898	291	111,898	291	67,402	1.77	8.82
Lighting	6.6 Amp Sarnes INC	HPS 100 POLE	RI	101		J	340,895	766	340,895	766	290,765	3.59	4.36
Lighting	750W INC	HPS 200 PEND	RI	99		J	70,551	202	70,551	202	66,858	2.77	5.64
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	83		I	1,843	4	1,843	4	311,935	40.24	0.39
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	39		C	918,552	1,968	918,552	1,968	839,873	3.68	3.68
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	20		B	7,368	17	7,368	17	5,954	4.10	3.81
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	49		D	184,288	394	184,288	394	156,192	2.85	5.48
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	63		G	16,589	43	16,589	43	8,919	1.67	4.65
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	4		A	41,454	103	41,454	103	23,397	1.74	8.97
Lighting	75W INC	CFL 2 11 CBL FIXT	RI	74		H	9,211	13	9,211	13	8,147	5.75	2.72
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	65		G	15,884	41	15,884	41	10,268	2.08	7.50
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	21		B	101,284	228	101,284	228	86,472	3.61	4.33
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	84		I	27,017	63	27,017	63	24,942	4.68	3.34
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	50		D	23,023	49	23,023	49	20,231	4.27	3.86
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	40		C	43,748	94	43,748	94	40,832	5.22	2.98
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	6		A	61,878	154	61,878	154	41,348	2.17	7.19
Lighting	90W INC	CFL 2 11 CBL FIXT	RI	75		H	65,023	89	65,023	89	57,336	7.31	2.14
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC	RI			B	12,123	37	12,123	37	9,513	2.44	6.41
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	5,900	18	5,900	18	4,421	2.40	6.52
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	8,670	18	8,670	18	6,236	2.20	7.11
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	18,587	37	18,587	37	14,638	2.49	6.27
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	9,748	0	9,748	0	7,299	3.28	4.76
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	4,176	0	4,176	0	2,637	2.29	6.81
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI			B	280,435	712	280,435	712	233,368	2.80	5.59
Lighting	FL 2X4 3 40 STD	FL 2X4 3 T8 ELC REF SENS	RI			B	10,898	28	10,898	28	8,158	2.35	6.85
Lighting	FL 2X4 3 40 STD	FL 2X4 3 T8 ELC REF SENS	RI			B	8,973	28	8,973	28	6,927	2.67	5.84
Lighting	FL 2X4 3 40 STD	FL 2X4 3 T8 ELC REF	RI			B	235,869	712	235,869	712	178,178	2.85	5.90
Lighting	FL 2X4 3 40 STD	FL 2X4 3 T8 ELC REF	RI			B	100,787	0	100,787	0	87,611	4.80	3.25
Lighting	FL 2X4 3 40 STD	FL 2X4 3 T8 ELC REF	RI			B	4,355	0	4,355	0	2,688	2.41	6.48
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF SENS	RI			B	131,971	323	131,971	323	106,374	2.80	5.59
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF SENS	RI			B	6,364	15	6,364	15	4,744	2.45	6.39
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF	RI			B	108,985	323	108,985	323	77,977	2.55	6.12
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF	RI			B	5,030	15	5,030	15	3,790	2.58	6.06
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF	RI			B	2,696	0	2,696	0	1,863	3.13	4.99
Lighting	FL 2X4 4 40 STD	FL 2X4 4 T8 ELC REF	RI			B	50,486	0	50,486	0	44,945	5.97	2.92
Motors	AHU	SENSOR	RI	22.5	1000	B	847	8	847	8	257	1.19	13.15
Motors	AHU	EEM	RI	31.5	1000	B	1,066	10	1,066	10	855	1.62	9.86
Motors	AHU	EEM	RI	20.5	1000	B	209	2	209	2	44	1.11	14.07
Motors	AHU	EEM	RI	17	5000	B	2,640	5	2,640	5	2,038	3.99	3.91
Motors	AHU	EEM	RI	11	5000	B	21,290	38	21,290	38	17,295	3.08	5.08
Motors	AHU	EEM	RI	41	2100	B	14,571	62	14,571	62	12,981	2.71	5.77
Motors	AHU	EEM	RI	16	4000	B	5,793	13	5,793	13	3,894	3.45	4.53

Table 3.4

AB EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kW-hr)	First Year Demand Savings (kW-mw)	Full Implement Energy Savings (kW-hr)	Full Implement Demand Savings (kW-mw)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	RI	12.5	8760		11,721	12	11,721	12	7,980	0.83	2.29
Motors	AHU	EEM	RI	49	1650		2,350	13	2,350	13	1,513	1.95	8.00
Motors	AHU	EEM	RI	14	1650		878	5	878	5	844	1.81	8.83
Motors	AHU	EEM	RI	31.5	2100		636	3	636	3	441	2.10	7.45
Motors	AHU	EEM	RI	13	1000		103	1	103	1	83	0.79	19.88
Motors	AHU	EEM	RI	2	1000		34	0	34	0	88	0.61	25.72
Motors	AHU	EEM	RI	38.5	1650		2,882	18	2,882	18	2,034	2.07	7.54
Motors	AHU	EEM	RI	11	4000		4,826	10	4,826	10	3,328	3.63	4.30
Motors	AHU	EEM	RI	33.5	3270		24,107	68	24,107	68	18,428	3.29	4.75
Motors	AHU	EEM	RI	6.5	4000		2,640	6	2,640	6	1,655	2.39	6.53
Motors	AHU	EEM	RI	40.5	3200		3,090	9	3,090	9	1,923	2.80	6.02
Motors	AHU	EEM	RI	35	2100		18,732	80	18,732	80	16,575	2.82	5.54
Motors	AHU	EEM	RI	11.5	4000		9,251	21	9,251	21	6,656	3.63	4.30
Motors	AHU	EEM	RI	19.5	2100		1,733	7	1,733	7	1,336	1.90	8.22
Motors	AHU	EEM	RI	31	2100		636	3	636	3	441	2.10	7.45
Motors	AHU	EEM	RI	46.5	1650		1,593	9	1,593	9	908	1.75	8.91
Motors	AHU	EEM	RI	10	4000		5,352	12	5,352	12	3,990	3.92	3.99
Motors	AHU	EEM	RI	7	1000		131	1	131	1	439	0.56	27.82
Motors	AHU	EEM	RI	18	2100		3,353	14	3,353	14	3,061	1.98	7.88
Motors	AHU	EEM	RI	50	2100		3,598	15	3,598	15	2,316	2.77	7.18
Motors	AHU	EEM	RI	12	8760		7,814	8	7,814	8	5,320	6.83	2.29
Motors	AHU	EEM	RI	38	1650		954	5	954	5	878	2.07	7.54
Motors	AHU	EEM	RI	9	4000		2,112	5	2,112	5	1,636	3.41	4.59
Motors	AHU	EEM	RI	23.5	5000		10,273	18	10,273	18	7,345	4.35	3.59
Motors	AHU	EEM	RI	50.5	2100		7,195	31	7,195	31	4,833	2.17	7.18
Motors	AHU	EEM	RI	60	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	AHU	EEM	RI	35.5	2100		37,483	161	37,483	161	33,150	2.82	5.54
Motors	AHU	EEM	RI	5	2100		285	1	285	1	50	1.11	14.06
Motors	AHU	EEM	RI	21.5	5000		2,230	4	2,230	4	1,678	4.88	3.34
Motors	AHU	EEM	RI	58	2100		5,089	22	5,089	22	3,193	2.15	7.25
Motors	AHU	EEM	RI	6.5	800		496	6	496	6	890	0.50	31.21
Motors	AHU	EEM	RI	49.5	1650		2,390	13	2,390	13	1,513	1.95	8.00
Motors	AHU	EEM	RI	54	2100		2,028	9	2,028	9	1,203	2.00	7.82
Motors	AHU	EEM	RI	41.5	1650		9,040	49	9,040	49	7,548	2.29	6.82
Motors	AHU	EEM	RI	33	3200		10,958	31	10,958	31	8,378	3.29	4.75
Motors	AHU	EEM	RI	16	1650		545	3	545	3	233	1.39	11.22
Motors	AHU	EEM	RI	14	5000		9,302	18	9,302	18	6,485	2.82	5.54
Motors	AHU	EEM	RI	9	8760		1,446	1	1,446	1	926	4.12	3.79
Motors	AHU	EEM	RI	13.5	1000		103	1	103	1	63	0.79	19.88
Motors	AHU	EEM	RI	3	4000		334	1	334	1	163	1.88	9.44
Motors	AHU	EEM	RI	15.5	4000		7,724	17	7,724	17	5,089	3.11	5.03
Motors	AHU	EEM	RI	24.5	3200		7,136	20	7,136	20	5,833	3.56	4.38
Motors	AHU	EEM	RI	41	1650		4,520	25	4,520	25	3,774	2.29	6.82
Motors	AHU	EEM	RI	8.5	8000		990	1	990	1	882	3.30	4.74
Motors	AHU	EEM	RI	20.5	6000		14,483	22	14,483	22	8,795	4.18	3.74
Motors	AHU	EEM	RI	4	5000		1,671	3	1,671	3	1,075	2.08	7.51
Motors	AHU	EEM	RI	11.5	3200		1,690	5	1,690	5	1,563	3.30	4.74
Motors	AHU	EEM	RI	16.5	4000		11,586	26	11,586	26	7,789	3.45	4.53
Motors	AHU	EEM	RI	14.5	5000		18,153	33	18,153	33	11,890	2.82	5.54
Motors	AHU	EEM	RI	26.5	1000		434	4	434	4	375	1.59	9.81
Motors	AHU	EEM	RI	27	1650		1,498	8	1,498	8	1,430	2.19	7.15
Motors	AHU	EEM	RI	27.5	1650		3,498	19	3,498	19	3,338	2.19	7.15
Motors	AHU	EEM	RI	17.5	3200		1,937	5	1,937	5	1,377	2.71	5.78
Motors	AHU	EEM	RI	15	4000		3,882	9	3,882	9	2,540	3.11	5.03
Motors	AHU	EEM	RI	23	1650		871	5	871	5	885	2.02	7.73
Motors	AHU	EEM	RI	15	6000		2,676	4	2,676	4	1,830	5.01	3.12
Motors	AHU	EEM	RI	9.5	8760		1,446	1	1,446	1	782	4.12	3.79
Motors	AHU	EEM	RI	11	3200		845	2	845	2	782	3.30	4.74
Motors	AHU	EEM	RI	60.5	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	AHU	EEM	RI	9.5	4000		4,224	10	4,224	10	3,272	3.41	4.59
Motors	AHU	EEM	RI	23.5	1650		2,178	12	2,178	12	1,738	2.02	7.73

Table 2.4
All EROs: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	ER or ROF	ID	ID2	Facility or Number	First Year Energy Savings (MMBtu)	First Year Demand Savings (kW and)	Full Implementation Energy Savings (MMBtu)	Full Implementation Demand Savings (kW and)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Microns	AHU	EEM	PR	24	3200		4,282	12	4,282	12	3,500	3.56	4.39
Microns	AHU	EEM	PR	44.5	2100		7,191	31	7,191	31	5,043	2.38	8.58
Microns	AHU	EEM	PR	6	4000		1,320	3	1,320	3	828	2.39	8.53
Microns	AHU	EEM	PR	25.5	2100		554	2	554	2	438	2.25	8.83
Microns	AHU	EEM	PR	13	800		757	9	757	9	142	1.10	14.24
Microns	AHU	EEM	PR	41.5	2100		30,355	130	30,355	130	27,003	2.71	5.77
Microns	AHU	EEM	PR	20	6000		7,242	11	7,242	11	4,398	4.18	3.74
Microns	AHU	EEM	PR	15.5	8000		2,676	4	2,676	4	1,830	5.01	3.12
Microns	AHU	EEM	PR	30	3200		1,850	5	1,850	5	1,328	3.10	5.04
Microns	AHU	EEM	PR	19	2100		1,040	4	1,040	4	801	1.90	8.22
Microns	AHU	EEM	PR	9.5	800		167	2	167	2	15	1.04	15.07
Microns	AHU	EEM	PR	16.5	1050		817	4	817	4	349	1.39	11.22
Microns	AHU	EEM	PR	17	3200		969	3	969	3	689	2.71	5.76
Microns	AHU	EEM	PR	13.5	800		1,892	21	1,892	21	355	1.10	14.24
Microns	AHU	EEM	PR	14.5	6000		1,816	3	1,816	3	1,297	4.23	3.70
Microns	AHU	EEM	PR	23	5000		3,424	6	3,424	6	2,448	4.35	3.59
Microns	AHU	EEM	PR	22	1000		565	5	565	5	172	1.19	13.15
Microns	AHU	EEM	PR	44	2100		4,315	18	4,315	18	3,028	2.38	8.58
Microns	AHU	EEM	PR	30.5	3200		5,551	16	5,551	16	3,985	3.10	5.04
Microns	AHU	EEM	PR	33.5	1050		1,472	8	1,472	8	1,381	2.51	6.21
Microns	AHU	EEM	PR	10.5	4000		8,920	20	8,920	20	6,651	3.92	3.99
Microns	AHU	EEM	PR	33	1050		1,472	8	1,472	8	1,381	2.51	6.21
Microns	AHU	EEM	PR	54.5	2100		8,111	35	8,111	35	4,810	2.00	7.82
Microns	AHU	EEM	PR	11	1000		63	1	63	1	68	0.74	21.10
Microns	AHU	EEM	PR	21	5000		2,230	4	2,230	4	1,678	4.68	3.34
Microns	AHU	EEM	PR	17.5	5000		3,980	7	3,980	7	3,054	3.99	3.91
Microns	AHU	EEM	PR	58.5	2100		10,138	43	10,138	43	6,387	2.15	7.25
Microns	AHU	EEM	PR	14.5	6000		4,538	7	4,538	7	7,930	0.11	136.80
Microns	AHU	EEM	PR	19.5	2100		2,905	12	2,905	12	22,022	0.16	99.37
Microns	AHU	EEM	PR	6.5	800		1,328	15	1,328	15	50,843	0.33	48.85
Microns	AHU	EEM	PR	15.5	6000		7,431	11	7,431	11	12,212	0.11	142.82
Microns	AHU	EEM	PR	49.5	1050		11,482	63	11,708	64	92,448	0.19	88.11
Microns	AHU	EEM	PR	31.5	1000		5,912	53	5,912	53	79,688	0.24	65.73
Microns	AHU	EEM	PR	60.5	2100		29,253	125	29,796	128	282,789	0.24	65.73
Microns	AHU	EEM	PR	22.5	1000		3,715	33	3,889	35	50,887	0.24	65.90
Microns	AHU	EEM	PR	26.5	1000		1,823	16	1,914	17	24,780	0.23	69.34
Microns	AHU	EEM	PR	21.5	5000		37,147	84	37,508	84	107,232	0.02	804.84
Microns	AHU	EEM	PR	44.5	2100		25,182	108	25,796	111	154,076	0.07	214.32
Microns	AHU	EEM	PR	38.5	1050		9,025	49	9,474	52	71,510	0.18	99.80
Microns	AHU	EEM	PR	12.5	8780		32,547	33	33,884	35	28,680	0.30	51.49
Microns	AHU	EEM	PR	11.5	3200		3,305	9	3,882	10	13,272	0.05	307.32
Microns	AHU	EEM	PR	11.5	4000		29,171	86	30,822	88	80,653	0.08	245.51
Microns	AHU	EEM	PR	23.5	5000		35,974	85	36,851	86	75,196	0.08	245.51
Microns	AHU	EEM	PR	33.5	1050		4,087	22	4,256	23	50,185	0.25	62.79
Microns	AHU	EEM	PR	9.5	800		805	7	848	7	11,087	0.25	62.35
Microns	AHU	EEM	PR	54.5	2100		39,004	167	39,382	169	171,434	0.05	181.94
Microns	AHU	EEM	PR	13.5	800		9,593	108	9,827	111	167,735	0.26	61.18
Microns	AHU	EEM	PR	24.5	3200		19,816	58	20,635	58	73,287	0.08	263.57
Microns	AHU	EEM	PR	8.5	6000		1,880	2	1,887	3	3,446	0.08	194.43
Microns	AHU	EEM	PR	20.5	6000		89,850	104	70,944	108	117,713	0.10	163.05
Microns	AHU	EEM	PR	30.5	3200		17,503	49	18,373	52	64,063	0.08	248.24
Microns	AHU	EEM	PR	9.5	4000		8,263	19	9,004	20	25,581	0.02	924.54
Microns	AHU	EEM	PR	41.5	1050		31,657	173	32,429	177	252,989	0.18	84.62
Microns	AHU	EEM	PR	23.5	1050		4,280	25	4,643	25	36,978	0.18	84.62
Microns	AHU	EEM	PR	13.5	1000		277	2	311	3	4,595	0.25	63.42
Microns	AHU	EEM	PR	27.5	1050		8,737	48	9,355	51	73,593	0.17	89.85
Microns	AHU	EEM	PR	58.5	2100		48,755	209	49,861	213	299,087	0.16	97.98
Microns	AHU	EEM	PR	17.5	3200		4,841	14	5,184	15	19,056	0.07	211.81
Microns	AHU	EEM	PR	33.5	3200		84,419	237	85,477	243	313,294	0.07	238.00
Microns	AHU	EEM	PR	16.5	1050		1,370	7	1,541	8	13,304	0.20	77.00

Table 3.4
All EROs: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	PI or RCF	ID	Q2	Facility or Factory Number	First Year Energy Savings (\$/HR)	First Year Demand Savings kW/HR	Full Implementation Energy Savings (\$/HR)	Full Implementation Demand Savings kW/HR	Net Present Value (\$/HR)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	VSD to existing rate	PI	65	4000		4,427	10	4,980	11	15,837	-0.05	298.11
Motors	AHU	VSD to existing rate	PI	255	2100		1,084	5	1,182	5	7,193	-0.15	103.12
Motors	AHU	VSD to existing rate	PI	165	4000		55,720	125	58,755	128	158,536	-0.01	1,057.55
Motors	AHU	VSD to existing rate	PI	505	2100		29,674	127	30,263	130	182,503	-0.16	98.52
Motors	AHU	VSD to existing rate	PI	95	8760		2,424	2	2,727	3	2,856	0.23	89.35
Motors	AHU	VSD to existing rate	PI	465	1650		7,682	42	7,736	42	42,701	0.20	79.44
Motors	AHU	VSD to existing rate	PI	145	5000		30,433	55	34,237	62	79,384	0.02	735.41
Motors	AHU	VSD to existing rate	PI	355	2100		104,033	446	108,336	464	833,388	0.14	108.40
Motors	AHU	VSD to existing rate	PI	205	1000		758	7	810	7	10,966	0.24	68.25
Motors	AHU	VSD to existing rate	PI	315	2100		1,589	7	1,701	7	10,247	0.15	100.93
Motors	AHU	VSD to existing rate	PI	105	4000		24,770	58	25,794	58	70,004	-0.01	1,430.63
Motors	AHU	VSD to existing rate	PI	415	2100		95,719	410	100,477	431	550,600	0.13	121.63
Motors	AHU	VSD to existing rate	PI	405	3200		14,858	42	15,003	42	55,398	0.09	204.45
Motors	AHU	VSD to existing rate	PI	175	5000		7,746	14	8,441	15	17,653	0.06	269.50
Motors	AHU	VSD & EEM	PI	145	6000		5,159	8	5,159	8	7,930	0.12	132.05
Motors	AHU	VSD & EEM	PI	415	1650		34,421	188	34,421	188	253,541	0.01	2,686.82
Motors	AHU	VSD & EEM	PI	245	3200		21,919	62	21,919	62	73,323	0.18	84.56
Motors	AHU	VSD & EEM	PI	305	3200		19,488	55	19,488	55	64,272	-0.06	265.17
Motors	AHU	VSD & EEM	PI	385	1650		10,048	55	10,048	55	72,026	-0.18	85.04
Motors	AHU	VSD & EEM	PI	155	6000		8,220	12	8,220	12	12,189	0.12	132.05
Motors	AHU	VSD & EEM	PI	105	4000		27,399	62	27,399	62	70,204	0.01	2,686.82
Motors	AHU	VSD & EEM	PI	95	8760		2,900	3	2,900	3	2,861	0.24	65.45
Motors	AHU	VSD & EEM	PI	195	2100		3,476	15	3,476	15	22,107	-0.16	98.73
Motors	AHU	VSD & EEM	PI	505	2100		32,120	138	32,120	138	183,512	0.16	98.87
Motors	AHU	VSD & EEM	PI	315	1000		6,267	56	6,267	56	79,742	0.24	66.08
Motors	AHU	VSD & EEM	PI	275	1650		9,930	54	9,930	54	73,739	0.17	89.49
Motors	AHU	VSD & EEM	PI	545	2100		41,765	179	41,765	179	172,121	-0.08	185.42
Motors	AHU	VSD & EEM	PI	95	800		688	8	688	8	11,257	-0.25	61.27
Motors	AHU	VSD & EEM	PI	85	6000		1,988	3	1,988	3	3,453	0.08	192.45
Motors	AHU	VSD & EEM	PI	165	1650		1,639	9	1,639	9	13,652	0.21	74.07
Motors	AHU	VSD & EEM	PI	265	1000		2,030	18	2,030	18	24,794	-0.23	69.28
Motors	AHU	VSD & EEM	PI	335	1650		4,521	25	4,521	25	50,268	-0.25	62.68
Motors	AHU	VSD & EEM	PI	115	4000		32,480	73	32,480	73	80,720	0.00	3,521.50
Motors	AHU	VSD & EEM	PI	135	1000		331	3	331	3	4,722	-0.26	60.89
Motors	AHU	VSD & EEM	PI	135	800		10,431	117	10,431	117	189,136	-0.16	98.77
Motors	AHU	VSD & EEM	PI	585	2100		52,640	226	52,640	226	300,297	0.08	198.94
Motors	AHU	VSD & EEM	PI	215	5000		8,650	12	8,650	12	12,738	-0.02	849.34
Motors	AHU	VSD & EEM	PI	155	4000		39,776	89	39,776	89	107,310	-0.07	209.34
Motors	AHU	VSD & EEM	PI	405	3200		15,911	45	15,911	45	55,617	-0.07	219.18
Motors	AHU	VSD & EEM	PI	175	3200		5,502	15	5,502	15	19,219	0.24	65.18
Motors	AHU	VSD & EEM	PI	205	1000		880	8	880	8	11,120	-0.20	79.17
Motors	AHU	VSD & EEM	PI	465	1650		8,204	45	8,204	45	63,083	-0.05	236.09
Motors	AHU	VSD & EEM	PI	65	4000		5,297	12	5,297	12	16,138	0.19	86.79
Motors	AHU	VSD & EEM	PI	495	1650		12,408	68	12,408	68	92,852	0.07	228.90
Motors	AHU	VSD & EEM	PI	235	5000		39,115	70	39,115	70	75,189	-0.19	83.52
Motors	AHU	VSD & EEM	PI	235	1650		4,941	27	4,941	27	37,558	-0.07	238.60
Motors	AHU	VSD & EEM	PI	335	3200		91,789	258	91,789	258	313,494	0.32	49.07
Motors	AHU	VSD & EEM	PI	125	8760		36,002	37	36,002	37	28,270	0.14	104.48
Motors	AHU	VSD & EEM	PI	175	5000		8,984	16	8,984	16	17,736	0.10	150.89
Motors	AHU	VSD & EEM	PI	355	2100		115,075	493	115,075	493	634,138	-0.16	100.48
Motors	AHU	VSD & EEM	PI	205	6000		75,200	113	75,200	113	116,808	-0.15	102.04
Motors	AHU	VSD & EEM	PI	315	2100		1,805	8	1,805	8	10,365	-0.34	48.36
Motors	AHU	VSD & EEM	PI	255	2100		1,258	5	1,258	5	7,297	-0.01	1,183.50
Motors	AHU	VSD & EEM	PI	165	4000		60,180	135	60,180	135	158,516	-0.01	1,263.78
Motors	AHU	VSD & EEM	PI	65	800		1,589	18	1,589	18	51,306	0.02	638.83
Motors	AHU	VSD & EEM	PI	95	4000		9,583	22	9,583	22	25,797	0.05	309.32
Motors	AHU	VSD & EEM	PI	605	2100		31,584	135	31,584	135	294,295	-0.24	65.29
Motors	AHU	VSD & EEM	PI	145	5000		36,414	66	36,414	66	80,654	-0.02	638.83
Motors	AHU	VSD & EEM	PI	115	3200		3,833	11	3,833	11	13,295	0.05	309.32
Motors	AHU	VSD & EEM	PI	225	1000		4,110	37	4,110	37	51,395	-0.24	65.29
Motors	AHU	VSD & EEM	PI	415	2100		108,574	457	108,574	457	549,753	-0.13	123.29

Table 2.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	W or R/F	ID	ID2	Facility or Furniture Number	First Year Energy Savings (\$/HR)	First Year Demand Savings (\$/HR)	Full Implement Energy Savings (\$/HR)	Full Implement Demand Savings (\$/HR)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	VSD & EEM	R	44.5	2100		27,380	117	27,380	117	155,043	-0.16	100.03
Motors	AHU	EEM	R/F	30	3200		0	0	372	1	929	3.01	5.19
Motors	AHU	EEM	R/F	13.5	1000		0	0	20	0	42	1.20	13.07
Motors	AHU	EEM	R/F	9.5	800		0	0	40	0	129	1.44	10.84
Motors	AHU	EEM	R/F	9	4000		0	0	290	1	1,195	3.40	4.59
Motors	AHU	EEM	R/F	6.5	4000		0	0	317	1	1,296	2.49	6.27
Motors	AHU	EEM	R/F	4	5000		0	0	199	0	1,048	2.28	8.85
Motors	AHU	EEM	R/F	41	1650		0	0	996	5	3,654	2.41	6.49
Motors	AHU	EEM	R/F	33	1650		0	0	265	1	1,374	2.63	5.94
Motors	AHU	EEM	R/F	31.5	1000		0	0	98	1	451	1.69	9.23
Motors	AHU	EEM	R/F	9	8760		0	0	355	3	919	1.72	9.09
Motors	AHU	EEM	R/F	12	8760		0	0	173	0	623	3.87	4.03
Motors	AHU	EEM	R/F	17.5	5000		0	0	1,408	1	3,267	5.93	2.63
Motors	AHU	EEM	R/F	16.5	4000		0	0	543	1	2,140	3.87	4.04
Motors	AHU	EEM	R/F	40.5	3200		0	0	3,405	8	6,902	3.47	4.50
Motors	AHU	EEM	R/F	16	2100		0	0	908	3	1,341	2.52	6.19
Motors	AHU	EEM	R/F	15	6000		0	0	386	2	3,195	2.11	7.41
Motors	AHU	EEM	R/F	22.5	1000		0	0	481	1	1,173	4.52	3.46
Motors	AHU	EEM	R/F	14.5	6000		0	0	241	2	519	1.52	10.29
Motors	AHU	EEM	R/F	14	5000		0	0	299	0	1,245	4.35	3.59
Motors	AHU	EEM	R/F	9.5	8760		0	0	1,187	2	4,776	2.83	5.51
Motors	AHU	EEM	R/F	15.5	4000		0	0	173	0	623	3.87	4.03
Motors	AHU	EEM	R/F	12.5	8760		0	0	2,270	5	4,602	3.15	4.96
Motors	AHU	EEM	R/F	31.5	2100		0	0	2,108	2	4,931	5.93	2.63
Motors	AHU	EEM	R/F	15.5	6000		0	0	105	0	379	2.29	6.83
Motors	AHU	EEM	R/F	19.5	2100		0	0	481	1	1,173	4.52	3.46
Motors	AHU	EEM	R/F	58	2100		0	0	2,081	6	1,389	2.01	7.77
Motors	AHU	EEM	R/F	6.5	800		0	0	1,490	13	2,447	2.21	7.07
Motors	AHU	EEM	R/F	11	4000		0	0	2,979	1	4,894	2.21	7.07
Motors	AHU	EEM	R/F	9.5	4000		0	0	95	0	215	0.83	18.71
Motors	AHU	EEM	R/F	9.5	4000		0	0	929	2	2,234	3.42	4.57
Motors	AHU	EEM	R/F	50	2100		0	0	579	1	2,389	3.40	4.59
Motors	AHU	EEM	R/F	19	2100		0	0	918	4	1,791	2.24	6.96
Motors	AHU	EEM	R/F	3	4000		0	0	125	1	634	2.01	7.77
Motors	AHU	EEM	R/F	31	2100		0	0	40	0	174	1.96	7.99
Motors	AHU	EEM	R/F	6	4000		0	0	105	0	379	2.29	6.83
Motors	AHU	EEM	R/F	13	1000		0	0	158	0	648	2.49	6.27
Motors	AHU	EEM	R/F	23.5	5000		0	0	2,764	4	5,398	4.11	3.80
Motors	AHU	EEM	R/F	11	5000		0	0	2,452	4	16,996	3.21	4.87
Motors	AHU	EEM	R/F	33	3200		0	0	2,415	7	8,091	3.39	4.60
Motors	AHU	EEM	R/F	44	2100		0	0	160	1	346	1.52	10.29
Motors	AHU	EEM	R/F	7	1000		0	0	951	4	2,298	2.43	6.42
Motors	AHU	EEM	R/F	33.5	3200		0	0	40	0	48	1.07	14.65
Motors	AHU	EEM	R/F	13	800		0	0	5,312	15	17,601	3.39	4.60
Motors	AHU	EEM	R/F	8.5	6000		0	0	241	3	457	1.43	10.94
Motors	AHU	EEM	R/F	30.5	3200		0	0	1,119	0	683	3.42	4.57
Motors	AHU	EEM	R/F	21	5000		0	0	1,115	3	2,787	3.01	5.19
Motors	AHU	EEM	R/F	49	1650		0	0	401	1	1,246	4.46	3.50
Motors	AHU	EEM	R/F	11.5	4000		0	0	702	4	1,232	2.06	7.56
Motors	AHU	EEM	R/F	16	4000		0	0	1,856	4	4,468	3.42	4.57
Motors	AHU	EEM	R/F	16	4000		0	0	1,702	4	3,491	3.47	4.50
Motors	AHU	EEM	R/F	17	5000		0	0	15	0	42	1.22	12.80
Motors	AHU	EEM	R/F	2	1000		0	0	362	1	1,427	3.87	4.04
Motors	AHU	EEM	R/F	10.5	4000		0	0	6	0	19	1.12	13.99
Motors	AHU	EEM	R/F	24.5	3200		0	0	1,805	4	4,451	3.67	4.25
Motors	AHU	EEM	R/F	26.5	1000		0	0	1,284	4	5,635	3.67	4.25
Motors	AHU	EEM	R/F	5	2100		0	0	116	1	409	1.70	9.19
Motors	AHU	EEM	R/F	20	6000		0	0	27	0	174	1.53	10.20
Motors	AHU	EEM	R/F	10	4000		0	0	2,128	3	2,707	3.88	4.25
Motors	AHU	EEM	R/F	10	4000		0	0	963	2	2,671	3.67	4.25

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	ROF	23	5000		0	0	755	1	1,799	4.11	3.80
Motors	AHU	EEM	ROF	11.5	3200		0	0	232	1	1,534	3.44	4.54
Motors	AHU	EEM	ROF	17	3200		0	0	159	0	520	2.77	5.84
Motors	AHU	EEM	ROF	41.5	1650		0	0	1,992	11	7,308	2.41	6.49
Motors	AHU	EEM	ROF	41	2100		0	0	2,926	13	12,157	2.67	5.84
Motors	AHU	EEM	ROF	24	3200		0	0	770	2	3,381	3.67	4.25
Motors	AHU	EEM	ROF	54.5	2100		0	0	2,383	10	3,839	2.09	7.47
Motors	AHU	EEM	ROF	38	1650		0	0	192	1	565	2.22	7.03
Motors	AHU	EEM	ROF	16	1650		0	0	65	0	301	1.69	9.23
Motors	AHU	EEM	ROF	41.5	2100		0	0	6,097	26	25,243	2.66	5.87
Motors	AHU	EEM	ROF	27	1650		0	0	246	1	1,458	6.77	6.77
Motors	AHU	EEM	ROF	44.5	2100		0	0	1,585	7	3,830	2.43	6.42
Motors	AHU	EEM	ROF	14	1650		0	0	101	1	901	1.94	8.07
Motors	AHU	EEM	ROF	35.5	2100		0	0	6,739	29	32,593	2.93	5.33
Motors	AHU	EEM	ROF	23	1550		0	0	120	1	650	2.31	6.77
Motors	AHU	EEM	ROF	46.5	1650		0	0	468	3	804	1.91	8.17
Motors	AHU	EEM	ROF	60	2100		0	0	1,788	8	2,933	2.26	6.90
Motors	AHU	EEM	ROF	17.5	3200		0	0	319	1	1,040	2.77	5.64
Motors	AHU	EEM	ROF	60.5	2100		0	0	1,788	8	2,933	2.26	6.90
Motors	AHU	EEM	ROF	11	3200		0	0	116	0	767	3.44	4.54
Motors	AHU	EEM	ROF	21.5	5000		0	0	401	1	1,246	4.46	3.50
Motors	AHU	EEM	ROF	13.5	800		0	0	604	7	1,142	1.43	10.94
Motors	AHU	EEM	ROF	15	4000		0	0	1,135	3	2,301	3.15	4.96
Motors	AHU	EEM	ROF	35	2100		0	0	3,369	14	16,296	2.93	5.33
Motors	AHU	EEM	ROF	20.5	1000		0	0	50	0	146	1.50	10.45
Motors	AHU	EEM	ROF	50.5	2100		0	0	1,837	8	3,582	2.24	6.96
Motors	AHU	EEM	ROF	25.5	2100		0	0	76	0	377	2.52	6.20
Motors	AHU	EEM	ROF	14.5	5000		0	0	2,176	4	8,755	2.83	5.51
Motors	AHU	EEM	ROF	33.5	1650		0	0	265	1	1,374	2.63	5.94
Motors	AHU	EEM	ROF	38.5	1650		0	0	575	3	1,694	2.22	7.03
Motors	AHU	EEM	ROF	54	2100		0	0	596	3	960	2.09	7.47
Motors	AHU	EEM	ROF	23.5	1650		0	0	299	2	1,625	2.31	6.77
Motors	AHU	EEM	ROF	49.5	1650		0	0	702	4	1,232	2.06	7.58
Motors	AHU	EEM	ROF	27.5	1650		0	0	575	3	3,401	2.31	6.77
Motors	AHU	EEM	ROF	20.5	6000		0	0	4,256	6	5,413	3.68	4.25
Motors	Air Compressor	EEM	RI	10	800		223	3	223	3	294	1.73	9.02
Motors	Air Compressor	EEM	RI	14	800		757	11	757	11	333	1.23	12.72
Motors	Air Compressor	EEM	RI	11	800		678	10	678	10	318	1.23	12.68
Motors	Air Compressor	EEM	RI	12	800		347	5	347	5	403	1.64	9.54
Motors	Air Compressor	EEM	RI	19	800		3,071	46	3,071	46	3,325	1.70	9.20
Motors	Air Compressor	EEM	RI	7	800		2,565	38	2,565	38	1,348	1.15	13.63
Motors	Air Compressor	EEM	ROF	12	800		0	0	93	1	435	1.74	8.95
Motors	Air Compressor	EEM	ROF	10	800		0	0	53	1	315	1.85	8.46
Motors	Air Compressor	EEM	ROF	7	800		0	0	491	7	2,147	1.25	12.48
Motors	Air Compressor	EEM	ROF	19	800		0	0	1,021	15	3,510	1.80	8.70
Motors	Air Compressor	EEM	ROF	14	800		0	0	241	4	556	1.52	10.27
Motors	Air Compressor	EEM	ROF	11	800		0	0	193	3	551	1.55	10.07
Motors	BLAST HEATER	EEM	RI	45	2100		5,753	16	5,753	16	4,174	2.43	6.44
Motors	BLAST HEATER	EEM	RI	32.5	2100		3,178	9	3,178	9	2,539	2.26	6.90
Motors	BLAST HEATER	EEM	RI	42	1650		2,260	8	2,260	8	1,682	2.15	7.26
Motors	BLAST HEATER	EEM	RI	8.5	3200		4,225	8	4,225	8	2,910	2.22	7.02
Motors	BLAST HEATER	EEM	RI	8	3200		1,584	3	1,584	3	1,091	2.22	7.02
Motors	BLAST HEATER	EEM	RI	17.5	1650		272	1	272	1	176	1.59	9.82
Motors	BLAST HEATER	EEM	RI	7.5	4000		10,562	16	10,562	16	7,372	2.55	6.12
Motors	BLAST HEATER	EEM	RI	14.5	1000		103	1	103	1	15	1.05	14.88
Motors	BLAST HEATER	EEM	RI	20	2100		3,466	10	3,466	10	2,303	1.78	8.90
Motors	BLAST HEATER	EEM	RI	45.5	2100		12,944	37	12,944	37	9,290	2.43	6.44
Motors	BLAST HEATER	EEM	RI	25.5	3200		19,980	37	19,980	37	15,024	3.35	4.66
Motors	BLAST HEATER	EEM	RI	32	2100		1,907	5	1,907	5	1,523	2.26	6.90
Motors	BLAST HEATER	EEM	RI	20.5	2100		6,585	19	6,585	19	4,375	1.78	8.80
Motors	BLAST HEATER	EEM	RI	25	3200		9,990	19	9,990	19	7,512	3.35	4.68

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mc)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mc)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	BLAST HEATER	EEM	Ri	18	3200		20,342	38	20,342	38	15,561	2.84	5.49
Motors	BLAST HEATER	EEM	Ri	42.5	1650		2,260	8	2,260	8	1,682	2.15	7.26
Motors	BLAST HEATER	EEM	Ri	18.5	3200		38,746	73	38,746	73	29,639	2.84	5.49
Motors	BLAST HEATER	EEM	Ri	14	1000		103	1	103	1	15	1.05	14.88
Motors	BLAST HEATER	EEM	Ri	7	4000		5,281	8	5,281	8	3,686	2.55	6.12
Motors	BLAST HEATER	VSD to existing mtr	Ri	17.5	1650		638	2	675	2	-1,239	0.20	78.49
Motors	BLAST HEATER	VSD to existing mtr	Ri	14.5	1000		387	2	409	2	-2,131	-0.05	322.05
Motors	BLAST HEATER	VSD to existing mtr	Ri	8.5	3200		9,901	19	10,465	20	-8,162	0.42	37.00
Motors	BLAST HEATER	VSD to existing mtr	Ri	32.5	2100		11,123	32	11,434	33	-2,200	0.81	19.30
Motors	BLAST HEATER	VSD to existing mtr	Ri	45.5	2100		63,531	182	63,723	182	32,915	2.11	7.41
Motors	BLAST HEATER	VSD to existing mtr	Ri	7.5	4000		24,753	37	26,163	39	-12,935	0.55	28.26
Motors	BLAST HEATER	VSD to existing mtr	Ri	42.5	1650		11,093	44	11,126	40	3,482	1.46	10.69
Motors	BLAST HEATER	VSD to existing mtr	Ri	20.5	2100		15,432	44	16,311	47	-27,797	0.20	80.04
Motors	BLAST HEATER	VSD to existing mtr	Ri	25.5	3200		77,723	146	78,659	147	36,881	2.12	7.37
Motors	BLAST HEATER	VSD to existing mtr	Ri	18.5	3200		135,592	254	139,390	261	24,471	1.27	12.30
Motors	BLAST HEATER	VSD & EEM	Ri	18.5	3200		145,763	273	145,763	273	22,983	1.25	12.48
Motors	BLAST HEATER	VSD & EEM	Ri	32.5	2100		11,957	34	11,957	34	-2,422	0.79	19.72
Motors	BLAST HEATER	VSD & EEM	Ri	17.5	1650		707	3	707	3	-1,260	0.19	81.54
Motors	BLAST HEATER	VSD & EEM	Ri	25.5	3200		82,253	154	82,253	154	36,334	2.09	7.47
Motors	BLAST HEATER	VSD & EEM	Ri	20.5	2100		17,100	49	17,100	49	-28,429	0.18	84.58
Motors	BLAST HEATER	VSD & EEM	Ri	45.5	2100		66,575	190	66,575	190	32,299	2.08	7.53
Motors	BLAST HEATER	VSD & EEM	Ri	7.5	4000		27,429	41	27,429	41	-13,391	0.54	28.85
Motors	BLAST HEATER	VSD & EEM	Ri	8.5	3200		10,972	21	10,972	21	37,91	0.41	21
Motors	BLAST HEATER	VSD & EEM	Ri	42.5	1650		11,624	42	11,624	42	3,267	1.43	10.95
Motors	BLAST HEATER	VSD & EEM	Ri	14.5	1000		429	3	429	3	-2,179	-0.06	259.77
Motors	BLAST HEATER	EEM	ROF	32	2100		0	0	314	1	1,544	2.38	6.55
Motors	BLAST HEATER	EEM	ROF	25.5	3200		0	0	3,594	7	14,570	3.47	4.50
Motors	BLAST HEATER	EEM	ROF	7	4000		0	0	633	1	3,661	2.67	5.86
Motors	BLAST HEATER	EEM	ROF	14	1000		0	0	20	0	43	1.16	13.52
Motors	BLAST HEATER	EEM	ROF	7.5	4000		0	0	1,266	2	7,323	2.67	5.86
Motors	BLAST HEATER	EEM	ROF	8	3200		0	0	190	0	1,103	2.34	6.68
Motors	BLAST HEATER	EEM	ROF	20	2100		0	0	415	1	2,436	1.89	8.28
Motors	BLAST HEATER	EEM	ROF	14.5	1000		0	0	20	0	43	1.16	13.52
Motors	BLAST HEATER	EEM	ROF	42.5	1650		0	0	498	2	1,701	2.26	6.92
Motors	BLAST HEATER	EEM	ROF	45.5	2100		0	0	2,852	8	9,330	2.53	6.17
Motors	BLAST HEATER	EEM	ROF	18.5	3200		0	0	6,373	12	29,214	2.97	5.27
Motors	BLAST HEATER	EEM	ROF	18	3200		0	0	3,346	6	15,337	2.97	5.27
Motors	BLAST HEATER	EEM	ROF	25	3200		0	0	1,797	3	7,285	3.47	4.50
Motors	BLAST HEATER	EEM	ROF	32.5	2100		0	0	523	1	2,573	2.38	6.55
Motors	BLAST HEATER	EEM	ROF	20.5	2100		0	0	789	2	4,628	1.89	8.28
Motors	BLAST HEATER	EEM	ROF	8.5	3200		0	0	506	1	2,940	2.34	6.68
Motors	BLAST HEATER	EEM	ROF	42	1650		0	0	498	2	1,701	2.26	6.92
Motors	BLAST HEATER	EEM	ROF	45	2100		0	0	1,268	4	4,147	2.53	6.17
Motors	BLAST HEATER	EEM	ROF	17.5	1650		0	0	33	0	193	1.70	9.18
Motors	CABINET HEATER	EEM	Ri	4	4000		2,005	3	2,005	3	1,412	1.94	8.03
Motors	CABINET HEATER	EEM	Ri	4	3200		535	1	535	1	372	1.75	8.94
Motors	CABINET HEATER	EEM	Ri	6	2100		3,566	10	3,566	10	2,459	1.44	10.86
Motors	CABINET HEATER	EEM	Ri	5	5000		14,618	18	14,618	18	7,743	1.89	8.27
Motors	CABINET HEATER	EEM	Ri	8	1000		65	5	65	5	-203	0.59	26.35
Motors	CABINET HEATER	EEM	Ri	2	1650		1,457	5	1,457	5	979	1.34	11.69
Motors	CABINET HEATER	EEM	Ri	3	1000		201	1	201	1	-23	0.98	15.89
Motors	CABINET HEATER	EEM	Ri	11	2100		1,228	4	1,228	4	830	1.48	10.58
Motors	CABINET HEATER	EEM	Ri	7	1650		138	1	138	1	91	1.36	11.45
Motors	CABINET HEATER	EEM	Ri	1	4000		543	1	543	1	392	1.87	8.34
Motors	CABINET HEATER	EEM	Ri	5	8760		1,464	1	1,464	1	831	2.67	5.85
Motors	CABINET HEATER	EEM	Ri	1	5000		9,170	11	9,170	11	7,157	2.18	7.15
Motors	CABINET HEATER	EEM	ROF	4	4000		0	0	239	0	1,475	2.07	7.55
Motors	CABINET HEATER	EEM	ROF	5	5000		0	0	1,740	2	7,533	2.14	7.31
Motors	CABINET HEATER	EEM	ROF	5	8760		0	0	174	0	677	2.79	5.60
Motors	CABINET HEATER	EEM	ROF	6	2100		0	0	337	1	2,910	1.56	10.00
Motors	CABINET HEATER	EEM	ROF	7	1650		0	0	16	0	112	1.49	10.52

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Rt or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	CABINET HEATER	EEM	ROF	11	2100		0	0	146	0	982	1.60	9.78
Motors	CABINET HEATER	EEM	ROF	1	4000		0	0	51	0	414	2.00	7.81
Motors	CABINET HEATER	EEM	ROF	8	1000		0	0	20	0	18	1.05	14.92
Motors	CABINET HEATER	EEM	ROF	4	3200		0	0	64	0	400	1.87	8.36
Motors	CABINET HEATER	EEM	ROF	3	1000		0	0	39	0	126	1.10	14.18
Motors	CABINET HEATER	EEM	ROF	1	5000		0	0	87	1	6,831	2.17	7.18
Motors	CABINET HEATER	EEM	ROF	2	1850		0	0	138	1	1,234	1.46	10.71
Motors	Chilled Wtr Pump	EEM	Rt	28	1650		499	2	499	2	271	1.67	9.33
Motors	Chilled Wtr Pump	EEM	Rt	43.5	3200		3,862	7	3,862	7	2,249	2.62	5.95
Motors	Chilled Wtr Pump	EEM	Rt	46	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Chilled Wtr Pump	EEM	Rt	18.5	1650		272	1	272	1	78	1.26	12.38
Motors	Chilled Wtr Pump	EEM	Rt	36.5	2100		937	3	937	3	606	2.33	6.71
Motors	Chilled Wtr Pump	EEM	Rt	55.5	2100		2,028	6	2,028	6	1,003	1.83	8.52
Motors	Chilled Wtr Pump	EEM	Rt	15.5	1000		103	1	103	1	86	0.71	22.03
Motors	Chilled Wtr Pump	EEM	Rt	63.5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Chilled Wtr Pump	EEM	Rt	39.5	1650		954	3	954	3	447	1.71	9.15
Motors	Chilled Wtr Pump	EEM	Rt	4	1650		134	0	134	0	4	1.02	15.37
Motors	Chilled Wtr Pump	EEM	Rt	34.5	1650		736	3	736	3	458	2.01	7.79
Motors	Chilled Wtr Pump	EEM	Rt	20.5	5000		1,514	2	1,514	2	1,026	3.55	4.40
Motors	Chilled Wtr Pump	EEM	Rt	19	3200		969	2	969	2	620	2.54	6.14
Motors	Chilled Wtr Pump	EEM	Rt	66.5	2100		4,093	12	4,093	12	1,798	1.78	8.79
Motors	Chilled Wtr Pump	EEM	Rt	46.5	2100		4,315	12	4,315	12	2,579	2.18	7.18
Motors	Chilled Wtr Pump	EEM	Rt	34	1650		736	3	736	3	458	2.01	7.79
Motors	Chilled Wtr Pump	EEM	Rt	26	2100		554	2	554	2	377	2.11	7.41
Motors	Chilled Wtr Pump	EEM	Rt	48.5	1650		1,991	7	1,991	7	979	1.71	9.15
Motors	Chilled Wtr Pump	EEM	Rt	26	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Chilled Wtr Pump	EEM	Rt	18.5	4000		7,033	11	7,033	11	4,140	3.10	5.04
Motors	Chilled Wtr Pump	EEM	Rt	59.5	2100		2,535	7	2,535	7	1,348	1.97	7.91
Motors	Chilled Wtr Pump	EEM	Rt	12	2100		175	1	175	1	22	1.09	14.36
Motors	Chilled Wtr Pump	EEM	Rt	39	1650		954	3	954	3	447	1.71	9.15
Motors	Chilled Wtr Pump	EEM	Rt	34.5	3200		4,383	8	4,383	8	2,798	2.91	5.36
Motors	Chilled Wtr Pump	EEM	Rt	16.5	6000		2,676	3	2,676	3	1,730	4.79	3.28
Motors	Chilled Wtr Pump	EEM	Rt	26.5	3200		2,854	5	2,854	5	1,935	3.12	5.00
Motors	Chilled Wtr Pump	EEM	Rt	19.5	3200		969	2	969	2	620	2.54	6.14
Motors	Chilled Wtr Pump	EEM	Rt	63	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Chilled Wtr Pump	EEM	Rt	27.5	1000		434	3	434	3	86	1.14	13.76
Motors	Chilled Wtr Pump	EEM	Rt	12	5000		665	1	665	1	422	2.62	5.96
Motors	Chilled Wtr Pump	EEM	Rt	51.5	2100		10,793	31	10,793	31	5,858	1.99	7.85
Motors	Chilled Wtr Pump	EEM	Rt	21.5	2100		347	1	347	1	135	1.45	10.74
Motors	Chilled Wtr Pump	EEM	Rt	28.5	1650		499	2	499	2	271	1.67	9.33
Motors	Chilled Wtr Pump	EEM	Rt	26.5	2100		554	2	554	2	377	2.11	7.41
Motors	Chilled Wtr Pump	EEM	Rt	24.5	5000		4,283	5	4,283	5	2,710	3.75	4.17
Motors	Chilled Wtr Pump	EEM	Rt	9.5	6000		990	1	990	1	568	2.91	5.36
Motors	Chilled Wtr Pump	EEM	Rt	34	3200		2,192	4	2,192	4	1,399	2.91	5.36
Motors	Chilled Wtr Pump	EEM	Rt	8	1650		276	1	276	1	14	0.97	16.07
Motors	Chilled Wtr Pump	EEM	Rt	13.5	8760		5,999	4	5,999	4	3,776	6.17	2.53
Motors	Chilled Wtr Pump	EEM	Rt	28.5	1000		473	3	473	3	38	1.05	14.85
Motors	Chilled Wtr Pump	EEM	Rt	43.5	1650		1,130	4	1,130	4	639	1.87	8.34
Motors	Chilled Wtr Pump	EEM	Rt	23.5	6000		8,690	9	8,690	9	5,017	4.16	3.76
Motors	Chilled Wtr Pump	EEM	Rt	17.5	800		632	5	632	5	54	0.96	16.35
Motors	Chilled Wtr Pump	EEM	Rt	37.5	3200		2,741	5	2,741	5	1,634	2.66	5.88
Motors	Chilled Wtr Pump	EEM	Rt	51	2100		5,396	15	5,396	15	2,929	1.99	7.85
Motors	Chilled Wtr Pump	EEM	Rt	9.5	6000		1,660	2	1,660	2	1,026	0.46	34.24
Motors	Chilled Wtr Pump	EEM	Rt	23.5	6000		41,790	42	42,566	43	3,626	1.15	13.56
Motors	Chilled Wtr Pump	EEM	Rt	36.5	2100		2,601	7	2,708	8	3,483	0.26	59.81
Motors	Chilled Wtr Pump	EEM	Rt	63.5	2100		58,094	166	59,473	170	-62,921	0.33	47.96
Motors	Chilled Wtr Pump	EEM	Rt	27.5	1000		11,914	11	11,914	11	-6,282	0.05	344.33
Motors	Chilled Wtr Pump	EEM	Rt	37.5	3200		11,305	21	11,537	22	-5,523	0.56	27.96
Motors	Chilled Wtr Pump	EEM	Rt	20.5	5000		3,782	5	4,050	5	-963	0.72	21.61
Motors	Chilled Wtr Pump	EEM	Rt	21.5	2100		581	2	654	2	-1,870	0.01	1,724.20
Motors	Chilled Wtr Pump	EEM	Rt	15.5	1000		277	2	311	2	-2,141	-0.13	-115.92

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	34.5	3200		15,349	29	15,723	29	-7,505	0.56	27.90
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	28.5	1650		1,248	5	1,336	5	-3,152	0.09	168.96
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	51.5	2100		44,512	127	45,425	130	-51,537	0.31	51.01
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	66.5	2100		24,008	69	24,281	69	-26,684	0.31	50.19
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	48.5	1650		9,577	35	9,755	35	-16,589	0.19	82.37
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	18.5	4000		36,885	55	37,761	57	-8,255	0.80	19.55
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	34.5	1650		2,044	7	2,128	8	-3,956	0.16	97.12
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	24.5	5000		17,663	21	18,026	22	-192	0.98	15.87
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	13.5	8760		21,009	14	21,521	15	5,743	1.66	9.42
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	19.5	3200		2,421	5	2,592	5	-2,139	0.38	40.67
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	18.5	1650		457	2	514	2	-1,981	-0.05	-313.95
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	46.5	2100		15,109	43	15,477	44	-18,188	0.29	53.07
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	55.5	2100		9,751	28	9,845	28	-11,554	0.30	52.90
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	39.5	1650		3,008	11	3,158	11	-5,283	0.19	82.89
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	43.5	3200		18,573	35	18,918	35	-9,055	0.56	28.01
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	43.5	1650		3,957	14	4,054	15	-7,155	0.18	86.88
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	28.5	1000		2,398	14	2,457	15	-8,465	0.03	527.93
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	59.5	2100		12,189	35	12,415	35	-14,402	0.30	52.69
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	17.5	800		3,715	28	3,751	28	-16,583	-0.01	-1,375.66
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	26.5	3200		7,926	15	8,254	15	-4,842	0.49	31.64
Motors	Chilled Wtr Pump	VSD to existing mtr	RI	26.5	2100		1,084	7	7,738	8	114	1.02	15.25
Motors	Chilled Wtr Pump	VSD & EEM	RI	43.5	1650		4,303	16	4,303	16	-2,272	0.14	110.30
Motors	Chilled Wtr Pump	VSD & EEM	RI	13.5	8760		22,843	16	22,843	16	5,927	1.67	9.38
Motors	Chilled Wtr Pump	VSD & EEM	RI	24.5	5000		19,119	23	19,119	23	-203	0.98	15.88
Motors	Chilled Wtr Pump	VSD & EEM	RI	48.5	1650		10,340	38	10,340	38	-17,003	0.18	85.50
Motors	Chilled Wtr Pump	VSD & EEM	RI	19.5	3200		2,751	5	2,751	5	-2,231	0.38	41.64
Motors	Chilled Wtr Pump	VSD & EEM	RI	39.5	1650		3,349	12	3,349	12	-5,565	0.17	90.14
Motors	Chilled Wtr Pump	VSD & EEM	RI	27.5	1000		2,030	12	2,030	12	-6,517	0.03	488.59
Motors	Chilled Wtr Pump	VSD & EEM	RI	46.5	2100		16,428	47	16,428	47	-18,829	0.28	54.99
Motors	Chilled Wtr Pump	VSD & EEM	RI	21.5	2100		695	2	695	2	-1,983	-0.01	-1,226.98
Motors	Chilled Wtr Pump	VSD & EEM	RI	18.5	1650		546	2	546	2	-2,102	-0.07	-212.84
Motors	Chilled Wtr Pump	VSD & EEM	RI	51.5	2100		48,180	138	48,180	138	-53,220	0.30	52.59
Motors	Chilled Wtr Pump	VSD & EEM	RI	26.5	2100		1,258	4	1,258	4	-2,384	0.13	123.79
Motors	Chilled Wtr Pump	VSD & EEM	RI	36.5	2100		2,877	8	2,877	8	-3,616	0.25	62.36
Motors	Chilled Wtr Pump	VSD & EEM	RI	28.5	1650		1,419	5	1,419	5	-3,295	0.08	202.70
Motors	Chilled Wtr Pump	VSD & EEM	RI	26.5	3200		8,768	16	8,768	16	-5,015	0.49	32.05
Motors	Chilled Wtr Pump	VSD & EEM	RI	43.5	3200		20,053	38	20,053	38	-9,240	0.56	28.10
Motors	Chilled Wtr Pump	VSD & EEM	RI	28.5	1000		2,608	16	2,608	16	-8,752	0.02	948.94
Motors	Chilled Wtr Pump	VSD & EEM	RI	66.5	2100		25,728	74	25,728	74	-27,223	0.31	50.85
Motors	Chilled Wtr Pump	VSD & EEM	RI	20.5	5000		4,299	5	4,299	5	-995	0.72	21.86
Motors	Chilled Wtr Pump	VSD & EEM	RI	34.5	1650		2,260	8	2,260	8	-4,108	0.15	105.19
Motors	Chilled Wtr Pump	VSD & EEM	RI	63.5	2100		63,001	180	63,001	180	-64,091	0.32	48.29
Motors	Chilled Wtr Pump	VSD & EEM	RI	15.5	1000		331	2	331	2	-2,273	-0.16	-96.96
Motors	Chilled Wtr Pump	VSD & EEM	RI	18.5	4000		40,000	60	40,000	60	-6,173	0.80	19.42
Motors	Chilled Wtr Pump	VSD & EEM	RI	55.5	2100		10,441	30	10,441	30	-11,921	0.29	54.70
Motors	Chilled Wtr Pump	VSD & EEM	RI	23.5	6000		45,120	45	45,120	45	3,854	1.16	13.48
Motors	Chilled Wtr Pump	VSD & EEM	RI	17.5	800		3,978	30	3,978	30	-17,086	-0.02	-652.25
Motors	Chilled Wtr Pump	VSD & EEM	RI	59.5	2100		13,160	38	13,160	38	-14,749	0.29	53.68
Motors	Chilled Wtr Pump	VSD & EEM	RI	9.5	6000		1,986	2	1,986	2	-1,080	0.45	34.83
Motors	Chilled Wtr Pump	VSD & EEM	RI	16.5	6000		8,220	8	8,220	8	125	1.03	15.23
Motors	Chilled Wtr Pump	VSD & EEM	RI	34.5	3200		16,689	31	16,689	31	-7,785	0.55	28.27
Motors	Chilled Wtr Pump	VSD & EEM	RI	37.5	3200		12,236	23	12,236	23	-5,702	0.55	28.25
Motors	Chilled Wtr Pump	VSD & EEM	ROF	37.5	3200		0	0	0	0	1,154	2.60	6.00
Motors	Chilled Wtr Pump	EEM	ROF	18.5	1650		0	0	0	0	128	1.59	9.83
Motors	Chilled Wtr Pump	EEM	ROF	59.5	2100		0	0	0	0	149	1.41	11.08
Motors	Chilled Wtr Pump	EEM	ROF	43.5	3200		0	0	0	0	1,092	2.08	7.51
Motors	Chilled Wtr Pump	EEM	ROF	23.5	6000		0	0	0	0	1,135	2.55	6.12
Motors	Chilled Wtr Pump	EEM	ROF	24.5	5000		0	0	0	0	2,554	3.66	4.27
Motors	Chilled Wtr Pump	EEM	ROF	63	2100		0	0	0	0	1,093	3.41	4.58
Motors	Chilled Wtr Pump	EEM	ROF				0	0	0	0	3,033	2.05	7.61

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Wtr Pump	EEM	ROF	26	3200		0	0	257	0	685	3.06	5.11
Motors	Chilled Wtr Pump	EEM	ROF	19.5	3200		0	0	159	0	481	2.64	5.92
Motors	Chilled Wtr Pump	EEM	ROF	27.5	1000		0	0	116	1	222	1.48	10.54
Motors	Chilled Wtr Pump	EEM	ROF	48.5	1650		0	0	585	2	897	1.89	8.28
Motors	Chilled Wtr Pump	EEM	ROF	4	1650		0	0	13	0	76	1.45	10.75
Motors	Chilled Wtr Pump	EEM	ROF	34.5	3200		0	0	966	2	1,965	2.84	5.50
Motors	Chilled Wtr Pump	EEM	ROF	34.5	1650		0	0	132	0	396	2.19	7.13
Motors	Chilled Wtr Pump	EEM	ROF	19	3200		0	0	159	0	481	2.64	5.92
Motors	Chilled Wtr Pump	EEM	ROF	63.5	2100		0	0	3,527	30	4,549	2.05	7.61
Motors	Chilled Wtr Pump	EEM	ROF	26	2100		0	0	76	0	342	2.38	6.57
Motors	Chilled Wtr Pump	EEM	ROF	15.5	1000		0	0	20	0	30	1.14	13.75
Motors	Chilled Wtr Pump	EEM	ROF	26.5	2100		0	0	76	0	342	2.38	6.57
Motors	Chilled Wtr Pump	EEM	ROF	66.5	2100		0	0	1,447	4	1,428	1.85	8.47
Motors	Chilled Wtr Pump	EEM	ROF	34	1650		0	0	132	0	396	2.19	7.13
Motors	Chilled Wtr Pump	EEM	ROF	34	3200		0	0	483	1	982	2.84	5.50
Motors	Chilled Wtr Pump	EEM	ROF	51.5	2100		0	0	2,755	8	4,781	2.11	7.42
Motors	Chilled Wtr Pump	EEM	ROF	21.5	2100		0	0	42	0	161	1.74	8.96
Motors	Chilled Wtr Pump	EEM	ROF	39.5	1650		0	0	192	1	357	1.90	8.21
Motors	Chilled Wtr Pump	EEM	ROF	36.5	2100		0	0	168	0	480	2.44	6.40
Motors	Chilled Wtr Pump	EEM	ROF	9.5	6000		0	0	119	0	414	2.91	5.37
Motors	Chilled Wtr Pump	EEM	ROF	17.5	800		0	0	227	2	277	1.31	11.88
Motors	Chilled Wtr Pump	EEM	ROF	12	2100		0	0	21	0	91	1.50	10.40
Motors	Chilled Wtr Pump	EEM	ROF	28.5	1650		0	0	82	0	282	1.96	7.98
Motors	Chilled Wtr Pump	EEM	ROF	16.5	6000		0	0	481	0	1,117	4.35	3.59
Motors	Chilled Wtr Pump	EEM	ROF	20.5	5000		0	0	249	0	713	3.43	4.58
Motors	Chilled Wtr Pump	EEM	ROF	18.5	4000		0	0	2,240	3	2,675	2.88	5.47
Motors	Chilled Wtr Pump	EEM	ROF	51	2100		0	0	1,378	4	2,391	2.11	7.42
Motors	Chilled Wtr Pump	EEM	ROF	28.5	1000		0	0	151	1	211	1.40	11.19
Motors	Chilled Wtr Pump	EEM	ROF	43.5	1650		0	0	249	1	561	2.05	7.62
Motors	Chilled Wtr Pump	EEM	ROF	39	1650		0	0	192	1	357	1.90	8.21
Motors	Chilled Wtr Pump	EEM	ROF	12	5000		0	0	77	0	331	2.74	5.69
Motors	Chilled Wtr Pump	EEM	ROF	46	2100		0	0	317	1	683	2.28	6.85
Motors	Chilled Wtr Pump	EEM	ROF	28	1650		0	0	82	0	282	1.96	7.98
Motors	Chilled Wtr Pump	EEM	ROF	46.5	2100		0	0	951	3	2,050	2.28	6.85
Motors	Chilled Wtr Pump	EEM	ROF	55.5	2100		0	0	596	2	854	1.97	7.93
Motors	Chilled Wtr Pump	EEM	ROF	13.5	8760		0	0	1,322	1	2,300	5.31	2.94
Motors	Chilled Wtr Pump	EEM	ROF	26.5	3200		0	0	513	1	1,370	3.06	5.11
Motors	Circ. Pump	EEM	RI	17	6000		34,787	70	34,787	70	25,640	5.33	2.93
Motors	Circ. Pump	EEM	RI	3	6000		11,412	23	11,412	23	8,536	3.42	6.62
Motors	Circ. Pump	EEM	RI	10	6000		23,764	48	23,764	48	17,254	3.42	4.57
Motors	Circ. Pump	EEM	RI	5	6000		36,086	72	36,086	72	26,357	2.47	6.32
Motors	Circ. Pump	EEM	RI	6	6000		1,597	3	1,597	3	1,242	3.39	4.61
Motors	Circ. Pump	EEM	RI	13	6000		4,752	10	4,752	10	3,845	4.77	3.28
Motors	Circ. Pump	EEM	ROF	5	6000		0	0	4,296	9	26,452	2.60	6.02
Motors	Circ. Pump	EEM	ROF	3	6000		0	0	1,079	2	8,641	2.49	6.27
Motors	Circ. Pump	EEM	ROF	10	6000		0	0	2,849	6	16,740	3.54	4.41
Motors	Circ. Pump	EEM	ROF	17	6000		0	0	6,258	13	24,330	5.44	2.87
Motors	Circ. Pump	EEM	ROF	13	6000		0	0	652	1	3,692	4.91	3.18
Motors	Circ. Pump	EEM	ROF	6	6000		0	0	184	0	1,213	3.52	4.43
Motors	Condensate Pump	EEM	RI	3	1650		448	2	448	2	301	1.34	11.68
Motors	Condensate Pump	EEM	RI	7	2100		858	2	856	2	590	1.44	10.86
Motors	Condensate Pump	EEM	RI	5	3200		7,752	15	7,752	15	5,397	1.75	8.94
Motors	Condensate Pump	EEM	RI	12	3200		845	2	845	2	724	3.13	4.99
Motors	Condensate Pump	EEM	RI	3	3200		652	1	652	1	464	1.69	9.24
Motors	Condensate Pump	EEM	RI	5	4000		2,005	3	2,005	3	1,412	1.94	8.03
Motors	Condensate Pump	EEM	RI	27	2100		1,109	3	1,109	3	1,028	2.51	6.22
Motors	Condensate Pump	EEM	RI	9	3200		528	1	528	1	364	2.22	7.02
Motors	Condensate Pump	EEM	RI	2	800		26	0	26	0	-21	0.92	17.04
Motors	Condensate Pump	EEM	RI	13	2100		5,964	17	5,964	17	4,029	1.48	10.58
Motors	Condensate Pump	EEM	RI	2	5000		679	1	679	1	494	2.10	7.43
Motors	Condensate Pump	EEM	RI	6	5000		4,594	6	4,594	6	3,264	2.19	7.13

Table 4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Condensate Pump	EEM	RI	15	5000		825	1	825	1	582	2.96	5.28
Motors	Condensate Pump	EEM	RI	9	1000		163	1	163	1	-84	0.93	16.75
Motors	Condensate Pump	EEM	RI	9	1650		3,584	13	3,584	13	2,363	1.36	11.45
Motors	Condensate Pump	EEM	RI	8	4000		1,320	2	1,320	2	922	2.55	6.12
Motors	Condensate Pump	EEM	ROF	8	4000		0	0	158	0	915	2.67	5.86
Motors	Condensate Pump	EEM	ROF	6	5000		0	0	547	1	3,333	2.32	6.75
Motors	Condensate Pump	EEM	ROF	27	2100		0	0	152	0	1,038	2.65	5.89
Motors	Condensate Pump	EEM	ROF	13	2100		0	0	710	2	4,673	1.60	9.78
Motors	Condensate Pump	EEM	ROF	9	1000		0	0	50	0	56	1.05	14.90
Motors	Condensate Pump	EEM	ROF	5	3200		0	0	923	2	5,807	1.87	8.36
Motors	Condensate Pump	EEM	ROF	12	3200		0	0	116	0	713	3.27	4.78
Motors	Condensate Pump	EEM	ROF	15	5000		0	0	99	0	570	3.08	5.08
Motors	Condensate Pump	EEM	ROF	3	3200		0	0	62	0	507	1.82	8.60
Motors	Condensate Pump	EEM	ROF	3	1650		0	0	42	0	380	1.46	10.71
Motors	Condensate Pump	EEM	ROF	9	1650		0	0	427	2	2,905	1.49	10.52
Motors	Condensate Pump	EEM	ROF	2	5000		0	0	64	0	510	2.23	7.00
Motors	Condensate Pump	EEM	ROF	9	3200		0	0	63	0	368	2.34	6.68
Motors	Condensate Pump	EEM	ROF	5	4000		0	0	239	0	1,475	2.07	7.55
Motors	Condensate Pump	EEM	ROF	2	800		0	0	8	0	8	1.03	15.12
Motors	Condensate Pump	EEM	ROF	7	2100		0	0	81	0	698	1.56	10.00
Motors	Condenser Fan	EEM	RI	22	5000		2,230	3	2,230	3	1,559	4.42	3.54
Motors	Condenser Fan	EEM	RI	35	1650		2,208	8	2,208	8	1,375	2.01	7.79
Motors	Condenser Fan	EEM	RI	2	4000		325	0	325	0	152	1.66	9.40
Motors	Condenser Fan	EEM	RI	28	2100		554	2	554	2	377	2.11	7.41
Motors	Condenser Fan	EEM	RI	8	800		232	2	232	2	-44	0.94	16.70
Motors	Condenser Fan	EEM	RI	17	2100		279	1	279	1	125	1.48	10.56
Motors	Condenser Fan	EEM	RI	3	800		52	0	52	0	-242	0.51	30.34
Motors	Condenser Fan	EEM	RI	37	2100		10,302	29	10,302	29	6,668	2.33	6.71
Motors	Condenser Fan	EEM	RI	18	800		632	5	632	5	-54	0.96	16.35
Motors	Condenser Fan	EEM	RI	22	2100		1,386	4	1,386	4	540	1.45	10.74
Motors	Condenser Fan	EEM	RI	12	4000		2,313	3	2,313	3	1,536	3.43	4.55
Motors	Condenser Fan	EEM	RI	7	6000		798	1	798	1	475	2.83	5.53
Motors	Condenser Fan	EEM	RI	27	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Condenser Fan	EEM	RI	24	1650		436	2	436	2	287	1.84	8.48
Motors	Condenser Fan	EEM	RI	6	8760		1,464	1	1,464	1	807	2.82	5.96
Motors	Condenser Fan	EEM	RI	12	1000		126	1	126	1	-162	0.69	22.70
Motors	Condenser Fan	EEM	RI	47	2100		11,506	33	11,506	33	6,877	2.18	7.18
Motors	Condenser Fan	EEM	RI	3	5000		406	0	406	0	215	1.94	8.07
Motors	Condenser Fan	EEM	RI	13	3200		2,534	5	2,534	5	1,791	2.76	5.67
Motors	Condenser Fan	EEM	RI	13	4000		8,218	12	8,218	12	5,374	3.45	4.53
Motors	Condenser Fan	EEM	RI	7	5000		418	1	418	1	208	1.83	8.52
Motors	Condenser Fan	EEM	RI	19	1650		545	2	545	2	156	1.26	12.38
Motors	Condenser Fan	EEM	RI	21	1000		417	3	417	3	-1	1.00	15.65
Motors	Condenser Fan	EEM	RI	40	1650		2,862	10	2,862	10	1,651	1.87	8.35
Motors	Condenser Fan	EEM	RI	10	1650		138	1	138	1	-7	0.97	16.07
Motors	Condenser Fan	EEM	RI	20	3200		2,906	5	2,906	5	1,861	2.54	6.14
Motors	Condenser Fan	EEM	RI	10	1000		33	0	33	0	-116	0.53	29.33
Motors	Condenser Fan	EEM	RI	5	1000		39	0	39	0	-94	0.59	26.36
Motors	Condenser Fan	EEM	RI	15	1650		659	2	659	2	236	1.30	11.99
Motors	Condenser Fan	EEM	RI	50	1650		2,390	9	2,390	9	1,214	1.76	8.86
Motors	Condenser Fan	EEM	RI	29	1650		499	2	499	2	271	1.67	9.33
Motors	Condenser Fan	EEM	RI	14	2100		702	2	702	2	88	1.09	14.38
Motors	Condenser Fan	EEM	RI	33	2100		5,085	15	5,085	15	2,979	1.93	8.11
Motors	Condenser Fan	EEM	ROF	14	2100		0	0	84	0	365	1.50	10.40
Motors	Condenser Fan	EEM	ROF	28	2100		0	0	76	0	342	2.38	6.57
Motors	Condenser Fan	EEM	ROF	22	5000		0	0	401	0	1,020	4.06	3.85
Motors	Condenser Fan	EEM	ROF	17	2100		0	0	32	0	158	1.83	8.54
Motors	Condenser Fan	EEM	ROF	2	4000		0	0	32	0	164	1.97	7.92
Motors	Condenser Fan	EEM	ROF	35	1650		0	0	397	1	1,189	2.19	7.13
Motors	Condenser Fan	EEM	ROF	3	5000		0	0	40	0	201	2.20	7.12
Motors	Condenser Fan	EEM	ROF	27	3200		0	0	257	0	685	3.06	5.11

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Condenser Fan	EEM	ROF	50	1650		0	0	702	3	1,074	1.93	8.11
Motors	Condenser Fan	EEM	ROF	37	2100		0	0	1,853	5	5,281	2.44	6.40
Motors	Condenser Fan	EEM	ROF	10	1000		0	0	10	0	9	1.05	14.92
Motors	Condenser Fan	EEM	ROF	13	3200		0	0	348	1	1,408	2.89	5.41
Motors	Condenser Fan	EEM	ROF	19	1650		0	0	65	0	256	1.59	9.83
Motors	Condenser Fan	EEM	ROF	21	1000		0	0	100	1	242	1.41	11.06
Motors	Condenser Fan	EEM	ROF	13	4000		0	0	1,811	3	3,599	3.25	4.81
Motors	Condenser Fan	EEM	ROF	7	5000		0	0	50	0	200	2.10	7.44
Motors	Condenser Fan	EEM	ROF	10	1650		0	0	16	0	75	1.41	11.08
Motors	Condenser Fan	EEM	ROF	12	4000		0	0	465	1	1,045	3.26	4.79
Motors	Condenser Fan	EEM	ROF	5	1000		0	0	8	0	17	1.10	14.17
Motors	Condenser Fan	EEM	ROF	12	1000		0	0	31	0	69	1.18	13.22
Motors	Condenser Fan	EEM	ROF	15	1650		0	0	76	0	392	1.69	9.25
Motors	Condenser Fan	EEM	ROF	6	8760		0	0	174	0	628	2.73	5.73
Motors	Condenser Fan	EEM	ROF	33	2100		0	0	836	2	2,715	2.16	7.25
Motors	Condenser Fan	EEM	ROF	22	2100		0	0	166	0	645	1.74	8.96
Motors	Condenser Fan	EEM	ROF	8	800		0	0	58	0	213	1.43	10.94
Motors	Condenser Fan	EEM	ROF	24	1650		0	0	60	0	290	2.17	7.21
Motors	Condenser Fan	EEM	ROF	18	800		0	0	227	2	277	1.31	11.88
Motors	Condenser Fan	EEM	ROF	47	2100		0	0	2,535	7	5,468	2.28	6.85
Motors	Condenser Fan	EEM	ROF	3	800		0	0	16	0	12	1.03	15.10
Motors	Condenser Fan	EEM	ROF	20	3200		0	0	478	1	1,443	2.64	5.92
Motors	Condenser Fan	EEM	ROF	7	6000		0	0	92	0	363	2.91	5.37
Motors	Condenser Fan	EEM	ROF	40	1650		0	0	575	2	1,479	2.07	7.56
Motors	Condenser Fan	EEM	ROF	29	1650		0	0	82	0	282	1.96	7.98
Motors	Cond. Wtr. Pump	EEM	RI	8	5000		418	1	418	1	208	1.83	8.52
Motors	Cond. Wtr. Pump	EEM	RI	29.5	1000		473	3	473	3	38	1.05	14.85
Motors	Cond. Wtr. Pump	EEM	RI	18.5	6000		2,676	3	2,676	3	1,730	4.79	3.26
Motors	Cond. Wtr. Pump	EEM	RI	15.5	800		533	4	533	4	-22	0.98	15.99
Motors	Cond. Wtr. Pump	EEM	RI	21.5	6000		7,242	7	7,242	7	4,149	4.00	3.91
Motors	Cond. Wtr. Pump	EEM	RI	44.5	1650		1,130	4	1,130	4	639	1.87	8.34
Motors	Cond. Wtr. Pump	EEM	RI	48	2100		4,315	12	4,315	12	2,579	2.18	7.18
Motors	Cond. Wtr. Pump	EEM	RI	48.5	2100		10,068	29	10,068	29	6,017	2.18	7.18
Motors	Cond. Wtr. Pump	EEM	RI	17.5	4000		5,793	9	5,793	9	3,523	3.22	4.86
Motors	Cond. Wtr. Pump	EEM	RI	25.5	1650		436	2	436	2	287	1.84	8.48
Motors	Cond. Wtr. Pump	EEM	RI	35.5	3200		4,383	8	4,383	8	2,798	3.12	5.00
Motors	Cond. Wtr. Pump	EEM	RI	28.5	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Cond. Wtr. Pump	EEM	RI	42	2100		1,214	3	1,214	3	739	2.17	7.20
Motors	Cond. Wtr. Pump	EEM	RI	52.5	2100		1,799	5	1,799	5	976	1.99	7.85
Motors	Cond. Wtr. Pump	EEM	RI	14.5	8760		5,999	4	5,999	4	3,776	6.17	2.53
Motors	Cond. Wtr. Pump	EEM	RI	36.5	1650		1,472	5	1,472	5	917	2.01	7.79
Motors	Cond. Wtr. Pump	EEM	RI	20.5	1650		272	1	272	1	78	1.26	12.38
Motors	Cond. Wtr. Pump	EEM	RI	23.5	2100		347	1	347	1	135	1.45	10.74
Motors	Cond. Wtr. Pump	EEM	RI	47.5	1650		1,593	6	1,593	6	709	1.59	9.84
Motors	Cond. Wtr. Pump	EEM	RI	28	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Cond. Wtr. Pump	EEM	RI	11	1650		276	1	276	1	-14	0.97	16.07
Motors	Cond. Wtr. Pump	EEM	RI	23.5	1000		282	2	282	2	27	1.06	14.75
Motors	Cond. Wtr. Pump	EEM	RI	64	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Cond. Wtr. Pump	EEM	RI	29.5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Cond. Wtr. Pump	EEM	RI	38.5	2100		554	2	554	2	377	2.11	7.41
Motors	Cond. Wtr. Pump	EEM	RI	56.5	2100		937	3	937	3	606	2.33	6.71
Motors	Cond. Wtr. Pump	EEM	RI	41.5	3200		4,055	12	4,055	12	2,007	1.83	8.52
Motors	Cond. Wtr. Pump	EEM	RI	18.5	5000		3,090	6	3,090	6	1,724	2.43	6.43
Motors	Cond. Wtr. Pump	EEM	RI	38.5	3200		1,320	2	1,320	2	957	3.82	4.09
Motors	Cond. Wtr. Pump	EEM	RI	16.5	1000		2,741	5	2,741	5	1,634	2.86	5.88
Motors	Cond. Wtr. Pump	EEM	RI	8	1650		103	1	103	1	-86	0.71	22.03
Motors	Cond. Wtr. Pump	EEM	RI	36	1650		736	3	736	3	458	2.01	7.79
Motors	Cond. Wtr. Pump	EEM	RI	8	2100		170	0	170	0	32	1.14	13.70
Motors	Cond. Wtr. Pump	EEM	RI	42.5	2100		1,214	3	1,214	3	739	2.17	7.20
Motors	Cond. Wtr. Pump	EEM	RI	21	3200		969	2	969	2	620	2.54	6.14
Motors	Cond. Wtr. Pump	EEM	RI	31.5	3200		1,850	3	1,850	3	1,201	2.90	5.39

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cond. Wtr. Pump	EEM	R	14.5	3200		845	2	845	2	597	2.76	5.67
Motors	Cond. Wtr. Pump	EEM	R	61.5	2100		3,041	9	3,041	9	1,656	2.04	7.05
Motors	Cond. Wtr. Pump	EEM	R	5	1650		134	0	134	0	4	1.02	15.37
Motors	Cond. Wtr. Pump	EEM	R	11.5	6000		990	1	990	1	568	2.91	5.36
Motors	Cond. Wtr. Pump	EEM	R	56	2100		2,028	6	2,028	6	1,003	1.83	8.52
Motors	Cond. Wtr. Pump	EEM	R	30.5	1650		499	2	499	2	271	1.67	9.33
Motors	Cond. Wtr. Pump	EEM	R	21.5	3200		969	2	969	2	620	2.54	6.14
Motors	Cond. Wtr. Pump	EEM	R	23	2100		347	1	347	1	135	1.45	10.74
Motors	Cond. Wtr. Pump	EEM	R	25.5	5000		4,283	5	4,283	5	2,710	3.75	4.17
Motors	Cond. Wtr. Pump	EEM	R	18.5	5000		3,649	4	3,786	5	1,519	1.98	7.88
Motors	Cond. Wtr. Pump	EEM	R	15.5	800		3,962	30	3,967	30	1,480	1.41	11.09
Motors	Cond. Wtr. Pump	EEM	R	52.5	2100		10,401	30	10,412	30	6,815	2.88	5.42
Motors	Cond. Wtr. Pump	EEM	R	64.5	2100		81,479	233	81,727	234	62,050	3.87	4.04
Motors	Cond. Wtr. Pump	EEM	R	14.5	8760		29,446	20	29,535	20	20,724	8.34	1.87
Motors	Cond. Wtr. Pump	EEM	R	31.5	3200		8,175	15	8,313	16	5,538	3.54	4.41
Motors	Cond. Wtr. Pump	EEM	R	16.5	1000		387	2	409	2	1,302	0.06	256.12
Motors	Cond. Wtr. Pump	EEM	R	25.5	1650		1,204	4	1,249	5	552	0.64	24.29
Motors	Cond. Wtr. Pump	EEM	R	23.5	1000		1,735	10	1,756	11	71	1.04	15.03
Motors	Cond. Wtr. Pump	EEM	R	47.5	1650		10,744	39	10,893	39	6,832	2.52	6.20
Motors	Cond. Wtr. Pump	EEM	R	38.5	3200		15,849	30	15,866	30	11,330	4.13	3.78
Motors	Cond. Wtr. Pump	EEM	R	36.5	1650		5,725	21	5,794	21	1,834	1.49	10.50
Motors	Cond. Wtr. Pump	EEM	R	18.5	6000		10,409	10	10,535	11	6,613	4.64	3.36
Motors	Cond. Wtr. Pump	EEM	R	28.5	3200		5,552	10	5,618	11	3,255	2.79	5.59
Motors	Cond. Wtr. Pump	EEM	R	11.5	6000		2,321	2	2,453	2	196	1.14	13.69
Motors	Cond. Wtr. Pump	EEM	R	42.5	2100		5,365	15	5,455	16	3,187	2.46	6.35
Motors	Cond. Wtr. Pump	EEM	R	30.5	1650		1,748	6	1,797	7	225	0.87	17.89
Motors	Cond. Wtr. Pump	EEM	R	25.5	5000		24,765	30	24,791	30	18,716	6.17	2.53
Motors	Cond. Wtr. Pump	EEM	R	23.5	2100		81.2	2	85.8	2	937	0.32	48.22
Motors	Cond. Wtr. Pump	EEM	R	39.070	59		39,076	59	39,076	59	30,301	6.09	2.56
Motors	Cond. Wtr. Pump	EEM	R	21.513	40		21,513	40	21,513	40	15,734	4.42	3.53
Motors	Cond. Wtr. Pump	EEM	R	48.838	49		48,845	49	48,845	49	34,678	7.22	2.16
Motors	Cond. Wtr. Pump	EEM	R	20.512	59		20,515	59	20,515	59	14,934	3.51	4.45
Motors	Cond. Wtr. Pump	EEM	R	2.336	4		2,336	4	2,423	5	407	1.26	12.37
Motors	Cond. Wtr. Pump	EEM	R	1.533	4		1,533	4	1,590	5	274	0.82	18.98
Motors	Cond. Wtr. Pump	EEM	R	20.838	39		20,838	39	20,739	39	15,165	4.37	3.57
Motors	Cond. Wtr. Pump	EEM	R	3.643	10		3,643	10	3,687	11	1,663	1.92	8.15
Motors	Cond. Wtr. Pump	EEM	R	3.390	6		3,390	6	3,485	7	1,158	1.65	9.45
Motors	Cond. Wtr. Pump	EEM	R	638	2		638	2	675	2	1,087	0.22	72.19
Motors	Cond. Wtr. Pump	EEM	R	49.413	141		49,413	141	49,562	142	30,058	2.58	6.05
Motors	Cond. Wtr. Pump	EEM	R	3.361	20		3,372	20	3,372	20	1,067	1.38	11.34
Motors	Cond. Wtr. Pump	EEM	R	5.546	20		5,546	20	5,546	20	2,880	2.02	7.73
Motors	Cond. Wtr. Pump	EEM	R	27.349	78		27,349	78	27,220	78	19,810	3.46	4.52
Motors	Cond. Wtr. Pump	EEM	R	1.696	5		1,696	5	1,686	5	402	0.75	20.75
Motors	Cond. Wtr. Pump	EEM	R	3.967	5		3,967	5	3,967	5	1,449	1.89	8.26
Motors	Cond. Wtr. Pump	EEM	R	1.309	5		1,309	5	1,309	5	689	0.58	27.10
Motors	Cond. Wtr. Pump	EEM	R	85.254	244		85,254	244	85,254	244	60,414	3.62	4.31
Motors	Cond. Wtr. Pump	EEM	R	900	3		900	3	900	3	1,062	0.27	57.47
Motors	Cond. Wtr. Pump	EEM	R	2.539	5		2,539	5	2,539	5	300	1.18	13.19
Motors	Cond. Wtr. Pump	EEM	R	6.059	22		6,059	22	6,059	22	1,487	1.37	11.37
Motors	Cond. Wtr. Pump	EEM	R	4.142	31		4,142	31	4,142	31	1,048	1.27	12.28
Motors	Cond. Wtr. Pump	EEM	R	8.684	16		8,684	16	8,684	16	5,390	3.31	4.72
Motors	Cond. Wtr. Pump	EEM	R	1.836	11		1,836	11	1,836	11	1,23	0.94	16.69
Motors	Cond. Wtr. Pump	EEM	R	30.857	21		30,857	21	30,857	21	20,774	7.93	1.97
Motors	Cond. Wtr. Pump	EEM	R	40.778	61		40,778	61	40,778	61	30,072	5.75	2.72
Motors	Cond. Wtr. Pump	EEM	R	429	3		429	3	429	3	1,441	0.01	1,338.05
Motors	Cond. Wtr. Pump	EEM	R	5.812	21		5,812	21	5,812	21	2,602	1.87	8.36
Motors	Cond. Wtr. Pump	EEM	R	50.973	51		50,973	51	50,973	51	34,627	6.86	2.28
Motors	Cond. Wtr. Pump	EEM	R	16.566	31		16,566	31	16,566	31	11,070	3.87	4.04
Motors	Cond. Wtr. Pump	EEM	R	707	3		707	3	707	3	1,217	0.17	94.43
Motors	Cond. Wtr. Pump	EEM	R	1.879	7		1,879	7	1,879	7	385	0.79	19.67
Motors	Cond. Wtr. Pump	EEM	R	11.016	11		11,016	11	11,016	11	6,564	4.41	3.54

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cond. Wtr. Pump	VSD & EEM	RI	41.5	3200		21,647	41	21,647	41	14,822	4.10	3.81
Motors	Cond. Wtr. Pump	VSD & EEM	RI	38.5	2100		3,856	11	3,856	11	1,504	1.78	8.77
Motors	Cond. Wtr. Pump	VSD & EEM	RI	11.5	6000		2,571	3	2,571	3	118	1.08	14.46
Motors	Cond. Wtr. Pump	VSD & EEM	RI	21.5	3200		3,644	7	3,644	7	1,038	1.55	10.05
Motors	Cond. Wtr. Pump	VSD & EEM	RI	25.5	5000		25,885	31	25,885	31	18,585	5.82	2.68
Motors	Cond. Wtr. Pump	VSD & EEM	RI	61.5	2100		21,408	61	21,408	61	14,445	3.28	4.76
Motors	Cond. Wtr. Pump	VSD & EEM	RI	56.5	2100		28,411	81	28,411	81	18,946	3.19	4.89
Motors	Cond. Wtr. Pump	VSD & EEM	RI	42.5	2100		5,699	16	5,699	16	2,983	2.28	6.85
Motors	Cond. Wtr. Pump	VSD & EEM	RI	28.5	3200		5,875	11	5,875	11	3,132	2.63	5.95
Motors	Cond. Wtr. Pump	VSD & EEM	RI	35.5	3200		22,544	42	22,544	42	15,731	4.30	3.64
Motors	Cond. Wtr. Pump	VSD & EEM	RI	48.5	2100		51,781	148	51,781	148	28,270	2.40	6.51
Motors	Cond. Wtr. Pump	VSD & EEM	RI	47.5	1650		11,162	41	11,162	41	6,364	2.33	6.71
Motors	Cond. Wtr. Pump	VSD & EEM	RI	29.5	1000		3,522	21	3,522	21	755	1.25	12.48
Motors	Cond. Wtr. Pump	VSD & EEM	RI	52.5	2100		10,872	31	10,872	31	6,477	2.68	5.83
Motors	Cond. Wtr. Pump	EEM	ROF	25.5	5000		0	0	1,093	1	1,738	3.41	4.58
Motors	Cond. Wtr. Pump	EEM	ROF	29.5	1000		0	0	151	1	211	1.40	11.19
Motors	Cond. Wtr. Pump	EEM	ROF	36.5	1650		0	0	265	1	793	2.19	7.13
Motors	Cond. Wtr. Pump	EEM	ROF	44.5	1650		0	0	249	1	561	2.05	7.62
Motors	Cond. Wtr. Pump	EEM	ROF	20.5	2100		0	0	33	0	128	1.59	9.83
Motors	Cond. Wtr. Pump	EEM	ROF	23.5	2100		0	0	42	0	161	1.74	8.96
Motors	Cond. Wtr. Pump	EEM	ROF	30.5	1650		0	0	82	0	282	1.96	7.98
Motors	Cond. Wtr. Pump	EEM	ROF	18.5	1000		0	0	20	0	30	1.14	13.75
Motors	Cond. Wtr. Pump	EEM	ROF	18.5	5000		0	0	181	0	678	3.73	4.19
Motors	Cond. Wtr. Pump	EEM	ROF	42	2100		0	0	244	1	599	2.30	6.80
Motors	Cond. Wtr. Pump	EEM	ROF	17.5	4000		0	0	1,702	3	2,297	2.98	5.25
Motors	Cond. Wtr. Pump	EEM	ROF	14.5	8760		0	0	50	0	200	2.10	7.44
Motors	Cond. Wtr. Pump	EEM	ROF	23	2100		0	0	1,322	1	2,300	5.31	2.94
Motors	Cond. Wtr. Pump	EEM	ROF	8	2100		0	0	42	0	161	1.74	8.96
Motors	Cond. Wtr. Pump	EEM	ROF	42.5	2100		0	0	17	0	93	1.55	10.06
Motors	Cond. Wtr. Pump	EEM	ROF	23.5	1000		0	0	244	1	599	2.30	6.80
Motors	Cond. Wtr. Pump	EEM	ROF	5	1650		0	0	80	0	142	1.42	10.96
Motors	Cond. Wtr. Pump	EEM	ROF	29.5	2100		0	0	13	0	76	1.45	10.75
Motors	Cond. Wtr. Pump	EEM	ROF	52.5	2100		0	0	459	1	797	2.11	7.42
Motors	Cond. Wtr. Pump	EEM	ROF	25.5	1650		0	0	60	0	290	2.17	7.21
Motors	Cond. Wtr. Pump	EEM	ROF	21.5	3200		0	0	159	0	481	2.64	5.92
Motors	Cond. Wtr. Pump	EEM	ROF	64.5	2100		0	0	3,527	10	4,549	2.05	7.61
Motors	Cond. Wtr. Pump	EEM	ROF	38	1650		0	0	132	0	396	2.19	7.13
Motors	Cond. Wtr. Pump	EEM	ROF	38.5	3200		0	0	700	1	1,154	2.80	6.00
Motors	Cond. Wtr. Pump	EEM	ROF	31.5	3200		0	0	372	1	857	2.86	5.47
Motors	Cond. Wtr. Pump	EEM	ROF	56	2100		0	0	966	2	1,965	1.97	7.93
Motors	Cond. Wtr. Pump	EEM	ROF	35.5	3200		0	0	908	2	1,236	2.94	5.50
Motors	Cond. Wtr. Pump	EEM	ROF	15.5	800		0	0	175	1	239	2.40	6.50
Motors	Cond. Wtr. Pump	EEM	ROF	28	3200		0	0	257	0	685	3.06	5.11
Motors	Cond. Wtr. Pump	EEM	ROF	61.5	2100		0	0	894	3	1,308	2.13	7.35
Motors	Cond. Wtr. Pump	EEM	ROF	21.5	6000		0	0	2,128	2	2,575	3.55	4.41
Motors	Cond. Wtr. Pump	EEM	ROF	21	3200		0	0	159	0	481	2.64	5.92
Motors	Cond. Wtr. Pump	EEM	ROF	64	2100		0	0	2,351	7	3,033	2.05	7.61
Motors	Cond. Wtr. Pump	EEM	ROF	14.5	3200		0	0	33	0	149	1.41	11.08
Motors	Cond. Wtr. Pump	EEM	ROF	48	2100		0	0	116	0	409	2.89	5.41
Motors	Cond. Wtr. Pump	EEM	ROF	18.5	6000		0	0	951	3	2,050	2.28	6.85
Motors	Cond. Wtr. Pump	EEM	ROF	28.5	3200		0	0	481	0	1,117	4.35	3.59
Motors	Cond. Wtr. Pump	EEM	ROF	11.5	6000		0	0	257	0	685	3.06	5.11
Motors	Cond. Wtr. Pump	EEM	ROF	38.5	2100		0	0	168	0	414	2.44	6.40
Motors	Cond. Wtr. Pump	EEM	ROF	48.5	2100		0	0	2,218	6	4,784	2.28	6.85
Motors	Cond. Wtr. Pump	EEM	ROF	56.5	2100		0	0	1,192	3	1,709	1.97	7.93
Motors	Cond. Wtr. Pump	EEM	ROF	47.5	1650		0	0	468	2	698	1.79	8.71
Motors	Cooling Tower Fan	EEM	RI	36.5	3200		2,192	4	2,192	4	1,399	2.91	5.36
Motors	Cooling Tower Fan	EEM	RI	65.5	2100		3,692	11	3,692	11	1,915	1.97	7.92

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	R or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (Btu/yr)	First Year Demand Savings (kW-mr)	Full Implement. Energy Savings (Btu/yr)	Full Implement. Demand Savings (kW-mr)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	EEM	R	45.5	1650		2,200	8	2,200	8	1,278	1.87	8.34
Motors	Cooling Tower Fan	EEM	R	57.5	2100		2,028	6	2,028	6	1,003	1.83	8.52
Motors	Cooling Tower Fan	EEM	R	15.5	3200		845	2	845	2	597	2.76	5.67
Motors	Cooling Tower Fan	EEM	R	28.5	5000		4,283	5	4,283	5	2,710	3.75	4.17
Motors	Cooling Tower Fan	EEM	R	29.5	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Cooling Tower Fan	EEM	R	16.5	800		533	4	533	4	22	0.98	15.99
Motors	Cooling Tower Fan	EEM	R	22	3200		989	2	989	2	620	2.54	6.14
Motors	Cooling Tower Fan	EEM	R	30.5	1000		473	3	473	3	38	1.05	14.85
Motors	Cooling Tower Fan	EEM	R	53.5	2100		3,598	10	3,598	10	1,953	1.99	7.85
Motors	Cooling Tower Fan	EEM	R	31.5	1650		499	2	499	2	271	1.67	9.33
Motors	Cooling Tower Fan	EEM	R	12.5	6000		990	1	990	1	588	2.91	5.36
Motors	Cooling Tower Fan	EEM	R	24.5	1000		282	2	282	2	106	1.06	14.75
Motors	Cooling Tower Fan	EEM	R	19.5	5000		1,320	2	1,320	2	957	3.82	4.09
Motors	Cooling Tower Fan	EEM	R	6	1650		134	0	134	0	4	1.02	15.37
Motors	Cooling Tower Fan	EEM	R	39.5	2100		1,873	5	1,873	5	1,212	2.33	6.71
Motors	Cooling Tower Fan	EEM	R	45	1650		1,130	4	1,130	4	639	1.87	8.34
Motors	Cooling Tower Fan	EEM	R	17.5	1000		103	1	103	1	86	0.71	22.03
Motors	Cooling Tower Fan	EEM	R	34.5	2100		636	2	636	2	372	1.93	8.11
Motors	Cooling Tower Fan	EEM	R	21.5	1650		272	1	272	1	135	1.45	10.74
Motors	Cooling Tower Fan	EEM	R	39.5	3200		2,741	5	2,741	5	1,634	2.66	5.88
Motors	Cooling Tower Fan	EEM	R	32.5	1650		2,192	4	2,192	4	1,399	2.91	5.36
Motors	Cooling Tower Fan	EEM	R	42.5	3200		666	2	666	2	441	2.10	7.45
Motors	Cooling Tower Fan	EEM	R	43.5	2100		3,090	6	3,090	6	1,724	2.43	6.43
Motors	Cooling Tower Fan	EEM	R	62	2100		2,428	7	2,428	7	1,478	2.17	7.20
Motors	Cooling Tower Fan	EEM	R	24.5	2100		6,083	17	6,083	17	3,313	2.04	7.65
Motors	Cooling Tower Fan	EEM	R	12	1650		347	1	347	1	135	1.45	10.74
Motors	Cooling Tower Fan	EEM	R	37.5	1650		276	1	276	1	14	0.97	16.07
Motors	Cooling Tower Fan	EEM	R	14.5	4000		736	3	736	3	458	2.01	7.79
Motors	Cooling Tower Fan	EEM	R	43	2100		6,852	10	6,852	10	4,225	3.14	4.97
Motors	Cooling Tower Fan	EEM	R	19.5	6000		1,214	3	1,214	3	739	2.17	7.20
Motors	Cooling Tower Fan	EEM	R	30.5	2100		2,676	3	2,676	3	1,730	4.79	3.26
Motors	Cooling Tower Fan	EEM	R	34	2100		554	2	554	2	377	2.11	7.41
Motors	Cooling Tower Fan	EEM	R	9	2100		636	2	636	2	372	1.93	8.11
Motors	Cooling Tower Fan	EEM	R	32.5	3200		1,850	3	1,850	3	1,201	2.90	5.39
Motors	Cooling Tower Fan	EEM	R	15.5	8760		5,999	4	5,999	4	3,776	6.17	2.53
Motors	Cooling Tower Fan	EEM	R	39	2100		937	3	937	3	606	2.33	6.71
Motors	Cooling Tower Fan	EEM	R	29	3200		1,427	3	1,427	3	988	3.12	5.00
Motors	Cooling Tower Fan	EEM	R	22.5	6000		5,753	16	5,753	16	3,439	2.18	7.18
Motors	Cooling Tower Fan	EEM	R	49.5	2100		7,242	7	7,242	7	4,149	4.00	3.91
Motors	Cooling Tower Fan	EEM	R	62.5	2100		11,506	33	11,506	33	6,877	2.18	7.18
Motors	Cooling Tower Fan	EEM	R	32	1650		6,083	17	6,083	17	3,313	2.04	7.65
Motors	Cooling Tower Fan	EEM	R	26.5	1650		436	2	436	2	287	2.10	7.45
Motors	Cooling Tower Fan	EEM	R	22.5	3200		989	2	989	2	620	1.84	8.48
Motors	Cooling Tower Fan	EEM	R	29.5	3200		5,552	10	5,552	10	3,255	2.54	6.14
Motors	Cooling Tower Fan	EEM	R	43.5	2100		10,730	31	10,730	31	6,160	2.79	5.59
Motors	Cooling Tower Fan	EEM	R	15.5	8760		29,446	20	29,446	20	20,724	2.37	6.61
Motors	Cooling Tower Fan	EEM	R	26.5	5000		24,785	30	24,785	30	18,716	8.34	1.87
Motors	Cooling Tower Fan	EEM	R	39.5	2100		7,287	21	7,287	21	3,136	6.17	2.53
Motors	Cooling Tower Fan	EEM	R	19.5	6000		10,409	10	10,409	10	6,613	4.64	3.36
Motors	Cooling Tower Fan	EEM	R	34.5	2100		2,225	6	2,225	6	177	1.10	14.21
Motors	Cooling Tower Fan	EEM	R	19.5	5000		3,649	4	3,649	4	1,519	1.98	7.88
Motors	Cooling Tower Fan	EEM	R	24.5	1000		1,735	10	1,735	10	71	1.04	15.03
Motors	Cooling Tower Fan	EEM	R	39.5	3200		15,849	30	15,849	30	11,330	4.13	3.78
Motors	Cooling Tower Fan	EEM	R	24.5	2100		812	2	812	2	937	0.32	49.22
Motors	Cooling Tower Fan	EEM	R	15.5	3200		2,336	4	2,336	4	407	1.26	12.37
Motors	Cooling Tower Fan	EEM	R	62.5	2100		41,024	117	41,024	117	28,953	3.26	4.79
Motors	Cooling Tower Fan	EEM	R	17.5	1000		387	2	387	2	1,302	0.08	256.12

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-m)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-m)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	VSD to existing mtr	RI	32.5	1650		1,748	6	1,797	7	225	0.87	17.89
Motors	Cooling Tower Fan	VSD to existing mtr	RI	22.5	6000		48,838	49	48,845	49	34,678	7.22	2.16
Motors	Cooling Tower Fan	VSD to existing mtr	RI	42.5	3200		20,838	39	20,739	39	15,165	4.37	3.57
Motors	Cooling Tower Fan	VSD to existing mtr	RI	30.5	1000		3,361	20	3,372	20	1,087	1.38	11.34
Motors	Cooling Tower Fan	VSD to existing mtr	RI	31.5	1650		1,748	6	1,797	7	225	0.87	17.89
Motors	Cooling Tower Fan	VSD to existing mtr	RI	14.5	4000		39,624	59	39,666	59	30,804	6.01	2.60
Motors	Cooling Tower Fan	VSD to existing mtr	RI	49.5	2100		56,472	161	56,643	162	34,193	2.57	6.08
Motors	Cooling Tower Fan	VSD to existing mtr	RI	53.5	2100		20,802	59	20,825	59	15,009	3.46	4.52
Motors	Cooling Tower Fan	VSD to existing mtr	RI	30.5	2100		1,533	4	1,590	5	274	0.82	18.98
Motors	Cooling Tower Fan	VSD to existing mtr	RI	16.5	800		3,962	30	3,967	30	1,480	1.41	11.09
Motors	Cooling Tower Fan	VSD to existing mtr	RI	65.5	2100		27,160	78	27,242	78	20,683	3.87	4.04
Motors	Cooling Tower Fan	VSD to existing mtr	RI	12.5	6000		2,321	2	2,453	2	196	1.14	13.69
Motors	Cooling Tower Fan	VSD to existing mtr	RI	21.5	1650		638	2	675	2	1,087	0.22	72.19
Motors	Cooling Tower Fan	VSD to existing mtr	RI	45.5	1650		11,083	40	11,126	40	6,317	2.20	7.09
Motors	Cooling Tower Fan	VSD to existing mtr	RI	37.5	1650		2,863	10	2,897	11	1,012	1.56	10.03
Motors	Cooling Tower Fan	VSD to existing mtr	RI	26.5	2100		1,204	4	1,249	5	552	0.64	24.29
Motors	Cooling Tower Fan	VSD to existing mtr	RI	57.5	2100		13,675	39	13,610	39	9,251	3.06	5.11
Motors	Cooling Tower Fan	VSD to existing mtr	RI	36.5	3200		10,757	20	10,768	20	7,203	3.55	4.40
Motors	Cooling Tower Fan	VSD to existing mtr	RI	22.5	3200		3,390	6	3,485	7	1,158	1.05	9.45
Motors	Cooling Tower Fan	VSD to existing mtr	RI	32.5	3200		8,175	15	8,313	16	5,538	3.54	4.41
Motors	Cooling Tower Fan	VSD & EEM	RI	32.5	3200		8,084	16	8,084	16	5,390	3.31	4.72
Motors	Cooling Tower Fan	VSD & EEM	RI	14.5	4000		41,415	62	41,415	62	30,730	5.84	2.68
Motors	Cooling Tower Fan	VSD & EEM	RI	43.5	2100		11,398	33	11,398	33	5,753	2.19	7.12
Motors	Cooling Tower Fan	VSD & EEM	RI	12.5	6000		2,571	3	2,571	3	118	1.08	14.46
Motors	Cooling Tower Fan	VSD & EEM	RI	22.5	6000		50,973	51	50,973	51	34,627	6.86	2.28
Motors	Cooling Tower Fan	VSD & EEM	RI	26.5	5000		25,885	31	25,885	31	18,585	5.82	2.68
Motors	Cooling Tower Fan	VSD & EEM	RI	17.5	1000		429	3	429	3	1,441	0.01	1,338.05
Motors	Cooling Tower Fan	VSD & EEM	RI	45.5	1650		11,624	42	11,624	42	5,760	2.03	7.70
Motors	Cooling Tower Fan	VSD & EEM	RI	30.5	1000		3,522	21	3,522	21	755	1.25	12.48
Motors	Cooling Tower Fan	VSD & EEM	RI	21.5	1650		707	3	707	3	1,217	0.17	94.43
Motors	Cooling Tower Fan	VSD & EEM	RI	65.5	2100		28,418	81	28,418	81	20,138	3.62	4.31
Motors	Cooling Tower Fan	VSD & EEM	RI	31.5	1650		1,879	7	1,879	7	385	0.79	19.67
Motors	Cooling Tower Fan	VSD & EEM	RI	53.5	2100		21,743	62	21,743	62	14,864	3.34	4.68
Motors	Cooling Tower Fan	VSD & EEM	RI	30.5	2100		1,668	5	1,668	5	402	0.75	20.75
Motors	Cooling Tower Fan	VSD & EEM	RI	15.5	3200		2,539	5	2,539	5	300	1.18	13.19
Motors	Cooling Tower Fan	VSD & EEM	RI	32.5	1650		1,879	7	1,879	7	385	0.79	19.67
Motors	Cooling Tower Fan	VSD & EEM	RI	16.5	800		4,142	31	4,142	31	1,048	1.27	12.28
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5	3200		16,566	31	16,566	31	13,988	4.63	3.38
Motors	Cooling Tower Fan	VSD & EEM	RI	19.5	5000		3,967	5	3,967	5	1,449	1.89	8.26
Motors	Cooling Tower Fan	VSD & EEM	RI	42.5	3200		21,647	41	21,647	41	18,445	4.85	3.22
Motors	Cooling Tower Fan	VSD & EEM	RI	26.5	1650		1,309	5	1,309	5	689	0.58	27.10
Motors	Cooling Tower Fan	VSD & EEM	RI	19.5	6000		11,016	11	11,016	11	6,564	4.41	3.54
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5	2100		7,711	22	7,711	22	2,819	1.71	9.15
Motors	Cooling Tower Fan	VSD & EEM	RI	15.5	8760		30,857	21	30,857	21	20,774	7.93	1.97
Motors	Cooling Tower Fan	VSD & EEM	RI	62.5	2100		42,817	122	42,817	122	27,118	2.95	5.30
Motors	Cooling Tower Fan	VSD & EEM	RI	34.5	2100		2,391	7	2,391	7	28	1.02	15.39
Motors	Cooling Tower Fan	VSD & EEM	RI	37.5	1650		3,029	11	3,029	11	839	1.44	10.88
Motors	Cooling Tower Fan	VSD & EEM	RI	24.5	2100		900	3	900	3	1,062	0.27	57.47
Motors	Cooling Tower Fan	VSD & EEM	RI	49.5	2100		59,178	169	59,178	169	32,150	2.39	6.55
Motors	Cooling Tower Fan	VSD & EEM	RI	22.5	3200		3,644	7	3,644	7	1,038	1.55	10.05
Motors	Cooling Tower Fan	VSD & EEM	RI	24.5	1000		1,836	11	1,836	11	123	0.94	16.69
Motors	Cooling Tower Fan	VSD & EEM	RI	36.5	3200		11,272	21	11,272	21	7,004	3.34	4.68
Motors	Cooling Tower Fan	VSD & EEM	RI	57.5	2100		14,206	41	14,206	41	8,819	2.84	5.50
Motors	Cooling Tower Fan	VSD & EEM	RI	29.5	3200		5,875	11	5,875	11	3,132	2.63	5.95
Motors	Cooling Tower Fan	EEM	ROF	22	3200		0	0	159	0	481	2.64	5.92
Motors	Cooling Tower Fan	EEM	ROF	9	2100		0	0	17	0	93	1.55	10.06
Motors	Cooling Tower Fan	EEM	ROF	15.5	8760		0	0	132	0	2,300	5.31	2.94
Motors	Cooling Tower Fan	EEM	ROF	37.5	1650		0	0	244	0	396	2.19	7.13
Motors	Cooling Tower Fan	EEM	ROF	43	2100		0	0	1,749	0	599	2.30	6.80
Motors	Cooling Tower Fan	EEM	ROF	14.5	4000		0	0	257	0	2,827	2.96	5.27
Motors	Cooling Tower Fan	EEM	ROF	29.5	3200		0	0	0	0	685	3.06	5.11

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	PI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-req)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-req)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	EEM	ROF	6	1650		0	0	13	0	76	1.45	10.75
Motors	Cooling Tower Fan	EEM	ROF	49	2100		0	0	1,268	4	2,734	2.28	8.85
Motors	Cooling Tower Fan	EEM	ROF	39	2100		0	0	108	0	480	2.44	6.40
Motors	Cooling Tower Fan	EEM	ROF	12.5	6000		0	0	414	0	537	2.91	5.37
Motors	Cooling Tower Fan	EEM	ROF	29	3200		0	0	257	0	685	3.06	5.11
Motors	Cooling Tower Fan	EEM	ROF	36	3200		0	0	483	1	982	2.84	5.50
Motors	Cooling Tower Fan	EEM	ROF	19.5	6000		0	0	481	0	1,117	4.35	3.59
Motors	Cooling Tower Fan	EEM	ROF	30.5	2100		0	0	76	0	342	2.38	6.57
Motors	Cooling Tower Fan	EEM	ROF	53.5	2100		0	0	918	3	1,594	2.11	7.42
Motors	Cooling Tower Fan	EEM	ROF	9	5000		0	0	50	0	200	2.10	7.44
Motors	Cooling Tower Fan	EEM	ROF	62.5	2100		0	0	1,788	5	2,617	2.13	7.35
Motors	Cooling Tower Fan	EEM	ROF	62	2100		0	0	1,788	5	2,617	2.13	7.35
Motors	Cooling Tower Fan	EEM	ROF	49.5	2100		0	0	2,535	7	5,488	2.28	6.85
Motors	Cooling Tower Fan	EEM	ROF	26.5	5000		0	0	1,053	1	1,738	3.41	4.56
Motors	Cooling Tower Fan	EEM	ROF	32.5	1650		0	0	110	0	378	2.29	6.83
Motors	Cooling Tower Fan	EEM	ROF	24.5	1000		0	0	80	0	142	1.42	10.98
Motors	Cooling Tower Fan	EEM	ROF	15.5	3200		0	0	116	0	469	2.89	5.41
Motors	Cooling Tower Fan	EEM	ROF	30.5	1000		0	0	151	1	211	1.40	11.19
Motors	Cooling Tower Fan	EEM	ROF	12	1650		0	0	33	0	149	1.41	11.08
Motors	Cooling Tower Fan	EEM	ROF	43.5	2100		0	0	488	1	1,198	2.30	6.80
Motors	Cooling Tower Fan	EEM	ROF	31.5	1650		0	0	82	0	282	1.96	7.98
Motors	Cooling Tower Fan	EEM	ROF	39.5	2100		0	0	337	1	960	2.44	6.40
Motors	Cooling Tower Fan	EEM	ROF	21.5	1650		0	0	105	0	128	1.59	9.83
Motors	Cooling Tower Fan	EEM	ROF	34	2100		0	0	175	1	239	2.16	7.25
Motors	Cooling Tower Fan	EEM	ROF	16.5	800		0	0	110	0	378	2.29	6.83
Motors	Cooling Tower Fan	EEM	ROF	32	1650		0	0	2128	2	2,575	3.55	4.41
Motors	Cooling Tower Fan	EEM	ROF	22.5	6000		0	0	159	0	481	2.64	5.92
Motors	Cooling Tower Fan	EEM	ROF	45.5	1650		0	0	438	2	1,123	2.05	7.62
Motors	Cooling Tower Fan	EEM	ROF	32.5	3200		0	0	372	1	857	2.86	5.47
Motors	Cooling Tower Fan	EEM	ROF	24.5	2100		0	0	42	0	161	1.74	8.96
Motors	Cooling Tower Fan	EEM	ROF	34.5	2100		0	0	105	0	339	2.16	7.25
Motors	Cooling Tower Fan	EEM	ROF	19.5	5000		0	0	181	0	678	3.73	4.19
Motors	Cooling Tower Fan	EEM	ROF	57.5	2100		0	0	596	2	1,973	2.05	7.61
Motors	Cooling Tower Fan	EEM	ROF	65.5	2100		0	0	1,176	3	1,516	2.05	7.61
Motors	Cooling Tower Fan	EEM	ROF	42.5	3200		0	0	908	2	1,236	2.40	6.50
Motors	Cooling Tower Fan	EEM	ROF	24	2100		0	0	42	0	161	1.74	8.96
Motors	Cooling Tower Fan	EEM	ROF	45	1650		0	0	249	1	561	2.05	7.62
Motors	Cooling Tower Fan	EEM	ROF	26.5	1650		0	0	60	0	290	2.17	7.21
Motors	Cooling Tower Fan	EEM	ROF	17.5	1000		0	0	20	0	30	1.14	13.75
Motors	Cooling Tower Fan	EEM	ROF	36.5	3200		0	0	483	1	982	2.84	5.50
Motors	Cooling Tower Fan	EEM	ROF	39.5	3200		0	0	700	1	1,154	2.60	6.00
Motors	EXH FAN	EEM	RI	25	4000		7,921	24	7,921	24	5,342	2.50	6.25
Motors	EXH FAN	EEM	RI	25	4000		7,921	24	7,921	24	5,342	2.50	6.25
Motors	Furnace Fans	EEM	RI	40	2100		2,810	8	2,810	8	3,419	2.48	6.31
Motors	Furnace Fans	EEM	RI	10	8760		13,011	9	13,011	9	7,991	3.99	3.92
Motors	Furnace Fans	EEM	RI	16	3200		5,069	10	5,069	10	3,562	2.76	5.67
Motors	Furnace Fans	EEM	RI	13	1650		138	13	138	13	161	0.97	16.07
Motors	Furnace Fans	EEM	RI	10	3200		8,805	13	8,805	13	3,564	1.92	8.12
Motors	Furnace Fans	EEM	RI	8	3200		2,673	5	2,673	5	924	1.37	11.39
Motors	Furnace Fans	EEM	RI	8	8760		3,497	2	3,497	2	2,202	3.82	4.09
Motors	Furnace Fans	EEM	RI	1	800		1,046	8	1,046	8	3,911	0.55	28.29
Motors	Furnace Fans	EEM	RI	3	8760		4,165	3	4,165	3	2,267	2.45	6.39
Motors	Furnace Fans	EEM	RI	4	6000		487	0	487	0	248	2.08	7.51
Motors	Furnace Fans	EEM	RI	4	800		7,237	54	7,237	54	33,454	0.51	40.34
Motors	Furnace Fans	EEM	RI	7	8760		1,464	1	1,464	1	807	2.32	5.96
Motors	Furnace Fans	EEM	RI	7	3200		3,832	7	3,832	7	2,137	1.91	8.17
Motors	Furnace Fans	EEM	RI	23	3200		7,749	15	7,749	15	4,962	2.54	6.14
Motors	Furnace Fans	EEM	RI	13	5000		685	1	685	1	422	2.82	5.96
Motors	Furnace Fans	EEM	RI	10	2100		511	1	511	1	114	1.14	13.70
Motors	Furnace Fans	EEM	RI	18	2100		838	2	838	2	374	1.48	10.58

Table 3.4
All ERDs: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-yr)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-yr)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Furnace Fans	EEM	RI	4	8760		3,556	2	3,556	2	2,040	2.77	5.63
Motors	Furnace Fans	EEM	RI	11	8760		9,251	6	9,251	6	6,270	5.61	2.78
Motors	Furnace Fans	EEM	RI	10	5000		3,341	4	3,341	4	1,882	1.83	8.52
Motors	Furnace Fans	EEM	RI	4	1000		5,297	32	5,297	32	-15,071	0.57	27.21
Motors	Furnace Fans	EEM	RI	22	1650		3,540	13	3,540	13	1,013	1.26	12.38
Motors	Furnace Fans	EEM	RI	5	800		101	1	101	1	-180	0.65	23.88
Motors	Furnace Fans	EEM	RI	16	5000		4,951	6	4,951	6	3,012	2.89	5.81
Motors	Furnace Fans	EEM	RI	15	2100		526	2	526	2	66	1.09	14.36
Motors	Furnace Fans	EEM	RI	6	1000		4,312	26	4,312	26	-10,398	0.59	26.36
Motors	Furnace Fans	EEM	RI	18	1000		207	1	207	1	-173	0.71	22.03
Motors	Furnace Fans	EEM	ROF	15	2100		0	0	63	0	274	1.50	10.40
Motors	Furnace Fans	EEM	ROF	4	6000		0	0	48	0	220	2.31	6.76
Motors	Furnace Fans	EEM	ROF	18	2100		0	0	97	0	473	1.83	8.54
Motors	Furnace Fans	EEM	ROF	3	8760		0	0	394	0	1,845	2.61	5.98
Motors	Furnace Fans	EEM	ROF	40	2100		0	0	505	1	1,440	2.44	6.40
Motors	Furnace Fans	EEM	ROF	4	1000		0	0	1,015	0	2,350	1.09	14.32
Motors	Furnace Fans	EEM	ROF	5	800		0	0	25	0	59	1.16	13.51
Motors	Furnace Fans	EEM	ROF	13	1650		0	0	16	0	75	1.41	11.08
Motors	Furnace Fans	EEM	ROF	7	8760		0	0	174	0	628	2.73	5.73
Motors	Furnace Fans	EEM	ROF	7	3200		0	0	441	1	2,012	2.16	7.18
Motors	Furnace Fans	EEM	ROF	13	5000		0	0	77	0	331	2.74	5.69
Motors	Furnace Fans	EEM	ROF	10	2100		0	0	50	0	279	1.55	10.06
Motors	Furnace Fans	EEM	ROF	10	3200		0	0	318	2	3,152	2.12	7.38
Motors	Furnace Fans	EEM	ROF	6	3200		0	0	886	1	1,325	1.73	9.04
Motors	Furnace Fans	EEM	ROF	6	1000		0	0	2,204	5	1,916	1.10	14.17
Motors	Furnace Fans	EEM	ROF	4	800		0	0	1,275	17	1,729	1.03	15.10
Motors	Furnace Fans	EEM	ROF	23	3200		0	0	583	2	3,848	2.64	5.92
Motors	Furnace Fans	EEM	ROF	18	1000		0	0	40	1	2,253	2.73	5.72
Motors	Furnace Fans	EEM	ROF	4	8760		0	0	350	0	59	1.14	13.75
Motors	Furnace Fans	EEM	ROF	10	8760		0	0	1,560	1	5,407	3.77	4.15
Motors	Furnace Fans	EEM	ROF	10	5000		0	0	398	0	1,599	2.10	7.44
Motors	Furnace Fans	EEM	ROF	1	800		0	0	200	2	473	1.07	14.55
Motors	Furnace Fans	EEM	ROF	11	8760		0	0	1,269	1	4,126	5.15	3.03
Motors	Furnace Fans	EEM	ROF	16	3200		0	0	695	1	2,817	2.89	5.41
Motors	Furnace Fans	EEM	ROF	22	1650		0	0	424	2	1,864	1.59	9.83
Motors	Furnace Fans	EEM	ROF	8	8760		0	0	403	0	1,542	3.71	4.22
Motors	Furnace Fans	EEM	RI	19	1000		1,034	12	1,034	12	576	1.19	13.09
Motors	Furnace Fans	EEM	RI	32	1000		8,956	107	8,956	107	8,781	1.79	8.73
Motors	Furnace Fans	EEM	RI	33	1000		15,823	190	15,823	190	16,204	1.91	8.16
Motors	Furnace Fans	EEM	RI	25	1000		2,825	34	2,825	34	2,842	1.82	9.82
Motors	Furnace Fans	EEM	ROF	32	1000		0	0	2,979	36	9,116	1.89	8.28
Motors	Furnace Fans	EEM	ROF	33	1000		0	0	5,039	60	16,560	2.01	7.77
Motors	Furnace Fans	EEM	ROF	19	1000		0	0	198	2	822	1.30	12.02
Motors	Furnace Fans	EEM	ROF	25	1000		0	0	802	10	3,078	1.73	9.03
Motors	Furnace Fans	EEM	RI	27.5	4000		17,517	53	18,172	55	15,414	4.12	3.79
Motors	Furnace Fans	EEM	RI	26.5	4000		51,053	153	53,961	162	31,105	2.25	6.95
Motors	Furnace Fans	EEM	RI	28.5	4000		71,457	292	100,187	301	90,562	5.24	2.98
Motors	Furnace Fans	EEM	RI	28.5	4000		14,787	314	104,767	314	90,281	5.16	3.03
Motors	Furnace Fans	EEM	RI	27.5	4000		56,573	170	58,573	170	15,345	4.06	3.85
Motors	Furnace Fans	EEM	RI	26.5	4000		14,530	44	14,530	44	30,649	2.21	7.06
Motors	Furnace Fans	EEM	RI	26.5	4000		21,784	65	21,784	65	18,490	3.70	4.22
Motors	Furnace Fans	EEM	RI	23	4000		1,671	5	1,671	5	1,429	2.15	7.27
Motors	Furnace Fans	EEM	RI	26	4000		7,921	24	7,921	24	6,233	2.23	6.99
Motors	Furnace Fans	EEM	RI	24	4000		5,855	18	5,855	18	5,419	2.89	5.40
Motors	Furnace Fans	EEM	RI	27.5	4000		6,336	19	6,336	19	6,195	4.04	3.87
Motors	Furnace Fans	EEM	RI	21	4000		6,521	20	6,521	20	5,708	2.06	7.56
Motors	Furnace Fans	EEM	RI	27	4000		3,168	10	3,168	10	2,098	4.04	3.87
Motors	Furnace Fans	EEM	RI	22	4000		325	1	325	1	269	2.26	6.92
Motors	Furnace Fans	EEM	RI	28.5	4000		27,849	84	27,849	84	24,948	3.70	4.22

Table 3.4
All EROs: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	Ph or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (Btu/yr)	First Year Demand Savings (kW/yr)	Full Implement Energy Savings (Btu/yr)	Full Implement Demand Savings (kW/yr)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	POWER VENT	EEM	ROF	28	4000		0	0	2,390	7	12,580	3.82	4.09
Motors	POWER VENT	EEM	ROF	26	4000		0	0	950	3	6,294	2.35	6.65
Motors	POWER VENT	EEM	ROF	27	4000		0	0	435	1	2,999	4.18	3.74
Motors	POWER VENT	EEM	ROF	21	4000		0	0	616	2	5,909	2.19	7.14
Motors	POWER VENT	EEM	ROF	22	4000		0	0	32	0	294	2.38	6.55
Motors	POWER VENT	EEM	ROF	27.5	4000		0	0	869	3	5,997	3.74	3.74
Motors	POWER VENT	EEM	ROF	23	4000		0	0	199	1	1,464	2.27	6.88
Motors	POWER VENT	EEM	ROF	24	4000		0	0	674	2	5,357	3.03	5.16
Motors	POWER VENT	EEM	ROF	28.5	4000		0	0	4,581	14	24,111	3.82	4.09
Motors	POWER VENT	EEM	ROF	26.5	4000		0	0	2,811	8	18,155	3.00	5.20
Refrigerator	Refrigerator	High Efficiency Ref	Ph	1	RF-1	On Post Hrg	257,982	459	257,982	459	92,508	0.68	22.88
Refrigerator	Refrigerator	High Efficiency Ref	Ph	2	RF-2	Substation	140,398	250	140,398	250	47,130	0.69	22.58
Trane & Dist		CVR	Ph	1		Substation	25,041	47	25,041	47	23,154	116.77	0.13
Trane & Dist		CVR	Ph	2		Substation	138,606	258	138,606	258	127,332	637.66	0.02
Trane & Dist		CVR	Ph	3		Substation	298,217	500	298,217	500	410,307	2,052.54	0.01
Trane & Dist		Pwr Fac. Cor to 0.95	Ph	4		Substation	4,602	4	4,602	4	720	0.84	18.60
Trane & Dist	Capacitors	Pwr Fac. Cor to 1.00	Ph	8		Substation	27,648	25	27,648	25	1,575	1.07	14.55
Trane & Dist	Capacitors	Asynchronous	ROF	8	1Ph		103,110	0	103,110	48	32,842	12.19	1.28
Trane & Dist	Transformer	Asynchronous	ROF	12	1Ph		10,007	0	10,007	5	2,262	1.28	12.23
Trane & Dist	Transformer	Asynchronous	ROF	15	1Ph		15,453	0	15,453	7	3,748	1.36	11.47
Trane & Dist	Transformer	Asynchronous	ROF	7	1Ph		91,888	0	91,888	42	29,284	13.53	1.15
Trane & Dist	Transformer	Asynchronous	ROF	18	1Ph		41,943	0	41,943	19	11,996	1.95	7.99
Trane & Dist	Transformer	Asynchronous	ROF	13	1Ph		11,222	0	11,222	5	2,545	1.28	12.19
Trane & Dist	Transformer	Asynchronous	ROF	35	3Ph		88,301	0	88,301	41	26,508	2.75	5.69
Trane & Dist	Transformer	Asynchronous	ROF	5	1Ph		152,675	0	152,675	70	48,869	31.77	0.49
Trane & Dist	Transformer	Asynchronous	ROF	27	3Ph		13,245	0	13,245	6	3,984	2.36	6.63
Trane & Dist	Transformer	Asynchronous	ROF	9	1Ph		43,537	0	43,537	20	13,659	4.96	3.15
Trane & Dist	Transformer	Asynchronous	ROF	6	1Ph		53,949	0	53,949	25	17,139	9.61	1.63
Trane & Dist	Transformer	Asynchronous	ROF	33	3Ph		17,942	0	17,942	8	4,357	1.36	11.45
Trane & Dist	Transformer	Asynchronous	ROF	34	3Ph		225,658	0	225,658	104	70,969	6.65	2.35
Trane & Dist	Transformer	Asynchronous	ROF	10	1Ph		35,173	0	35,173	18	10,462	2.47	6.32
Trane & Dist	Transformer	Asynchronous	ROF	11	1Ph		21,462	0	21,462	10	6,017	1.81	8.65
Trane & Dist	Transformer	Asynchronous	ROF	3	1Ph		9,400	0	9,400	4	2,941	4.08	3.83
Trane & Dist	Transformer	Asynchronous	ROF	4	1Ph		16,481	0	16,481	8	5,192	5.34	2.93
Trane & Dist	Transformer	Asynchronous	ROF	2	1Ph		356	0	356	0	52	1.08	14.69
Trane & Dist	Transformer	Asynchronous	ROF	32	3Ph		90,140	0	90,140	42	27,778	3.82	4.09
Trane & Dist	Transformer	Asynchronous	ROF	22	3Ph		8,462	0	8,462	4	167	1.11	14.14
Trane & Dist	Transformer	Asynchronous	ROF	25	3Ph		3,360	0	3,360	2	2,521	2.14	7.29
Trane & Dist	Transformer	Asynchronous	ROF	21	3Ph		773	0	773	0	962	1.69	9.27
Trane & Dist	Transformer	Asynchronous	ROF	1	1Ph		9,750	0	9,750	5	2,404	1.31	11.96
Trane & Dist	Transformer	Asynchronous	ROF	28	3Ph		32,377	0	32,377	15	7,47	1.39	11.26
Trane & Dist	Transformer	Asynchronous	ROF	30	3Ph		54,377	0	54,377	27	17,908	2.09	7.47
Trane & Dist	Transformer	Asynchronous	ROF	29	3Ph		0	0	0	0	0	3.52	4.44
Generating EROs													
Peak Share (d)	Generator	DGEN-1	Ph	1		B-29	1,208,791	12,300	1,208,791	12,300	918,551	26.84	0.59
Peak Share (d)	Generator	DGEN-10	Ph	10		B-942	18,548,264	48,420	18,548,264	48,420	416,136	1.56	9.99
Peak Share (d)	Generator	DGEN-11	Ph	11		B-942	19,607,852	50,220	19,607,852	50,220	262,380	1.30	11.96
Peak Share (d)	Generator	DGEN-12	Ph	12		B-793	20,687,439	52,020	20,687,439	52,020	101,015	1.10	14.15
Peak Share (d)	Generator	DGEN-13	Ph	13		B-21	21,727,027	53,820	21,727,027	53,820	-67,839	0.94	16.81
Peak Share (d)	Generator	DGEN-14	Ph	14		B-301	22,609,870	55,320	22,609,870	55,320	238,752	0.81	19.20
Peak Share (d)	Generator	DGEN-15	Ph	15		B-510	23,316,262	58,520	23,316,262	58,520	-409,813	0.71	21.52
Peak Share (d)	Generator	DGEN-16	Ph	16		B-220	24,022,361	57,720	24,022,361	57,720	585,812	0.63	24.87
Peak Share (d)	Generator	DGEN-17	Ph	17		B-782	24,552,301	59,340	24,552,301	59,340	-761,250	0.56	27.96
Peak Share (d)	Generator	DGEN-18	Ph	18		B-2645	24,974,195	60,080	24,974,195	60,080	-938,940	0.50	31.21
Peak Share (d)	Generator	DGEN-19	Ph	19		B-898	25,388,798	60,080	25,388,798	60,080	1,115,513	0.45	34.68
Peak Share (d)	Generator	DGEN-20	Ph	20		B-510	25,543,903	60,780	25,543,903	60,780	1,033,073	0.41	38.41
Peak Share (d)	Generator	DGEN-21	Ph	21		B-654	25,823,689	61,380	25,823,689	61,380	-1,297,208	0.37	42.35
Peak Share (d)	Generator	DGEN-2	Ph	2		B-3	26,176,885	61,380	26,176,885	61,380	-1,479,352	0.37	42.35
Peak Share (d)	Generator	DGEN-2	Ph	3		B-880	-8,109,229	25,880	-8,109,229	25,880	1,130,061	11.28	1.38

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Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Peak-Shave (a)	Generator	DGEN-4	RI	4		B/748	-9,117,023	32,220	-9,117,023	32,220	1,138,673	7.57	2.06
Peak-Shave (a)	Generator	DGEN-5	RI	5		B/100	-11,460,463	36,420	-11,460,463	36,420	1,051,996	5.26	2.97
Peak-Shave (a)	Generator	DGEN-6	RI	6		B/930	-13,250,911	39,420	-13,250,911	39,420	939,276	3.87	4.03
Peak-Shave (a)	Generator	DGEN-7	RI	7		B/443	-14,663,402	41,820	-14,663,402	41,820	824,348	2.99	5.23
Peak-Shave (a)	Generator	DGEN-8	RI	8		B/779	-16,076,186	44,220	-16,076,186	44,220	698,931	2.37	6.60
Peak-Shave (a)	Generator	DGEN-9	RI	9		B/773	-17,488,969	46,620	-17,488,969	46,620	563,257	1.91	8.17

(a) Energy savings for Peak-shaving EROs are calculated as generated electricity less diesel consumed in generating. Diesel energy is expressed in kWh for internal consistency. Conversion factor used was (1 MBtu/7,2046 gallons)*(10⁻⁶ Btu/1MBtu)*(1 kWh/3,412 Btu).

Table 3.6
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace. Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
AC	Large Centrifugal	High Eff. AC/Chiller	Ri	15		3	354,154	66,898	31,300	0	329,097	417,295	63,141	1.18	13.26
AC	Large Package	High Eff. AC/Chiller	Ri	89		610	157,031	1,571	1,287	0	145,921	145,789	8,242	0.96	16.49
AC	Large Package	High Eff. AC/Chiller	Ri	105		778	144,520	1,423	811	0	134,296	130,629	-7,991	0.94	16.54
AC	Large Package	High Eff. AC/Chiller	Ri	126		917	111,059	468	348	0	95,680	96,487	-14,612	0.87	17.99
AC	Large Package	High Eff. AC/Chiller	Ri	10		1	46,927	162	92	0	43,007	43,881	-3,066	0.93	16.71
AC	Large Package	High Eff. AC/Chiller	Ri	72		311	63,108	197	112	0	54,348	54,067	-8,449	0.87	18.04
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	17		3	94,534	22,076	12,143	0	69,070	92,288	-2,248	0.98	16.00
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	57		240	133,194	33,717	18,548	0	74,370	126,634	-6,580	0.95	16.43
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	80		604	49,927	1,874	1,068	0	48,395	49,336	-591	0.99	16.81
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	37		301	70,744	9,559	799	0	7,120	9,322	-40,606	0.19	83.67
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	12		112	61,822	2,342	5,449	0	39,600	64,509	-16,235	0.77	20.28
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	47		2	61,822	2,342	1,336	0	57,448	61,126	-697	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	120		123	61,822	2,343	1,336	0	57,448	61,127	-895	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	38		821	46,953	1,318	1,002	0	43,631	45,961	-1,002	0.98	15.98
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	113		793	73,718	2,810	1,802	0	68,502	72,914	-803	0.99	15.79
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	34		106	91,560	3,452	2,003	0	85,082	90,537	-1,024	0.99	15.60
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	11		2	240,251	9,372	5,343	0	223,253	237,968	-2,283	0.99	15.77
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	111		789	61,822	8,312	4,738	0	34,519	47,670	-14,253	0.77	20.30
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	76		346	61,822	4,886	2,871	0	112,716	120,074	-1,225	0.99	15.78
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	16		3	133,194	33,717	18,548	0	74,370	126,634	-6,580	0.95	16.43
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	91		700	160,553	88,852	24,384	0	72,714	186,749	-25,198	1.16	13.60
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	32		104	61,822	2,343	1,836	0	57,448	61,127	-895	0.99	15.80
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	114		796	91,560	49,992	13,760	0	41,467	105,209	-13,649	1.16	13.60
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	124		917	97,508	2,812	2,137	0	90,809	95,558	-1,960	0.98	15.84
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	61		247	137,952	5,340	3,044	0	128,192	130,676	-1,377	0.99	15.78
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	82		443	61,822	4,227	2,463	0	13,771	20,461	-41,372	0.33	20.47
AC	Large Reciprocating	High Eff. AC/Chiller	Ri	3		1	46,953	1,767	1,002	0	43,631	46,390	-563	0.99	15.81
AC	Room/Window	High Eff. AC/Chiller	Ri	64		272	3,203	201	117	0	2,976	3,294	-91	1.03	15.19
AC	Room/Window	High Eff. AC/Chiller	Ri	46		120	1,488	29	27	0	1,183	1,239	-248	0.83	18.75
AC	Room/Window	High Eff. AC/Chiller	Ri	60		240	8,803	1,552	854	0	7,994	10,399	-1,797	1.21	12.92
AC	Room/Window	High Eff. AC/Chiller	Ri	107		778	6,723	406	232	0	6,247	6,885	-162	1.02	16.26
AC	Room/Window	High Eff. AC/Chiller	Ri	118		819	890	14	13	0	841	866	-22	0.97	16.13
AC	Room/Window	High Eff. AC/Chiller	Ri	79		428	890	23	13	0	841	866	-22	0.97	16.13
AC	Room/Window	High Eff. AC/Chiller	Ri	115		799	1,120	26	15	0	1,040	1,081	-39	0.97	16.18
AC	Room/Window	High Eff. AC/Chiller	Ri	19		3	1,120	61	28	0	888	767	-363	0.89	22.80
AC	Room/Window	High Eff. AC/Chiller	Ri	36		106	4,362	319	182	0	4,053	4,554	-192	1.04	14.99
AC	Room/Window	High Eff. AC/Chiller	Ri	22		14	4,788	172	98	0	4,460	4,719	-89	0.98	15.85
AC	Room/Window	High Eff. AC/Chiller	Ri	14		2	4,577	86	49	0	2,310	2,445	-2,132	0.53	29.24
AC	Room/Window	High Eff. AC/Chiller	Ri	41		112	890	10	5	0	841	866	-34	0.95	16.43
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	50		240	131,117	8,026	4,415	0	121,840	134,280	-3,164	1.02	15.25
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	2		1	89,693	2,480	1,414	0	83,347	87,241	-2,463	0.97	16.06
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	88		610	131,117	15,589	12,864	0	131,117	169,670	-28,453	1.22	12.84
AC	Small Centrifugal	High Eff. AC/Chiller	Ri	1		1	71,446	1,769	1,009	0	66,391	69,169	-2,277	0.97	16.14
AC	Small Package	High Eff. AC/Chiller	Ri	97		745	8,476	74	43	0	7,876	7,992	-483	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	48		131	2,733	22	13	0	2,540	2,675	-168	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	109		780	4,374	16	9	0	4,065	4,089	-285	0.93	16.71
AC	Small Package	High Eff. AC/Chiller	Ri	33		104	15,038	134	76	0	13,974	14,184	-864	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	121		823	10,936	44	34	0	10,163	10,240	-696	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	40		112	2,733	22	13	0	2,540	2,675	-168	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	77		400	26,583	260	148	0	26,932	27,341	-1,642	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	Ri	18		3	5,194	42	23	0	4,827	4,992	-303	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	98		760	4,374	26	14	0	4,207	4,247	-212	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	122		829	12,577	71	64	0	11,987	12,181	-764	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	59		240	15,038	198	109	0	13,974	14,281	-767	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	62		247	37,186	337	192	0	34,555	35,083	-2,102	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	45		119	4,374	37	21	0	4,065	4,123	-261	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	51		133	14,218	318	88	0	13,974	14,281	-767	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	69		302	55,232	501	286	0	51,324	52,112	-6,338	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	123		808	4,374	37	21	0	4,065	4,123	-261	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	Ri	103		774	2,733	9	5	0	2,540	2,655	-179	0.93	16.71
AC	Small Package	High Eff. AC/Chiller	Ri	60		133	13,807	288	79	0	12,807	13,356	-6,472	0.93	16.71
AC	Small Package	High Eff. AC/Chiller	Ri	84		447	3,554	22	18	0	3,302	3,342	-211	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	Ri	83		446	3,554	22	18	0	3,302	3,342	-211	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	Ri	90		520	16,878	149	86	0	16,498	16,732	-947	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	4		1	2,733	22	13	0	2,540	2,675	-168	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	Ri	44		119	14,218	106	61	0	13,212	13,378	-840	0.94	16.90
AC	Small Package	High Eff. AC/Chiller	Ri	94		712	5,194	40	23	0	3,493	3,565	-1,639	0.88	22.82

Table 3.5

All EROs: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Replace Savings (1993 \$)	Present Total Value of Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
AC	Small Package	High Eff. AC/Chiller	RI	102		774	28,162	253	144	0	26,170	28,667	-1,596	0.1	16.56
AC	Small Package	High Eff. AC/Chiller	RI	71		311	3,554	20	12	0	3,061	3,093	-491	0.1	17.95
AC	Small Package	High Eff. AC/Chiller	RI	93		704	2,733	23	14	0	1,528	1,563	-1,170	0.57	27.32
AC	Small Package	High Eff. AC/Chiller	RI	28		100	33,084	297	170	0	30,743	31,210	-1,874	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	7		1	12,577	89	51	0	10,009	10,149	-2,428	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	98		724	47,029	334	194	0	43,702	44,230	-2,799	0.94	16.61
AC	Small Package	High Eff. AC/Chiller	RI	99		767	1,093	11	6	0	1,093	1,110	-17	1.02	16.38
AC	Small Package	High Eff. AC/Chiller	RI	6		707	8,476	58	33	0	6,212	6,303	-2,173	0.74	21.01
AC	Small Package	High Eff. AC/Chiller	RI	95		712	1,913	13	8	0	1,286	1,307	-608	0.88	22.86
AC	Small Package	High Eff. AC/Chiller	RI	70		311	3,554	23	13	0	2,805	2,841	-913	0.74	21.02
AC	Small Package	High Eff. AC/Chiller	RI	25		42	4,374	37	21	0	4,065	4,123	-251	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	108		728	8,476	76	43	0	7,876	7,993	-482	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	78		428	20,780	149	86	0	19,310	19,544	-1,236	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	21		14	12,577	112	64	0	11,687	11,883	-714	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	108		780	41,287	374	213	0	38,366	38,954	-2,334	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	112		789	12,577	112	64	0	11,687	11,882	-715	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	5		1	8,476	60	34	0	6,745	6,838	-1,837	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	39		112	143,003	1,294	738	0	132,885	134,917	-8,088	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	68		301	8,476	67	38	0	6,745	6,838	-1,837	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	117		817	17,499	117	69	0	16,261	16,467	-1,032	0.88	22.81
AC	Small Package	High Eff. AC/Chiller	RI	116		814	6,016	52	30	0	5,589	5,671	-343	0.94	16.60
AC	Small Package	High Eff. AC/Chiller	RI	87		504	10,936	141	80	0	10,936	11,168	-222	1.02	15.31
AC	Small Package	High Eff. AC/Chiller	RI	23		301	4,374	37	21	0	4,065	4,123	-251	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	66		301	2,733	22	13	0	2,640	2,675	-158	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	13		2	28,983	260	148	0	26,932	27,341	-1,642	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	53		144	20,780	140	107	0	19,310	19,567	-1,223	0.94	16.60
AC	Small Package	High Eff. AC/Chiller	RI	75		329	8,476	31	18	0	7,876	7,925	-551	0.94	16.71
AC	Small Package	High Eff. AC/Chiller	RI	9		1	8,476	60	34	0	6,745	6,838	-1,837	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	35		106	94,606	856	487	0	87,912	89,255	-5,361	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	81		439	9,296	73	42	0	8,633	8,763	-542	0.94	16.59
AC	Small Package	High Eff. AC/Chiller	RI	74		324	8,476	183	113	0	7,876	8,172	-304	0.94	16.59
AC	Small Package	High Eff. AC/Chiller	RI	104		778	8,476	80	34	0	6,745	6,838	-1,837	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	29		100	3,554	53	17	0	3,302	3,349	-204	0.81	19.36
AC	Small Package	High Eff. AC/Chiller	RI	119		820	4,374	53	31	0	4,374	4,457	-83	0.94	16.58
AC	Small Package	High Eff. AC/Chiller	RI	52		143	28,983	257	149	0	26,932	27,339	-1,644	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	30		101	43,748	374	213	0	40,653	41,239	-2,509	0.94	16.57
AC	Small Package	High Eff. AC/Chiller	RI	8		1	12,577	87	50	0	9,218	9,354	-323	0.74	11.00
AC	Small Package	High Eff. AC/Chiller	RI	27		45	16,678	213	124	0	16,678	17,016	-337	1.02	15.31
AC	Small Package	High Eff. AC/Chiller	RI	63		272	20,780	184	107	0	19,310	19,600	-1,180	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	67		301	8,476	75	43	0	7,876	7,993	-482	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	92		700	4,374	798	219	0	3,767	4,784	-1,017	1.09	14.28
AC	Small Package	High Eff. AC/Chiller	RI	100		770	28,983	262	149	0	26,932	27,343	-1,639	0.94	16.56
AC	Small Package	High Eff. AC/Chiller	RI	58		240	253,742	4,233	2,328	0	236,769	242,350	-11,392	0.96	16.36
AC	Small Reciprocating	High Eff. AC/Chiller	RI	49		133	26,579	3,340	919	0	3,790	8,048	-18,531	0.30	51.59
AC	Small Reciprocating	High Eff. AC/Chiller	RI	43		119	37,816	1,293	760	0	35,139	37,183	-832	0.98	15.89
AC	Small Reciprocating	High Eff. AC/Chiller	RI	20		14	26,579	880	501	0	24,898	26,079	-800	0.98	15.92
AC	Small Reciprocating	High Eff. AC/Chiller	RI	31		102	26,579	2,578	1,470	0	9,446	13,494	-13,086	0.51	30.77
AC	Small Reciprocating	High Eff. AC/Chiller	RI	80		439	26,114	763	436	0	24,898	26,076	-650	0.98	16.02
AC	Small Reciprocating	High Eff. AC/Chiller	RI	101		774	26,579	877	500	0	24,898	26,076	-650	0.98	16.02
AC	Small Reciprocating	High Eff. AC/Chiller	RI	42		116	20,403	299	170	0	2,139	2,608	-503	0.98	16.01
AC	Small Reciprocating	High Eff. AC/Chiller	RI	110		789	22,283	658	375	0	20,707	21,740	-943	0.98	16.01
AC	Small Reciprocating	High Eff. AC/Chiller	RI	26		44	20,403	1,711	992	0	8,226	10,929	-947	0.64	29.16
AC	Small Reciprocating	High Eff. AC/Chiller	RI	85		482	20,403	798	455	0	17,571	18,826	-1,578	0.92	16.93
AC	Small Reciprocating	High Eff. AC/Chiller	RI	54		150	18,682	1,150	656	0	5,791	7,666	-11,095	0.41	38.47
AC	Small Reciprocating	High Eff. AC/Chiller	RI	55		212	26,579	658	500	0	24,898	26,076	-650	0.97	16.06
AC	Small Reciprocating	High Eff. AC/Chiller	RI	73		324	26,579	2,155	1,334	0	24,898	26,187	-722	0.97	16.06
AC	Small Reciprocating	High Eff. AC/Chiller	RI	24		40	37,816	1,319	762	0	35,139	37,211	-1,608	1.06	14.73
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	41		C	10,581	38,817	8,808	-12,404	0	37,211	298,458	1,41	11.08
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	76		H	9,946	54,018	8,182	-19,768	0	35,021	298,458	17.34	0.90
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	7		A	38,813	52,234	14,118	-9,947	0	42,432	10,344	1.98	1.98
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	22		B	36,301	88,946	20,905	-25,309	0	60,406	17,792	6.42	2.88
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	85		I	7,427	23,816	5,770	-7,287	0	84,541	48,240	2.33	6.71
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	51		D	6,779	19,979	4,524	-6,186	0	22,320	14,893	3.01	5.20
Lighting	100W INC	CFL 2-15 CEIL FIXT	RI	66		G	10,392	13,117	3,900	-2,260	0	18,318	11,538	2.70	5.78
Lighting	150W QUARTZ	HPS 400 POLE	RI	103		Str. Ltd.	18,270	194,800	65,862	-56,266	0	14,967	4,265	1.41	11.08
Lighting	150W INC	CFL 2-15 CEIL FIXT	RI	42		C	1,501	10,096	2,239	-490	0	316,728	298,458	17.34	0.90
Lighting	150W INC	CFL 2-15 CEIL FIXT	RI	23		B	34,898	155,866	36,633	-4,428	0	11,846	10,344	7.89	1.98
Lighting	150W INC	CFL 2-15 CEIL FIXT	RI	86		I	4,095	24,078	978	-978	0	188,070	163,372	6.42	2.88
Lighting	150W INC	CFL 2-15 CEIL FIXT	RI	8		A	3,873	9,908	2,596	-265	0	24,834	24,838	7.06	2.21
Lighting	150W INC FLOOD	HPS 50 FLD	RI	104		Str. Ltd.	3,100	4,242	1,430	-8,956	0	12,467	8,594	4.85	4.85
Lighting	150W INC FLOOD	HPS 50 FLD	RI									14,627	11,527	3.22	4.72
Lighting	150W INC FLOOD	HPS 50 FLD	RI									14,627	11,527	4.72	3.31

Table 3.6
All EROs Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replacement Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	67		G	4,272	3,800	1,101	4,894	0	9,795	5,523	2.29	6.81
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	62		D	2,787	5,788	1,310	5,444	0	9,795	9,765	4.50	3.47
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	43		C	4,350	11,246	1,246	9,876	0	23,613	19,283	6.43	2.88
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	9		A	15,874	15,131	4,090	18,721	0	37,943	22,069	2.39	6.54
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	24		B	14,923	26,768	6,056	26,245	0	67,067	42,144	3.82	4.09
Lighting	150W PAR SPOT	HPS 50 FLD	RI	87		I	3,063	6,899	1,872	6,278	0	14,849	11,795	4.86	3.21
Lighting	150W PAR SPOT	HPS 50 FLD	RI	68		G	1,003	892	258	1,149	0	2,299	1,296	2.29	6.81
Lighting	150W PAR SPOT	HPS 50 FLD	RI	44		C	1,021	2,640	585	2,318	0	5,543	4,522	6.43	2.88
Lighting	150W PAR SPOT	HPS 50 FLD	RI	53		D	717	1,820	392	1,474	0	2,944	2,290	4.60	3.47
Lighting	150W PAR SPOT	HPS 50 FLD	RI	88		I	3,063	6,899	1,872	6,278	0	14,849	11,795	4.86	3.21
Lighting	150W PAR SPOT	HPS 50 FLD	RI	25		B	3,063	6,899	1,872	6,278	0	14,849	11,795	4.86	3.21
Lighting	150W PAR SPOT	HPS 50 FLD	RI	78		H	190	357	64	77	0	488	297	3.82	4.09
Lighting	150W PAR SPOT	HPS 50 FLD	RI	45		C	198,338	251,157	55,697	89,318	0	396,172	197,833	2.00	7.82
Lighting	150W PAR SPOT	HPS 50 FLD	RI	31		B	3,914	3,311	778	1,763	0	6,842	1,928	1.49	10.47
Lighting	150W PAR SPOT	HPS 50 FLD	RI	93		I	1,731	1,916	464	750	0	3,130	1,359	1.81	8.84
Lighting	150W PAR SPOT	HPS 50 FLD	RI	26		B	127,816	272,858	64,129	79,348	0	416,336	288,518	3.26	4.80
Lighting	150W PAR SPOT	HPS 50 FLD	RI	89		I	17,305	48,349	11,714	12,157	0	72,219	54,914	4.17	3.74
Lighting	150W PAR SPOT	HPS 50 FLD	RI	102		Str. Ltg.	27,408	69,573	23,461	1,164	0	91,871	64,485	3.36	4.80
Lighting	150W PAR SPOT	HPS 50 FLD	RI	98		I	998	1,965	298	1,318	0	3,580	2,583	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	68		D	911	1,793	272	1,203	0	3,288	2,357	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	48		C	1,421	2,799	424	1,878	0	5,101	3,879	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	37		B	4,878	9,602	1,464	6,443	0	17,499	12,823	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	82		H	1,330	2,631	398	1,765	0	4,794	3,458	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	18		M	6,187	10,214	1,547	8,853	0	18,614	13,427	3.59	4.35
Lighting	150W PAR SPOT	HPS 50 FLD	RI	59		G	47,425	68,659	19,889	46,795	0	135,343	87,918	2.85	5.47
Lighting	150W PAR SPOT	HPS 50 FLD	RI	60		G	2,804	1,897	649	678	0	3,124	520	1.20	13.02
Lighting	150W PAR SPOT	HPS 50 FLD	RI	19		B	888	2,721	639	33	0	3,328	2,740	6.66	2.76
Lighting	150W PAR SPOT	HPS 50 FLD	RI	3		A	92,490	166,921	45,090	49,620	0	281,531	189,041	2.83	5.52
Lighting	150W PAR SPOT	HPS 50 FLD	RI	82		G	200,636	377,665	97,812	107,640	0	643,116	424,480	2.71	5.77
Lighting	150W PAR SPOT	HPS 50 FLD	RI	64		G	26,440	61,184	17,723	34,306	0	113,214	86,774	4.28	3.66
Lighting	150W PAR SPOT	HPS 50 FLD	RI	5		A	16,755	39,072	10,661	21,076	0	70,707	54,952	4.48	3.48
Lighting	150W PAR SPOT	HPS 50 FLD	RI	72		B	7,217	4,708	1,364	2,292	0	8,366	1,147	1.16	13.48
Lighting	150W PAR SPOT	HPS 50 FLD	RI	32		G	244,778	309,982	72,864	122,317	0	505,153	280,378	2.06	7.57
Lighting	150W PAR SPOT	HPS 50 FLD	RI	64		B	99,539	161,809	34,329	45,741	0	236,679	136,140	2.37	6.00
Lighting	150W PAR SPOT	HPS 50 FLD	RI	94		I	112,649	186,539	45,197	66,742	0	288,477	175,928	2.56	6.09
Lighting	150W PAR SPOT	HPS 50 FLD	RI	74		A	63,928	44,958	12,081	22,433	0	79,209	16,282	1.24	12.61
Lighting	150W PAR SPOT	HPS 50 FLD	RI	19		H	12,374	34,738	6,261	6,733	0	46,731	34,357	3.78	4.14
Lighting	150W PAR SPOT	HPS 50 FLD	RI	97		I	269,239	359,878	87,195	60,470	0	497,544	278,305	1.85	8.45
Lighting	150W PAR SPOT	HPS 50 FLD	RI	47		C	7,895	12,072	2,677	1,487	0	16,218	8,321	2.05	7.61
Lighting	150W PAR SPOT	HPS 50 FLD	RI	57		D	9,812	11,807	2,673	1,859	0	16,339	6,727	1.70	9.19
Lighting	150W PAR SPOT	HPS 50 FLD	RI	17		B	9,887	6,727	1,818	2,924	0	11,470	1,602	1.16	13.44
Lighting	150W PAR SPOT	HPS 50 FLD	RI	36		B	260,956	321,887	75,662	109,601	0	507,040	246,384	1.96	8.03
Lighting	150W PAR SPOT	HPS 50 FLD	RI	27		B	30,644	106,426	24,778	31,289	0	161,492	130,848	6.27	2.96
Lighting	150W PAR SPOT	HPS 50 FLD	RI	50		B	4,149	18,081	4,528	6,083	0	28,290	24,141	6.82	2.29
Lighting	150W PAR SPOT	HPS 50 FLD	RI	33		B	663,929	994,771	233,798	287,856	0	1,516,425	862,498	2.28	6.84
Lighting	150W PAR SPOT	HPS 50 FLD	RI	16		A	884	731	198	232	0	1,161	277	1.31	11.90
Lighting	150W PAR SPOT	HPS 50 FLD	RI	55		D	92,599	166,868	37,784	44,564	0	249,208	156,807	2.69	5.80
Lighting	150W PAR SPOT	HPS 50 FLD	RI	96		I	342,871	671,951	162,808	172,488	0	1,007,248	684,674	2.94	6.31
Lighting	150W PAR SPOT	HPS 50 FLD	RI	80		H	37,975	125,128	18,953	28,566	0	172,648	134,971	4.68	3.41
Lighting	150W PAR SPOT	HPS 50 FLD	RI	100		J	15,105	108,003	16,627	16,093	0	107,537	92,432	7.12	2.19
Lighting	150W PAR SPOT	HPS 50 FLD	RI	1		A	42,233	107,894	29,162	10,211	0	147,267	105,034	3.49	4.48
Lighting	150W PAR SPOT	HPS 50 FLD	RI	34		B	1,427,661	2,061,633	486,948	485,900	0	3,039,481	1,811,819	2.13	7.34
Lighting	150W PAR SPOT	HPS 50 FLD	RI	90		I	702,508	1,331,551	322,622	263,965	0	1,908,139	1,205,631	2.72	5.75
Lighting	150W PAR SPOT	HPS 50 FLD	RI	81		H	77,306	248,176	37,690	34,194	0	319,930	242,826	4.14	3.77
Lighting	150W PAR SPOT	HPS 50 FLD	RI	58		D	161,020	51,806	11,730	10,560	0	74,086	44,344	2.49	6.27
Lighting	150W PAR SPOT	HPS 50 FLD	RI	46		C	327,460	22,667	6,534	7,466	0	456,976	305,955	3.03	6.16
Lighting	150W PAR SPOT	HPS 50 FLD	RI	73		G	24,913	43,172	13,291	16,578	0	36,556	11,643	1.47	10.65
Lighting	150W PAR SPOT	HPS 50 FLD	RI	16		A	50,875	83,411	22,545	43,083	0	79,041	28,366	1.56	10.02
Lighting	150W PAR SPOT	HPS 50 FLD	RI	2		C	90,035	55,968	12,410	19,630	0	149,018	68,379	1.85	8.45
Lighting	150W PAR SPOT	HPS 50 FLD	RI	38		C	19,949	84,416	24,463	45,998	0	87,998	68,049	4.41	3.54
Lighting	150W PAR SPOT	HPS 50 FLD	RI	61		G	37,463	84,416	24,463	45,998	0	154,895	67,402	1.77	8.82
Lighting	150W PAR SPOT	HPS 50 FLD	RI	36		B	112,466	273,327	64,239	95,665	0	403,231	290,765	3.69	4.36
Lighting	150W PAR SPOT	HPS 50 FLD	RI	101		I	37,813	50,280	16,948	37,443	0	104,671	66,868	2.77	6.84
Lighting	150W PAR SPOT	HPS 50 FLD	RI	99		J	7,960	129,334	20,288	170,265	0	315,886	311,935	40.24	0.39
Lighting	150W PAR SPOT	HPS 50 FLD	RI	83		I	617	1,484	360	427	0	2,271	1,654	3.68	4.24
Lighting	150W PAR SPOT	HPS 50 FLD	RI	30		C	270,613	744,548	165,114	200,824	0	1,110,486	839,873	4.10	3.81
Lighting	150W PAR SPOT	HPS 50 FLD	RI	20		B	3,217	5,911	1,870	1,870	0	9,171	6,954	2.86	6.48
Lighting	150W PAR SPOT	HPS 50 FLD	RI	49		D	66,100	148,095	33,080	43,117	0	222,292	156,192	3.36	4.65
Lighting	150W PAR SPOT	HPS 50 FLD	RI	63		G	13,220	12,515	3,625	6,999	0	22,139	8,919	1.07	9.33

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of Off-M. Savings (1993 \$)	Present Value of Repairs Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Lighting	75W INC	CFL 2-11 CEIL FIXT	RI	4		A	31,509	31,988	8,840	14,298	0	54,909	23,397	1.74	8.97
Lighting	75W INC	CFL 2-11 CEIL FIXT	RI	74		H	1,716	9,991	0	1,813	0	9,863	8,147	5.75	7.72
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	65		G	9,493	11,983	3,471	4,308	0	19,762	10,268	2.08	7.50
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	21		B	33,163	81,267	19,097	19,281	0	119,636	86,472	3.61	4.33
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	84		I	6,785	21,757	5,272	4,698	0	31,727	24,942	4.68	3.34
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	50		D	6,193	18,262	4,133	4,040	0	26,424	20,231	4.27	3.86
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	40		C	9,867	35,481	7,864	7,174	0	50,499	40,832	5.22	2.99
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	76		A	35,276	47,718	12,898	16,007	0	78,623	41,348	6.22	2.14
Lighting	FL 2X4 2-40 STD	CFL 2-11 CEIL FIXT	RI	6		H	9,088	49,349	7,475	9,599	0	66,422	57,336	7.31	2.14
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC	RI	RETROD		B	3,124	2,643	0	1,132	0	16,125	9,513	2.44	6.41
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC	RI	RETROA		B	3,166	4,959	1,495	1,132	0	7,586	4,421	2.40	6.62
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RASENSA		B	6,205	7,310	1,495	2,636	0	11,442	6,236	2.20	7.11
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RASENSB		B	9,808	15,566	3,124	5,756	0	24,446	14,638	2.49	6.27
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORD		B	3,195	7,851	0	2,643	0	10,496	7,259	3.28	4.79
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	130,009	236,069	69,784	87,523	0	4,677	2,637	2.29	6.81
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RASENSB		B	6,040	9,218	2,312	2,088	0	14,198	8,168	2.35	6.85
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RETROSE		B	4,136	7,967	2,312	1,085	0	11,064	6,927	2.87	6.84
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RETROB		B	106,957	198,239	69,784	25,109	0	283,132	176,176	2.85	5.90
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	23,052	85,554	0	25,109	0	110,663	87,611	4.80	3.26
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,904	3,508	0	1,085	0	4,693	2,689	2.41	5.48
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RASENSC		B	69,233	111,126	27,117	27,396	0	195,608	106,374	2.80	6.59
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RASENSD		B	5,372	3,283	1,296	1,359	0	8,027	4,744	2.45	6.39
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RETROF		B	60,189	89,917	27,117	11,133	0	128,166	77,977	2.56	6.12
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	RETROF		B	2,399	4,298	1,296	596	0	6,189	3,790	2.68	6.08
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	884	2,172	0	696	0	2,767	1,882	3.13	4.99
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	9,044	42,956	0	11,133	0	53,989	44,945	5.97	2.82
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,368	679	528	0	518	1,625	267	1.19	13.15
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,384	908	554	0	1,077	2,239	855	1.62	9.86
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	402	147	135	0	164	446	44	1.11	14.07
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	880	2,002	366	0	349	2,716	2,036	3.99	3.91
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	8,320	15,727	2,869	0	7,010	25,605	17,285	3.08	5.08
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	7,584	9,801	4,267	0	6,488	20,545	12,961	2.71	5.77
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,589	3,562	812	0	1,109	5,483	3,694	3.45	4.53
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,368	7,932	899	0	518	9,348	7,980	6.83	2.29
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,589	1,822	899	0	518	3,102	1,513	1.95	8.00
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,040	649	369	0	876	1,884	844	1.81	8.63
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	402	473	206	0	164	843	441	2.10	7.45
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	297	76	69	0	89	234	79	1.98	19.86
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	224	24	22	0	89	136	88	0.81	26.72
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,896	2,078	1,148	0	704	3,930	2,034	2.07	7.54
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,264	3,367	766	0	469	4,592	3,328	3.63	4.30
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	8,041	15,941	4,515	0	6,113	26,465	18,428	3.29	4.76
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,188	2,026	462	0	366	2,843	1,665	2.39	6.53
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,206	2,096	598	0	434	3,128	1,923	2.80	6.02
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	9,120	12,896	5,801	0	938	26,695	16,576	3.63	4.30
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	2,528	6,715	1,631	0	7197	9,184	6,056	2.82	5.54
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,486	1,274	553	0	994	2,821	1,336	1.90	8.22
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,206	402	206	0	184	843	441	2.10	7.45
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,081	1,081	598	0	434	2,113	908	1.75	8.91
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,368	3,942	899	0	518	5,358	3,990	3.92	3.99
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	996	88	80	0	389	667	439	0.66	27.92
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	3,120	2,477	1,076	0	2,029	6,181	3,061	1.98	7.88
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,372	2,512	1,091	0	686	4,288	2,316	2.17	7.18
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	912	5,288	699	0	345	6,232	5,320	6.83	1.29
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	632	953	383	0	235	1,310	678	2.07	5.4
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	2,193	7,171	3,065	0	349	2,316	1,638	3.41	4.89
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	3,944	5,023	2,182	0	1,058	9,538	7,345	4.35	3.69
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	3,178	4,127	1,793	0	1,372	8,677	4,633	2.17	7.18
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	18,240	25,793	11,202	0	14,395	51,290	33,150	2.82	5.54
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	448	223	97	0	178	498	60	1.11	14.06
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,810	1,810	294	0	230	2,134	1,078	4.08	3.34
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	2,768	3,439	1,494	0	1,028	5,961	3,193	2.15	7.26
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,782	3,63	414	0	116	892	890	0.60	31.21
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	1,589	1,922	896	0	584	3,102	1,613	1.95	8.00
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	1,206	1,376	598	0	434	2,408	1,203	2.00	7.82
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	5,848	6,041	3,339	0	4,016	13,396	7,548	2.29	6.82
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORB		B	3,655	7,201	2,052	0	2,779	12,031	8,376	3.29	4.76
Lighting	FL 2X4 2-40 STD	FL 2X4 2-18 ELC + SENS	RI	SENSORA		B	594	418	231	0	178	827	233	1.39	11.22

Table 3.6
All ERDs: Present Value of Costs and Savings

ERD Category	Equipment	Description of ERD	R or R/F	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replacement Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	R	14	5000		3,564	7,595	1,385	0	1,069	10,049	6,486	2.82	5.64
Motors	AHU	EEM	R	9	8760		297	1,019	115	0	89	1,233	928	4.12	3.79
Motors	AHU	EEM	R	13.5	1000		297	76	69	0	89	224	-83	0.79	19.86
Motors	AHU	EEM	R	3	4000		249	256	58	0	97	412	163	1.66	9.44
Motors	AHU	EEM	R	15.5	4000		2,410	4,749	1,083	0	1,068	7,490	5,080	3.11	5.03
Motors	AHU	EEM	R	24.5	3200		2,280	4,913	1,400	0	1,799	8,113	5,833	3.68	4.39
Motors	AHU	EEM	R	41	1850		2,924	3,020	1,670	0	2,008	6,698	3,774	2.29	6.82
Motors	AHU	EEM	R	8.5	6000		297	670	111	0	199	979	682	3.30	4.74
Motors	AHU	EEM	R	20.5	6000		2,768	9,041	1,494	0	1,028	11,563	8,795	4.18	3.74
Motors	AHU	EEM	R	4	5000		999	1,257	229	0	686	2,071	1,075	2.08	7.51
Motors	AHU	EEM	R	11.5	3200		680	1,219	348	0	677	2,297	1,563	3.30	4.74
Motors	AHU	EEM	R	19.5	4000		3,178	7,124	1,624	0	2,219	10,987	7,789	3.45	4.53
Motors	AHU	EEM	R	14.5	5000		6,534	13,924	2,540	0	1,990	18,424	11,890	2.82	5.54
Motors	AHU	EEM	R	26.5	1000		632	285	246	0	492	1,007	375	1.59	9.81
Motors	AHU	EEM	R	27	1850		1,209	1,050	580	0	1,007	2,636	1,430	2.18	7.15
Motors	AHU	EEM	R	27.5	1850		2,814	2,449	1,354	0	2,349	6,152	3,338	2.19	5.76
Motors	AHU	EEM	R	17.5	3200		804	1,442	411	0	328	2,181	1,377	2.71	7.73
Motors	AHU	EEM	R	15	4000		1,205	2,375	541	0	829	3,745	2,540	3.11	6.03
Motors	AHU	EEM	R	23	1850		680	661	366	0	349	1,375	695	2.02	7.73
Motors	AHU	EEM	R	15	6000		456	1,813	300	0	173	2,286	1,830	5.01	3.12
Motors	AHU	EEM	R	9.5	8760		297	1,019	115	0	89	1,223	928	4.12	3.79
Motors	AHU	EEM	R	11	3200		3,178	4,127	1,793	0	338	7,088	3,910	3.20	4.74
Motors	AHU	EEM	R	60.5	2100		3,178	4,127	1,793	0	338	7,088	3,910	3.20	4.74
Motors	AHU	EEM	R	9.5	4000		1,360	3,203	730	0	699	4,632	3,272	3.41	4.59
Motors	AHU	EEM	R	23.5	1850		1,700	1,852	913	0	873	3,438	1,738	2.02	7.73
Motors	AHU	EEM	R	24	3200		1,368	2,948	840	0	1,080	4,868	3,500	3.66	4.39
Motors	AHU	EEM	R	44.5	2100		3,655	5,148	2,236	0	1,314	8,698	5,043	2.38	5.58
Motors	AHU	EEM	R	6	4000		594	1,013	231	0	178	1,422	828	2.39	5.53
Motors	AHU	EEM	R	25.5	2100		340	420	183	0	175	778	438	2.29	6.83
Motors	AHU	EEM	R	13	800		1,462	1,462	504	0	526	1,604	142	1.70	14.24
Motors	AHU	EEM	R	41.5	2100		15,800	20,418	8,868	0	13,517	42,803	27,003	2.71	5.77
Motors	AHU	EEM	R	20	6000		1,384	4,521	747	0	514	5,782	4,358	4.18	3.74
Motors	AHU	EEM	R	15.5	6000		456	1,813	300	0	173	2,286	1,830	5.01	3.12
Motors	AHU	EEM	R	30	3200		632	1,343	383	0	235	1,990	1,328	3.10	6.04
Motors	AHU	EEM	R	19	2100		891	764	332	0	696	1,692	801	1.90	8.22
Motors	AHU	EEM	R	9.5	800		402	118	135	0	207	1,240	417	1.04	15.07
Motors	AHU	EEM	R	18.5	1850		891	627	346	0	207	1,240	417	1.04	15.07
Motors	AHU	EEM	R	17	3200		402	721	206	0	184	1,091	689	2.71	5.78
Motors	AHU	EEM	R	13.5	800		3,655	1,259	1,436	0	1,314	4,010	365	1.10	14.24
Motors	AHU	EEM	R	14.5	6000		731	1,170	193	0	336	1,699	1,297	4.23	3.70
Motors	AHU	EEM	R	22	1000		912	3,088	352	0	345	3,179	2,448	4.35	3.69
Motors	AHU	EEM	R	44	2100		2,193	3,088	1,342	0	789	6,219	3,028	2.38	6.56
Motors	AHU	EEM	R	30.5	3200		1,896	4,029	1,148	0	704	6,881	3,985	3.10	5.04
Motors	AHU	EEM	R	33.5	1660		912	1,013	600	0	720	2,293	1,381	2.51	6.21
Motors	AHU	EEM	R	10.5	4000		2,280	6,569	1,498	0	863	8,931	6,651	3.52	3.99
Motors	AHU	EEM	R	33	1850		912	1,013	600	0	720	2,293	1,381	2.51	6.21
Motors	AHU	EEM	R	54.5	2100		4,820	5,503	2,390	0	1,737	9,530	4,810	2.00	7.82
Motors	AHU	EEM	R	11	1000		260	44	41	0	108	192	-88	0.74	21.10
Motors	AHU	EEM	R	21	5000		456	1,810	294	0	230	2,134	1,678	4.68	3.34
Motors	AHU	EEM	R	17.5	5000		1,020	3,003	648	0	524	4,074	3,054	3.99	3.91
Motors	AHU	EEM	R	58.5	2100		5,536	8,879	2,988	0	2,066	11,923	6,387	2.15	7.26
Motors	AHU	EEM	R	14.5	6000		8,955	3,087	609	0	3,116	1,024	-7,930	0.11	136.00
Motors	AHU	EEM	R	19.5	2100		19,030	2,687	1,187	-166	-8,065	-22,022	-22,022	-0.18	-99.37
Motors	AHU	EEM	R	6.5	900		38,089	1,184	1,360	-937	-14,360	-12,764	-50,843	-0.33	-46.66
Motors	AHU	EEM	R	45.5	8000		13,715	5,906	959	-158	5,108	1,502	-12,212	0.11	142.62
Motors	AHU	EEM	R	31.5	1000		64,441	77,426	5,320	-158	29,813	-16,024	-92,448	-0.19	-80.51
Motors	AHU	EEM	R	60.5	2100		228,685	4,888	4,460	-166	-24,400	-16,228	-79,608	-0.24	-65.73
Motors	AHU	EEM	R	22.5	1000		41,144	3,164	2,877	-489	-16,311	-9,764	-50,897	-0.24	-65.90
Motors	AHU	EEM	R	28.5	1000		20,208	1,580	1,471	-166	-7,417	-4,563	-24,760	-0.23	-69.34
Motors	AHU	EEM	R	16.5	4000		106,190	31,019	7,073	-166	-39,822	-2,042	-107,232	0.02	-804.84
Motors	AHU	EEM	R	21.5	5000		133,743	6,278	983	-166	-5,083	1,002	-12,741	0.07	214.32
Motors	AHU	EEM	R	44.5	2100		60,393	21,183	9,192	-469	-22,607	-20,865	-154,076	-0.16	-99.80
Motors	AHU	EEM	R	36.5	1660		41,144	25,392	2,877	-469	-15,317	-11,117	-71,510	-0.18	-84.89
Motors	AHU	EEM	R	12.5	8760		12,030	2,967	846	-312	-4,142	12,484	-28,600	0.30	61.49
Motors	AHU	EEM	R	11.5	3200		24,892	30,304	6,076	-625	-30,123	-13,272	-80,653	-0.06	-307.32
Motors	AHU	EEM	R	23.5	5000		80,306	30,304	6,076	-625	-30,123	-13,272	-80,653	-0.06	-307.32
Motors	AHU	EEM	R	33.5	1660		40,186	3,516	1,943	-312	-15,145	-9,998	-50,185	0.08	245.51
Motors	AHU	EEM	R											-0.26	-62.79

Table 3.6
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROE	ID	102	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Repairs Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	VSD to existing mtr	RI	9.6	800		8,873	623	156	3,186	-2,233	-11,097	-0.26	62.36
Motors	AHU	VSD to existing mtr	RI	54.6	2100		187,878	32,488	-626	-59,630	-14,111	-171,434	-0.09	181.94
Motors	AHU	VSD to existing mtr	RI	13.6	800		133,617	8,061	-781	-50,689	-34,117	-107,735	-0.28	81.18
Motors	AHU	VSD to existing mtr	RI	24.6	3200		69,167	17,044	-781	-25,221	-4,100	-73,287	-0.06	283.67
Motors	AHU	VSD to existing mtr	RI	8.6	6000		3,747	1,413	-156	-1,189	301	-3,448	0.08	194.43
Motors	AHU	VSD to existing mtr	RI	20.6	6000		129,633	53,667	-312	-49,800	12,421	-117,213	0.10	163.06
Motors	AHU	VSD to existing mtr	RI	30.6	3200		60,241	14,938	-469	-22,648	-426	-84,083	-0.09	246.24
Motors	AHU	VSD to existing mtr	RI	9.6	4000		213,663	26,719	-1,846	-8,666	-426	-26,581	-0.02	924.54
Motors	AHU	VSD to existing mtr	RI	41.6	1660		213,663	26,719	-1,846	-8,666	-426	-26,581	-0.02	924.54
Motors	AHU	VSD to existing mtr	RI	23.6	1660		31,232	3,722	-2,058	-10,745	-6,748	-36,978	-0.18	84.82
Motors	AHU	VSD to existing mtr	RI	13.6	1000		3,687	247	-156	-1,224	-908	-4,696	-0.25	84.91
Motors	AHU	VSD to existing mtr	RI	27.6	1660		62,672	7,714	-625	-21,806	-10,921	-73,593	-0.17	89.66
Motors	AHU	VSD to existing mtr	RI	58.6	2100		267,967	40,831	-312	-99,070	-41,130	-299,087	-0.16	57.98
Motors	AHU	VSD to existing mtr	RI	17.6	3200		17,747	4,183	-312	-1,309	-19,056	-211.81	-0.07	233.00
Motors	AHU	VSD to existing mtr	RI	33.6	3200		293,996	71,459	-1,718	-109,457	-19,298	-313,254	-0.07	233.00
Motors	AHU	VSD to existing mtr	RI	16.6	1660		11,090	1,221	-469	-3,871	-2,244	-13,304	-0.20	77.00
Motors	AHU	VSD to existing mtr	RI	8.6	4000		16,044	3,947	-625	-5,016	-794	-16,837	-0.06	296.11
Motors	AHU	VSD to existing mtr	RI	26.6	2100		6,248	947	-156	-2,149	-948	-7,193	-0.16	103.12
Motors	AHU	VSD to existing mtr	RI	18.6	4000		156,228	48,888	-312	-59,676	-2,308	-158,636	-0.01	1,067.65
Motors	AHU	VSD to existing mtr	RI	60.6	2100		167,626	24,881	-926	-60,040	-24,978	-182,603	-0.16	98.62
Motors	AHU	VSD to existing mtr	RI	9.6	8780		3,687	938	-156	-1,224	830	-2,866	0.23	69.36
Motors	AHU	VSD to existing mtr	RI	46.6	1660		62,397	9,382	-156	-20,068	-10,304	-82,701	-0.20	79.44
Motors	AHU	VSD to existing mtr	RI	35.6	5000		81,107	27,134	-3,437	-26,924	-1,723	-79,384	0.02	735.41
Motors	AHU	VSD to existing mtr	RI	20.6	2100		653,608	89,480	-6,249	-201,874	-79,780	-833,388	-0.14	108.40
Motors	AHU	VSD to existing mtr	RI	31.6	1000		8,873	664	-156	-3,186	-2,092	-10,966	-0.24	66.26
Motors	AHU	VSD to existing mtr	RI	10.6	4000		69,248	21,031	-781	-26,802	-1,373	-10,247	-0.15	100.93
Motors	AHU	VSD to existing mtr	RI	41.6	2100		487,928	82,938	-3,908	-177,727	-62,672	-560,600	-0.01	1,430.63
Motors	AHU	VSD to existing mtr	RI	40.6	3200		61,469	12,377	-156	-19,681	-3,932	-66,398	-0.08	204.46
Motors	AHU	VSD to existing mtr	RI	17.6	6000		18,739	6,787	-469	-6,447	1,086	-17,663	0.06	269.50
Motors	AHU	VSD to existing mtr	RI	14.6	6000		8,970	3,777	-156	-3,136	1,040	-7,930	0.12	134.80
Motors	AHU	VSD to existing mtr	RI	41.6	1660		214,004	27,058	-625	-60,301	-39,637	-263,641	-0.18	84.68
Motors	AHU	VSD to existing mtr	RI	24.6	3200		69,266	17,164	-781	-26,330	-4,068	-73,323	-0.06	266.17
Motors	AHU	VSD to existing mtr	RI	30.6	3200		60,698	15,669	-469	-23,114	-3,676	-84,272	-0.06	266.17
Motors	AHU	VSD to existing mtr	RI	38.6	1660		60,848	4,438	-469	-23,176	-11,178	-72,026	-0.08	186.42
Motors	AHU	VSD to existing mtr	RI	16.6	6000		13,824	6,037	-156	-5,242	1,636	-12,188	0.12	132.06
Motors	AHU	VSD to existing mtr	RI	10.6	4000		69,796	21,870	-781	-26,486	-409	-70,204	-0.01	2,666.82
Motors	AHU	VSD to existing mtr	RI	9.6	8780		3,768	1,126	-156	-1,203	306	-3,453	0.24	66.46
Motors	AHU	VSD to existing mtr	RI	19.6	2100		18,087	2,717	-781	-6,136	-3,020	-22,107	0.16	98.73
Motors	AHU	VSD to existing mtr	RI	50.6	2100		158,472	26,062	-626	-61,222	-26,040	-183,612	-0.16	98.87
Motors	AHU	VSD to existing mtr	RI	31.6	1000		64,494	4,913	-156	-7,448	-4,562	-24,754	-0.23	69.28
Motors	AHU	VSD to existing mtr	RI	27.6	1660		62,760	7,777	-1,094	-21,941	-10,929	-50,268	-0.25	62.68
Motors	AHU	VSD to existing mtr	RI	54.6	2100		168,748	33,370	-626	-60,813	-360	-80,720	0.00	3,621.60
Motors	AHU	VSD to existing mtr	RI	9.6	800		8,970	649	-156	-3,308	-2,287	-11,267	-0.08	186.42
Motors	AHU	VSD to existing mtr	RI	8.6	6000		3,768	1,428	-156	-1,203	306	-3,453	0.24	66.46
Motors	AHU	VSD to existing mtr	RI	16.6	1660		11,274	1,307	-469	-3,939	-2,378	-13,662	-0.21	74.07
Motors	AHU	VSD to existing mtr	RI	28.6	1000		20,232	1,691	-156	-7,448	-4,562	-24,754	-0.23	69.28
Motors	AHU	VSD to existing mtr	RI	33.6	1660		40,239	3,638	-312	-16,210	-10,029	-50,268	-0.25	62.68
Motors	AHU	VSD to existing mtr	RI	11.6	4000		81,080	25,948	-626	-60,813	-360	-80,720	0.00	3,621.60
Motors	AHU	VSD to existing mtr	RI	13.6	1000		3,768	264	-156	-1,313	-964	-4,722	-0.28	60.89
Motors	AHU	VSD to existing mtr	RI	58.6	2100		259,280	42,071	-625	-100,730	-41,011	-300,297	-0.16	98.77
Motors	AHU	VSD to existing mtr	RI	21.6	6000		13,824	5,436	-156	-6,186	-1,086	-12,738	0.08	198.94
Motors	AHU	VSD to existing mtr	RI	16.6	4000		31,289	7,136	-312	-40,049	-1,938	-107,310	-0.02	849.34
Motors	AHU	VSD to existing mtr	RI	40.6	3200		51,766	12,713	-156	-20,042	-3,862	-66,617	-0.07	209.34
Motors	AHU	VSD to existing mtr	RI	17.6	3200		17,940	4,394	-312	-6,813	-1,279	-19,219	-0.07	219.18
Motors	AHU	VSD to existing mtr	RI	20.6	1000		8,970	887	-156	-3,308	-2,160	-11,120	-0.24	66.18
Motors	AHU	VSD to existing mtr	RI	48.6	1660		62,668	6,656	-626	-20,419	-10,397	-83,083	-0.20	79.17
Motors	AHU	VSD to existing mtr	RI	8.6	4000		16,329	4,276	-625	-5,372	-809	-16,138	-0.06	296.09
Motors	AHU	VSD to existing mtr	RI	49.6	1660		77,808	9,917	-156	-30,289	-16,048	-92,862	-0.19	80.79
Motors	AHU	VSD to existing mtr	RI	23.6	6000		80,897	31,052	-469	-30,741	-6,508	-76,189	0.07	228.90
Motors	AHU	VSD to existing mtr	RI	23.6	1660		31,640	3,940	-781	-11,266	-6,918	-37,668	-0.19	83.62
Motors	AHU	VSD to existing mtr	RI	33.6	3200		294,306	71,884	-1,718	-109,843	-19,189	-313,494	-0.07	239.90
Motors	AHU	VSD to existing mtr	RI	12.6	8780		41,472	28,406	-469	-16,727	13,202	-28,270	0.32	49.07
Motors	AHU	VSD to existing mtr	RI	17.6	5000		18,984	7,163	-469	-6,763	1,248	-17,736	0.07	237.67
Motors	AHU	VSD to existing mtr	RI	36.6	2100		564,310	90,067	-6,249	-202,750	-79,828	-834,138	-0.14	108.48
Motors	AHU	VSD to existing mtr	RI	20.6	6000		130,298	66,297	-312	-50,830	-13,480	-116,808	-0.10	160.89
Motors	AHU	VSD to existing mtr	RI	31.6	2100		8,970	1,442	-156	-3,308	-1,396	-10,366	-0.16	102.04
Motors	AHU	VSD to existing mtr	RI	25.6	2100		6,328	1,003	-156	-2,251	-969	-7,297	-0.15	102.04
Motors	AHU	VSD to existing mtr	RI	16.6	4000		156,488	47,343	-312	-69,874	-2,048	-158,616	-0.01	1,193.60

Table 3.6
All EROs Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI by ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Repairs (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AMU	VSD & EEM	RI	85	800		38 374	1 267	1 445	937	14 708	-12 932	-51 306	-0.34	46.36
Motors	AMU	VSD & EEM	RI	95	4000		26 482	7 940	1 742	-825	9 073	-316	-25 797	-0.01	1.263 76
Motors	AMU	VSD & EEM	RI	80 5	2100		229 829	25 243	10 984	-312	90 590	-64 068	-284 295	0.24	66.82
Motors	AMU	VSD & EEM	RI	14 5	5000		82 878	29 043	6 298	-3 437	28 883	2 022	80 864	0.02	638.83
Motors	AMU	VSD & EEM	RI	11 5	3200		12 956	2 994	863	-312	4 175	639	-13 296	-0.05	-309.32
Motors	AMU	VSD & EEM	RI	22 5	1000		41 472	3 280	2 992	-409	15 727	-9 823	-51 395	-0.24	-66.29
Motors	AMU	VSD & EEM	RI	41 5	2100		487 828	83 529	36 279	-3 906	177 727	-61 826	-549 753	0.13	-123.29
Motors	AMU	VSD & EEM	RI	44 5	2100		134 059	21 866	9 497	-781	-51 524	-20 944	-166 043	-0.18	-100.03
Motors	AMU	EEM	ROF	30	3200		482	752	214	0	424	1 391	929	3.01	6.19
Motors	AMU	EEM	ROF	13 5	1000		217	43	39	0	178	269	42	1.20	13.07
Motors	AMU	EEM	ROF	9 5	800		294	66	74	0	285	129	129	1.44	10.84
Motors	AMU	EEM	ROF	9	4000		497	927	211	0	553	1 892	1 195	3.40	4.59
Motors	AMU	EEM	ROF	6 5	4000		888	1 182	270	0	712	2 184	1 298	2.49	6.27
Motors	AMU	EEM	ROF	41	5000		919	932	170	0	765	1 867	1 048	2.28	8.86
Motors	AMU	EEM	ROF	41	1650		2 599	2 557	1 413	0	2 283	6 263	3 654	2.41	6.49
Motors	AMU	EEM	ROF	33	1650		843	936	618	0	764	2 218	1 374	2.63	5.94
Motors	AMU	EEM	ROF	16 5	1650		651	368	202	0	534	1 102	451	1.89	9.23
Motors	AMU	EEM	ROF	31 5	1000		1 280	562	503	0	1 144	2 199	919	1.72	9.09
Motors	AMU	EEM	ROF	9	8780		217	595	87	0	178	840	823	3.87	4.03
Motors	AMU	EEM	ROF	12	8780		698	2 996	339	0	619	3 954	3 287	5.93	2.83
Motors	AMU	EEM	ROF	17 5	5000		745	1 738	317	0	830	2 886	2 140	3.87	4.04
Motors	AMU	EEM	ROF	16 5	4000		2 826	5 936	1 353	0	2 518	9 807	6 982	3.47	4.50
Motors	AMU	EEM	ROF	40 5	3200		880	1 110	316	0	795	2 222	1 347	2.52	7.41
Motors	AMU	EEM	ROF	18	2100		2 886	2 302	1 000	0	2 778	6 080	3 195	2.11	7.41
Motors	AMU	EEM	ROF	15	6000		333	1 027	170	0	309	1 608	1 173	4.52	3.48
Motors	AMU	EEM	ROF	22 5	1000		1 000	309	282	0	528	1 618	1 245	1.52	10.29
Motors	AMU	EEM	ROF	14 5	6000		372	1 083	179	0	355	1 617	1 245	4.35	3.59
Motors	AMU	EEM	ROF	9 5	5000		2 804	4 434	809	0	2 137	7 380	4 778	2.83	5.51
Motors	AMU	EEM	ROF	15 5	8780		217	596	87	0	178	840	823	3.87	4.03
Motors	AMU	EEM	ROF	15 5	4000		2 142	3 967	902	0	1 886	6 744	4 802	3.16	4.96
Motors	AMU	EEM	ROF	12 5	8780		1 000	4 483	605	0	928	6 931	4 931	5.93	2.83
Motors	AMU	EEM	ROF	31 5	2100		754	270	117	0	286	872	379	2.29	6.83
Motors	AMU	EEM	ROF	15 5	6000		333	1 027	170	0	309	1 608	1 173	4.52	3.48
Motors	AMU	EEM	ROF	19 5	2100		1 373	1 183	514	0	1 065	2 762	1 389	2.01	7.77
Motors	AMU	EEM	ROF	58 5	2100		2 023	1 821	791	0	1 858	4 470	2 447	2.21	7.07
Motors	AMU	EEM	ROF	8 5	800		4 045	3 842	1 582	0	3 715	8 940	4 894	2.21	7.07
Motors	AMU	EEM	ROF	9 5	4000		1 302	204	233	0	660	1 067	215	0.83	18.71
Motors	AMU	EEM	ROF	9 5	4000		924	1 881	429	0	848	3 158	2 324	3.42	4.57
Motors	AMU	EEM	ROF	9 5	4000		954	1 854	423	0	1 108	3 383	2 389	4.59	4.59
Motors	AMU	EEM	ROF	50	2100		1 441	1 363	592	0	1 277	3 232	1 791	2.24	6.96
Motors	AMU	EEM	ROF	19	2100		824	710	308	0	639	1 867	834	2.01	7.77
Motors	AMU	EEM	ROF	3	4000		182	160	34	0	172	366	174	1.98	7.99
Motors	AMU	EEM	ROF	31	2100		254	270	117	0	285	872	379	2.29	6.83
Motors	AMU	EEM	ROF	8	4000		434	591	136	0	358	1 082	648	2.49	6.27
Motors	AMU	EEM	ROF	13	1000		217	43	39	0	178	259	42	1.20	13.07
Motors	AMU	EEM	ROF	23 5	5000		1 733	4 723	882	0	1 548	7 131	5 398	4.11	3.80
Motors	AMU	EEM	ROF	11	5000		7 992	14 814	2 898	0	7 409	24 089	10 936	3.21	4.87
Motors	AMU	EEM	ROF	33	3200		3 379	6 828	1 889	0	2 954	11 471	8 091	3.39	4.80
Motors	AMU	EEM	ROF	22	1000		686	206	188	0	619	1 012	346	1.52	10.29
Motors	AMU	EEM	ROF	44	2100		1 802	1 711	743	0	1 448	3 901	2 298	2.43	6.42
Motors	AMU	EEM	ROF	7	1000		728	46	42	0	688	778	48	1.07	14.95
Motors	AMU	EEM	ROF	33 5	3200		7 434	14 581	4 166	0	6 499	26 236	17 801	3.39	4.80
Motors	AMU	EEM	ROF	13	800		1 088	282	299	0	984	1 526	457	1.43	10.94
Motors	AMU	EEM	ROF	8 5	6000		276	822	103	0	213	938	863	3.42	4.67
Motors	AMU	EEM	ROF	30 5	3200		2 267	643	197	0	1 272	4 172	2 787	3.01	6.19
Motors	AMU	EEM	ROF	21	5000		380	1 078	197	0	332	1 807	1 248	4.46	3.50
Motors	AMU	EEM	ROF	49	1650		1 161	869	476	0	1 080	2 394	1 232	2.06	7.58
Motors	AMU	EEM	ROF	11 5	4000		3 787	3 787	858	0	1 698	6 315	4 468	4.67	4.67
Motors	AMU	EEM	ROF	18	4000		1 413	2 968	677	0	1 259	4 904	3 491	3.42	4.67
Motors	AMU	EEM	ROF	11	1000		190	24	22	0	185	232	42	1.22	12.80
Motors	AMU	EEM	ROF	17	5000		497	1 159	211	0	553	1 923	1 427	3.87	4.04
Motors	AMU	EEM	ROF	2	1000		164	14	13	0	156	183	19	1.12	13.99
Motors	AMU	EEM	ROF	10 5	4000		1 998	3 722	849	0	1 547	6 117	4 451	3.67	4.26
Motors	AMU	EEM	ROF	24 5	3200		2 108	4 540	1 294	0	1 909	7 743	5 835	3.67	4.26
Motors	AMU	EEM	ROF	28 5	1000		584	247	226	0	522	954	409	1.70	9.19
Motors	AMU	EEM	ROF	6	2100		327	131	57	0	313	601	174	1.63	10.20
Motors	AMU	EEM	ROF	20	6000		1 011	2 394	396	0	929	3 718	2 707	3.68	4.26
Motors	AMU	EEM	ROF	10	4000		1 000	2 233	509	0	928	3 670	2 871	3.67	4.26
Motors	AMU	EEM	ROF	23	5000		578	1 574	287	0	515	2 377	1 799	4.11	3.80
Motors	AMU	EEM	ROF	11 5	3200		629	1 131	322	0	709	2 163	1 534	3.44	4.54

Table 3.5
All ERDs Present Value of Costs and Savings

ERD Category	Equipment	Description of ERD	R or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	ROF	17	3200		294	412	117	0	285	814	520	2.77	6.64
Motors	AHU	EEM	ROF	41.5	1650		5,199	5,114	2,827	0	4,587	12,507	7,308	2.41	6.49
Motors	AHU	EEM	ROF	41	2100		7,284	9,009	3,913	0	6,500	19,421	12,157	2.87	5.84
Motors	AHU	EEM	ROF	24	3200		1,265	2,724	776	0	1,145	4,649	3,381	3.07	4.25
Motors	AHU	EEM	ROF	54.5	2100		3,522	2,914	1,260	0	3,182	7,301	3,839	2.09	7.47
Motors	AHU	EEM	ROF	38	1850		482	388	214	0	424	1,028	566	2.22	7.03
Motors	AHU	EEM	ROF	16	1650		434	244	136	0	366	730	301	1.05	5.23
Motors	AHU	EEM	ROF	41.5	2100		15,192	18,768	8,161	0	13,517	40,436	25,243	2.06	6.87
Motors	AHU	EEM	ROF	27	1650		1,116	971	537	0	1,066	2,673	2,31	0.77	6.77
Motors	AHU	EEM	ROF	44.5	2100		2,871	2,852	1,239	0	2,410	6,501	3,830	2.43	6.42
Motors	AHU	EEM	ROF	14	1650		962	603	333	0	928	1,862	901	1.94	8.07
Motors	AHU	EEM	ROF	35.5	2100		16,804	23,834	10,362	0	15,270	49,457	32,593	2.53	5.33
Motors	AHU	EEM	ROF	23	1850		497	382	211	0	553	1,147	650	0.77	7.77
Motors	AHU	EEM	ROF	49.5	1850		880	672	318	0	796	1,684	804	1.91	8.17
Motors	AHU	EEM	ROF	60	2100		2,322	2,186	949	0	2,121	6,256	2,933	2.28	6.90
Motors	AHU	EEM	ROF	17.5	3200		687	824	236	0	589	1,628	1,040	2.77	6.64
Motors	AHU	EEM	ROF	80.5	2100		2,322	2,186	949	0	2,121	6,256	2,933	2.28	6.90
Motors	AHU	EEM	ROF	11	3200		314	665	191	0	355	1,081	797	3.44	4.64
Motors	AHU	EEM	ROF	21.5	5000		380	1,078	197	0	332	1,807	1,248	4.48	3.60
Motors	AHU	EEM	ROF	13.5	800		2,871	665	747	0	2,410	3,813	1,142	4.43	10.94
Motors	AHU	EEM	ROF	15	4000		1,071	1,979	451	0	542	3,372	2,301	3.16	4.99
Motors	AHU	EEM	ROF	36	2100		8,432	11,917	5,178	0	7,638	24,726	16,296	2.93	6.33
Motors	AHU	EEM	ROF	20.5	1000		294	81	74	0	286	439	148	1.50	10.46
Motors	AHU	EEM	ROF	50.5	2100		2,882	2,728	1,184	0	2,564	6,484	3,582	2.24	6.20
Motors	AHU	EEM	ROF	28.5	2100		248	243	109	0	277	626	377	2.62	6.20
Motors	AHU	EEM	ROF	14.5	5000		4,774	8,128	1,483	0	3,918	13,629	8,756	2.83	5.51
Motors	AHU	EEM	ROF	33.5	1650		943	936	518	0	784	2,218	1,374	2.83	5.94
Motors	AHU	EEM	ROF	38.5	1650		1,386	1,184	643	0	1,272	3,078	1,884	2.22	7.03
Motors	AHU	EEM	ROF	64	2100		880	728	318	0	796	1,840	960	2.09	7.47
Motors	AHU	EEM	ROF	23.5	1650		1,242	958	529	0	1,383	2,807	1,626	2.31	6.77
Motors	AHU	EEM	ROF	49.5	1650		1,161	859	476	0	1,060	2,394	1,332	2.06	7.58
Motors	AHU	EEM	ROF	27.5	1650		2,802	2,268	1,263	0	2,484	6,003	3,401	2.31	6.77
Motors	AHU	EEM	ROF	20.5	6000		2,023	4,787	791	0	1,858	7,438	5,413	3.68	4.26
Motors	AHU	EEM	ROF	10	800		402	143	218	0	338	698	254	1.73	9.02
Motors	AHU	EEM	ROF	14	800		1,462	504	786	0	528	1,795	333	1.33	12.72
Motors	AHU	EEM	ROF	11	800		1,368	483	704	0	518	1,698	318	1.23	12.88
Motors	AHU	EEM	ROF	12	800		632	218	328	0	492	1,036	403	0.84	9.64
Motors	AHU	EEM	ROF	19	800		4,767	1,750	2,060	0	3,682	10,092	3,326	1.70	9.20
Motors	AHU	EEM	ROF	7	800		9,207	1,743	2,650	0	6,163	10,566	1,348	1.15	13.83
Motors	AHU	EEM	ROF	12	800		684	197	300	0	522	1,019	436	1.74	9.96
Motors	AHU	EEM	ROF	10	800		372	131	200	0	355	688	316	1.86	8.48
Motors	AHU	EEM	ROF	7	800		8,512	1,609	2,446	0	6,005	10,669	2,147	1.25	12.48
Motors	AHU	EEM	ROF	19	800		4,407	1,589	2,416	0	3,911	7,917	3,510	1.80	8.70
Motors	AHU	EEM	ROF	14	800		1,068	262	398	0	964	1,826	586	1.52	10.07
Motors	AHU	EEM	ROF	11	800		1,000	247	375	0	928	1,560	551	1.55	10.07
Motors	AHU	EEM	ROF	45	2100		2,924	3,780	1,096	0	2,223	7,098	4,174	2.43	6.44
Motors	AHU	EEM	ROF	37.5	2100		2,010	2,226	646	0	1,678	4,649	2,639	2.28	6.90
Motors	AHU	EEM	ROF	42	1650		1,482	1,486	647	0	1,111	3,144	1,882	2.16	7.28
Motors	AHU	EEM	ROF	8.5	3200		2,376	3,106	590	0	1,590	5,288	2,910	2.22	7.02
Motors	AHU	EEM	ROF	8	3200		391	1,165	221	0	596	1,982	1,091	2.22	7.02
Motors	AHU	EEM	ROF	17.5	1650		297	200	74	0	199	473	176	1.69	9.82
Motors	AHU	EEM	ROF	7.5	4000		4,752	7,783	1,180	0	3,181	12,124	7,372	2.56	6.12
Motors	AHU	EEM	ROF	14.5	1000		297	70	43	0	199	312	15	1.06	14.88
Motors	AHU	EEM	ROF	20	2100		2,970	2,647	738	0	1,989	5,273	2,303	1.78	8.80
Motors	AHU	EEM	ROF	48.5	2100		6,579	8,606	2,483	0	5,001	16,969	9,390	2.43	6.44
Motors	AHU	EEM	ROF	25.5	3200		6,384	13,758	2,814	0	5,038	21,408	15,024	3.36	4.88
Motors	AHU	EEM	ROF	32	2100		1,208	1,336	387	0	1,007	2,729	1,523	2.28	6.90
Motors	AHU	EEM	ROF	20.5	2100		6,643	4,840	1,401	0	3,777	10,018	4,375	1.78	8.80
Motors	AHU	EEM	ROF	25	3200		3,192	6,878	1,307	0	2,519	10,704	6,612	3.36	4.68
Motors	AHU	EEM	ROF	18	3200		8,442	14,248	2,707	0	7,047	24,003	16,561	2.84	6.49
Motors	AHU	EEM	ROF	42.5	1650		1,482	1,495	647	0	1,111	3,144	1,882	2.16	7.28
Motors	AHU	EEM	ROF	18.5	3200		16,080	21,139	5,167	0	13,424	45,719	29,639	2.84	6.49
Motors	AHU	EEM	ROF	14	1000		237	70	43	0	199	312	15	1.06	14.88
Motors	AHU	EEM	ROF	7	4000		2,378	3,882	590	0	1,590	6,062	3,688	2.56	6.12
Motors	AHU	EEM	ROF	17.5	1650		1,647	657	206	0	1,298	3,08	1,239	0.20	78.49
Motors	AHU	EEM	ROF	14.5	1000		2,032	337	206	0	1,58	99	2,131	-0.06	-322.06
Motors	AHU	EEM	ROF	8.5	3200		14,120	9,638	1,641	0	1,260	6,964	-8,182	0.81	37.00
Motors	AHU	EEM	ROF	32.5	2100		11,532	5,452	2,737	0	-781	5,332	19,30	2.11	7.41
Motors	AHU	EEM	ROF	45.5	2100		29,666	51,764	15,275	0	4,042	62,681	32,915	2.11	7.41
Motors	AHU	EEM	ROF	7.5	4000		28,927	21,690	3,282	0	2,500	15,991	-12,936	0.65	28.28

Table 3.5
All EROs Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Present Installed Cost (\$1993 \$)	Present Value of Energy Savings (\$1993 \$)	Present Value of Demand Savings (\$1993 \$)	Present Value of O&M Savings (\$1993 \$)	Present Value of Replaces Savings (\$1993 \$)	Present Total Value of Savings (\$1993 \$)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	BLAST HEATER	VSD to existing mtr	RI	42.5	1650		7,552	9,212	3,394	312	-1,200	11,033	3,482	1.46	10.69
Motors	BLAST HEATER	VSD to existing mtr	RI	20.5	2100		34,538	13,480	3,897	-2,988	-7,848	6,741	27,797	0.20	80.04
Motors	BLAST HEATER	VSD to existing mtr	RI	26.5	3200		32,996	66,084	12,367	-2,187	-5,418	69,845	36,881	2.12	7.37
Motors	BLAST HEATER	VSD to existing mtr	RI	18.5	3200		90,479	116,222	21,894	-6,249	-15,917	114,950	24,471	1.27	12.30
Motors	BLAST HEATER	VSD & EEM	RI	18.5	3200		91,422	116,754	21,995	6,249	-17,095	114,405	22,983	1.26	12.48
Motors	BLAST HEATER	VSD & EEM	RI	32.5	2100		11,656	9,496	2,749	-781	-2,229	9,234	-2,422	0.79	19.72
Motors	BLAST HEATER	VSD & EEM	RI	17.5	1650		1,568	600	208	-168	-312	298	-1,260	0.19	81.54
Motors	BLAST HEATER	VSD & EEM	RI	26.5	3200		33,333	66,321	12,412	2,187	-5,878	69,667	36,334	2.09	7.47
Motors	BLAST HEATER	VSD & EEM	RI	20.5	2100		34,869	13,647	3,923	-2,988	-8,061	6,440	-28,429	0.18	84.58
Motors	BLAST HEATER	VSD & EEM	RI	45.5	2100		30,031	62,913	16,321	-1,406	-4,498	92,330	32,299	2.08	7.53
Motors	BLAST HEATER	VSD & EEM	RI	7.5	4000		29,201	21,729	3,303	-2,600	-6,723	16,810	13,391	0.54	28.86
Motors	BLAST HEATER	VSD & EEM	RI	8.5	3200		8,692	14,252	1,962	-1,250	-3,220	5,874	8,378	0.41	37.91
Motors	BLAST HEATER	VSD & EEM	RI	42.5	1650		7,664	9,239	3,406	-312	-1,401	10,931	3,267	1.43	10.95
Motors	BLAST HEATER	VSD & EEM	RI	14.5	1000		2,056	340	208	-168	-513	124	-2,179	-0.06	259.77
Motors	BLAST HEATER	EEM	ROF	32	2100		1,116	1,238	368	0	1,095	2,659	1,644	2.38	6.55
Motors	BLAST HEATER	EEM	ROF	26.5	3200		5,902	12,712	2,415	0	5,345	20,472	14,570	3.47	4.50
Motors	BLAST HEATER	EEM	ROF	7	4000		2,197	3,808	548	0	1,704	5,858	3,661	2.87	5.89
Motors	BLAST HEATER	EEM	ROF	14	1000		276	66	39	0	213	317	43	1.16	13.52
Motors	BLAST HEATER	EEM	ROF	7.5	4000		4,393	7,211	1,096	0	3,409	11,716	7,323	2.67	5.89
Motors	BLAST HEATER	EEM	ROF	8	3200		824	1,082	208	0	639	1,926	1,103	2.34	6.88
Motors	BLAST HEATER	EEM	ROF	20	2100		2,748	2,366	686	0	1,131	5,182	2,436	1.85	8.28
Motors	BLAST HEATER	EEM	ROF	14.5	1000		276	66	39	0	213	317	43	1.16	13.52
Motors	BLAST HEATER	EEM	ROF	42.5	1650		1,362	1,367	504	0	1,182	3,062	1,701	2.28	6.52
Motors	BLAST HEATER	EEM	ROF	45.5	2100		6,083	7,829	2,267	0	5,317	15,413	9,330	2.53	6.17
Motors	BLAST HEATER	EEM	ROF	18.5	3200		14,867	26,113	4,772	0	14,196	44,081	29,214	2.97	5.27
Motors	BLAST HEATER	EEM	ROF	18	3200		7,806	13,186	2,505	0	7,463	23,143	15,337	2.97	5.27
Motors	BLAST HEATER	EEM	ROF	26	3200		2,951	6,358	1,208	0	2,872	10,238	7,285	3.47	4.50
Motors	BLAST HEATER	EEM	ROF	32.5	2100		1,858	2,060	596	0	1,774	4,431	2,673	2.38	6.55
Motors	BLAST HEATER	EEM	ROF	20.5	2100		6,217	4,498	1,302	0	4,048	9,845	4,828	1.89	8.28
Motors	BLAST HEATER	EEM	ROF	8.5	3200		2,197	2,885	548	0	1,704	5,137	2,940	2.34	6.88
Motors	BLAST HEATER	EEM	ROF	42	1650		1,362	1,367	504	0	1,182	3,062	1,701	2.28	6.52
Motors	BLAST HEATER	EEM	ROF	45	2100		2,703	3,479	1,007	0	2,383	6,850	4,147	2.53	6.17
Motors	BLAST HEATER	EEM	ROF	17.5	1650		276	188	69	0	213	467	193	1.70	9.18
Motors	CABINET HEATER	EEM	RI	4	4000		1,494	1,476	224	0	1,207	2,908	1,412	1.94	8.03
Motors	CABINET HEATER	EEM	RI	4	3200		498	393	75	0	402	870	372	1.75	8.94
Motors	CABINET HEATER	EEM	RI	6	2100		6,800	2,891	779	0	4,588	8,059	2,459	1.44	10.89
Motors	CABINET HEATER	EEM	RI	6	5000		8,715	11,160	3,963	0	3,963	16,458	7,743	1.89	8.27
Motors	CABINET HEATER	EEM	RI	8	1000		498	43	28	0	228	295	-203	0.59	26.35
Motors	CABINET HEATER	EEM	RI	2	1650		2,912	1,100	406	0	2,386	3,891	979	1.34	11.69
Motors	CABINET HEATER	EEM	RI	3	1000		1,344	37	83	0	1,101	1,321	-23	0.98	16.89
Motors	CABINET HEATER	EEM	RI	11	2100		1,743	903	282	0	1,408	2,573	830	1.48	10.58
Motors	CABINET HEATER	EEM	RI	7	1650		249	101	37	0	201	340	91	1.36	11.45
Motors	CABINET HEATER	EEM	RI	1	4000		448	448	62	0	367	840	392	1.87	8.34
Motors	CABINET HEATER	EEM	RI	6	1850		1,026	1,026	77	0	228	1,329	831	2.07	6.86
Motors	CABINET HEATER	EEM	RI	1	5000		6,048	6,922	842	0	6,441	13,206	7,167	2.18	7.15
Motors	CABINET HEATER	EEM	ROF	4	4000		1,381	1,370	208	0	1,278	2,867	1,476	2.07	7.55
Motors	CABINET HEATER	EEM	ROF	6	5000		6,823	7,062	869	0	6,234	14,156	7,533	2.14	7.31
Motors	CABINET HEATER	EEM	ROF	6	8750		378	950	49	0	358	1,056	677	2.79	5.90
Motors	CABINET HEATER	EEM	ROF	0	2100		5,178	2,505	725	0	4,867	8,087	2,910	1.56	10.00
Motors	CABINET HEATER	EEM	ROF	7	1650		230	94	35	0	213	342	112	1.49	10.62
Motors	CABINET HEATER	EEM	ROF	11	2100		1,812	838	243	0	1,451	2,674	982	1.90	9.78
Motors	CABINET HEATER	EEM	ROF	1	4000		414	382	58	0	389	828	414	2.00	7.81
Motors	CABINET HEATER	EEM	ROF	8	1000		378	25	15	0	356	396	18	1.06	14.92
Motors	CABINET HEATER	EEM	ROF	4	3200		1,243	395	69	0	428	881	400	1.87	8.36
Motors	CABINET HEATER	EEM	ROF	3	1000		1,243	128	77	0	1,166	1,369	128	1.10	14.18
Motors	CABINET HEATER	EEM	ROF	1	5000		6,815	6,424	781	0	5,441	12,846	8,831	2.17	7.18
Motors	CABINET HEATER	EEM	ROF	2	1850		2,892	1,024	377	0	2,528	3,926	1,234	1.48	10.71
Motors	Chilled Wtr Pump	EEM	RI	28	1650		402	372	137	0	164	673	271	1.67	9.33
Motors	Chilled Wtr Pump	EEM	RI	43.5	3200		1,384	2,621	498	0	514	3,633	2,249	2.82	5.95
Motors	Chilled Wtr Pump	EEM	RI	48	2100		731	1,030	298	0	263	1,591	860	2.18	7.18
Motors	Chilled Wtr Pump	EEM	RI	18.5	1650		297	209	77	0	89	376	78	1.26	12.38
Motors	Chilled Wtr Pump	EEM	RI	36.5	2100		456	690	200	0	173	1,062	608	2.33	6.71
Motors	Chilled Wtr Pump	EEM	RI	55.5	2100		1,378	1,378	398	0	434	2,208	1,003	1.83	8.52
Motors	Chilled Wtr Pump	EEM	RI	16.5	1000		297	78	48	0	89	211	-88	0.71	22.03
Motors	Chilled Wtr Pump	EEM	RI	63.5	2100		5,910	7,377	2,138	0	2,143	11,666	5,748	1.97	7.92
Motors	Chilled Wtr Pump	EEM	RI	39.5	1650		632	720	266	0	94	1,079	447	1.71	9.16
Motors	Chilled Wtr Pump	EEM	RI	4	1850		230	104	38	0	173	234	4	1.02	15.37
Motors	Chilled Wtr Pump	EEM	RI	34.5	1650		456	542	200	0	173	914	458	2.01	7.79
Motors	Chilled Wtr Pump	EEM	RI	20.5	5000		1,127	1,127	137	0	164	1,428	1,028	3.56	4.40
Motors	Chilled Wtr Pump	EEM	RI	19	3200		402	721	137	0	164	1,022	620	2.54	6.14

Table 3.6
All EROs Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or RCF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Wtr Pump	EEM	R	66.6	2100		2,312	2,953	768	0	688	4,110	1,798	1.78	8.79
Motors	Chilled Wtr Pump	EEM	R	46.5	2100		2,193	3,089	894	0	789	4,772	2,579	2.18	7.78
Motors	Chilled Wtr Pump	EEM	R	34	1850		456	542	200	0	173	717	468	2.01	7.79
Motors	Chilled Wtr Pump	EEM	R	26	2100		340	420	122	0	175	717	377	2.11	7.41
Motors	Chilled Wtr Pump	EEM	R	48.5	1850		1,384	1,361	498	0	514	2,363	979	1.71	9.15
Motors	Chilled Wtr Pump	EEM	R	26	3200		458	1,051	200	0	173	1,424	968	3.12	6.00
Motors	Chilled Wtr Pump	EEM	R	18.5	4000		1,970	4,884	712	0	714	6,110	4,140	3.10	6.04
Motors	Chilled Wtr Pump	EEM	R	69.5	2100		1,384	1,720	498	0	514	2,732	1,348	1.97	7.31
Motors	Chilled Wtr Pump	EEM	R	12	2100		249	136	39	0	97	271	22	1.09	14.36
Motors	Chilled Wtr Pump	EEM	R	39	1850		632	720	266	0	94	1,079	447	1.71	9.16
Motors	Chilled Wtr Pump	EEM	R	34.5	3200		1,492	3,138	596	0	526	4,260	2,798	2.91	6.36
Motors	Chilled Wtr Pump	EEM	R	18.5	6000		458	1,813	200	0	173	2,186	1,730	4.79	3.26
Motors	Chilled Wtr Pump	EEM	R	29.5	3200		912	2,102	399	0	345	2,847	1,935	3.12	6.00
Motors	Chilled Wtr Pump	EEM	R	19.5	3200		402	721	137	0	164	1,022	620	2.54	9.14
Motors	Chilled Wtr Pump	EEM	R	63	2100		3,940	4,918	1,424	0	1,429	7,771	3,831	1.97	7.32
Motors	Chilled Wtr Pump	EEM	R	27.5	1000		632	300	183	0	235	718	88	1.14	13.78
Motors	Chilled Wtr Pump	EEM	R	12	5000		260	512	62	0	108	682	422	2.82	5.96
Motors	Chilled Wtr Pump	EEM	R	51.5	2100		7,535	7,356	2,182	0	2,068	11,774	5,858	1.95	7.85
Motors	Chilled Wtr Pump	EEM	R	21.5	2100		297	266	77	0	89	432	136	1.45	10.74
Motors	Chilled Wtr Pump	EEM	R	28.5	1850		402	372	137	0	184	673	271	1.67	9.33
Motors	Chilled Wtr Pump	EEM	R	26.5	2100		340	420	122	0	175	717	377	2.11	7.41
Motors	Chilled Wtr Pump	EEM	R	24.5	5000		986	2,990	364	0	343	3,696	2,710	3.76	4.17
Motors	Chilled Wtr Pump	EEM	R	9.5	6000		297	699	77	0	89	865	588	2.91	6.36
Motors	Chilled Wtr Pump	EEM	R	34	3200		731	1,569	298	0	263	2,130	1,399	2.91	5.76
Motors	Chilled Wtr Pump	EEM	R	8	1850		498	212	78	0	195	484	14	0.97	16.27
Motors	Chilled Wtr Pump	EEM	R	13.5	8760		731	3,947	298	0	263	4,507	3,778	0.17	2.53
Motors	Chilled Wtr Pump	EEM	R	28.5	1000		315	315	191	0	263	769	38	1.06	14.86
Motors	Chilled Wtr Pump	EEM	R	43.5	1850		731	809	298	0	263	1,370	639	1.87	8.34
Motors	Chilled Wtr Pump	EEM	R	23.5	9000		5426	5,426	598	0	584	6,008	5,017	4.16	3.76
Motors	Chilled Wtr Pump	EEM	R	17.5	900		1,205	407	310	0	434	1,161	64	0.95	18.35
Motors	Chilled Wtr Pump	EEM	R	37.5	3200		588	1,914	364	0	343	2,620	1,634	2.86	5.88
Motors	Chilled Wtr Pump	EEM	R	51	2100		2,969	3,767	1,091	0	1,029	6,887	2,929	1.99	7.85
Motors	Chilled Wtr Pump	EEM	R	9.5	6000		1,887	1,362	150	0	495	861	1,026	0.48	34.24
Motors	Chilled Wtr Pump	EEM	R	23.5	6000		23,863	32,200	639	0	1,490	3,628	3,628	1.15	13.56
Motors	Chilled Wtr Pump	EEM	R	63.5	2100		4,715	2,208	639	0	1,490	1,231	3,483	0.26	49.81
Motors	Chilled Wtr Pump	EEM	R	27.5	1000		93,321	48,805	14,131	0	2,047	30,400	62,321	0.33	47.95
Motors	Chilled Wtr Pump	EEM	R	37.5	3200		6,590	9,479	948	0	2,047	299	6,292	0.06	344.33
Motors	Chilled Wtr Pump	EEM	R	20.5	6000		3,473	3,268	1,801	0	4,729	6,996	6,623	0.68	27.96
Motors	Chilled Wtr Pump	EEM	R	21.5	2100		1,887	618	397	0	999	2,511	983	0.72	21.81
Motors	Chilled Wtr Pump	EEM	R	15.5	1000		1,887	247	150	0	495	17	1,870	0.01	1,724.20
Motors	Chilled Wtr Pump	EEM	R	34.5	3200		17,061	12,900	2,461	0	495	254	2,141	0.13	115.92
Motors	Chilled Wtr Pump	EEM	R	28.5	1850		3,473	1,078	397	0	999	321	3,152	0.09	278.96
Motors	Chilled Wtr Pump	EEM	R	51.5	2100		74,288	37,321	10,806	0	937	22,751	51,537	0.31	61.01
Motors	Chilled Wtr Pump	EEM	R	66.5	2100		38,742	20,018	6,798	0	1,800	12,068	28,684	0.31	60.18
Motors	Chilled Wtr Pump	EEM	R	48.5	1850		8,021	2,966	2,966	0	1,800	3,883	16,589	0.19	82.37
Motors	Chilled Wtr Pump	EEM	R	18.5	4000		30,987	4,710	639	0	1,800	24,862	6,256	0.80	19.65
Motors	Chilled Wtr Pump	EEM	R	34.5	1850		4,715	1,735	1,801	0	1,800	758	3,959	0.16	97.12
Motors	Chilled Wtr Pump	EEM	R	24.5	5000		12,519	14,810	1,801	0	1,800	12,326	192	0.98	15.87
Motors	Chilled Wtr Pump	EEM	R	13.5	8760		8,723	16,223	1,226	0	2,827	14,466	6,743	1.89	9.42
Motors	Chilled Wtr Pump	EEM	R	19.5	3200		3,473	2,052	1,226	0	999	1,334	2,139	0.38	40.87
Motors	Chilled Wtr Pump	EEM	R	18.5	1850		1,887	407	160	0	495	94	1,981	0.06	313.95
Motors	Chilled Wtr Pump	EEM	R	46.5	2100		25,774	12,698	3,677	0	819	7,687	18,186	0.29	63.07
Motors	Chilled Wtr Pump	EEM	R	65.5	2100		16,397	8,122	2,352	0	6,476	4,842	11,554	0.30	52.90
Motors	Chilled Wtr Pump	EEM	R	39.5	1850		6,511	2,548	2,966	0	1,800	1,227	6,283	0.19	82.89
Motors	Chilled Wtr Pump	EEM	R	43.5	3200		20,472	15,556	3,938	0	1,800	11,417	9,055	0.58	28.01
Motors	Chilled Wtr Pump	EEM	R	43.5	1850		8,723	3,326	1,226	0	2,827	1,569	7,155	0.19	80.88
Motors	Chilled Wtr Pump	EEM	R	28.5	1000		8,723	2,015	1,226	0	2,827	259	8,465	0.03	527.53
Motors	Chilled Wtr Pump	EEM	R	59.5	2100		20,472	10,208	2,966	0	1,800	6,070	14,402	0.30	52.89
Motors	Chilled Wtr Pump	EEM	R	17.5	800		16,397	3,094	2,362	0	6,476	1,886	16,583	0.01	1,375.66
Motors	Chilled Wtr Pump	EEM	R	26.5	3200		9,564	6,730	1,279	0	2,975	4,722	4,942	0.01	1,375.66
Motors	Chilled Wtr Pump	EEM	R	19.5	6000		5,805	5,805	639	0	1,460	4,828	1,14	1.02	15.25
Motors	Chilled Wtr Pump	EEM	R	26.5	2100		2,648	547	274	0	691	376	2,272	0.14	110.30
Motors	Chilled Wtr Pump	EEM	R	43.5	1850		8,899	3,436	1,266	0	3,046	1,500	7,399	0.17	92.65
Motors	Chilled Wtr Pump	EEM	R	13.5	8760		8,899	16,761	1,266	0	3,046	14,829	6,527	1.87	9.38
Motors	Chilled Wtr Pump	EEM	R	24.5	5000		12,755	16,274	1,858	0	3,046	12,562	203	0.98	15.88
Motors	Chilled Wtr Pump	EEM	R	48.5	1850		20,804	8,265	3,465	0	7,362	3,801	17,003	0.18	85.50
Motors	Chilled Wtr Pump	EEM	R	19.5	3200		3,570	2,197	417	0	1,119	1,339	2,231	0.38	41.64
Motors	Chilled Wtr Pump	EEM	R	39.5	1850		6,732	2,704	596	0	2,377	1,167	5,565	0.17	90.14
Motors	Chilled Wtr Pump	EEM	R	27.5	1000		6,732	1,622	986	0	2,377	216	5,517	0.03	489.59

Table 3.6
All EROs Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Total Value of Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Wtr Pump	VSD & EEM	RI	40.5	2100		26,301	13,119	3,799	-409	-8,977	7,472	-18,829	0.28	54.99
Motors	Chilled Wtr Pump	VSD & EEM	RI	21.5	2100		1,958	564	161	-156	-584	-25	-1,983	-0.01	-1,226.98
Motors	Chilled Wtr Pump	VSD & EEM	RI	18.5	1850		1,958	436	161	-156	-584	-25	-1,983	-0.07	-212.84
Motors	Chilled Wtr Pump	VSD & EEM	RI	11.5	2100		76,708	38,493	11,146	-937	-26,213	22,488	-53,220	0.30	62.69
Motors	Chilled Wtr Pump	VSD & EEM	RI	28.5	2100		2,728	1,003	290	-156	-793	344	-2,384	0.13	123.79
Motors	Chilled Wtr Pump	VSD & EEM	RI	36.5	2100		4,824	2,296	665	-156	-1,597	1,208	-3,816	0.26	62.38
Motors	Chilled Wtr Pump	VSD & EEM	RI	28.5	1850		3,570	1,133	417	-156	-1,119	275	-3,296	0.08	202.70
Motors	Chilled Wtr Pump	VSD & EEM	RI	29.5	3200		9,783	6,999	1,330	-312	-3,248	4,768	-6,016	0.49	32.06
Motors	Chilled Wtr Pump	VSD & EEM	RI	43.5	3200		20,804	16,027	3,046	-156	-7,352	11,664	-9,240	0.66	28.10
Motors	Chilled Wtr Pump	VSD & EEM	RI	28.5	1000		8,999	2,082	1,266	-156	-3,046	147	-7,52	0.02	948.94
Motors	Chilled Wtr Pump	VSD & EEM	RI	60.5	2100		39,297	20,567	6,965	-156	-14,223	12,074	-27,223	0.31	50.86
Motors	Chilled Wtr Pump	VSD & EEM	RI	20.5	5000		3,433	3,433	417	-156	-1,119	275	-995	0.72	21.86
Motors	Chilled Wtr Pump	VSD & EEM	RI	34.5	1850		1,804	1,804	665	-156	-1,119	718	-4,108	0.15	108.19
Motors	Chilled Wtr Pump	VSD & EEM	RI	63.5	2100		50,371	14,585	14,585	-409	-33,839	30,649	-64,091	0.32	48.29
Motors	Chilled Wtr Pump	VSD & EEM	RI	15.5	1000		264	264	161	-156	-584	-315	-2,273	-0.16	-96.98
Motors	Chilled Wtr Pump	VSD & EEM	RI	15.5	4000		31,580	31,580	4,802	-156	-11,280	25,407	-6,173	0.80	19.42
Motors	Chilled Wtr Pump	VSD & EEM	RI	55.5	2100		16,886	8,342	2,416	-156	-6,837	4,766	-11,921	0.29	64.70
Motors	Chilled Wtr Pump	VSD & EEM	RI	23.5	6000		24,234	33,178	3,055	-156	-8,589	28,088	-3,854	1.16	13.48
Motors	Chilled Wtr Pump	VSD & EEM	RI	17.5	800		16,886	3,178	2,416	-156	-5,837	-400	-17,088	-0.02	-652.26
Motors	Chilled Wtr Pump	VSD & EEM	RI	69.5	2100		20,804	10,518	3,045	-156	-7,352	6,065	-14,749	0.29	63.68
Motors	Chilled Wtr Pump	VSD & EEM	RI	9.5	6000		1,958	1,458	161	-156	-584	878	-1,080	0.45	34.83
Motors	Chilled Wtr Pump	VSD & EEM	RI	16.5	6000		6,037	6,037	665	-156	-1,597	4,949	-1,25	1.03	16.23
Motors	Chilled Wtr Pump	VSD & EEM	RI	34.5	3200		13,328	2,532	2,532	-312	-5,931	9,617	-7,786	0.55	28.27
Motors	Chilled Wtr Pump	VSD & EEM	RI	37.5	3200		9,778	9,778	1,858	-156	-4,424	7,063	-6,702	0.66	28.25
Motors	Chilled Wtr Pump	VSD & EEM	RI	37.5	3200		720	1,039	197	0	639	1,874	1,154	2.80	6.00
Motors	Chilled Wtr Pump	VSD & EEM	ROF	18.5	1850		217	122	45	0	178	345	129	1.59	9.83
Motors	Chilled Wtr Pump	VSD & EEM	ROF	8	1850		364	124	46	0	344	513	149	1.41	11.08
Motors	Chilled Wtr Pump	VSD & EEM	ROF	59.5	2100		1,011	911	264	0	929	2,103	1,092	2.08	7.51
Motors	Chilled Wtr Pump	VSD & EEM	ROF	43.5	3200		1,011	1,388	284	0	929	2,580	1,589	2.55	6.12
Motors	Chilled Wtr Pump	VSD & EEM	ROF	23.5	6000		1,161	2,872	316	0	1,060	4,249	3,088	3.66	4.27
Motors	Chilled Wtr Pump	VSD & EEM	ROF	24.5	6000		1,223	1,923	197	0	839	2,458	1,738	3.41	4.68
Motors	Chilled Wtr Pump	VSD & EEM	ROF	63	2100		2,560	2,560	741	0	2,610	5,912	3,033	2.05	7.61
Motors	Chilled Wtr Pump	VSD & EEM	ROF	26	3200		333	595	113	0	309	1,018	685	3.06	5.11
Motors	Chilled Wtr Pump	VSD & EEM	ROF	19.5	3200		294	412	78	0	285	775	481	2.64	5.92
Motors	Chilled Wtr Pump	VSD & EEM	ROF	27.5	1000		462	162	98	0	424	684	222	1.48	10.54
Motors	Chilled Wtr Pump	VSD & EEM	ROF	48.5	1850		1,011	1,715	264	0	929	1,908	897	1.89	8.28
Motors	Chilled Wtr Pump	VSD & EEM	ROF	4	1850		168	61	23	0	160	244	76	1.45	10.75
Motors	Chilled Wtr Pump	VSD & EEM	ROF	34.5	3200		1,739	1,739	330	0	984	3,033	1,985	2.84	5.60
Motors	Chilled Wtr Pump	VSD & EEM	ROF	34.5	1850		333	307	113	0	309	730	396	2.19	7.13
Motors	Chilled Wtr Pump	VSD & EEM	ROF	19	3200		294	412	78	0	285	775	481	2.64	5.92
Motors	Chilled Wtr Pump	VSD & EEM	ROF	63.5	2100		4,318	3,841	1,112	0	3,915	8,649	4,649	2.05	7.81
Motors	Chilled Wtr Pump	VSD & EEM	ROF	28	2100		248	243	70	0	277	590	342	2.38	6.57
Motors	Chilled Wtr Pump	VSD & EEM	ROF	16.5	1000		217	43	26	0	178	247	30	1.14	13.75
Motors	Chilled Wtr Pump	VSD & EEM	ROF	28.5	2100		248	243	70	0	277	590	342	2.38	6.57
Motors	Chilled Wtr Pump	VSD & EEM	ROF	66.5	2100		1,089	1,346	390	0	1,381	3,118	1,428	1.85	8.47
Motors	Chilled Wtr Pump	VSD & EEM	ROF	34	1850		333	307	113	0	309	730	396	2.19	7.13
Motors	Chilled Wtr Pump	VSD & EEM	ROF	34	3200		534	869	165	0	482	1,516	982	2.84	6.50
Motors	Chilled Wtr Pump	VSD & EEM	ROF	61.5	2100		4,323	4,088	1,184	0	3,831	9,104	4,781	2.11	7.42
Motors	Chilled Wtr Pump	VSD & EEM	ROF	21.5	2100		217	155	45	0	178	378	181	1.74	8.96
Motors	Chilled Wtr Pump	VSD & EEM	ROF	39.5	1850		333	278	103	0	309	751	357	1.90	8.21
Motors	Chilled Wtr Pump	VSD & EEM	ROF	30.5	2100		333	391	113	0	309	751	357	1.90	8.21
Motors	Chilled Wtr Pump	VSD & EEM	ROF	9.5	6000		217	408	45	0	178	631	414	2.91	5.37
Motors	Chilled Wtr Pump	VSD & EEM	ROF	17.5	800		880	206	150	0	795	1,158	277	1.31	11.88
Motors	Chilled Wtr Pump	VSD & EEM	ROF	12	2100		182	79	23	0	172	273	91	1.50	10.40
Motors	Chilled Wtr Pump	VSD & EEM	ROF	28.5	1850		294	212	78	0	285	675	282	1.96	7.98
Motors	Chilled Wtr Pump	VSD & EEM	ROF	18.5	6000		333	1,027	113	0	309	1,450	1,117	4.35	3.59
Motors	Chilled Wtr Pump	VSD & EEM	ROF	20.5	5000		294	643	78	0	285	1,006	713	3.43	4.56
Motors	Chilled Wtr Pump	VSD & EEM	ROF	18.5	4000		1,439	2,438	371	0	1,305	4,114	2,875	2.88	5.47
Motors	Chilled Wtr Pump	VSD & EEM	ROF	51	2100		2,161	2,045	592	0	1,916	4,652	2,391	2.11	7.42
Motors	Chilled Wtr Pump	VSD & EEM	ROF	28.5	1000		534	164	100	0	482	745	211	1.40	11.19
Motors	Chilled Wtr Pump	VSD & EEM	ROF	43.5	1850		534	448	165	0	482	1,085	581	2.05	7.62
Motors	Chilled Wtr Pump	VSD & EEM	ROF	39	1850		395	278	103	0	370	751	357	1.90	8.21
Motors	Chilled Wtr Pump	VSD & EEM	ROF	12	5000		190	300	36	0	185	521	331	2.74	5.69
Motors	Chilled Wtr Pump	VSD & EEM	ROF	48	2100		534	570	165	0	482	1,218	683	2.28	6.85
Motors	Chilled Wtr Pump	VSD & EEM	ROF	28	1850		294	212	78	0	285	675	282	1.96	7.98
Motors	Chilled Wtr Pump	VSD & EEM	ROF	48.5	2100		1,002	1,711	496	0	1,446	3,663	2,050	2.28	6.85
Motors	Chilled Wtr Pump	VSD & EEM	ROF	55.5	2100		880	728	211	0	795	1,735	854	1.97	7.93
Motors	Chilled Wtr Pump	VSD & EEM	ROF	13.5	8760		534	2,187	165	0	482	2,834	2,300	5.31	2.94
Motors	Chilled Wtr Pump	VSD & EEM	ROF	26.5	3200		666	1,191	226	0	619	2,036	1,370	3.06	6.11
Motors	Circ Pump	VSD & EEM	RI	17	6000		5,928	22,036	4,854	0	4,878	31,568	25,640	6.33	2.93

Table 3.6
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Repairs Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Circ. Pump	EEM	RI	3	8000		6,272	7,924	1,746	0	5,139	14,808	8,636	2.36	6.62
Motors	Circ. Pump	EEM	RI	10	6000		7,128	16,071	3,640	0	4,771	24,382	17,254	3.42	4.67
Motors	Circ. Pump	EEM	RI	5	6000		17,928	24,425	6,381	0	14,479	44,285	26,367	2.47	6.32
Motors	Circ. Pump	EEM	RI	6	6000		520	1,086	239	0	438	1,782	1,242	3.39	4.81
Motors	Circ. Pump	EEM	RI	13	6000		1,020	3,155	695	0	1,015	4,865	3,845	4.77	3.28
Motors	Circ. Pump	EEM	ROF	6	6000		16,576	22,690	4,998	0	15,340	43,028	28,452	2.90	6.02
Motors	Circ. Pump	EEM	ROF	3	6000		6,799	7,375	1,825	0	5,440	14,440	8,641	2.49	6.27
Motors	Circ. Pump	EEM	ROF	10	6000		6,590	14,328	3,289	0	6,113	23,330	16,740	3.54	4.41
Motors	Circ. Pump	EEM	ROF	17	8000		6,481	20,362	4,486	0	4,983	29,811	24,330	5.44	2.87
Motors	Circ. Pump	EEM	ROF	13	6000		943	2,928	645	0	1,064	4,635	3,692	4.91	3.18
Motors	Circ. Pump	EEM	ROF	6	6000		481	1,008	222	0	443	1,694	1,213	3.52	4.43
Motors	Condensate Pump	EEM	RI	3	1850		896	338	125	0	734	1,197	301	1.34	11.69
Motors	Condensate Pump	EEM	RI	7	2100		1,344	648	187	0	1,101	1,934	590	1.44	10.86
Motors	Condensate Pump	EEM	RI	5	3200		6,703	5,703	1,084	0	5,832	12,618	5,397	1.75	8.94
Motors	Condensate Pump	EEM	RI	12	3200		340	910	118	0	338	1,064	724	3.13	4.99
Motors	Condensate Pump	EEM	RI	3	3200		972	492	94	0	551	1,136	464	1.89	9.24
Motors	Condensate Pump	EEM	RI	6	4000		1,494	1,475	224	0	1,207	2,908	1,412	1.84	8.03
Motors	Condensate Pump	EEM	RI	27	2100		680	800	232	0	677	1,708	1,028	2.51	6.22
Motors	Condensate Pump	EEM	RI	9	3200		297	388	74	0	199	681	384	2.22	7.02
Motors	Condensate Pump	EEM	RI	2	800		249	15	12	0	201	228	-21	0.92	17.04
Motors	Condensate Pump	EEM	RI	13	2100		8,486	4,388	1,270	0	6,837	12,495	4,029	1.48	10.58
Motors	Condensate Pump	EEM	RI	2	5000		448	513	62	0	387	942	494	2.10	7.43
Motors	Condensate Pump	EEM	RI	6	5000		2,739	3,380	411	0	2,212	6,003	3,264	2.19	7.13
Motors	Condensate Pump	EEM	RI	15	5000		297	908	74	0	199	879	582	2.96	5.28
Motors	Condensate Pump	EEM	RI	9	1000		1,245	97	59	0	1,005	1,161	-84	0.93	16.76
Motors	Condensate Pump	EEM	RI	9	1850		8,474	2,837	972	0	5,228	8,837	2,363	1.36	11.46
Motors	Condensate Pump	EEM	RI	8	4000		594	970	148	0	398	1,616	922	2.55	6.12
Motors	Condensate Pump	EEM	ROF	8	4000		549	901	137	0	426	1,465	915	2.87	5.86
Motors	Condensate Pump	EEM	ROF	6	5000		2,532	3,140	382	0	2,344	5,865	3,333	2.32	6.75
Motors	Condensate Pump	EEM	ROF	27	2100		629	742	215	0	709	1,666	1,038	2.85	5.89
Motors	Condensate Pump	EEM	ROF	13	2100		7,827	4,078	1,180	0	7,244	12,500	4,673	1.90	9.78
Motors	Condensate Pump	EEM	ROF	5	1000		1,151	88	54	0	1,065	1,207	56	1.05	14.90
Motors	Condensate Pump	EEM	ROF	6	3200		6,878	6,298	1,007	0	6,178	12,483	5,807	1.87	8.36
Motors	Condensate Pump	EEM	ROF	12	3200		314	565	107	0	355	1,028	713	3.27	4.78
Motors	Condensate Pump	EEM	ROF	15	5000		275	683	67	0	213	845	570	3.06	5.08
Motors	Condensate Pump	EEM	ROF	3	3200		921	458	87	0	583	1,128	507	1.82	8.90
Motors	Condensate Pump	EEM	ROF	3	1850		828	315	116	0	777	1,208	380	1.48	10.71
Motors	Condensate Pump	EEM	ROF	9	1850		5,986	2,449	902	0	6,539	8,891	2,905	1.49	10.52
Motors	Condensate Pump	EEM	ROF	2	5000		414	477	68	0	389	924	510	2.23	7.00
Motors	Condensate Pump	EEM	ROF	9	3200		275	361	69	0	213	368	368	2.34	6.68
Motors	Condensate Pump	EEM	ROF	5	4000		1,381	1,370	208	0	1,278	2,857	1,475	2.07	7.55
Motors	Condensate Pump	EEM	ROF	2	800		230	14	11	0	213	238	8	1.03	15.12
Motors	Condensate Pump	EEM	ROF	7	2100		1,243	901	174	0	1,168	1,941	698	1.56	10.00
Motors	Condensate Fan	EEM	RI	22	5000		456	1,642	200	0	173	2,015	1,569	4.42	3.64
Motors	Condensate Fan	EEM	RI	35	1850		1,368	1,826	599	0	518	2,743	1,376	2.01	7.79
Motors	Condensate Fan	EEM	RI	2	4000		230	253	38	0	91	382	152	1.86	9.40
Motors	Condensate Fan	EEM	RI	28	2100		340	420	122	0	175	717	377	2.11	7.41
Motors	Condensate Fan	EEM	RI	8	800		680	163	124	0	349	636	-44	0.94	16.70
Motors	Condensate Fan	EEM	RI	17	2100		260	215	62	0	108	385	125	1.48	10.58
Motors	Condensate Fan	EEM	RI	3	900		498	35	27	0	195	266	-242	0.51	30.34
Motors	Condensate Fan	EEM	RI	37	2100		6,016	7,588	2,197	0	1,899	11,684	6,688	2.33	8.71
Motors	Condensate Fan	EEM	RI	18	800		1,205	407	310	0	434	1,151	54	0.96	16.36
Motors	Condensate Fan	EEM	RI	22	2100		1,188	1,083	308	0	358	1,728	540	1.46	10.74
Motors	Condensate Fan	EEM	RI	12	4000		632	1,879	265	0	236	2,168	1,536	3.43	4.55
Motors	Condensate Fan	EEM	RI	7	6000		280	665	62	0	108	735	475	2.83	5.83
Motors	Condensate Fan	EEM	RI	27	3200		456	1,051	200	0	173	1,424	988	3.12	5.00
Motors	Condensate Fan	EEM	RI	24	1850		340	330	122	0	175	627	287	1.84	8.48
Motors	Condensate Fan	EEM	RI	6	8760		498	1,032	78	0	195	1,305	807	2.82	5.96
Motors	Condensate Fan	EEM	RI	12	1000		520	89	54	0	215	368	-182	0.89	22.70
Motors	Condensate Fan	EEM	RI	47	2100		5,848	8,237	2,385	0	2,103	12,725	6,877	2.18	7.18
Motors	Condensate Fan	EEM	RI	3	5000		230	316	38	0	91	445	215	1.94	8.07
Motors	Condensate Fan	EEM	RI	13	3200		1,020	1,922	365	0	524	2,811	1,791	2.76	5.87
Motors	Condensate Fan	EEM	RI	13	4000		2,193	6,884	894	0	789	7,667	5,374	3.45	4.53
Motors	Condensate Fan	EEM	RI	7	5000		249	321	39	0	97	457	208	1.83	8.52
Motors	Condensate Fan	EEM	RI	19	1850		594	418	154	0	178	750	158	1.26	12.38
Motors	Condensate Fan	EEM	RI	21	1000		804	295	179	0	328	803	-1	1.00	15.85
Motors	Condensate Fan	EEM	RI	40	1850		1,896	2,078	766	0	704	3,547	1,651	1.87	8.36
Motors	Condensate Fan	EEM	RI	10	1850		249	106	39	0	97	242	-7	0.97	16.07
Motors	Condensate Fan	EEM	RI	20	3200		1,206	2,163	411	0	493	3,087	1,881	2.54	6.14
Motors	Condensate Fan	EEM	RI	10	1000		249	22	13	0	97	133	-118	0.53	29.33

Table 3.6
All EROs: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace. Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Condenser Fan	EEM	Ri	5	1000		230	28	17	0	91	136	-94	0.69	28.38
Motors	Condenser Fan	EEM	Ri	16	1850		780	607	187	0	323	1,016	236	1.30	11.99
Motors	Condenser Fan	EEM	Ri	60	1850		1,589	1,622	698	0	684	2,903	1,214	1.76	8.88
Motors	Condenser Fan	EEM	Ri	29	1850		402	372	137	0	164	873	271	1.67	9.33
Motors	Condenser Fan	EEM	Ri	14	2100		998	639	168	0	389	1,094	88	1.09	14.36
Motors	Condenser Fan	EEM	Ri	33	2100		3,216	3,785	1,098	0	1,314	6,195	2,379	1.93	10.40
Motors	Condenser Fan	EEM	ROF	14	2100		728	314	91	0	688	1,053	366	1.60	10.40
Motors	Condenser Fan	EEM	ROF	28	2100		248	243	70	0	277	590	342	2.38	6.67
Motors	Condenser Fan	EEM	ROF	22	5000		333	930	113	0	309	1,363	1,020	4.06	3.85
Motors	Condenser Fan	EEM	ROF	17	2100		190	128	38	0	185	348	158	1.83	8.64
Motors	Condenser Fan	EEM	ROF	2	4000		168	149	23	0	160	332	164	1.97	7.92
Motors	Condenser Fan	EEM	ROF	35	1850		1,000	921	339	0	928	2,189	1,189	2.19	7.13
Motors	Condenser Fan	EEM	ROF	3	5000		168	186	23	0	180	369	201	2.20	7.12
Motors	Condenser Fan	EEM	ROF	27	3200		333	595	113	0	309	1,018	685	3.06	5.11
Motors	Condenser Fan	EEM	ROF	60	1850		1,161	859	318	0	1,080	2,235	1,074	1.93	8.11
Motors	Condenser Fan	EEM	ROF	37	2100		3,895	4,299	1,245	0	3,402	8,946	5,281	2.44	6.40
Motors	Condenser Fan	EEM	ROF	10	1000		182	12	7	0	172	190	9	1.06	14.92
Motors	Condenser Fan	EEM	ROF	13	3200		746	1,113	211	0	830	2,154	1,408	2.89	6.41
Motors	Condenser Fan	EEM	ROF	19	1850		434	244	90	0	356	850	256	1.59	9.83
Motors	Condenser Fan	EEM	ROF	21	1000		587	162	98	0	589	829	242	1.41	11.06
Motors	Condenser Fan	EEM	ROF	13	4000		1,802	3,260	496	0	1,448	5,201	3,599	3.26	4.81
Motors	Condenser Fan	EEM	ROF	7	5000		182	62	23	0	172	382	200	2.10	7.44
Motors	Condenser Fan	EEM	ROF	10	1850		182	62	23	0	172	382	200	2.10	7.44
Motors	Condenser Fan	EEM	ROF	12	4000		462	940	143	0	424	1,507	75	1.41	11.08
Motors	Condenser Fan	EEM	ROF	6	1000		168	18	10	0	160	185	17	1.10	14.17
Motors	Condenser Fan	EEM	ROF	12	1000		380	49	30	0	371	449	69	1.18	13.22
Motors	Condenser Fan	EEM	ROF	15	1850		570	297	109	0	556	962	392	1.69	9.25
Motors	Condenser Fan	EEM	ROF	6	8760		364	603	48	0	344	992	628	2.73	6.73
Motors	Condenser Fan	EEM	ROF	33	2100		2,350	2,162	628	0	2,278	5,086	2,716	2.10	7.25
Motors	Condenser Fan	EEM	ROF	22	2100		888	621	180	0	712	1,513	646	1.74	8.98
Motors	Condenser Fan	EEM	ROF	8	800		497	89	87	0	563	709	213	1.43	10.94
Motors	Condenser Fan	EEM	ROF	24	1850		248	191	70	0	277	538	290	2.17	7.21
Motors	Condenser Fan	EEM	ROF	18	900		880	206	156	0	795	1,158	277	1.31	11.88
Motors	Condenser Fan	EEM	ROF	47	2100		4,273	4,564	1,321	0	3,856	9,741	5,468	2.28	8.86
Motors	Condenser Fan	EEM	ROF	3	800		364	18	14	0	344	376	12	1.03	16.10
Motors	Condenser Fan	EEM	ROF	20	3200		881	1,235	235	0	854	2,324	1,443	2.64	6.92
Motors	Condenser Fan	EEM	ROF	7	6000		190	331	38	0	185	553	363	2.91	5.37
Motors	Condenser Fan	EEM	ROF	40	1850		1,386	1,164	429	0	1,272	2,865	1,479	2.07	7.56
Motors	Condenser Fan	EEM	ROF	29	1850		294	212	78	0	285	676	282	1.96	7.98
Motors	Cond. Wtr. Pump	EEM	Ri	8	5000		249	321	39	0	97	457	208	1.83	8.52
Motors	Cond. Wtr. Pump	EEM	Ri	29.5	1000		731	315	191	0	283	769	38	1.06	14.85
Motors	Cond. Wtr. Pump	EEM	Ri	18.5	6000		456	1,813	200	0	173	2,198	1,730	4.78	3.28
Motors	Cond. Wtr. Pump	EEM	Ri	16.5	900		986	353	268	0	343	964	-22	0.98	16.99
Motors	Cond. Wtr. Pump	EEM	Ri	21.5	6000		1,384	4,521	498	0	614	5,633	4,149	4.00	3.91
Motors	Cond. Wtr. Pump	EEM	Ri	44.5	1850		731	809	298	0	263	1,370	639	1.87	8.34
Motors	Cond. Wtr. Pump	EEM	Ri	48	2100		2,193	3,089	894	0	789	4,772	2,579	2.18	7.18
Motors	Cond. Wtr. Pump	EEM	Ri	48.5	2100		5,117	7,208	2,087	0	1,840	11,134	6,017	3.22	4.86
Motors	Cond. Wtr. Pump	EEM	Ri	17.5	4000		1,589	3,931	698	0	684	5,112	3,623	3.22	4.86
Motors	Cond. Wtr. Pump	EEM	Ri	25.5	1850		330	330	122	0	176	627	287	1.84	8.48
Motors	Cond. Wtr. Pump	EEM	Ri	35.5	3200		1,462	3,138	696	0	573	4,290	2,798	2.91	5.36
Motors	Cond. Wtr. Pump	EEM	Ri	28.5	3200		456	1,051	200	0	176	1,424	988	3.12	5.00
Motors	Cond. Wtr. Pump	EEM	Ri	42	2100		632	881	255	0	235	1,371	739	2.17	7.20
Motors	Cond. Wtr. Pump	EEM	Ri	62.5	2100		986	1,256	384	0	343	1,962	978	1.99	7.86
Motors	Cond. Wtr. Pump	EEM	Ri	14.5	8760		731	3,947	298	0	263	4,607	3,778	6.17	2.53
Motors	Cond. Wtr. Pump	EEM	Ri	38.5	1850		912	1,084	399	0	346	1,829	917	2.01	7.79
Motors	Cond. Wtr. Pump	EEM	Ri	20.5	1850		297	209	77	0	89	375	78	1.28	12.38
Motors	Cond. Wtr. Pump	EEM	Ri	23.5	2100		297	268	77	0	89	432	135	1.45	10.74
Motors	Cond. Wtr. Pump	EEM	Ri	47.5	1850		1,205	1,081	398	0	434	1,914	709	1.59	9.84
Motors	Cond. Wtr. Pump	EEM	Ri	28	3200		456	1,051	200	0	173	1,424	988	3.12	5.00
Motors	Cond. Wtr. Pump	EEM	Ri	11	1850		498	212	78	0	195	484	-14	0.97	16.07
Motors	Cond. Wtr. Pump	EEM	Ri	23.5	1000		456	193	117	0	173	483	27	1.09	14.76
Motors	Cond. Wtr. Pump	EEM	Ri	64	2100		3,940	4,918	1,424	0	1,429	7,771	3,831	1.97	7.92
Motors	Cond. Wtr. Pump	EEM	Ri	64.5	2100		5,310	7,377	2,136	0	2,143	11,656	5,746	1.97	7.92
Motors	Cond. Wtr. Pump	EEM	Ri	29.5	2100		340	420	122	0	175	717	377	2.11	7.41
Motors	Cond. Wtr. Pump	EEM	Ri	38.5	2100		456	690	200	0	173	1,062	806	2.33	6.71
Motors	Cond. Wtr. Pump	EEM	Ri	68.5	2100		2,410	2,762	797	0	888	4,417	2,007	1.83	8.62
Motors	Cond. Wtr. Pump	EEM	Ri	41.5	3200		1,205	2,096	398	0	434	2,929	1,724	2.43	6.43
Motors	Cond. Wtr. Pump	EEM	Ri	18.5	5000		340	1,001	122	0	175	1,297	967	3.82	4.08
Motors	Cond. Wtr. Pump	EEM	Ri	38.5	3200		986	1,914	364	0	343	2,620	1,624	2.86	5.88
Motors	Cond. Wtr. Pump	EEM	Ri	18.5	1000		297	76	45	0	89	211	-86	0.71	22.03

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Repairs Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cond Wtr Pump	EEM	RI	36	1650		458	542	200	0	173	914	468	2.01	7.79
Motors	Cond Wtr Pump	EEM	RI	8	2100		230	133	38	0	91	202	32	1.14	13.70
Motors	Cond Wtr Pump	EEM	RI	42.5	2100		632	881	265	0	235	1,371	739	2.17	7.20
Motors	Cond Wtr Pump	EEM	RI	21	3200		402	721	137	0	164	1,022	820	2.64	6.14
Motors	Cond Wtr Pump	EEM	RI	31.5	3200		632	1,343	265	0	235	1,833	1,201	2.90	5.39
Motors	Cond Wtr Pump	EEM	RI	14.5	3200		340	641	122	0	176	937	597	2.78	6.07
Motors	Cond Wtr Pump	EEM	RI	61.5	2100		1,589	2,064	598	0	584	3,245	1,656	2.04	7.85
Motors	Cond Wtr Pump	EEM	RI	5	1650		230	374	38	0	91	234	4	1.02	15.37
Motors	Cond Wtr Pump	EEM	RI	11.5	8000		297	699	77	0	89	865	568	2.91	5.36
Motors	Cond Wtr Pump	EEM	RI	56	2100		1,206	1,378	398	0	434	2,208	1,003	1.83	8.52
Motors	Cond Wtr Pump	EEM	RI	30.5	1650		402	372	137	0	164	673	271	1.87	9.33
Motors	Cond Wtr Pump	EEM	RI	21.5	3200		402	721	137	0	164	1,022	820	2.84	6.14
Motors	Cond Wtr Pump	EEM	RI	23	2100		297	268	77	0	89	432	136	1.45	10.74
Motors	Cond Wtr Pump	EEM	RI	25.5	5000		986	2,990	364	0	343	3,696	2,710	3.75	4.17
Motors	Cond Wtr Pump	EEM	RI	18.5	5000		1,646	3,091	376	0	343	3,066	1,519	1.98	7.88
Motors	Cond Wtr Pump	EEM	RI	15.5	800		3,818	3,283	2,496	-156	-524	5,098	1,480	1.41	11.09
Motors	Cond Wtr Pump	EEM	RI	52.5	2100		8,618	8,618	2,496	-156	-524	10,434	8,815	2.88	5.42
Motors	Cond Wtr Pump	EEM	RI	64.5	2100		21,621	67,592	19,571	-469	-3,024	83,671	62,060	3.87	4.04
Motors	Cond Wtr Pump	EEM	RI	14.5	8760		2,823	22,445	1,096	-156	-437	23,547	20,724	8.34	1.87
Motors	Cond Wtr Pump	EEM	RI	31.5	3200		2,180	6,839	1,300	-156	-265	7,718	5,538	3.84	4.41
Motors	Cond Wtr Pump	EEM	RI	16.5	1000		1,387	331	202	-156	-292	86	-1,302	0.06	266.12
Motors	Cond Wtr Pump	EEM	RI	25.5	1650		1,646	1,020	376	0	285	2,951	1,305	0.84	24.29
Motors	Cond Wtr Pump	EEM	RI	23.5	1000		1,915	1,447	880	0	-245	1,955	71	1.04	15.03
Motors	Cond Wtr Pump	EEM	RI	47.5	1650		4,957	8,871	3,289	-156	-655	11,329	8,832	2.52	6.20
Motors	Cond Wtr Pump	EEM	RI	38.5	3200		3,818	13,133	2,496	-156	-524	14,948	11,330	4.13	3.78
Motors	Cond Wtr Pump	EEM	RI	36.5	1650		3,764	4,776	1,760	-312	-825	5,698	1,834	1.49	10.50
Motors	Cond Wtr Pump	EEM	RI	18.5	6000		1,815	7,989	880	-156	-285	8,427	6,613	4.84	3.38
Motors	Cond Wtr Pump	EEM	RI	28.5	3200		1,815	4,631	880	-156	-285	5,069	3,256	2.79	5.59
Motors	Cond Wtr Pump	EEM	RI	11.5	9000		1,387	1,830	202	-156	-292	1,583	196	1.14	13.09
Motors	Cond Wtr Pump	EEM	RI	42.5	2100		2,180	4,488	1,300	-156	-285	5,307	3,187	2.48	6.35
Motors	Cond Wtr Pump	EEM	RI	30.5	1650		1,773	1,472	543	0	-310	1,649	-225	0.87	17.89
Motors	Cond Wtr Pump	EEM	RI	25.5	5000		3,818	20,519	2,496	-156	-524	22,334	18,718	6.17	2.53
Motors	Cond Wtr Pump	EEM	RI	23.5	2100		1,387	698	202	-156	-292	449	-937	0.32	48.22
Motors	Cond Wtr Pump	EEM	RI	17.5	4000		5,953	32,353	4,918	-156	-882	38,264	30,301	6.09	2.58
Motors	Cond Wtr Pump	EEM	RI	36.5	3200		4,596	17,947	3,391	-312	-596	20,330	16,734	4.42	3.53
Motors	Cond Wtr Pump	EEM	RI	21.5	9000		6,572	37,209	4,099	-156	-902	40,249	34,678	7.22	2.18
Motors	Cond Wtr Pump	EEM	RI	61.5	2100		5,953	16,986	4,918	-156	-882	20,888	14,934	3.51	4.46
Motors	Cond Wtr Pump	EEM	RI	14.5	3200		1,548	1,978	378	-156	-245	1,953	407	1.28	12.37
Motors	Cond Wtr Pump	EEM	RI	29.5	2100		1,298	1,298	378	-156	-245	1,273	-274	0.82	18.98
Motors	Cond Wtr Pump	EEM	RI	41.5	3200		4,487	17,204	3,289	-156	-856	19,062	16,165	4.37	3.67
Motors	Cond Wtr Pump	EEM	RI	38.5	2100		1,815	3,039	880	-156	-285	3,477	1,663	1.92	8.15
Motors	Cond Wtr Pump	EEM	RI	20.5	3200		1,773	2,856	543	-156	-310	2,932	1,158	1.85	9.45
Motors	Cond Wtr Pump	EEM	RI	20.5	1650		1,387	547	202	-156	-292	300	-1,087	0.22	72.19
Motors	Cond Wtr Pump	EEM	RI	48.5	2100		18,972	40,991	11,869	-1,094	-2,738	49,030	30,068	2.88	6.06
Motors	Cond Wtr Pump	EEM	RI	29.5	1000		2,823	2,788	1,696	-156	-437	3,891	1,087	1.38	11.34
Motors	Cond Wtr Pump	EEM	RI	44.5	1650		2,823	4,901	1,696	-156	-437	6,704	2,880	2.02	7.73
Motors	Cond Wtr Pump	EEM	RI	66.5	2100		8,082	22,580	6,538	-312	-933	27,872	19,810	3.48	4.52
Motors	Cond Wtr Pump	EEM	RI	29.5	2100		1,828	1,341	388	-156	-347	1,226	-402	0.76	20.75
Motors	Cond Wtr Pump	EEM	RI	18.5	5000		1,628	3,192	388	-156	-347	3,077	1,449	1.89	8.28
Motors	Cond Wtr Pump	EEM	RI	25.5	1650		1,628	1,054	388	-156	-347	939	-889	0.58	21.10
Motors	Cond Wtr Pump	EEM	RI	84.5	2100		23,040	68,737	19,920	-469	-4,795	83,454	60,414	3.82	4.31
Motors	Cond Wtr Pump	EEM	RI	23.5	2100		1,458	724	210	-156	-381	1,928	-1,082	0.27	67.47
Motors	Cond Wtr Pump	EEM	RI	14.5	3200		1,628	2,043	388	-156	-347	1,928	396	1.18	13.19
Motors	Cond Wtr Pump	EEM	RI	36.5	1650		3,983	4,882	1,799	-312	-899	5,470	1,487	1.37	11.37
Motors	Cond Wtr Pump	EEM	RI	15.5	800		3,855	3,340	2,539	-156	-819	4,903	1,048	1.27	12.28
Motors	Cond Wtr Pump	EEM	RI	31.5	3200		2,332	7,002	1,330	-156	-454	7,722	5,390	3.31	4.72
Motors	Cond Wtr Pump	EEM	RI	23.5	1000		1,924	1,479	900	-156	-422	1,801	-123	0.94	16.09
Motors	Cond Wtr Pump	EEM	RI	14.5	8760		2,999	22,859	7,727	-156	-658	23,773	20,774	7.93	1.97
Motors	Cond Wtr Pump	EEM	RI	17.5	4000		6,334	32,899	6,001	-156	-1,338	36,406	30,072	6.75	2.72
Motors	Cond Wtr Pump	EEM	RI	44.5	1000		1,458	345	210	-156	-381	17	-1,441	0.01	1,338.06
Motors	Cond Wtr Pump	EEM	RI	18.5	1650		2,999	4,688	1,727	-156	-655	5,801	2,802	1.87	8.38
Motors	Cond Wtr Pump	EEM	RI	21.5	9000		5,904	37,838	4,168	-156	-1,317	40,631	34,627	6.86	2.28
Motors	Cond Wtr Pump	EEM	RI	38.5	3200		3,855	13,381	2,639	-156	-819	14,925	11,070	3.87	4.04
Motors	Cond Wtr Pump	EEM	RI	20.5	1650		1,458	609	210	-156	-381	241	-1,217	0.17	94.43
Motors	Cond Wtr Pump	EEM	RI	38.5	1650		1,870	1,614	568	-156	-430	1,486	-385	0.79	18.87
Motors	Cond Wtr Pump	EEM	RI	41.5	6000		1,924	1,924	8167	-156	-422	8,488	900	4.41	3.64
Motors	Cond Wtr Pump	EEM	RI	38.5	3200		4,786	17,482	3,318	-156	-1,018	19,608	14,822	4.10	3.81
Motors	Cond Wtr Pump	EEM	RI	38.5	2100		1,924	3,107	900	-156	-422	3,428	1,604	8.77	1.78
Motors	Cond Wtr Pump	EEM	RI	11.5	9000		1,458	1,903	210	-156	-381	1,578	118	1.08	14.48
Motors	Cond Wtr Pump	EEM	RI	21.5	3200		1,870	2,936	558	-156	-430	2,908	1,038	1.55	10.06

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cond. Wtr. Pump	VSD & EEM	RI	25.5	6000	3,855	20,876	2,539	156	-156	819	22,440	18,586	6.62	2.68
Motors	Cond. Wtr. Pump	VSD & EEM	RI	61.5	2100	6,334	17,272	6,001	-166	-166	-1,338	20,779	14,445	3.28	4.76
Motors	Cond. Wtr. Pump	VSD & EEM	RI	50.5	2100	8,841	22,919	6,936	-312	-312	-1,338	27,587	18,948	3.19	4.89
Motors	Cond. Wtr. Pump	VSD & EEM	RI	42.5	2100	2,332	4,695	4,695	-156	-156	-454	5,056	2,983	2.28	6.86
Motors	Cond. Wtr. Pump	VSD & EEM	RI	28.5	3200	1,924	4,734	900	-422	-422	-422	5,056	3,132	2.63	5.95
Motors	Cond. Wtr. Pump	VSD & EEM	RI	35.5	3200	4,771	18,176	3,454	-312	-312	-815	20,502	16,731	4.30	3.64
Motors	Cond. Wtr. Pump	VSD & EEM	RI	48.5	2100	20,201	41,747	12,088	-1,094	-1,094	-4,270	48,471	28,270	2.40	6.51
Motors	Cond. Wtr. Pump	VSD & EEM	RI	47.5	1650	4,789	9,004	3,318	-156	-156	-1,018	11,150	6,364	2.33	6.71
Motors	Cond. Wtr. Pump	VSD & EEM	RI	29.5	1000	2,999	2,840	1,727	-156	-156	-856	3,754	755	1.26	12.48
Motors	Cond. Wtr. Pump	VSD & EEM	RI	52.5	2100	3,855	8,768	2,539	-156	-156	-819	10,332	6,477	2.08	6.83
Motors	Cond. Wtr. Pump	EEM	ROF	25.5	6000	720	1,623	197	0	0	639	2,458	1,738	3.41	4.58
Motors	Cond. Wtr. Pump	EEM	ROF	28.5	1000	534	164	100	0	0	482	746	211	1.40	11.19
Motors	Cond. Wtr. Pump	EEM	ROF	30.5	1650	666	614	228	0	0	619	793	219	7.13	7.92
Motors	Cond. Wtr. Pump	EEM	ROF	44.5	1650	634	448	165	0	0	482	1,096	561	2.06	7.92
Motors	Cond. Wtr. Pump	EEM	ROF	20.5	1650	217	122	128	45	0	178	345	128	1.59	9.83
Motors	Cond. Wtr. Pump	EEM	ROF	23.5	2100	217	166	45	0	0	178	378	161	1.74	8.98
Motors	Cond. Wtr. Pump	EEM	ROF	30.5	1650	294	212	78	0	0	285	575	282	1.96	7.98
Motors	Cond. Wtr. Pump	EEM	ROF	18.5	1000	217	43	28	0	0	178	247	30	1.14	13.75
Motors	Cond. Wtr. Pump	EEM	ROF	42	2100	462	679	143	0	0	424	1,061	599	2.30	6.80
Motors	Cond. Wtr. Pump	EEM	ROF	17.5	4000	1,161	2,081	318	0	0	1,080	3,468	2,297	2.98	5.26
Motors	Cond. Wtr. Pump	EEM	ROF	8	6000	182	187	23	0	0	172	382	200	2.10	7.44
Motors	Cond. Wtr. Pump	EEM	ROF	14.5	8760	634	2,187	165	0	0	482	2,824	2,300	6.31	2.94
Motors	Cond. Wtr. Pump	EEM	ROF	23	2100	165	166	45	0	0	178	378	161	1.74	8.98
Motors	Cond. Wtr. Pump	EEM	ROF	42.5	2100	168	78	23	0	0	180	281	93	1.56	10.08
Motors	Cond. Wtr. Pump	EEM	ROF	23.5	1000	333	494	143	0	0	424	1,061	599	2.30	6.80
Motors	Cond. Wtr. Pump	EEM	ROF	5	1650	168	103	63	0	0	309	476	142	1.42	10.96
Motors	Cond. Wtr. Pump	EEM	ROF	28.5	2100	248	243	70	0	0	277	590	342	2.38	6.57
Motors	Cond. Wtr. Pump	EEM	ROF	52.5	2100	720	682	197	0	0	639	1,517	797	2.11	7.42
Motors	Cond. Wtr. Pump	EEM	ROF	25.5	1650	248	191	70	0	0	277	590	342	2.17	7.21
Motors	Cond. Wtr. Pump	EEM	ROF	21.5	3200	294	412	78	0	0	285	775	481	2.64	5.92
Motors	Cond. Wtr. Pump	EEM	ROF	84.5	2100	4,318	3,841	1,112	0	0	3,915	8,868	4,549	2.06	7.61
Motors	Cond. Wtr. Pump	EEM	ROF	38	1650	333	307	113	0	0	309	730	396	2.19	7.13
Motors	Cond. Wtr. Pump	EEM	ROF	38.5	3200	720	1,039	197	0	0	639	1,874	1,154	2.80	6.00
Motors	Cond. Wtr. Pump	EEM	ROF	31.5	3200	462	762	143	0	0	424	1,319	857	2.86	5.47
Motors	Cond. Wtr. Pump	EEM	ROF	58	2100	880	728	211	0	0	795	1,735	854	1.97	7.93
Motors	Cond. Wtr. Pump	EEM	ROF	35.5	3200	1,068	1,739	330	0	0	984	3,033	1,965	2.84	5.50
Motors	Cond. Wtr. Pump	EEM	ROF	41.5	3200	880	1,110	211	0	0	795	2,119	1,239	2.40	6.50
Motors	Cond. Wtr. Pump	EEM	ROF	15.5	800	720	182	139	0	0	639	959	239	1.33	11.73
Motors	Cond. Wtr. Pump	EEM	ROF	28	3200	333	596	113	0	0	309	1,018	686	3.08	5.11
Motors	Cond. Wtr. Pump	EEM	ROF	81.5	2100	1,161	1,093	318	0	0	1,080	2,469	1,308	2.13	7.35
Motors	Cond. Wtr. Pump	EEM	ROF	21.5	6000	1,011	2,394	264	0	0	929	3,686	2,576	3.55	4.41
Motors	Cond. Wtr. Pump	EEM	ROF	21	3200	294	412	78	0	0	285	775	481	2.84	5.92
Motors	Cond. Wtr. Pump	EEM	ROF	64	2100	2,879	2,660	741	0	0	2,610	5,912	3,033	2.05	7.91
Motors	Cond. Wtr. Pump	EEM	ROF	11	1650	364	124	46	0	0	344	513	149	1.41	11.08
Motors	Cond. Wtr. Pump	EEM	ROF	14.5	3200	248	371	70	0	0	277	718	489	2.89	5.41
Motors	Cond. Wtr. Pump	EEM	ROF	48	2100	1,802	1,711	499	0	0	1,448	3,653	2,062	2.26	6.86
Motors	Cond. Wtr. Pump	EEM	ROF	18.5	6000	333	1,027	113	0	0	309	1,450	1,117	4.36	3.69
Motors	Cond. Wtr. Pump	EEM	ROF	28.5	3200	333	596	113	0	0	309	1,018	686	3.08	5.11
Motors	Cond. Wtr. Pump	EEM	ROF	11.5	8000	217	408	45	0	0	178	631	414	2.91	6.37
Motors	Cond. Wtr. Pump	EEM	ROF	38.5	2100	333	391	113	0	0	309	813	480	2.44	6.40
Motors	Cond. Wtr. Pump	EEM	ROF	48.5	2100	3,739	3,993	1,156	0	0	1,591	8,523	4,784	2.28	6.86
Motors	Cond. Wtr. Pump	EEM	ROF	59.5	2100	1,761	1,467	422	0	0	1,591	3,374	1,709	1.97	7.93
Motors	Cooling Twr Fan	EEM	RI	47.5	1650	880	672	211	0	0	796	1,579	698	1.79	8.71
Motors	Cooling Twr Fan	EEM	RI	36.5	3200	731	1,569	298	0	0	263	2,130	1,398	2.81	5.36
Motors	Cooling Twr Fan	EEM	RI	65.5	2100	1,970	2,459	712	0	0	714	3,886	1,916	1.97	7.92
Motors	Cooling Twr Fan	EEM	RI	45.5	1650	1,462	1,618	596	0	0	520	2,740	1,278	1.87	8.34
Motors	Cooling Twr Fan	EEM	RI	67.5	2100	1,205	1,378	398	0	0	434	2,208	1,003	1.83	8.52
Motors	Cooling Twr Fan	EEM	RI	15.5	3200	340	641	122	0	0	175	937	597	2.78	5.67
Motors	Cooling Twr Fan	EEM	RI	28.5	6000	986	2,990	364	0	0	343	3,698	2,710	3.76	4.17
Motors	Cooling Twr Fan	EEM	RI	29.5	3200	456	1,051	200	0	0	173	1,424	968	3.12	5.00
Motors	Cooling Twr Fan	EEM	RI	19.5	800	986	363	288	0	0	343	994	-22	0.98	18.99
Motors	Cooling Twr Fan	EEM	RI	22	3200	402	721	137	0	0	164	1,022	620	2.84	6.14
Motors	Cooling Twr Fan	EEM	RI	30.5	1000	731	315	191	0	0	263	769	38	1.06	14.86
Motors	Cooling Twr Fan	EEM	RI	63.5	2100	1,972	2,512	727	0	0	686	3,926	1,963	1.99	7.86
Motors	Cooling Twr Fan	EEM	RI	31.5	1650	402	372	137	0	0	164	673	271	1.67	9.33
Motors	Cooling Twr Fan	EEM	RI	12.5	6000	297	699	89	0	0	89	865	568	2.91	6.38
Motors	Cooling Twr Fan	EEM	RI	24.5	1000	456	193	117	0	0	173	483	27	1.08	14.76
Motors	Cooling Twr Fan	EEM	RI	19.5	5000	340	1,001	122	0	0	175	1,297	957	3.82	4.09

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replicable Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	EEM	RI	39.5	1960		230	104	38	0	91	234	4	1.02	15.37
Motors	Cooling Tower Fan	EEM	RI	45	2100		912	1,380	399	0	345	2,124	1,212	2.33	8.71
Motors	Cooling Tower Fan	EEM	RI	45	1960		731	809	298	0	263	1,370	639	1.87	8.34
Motors	Cooling Tower Fan	EEM	RI	17.5	1000		297	78	46	0	89	211	-86	0.71	22.03
Motors	Cooling Tower Fan	EEM	RI	34.5	2100		402	473	137	0	184	774	372	1.93	8.11
Motors	Cooling Tower Fan	EEM	RI	24	2100		297	266	77	0	89	432	136	1.46	10.74
Motors	Cooling Tower Fan	EEM	RI	21.5	1960		297	209	77	0	89	376	78	1.28	12.38
Motors	Cooling Tower Fan	EEM	RI	39.5	3200		988	1,914	364	0	343	2,620	1,634	2.86	5.88
Motors	Cooling Tower Fan	EEM	RI	38	3200		731	1,569	298	0	263	2,130	1,399	2.91	5.38
Motors	Cooling Tower Fan	EEM	RI	32.5	1960		402	496	183	0	164	843	441	2.10	7.46
Motors	Cooling Tower Fan	EEM	RI	42.5	3200		1,206	2,098	398	0	434	2,929	1,724	2.43	6.43
Motors	Cooling Tower Fan	EEM	RI	43.5	2100		1,264	1,763	510	0	469	2,742	1,478	2.17	7.20
Motors	Cooling Tower Fan	EEM	RI	62	2100		3,178	4,127	1,195	0	1,168	6,491	3,313	2.04	7.85
Motors	Cooling Tower Fan	EEM	RI	24.5	2100		297	266	77	0	89	432	136	1.46	10.74
Motors	Cooling Tower Fan	EEM	RI	12	1960		498	212	78	0	196	484	-14	0.97	16.07
Motors	Cooling Tower Fan	EEM	RI	37.5	1960		456	542	200	0	173	914	468	2.01	7.79
Motors	Cooling Tower Fan	EEM	RI	14.5	4000		1,372	4,784	727	0	688	6,197	4,226	3.14	4.97
Motors	Cooling Tower Fan	EEM	RI	43	2100		881	881	265	0	235	1,371	739	2.17	7.20
Motors	Cooling Tower Fan	EEM	RI	19.5	6000		1,813	1,813	200	0	173	2,186	1,730	4.79	3.26
Motors	Cooling Tower Fan	EEM	RI	30.5	2100		340	420	122	0	176	717	377	2.11	7.41
Motors	Cooling Tower Fan	EEM	RI	34	2100		402	473	137	0	184	774	372	1.93	8.11
Motors	Cooling Tower Fan	EEM	RI	9	2100		230	133	38	0	91	262	32	1.14	13.70
Motors	Cooling Tower Fan	EEM	RI	32.5	3200		632	1,343	256	0	236	1,833	1,201	2.90	5.39
Motors	Cooling Tower Fan	EEM	RI	16.5	8760		731	3,947	298	0	263	4,507	3,778	6.17	4.507
Motors	Cooling Tower Fan	EEM	RI	39	2100		456	890	200	0	173	1,082	608	2.33	6.71
Motors	Cooling Tower Fan	EEM	RI	29	3200		456	1,051	200	0	173	1,424	968	3.12	6.00
Motors	Cooling Tower Fan	EEM	RI	49	2100		2,924	4,119	1,193	0	1,051	6,363	3,439	2.18	7.18
Motors	Cooling Tower Fan	EEM	RI	22.5	6000		1,384	4,521	498	0	514	6,333	4,149	4.00	3.91
Motors	Cooling Tower Fan	EEM	RI	49.5	2100		5,848	8,237	2,386	0	2,103	12,726	6,877	2.18	7.18
Motors	Cooling Tower Fan	EEM	RI	82.5	2100		3,178	4,127	1,195	0	1,168	6,491	3,313	2.04	7.85
Motors	Cooling Tower Fan	EEM	RI	32	1960		402	496	183	0	164	843	441	2.10	7.46
Motors	Cooling Tower Fan	EEM	RI	28.5	1960		330	360	122	0	176	627	287	1.84	8.48
Motors	Cooling Tower Fan	EEM	RI	9	6000		249	321	39	0	97	467	208	1.82	8.52
Motors	Cooling Tower Fan	EEM	RI	22.5	3200		402	721	137	0	184	1,022	620	2.54	6.14
Motors	Cooling Tower Fan	EEM	RI	43.5	3200		1,815	4,631	880	-158	-286	5,089	3,266	2.79	6.59
Motors	Cooling Tower Fan	EEM	RI	29.5	2100		456	877	2,599	-312	-691	10,673	6,160	2.37	6.81
Motors	Cooling Tower Fan	EEM	RI	15.5	8760		2,823	22,446	1,096	-166	-437	23,647	20,724	8.34	1.87
Motors	Cooling Tower Fan	EEM	RI	28.5	6000		3,818	20,519	2,496	-166	-624	22,334	18,716	6.17	2.53
Motors	Cooling Tower Fan	EEM	RI	39.5	2100		3,764	6,078	1,760	-312	-625	6,900	3,136	1.83	8.52
Motors	Cooling Tower Fan	EEM	RI	19.5	6000		1,815	7,989	880	-158	-286	8,427	6,613	4.64	3.36
Motors	Cooling Tower Fan	EEM	RI	34.5	2100		1,773	1,874	543	-158	-310	1,960	177	1.10	14.21
Motors	Cooling Tower Fan	EEM	RI	19.5	6000		1,546	3,091	378	-158	-245	3,088	1,519	1.98	7.88
Motors	Cooling Tower Fan	EEM	RI	24.5	1000		1,815	1,447	880	-158	-286	1,886	71	1.04	16.03
Motors	Cooling Tower Fan	EEM	RI	38.5	3200		3,818	13,133	2,486	-166	-624	14,948	11,330	3.78	4.22
Motors	Cooling Tower Fan	EEM	RI	24.5	2100		1,387	696	202	-166	-292	449	937	0.32	48.22
Motors	Cooling Tower Fan	EEM	RI	15.5	3200		1,286	33,971	9,836	-312	-1,768	41,738	28,963	1.26	12.37
Motors	Cooling Tower Fan	EEM	RI	62.5	2100		1,387	1,978	376	-166	-245	1,963	407	1.26	12.37
Motors	Cooling Tower Fan	EEM	RI	17.5	1000		331	331	202	-158	-292	86	-1,302	0.08	258.12
Motors	Cooling Tower Fan	EEM	RI	32.5	1960		1,472	1,472	543	-158	-310	1,548	-226	0.87	17.89
Motors	Cooling Tower Fan	EEM	RI	22.5	6000		3,709	4,099	4,099	-158	-302	40,249	34,878	7.22	2.16
Motors	Cooling Tower Fan	EEM	RI	42.5	3200		4,497	17,704	3,269	-166	-666	19,062	16,166	4.37	3.67
Motors	Cooling Tower Fan	EEM	RI	30.5	1000		2,823	2,788	1,096	-166	-437	3,891	1,087	1.38	11.34
Motors	Cooling Tower Fan	EEM	RI	31.5	1960		1,773	1,472	643	-166	-310	1,548	-226	0.87	17.89
Motors	Cooling Tower Fan	EEM	RI	49.5	4000		32,830	48,947	13,566	-312	-792	36,711	30,604	6.01	2.80
Motors	Cooling Tower Fan	EEM	RI	53.5	2100		6,113	17,236	4,991	-312	-792	21,123	15,009	3.46	4.52
Motors	Cooling Tower Fan	EEM	RI	30.5	2100		1,546	1,298	378	-158	-245	1,273	-274	0.82	18.98
Motors	Cooling Tower Fan	EEM	RI	16.5	800		3,818	3,283	2,496	-166	-624	6,098	1,480	1.41	11.09
Motors	Cooling Tower Fan	EEM	RI	65.5	2100		7,207	22,631	6,524	-166	-624	27,890	20,683	3.87	4.04
Motors	Cooling Tower Fan	EEM	RI	12.5	6000		1,387	1,387	202	-166	-292	1,583	196	1.14	13.89
Motors	Cooling Tower Fan	EEM	RI	21.5	1960		547	547	202	-166	-292	300	-1,087	0.22	72.19
Motors	Cooling Tower Fan	EEM	RI	45.5	1960		5,261	9,203	3,391	-166	-312	11,668	6,317	2.20	7.09
Motors	Cooling Tower Fan	EEM	RI	37.5	1960		1,815	2,388	880	-158	-286	2,828	1,012	1.56	10.03
Motors	Cooling Tower Fan	EEM	RI	28.5	1960		1,546	1,020	378	-158	-245	896	-662	0.84	24.29
Motors	Cooling Tower Fan	EEM	RI	67.5	2100		4,497	11,250	3,269	-166	-666	13,748	9,261	3.08	6.11
Motors	Cooling Tower Fan	EEM	RI	36.5	3200		2,823	8,923	1,899	-166	-437	10,028	7,203	3.66	4.40
Motors	Cooling Tower Fan	EEM	RI	22.5	3200		1,773	2,696	1,096	-166	-310	2,932	1,168	1.66	9.45
Motors	Cooling Tower Fan	EEM	RI	32.5	3200		2,180	6,839	1,300	-166	-286	7,718	6,538	3.64	4.41
Motors	Cooling Tower Fan	EEM	RI	32.5	3200		2,332	7,002	1,330	-166	-464	7,722	6,390	3.31	4.72
Motors	Cooling Tower Fan	EEM	RI	14.5	4000		6,360	33,402	5,078	-312	-1,087	37,080	30,730	5.84	2.88

Table 3.5
All ERDs: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of Obligation Savings (1993 \$)	Present Value of Repurchases (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	VSD & EEM	RI	43.5	2100		4,816	9,190	2,661	312	970	10,669	5,763	2.19	7.12
Motors	Cooling Tower Fan	VSD & EEM	RI	12.5	6000		1,458	1,903	210	156	1,578	1,578	118	1.08	14.46
Motors	Cooling Tower Fan	VSD & EEM	RI	22.5	9000		6,904	37,836	4,168	156	1,317	40,631	34,827	0.86	2.28
Motors	Cooling Tower Fan	VSD & EEM	RI	28.5	5000		3,856	20,876	2,839	156	819	22,440	18,586	0.82	2.68
Motors	Cooling Tower Fan	VSD & EEM	RI	17.5	1000		1,458	346	346	156	381	17	1,441	0.01	1,338.06
Motors	Cooling Tower Fan	VSD & EEM	RI	45.5	1650		5,802	9,372	3,454	312	1,161	11,362	5,780	2.03	7.70
Motors	Cooling Tower Fan	VSD & EEM	RI	30.5	1000		2,959	2,940	1,727	156	669	3,754	765	1.25	12.49
Motors	Cooling Tower Fan	VSD & EEM	RI	21.5	1650		1,458	569	210	156	381	241	1,217	0.17	94.43
Motors	Cooling Tower Fan	VSD & EEM	RI	65.5	2100		7,980	22,932	6,640	156	1,538	27,818	20,138	0.79	4.31
Motors	Cooling Tower Fan	VSD & EEM	RI	53.5	1650		1,870	1,514	568	312	430	1,486	385	0.79	19.67
Motors	Cooling Tower Fan	VSD & EEM	RI	30.5	2100		8,350	17,536	6,078	156	1,087	21,214	14,864	0.76	4.68
Motors	Cooling Tower Fan	VSD & EEM	RI	16.5	3200		1,828	1,341	388	156	347	1,228	402	0.76	20.76
Motors	Cooling Tower Fan	VSD & EEM	RI	32.5	1650		1,870	2,043	388	156	347	1,928	300	1.18	13.19
Motors	Cooling Tower Fan	VSD & EEM	RI	18.5	800		3,856	1,514	558	156	430	4,903	385	0.79	19.67
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5	3200		3,856	13,361	2,539	156	819	4,903	1,048	1.27	12.28
Motors	Cooling Tower Fan	VSD & EEM	RI	19.5	5000		3,856	13,361	2,539	156	819	4,903	1,048	1.27	12.28
Motors	Cooling Tower Fan	VSD & EEM	RI	42.5	3200		4,789	17,462	3,318	156	347	3,077	13,988	4.63	3.38
Motors	Cooling Tower Fan	VSD & EEM	RI	20.5	1650		1,828	1,064	388	156	347	2,331	18,446	0.58	3.22
Motors	Cooling Tower Fan	VSD & EEM	RI	19.5	8000		1,924	8,167	900	156	422	8,488	6,564	4.41	3.54
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5	2100		3,963	6,214	1,759	312	898	6,802	2,819	1.71	9.15
Motors	Cooling Tower Fan	VSD & EEM	RI	16.5	8780		2,959	22,859	10,022	156	658	23,773	20,774	0.94	16.69
Motors	Cooling Tower Fan	VSD & EEM	RI	62.5	2100		13,929	34,544	10,002	312	3,187	41,047	27,118	2.96	5.30
Motors	Cooling Tower Fan	VSD & EEM	RI	34.5	2100		1,870	1,927	658	156	430	2,783	28	1.02	15.39
Motors	Cooling Tower Fan	VSD & EEM	RI	37.5	1650		1,924	2,441	900	156	422	2,783	839	1.44	10.88
Motors	Cooling Tower Fan	VSD & EEM	RI	24.5	2100		1,458	724	210	156	381	396	1,062	0.27	67.47
Motors	Cooling Tower Fan	VSD & EEM	RI	49.5	2100		23,200	47,711	13,816	1,260	4,926	55,360	32,160	2.39	6.55
Motors	Cooling Tower Fan	VSD & EEM	RI	22.5	3200		1,870	2,398	868	156	430	2,908	1,038	1.56	10.06
Motors	Cooling Tower Fan	VSD & EEM	RI	24.5	1000		1,924	1,475	900	156	422	1,801	1,23	0.94	16.69
Motors	Cooling Tower Fan	VSD & EEM	RI	38.5	3200		2,959	9,088	1,727	156	658	10,003	7,004	3.34	4.68
Motors	Cooling Tower Fan	VSD & EEM	RI	57.5	2100		4,789	11,459	3,318	156	422	10,116	8,819	2.84	5.50
Motors	Cooling Tower Fan	VSD & EEM	RI	22	3200		1,924	4,734	900	156	422	5,069	3,132	2.63	5.96
Motors	Cooling Tower Fan	EEM	ROF	22	3200		284	412	78	0	285	776	481	2.64	5.82
Motors	Cooling Tower Fan	EEM	ROF	16.5	2100		1,868	78	23	0	180	281	93	1.65	10.06
Motors	Cooling Tower Fan	EEM	ROF	16.5	8780		534	2,187	105	0	482	2,834	2,300	5.31	2.94
Motors	Cooling Tower Fan	EEM	ROF	37.5	1650		333	307	113	0	309	730	398	2.19	7.13
Motors	Cooling Tower Fan	EEM	ROF	43	2100		482	494	143	0	424	1,081	599	2.30	6.80
Motors	Cooling Tower Fan	EEM	ROF	14.5	4000		1,441	2,596	396	0	1,277	4,268	2,827	2.98	6.27
Motors	Cooling Tower Fan	EEM	ROF	29.5	3200		333	596	113	0	309	1,018	686	3.08	5.11
Motors	Cooling Tower Fan	EEM	ROF	6	1650		188	61	23	0	180	244	78	1.45	10.76
Motors	Cooling Tower Fan	EEM	ROF	49	2100		2,137	2,282	661	0	1,928	4,870	2,734	2.28	8.86
Motors	Cooling Tower Fan	EEM	ROF	39	2100		333	391	113	0	309	813	480	2.44	6.40
Motors	Cooling Tower Fan	EEM	ROF	2.5	6000		534	408	46	0	178	631	414	3.01	5.37
Motors	Cooling Tower Fan	EEM	ROF	29	3200		333	596	113	0	309	1,018	686	5.11	6.37
Motors	Cooling Tower Fan	EEM	ROF	19.5	6000		333	898	186	0	482	1,616	982	2.84	5.60
Motors	Cooling Tower Fan	EEM	ROF	30.5	2100		333	1,027	113	0	309	1,450	1,117	4.35	3.59
Motors	Cooling Tower Fan	EEM	ROF	53.5	2100		248	243	70	0	277	590	342	2.38	6.57
Motors	Cooling Tower Fan	EEM	ROF	9	6000		1,441	1,363	396	0	1,277	3,036	1,594	2.11	7.42
Motors	Cooling Tower Fan	EEM	ROF	62.5	2100		182	187	23	0	172	362	200	2.10	7.44
Motors	Cooling Tower Fan	EEM	ROF	62	2100		2,322	2,186	633	0	2,121	4,938	2,817	2.13	7.36
Motors	Cooling Tower Fan	EEM	ROF	49.5	2100		4,273	2,186	633	0	2,121	4,938	2,817	2.13	7.36
Motors	Cooling Tower Fan	EEM	ROF	20.5	5000		4,273	4,564	1,321	0	3,860	9,741	6,468	2.28	6.86
Motors	Cooling Tower Fan	EEM	ROF	32.5	1650		294	1,823	197	0	639	2,468	1,738	3.41	4.58
Motors	Cooling Tower Fan	EEM	ROF	24.5	1000		333	783	104	0	285	672	378	2.29	6.83
Motors	Cooling Tower Fan	EEM	ROF	15.5	3200		248	103	63	0	277	476	142	1.42	10.96
Motors	Cooling Tower Fan	EEM	ROF	30.5	1000		534	164	100	0	344	718	469	2.89	5.41
Motors	Cooling Tower Fan	EEM	ROF	12	1650		364	124	46	0	482	745	211	1.40	11.19
Motors	Cooling Tower Fan	EEM	ROF	43.5	2100		924	987	286	0	648	2,121	1,198	2.30	11.08
Motors	Cooling Tower Fan	EEM	ROF	31.5	1650		294	782	78	0	285	676	282	2.30	6.80
Motors	Cooling Tower Fan	EEM	ROF	39.5	2100		988	782	278	0	619	1,827	900	1.98	7.98
Motors	Cooling Tower Fan	EEM	ROF	21.5	1650		217	122	46	0	178	346	128	2.44	6.40
Motors	Cooling Tower Fan	EEM	ROF	34	2100		294	122	46	0	285	633	339	1.59	8.83
Motors	Cooling Tower Fan	EEM	ROF	18.5	800		294	122	46	0	285	633	339	2.18	7.26
Motors	Cooling Tower Fan	EEM	ROF	32	1650		720	182	139	0	639	969	378	1.33	11.73
Motors	Cooling Tower Fan	EEM	ROF	22.5	6000		294	283	104	0	285	872	239	2.29	6.83
Motors	Cooling Tower Fan	EEM	ROF	22.5	3200		1,011	2,394	284	0	929	3,589	2,575	3.55	4.41
Motors	Cooling Tower Fan	EEM	ROF	45.5	1650		294	412	78	0	285	776	481	2.84	5.92
Motors	Cooling Tower Fan	EEM	ROF	32.5	3200		1,088	897	330	0	944	2,191	1,123	2.06	7.62
Motors	Cooling Tower Fan	EEM	ROF	32.5	3200		462	762	143	0	424	1,319	667	2.89	5.47
Motors	Cooling Tower Fan	EEM	ROF	24.5	2100		217	155	45	0	178	378	161	1.74	8.96

Table 3.6
All EROs Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	402	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of Obliv Savings (1993 \$)	Present Value of Repairs Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	EEM	ROF	34.5	2100		254	270	78	0	285	633	339	2.16	7.26
Motors	Cooling Tower Fan	EEM	ROF	19.5	5000		248	575	70	0	277	929	679	3.73	4.19
Motors	Cooling Tower Fan	EEM	ROF	57.5	2100		880	728	211	0	796	1,736	854	1.97	7.93
Motors	Cooling Tower Fan	EEM	ROF	65.5	2100		1,439	1,280	371	0	1,305	2,958	1,516	2.06	7.91
Motors	Cooling Tower Fan	EEM	ROF	42.5	3200		880	1,170	211	0	796	2,116	1,236	2.40	6.50
Motors	Cooling Tower Fan	EEM	ROF	24	2100		217	155	45	0	178	378	161	1.74	8.98
Motors	Cooling Tower Fan	EEM	ROF	45	1650		534	448	166	0	482	1,096	581	2.05	7.82
Motors	Cooling Tower Fan	EEM	ROF	28.5	1650		248	191	70	0	277	538	290	2.17	7.21
Motors	Cooling Tower Fan	EEM	ROF	17.5	1000		217	43	26	0	178	247	30	1.14	13.76
Motors	Cooling Tower Fan	EEM	ROF	39.5	3200		534	885	166	0	482	1,516	982	2.84	5.60
Motors	Cooling Tower Fan	EEM	ROF	25	4000		720	1,039	197	0	639	1,874	1,154	2.80	6.00
Motors	EXH FAN	EEM	ROF	25	4000		3,564	6,505	1,879	0	518	8,908	5,342	2.50	6.26
Motors	Furnace Fans	EEM	ROF	25	4000		2,315	2,927	845	0	1,942	5,744	3,419	2.48	6.31
Motors	Furnace Fans	EEM	ROF	40	2100		1,368	2,069	599	0	618	3,186	1,818	2.33	6.71
Motors	Furnace Fans	EEM	ROF	10	8780		2,873	5,170	993	0	802	10,864	7,991	3.99	3.92
Motors	Furnace Fans	EEM	ROF	18	3200		2,040	3,844	730	0	1,048	6,622	3,582	2.78	5.87
Motors	Furnace Fans	EEM	ROF	13	1650		245	108	39	0	97	242	7	0.97	18.07
Motors	Furnace Fans	EEM	ROF	10	3200		3,881	5,258	1,001	0	1,168	7,426	3,544	1.92	8.12
Motors	Furnace Fans	EEM	ROF	8	3200		2,052	2,472	390	0	323	3,414	924	1.37	11.39
Motors	Furnace Fans	EEM	ROF	8	8780		780	2,472	187	0	323	2,982	2,202	3.82	4.09
Motors	Furnace Fans	EEM	ROF	1	800		764	2,965	581	0	3,480	4,826	3,911	0.66	28.29
Motors	Furnace Fans	EEM	ROF	3	8780		1,588	2,965	276	0	626	3,826	2,287	2.46	6.39
Motors	Furnace Fans	EEM	ROF	4	8000		230	349	38	0	91	478	248	2.08	7.81
Motors	Furnace Fans	EEM	ROF	4	800		88,973	4,870	3,702	0	20,948	36,515	-33,464	0.51	30.34
Motors	Furnace Fans	EEM	ROF	7	8780		498	1,032	78	0	195	1,305	807	2.82	5.98
Motors	Furnace Fans	EEM	ROF	7	3200		2,340	2,935	560	0	908	4,477	2,137	1.91	8.17
Motors	Furnace Fans	EEM	ROF	23	3200		3,216	6,788	1,098	0	1,314	8,178	4,982	2.64	6.14
Motors	Furnace Fans	EEM	ROF	13	5000		260	512	82	0	108	682	422	2.82	6.96
Motors	Furnace Fans	EEM	ROF	10	2100		890	398	116	0	273	787	97	1.14	13.70
Motors	Furnace Fans	EEM	ROF	18	2100		780	845	187	0	323	1,164	374	1.48	10.86
Motors	Furnace Fans	EEM	ROF	4	8780		1,150	2,842	192	0	466	3,190	2,040	2.77	5.83
Motors	Furnace Fans	EEM	ROF	11	8780		1,360	6,446	487	0	699	7,830	6,270	5.81	2.78
Motors	Furnace Fans	EEM	ROF	10	5000		1,952	2,584	312	0	778	3,864	1,882	1.83	8.52
Motors	Furnace Fans	EEM	ROF	4	1000		35,352	3,888	2,353	0	14,099	20,321	-15,071	0.57	27.21
Motors	Furnace Fans	EEM	ROF	22	1650		3,881	2,715	1,001	0	1,168	4,874	1,013	1.26	12.38
Motors	Furnace Fans	EEM	ROF	5	800		520	71	54	0	215	340	180	0.86	23.88
Motors	Furnace Fans	EEM	ROF	16	5000		1,782	3,797	482	0	534	4,794	3,012	2.89	6.81
Motors	Furnace Fans	EEM	ROF	16	2100		747	404	117	0	292	813	88	1.09	14.38
Motors	Furnace Fans	EEM	ROF	16	1000		25,530	3,119	1,897	0	10,115	15,132	-10,388	0.59	28.38
Motors	Furnace Fans	EEM	ROF	18	1000		584	161	52	0	178	421	173	0.71	22.03
Motors	Furnace Fans	EEM	ROF	15	2100		549	238	68	0	168	820	274	1.50	10.40
Motors	Furnace Fans	EEM	ROF	18	6000		1,688	208	23	0	180	388	220	2.31	8.78
Motors	Furnace Fans	EEM	ROF	18	2100		570	377	109	0	558	1,043	473	1.83	8.64
Motors	Furnace Fans	EEM	ROF	3	8780		1,148	1,763	133	0	1,096	2,891	1,846	2.81	5.98
Motors	Furnace Fans	EEM	ROF	40	2100		1,000	1,172	339	0	528	2,440	1,440	2.44	6.40
Motors	Furnace Fans	EEM	ROF	4	1000		25,981	2,178	1,325	0	24,708	28,211	2,380	1.09	14.32
Motors	Furnace Fans	EEM	ROF	5	800		380	35	30	0	371	439	59	1.16	13.51
Motors	Furnace Fans	EEM	ROF	13	1650		182	62	23	0	172	256	76	1.41	11.08
Motors	Furnace Fans	EEM	ROF	7	8780		364	603	46	0	344	992	628	2.73	5.73
Motors	Furnace Fans	EEM	ROF	7	3200		1,710	1,725	328	0	1,009	3,722	2,012	2.18	7.18
Motors	Furnace Fans	EEM	ROF	13	5000		190	300	38	0	185	521	331	2.74	6.89
Motors	Furnace Fans	EEM	ROF	10	2100		504	235	68	0	480	783	275	1.66	10.08
Motors	Furnace Fans	EEM	ROF	10	3200		2,821	3,074	584	0	2,315	6,574	3,162	2.12	7.38
Motors	Furnace Fans	EEM	ROF	8	3200		1,918	1,198	228	0	1,719	3,146	1,326	1.73	9.04
Motors	Furnace Fans	EEM	ROF	9	1000		18,656	1,743	1,060	0	17,768	20,571	1,916	1.10	14.17
Motors	Furnace Fans	EEM	ROF	23	3200		60,398	2,580	1,948	0	47,820	62,127	1,729	1.03	16.10
Motors	Furnace Fans	EEM	ROF	18	5000		1,302	2,217	270	0	1,069	3,585	2,263	2.94	5.92
Motors	Furnace Fans	EEM	ROF	18	1000		85	85	52	0	358	483	65	2.73	5.72
Motors	Furnace Fans	EEM	ROF	4	8780		940	1,499	113	0	800	2,412	1,572	1.14	13.75
Motors	Furnace Fans	EEM	ROF	70	8780		1,953	5,353	404	0	1,803	7,380	5,407	2.87	5.44
Motors	Furnace Fans	EEM	ROF	10	5000		1,464	1,493	182	0	1,376	3,065	1,599	2.10	7.46
Motors	Furnace Fans	EEM	ROF	11	8780		6,383	430	327	0	6,098	6,884	473	1.07	14.66
Motors	Furnace Fans	EEM	ROF	18	3200		994	3,731	282	0	1,709	6,119	4,128	6.16	3.03
Motors	Furnace Fans	EEM	ROF	22	1650		2,491	2,225	423	0	2,817	4,307	2,817	2.88	5.41
Motors	Furnace Fans	EEM	ROF	8	8780		2,821	1,585	594	0	2,315	4,486	1,894	1.59	9.83
Motors	Furnace Fans	EEM	ROF	19	1000		570	1,448	109	0	558	2,112	1,842	3.71	4.22
Motors	Let Trash Pump	EEM	ROF	32	1000		2,970	703	856	0	1,988	3,648	678	1.19	13.09
Motors	Let Trash Pump	EEM	ROF	33	1000		11,123	5,104	8,208	0	8,952	19,904	8,781	1.78	8.73
Motors	Let Trash Pump	EEM	ROF	33	1000		17,730	5,132	11,180	0	13,682	33,934	-8,204	1.91	8.16

Table 3.6
All EROs Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	ER or ROF	IO	IO-2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of Old Savings (1993 \$)	Present Value of Replicate Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Lit. Trough Pump	EEM	R	25	1000		4,590	1,716	2,087	0	3,595	7,402	2,842	1.62	9.62
Motors	Lit. Trough Pump	EEM	ROF	32	1000		10,284	4,838	5,638	0	5,129	19,400	9,116	1.85	8.28
Motors	Lit. Trough Pump	EEM	ROF	33	1000		10,352	8,306	10,174	0	14,414	32,963	18,540	2.01	7.77
Motors	Lit. Trough Pump	EEM	ROF	15	1000		2,748	849	789	0	2,131	3,569	822	1.30	12.02
Motors	Power Ventilator	VSD to existing mtr	R	27.5	4000		4,218	1,568	1,508	0	3,818	7,294	3,078	1.73	9.03
Motors	Power Ventilator	VSD to existing mtr	R	27.5	4000		4,544	15,810	4,504	337	920	20,357	18,414	4.12	3.79
Motors	Power Ventilator	VSD to existing mtr	R	28.5	4000		24,928	48,898	13,538	6,165	752	68,031	31,105	2.26	8.96
Motors	Power Ventilator	VSD to existing mtr	R	28.5	4000		21,364	87,217	25,178	3,593	3,114	111,918	50,582	5.24	2.98
Motors	Power Ventilator	VSD & EEM	R	27.5	4000		21,710	87,819	25,254	3,593	2,870	111,990	50,281	6.16	3.03
Motors	Power Ventilator	VSD & EEM	R	27.5	4000		5,022	15,894	4,588	5,937	822	20,387	16,346	4.08	3.86
Motors	Power Ventilator	VSD & EEM	R	28.5	4000		25,303	47,200	13,828	6,165	281	55,952	30,849	2.21	7.08
Motors	POWER VENT	EEM	R	28	4000		4,824	10,718	3,054	0	4,027	17,839	13,016	3.70	4.22
Motors	POWER VENT	EEM	R	28.5	4000		9,801	18,883	4,888	0	8,580	28,291	18,450	2.89	6.41
Motors	POWER VENT	EEM	R	23	4000		1,246	1,254	374	0	1,006	2,874	1,429	2.15	7.27
Motors	POWER VENT	EEM	R	28	4000		6,049	6,132	1,770	0	3,375	11,782	8,233	2.23	8.99
Motors	POWER VENT	EEM	R	24	4000		2,890	4,566	1,315	0	2,410	8,279	5,419	2.89	6.40
Motors	POWER VENT	EEM	R	27.5	4000		2,040	4,816	1,390	0	2,030	8,236	6,196	4.04	3.87
Motors	POWER VENT	EEM	R	21	4000		5,378	5,183	1,498	0	4,405	11,084	5,708	2.08	7.58
Motors	POWER VENT	EEM	R	27	4000		1,020	2,408	685	0	1,015	4,118	3,098	4.04	3.87
Motors	POWER VENT	EEM	R	22	4000		230	257	74	0	188	615	289	2.28	8.92
Motors	POWER VENT	EEM	R	28.5	4000		5,248	20,543	5,930	0	7,719	34,152	24,948	3.70	4.22
Motors	POWER VENT	EEM	ROF	28	4000		4,480	9,918	2,883	0	4,259	17,040	12,580	3.82	4.09
Motors	POWER VENT	EEM	ROF	28	4000		4,888	5,898	1,944	0	3,822	10,982	8,254	2.35	8.85
Motors	POWER VENT	EEM	ROF	27	4000		943	2,233	645	0	1,064	3,942	2,999	4.18	3.74
Motors	POWER VENT	EEM	ROF	21	4000		4,970	4,824	1,383	0	4,083	10,880	6,909	2.19	7.14
Motors	POWER VENT	EEM	ROF	22	4000		213	239	89	0	195	607	254	2.38	8.55
Motors	POWER VENT	EEM	ROF	27.5	4000		1,888	4,488	1,289	0	2,128	7,884	5,997	4.18	3.74
Motors	POWER VENT	EEM	ROF	23	4000		1,151	1,272	347	0	1,095	2,815	1,484	2.27	8.88
Motors	POWER VENT	EEM	ROF	24	4000		2,844	4,233	1,222	0	2,547	8,001	5,357	3.03	5.18
Motors	POWER VENT	EEM	ROF	28.5	4000		8,548	19,010	5,488	0	8,193	32,680	24,111	3.82	4.09
Motors	POWER VENT	EEM	ROF	28.5	4000		9,082	16,884	4,522	0	7,031	27,218	18,165	3.00	5.20
Refrigerator	Refrigerator	High Efficiency Ref	R	1	RF 1		282,995	58,811	11,597	0	132,179	200,087	92,908	0.88	22.88
Refrigerator	Refrigerator	High Efficiency Ref	R	2	RF 2		153,200	30,917	6,039	0	69,113	108,070	47,130	0.89	22.88
Transform & Dist			R	MAXINE 1			200	19,410	3,944	0	0	23,354	23,184	118.77	0.13
Transform & Dist			R	MAXINE 2			200	105,883	21,860	0	0	127,532	127,332	637.88	0.02
Transform & Dist			R	MAXINE 3			200	229,803	180,304	0	0	410,507	410,307	2,082.84	0.01
Transform & Dist	Compressor	Pow. Fac. Com. to 0.95	R	4			4,504	3,689	338	141	0	3,784	720	0.84	18.60
Transform & Dist	Compressor	Pow. Fac. Com. to 1.00	R	8			21,412	21,548	2,098	672	0	22,987	1,676	1.07	14.55
Transform & Dist	Transformer	Amorphous	ROF	8	1 Pkw		2,934	3,042	1,562	0	2,888	35,778	32,842	12.19	1.28
Transform & Dist	Transformer	Amorphous	ROF	12	1 Pkw		8,140	3,082	162	0	7,188	10,401	2,922	1.28	12.23
Transform & Dist	Transformer	Amorphous	ROF	16	1 Pkw		10,383	4,728	235	0	9,148	14,110	3,748	1.38	11.47
Transform & Dist	Transformer	Amorphous	ROF	7	1 Pkw		2,338	28,114	1,377	0	2,130	31,821	29,284	13.63	1.15
Transform & Dist	Transformer	Amorphous	ROF	16	1 Pkw		12,582	12,833	638	0	11,087	24,868	11,998	1.95	7.99
Transform & Dist	Transformer	Amorphous	ROF	13	1 Pkw		9,047	3,433	177	0	7,988	11,582	2,545	1.28	12.15
Transform & Dist	Transformer	Amorphous	ROF	36	3 Pkw		16,222	27,017	1,342	0	13,431	41,790	28,688	2.75	6.88
Transform & Dist	Transformer	Amorphous	ROF	5	1 Pkw		1,688	48,713	2,280	0	1,454	50,457	48,888	31.77	0.49
Transform & Dist	Transformer	Amorphous	ROF	27	3 Pkw		2,934	4,053	200	0	2,888	8,918	3,984	2.38	8.83
Transform & Dist	Transformer	Amorphous	ROF	3	1 Pkw		3,449	13,321	680	0	3,128	17,108	13,858	4.98	3.15
Transform & Dist	Transformer	Amorphous	ROF	33	3 Pkw		11,951	16,507	805	0	1,817	19,129	17,139	9.81	1.93
Transform & Dist	Transformer	Amorphous	ROF	34	3 Pkw		12,582	89,043	3,401	0	10,548	18,308	4,357	1.38	11.46
Transform & Dist	Transformer	Amorphous	ROF	10	1 Pkw		7,103	10,782	530	0	6,274	17,588	10,482	2.47	8.32
Transform & Dist	Transformer	Amorphous	ROF	11	1 Pkw		7,474	6,687	324	0	6,800	13,491	6,017	1.81	8.86
Transform & Dist	Transformer	Amorphous	ROF	3	1 Pkw		958	2,878	139	0	881	3,897	2,941	4.08	3.83
Transform & Dist	Transformer	Amorphous	ROF	4	1 Pkw		1,159	5,043	248	0	1,099	8,388	5,192	5.34	2.83
Transform & Dist	Transformer	Amorphous	ROF	2	1 Pkw		818	109	6	0	754	888	82	1.08	14.88
Transform & Dist	Transformer	Amorphous	ROF	32	3 Pkw		9,883	27,580	1,354	0	8,707	37,841	27,778	3.82	4.09
Transform & Dist	Transformer	Amorphous	ROF	22	3 Pkw		1,588	287	14	0	1,484	1,786	187	1.11	14.14
Transform & Dist	Transformer	Amorphous	ROF	25	3 Pkw		2,204	2,588	127	0	2,009	4,725	2,821	2.14	7.29
Transform & Dist	Transformer	Amorphous	ROF	21	3 Pkw		1,403	1,028	51	0	1,288	2,385	982	1.69	9.27
Transform & Dist	Transformer	Amorphous	ROF	1	1 Pkw		653	238	12	0	605	883	200	1.31	11.90
Transform & Dist	Transformer	Amorphous	ROF	28	3 Pkw		8,159	2,983	144	0	5,478	8,803	2,404	1.35	11.28
Transform & Dist	Transformer	Amorphous	ROF	30	3 Pkw		8,807	9,808	484	0	7,600	17,990	9,383	2.08	7.47
Transform & Dist	Transformer	Amorphous	ROF	29	3 Pkw		7,103	17,881	876	0	6,274	25,009	17,908	3.52	4.44

Table 3.6
All EROs Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	Re or RPS	ID	IO2	Facility or Factory Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of C&M Savings (1993 \$)	Present Value of Reliability Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Peak Share (a)	Generator	DGEN 12	Re	12		B-793	997,382	1,985,677	4,385,197	1,281,242	0	1,088,377	101,016	1.10	14.19
Peak Share (a)	Generator	DGEN 13	Re	13		B-791	1,137,781	2,087,383	4,618,242	-1,368,927	0	1,089,522	87,829	0.94	18.81
Peak Share (a)	Generator	DGEN 14	Re	14		B-301	1,281,276	2,172,189	4,842,112	-1,427,400	0	1,042,523	236,762	0.81	19.20
Peak Share (a)	Generator	DGEN 15	Re	15		B-510	1,426,980	2,240,088	4,742,808	-1,488,997	0	1,016,147	409,813	0.71	21.82
Peak Share (a)	Generator	DGEN 16	Re	16		B-220	1,575,424	2,307,841	4,843,505	-1,548,052	0	989,812	585,812	0.63	24.87
Peak Share (a)	Generator	DGEN 17	Re	17		B-789	1,726,390	2,369,800	4,919,028	-1,598,128	0	964,100	781,290	0.58	27.88
Peak Share (a)	Generator	DGEN 18	Re	18		B-2945	1,878,230	2,399,546	4,978,468	-1,640,810	0	939,290	938,940	0.50	31.21
Peak Share (a)	Generator	DGEN 19	Re	19		B-8888	2,029,932	2,440,191	5,038,894	-1,685,263	0	914,419	1,116,513	0.46	34.86
Peak Share (a)	Generator	DGEN 20	Re	20		B-510	2,188,497	2,480,461	5,100,319	-1,730,053	0	889,291	1,297,208	0.41	38.41
Peak Share (a)	Generator	DGEN 21	Re	21		B-854	2,344,031	2,514,877	5,160,800	-1,771,114	0	864,838	1,478,392	0.37	42.35
Peak Share (a)	Generator	DGEN 22	Re	22		B-5	2,498,497	2,549,842	5,221,311	-1,811,812	0	839,957	1,660,581	0.33	46.29
Peak Share (a)	Generator	DGEN 23	Re	23		B-8888	2,652,931	2,585,808	5,281,822	-1,852,514	0	815,076	1,842,776	0.29	50.23
Peak Share (a)	Generator	DGEN 24	Re	24		B-748	2,807,367	2,621,773	5,333,333	-1,893,216	0	790,195	2,024,968	0.25	54.17
Peak Share (a)	Generator	DGEN 25	Re	25		B-700	2,961,803	2,657,738	5,384,844	-1,933,916	0	765,314	2,207,160	0.21	58.11
Peak Share (a)	Generator	DGEN 26	Re	26		B-930	3,116,239	2,693,703	5,435,355	-1,974,616	0	740,433	2,389,352	0.17	62.05
Peak Share (a)	Generator	DGEN 27	Re	27		B-443	3,270,675	2,729,668	5,485,866	-2,015,316	0	715,552	2,571,544	0.13	65.99
Peak Share (a)	Generator	DGEN 28	Re	28		B-779	3,425,111	2,765,633	5,536,377	-2,056,016	0	690,671	2,753,736	0.09	69.93
Peak Share (a)	Generator	DGEN 29	Re	29		B-773	3,579,547	2,801,598	5,586,888	-2,096,716	0	665,790	2,935,928	0.05	73.87

(a) Energy savings for Peak sharing EROs are calculated as generated electricity less diesel consumed in generating thermal consistency. Conversion factor used was 11 kWh/7.2048 gallons*110 @ \$24.148/gal*11 kWh/2.412 Btu

Table 3.6
EROs Contributing the Minimum Life-Cycle Cost Reduction: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (\$/kW)	First Year Demand Reduction (kW)	Full Implement Energy Savings (\$/kW)	Full Implement Demand Reduction (kW)	Net Present Value (\$/kW)	Savings to Investment Ratio	Discounted Payback Period (Years)
Non-Generating EROs													
Trains & Duct		CVR	RI	MITKline 3		Substation	296,217	500	296,217	500	410,307	2,052.54	0.01
Trains & Duct		CVR	RI	MITKline 2		Substation	136,606	258	136,606	258	127,332	637.66	0.02
Trains & Duct		CVR	RI	MITKline 1		Substation	25,041	47	25,041	47	127,332	116.77	0.13
Lighting	750W BNC Transformer	HPS 200 PEND	RI	99		1 PHS	109,581	242	109,581	242	311,935	40.24	0.39
Lighting	1500W QUARTZ Transformer	HPS 400 PCLE	RI	103		1 PHS	0	0	152,675	70	48,869	31.77	0.49
Trains & Duct	Transformer	Asynchronous	RI	7		1 PHS	273,339	782	273,339	782	298,458	17.34	0.90
Trains & Duct	Transformer	Asynchronous	RI	8		1 PHS	0	0	91,888	42	29,284	13.53	1.15
Trains & Duct	Transformer	Asynchronous	RI	6		1 PHS	0	0	103,110	48	32,842	12.19	1.28
Motors	Condenser Water Pump	VSD & EEM	RI	14.5			30,857	21	53,949	25	17,139	9.61	1.63
Motors	Cooling Tower Fan	VSD & EEM	RI	15.5			30,857	21	30,857	21	20,774	7.93	1.97
Lighting	150W BNC	CFL 2.15 CFL FIXT	RI	42		C	12,455	27	12,455	27	10,344	7.89	1.98
Lighting	90W BNC	CFL 2.11 CFL FIXT	RI	75		H	65,023	89	65,023	89	57,336	7.31	2.14
Motors	Cooling Tower Fan	VSD to existing motor	RI	22.5			48,845	49	48,845	49	34,678	7.22	2.16
Motors	Condenser Water Pump	VSD to existing motor	RI	21.5			48,845	49	48,845	49	34,678	7.22	2.16
Lighting	400W Misc Vapor	HPS 200 PEND	RI	100		J	138,990	198	138,990	198	92,432	7.12	2.19
Lighting	150W BNC	CFL 2.15 CFL FIXT	RI	86		I	29,898	70	29,898	70	24,838	7.06	2.21
Motors	AHU	EEM	RI	12			7,814	8	7,814	8	5,320	6.83	2.29
Motors	AHU	EEM	RI	12.5			11,721	12	11,721	12	7,980	6.83	2.29
Lighting	300W BNC	HPS 70 PEND	RI	90		I	23,196	54	23,196	54	24,141	6.82	2.29
Trains & Duct	Transformer	Asynchronous	RI	34			0	0	275,658	104	70,969	6.65	2.35
Motors	Cooling Tower Fan	VSD to existing motor	RI	26.5			24,785	30	24,785	30	18,716	6.17	2.53
Motors	Condenser Water Pump	VSD to existing motor	RI	25.5			24,785	30	24,785	30	18,716	6.17	2.53
Motors	Condenser Water Pump	VSD to existing motor	RI	17.5			39,076	59	39,076	59	30,301	6.09	2.56
Motors	Cooling Tower Fan	VSD & EEM	RI	14.5			41,415	62	41,415	62	30,730	5.84	2.68
Lighting	75W BNC	CFL 2.11 CFL FIXT	RI	74		H	9,211	13	9,211	13	8,147	5.75	2.72
Lighting	2x50W BNC PAR Fluoresce	CFL 2.11 BTEG W .REF	RI	19		B	3,392	8	3,392	8	2,740	5.68	2.76
Motors	150W PAR SPOT	HPS 50 FLD	RI	11			9,251	6	9,251	6	6,270	5.61	2.78
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	44		C	3,257	7	3,257	7	4,522	5.43	2.88
Lighting	150W BNC	CFL 2.15 CFL FIXT	RI	43		C	13,873	30	13,873	30	19,263	5.43	2.88
Trains & Duct	Transformer	Asynchronous	RI	23		B	194,282	437	194,282	437	153,372	5.42	2.88
Motors	Circ Pump	EEM	RI	4			0	0	16,483	8	5,192	5.34	2.93
Lighting	300W BNC	HPS 70 PEND	RI	17		B	34,787	70	34,787	70	25,640	5.33	2.93
Lighting	Power Ventilator	VSD to existing motor	RI	27			131,410	295	131,410	295	130,848	5.27	2.98
Lighting	90W BNC	CFL 2.11 CFL FIXT	RI	28.5		C	97,457	292	100,187	301	90,502	5.24	2.98
Motors	AHU	EEM	RI	40			43,748	94	43,748	94	40,832	5.22	2.99
Motors	AHU	EEM	RI	15.5			2,878	4	2,878	4	1,830	5.01	3.12
Motors	AHU	EEM	RI	15			2,878	4	2,878	4	1,830	5.01	3.12
Trains & Duct	Transformer	Asynchronous	RI	9			0	0	43,537	20	13,659	5.01	3.15
Lighting	150W PAR SPOT	HPS 50 FLD	RI	88		I	2,011	5	2,011	5	2,769	4.86	3.21
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	87		I	8,567	20	8,567	20	11,795	4.86	3.21
Motors	Cooling Tower Fan	VSD & EEM	RI	42.5			21,647	41	21,647	41	18,445	4.85	3.22
Motors	Chilled Water Pump	EEM	RI	16.5			2,878	3	2,878	3	1,730	4.77	3.28
Motors	Circ Pump	EEM	RI	13			4,752	10	4,752	10	3,845	4.77	3.28
Lighting	150W BNC FLOOD	HPS 50 FLD	RI	104			5,953	17	5,953	17	11,527	4.72	3.31
Motors	AHU	EEM	RI	21			2,230	4	2,230	4	1,678	4.68	3.34
Motors	AHU	EEM	RI	21.5			2,230	4	2,230	4	1,678	4.68	3.34
Lighting	90W BNC	CFL 2.11 CFL FIXT	RI	84		I	27,017	63	27,017	63	24,942	4.68	3.34
Motors	Cooling Tower Fan	VSD to existing motor	RI	19.5			10,409	10	10,409	10	6,613	4.64	3.36
Motors	Condenser Water Pump	VSD to existing motor	RI	18.5			10,409	10	10,409	10	6,613	4.64	3.36
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5			16,568	31	16,568	31	13,968	4.63	3.38
Lighting	3x40 T 12	FL 2x4 2 T8 ELC REF	RI	80		H	164,870	226	164,870	226	134,971	4.58	3.41
Lighting	150W PAR SPOT	HPS 50 FLD	RI	53		D	1,714	4	1,714	4	2,290	4.50	3.47
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	52		D	7,301	16	7,301	16	9,755	4.50	3.47
Lighting	2x75W BNC	CFL 2.15 CFL FIXT	RI	5		A	50,866	126	50,866	126	54,952	4.49	3.48
Motors	Condenser Water Pump	VSD to existing motor	RI	35.5			21,513	40	21,513	40	15,734	4.42	3.53
Motors	Condenser Fan	EEM	RI	22			2,230	3	2,230	3	1,559	4.42	3.54
Lighting	90W BNC	CFL 15 CFL FIXT	RI	38		C	69,036	148	69,036	148	68,049	4.41	3.54
Motors	Condenser Water Pump	VSD to existing motor	RI	41.5			20,838	39	20,838	39	15,165	4.37	3.57

Table 3.6
EROs Contributing the Minimum Life-Cycle Cost Reduction: Annual Energy and Demand Reduction

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kBtu)	First Year Demand Savings (kW)	Full Implement Energy Savings (kBtu)	Full Implement Demand Savings (kW)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	RI	23.5	5000		10,273	18	10,273	18	7,345	4.35	3.59
Motors	AHU	EEM	RI	23	5000		3,424	6	3,424	6	2,448	4.35	3.59
Lighting	2x75W INC	CFL 2 15 CER FIXT	RI	64		G	81,103	211	81,103	211	86,774	4.28	3.65
Lighting	90W INC	CFL 2 11 CER FIXT	RI	50		D	23,023	49	23,023	49	20,231	4.27	3.66
Lighting	100W INC	CFL 2 15 CER FIXT	RI	76		H	71,175	98	71,175	98	32,487	4.27	3.66
Motors	AHU	EEM	RI	14.5	6000		1,816	3	1,816	3	1,297	4.23	3.70
Motors	AHU	EEM	RI	20	6000		7,242	11	7,242	11	4,398	4.18	3.74
Motors	AHU	EEM	RI	20.5	6000		14,483	22	14,483	22	8,795	4.18	3.74
Lighting	200W INC	MPS 50 PEND	RI	89		I	60,036	140	60,036	140	54,914	4.17	3.74
Lighting	4x40 T-12	FL 2X4 3 18 ELC REF	RI	23.5	6000		8,690	9	8,690	9	5,017	4.16	3.76
Motors	Condenser Water Pump	VSD to existing mtr	RI	38.5	3200	H	326,998	448	326,998	448	242,825	4.14	3.77
Motors	AHU	EEM	RI	9	8760		15,849	30	15,849	30	11,330	4.13	3.78
Motors	AHU	EEM	RI	9.5	8760		1,446	1	1,446	1	926	4.12	3.79
Motors	AHU	EEM	RI	27.5	4000		1,446	1	1,446	1	926	4.12	3.79
Lighting	Power Ventilator	VSD to existing mtr	RI	39	1-Ph	C	17,517	53	17,517	53	15,414	4.12	3.79
Trans. & Dist	Transformer	CFL 2 11 CER FIXT	ROF	3			918,552	1,968	918,552	1,968	839,873	4.10	3.81
Motors	POWER VENT	Atmospheric	RI	27	4000		3,168	10	3,168	10	2,941	4.08	3.83
Motors	AHU	EEM	RI	17	5000		2,640	5	2,640	5	3,098	4.04	3.87
Motors	Fluoresce Fans	EEM	RI	10	8760		13,011	9	13,011	9	7,991	3.99	3.91
Motors	AHU	EEM	RI	10.5	4000		8,920	20	8,920	20	6,651	3.92	3.92
Motors	AHU	EEM	RI	10	4000		5,352	12	5,352	12	3,980	3.92	3.99
Motors	AHU	EEM	ROF	17.5	5000		0	0	0	0	2,140	3.87	4.04
Motors	Cooling Tower Fan	VSD to existing mtr	RI	65.5	2100		27,160	78	27,160	78	20,683	3.87	4.04
Lighting	150W PAR SPOT	VSD to existing mtr	RI	25	2100	B	81,479	233	81,479	233	62,050	3.87	4.04
Lighting	150W PAR FLOOD	MPS 50 FLD	RI	24		B	7,539	17	7,539	17	9,683	3.82	4.09
Motors	Fluoresce Fans	EEM	RI	8	8760		3,497	2	3,497	2	42,144	3.82	4.09
Trans. & Dist	Transformer	Atmospheric	ROF	32	3-Ph		0	0	0	0	2,202	3.82	4.09
Lighting	2x40 T-12	FL 2X4 2 18 ELC	RI	79		H	45,769	63	45,769	63	27,778	3.82	4.09
Motors	Condenser Water Pump	EEM	RI	24.5	5000		4,283	5	4,283	5	34,357	3.78	4.14
Motors	POWER VENT	EEM	RI	28	4000	I	14,530	44	14,530	44	2,710	3.75	4.17
Lighting	75W INC	CFL 2 11 CER FIXT	RI	83			1,843	4	1,843	4	13,015	3.70	4.22
Motors	AHU	EEM	RI	11	4000		4,626	10	4,626	10	1,654	3.68	4.24
Lighting	AHU	EEM	RI	11.5	4000		9,251	21	9,251	21	3,328	3.63	4.30
Lighting	90W INC	CFL 2 11 CER FIXT	RI	21		B	101,284	228	101,284	228	86,472	3.61	4.33
Lighting	2x25W INC EXIT	LED	RI	37		B	12,652	17	12,652	17	12,623	3.59	4.35
Lighting	2x25W INC EXIT	LED	RI	18		A	13,458	18	13,458	18	13,427	3.59	4.35
Lighting	2x25W INC EXIT	LED	RI	58		D	2,363	3	2,363	3	2,357	3.59	4.35
Lighting	2x25W INC EXIT	LED	RI	98		I	2,588	4	2,588	4	2,583	3.59	4.35
Lighting	2x25W INC EXIT	LED	RI	82		H	3,466	5	3,466	5	3,458	3.59	4.35
Lighting	2x25W INC EXIT	LED	RI	48		C	3,688	5	3,688	5	3,679	3.59	4.35
Lighting	6x40 T-12	FL 2X4 4 18 ELC REF	RI	35		B	340,695	766	340,695	766	290,765	3.59	4.36
Motors	AHU	EEM	RI	24.5	3200		7,136	20	7,136	20	5,833	3.56	4.39
Motors	AHU	EEM	RI	24	3200		4,282	12	4,282	12	3,500	3.56	4.39
Motors	Cooling Tower Fan	EEM	RI	20.5	5000		1,514	2	1,514	2	1,026	3.55	4.40
Motors	Cooling Tower Fan	VSD to existing mtr	RI	38.5	3200		10,757	20	10,757	20	7,203	3.55	4.40
Motors	Cooling Tower Fan	VSD to existing mtr	RI	32.5	3200		8,175	15	8,175	15	5,538	3.54	4.41
Motors	Condenser Water Pump	VSD to existing mtr	RI	31.5	3200		8,175	15	8,175	15	5,538	3.54	4.41
Trans. & Dist	Transformer	Atmospheric	ROF	29	3-Ph		0	0	0	0	17,506	3.52	4.44
Motors	Condenser Water Pump	VSD to existing mtr	RI	61.5	2100		20,512	59	20,512	59	14,934	3.51	4.45
Lighting	4x50W INC PAR	4-CFL 11 INTEGRAL W REF	RI	1		A	139,910	348	139,910	348	105,034	3.49	4.48
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		27,349	78	27,349	78	19,810	3.46	4.52
Motors	Cooling Tower Fan	VSD to existing mtr	RI	53.5	2100		20,802	59	20,802	59	15,009	3.46	4.52
Motors	AHU	EEM	RI	16	4000		5,793	13	5,793	13	3,894	3.45	4.53
Motors	AHU	EEM	RI	16.5	4000		11,586	26	11,586	26	7,789	3.45	4.53
Motors	Condenser Fan	EEM	RI	13	4000		8,218	12	8,218	12	5,374	3.45	4.53
Motors	Condenser Fan	EEM	RI	12	4000		2,313	3	2,313	3	1,536	3.43	4.55
Motors	Circ Pump	EEM	RI	10	6000		23,764	48	23,764	48	17,254	3.42	4.57
Motors	AHU	EEM	RI	9	4000		2,112	5	2,112	5	1,636	3.41	4.59
Motors	AHU	EEM	RI	9.5	4000		4,224	10	4,224	10	3,272	3.41	4.59

Table 3.6
EROs Contributing the Minimum Life-Cycle Cost Reduction: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mt)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mt)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Circ Pump	EEM	RI	6	6000		1,597	3	1,597	3	1,242	3.39	4.01
Lighting	75W INC	CFL 2-11 CEL FIXT	RI	49		D	184,289	394	184,289	394	156,192	3.36	4.05
Motors	BLAST HEATER	EEM	RI	25	3200		9,950	19	9,950	19	7,512	3.35	4.66
Lighting	250W MERC	HPS 100 POLE	RI	102		Str Ltg C	97,623	279	97,623	279	64,465	3.35	4.66
Lighting	100W INC	CFL 2-15 CEL FIXT	RI	41			47,888	103	47,888	103	24,440	3.31	4.72
Motors	AHU	EEM	RI	11	3200		845	2	845	2	782	3.30	4.74
Motors	AHU	EEM	RI	11.5	3200		1,690	5	1,690	5	1,563	3.30	4.74
Motors	AHU	EEM	RI	8.5	6000		990	1	990	1	682	3.30	4.74
Motors	AHU	EEM	RI	33.5	3200		24,107	68	24,107	68	18,428	3.29	4.75
Motors	AHU	EEM	RI	33	3200		10,958	31	10,958	31	8,376	3.29	4.75
Motors	Cooling Tower Fan	VSD to existing mtr	RI	82.5	2100		41,024	117	41,024	117	28,953	3.26	4.79
Lighting	200W INC	HPS 50 PEND	RI	26		B	340,110	764	340,110	764	288,518	3.26	4.80
Lighting	150W INC	CFL 2-15 CEL FIXT	RI	8		A	12,456	31	12,456	31	8,594	3.22	4.85
Motors	Condensate Pump	EEM	RI	12	3200		845	2	845	2	724	3.13	4.99
Motors	Chilled Water Pump	EEM	RI	26	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Condenser Fan	EEM	RI	27	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Condenser Water Pump	EEM	RI	28	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Cooling Tower Fan	EEM	RI	29	3200		1,427	3	1,427	3	968	3.12	5.00
Motors	Chilled Water Pump	EEM	RI	26.5	3200		2,854	5	2,854	5	1,935	3.12	5.00
Motors	AHU	EEM	RI	15	4000		3,862	9	3,862	9	2,540	3.11	5.03
Motors	AHU	EEM	RI	15.5	4000		7,724	17	7,724	17	5,080	3.11	5.03
Motors	AHU	EEM	RI	30.5	3200		5,551	16	5,551	16	3,985	3.10	5.04
Motors	AHU	EEM	RI	30	3200		1,850	5	1,850	5	1,328	3.10	5.04
Motors	Chilled Water Pump	EEM	RI	18.5	4000		7,033	11	7,033	11	4,140	3.10	5.04
Motors	AHU	EEM	RI	11	5000		21,290	38	21,290	38	17,285	3.08	5.08
Motors	Cooling Tower Fan	VSD to existing mtr	RI	57.5	2100		13,675	39	13,675	39	9,251	3.08	5.11
Lighting	4x40 T-12	FL 2X4 3-T8 ELC REF	RI	46		C	403,988	865	403,988	865	305,955	3.03	5.16
Lighting	100W INC	CFL 2-15 CEL FIXT	RI	65		I	29,573	69	29,573	69	14,893	3.01	5.20
Motors	BLAST HEATER	EEM	ROF	18	3200		0	0	0	0	15,337	2.97	5.27
Motors	Condensate Pump	EEM	RI	15	5000		825	1	825	1	582	2.96	5.28
Lighting	3x40 T-12	FL 2X4 2-T8 ELC REF	RI	95		I	834,389	1,940	834,389	1,940	664,574	2.94	5.31
Motors	Cooling Tower Fan	EEM	RI	36	3200		2,192	4	2,192	4	1,399	2.91	5.36
Motors	Chilled Water Pump	EEM	RI	34	3200		2,192	4	2,192	4	1,399	2.91	5.36
Motors	Chilled Water Pump	EEM	RI	34.5	3200		4,383	8	4,383	8	2,798	2.91	5.36
Motors	Cooling Tower Fan	EEM	RI	12.5	6000		990	1	990	1	568	2.91	5.36
Motors	Condenser Water Pump	EEM	RI	9.5	6000		990	1	990	1	568	2.91	5.36
Motors	Chilled Water Pump	EEM	RI	24	4000		990	1	990	1	568	2.91	5.36
Motors	POWER VENT	EEM	RI	24	4000		990	1	990	1	568	2.91	5.36
Motors	Condenser Water Pump	VSD to existing mtr	RI	52.5	2100		5,855	18	5,855	18	5,419	2.89	5.40
Lighting	2x40W INC	CFL 15 CEL FIXT	RI	59		G	10,401	30	10,412	30	8,815	2.88	5.42
Lighting	75W INC	CFL 2-11 CEL FIXT	RI	20		B	91,011	237	91,011	237	87,918	2.85	5.47
Motors	BLAST HEATER	EEM	RI	18	3200		7,368	17	7,368	17	5,954	2.85	5.48
Motors	2x60W INC	EEM	RI	18.5	3200		20,342	38	20,342	38	15,561	2.84	5.49
Motors	Condenser Fan	CFL 2-15 CEL FIXT	RI	3		A	38,746	73	38,746	73	29,639	2.84	5.49
Motors	AHU	EEM	RI	7	6000		216,324	537	216,324	537	169,041	2.83	5.52
Motors	AHU	EEM	RI	14	5000		798	1	798	1	475	2.83	5.53
Motors	AHU	EEM	RI	14.5	5000		9,902	18	9,902	18	8,485	2.82	5.54
Motors	AHU	EEM	RI	35	2100		18,153	33	18,153	33	11,890	2.82	5.54
Motors	AHU	EEM	RI	35.5	2100		18,732	80	18,732	80	16,575	2.82	5.54
Lighting	FL 2X4 4-40 STD	FL 2X4 3-T8 ELC REF + SENS	RI	35.5			37,463	161	37,463	161	33,150	2.82	5.54
Lighting	FL 2X4 3-40 STD	FL 2X4 2-T8 ELC REF + SENS	RI	29.5		B	131,971	323	131,971	323	106,374	2.80	5.59
Motors	Cooling Tower Fan	VSD to existing mtr	RI	28.5		B	280,435	712	280,435	712	233,368	2.80	5.59
Motors	Condenser Water Pump	VSD to existing mtr	RI	28.5			5,552	10	5,618	11	3,255	2.79	5.59
Motors	Furnace Fans	EEM	RI	4	8760		3,556	2	3,556	2	2,040	2.77	5.63
Lighting	6-6 Amp Series INC	HPS 100 POLE	RI	101		Str Ltg	70,551	202	70,551	202	66,858	2.77	5.64
Motors	Condenser Fan	EEM	RI	13	3200		2,534	5	2,534	5	1,791	2.76	5.67
Motors	Furnace Fans	EEM	RI	16	3200		5,069	10	5,069	10	3,582	2.76	5.67
Motors	Condenser Water Pump	EEM	RI	14.5	3200		845	2	845	2	597	2.76	5.67
Motors	Cooling Tower Fan	EEM	RI	15.5	3200		845	2	845	2	597	2.76	5.67
Trans & Dist	Transformer	Amorphous	ROF	35	3-Phi		0	0	88,301	41	26,568	2.75	5.69
Lighting	4x40 T-12	FL 2X4 3-T8 ELC REF	RI	96		I	1,653,441	3,845	1,653,441	3,845	1,205,631	2.72	5.75

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	RI	17	3200		969	3	969	3	689	2.71	5.76
Motors	AHU	EEM	RI	17.5	3200		1,937	5	1,937	5	1,377	2.71	5.76
Motors	AHU	EEM	RI	41	2100		14,571	62	14,571	62	12,961	2.71	5.77
Motors	AHU	EEM	RI	41.5	2100		30,355	130	30,355	130	27,003	2.71	5.77
Lighting	2x50W INC	CFL 2.15 CEE FLX	RI	62		G	447,591	1,166	447,591	1,166	342,480	2.71	5.77
Lighting	100W INC	CFL 2.15 CEE FLX	RI	51		D	25,201	54	25,201	54	11,538	2.70	5.78
Lighting	3x40 T-12	FL 2X4 2-T8 ELC REF	RI	55		D	210,492	450	210,492	450	158,607	2.69	5.80
Motors	Furnace Fans	EEM	RI	16	5000		4,951	6	4,951	6	3,012	2.69	5.81
Motors	CABINET HEATER	EEM	RI	5	8760		1,464	1	1,464	1	831	2.67	5.85
Motors	Chilled Water Pump	EEM	RI	37.5	3200		2,741	5	2,741	5	1,634	2.66	5.88
Motors	Condensate Pump	EEM	ROF	27	2100		0	0	152	0	1,038	2.65	5.89
Motors	Chilled Water Pump	EEM	RI	43.5	3200		3,862	7	3,862	7	2,249	2.62	5.95
Motors	Furnace Fans	EEM	RI	13	5000		665	1	665	1	422	2.62	5.96
Motors	Chilled Water Pump	EEM	RI	12	5000		665	1	665	1	422	2.62	5.96
Motors	Condensate Fan	EEM	RI	6	8760		1,464	1	1,464	1	807	2.62	5.96
Motors	Furnace Fans	EEM	RI	7	8760		1,464	1	1,464	1	807	2.62	5.96
Motors	EEM	EEM	RI	40.5	3200		3,090	9	3,090	9	1,923	2.60	6.02
Motors	Circ. Pump	EEM	ROF	5	6000		0	0	4,296	9	26,452	2.60	6.02
Motors	Condensate Water Pump	VSD to existing mtr	RI	48.5	2100		49,413	141	49,413	141	30,058	2.58	6.05
Motors	Cooling Tower Fan	VSD to existing mtr	RI	49.5	2100		56,472	161	56,472	161	34,193	2.57	6.08
Lighting	2x40 T-12	FL 2X4 2-T8 ELC	RI	94		I	231,633	539	231,633	539	175,928	2.56	6.09
Lighting	1x40 T-12	FL 1X4 1-T8 ELC	RI	78		H	470	1	470	1	297	2.56	6.10
Motors	Condensate Pump	EEM	RI	8	4000		1,320	2	1,320	2	922	2.55	6.12
Motors	BLAST HEATER	EEM	RI	7	4000		5,281	8	5,281	8	3,686	2.55	6.12
Motors	BLAST HEATER	EEM	RI	7.5	4000		10,562	16	10,562	16	7,372	2.55	6.12
Motors	Chilled Water Pump	EEM	RI	19	3200		969	2	969	2	620	2.54	6.14
Motors	Condensate Water Pump	EEM	RI	21	3200		969	2	969	2	620	2.54	6.14
Motors	Cooling Tower Fan	EEM	RI	22	3200		969	2	969	2	620	2.54	6.14
Motors	Chilled Water Pump	EEM	RI	19.5	3200		969	2	969	2	620	2.54	6.14
Motors	Furnace Fans	EEM	RI	23	3200		7,749	15	7,749	15	4,962	2.54	6.14
Motors	Condensate Fan	EEM	RI	20	3200		2,906	5	2,906	5	1,861	2.54	6.14
Motors	Condensate Water Pump	VSD to existing mtr	RI	47.5	1650		10,744	39	10,693	39	6,832	2.52	6.20
Motors	AHU	EEM	RI	33.5	1650		1,472	8	1,472	8	1,381	2.51	6.21
Motors	AHU	EEM	RI	33	1650		1,472	8	1,472	8	1,381	2.51	6.21
Motors	EXP FAN	EEM	RI	25	4000		7,921	24	7,921	24	5,342	2.50	6.25
Lighting	FL 2X4 2-40 STD	FL 2X4 2-T8 ELC + SENS	RI	45			18,587	37	18,587	37	14,638	2.49	6.27
Lighting	4x40 T-12	FL 2X4 3-T8 ELC REF	RI	56		D	65,348	140	65,348	140	44,344	2.49	6.27
Motors	Circ. Pump	EEM	ROF	3	6000		0	0	1,079	2	8,641	2.49	6.27
Trans & Dist	Transformer	Amorphous	ROF	10	1-Pha		0	0	35,173	16	10,462	2.47	6.32
Motors	Condensate Water Pump	VSD to existing mtr	RI	42.5	2100		5,365	15	5,455	16	3,187	2.46	6.35
Motors	Furnace Fans	EEM	RI	3	8760		4,165	3	4,165	3	2,267	2.45	6.39
Lighting	FL 2X4 4-40 STD	FL 2X4 3-T8 ELC REF + SENS	RI	45		B	6,364	15	6,364	15	4,744	2.45	6.39
Motors	BLAST HEATER	EEM	RI	45	2100		5,753	16	5,753	16	4,174	2.43	6.44
Motors	AHU	EEM	RI	6	4000		1,320	3	1,320	3	828	2.39	6.53
Motors	AHU	EEM	RI	6.5	4000		2,640	6	2,640	6	1,655	2.39	6.53
Lighting	150W PAR SPOT	HPS 50 FLD	RI	10			4,606	11	4,606	11	5,181	2.39	6.54
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	9			19,622	49	19,622	49	22,069	2.39	6.54
Motors	BLAST HEATER	EEM	ROF	32.5	2100		0	0	523	1	2,573	2.38	6.55
Motors	POWER VENT	EEM	ROF	22	4000		0	0	314	1	1,544	2.38	6.55
Motors	AHU	EEM	RI	44.5	2100		7,191	31	7,191	31	5,043	2.38	6.58
Motors	AHU	EEM	RI	54	2100		4,315	18	4,315	18	3,028	2.38	6.58
Lighting	2x40 T-12	FL 2X4 2-T8 ELC	RI	44		D	191,244	409	191,244	409	136,140	2.37	6.61
Motors	Cooling Tower Fan	VSD to existing mtr	RI	43.5	2100		10,736	31	10,911	31	6,160	2.37	6.61
Trans & Dist	Transformer	Amorphous	ROF	27	3-Pha		0	0	13,245	6	3,984	2.36	6.63
Lighting	FL 2X4 3-40 STD	FL 2X4 2-T8 ELC REF + SENS	RI	28		B	10,898	28	10,898	28	8,158	2.35	6.65
Motors	POWER VENT	EEM	ROF	8	4000		0	0	0	0	6,294	2.35	6.65
Motors	BLAST HEATER	EEM	ROF	9	3200		0	0	190	0	1,103	2.34	6.68
Motors	Condensate Pump	EEM	ROF	8.5	3200		0	0	63	0	368	2.34	6.68
Motors	BLAST HEATER	EEM	RI	36.5	2100		937	3	506	1	2,940	2.33	6.71
Motors	Chilled Water Pump	EEM	RI						937	3	606		

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Twr Fan	EEM	RI	39	2100		937	3	937	3	606	2.33	6.71
Motors	Condenser Fan	EEM	RI	37	2100		10,302	29	10,302	29	6,668	2.33	6.71
Motors	Furnace Fans	EEM	RI	40	2100		2,810	8	2,810	8	1,818	2.33	6.71
Lighting	100W: INC	CFL 2 15 CEIL FIXT	RI	22		B	110,868	249	110,868	249	48,240	2.33	6.71
Motors	Condensate Pump	EEM	ROF	6	5000		0	0	0	1	3,333	2.32	6.75
Motors	AHU	ROF	27	1650			0	0	547	1	1,458	2.31	6.77
Motors	AHU	ROF	27.5	1650			0	0	246	1	3,401	2.29	6.81
Lighting	150W: PAR SPOT	HPS 50 FLD	RI	68		G	1,182	3	575	3	3,401	2.29	6.81
Lighting	150W: PAR FLOOD	HPS 50 FLD	RI	67		G	5,037	13	5,037	13	5,523	2.29	6.81
Motors	AHU	EEM	RI	41	1650		4,520	25	4,520	25	3,774	2.29	6.82
Motors	AHU	EEM	RI	41.5	1650		9,040	49	9,040	49	7,548	2.29	6.82
Motors	AHU	EEM	RI	25.5	2100		554	2	554	2	438	2.29	6.83
Lighting	3x40 T 12	FL 2X4 2 T8 ELC REF	RI	33		B	1,239,957	2,786	1,239,957	2,786	852,496	2.28	6.84
Motors	POWER VENT	EEM	ROF	23	4000		0	0	199	1	1,464	2.27	6.88
Motors	BLAST HEATER	EEM	ROF	42	1650		0	0	498	2	1,701	2.26	6.92
Motors	Power Ventilator	VSD to existing mtr	RI	26.5	4000		51,053	153	53,961	162	31,105	2.25	6.95
Motors	AHU	EEM	RI	60	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	AHU	EEM	RI	60.5	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	Condensate Pump	EEM	ROF	2	5000		0	0	64	0	510	2.23	7.00
Motors	Cooling Twr Fan	VSD to existing mtr	RI	45.5	1650		11,093	40	11,126	40	6,317	2.20	7.09
Lighting	FL 2X4 2 40 STD	FL 2X4 2 T8 ELC + SENS	RI	21		B	8,670	18	8,670	18	6,236	2.20	7.11
Motors	PC/VER VENT	EEM	ROF	21	4000		0	0	616	2	5,909	2.19	7.14
Motors	CABINET HEATER	EEM	RI	1	5000		9,170	11	9,170	11	7,157	2.18	7.15
Motors	Chilled Water Pump	EEM	RI	46	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Cooling Twr Fan	EEM	RI	49	2100		5,753	16	5,753	16	3,439	2.18	7.18
Motors	Condenser Fan	EEM	RI	47	2100		11,506	33	11,506	33	6,877	2.18	7.18
Motors	Chilled Water Pump	EEM	RI	46.5	2100		4,315	12	4,315	12	2,579	2.18	7.18
Motors	Condenser Water Pump	EEM	RI	48	2100		4,315	12	4,315	12	2,579	2.18	7.18
Motors	AHU	EEM	RI	50	2100		3,598	15	3,598	15	2,316	2.17	7.18
Motors	AHU	EEM	RI	50.5	2100		7,195	31	7,195	31	4,633	2.17	7.18
Lighting	90W INC	CFL 2 11 CEIL FIXT	RI	6		A	61,878	154	61,878	154	41,348	2.17	7.19
Motors	Cooling Twr Fan	EEM	RI	43	2100		1,214	3	1,214	3	739	2.17	7.20
Motors	Condenser Water Pump	EEM	RI	42	2100		1,214	3	1,214	3	739	2.17	7.20
Motors	Cooling Twr Fan	EEM	ROF	28.5	1650		0	0	60	0	290	2.17	7.21
Motors	Condenser Water Pump	EEM	ROF	25.5	1650		0	0	60	0	290	2.17	7.21
Motors	Condenser Fan	EEM	RI	24	1650		0	0	60	0	290	2.17	7.21
Motors	AHU	EEM	RI	58	2100		5,069	22	5,069	22	3,193	2.15	7.25
Motors	AHU	EEM	RI	58.5	2100		10,138	43	10,138	43	6,387	2.15	7.25
Trans. & Dist	Transformer	Amorphous	ROF	25	3-Pha		0	0	8,462	4	2,521	2.14	7.29
Lighting	4x40 T 12	FL 2X4 3 T8 ELC REF	RI	34		B	2,577,252	5,791	2,577,252	5,791	1,611,819	2.13	7.34
Motors	BLAST HEATER	VSD to existing mtr	RI	25.5	3200		77,723	146	78,659	147	36,881	2.12	7.37
Motors	BLAST HEATER	VSD to existing mtr	RI	45.5	2100		63,531	182	63,723	182	32,915	2.11	7.41
Motors	Chilled Water Pump	EEM	RI	26.5	2100		554	2	554	2	377	2.11	7.41
Motors	Cooling Twr Fan	EEM	RI	30.5	2100		554	2	554	2	377	2.11	7.41
Motors	Condenser Water Pump	EEM	RI	29.5	2100		554	2	554	2	377	2.11	7.41
Motors	Condenser Fan	EEM	RI	28	2100		554	2	554	2	377	2.11	7.41
Motors	Chilled Water Pump	EEM	RI	26	2100		554	2	554	2	377	2.11	7.41
Motors	AHU	EEM	ROF	16	2100		0	0	386	2	3,195	2.11	7.41
Motors	AHU	EEM	RI	31.5	2100		636	3	636	3	441	2.10	7.45
Motors	AHU	EEM	RI	31	2100		636	3	636	3	441	2.10	7.45
Motors	Cooling Twr Fan	EEM	RI	32	1650		666	2	666	2	441	2.10	7.45
Motors	Cooling Twr Fan	EEM	RI	32.5	1650		666	2	666	2	441	2.10	7.45
Trans. & Dist	Transformer	Amorphous	ROF	30	3-Pha		0	0	32,377	15	9,363	2.09	7.47
Lighting	90W INC	CFL 2 11 CEIL FIXT	RI	65		G	15,884	41	15,884	41	10,268	2.08	7.50
Motors	AHU	EEM	RI	4	5000		1,671	3	1,671	3	1,075	2.08	7.51
Motors	Furnace Fans	EEM	RI	4	6000		487	0	487	0	248	2.08	7.51
Motors	AHU	EEM	RI	38.5	1650		2,862	16	2,862	16	2,034	2.07	7.54
Motors	AHU	EEM	RI	38	1650		954	5	954	5	678	2.07	7.54
Motors	CABINET HEATER	EEM	ROF	4	4000		0	0	239	0	1,475	2.07	7.55
Motors	Condensate Pump	EEM	ROF	5	4000		0	0	239	0	1,475	2.07	7.55
Lighting	2x40 T 12	FL 2X4 2 T8 ELC	RI	32		B	386,385	868	386,385	868	260,378	2.06	7.57

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Lighting	2x96 T-12 75W Cooling Twr Fan	FL 1X8 2.60 ELC REF	RI	47	2100	C	14,893	32	14,893	32	8,321	2.05	7.61
Motors	AHU	EEM	RI	62	1650		6,083	17	6,083	17	3,313	2.04	7.65
Motors	AHU	EEM	RI	23.5	1650		2,178	12	2,178	12	1,738	2.02	7.73
Motors	Condenser Water Pump	VSD to existing mtr	RI	44.5	1650		871	5	871	5	695	2.02	7.73
Motors	AHU	EEM	ROF	19	2100		5,563	20	5,563	20	2,880	2.02	7.73
Motors	AHU	EEM	ROF	19.5	2100		0	0	125	1	834	2.01	7.77
Motors	Liq. Transfer Pump	EEM	ROF	33	1000		0	0	208	1	1,389	2.01	7.77
Motors	Condenser Water Pump	EEM	RI	36	1650		0	0	5,039	60	16,560	2.01	7.77
Motors	Chilled Water Pump	EEM	RI	34.5	1650		736	3	736	3	458	2.01	7.79
Motors	Chilled Water Pump	EEM	RI	34	1650		736	3	736	3	458	2.01	7.79
Motors	Condenser Fan	EEM	RI	35	1650		2,208	8	2,208	8	1,375	2.01	7.79
Motors	CABINET HEATER	EEM	ROF	1	4000		0	0	51	0	414	2.00	7.81
Motors	AHU	EEM	RI	54	2100		2,028	9	2,028	9	1,203	2.00	7.82
Motors	AHU	EEM	RI	54.5	2100		8,111	35	8,111	35	4,810	2.00	7.82
Lighting	1x40 T-12	FL 1X4 1.18 ELC	RI	45	2100	C	309,853	664	309,853	664	197,833	2.00	7.82
Motors	Chilled Water Pump	EEM	RI	51	2100		5,396	15	5,396	15	2,929	1.99	7.85
Motors	Chilled Water Pump	EEM	RI	51.5	2100		10,793	31	10,793	31	5,858	1.99	7.85
Motors	Cooling Twr Fan	VSD to existing mtr	RI	19.5	5000		3,649	4	3,786	5	1,519	1.98	7.88
Motors	Condenser Water Pump	VSD to existing mtr	RI	18.5	5000		3,649	4	3,786	5	1,519	1.98	7.88
Motors	Chilled Water Pump	EEM	RI	59.5	2100		2,535	7	2,535	7	1,348	1.97	7.91
Motors	Condenser Fan	EEM	ROF	2	4000		0	0	32	0	164	1.97	7.92
Motors	Chilled Water Pump	EEM	RI	63.5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Condenser Water Pump	EEM	RI	64	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Chilled Water Pump	EEM	RI	63	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Cooling Twr Fan	EEM	ROF	31.5	1650		0	0	82	0	282	1.96	7.98
Motors	Condenser Water Pump	EEM	ROF	30.5	1650		0	0	82	0	282	1.96	7.98
Motors	Chilled Water Pump	EEM	ROF	28.5	1650		0	0	82	0	282	1.96	7.98
Motors	Chilled Water Pump	EEM	ROF	28	1650		0	0	82	0	282	1.96	7.98
Motors	Condenser Fan	EEM	ROF	29	1650		0	0	82	0	282	1.96	7.98
Motors	AHU	EEM	ROF	3	4000		0	0	40	0	174	1.96	7.99
Trans. & Dist.	Transformer	Amorphous	ROF	16	1650		0	0	41,943	19	11,996	1.95	7.99
Motors	AHU	EEM	RI	49	1650		2,390	13	2,390	13	1,513	1.95	8.00
Motors	AHU	EEM	RI	49.5	1650		2,390	13	2,390	13	1,513	1.95	8.00
Lighting	2x96 T-12 75W	FL 1X8 2.96 ELC	RI	36	1650	B	401,224	902	401,224	902	246,384	1.95	8.03
Motors	AHU	EEM	ROF	14	1650		0	0	101	1	901	1.94	8.07
Motors	Condenser Fan	EEM	RI	3	5000		406	0	406	0	215	1.94	8.07
Motors	Cooling Twr Fan	EEM	RI	34	2100		636	2	636	2	372	1.93	8.11
Motors	Cooling Twr Fan	EEM	RI	34.5	2100		636	2	636	2	372	1.93	8.11
Motors	Condenser Fan	EEM	RI	33	2100		5,085	15	5,085	15	2,979	1.93	8.11
Motors	Furnace Fans	EEM	RI	10	3200		6,865	13	6,865	13	3,564	1.92	8.12
Motors	Condenser Water Pump	VSD to existing mtr	RI	38.5	2100		3,643	10	3,687	11	1,663	1.92	8.15
Motors	Furnace Fans	EEM	RI	7	3200		3,832	7	3,832	7	2,137	1.91	8.17
Motors	CABINET HEATER	EEM	RI	5	5000		14,618	18	14,618	18	7,743	1.89	8.27
Motors	BLAST HEATER	EEM	ROF	20	2100		0	0	415	1	2,436	1.89	8.28
Motors	BLAST HEATER	EEM	ROF	20.5	2100		0	0	789	2	4,628	1.89	8.28
Motors	Liq. Transfer Pump	EEM	ROF	32	1000		0	0	2,979	36	9,116	1.89	8.28
Motors	Cooling Twr Fan	EEM	RI	45	1650		1,130	4	1,130	4	639	1.87	8.34
Motors	Chilled Water Pump	EEM	RI	43.5	1650		1,130	4	1,130	4	639	1.87	8.34
Motors	Condenser Fan	EEM	RI	40	1650		2,862	10	2,862	10	1,651	1.87	8.35
Motors	CABINET HEATER	EEM	ROF	4	3200		0	0	64	0	400	1.87	8.36
Motors	Condensate Pump	EEM	ROF	5	3200		0	0	923	2	5,807	1.87	8.36
Lighting	60W INC	CFL 15 CEIL FIXT	RI	2	800	A	108,162	269	108,162	269	68,379	1.85	8.45
Lighting	2x96 T-12 75W	FL 1X8 2.60 ELC REF	RI	97	2100	1	446,875	1,039	446,875	1,039	228,305	1.85	8.45
Motors	Air Compressor	EEM	ROF	10	5000		0	0	53	1	315	1.85	8.46
Motors	Cooling Twr Fan	EEM	RI	9	5000		418	1	418	1	208	1.83	8.52
Motors	Condenser Fan	EEM	RI	7	5000		418	1	418	1	208	1.83	8.52
Motors	Condenser Water Pump	EEM	RI	8	5000		418	1	418	1	208	1.83	8.52
Motors	Furnace Fans	EEM	RI	10	5000		3,341	4	3,341	4	1,662	1.83	8.52
Motors	Cooling Twr Fan	VSD to existing mtr	RI	39.5	2100		7,287	21	7,374	21	3,136	1.83	8.52
Motors	Chilled Water Pump	EEM	RI	55.5	2100		2,028	6	2,028	6	1,003	1.83	8.52

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Condenser Water Pump	EEM	RI	56	2100		2,028	6	2,028	6	1,003	1.83	8.52
Motors	Condenser Fan	EEM	ROF	17	2100		0	0	32	0	158	1.83	8.54
Motors	Furnace Fans	EEM	ROF	18	2100		0	0	97	0	473	1.83	8.54
Motors	Condensate Pump	EEM	ROF	3	3200		0	0	62	0	507	1.82	8.60
Lighting	1x40 T-12 Transformer	FL 1X4 1-T8 ELC	RI	93		I	2,379	6	2,379	6	1,399	1.81	8.64
Trans. & Dist	Air Compressor	Amorphous	ROF	11	1-Ph:		0	0	21,462	10	6,017	1.81	8.65
Motors	Chilled Water Pump	EEM	ROF	19	800		0	0	1,021	15	3,510	1.80	8.70
Motors	60W INC	EEM	RI	66.5	2100		4,093	12	4,093	12	1,798	1.78	8.79
Lighting	Condenser Fan	CFL 15 CEIL FIXT	RI	61		G	111,838	291	111,838	291	67,402	1.77	8.82
Motors	AHU	EEM	RI	50	1650		2,390	9	2,390	9	1,214	1.76	8.86
Motors	Air Compressor	EEM	RI	46.5	1650		1,593	9	1,593	9	908	1.75	8.91
Motors	Cooling Twr Fan	EEM	ROF	12	800		0	0	93	1	435	1.74	8.95
Motors	Cooling Twr Fan	EEM	ROF	24	2100		0	0	42	0	161	1.74	8.96
Motors	Condenser Water Pump	EEM	ROF	24.5	2100		0	0	42	0	161	1.74	8.96
Motors	Condenser Water Pump	EEM	ROF	23.5	2100		0	0	42	0	161	1.74	8.96
Motors	Condenser Water Pump	EEM	ROF	23	2100		0	0	42	0	161	1.74	8.96
Motors	Chilled Water Pump	EEM	ROF	21.5	2100		0	0	42	0	161	1.74	8.96
Motors	Condenser Fan	EEM	ROF	22	2100		0	0	166	0	645	1.74	8.96
Lighting	75W INC	CFL 2 11 CEIL FIXT	RI	4		A	41,454	103	41,454	103	23,397	1.74	8.97
Motors	Liq. Transfer Pump	EEM	ROF	25	1000		0	0	802	10	3,078	1.73	9.03
Motors	Furnace Fans	EEM	ROF	6	3200		0	0	318	1	1,325	1.73	9.04
Motors	AHU	EEM	ROF	31.5	1000		0	0	355	3	919	1.72	9.09
Motors	Chilled Water Pump	EEM	RI	39	1650		954	3	954	3	447	1.71	9.15
Motors	Chilled Water Pump	EEM	RI	39.5	1650		954	3	954	3	447	1.71	9.15
Motors	Chilled Water Pump	EEM	RI	48.5	1650		1,991	7	1,991	7	979	1.71	9.15
Motors	BLAST HEATER	EEM	ROF	17.5	1650		0	0	33	0	193	1.70	9.18
Lighting	AHU	EEM	RI	26.5	1000		0	0	116	1	409	1.70	9.19
Motors	2x40 T-12 75W	FL 1X8 2-60 ELC REF	RI	57		D	14,893	32	14,893	32	6,727	1.70	9.19
Motors	AHU	EEM	ROF	16	1650		0	0	85	0	301	1.69	9.23
Motors	AHU	EEM	ROF	16.5	1650		0	0	98	1	451	1.69	9.23
Motors	Condenser Fan	EEM	ROF	15	1650		0	0	76	0	392	1.69	9.25
Trans. & Dist	Transformer	Amorphous	ROF	21	3-Ph:		0	0	3,360	2	962	1.69	9.27
Lighting	75W INC	CFL 2-11 CEIL FIXT	RI	63		G	16,589	43	16,589	43	8,919	1.67	9.33
Motors	Chilled Water Pump	VSD & EEM	RI	13.5	8760		22,843	16	22,843	16	5,927	1.67	9.38
Motors	Cooling Twr Fan	VSD to existing mtr	RI	22.5	3200		3,390	6	3,485	7	1,158	1.65	9.45
Motors	Condenser Water Pump	VSD to existing mtr	RI	21.5	3200		3,390	6	3,485	7	1,158	1.65	9.45
Motors	CABINET HEATER	EEM	ROF	11	2100		0	0	146	0	962	1.60	9.78
Motors	Condensate Pump	EEM	ROF	13	2100		0	0	710	2	4,673	1.60	9.78
Motors	Chilled Water Pump	EEM	ROF	18.5	1650		0	0	33	0	128	1.59	9.83
Motors	Cooling Twr Fan	EEM	ROF	21.5	1650		0	0	33	0	128	1.59	9.83
Motors	Condenser Water Pump	EEM	ROF	20.5	1650		0	0	65	0	256	1.59	9.83
Motors	Condenser Fan	EEM	ROF	19	1650		0	0	424	2	1,664	1.59	9.83
Motors	Furnace Fans	EEM	ROF	22	1650		0	0	81	0	698	1.56	10.00
Motors	Condensate Pump	EEM	ROF	7	2100		0	0	337	1	2,910	1.56	10.00
Motors	CABINET HEATER	EEM	ROF	6	2100		0	0	63,763	158	28,366	1.56	10.02
Lighting	4x40 T-12	FL 2X4 4-T8 ELC	RI	16		A	63,763	158	63,763	158	28,366	1.56	10.02
Motors	Cooling Twr Fan	VSD to existing mtr	RI	37.5	1650		2,863	10	2,897	11	1,012	1.55	10.06
Motors	Condenser Water Pump	EEM	ROF	8	2100		0	0	17	0	93	1.55	10.06
Motors	Cooling Twr Fan	EEM	ROF	9	2100		0	0	50	0	279	1.55	10.06
Motors	Furnace Fans	EEM	ROF	10	2100		0	0	193	3	551	1.55	10.07
Motors	Air Compressor	EEM	ROF	11	800		0	0	27	0	174	1.53	10.20
Motors	AHU	EEM	ROF	5	2100		0	0	241	4	556	1.52	10.27
Motors	Air Compressor	EEM	ROF	14	800		0	0	241	4	556	1.52	10.27
Motors	AHU	EEM	ROF	22.5	1000		0	0	160	2	346	1.52	10.29
Motors	AHU	EEM	ROF	22	1000		0	0	21	1	91	1.50	10.40
Motors	Chilled Water Pump	EEM	ROF	12	2100		0	0	63	0	274	1.50	10.40
Motors	Furnace Fans	EEM	ROF	15	2100		0	0	84	0	365	1.50	10.40
Motors	Condenser Fan	EEM	ROF	14	2100		0	0	50	0	146	1.50	10.45
Motors	AHU	EEM	ROF	20.5	1000		0	0	4,127	9	1,928	1.49	10.47
Lighting	1x40 T-12	FL 1X4 1-T8 ELC	RI	31		B	4,127	9	4,127	9	1,928	1.49	10.47
Motors	Condenser Water Pump	VSD to existing mtr	RI	36.5	1650		5,725	21	5,794	21	1,834	1.49	10.50

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	CABINET HEATER	EEM	ROF	7	1650		0	0	16	0	112	1.49	10.52
Motors	Condensate Pump	EEM	ROF	9	1650		0	0	427	2	2,905	1.49	10.52
Motors	Chilled Water Pump	EEM	ROF	27.5	1000		0	0	116	1	222	1.48	10.54
Lighting	4x40 T-12	FL 2X4 4 T8 ELC	RI	73		G	29,900	78	29,900	78	11,643	1.47	10.65
Motors	BLAST HEATER	VSD to existing mtr	RI	42.5	1650		11,093	40	11,126	40	3,482	1.46	10.69
Lighting	100W INC	CFL 2.15 CEN FIXT	RI	7		A	67,734	168	67,734	168	17,792	1.46	10.69
Motors	Condensate Pump	EEM	ROF	3	1650		0	0	42	0	380	1.46	10.71
Motors	CABINET HEATER	EEM	ROF	2	1650		0	0	138	1	1,234	1.46	10.71
Motors	Condenser Water Pump	EEM	ROF	5	1650		0	0	13	0	76	1.45	10.75
Motors	Chilled Water Pump	EEM	ROF	4	1650		0	0	13	0	76	1.45	10.75
Motors	Cooling Twr Fan	EEM	ROF	6	1650		0	0	13	0	76	1.45	10.75
Motors	AHU	EEM	ROF	9.5	800		0	0	40	0	129	1.44	10.84
Motors	Condenser Fan	EEM	ROF	8	800		0	0	58	0	213	1.43	10.94
Motors	AHU	EEM	ROF	13	800		0	0	241	3	457	1.43	10.94
Motors	AHU	EEM	ROF	13.5	800		0	0	604	7	1,142	1.43	10.94
Motors	Cooling Twr Fan	EEM	ROF	24.5	1000		0	0	80	0	142	1.42	10.96
Motors	Condenser Water Pump	EEM	ROF	23.5	1000		0	0	80	0	142	1.42	10.96
Motors	Condenser Fan	EEM	ROF	21	1000		0	0	100	1	242	1.41	11.06
Lighting	100W INC	CFL 2.15 CEN FIXT	RI	66		G	17,387	45	17,387	45	4,265	1.41	11.08
Motors	Condenser Fan	EEM	ROF	10	1650		0	0	16	0	75	1.41	11.08
Motors	Furnace Fans	EEM	ROF	13	1650		0	0	16	0	75	1.41	11.08
Motors	Chilled Water Pump	EEM	ROF	8	1650		0	0	33	0	149	1.41	11.08
Motors	Cooling Twr Fan	EEM	ROF	12	1650		0	0	33	0	149	1.41	11.08
Motors	Condenser Water Pump	EEM	ROF	11	1650		0	0	33	0	149	1.41	11.08
Motors	Condenser Water Pump	VSD to existing mtr	RI	15.5	800		3,962	30	3,967	30	1,480	1.41	11.09
Motors	Cooling Twr Fan	VSD to existing mtr	RI	16.5	800		3,962	30	3,967	30	1,480	1.41	11.09
Motors	Chilled Water Pump	EEM	ROF	28.5	1000		0	0	151	1	211	1.40	11.19
Trans. & Dist.	Transformer	Amorphous	ROF	28	3-Ph:		0	0	9,750	5	2,404	1.39	11.26
Motors	Condenser Water Pump	VSD to existing mtr	RI	29.5	1000		3,361	20	3,372	20	1,067	1.38	11.34
Motors	Cooling Twr Fan	VSD to existing mtr	RI	30.5	1000		3,361	20	3,372	20	1,067	1.38	11.34
Trans. & Dist.	Transformer	Amorphous	ROF	33	3-Ph:		0	0	17,942	8	4,357	1.36	11.45
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Ph:		0	0	15,453	7	3,748	1.36	11.47
Motors	Condenser Fan	EEM	ROF	18	800		0	0	227	2	277	1.31	11.88
Motors	Chilled Water Pump	EEM	ROF	17.5	800		0	0	227	2	277	1.31	11.88
Lighting	3x40 T-12	FL 2X4 2 T8 ELC REF	RI	15		A	948	2	948	2	277	1.31	11.90
Trans. & Dist.	Transformer	Amorphous	ROF	1	1-Ph:		0	0	773	0	200	1.31	11.96
Motors	Liq. Transfer Pump	EEM	ROF	19	1000		0	0	198	2	822	1.30	12.02
Trans. & Dist.	Transformer	Amorphous	ROF	13	1-Ph:		0	0	11,222	5	2,545	1.28	12.19
Trans. & Dist.	Transformer	Amorphous	ROF	12	1-Ph:		0	0	10,007	5	2,262	1.28	12.23
Motors	Air Compressor	EEM	ROF	7	800		0	0	491	7	2,147	1.25	12.48
Lighting	2x40 T-12	FL 2X4 2 T8 ELC	RI	14		A	57,959	144	57,959	144	15,282	1.24	12.61
Motors	AHU	EEM	ROF	11	1000		0	0	15	0	42	1.22	12.80
AC	Small Centrifugal	New High EH AC/Chiller	RI	88		510	97,274	778	97,274	778	28,453	1.22	12.84
AC	Room/Window	New High EH AC/Chiller	RI	60		240	30,207	161	30,207	161	1,797	1.21	12.92
Lighting	2x50W INC PAR	2 CFL 11 INTEG. W/REF	RI	60		G	2,514	7	2,514	7	520	1.20	13.02
Motors	AHU	EEM	ROF	13	1000		0	0	20	0	42	1.20	13.07
Motors	EEM	EEM	ROF	13.5	1000		0	0	20	0	42	1.20	13.07
Motors	Condenser Fan	EEM	ROF	12	1000		0	0	31	0	69	1.18	13.22
AC	Large Centrifugal	New High EH AC/Chiller	RI	15		3	1,107,704	5,908	1,107,704	5,908	63,141	1.18	13.26
Lighting	2x40 T-12	FL 1X8 2 96 ELC	RI	17		A	8,724	22	8,724	22	1,002	1.16	13.44
Lighting	2x40 T-12	FL 2X4 2 T8 ELC	RI	72		G	6,241	16	6,241	16	1,147	1.16	13.48
AC	Large Reciprocating	New High EH AC/Chiller	RI	91		700	228,964	611	228,964	611	25,196	1.16	13.50
Motors	Furnace Fans	EEM	ROF	5	800		0	0	25	0	59	1.16	13.51
Motors	BLAST HEATER	EEM	ROF	14	1000		0	0	20	0	43	1.16	13.52
Motors	BLAST HEATER	EEM	ROF	14.5	1000		0	0	20	0	43	1.16	13.52
AC	Large Reciprocating	New High EH AC/Chiller	RI	114		796	129,115	344	129,115	344	13,649	1.15	13.60
Motors	Condenser Water Pump	EEM	ROF	16.5	1000		0	0	20	0	30	1.14	13.75
Motors	Cooling Twr Fan	EEM	ROF	17.5	1000		0	0	20	0	30	1.14	13.75
Motors	Chilled Water Pump	EEM	ROF	15.5	1000		0	0	20	0	30	1.14	13.75
Motors	Furnace Fans	EEM	ROF	18	1000		0	0	40	0	59	1.14	13.75
Motors	AHU	EEM	ROF	2	1000		0	0	6	0	19	1.12	13.99

Table 3.6
EROs Contributing the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Trans & Dist	Transformer	Amorphous	ROF	27	3-Pha		0	0	938	0	167	1.11	14.14
Motors	Condenser Fan	EEM	ROF	5	1000		0	0	8	0	17	1.10	14.17
Motors	Furnace Fans	EEM	ROF	6	1000		0	0	886	5	1,916	1.10	14.17
Motors	CABINET HEATER	EEM	ROF	3	1000		0	0	39	0	128	1.10	14.18
AC	Small Package	EEM	RI	92		700	7,919	21	7,918	21	2,350	1.09	14.28
Motors	Furnace Fans	EEM	ROF	4	1000		0	0	1,015	6	473	1.09	14.32
Motors	Furnace Fans	EEM	ROF	1	800		0	0	200	2	1,575	1.07	14.55
Trans & Dist	Capacitors	Power Factor Correction to Unit RI	RI	8		Substn	27,648	25	27,648	25	48	1.07	14.55
Motors	AHU	EEM	ROF	7	1000		0	0	40	0	52	1.07	14.65
Trans & Dist	Transformer	Amorphous	ROF	2	1-Pha		0	0	356	0	52	1.06	14.69
AC	Small Reciprocating	New High Eff AC/Chiller	RI	73		324	41,955	252	41,955	252	1,608	1.06	14.73
Motors	Condensate Pump	EEM	ROF	9	1000		0	0	50	0	56	1.05	14.90
Motors	CABINET HEATER	EEM	ROF	8	1000		0	0	20	0	18	1.05	14.92
Motors	Condenser Fan	EEM	ROF	10	1000		0	0	10	0	9	1.05	14.92
AC	Room/Window	New High Eff AC/Chiller	RI	38		106	6,096	34	6,096	34	192	1.04	14.96
Motors	Condenser Fan	EEM	ROF	3	800		0	0	16	0	12	1.03	15.10
Motors	Furnace Fans	EEM	ROF	4	800		0	0	2,204	17	1,729	1.03	15.10
Motors	Condensate Pump	EEM	ROF	2	800		0	0	8	0	8	1.03	15.12
AC	Room/Window	New High Eff AC/Chiller	RI	64		272	3,919	22	3,919	22	91	1.03	15.19
AC	Small Centrifugal	New High Eff AC/Chiller	RI	56		240	156,242	833	156,242	833	3,164	1.02	15.25
AC	Room/Window	New High Eff AC/Chiller	RI	107		778	7,769	44	7,769	44	162	1.02	15.25
AC	Small Package	New High Eff AC/Chiller	RI	87		504	868	5	868	5	222	1.02	15.31
AC	Small Package	New High Eff AC/Chiller	RI	27		45	1,332	7	1,332	7	337	1.02	15.31
AC	Small Package	New High Eff AC/Chiller	RI	119		820	328	2	328	2	83	1.02	15.33
AC	Small Package	New High Eff AC/Chiller	RI	99		767	67	0	67	0	17	1.02	15.38
Non-Generating Subtotals													
							19,875,412	49,707	21,082,818	50,524	14,211,399	2.57	6.07
Generating ERO													
Peak-Shave (a)	Generator	DGEN-4	RI	4		B/748	-9,117,023	32,220	-9,117,023	32,220	1,138,673	7.57	2.06
Total							10,758,388	81,927	11,965,795	82,744	15,350,072	2.67	5.86

(a) Energy savings for Peak-shaving EROs are calculated as generated electricity less diesel consumed in generating. Diesel energy is expressed in kWh for internal consistency. Conversion factor used was (1 Mbtu/7,204.6 gallons)*(110.6 Btu/lb)*(1 kWh/3,412 Btu).

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Resource Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	Rt or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replication Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Non-Generating EROs															
Trans & Dist		CVR	R	MIXtr 3		Substn	200	229 803	180 804	0	0	410 507	410 307	2 052 54	0 01
Trans & Dist		CVR	R	MIXtr 2		Substn	200	105 863	21 860	0	0	127 632	127 332	637 89	0 02
Trans & Dist		CVR	R	MIXtr 1		Substn	200	19 410	3 944	0	0	23 354	23 154	116 77	0 13
Lighting	750W INC	HPS 200 PEND	R	59		J	7 950	129 334	20 266	0	0	319 886	311 935	40 24	0 39
Lighting	Transformer	Amorphous	ROF	6	1 Phe		1 588	49 713	2 290	0	1 464	50 467	48 869	31 77	0 49
Trans & Dist	150W QUARTZ	HPS 400 POLE	R	103		Str Ltg	18 270	194 800	66 982	0	0	316 728	298 458	17 34	0 90
Trans & Dist	Transformer	Amorphous	ROF	7	1 Phe		2 338	28 114	1 377	0	2 130	31 821	29 284	13 53	1 16
Trans & Dist	Transformer	Amorphous	ROF	8	1 Phe		2 934	31 548	1 502	0	2 098	36 776	32 842	12 19	1 28
Trans & Dist	Transformer	Amorphous	ROF	9	1 Phe		1 990	18 507	805	0	1 817	19 129	17 139	9 81	1 63
Motors	Condenser Water Pump	VSD & EEM	R	14 5	8760		2 959	22 859	1 727	159	656	23 773	20 774	7 93	1 97
Motors	Cooling Tower Fan	VSD & EEM	R	15 5	8760		2 959	22 859	1 727	159	656	23 773	20 774	7 93	1 97
Lighting	90W INC	CFL 2 15 CEIL FIXT	R	42		C	1 501	10 098	2 239	490	0	11 846	10 344	7 89	1 98
Motors	Cooling Tower Fan	VSD to existing mtr	R	75	6000	H	9 086	45 345	7 475	9 599	0	66 422	57 338	7 31	2 14
Motors	Condenser Water Pump	VSD to existing mtr	R	22 5	6000		5 572	37 209	4 099	159	902	40 249	34 878	7 22	2 18
Lighting	400W Merc Vapor	HPS 200 PEND	R	21 5	6000	J	5 572	37 209	4 099	159	902	40 249	34 878	7 22	2 18
Lighting	150W INC	CFL 2 15 CEIL FIXT	R	100		J	15 105	108 003	18 827	15 093	0	107 537	92 432	7 12	2 19
Motors	Motor	EEM	R	88		I	4 295	24 078	5 834	578	0	28 934	24 838	7 09	2 21
Motors	AHU	EEM	R	12 5	8760		5 712	6 268	599	0	345	6 232	5 320	6 83	2 29
Lighting	300W INC	HPS 70 PEND	R	12 5	8760		1 398	7 932	899	0	518	9 348	7 980	6 82	2 29
Trans & Dist	Transformer	Amorphous	ROF	90		I	12 562	65 043	3 401	0	11 087	78 290	24 141	6 82	2 29
Motors	Cooling Tower Fan	VSD to existing mtr	R	34	3 Phe		3 818	20 519	2 495	159	524	22 334	18 716	6 17	2 53
Motors	Condenser Water Pump	VSD to existing mtr	R	26 5	6000		2 495	11 246	2 494	159	524	22 334	18 716	6 17	2 53
Motors	Condenser Water Pump	VSD to existing mtr	R	25 5	6000		5 953	32 353	4 918	159	524	38 204	30 301	6 09	2 59
Motors	Cooling Tower Fan	VSD & EEM	R	14 5	4000		8 360	33 402	5 078	312	1 087	37 080	30 730	6 04	2 88
Lighting	75W INC	CFL 2 11 CEIL FIXT	R	74		H	1 719	6 991	1 059	1 813	0	9 863	8 147	5 76	2 72
Lighting	2x50W INC PAR	2 CFL 11 INTEG W REF	R	19		B	588	2 721	939	33	0	3 328	2 740	5 09	2 78
Motors	Furnace Fans	EEM	R	11	8760		1 380	6 446	487	0	699	7 630	6 270	5 91	2 78
Lighting	150W PAR SPOT	HPS 50 FLD	R	44		C	1 021	2 840	585	2 318	0	5 543	4 522	5 43	2 88
Lighting	150W PAR FLOOD	HPS 50 FLD	R	43		C	4 350	11 246	2 494	9 875	0	23 613	19 263	5 43	2 88
Trans & Dist	Transformer	Amorphous	ROF	23		B	34 998	165 890	36 033	4 428	0	188 070	153 372	5 42	2 88
Motors	Circ Pump	EEM	R	17	1 Phe		1 199	5 043	248	0	1 099	6 388	5 192	5 34	2 93
Lighting	300W INC	HPS 70 PEND	R	27	6000		5 928	22 038	4 864	0	4 678	31 608	25 640	5 33	2 93
Lighting	Power Ventilator	VSD to existing mtr	R	28 5	4000		30 844	105 426	24 778	31 289	0	181 492	130 848	5 27	2 96
Lighting	90W INC	CFL 2 11 CEIL FIXT	R	40		C	21 354	87 217	26 178	3 693	3 114	111 916	90 562	5 24	2 98
Motors	AHU	EEM	R	16 5	6000		9 887	35 461	7 864	7 174	0	50 499	40 832	5 22	2 99
Motors	AHU	EEM	R	15	6000		458	1 813	300	0	173	2 288	1 830	5 01	3 12
Trans & Dist	Transformer	Amorphous	ROF	9	1 Phe		3 449	13 321	980	0	3 128	17 108	13 069	6 01	3 12
Lighting	150W PAR SPOT	HPS 50 FLD	R	88		I	717	1 820	392	1 474	0	3 488	2 789	4 98	3 16
Lighting	150W PAR FLOOD	HPS 50 FLD	R	87		I	3 063	8 899	1 672	6 278	0	14 849	11 796	4 88	3 21
Motors	Cooling Tower Fan	VSD & EEM	R	42 5	3200		4 786	17 492	3 318	159	2 607	23 231	18 445	4 85	3 22
Motors	Chilled Water Pump	EEM	R	13	8000		458	1 813	200	0	173	2 188	1 730	4 75	3 28
Lighting	150W INC FLOOD	HPS 50 FLD	R	104		Str Ltg	1 020	3 155	696	0	1 015	4 885	3 845	4 77	3 28
Motors	AHU	EEM	R	21	6000		458	1 813	294	0	230	2 134	1 678	4 68	3 31
Motors	AHU	EEM	R	21 5	6000		458	1 813	294	0	230	2 134	1 678	4 68	3 31
Lighting	90W INC	CFL 2 11 CEIL FIXT	R	94		I	8 785	21 757	5 272	4 898	0	31 727	24 942	4 68	3 34
Motors	Cooling Tower Fan	VSD to existing mtr	R	15 5	6000		1 815	7 989	880	159	285	8 427	6 813	4 64	3 38
Motors	Condenser Water Pump	VSD to existing mtr	R	18 5	6000		1 815	7 989	880	159	285	8 427	6 813	4 64	3 38
Motors	Cooling Tower Fan	VSD & EEM	R	39 5	3200		3 855	13 381	2 539	159	2 099	17 843	13 988	4 63	3 38
Lighting	3x40 T 12	FL 2x4 2 18 ELC REF	R	80		H	37 976	125 128	18 963	28 586	0	172 848	134 971	4 58	3 41
Lighting	150W PAR SPOT	HPS 50 FLD	R	63		D	654	1 359	308	1 278	0	2 944	2 290	4 50	3 47
Lighting	150W PAR FLOOD	HPS 50 FLD	R	62		D	2 787	5 788	1 310	5 444	0	12 842	9 756	4 50	3 47
Lighting	2x75W INC	CFL 2 15 CEIL FIXT	R	5		A	15 755	39 072	10 581	21 075	0	70 707	54 952	4 49	3 48
Motors	Condenser Water Pump	VSD to existing mtr	R	36 5	3200		4 595	17 847	3 351	312	598	20 330	15 734	4 42	3 53
Motors	Condenser Fan	EEM	R	22	5000		458	1 813	200	0	173	2 015	1 559	4 42	3 54
Lighting	90W INC	CFL 15 CEIL FIXT	R	38		C	15 949	65 958	12 410	19 630	0	87 998	68 048	4 37	3 54
Motors	Condenser Water Pump	VSD to existing mtr	R	41 5	3200		4 497	17 204	4 497	17 204	0	37 998	28 448	4 36	3 59
Motors	AHU	EEM	R	23 5	6000		2 193	7 171	1 308	159	656	19 882	15 185	4 37	3 57
Motors	AHU	EEM	R	23	6000		731	2 390	438	0	1 059	9 538	7 345	4 36	3 59
Lighting	2x75W INC	CFL 2 15 CEIL FIXT	R	94		G	28 440	81 184	17 723	34 308	0	113 214	86 774	4 28	3 65
Lighting	90W INC	CFL 2 11 CEIL FIXT	R	50		D	6 193	18 252	4 040	4 133	0	28 424	20 231	4 27	3 68
Lighting	100W INC	CFL 2 15 CEIL FIXT	R	76		H	9 548	54 018	8 182	15 798	0	42 432	32 487	4 27	3 68
Motors	AHU	EEM	R	14 5	6000		402	1 170	193	0	336	1 699	1 297	4 23	3 70
Motors	AHU	EEM	R	20	8000		1 384	4 521	747	0	614	5 782	4 398	4 18	3 74
Lighting	200W INC	HPS 50 PEND	R	89		I	2 758	9 041	1 494	12 167	0	11 683	8 795	4 17	3 74

Table 3.7
ERDs Constituting the Minimum Life-Cycle Cost Resources Present Value of Costs and Savings

ERD Category	Equipment	Description of ERD	R/R or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Water Pump	FL 2.14 3 TB ELC REE	R	23.5	6000		1,589	5,425	598	0	594	6,808	5,017	4.18	3.78
Lighting	4x40 T 12	VSD to existing mtr	R	81	3200	M	77,305	248,175	37,590	34,194	0	319,830	242,625	4.14	3.77
Motors	Condenser Water Pump	VSD to existing mtr	R	38.5	3200		3,018	13,133	2,485	-166	624	14,548	11,330	4.13	3.78
Motors	AHU		R	9	8780		297	1,019	116	0	89	1,223	928	4.12	3.79
Motors	Power Ventilator	VSD to existing mtr	R	9.5	8780		297	1,019	116	0	89	1,223	928	4.12	3.79
Motors	75W INC	CFL 2.11 CEIL FIXT	R	27.5	4000	C	4,944	15,810	4,604	937	920	20,367	16,414	4.12	3.79
Lighting	Transformer	Amorphous	R	39			270,813	744,548	185,114	200,824	0	1,110,488	835,873	4.10	3.81
Therm & Dist	POWER VENT		ROF	3	1 Phs		956	2,878	139	0	881	3,897	2,941	4.08	3.83
Motors	Condenser Water Pump	VSD to existing mtr	R	27	4000		1,020	2,408	695	0	1,015	4,118	3,098	4.04	3.87
Motors	AHU		R	17	5000		980	2,002	365	0	349	2,718	2,038	3.99	3.91
Motors	Furnace Fan		R	10	8780		2,873	9,170	993	0	802	10,884	7,951	3.99	3.92
Motors	AHU		R	10.5	4000		2,280	8,565	1,498	0	883	9,931	6,951	3.92	3.99
Motors	AHU		R	10	4000		1,368	3,942	618	0	830	5,358	3,990	3.92	3.99
Motors	Condenser Water Pump	VSD to existing mtr	ROF	17.5	5000		7,786	1,735	317	0	830	2,885	2,140	3.87	4.04
Motors	150W PAR SPOT	VSD to existing mtr	R	65.5	2100		21,821	67,532	19,571	150	3,024	27,890	20,863	3.87	4.04
Lighting	150W PAR FLOOD	MPS 50 FLD	R	64.5			3,503	9,049	1,422	489	0	13,359	9,853	3.82	4.08
Motors	Furnace Fan		R	24			14,923	25,788	6,060	25,245	0	67,087	42,144	3.82	4.09
Therm & Dist	Transformer	Amorphous	ROF	32	3 Phs		9,883	27,880	1,354	0	323	2,982	2,202	3.82	4.09
Lighting	2x40 T 12	FL 2.14 2 TB ELC	R	79		M	12,374	34,730	5,281	8,733	0	37,841	27,778	3.82	4.09
Motors	POWER VENT		R	24.5	5000		980	2,990	304	0	4,027	46,731	34,357	3.78	4.14
Motors	75W INC	CFL 2.11 CEIL FIXT	R	28	4000		4,824	10,718	3,054	0	0	17,898	13,016	3.70	4.17
Lighting	AHU		R	83		I	917	1,484	380	427	0	2,271	1,654	3.68	4.24
Motors	AHU		R	11.5	4000		1,264	3,357	788	0	469	4,532	3,328	3.63	4.30
Lighting	90W INC	CFL 2.11 CEIL FIXT	R	21		B	33,163	81,257	19,097	19,281	0	91,164	68,472	3.61	4.33
Lighting	2x25W INC EXIT	LED	R	37		B	4,878	9,902	1,454	6,443	0	17,459	12,023	3.59	4.36
Lighting	2x25W INC EXIT	LED	R	18		A	5,187	10,214	1,547	8,863	0	18,614	13,427	3.59	4.36
Lighting	2x25W INC EXIT	LED	R	58		D	911	1,793	272	1,203	0	3,268	2,357	3.59	4.36
Lighting	2x25W INC EXIT	LED	R	92		I	998	1,995	298	1,318	0	3,580	2,583	3.59	4.36
Lighting	2x25W INC EXIT	LED	R	82		M	1,238	2,831	398	1,786	0	4,794	3,458	3.59	4.36
Lighting	2x25W INC EXIT	LED	R	48		C	1,421	2,799	424	1,878	0	6,101	3,879	3.59	4.36
Lighting	6x40 T 12	FL 2.14 4 TB ELC REE	R	35		B	112,488	273,327	94,239	85,085	0	403,231	290,765	3.58	4.38
Motors	AHU		R	24.5	3200		1,388	4,913	1,400	0	1,799	8,113	5,823	3.58	4.39
Motors	AHU		R	24	3200		1,388	2,948	840	0	1,080	4,808	3,500	3.56	4.39
Motors	Chilled Water Pump	VSD to existing mtr	R	20.5	6000		402	1,127	137	0	164	1,426	1,028	3.56	4.40
Motors	Cooling Tower Fan	VSD to existing mtr	R	38.5	3200		2,823	8,523	1,896	154	437	10,026	7,203	3.56	4.40
Motors	Cooling Tower Fan	VSD to existing mtr	R	32.5	3200		2,180	6,839	2,086	154	286	7,718	5,538	3.54	4.41
Motors	Condenser Water Pump	VSD to existing mtr	R	31.5	3200		2,180	6,839	2,086	154	286	7,718	5,538	3.54	4.41
Therm & Dist	Transformer	Amorphous	ROF	29	3 Phs		7,103	17,881	875	0	6,274	25,079	17,908	3.52	4.44
Motors	Condenser Water Pump	VSD to existing mtr	R	61.5	2100		6,953	19,988	4,918	154	882	26,088	19,908	3.52	4.44
Lighting	4x60W INC PAR	4 CFL 11 INTEGRAL W REE	R	58.5	2100	A	8,062	22,580	23,182	10,211	933	47,297	35,034	3.51	4.48
Motors	Condenser Water Pump	VSD to existing mtr	R	53.5			9,113	27,338	9,538	312	792	21,723	16,009	3.48	4.52
Motors	Cooling Tower Fan	VSD to existing mtr	R	18	4000		1,589	3,962	812	312	1,109	6,483	3,884	3.46	4.53
Motors	AHU		R	18.5	4000		1,589	3,962	812	312	1,109	6,483	3,884	3.46	4.53
Motors	Condenser Fan		R	13	4000		3,178	7,124	1,624	0	2,219	10,587	7,789	3.46	4.53
Motors	Condenser Fan		R	12	4000		632	1,879	255	0	235	2,188	1,538	3.43	4.55
Motors	Circ Pump		R	10	6000		7,128	18,071	3,540	0	4,771	24,382	17,264	3.42	4.57
Motors	AHU		R	9.5	4000		1,801	4,901	365	0	349	6,058	4,358	3.41	4.58
Motors	AHU		R	9.5	4000		1,360	3,203	730	0	699	4,332	3,272	3.41	4.59
Motors	Circ Pump		R	8	6000		1,085	2,985	239	0	438	4,332	3,272	3.41	4.59
Lighting	75W INC	CFL 2.11 CEIL FIXT	R	49		D	68,100	148,095	33,080	43,117	0	222,292	166,132	3.39	4.61
Motors	BLAST HEATER		R	25	3200		3,192	8,878	1,307	0	2,519	10,704	7,512	3.36	4.66
Lighting	250W MERC	MPS 100 POLE	R	102			27,408	69,573	23,451	1,154	0	91,871	64,405	3.36	4.68
Lighting	100W INC	CFL 2.15 CEIL FIXT	R	41		C	10,581	38,817	8,008	12,404	0	35,021	24,440	3.31	4.72
Motors	AHU		R	11	3200		340	910	174	0	338	1,122	782	2.30	4.74
Motors	AHU		R	11.5	3200		680	1,219	348	0	677	2,243	1,583	2.30	4.74
Motors	AHU		R	8.5	6000		257	870	111	0	199	978	682	3.30	4.74
Motors	AHU		R	33.5	3200		8,041	15,841	4,515	0	8113	28,465	18,428	3.29	4.75
Motors	AHU		R	33	3200		3,856	7,201	2,062	0	2,779	12,031	8,378	3.29	4.75
Motors	Cooling Tower Fan	VSD to existing mtr	R	62.5	2100		12,785	33,971	9,838	312	1,758	41,738	28,863	3.28	4.78
Lighting	200W INC	MPS 50 PEND	R	28		B	127,818	272,858	94,129	79,346	0	416,335	288,518	3.28	4.80
Lighting	150W INC	CFL 2.15 CEIL FIXT	R	8		A	3,873	9,908	2,598	285	0	12,487	8,594	3.22	4.85
Motors	Condenser Pump		R	12	3200		340	810	118	0	338	1,094	774	3.13	4.89
Motors	Chilled Water Pump		R	26	3200		458	1,051	200	0	173	1,424	988	3.12	4.90
Motors	Condenser Fan		R	27	3200		458	1,051	200	0	173	1,424	988	3.12	4.90
Motors	Condenser Water Pump		R	28	3200		458	1,051	200	0	173	1,424	988	3.12	4.90
Motors	Cooling Tower Fan		R	29	3200		458	1,051	200	0	173	1,424	988	3.12	4.90

Table 3.7
EROs Contributing the Minimum Life-Cycle Cost Remainder Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	IO2	Facility or Facility Number	Present Value of Investment (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Repairs (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Water Pump	EEM	R	20.5	3200		912	2,102	399	0	346	2,847	1,936	3.12	5.00
Motors	AHU	EEM	R	16	4000		1,206	2,376	541	0	0	3,746	2,540	3.11	5.03
Motors	AHU	EEM	R	15.5	4000		2,410	4,749	1,083	0	1,684	7,842	5,080	3.11	5.03
Motors	AHU	EEM	R	30.5	3200		1,898	4,025	1,148	0	704	6,881	3,980	3.10	5.04
Motors	Chilled Water Pump	EEM	R	30	3200		832	1,343	383	0	276	1,980	1,328	3.10	5.04
Motors	AHU	EEM	R	18.5	4000		1,970	4,084	712	0	714	6,110	4,140	3.10	5.04
Motors	Chilled Water Pump	EEM	R	11	5000		8,320	15,727	2,889	0	7,010	25,806	17,286	3.08	5.08
Lighting	100W INC	EEM	R	67.5	2100		11,290	327,480	72,819	0	686	13,748	9,251	3.08	5.11
Lighting	4'x4'0 T-12	EEM	R	48			161,020	72,819	7,427	0	0	466,937	306,966	3.03	5.16
Motors	BLAST HEATER	EEM	R	86			7,806	13,185	2,806	0	7,483	23,143	15,337	3.01	5.20
Motors	Condensate Pump	EEM	R	15	6000		671,951	808	74	0	196	879	582	2.98	5.27
Lighting	3'x4'0 T-12	EEM	R	95			342,871	182,808	172,489	0	1,007,246	864,574	584	2.94	5.28
Motors	Chilled Water Pump	EEM	R	38	3200		1,589	2,988	288	0	283	2,130	1,399	2.91	5.38
Motors	Chilled Water Pump	EEM	R	34	3200		731	1,588	298	0	283	2,130	1,399	2.91	5.38
Motors	Chilled Water Pump	EEM	R	34.5	3200		1,482	3,138	694	0	528	4,260	2,798	2.91	5.38
Motors	Chilled Water Pump	EEM	R	12.5	6000		297	899	77	0	89	806	568	2.91	5.38
Motors	Condensate Water Pump	EEM	R	11.5	6000		297	899	77	0	89	806	568	2.91	5.38
Motors	POWER VENT	EEM	R	9.5	6000		297	899	77	0	89	806	568	2.91	5.38
Motors	Condensate Water Pump	EEM	R	24	4000		2,880	4,856	1,316	0	2,410	8,279	5,418	2.89	5.40
Lighting	2'x4'0 INC	EEM	R	62.5	2100		3,818	8,818	2,495	158	524	10,434	8,816	2.88	5.42
Lighting	75W REC	EEM	R	59			47,426	98,059	19,889	48,796	0	136,343	87,918	2.86	5.47
Motors	BLAST HEATER	EEM	R	20			3,217	5,911	1,389	1,870	0	9,111	6,964	2.86	5.48
Motors	BLAST HEATER	EEM	R	18	3200		8,442	14,248	2,707	0	7,047	24,003	15,581	2.84	5.49
Lighting	2'x4'0 INC	EEM	R	18.5	3200		18,080	27,135	9,167	0	13,424	46,715	29,839	2.84	5.49
Motors	Condensate Fan	EEM	R	3			92,490	168,821	46,920	49,920	291,531	165,041	165,041	2.83	5.52
Motors	AHU	EEM	R	7	6000		280	585	82	0	108	776	476	2.83	5.52
Motors	AHU	EEM	R	14	5000		3,684	7,595	1,368	0	1,089	10,649	8,485	2.82	5.54
Motors	AHU	EEM	R	14.5	5000		6,534	13,524	2,540	0	1,980	18,424	11,880	2.82	5.54
Motors	AHU	EEM	R	36	2100		9,120	12,888	5,801	0	7,187	26,886	18,676	2.82	5.54
Motors	FL 2'x4 4.40 STD	EEM	R	35.5	2100		26,743	11,322	11,322	0	14,395	61,390	33,160	2.82	5.54
Lighting	FL 2'x4 3.40 STD	EEM	R	28.5			59,223	111,128	27,117	27,346	0	186,808	108,374	2.80	5.58
Motors	Condensate Water Pump	EEM	R	28.5			130,029	238,089	69,784	67,823	0	380,378	233,388	2.80	5.59
Motors	Condensate Water Pump	EEM	R	28.5			1,816	4,831	880	168	285	6,088	3,256	2.79	5.59
Motors	Condensate Water Pump	EEM	R	4			1,160	2,542	192	0	464	3,190	2,040	2.77	5.63
Motors	Condensate Water Pump	EEM	R	101			37,813	50,260	18,948	37,443	0	104,871	68,858	2.77	5.63
Motors	Condensate Water Pump	EEM	R	13	3200		1,922	3,844	782	0	1,048	5,622	3,682	2.76	5.67
Motors	Condensate Water Pump	EEM	R	14.5	3200		2,040	3,844	782	0	1,048	5,622	3,682	2.76	5.67
Motors	Condensate Water Pump	EEM	R	15.5	3200		340	841	122	0	176	937	597	2.76	5.67
Trane & Dair	Transformer	EEM	R	35	3-Phase		16,222	27,017	1,342	0	13,431	41,790	28,608	2.76	5.68
Lighting	4'x4'0 T-12	EEM	R	98			702,908	1,331,651	322,822	253,986	0	1,908,339	1,208,831	2.72	5.76
Motors	AHU	EEM	R	17	3200		402	721	208	0	164	1,081	689	2.71	5.78
Motors	AHU	EEM	R	17.5	3200		804	1,442	411	0	328	2,181	1,377	2.71	5.78
Motors	AHU	EEM	R	41	2100		7,584	9,801	4,267	0	8,488	20,846	12,981	2.71	5.77
Motors	AHU	EEM	R	41.5	2100		15,800	20,418	8,888	0	13,517	42,803	27,003	2.71	5.77
Lighting	2'x4'0 INC	EEM	R	62			337,896	97,812	107,840	0	643,118	342,480	271	2.70	5.78
Lighting	3'x4'0 T-12	EEM	R	51			19,575	4,524	0,186	0	18,378	11,538	11,538	2.69	5.80
Motors	Furnace Fan	EEM	R	56			92,699	168,888	37,784	44,864	0	249,208	168,807	2.69	5.80
Motors	CABINET HEATER	EEM	R	16	5000		1,782	3,793	462	0	634	4,794	3,012	2.69	5.81
Motors	Chilled Water Pump	EEM	R	37.5	3200		988	1,028	77	0	278	1,329	831	2.67	5.86
Motors	Condensate Pump	EEM	R	27	2100		629	742	215	0	343	2,820	1,824	2.66	5.88
Motors	Chilled Water Pump	EEM	R	43.5	3200		1,384	2,821	488	0	514	3,833	2,248	2.66	5.89
Motors	Furnace Fan	EEM	R	13	5000		280	512	82	0	108	882	422	2.62	5.98
Motors	Chilled Water Pump	EEM	R	12	6000		290	812	82	0	108	882	422	2.62	5.98
Motors	Condensate Fan	EEM	R	6	6780		498	1,032	78	0	196	1,306	807	2.62	5.98
Motors	Furnace Fan	EEM	R	7	6780		498	1,032	78	0	196	1,306	807	2.62	5.98
Motors	AHU	EEM	R	40.5	3200		1,206	2,098	698	0	434	3,128	1,923	2.60	6.02
Motors	Condensate Water Pump	EEM	R	5	6000		18,576	22,890	4,998	0	15,340	43,028	28,462	2.60	6.02
Motors	Condensate Water Pump	EEM	R	48.5	2100		18,972	40,951	11,889	1,094	2,798	49,030	30,046	2.57	6.06
Lighting	2'x4'0 T-12	EEM	R	94			21,798	48,867	13,885	1,260	3,173	56,988	34,183	2.57	6.08
Lighting	1'x4'0 T-12	EEM	R	78			112,548	188,535	46,197	64,742	0	288,477	176,928	2.58	6.08
Motors	Condensate Pump	EEM	R	8	4000		554	367	54	77	0	488	297	2.58	6.10
Motors	BLAST HEATER	EEM	R	8	4000		554	367	54	77	0	488	297	2.58	6.10
Motors	BLAST HEATER	EEM	R	7.5	4000		2,378	3,882	590	0	1,590	8,082	3,688	2.58	6.12
Motors	Chilled Water Pump	EEM	R	19	3200		4,762	7,783	1,180	0	3,181	12,124	7,372	2.56	6.12
Motors	Chilled Water Pump	EEM	R	21	3200		402	721	137	0	184	1,022	620	2.54	6.14
Motors	Chilled Water Pump	EEM	R	21	3200		402	721	137	0	184	1,022	620	2.54	6.14

Table 3.7
Estimating the Minimum Life Cycle Cost Return **Present Value of Costs and Benefits**

ENR Category	Equipment	Description of EIC	in or ROF	Q	Q2	Facility or Facility Number	Value of Installed Cost (1993 \$)	Value of Energy Savings (1993 \$)	Value of Demand Savings (1993 \$)	Value of Other Savings (1993 \$)	Value of Repurchase Savings (1993 \$)	Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Cooling Tower Fan	EEM	in	22	3200		402	721	137			1,022	620	2.64	0.14
Motors	Chilled Water Pump	EEM	in	19.5	3200		402	721	137			1,022	620	2.64	0.14
Motors	Furnace Fans	EEM	in		3200		3,216	5,768	1,058			8,178	4,982	2.64	0.14
Motors	Condenser Fan	EEM	in	20	3200		1,208	3,200	411			3,611	1,881	2.64	0.14
Motors	VSD to existing motor	EEM	in	47.5	1650		4,497	8,871	3,269			11,329	8,832	2.64	0.20
Motors	Condenser Water Pump	AMU	in	33.5	1650		912	1,013	560			1,573	1,381	2.51	0.21
Motors	EHX FAN	EEM	in		1650		912	1,013	560			1,573	1,381	2.51	0.21
Motors	FL 2X4 2.40 STD	EEM	in	25	4000		3,684	6,809	1,013			7,822	5,811	2.49	0.27
Lighting	4x4x10 T 12	EEM	in				5,808	15,569	3,174	5,756		21,325	14,538	2.49	0.27
Motors	Car. Pump	EEM	in	NS/SENSE			29,741	61,806	11,730	10,850		74,085	44,344	2.49	0.27
Tanks & Duct	Transformer	EEM	in	10	6000		7,103	10,762	530			11,292	7,861	2.47	0.32
Motors	Condenser Water Pump	EEM	in	42.5	1 Phs		2,180	4,488	1,302	158		5,888	3,787	2.46	0.36
Motors	FL 2X4 3.40 STD	EEM	in	3	8760		3,283	6,372	1,258			7,630	5,377	2.46	0.36
Motors	BLAST HEATER	EEM	in	NS/SENSE			2,924	3,790	1,086	1,359		5,179	4,744	2.45	0.43
Motors	AMU	EEM	in	45	2100		584	1,013	231			1,244	1,174	2.43	0.44
Motors	150W PAR SPOT	EEM	in	8.5	4000		1,188	2,025	462			2,843	1,856	2.39	0.53
Lighting	150W PAR FLOOD	EEM	in	10			3,726	3,562	960	4,395		8,507	5,187	2.36	0.53
Lighting	BLAST HEATER	EEM	in	32.5	2100		15,874	16,131	4,050	18,721		37,543	22,089	2.36	0.54
Motors	BLAST HEATER	EEM	in	32	2100		1,854	2,260	358			2,612	2,572	2.36	0.54
Motors	POWER VENT	EEM	in	22	4000		213	239	69			282	1,544	2.36	0.55
Motors	AMU	EEM	in	44.5	2100		3,655	5,148	2,238			6,386	3,948	2.36	0.55
Motors	FL 2X4 2 TB ELC	EEM	in	54	2100		2,193	3,088	1,342			4,430	3,043	2.36	0.56
Lighting	2x4x10 T 12	EEM	in	44			99,529	161,829	34,329	48,741		236,879	136,140	2.37	0.60
Tanks & Duct	Cooling Tower Fan	AMU	in	43.5	2100		4,513	8,577	2,699	372		10,873	9,910	2.37	0.61
Motors	Transformer	EEM	in	27	3 Phs		8,040	9,218	2,312	2,688		14,916	8,164	2.36	0.60
Lighting	FL 2X4 3.40 STD	EEM	in	NS/SENSE			4,868	6,888	1,844			10,982	8,294	2.36	0.60
Motors	BLAST HEATER	EEM	in	28	4000		824	1,062	208			1,328	1,103	2.34	0.68
Motors	Condensate Pump	EEM	in	8.5	3200		276	381	69			450	389	2.34	0.68
Motors	BLAST HEATER	EEM	in	38.5	2100		2,197	2,885	648			3,631	2,940	2.34	0.68
Motors	Cooling Tower Fan	EEM	in	37	2100		458	680	200			1			

Table 3.7
EBRs Constituting the Minimum Life-Cycle Cost Estimate Present Values of Costs and Savings

EBR Category	Equipment	Description of EBR	EB or R/S	Q	Q2	Facility or Facility Number	Present Value of Incremental Cost (\$1993 \$)	Present Value of Energy Savings (\$1993 \$)	Present Value of Demand Savings (\$1993 \$)	Present Value of Other Savings (\$1993 \$)	Present Value of Total Savings (\$1993 \$)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Present Value (\$1993 \$)
Motors	AMU	EBM	R	58	2100		2 788	3 439	1 484	0	1 028	3 193	2.15	7.25
Motors	AMU	EBM	R	64.5	2100		5 538	6 876	2 989	0	2 064	11 921	2.15	7.25
Turns & Dst	Transformer	Amorphous	R/S	34	3 Phs		2 204	2 585	127	0	2 008	2 821	2.14	7.25
Lighting	Adaco T-12	FL 214 3 TB ELC REF		25			1 427 081	2 087 833	485 920	0	3 029 481	1 911 819	2.13	7.34
Motors	BLAST HEATER	VSD to existing motor	R	25.5	3200		32 995	65 084	12 387	2 187	5 418	88 886	2.12	7.37
Motors	Chilled Water Pump	VSD to existing motor	R	45.5	2100		29 888	52 364	18 275	1 406	4 042	62 581	2.11	7.41
Motors	Cooling Tower Fan	EBM	R	20.5	2100		340	420	0	0	176	377	2.11	7.41
Motors	Condenser Water Pump	EBM	R	20.5	2100		340	420	0	0	176	377	2.11	7.41
Motors	Condenser Fan	EBM	R	28	2100		340	420	0	0	176	377	2.11	7.41
Motors	Chilled Water Pump	EBM	R	28	2100		340	420	0	0	176	377	2.11	7.41
Motors	AMU	EBM	R/S	10	2100		2 888	2 302	1 000	0	2 778	3 196	2.11	7.41
Motors	AMU	EBM	R	31.5	2100		402	473	208	0	184	441	2.10	7.46
Motors	Cooling Tower Fan	EBM	R	31	2100		402	473	208	0	184	441	2.10	7.46
Motors	Cooling Tower Fan	EBM	R	32	1800		402	498	183	0	184	441	2.10	7.46
Motors	Transformer	Amorphous	R/S	32.5	1800		402	498	183	0	184	441	2.10	7.46
Turns & Dst	90W MC	FL 214 2 TB ELC REF		30	3 Phs		8 077	9 508	404	0	7 600	9 383	2.09	7.47
Motors	AMU	FL 214 2 TB ELC REF	R	66			9 493	11 983	3 471	4 328	16 762	10 288	2.08	7.50
Motors	Furnace Fans	EBM	R	4	6000		1 257	1 257	229	0	568	1 076	2.08	7.51
Motors	AMU	EBM	R	4	8000		230	346	38	0	478	248	2.07	7.54
Motors	AMU	EBM	R	38.5	1800		1 888	2 078	1 148	0	2 930	2 034	2.07	7.54
Motors	CABINET HEATER	EBM	R/S	38	4000		632	683	383	0	1 310	978	2.07	7.55
Motors	Condenser Pump	EBM	R/S	4	4000		1 381	1 376	208	0	2 867	1 476	2.07	7.55
Lighting	Adaco T-12	FL 214 2 TB ELC		32			1 381	1 376	208	0	2 867	1 476	2.07	7.55
Motors	2400 T-12 75W	FL 214 2 TB ELC REF	R	47			244 778	329 582	72 864	122 317	605 163	262 378	2.06	7.57
Motors	Cooling Tower Fan	EBM	R	61	2100		3 786	4 177	1 186	1 487	10 216	8 321	2.06	7.61
Motors	AMU	EBM	R	23.5	1800		1 700	1 682	913	0	1 988	3 313	2.04	7.65
Motors	Condenser Water Pump	EBM	R	23	1800		680	681	385	0	873	1 738	2.02	7.73
Motors	AMU	VSD to existing motor	R/S	44.5	1800		2 873	4 801	1 888	168	437	896	2.02	7.73
Motors	AMU	EBM	R	19	2100		824	710	308	0	676	2 880	2.01	7.77
Motors	Light Transformer	EBM	R/S	19.5	2100		1 373	1 183	514	0	1 085	1 834	2.01	7.77
Motors	Chilled Water Pump	EBM	R	33	1800		18 382	8 386	10 734	0	14 614	7 389	2.01	7.77
Motors	Chilled Water Pump	EBM	R	34.5	1800		468	642	200	0	914	468	2.01	7.77
Motors	Chilled Water Pump	EBM	R	34	1800		468	642	200	0	914	468	2.01	7.77
Motors	Condenser Fan	EBM	R	36	1800		1 388	1 629	686	0	1 73	814	2.01	7.79
Motors	CABINET HEATER	EBM	R/S	1	4000		414	382	58	0	173	378	2.01	7.79
Motors	AMU	EBM	R	54	2100		1 205	1 378	58	0	2 343	1 378	2.01	7.79
Motors	Lighting	FL 214 1 TB ELC	R	54.5			4 820	5 823	2 380	0	434	1 203	2.00	7.81
Motors	Adaco T-12	EBM	R	45	2100		149 338	251 167	88 887	89 318	2 408	1 203	2.00	7.82
Motors	Chilled Water Pump	EBM	R	51	2100		2 956	3 787	1 091	0	3 683	4 870	2.00	7.82
Motors	Chilled Water Pump	VSD to existing motor	R	51.5	5000		9 518	7 535	2 982	0	1 229	1 929	1.98	7.85
Motors	Cooling Tower Fan	EBM	R	19.5	5000		1 548	3 091	378	168	1 174	8 888	1.98	7.85
Motors	Chilled Water Pump	EBM	R	54.5	2100		1 364	1 720	686	158	3 088	1 519	1.98	7.85
Motors	Condenser Fan	EBM	R/S	2	4000		188	148	23	0	614	1 519	1.98	7.85
Motors	Chilled Water Pump	EBM	R	83.5	2100		9 510	2 377	2 138	0	1 160	332	1.97	7.92
Motors	Chilled Water Pump	EBM	R	84	2100		3 840	4 918	1 434	0	2 143	1 160	1.97	7.92
Motors	Cooling Tower Fan	EBM	R	83	2100		3 840	4 918	1 434	0	2 143	1 160	1.97	7.92
Motors	Chilled Water Pump	EBM	R/S	31.5	1800		294	212	78	0	676	782	1.97	7.92
Motors	Chilled Water Pump	EBM	R/S	30.5	1800		294	212	78	0	676	782	1.97	7.92
Motors	Chilled Water Pump	EBM	R/S	28.5	1800		294	212	78	0	676	782	1.97	7.92
Motors	Condenser Fan	EBM	R/S	29	1800		294	212	78	0	676	782	1.97	7.92
Motors	AMU	EBM	R/S	3	4000		182	160	34	0	172	368	1.97	7.92
Motors	Transformer	Amorphous	R/S	18	1 Phs		12 842	12 833	828	0	11 087	11 088	1.96	7.99
Turns & Dst	AMU	EBM	R	49	1800		1 688	1 622	888	0	3 102	1 568	1.96	8.00
Lighting	2400 T-12 75W	FL 148 2 98 ELC	R	49.5			1 589	1 589	888	0	584	1 513	1.96	8.00
Motors	Condenser Fan	EBM	R/S	14	1800		982	321 887	78 882	105 501	607 040	248 384	1.96	8.00
Motors	Condenser Fan	EBM	R	3	5000		230	318	38	0	1 282	901	1.94	8.07
Motors	Cooling Tower Fan	EBM	R	34	2100		402	473	137	0	774	372	1.93	8.11
Motors	Cooling Tower Fan	EBM	R	34.5	2100		402	473	137	0	774	372	1.93	8.11
Motors	Condenser Fan	EBM	R	33	2100		3 718	3 785	1 090	0	8 195	2 978	1.92	8.12
Motors	Furnace Fans	EBM	R	1C	3200		3 881	3 785	1 090	0	8 195	2 978	1.92	8.12
Motors	Condenser Water Pump	VSD to existing motor	R	38.5	2100		2 340	3 239	880	168	3 477	1 882	1.91	8.16
Motors	CABINET HEATER	EBM	R	5	5000		8716	11 160	1 368	0	3 983	2 137	1.89	8.27
Motors	BLAST HEATER	EBM	R/S	20	2100		7 748	2 388	888	0	6 182	2 438	1.89	8.28

Table 3.7
PCOs Contributing the Minimum Life Cycle Cost Reductions: Present Values of Costs and Benefits

END Category	Equipment	Description of EDC	Ref. RCS	Q	Q2	Facility or Location	Present Value of Energy Cost (1993 \$)	Present Value of Disposal (1993 \$)	Present Value of Other Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Rate	Discounted Present Value (1993 \$)
Mech	BLAST HEATER	EEM	RCS	20.5	2100		6,217	4,499	1,322	9,048	4,020	1.89	29
Mech	Let. Transfer Pump	EEM	RCS	32	1000		10,204	4,838	8,038	19,400	9,110	1.89	29
Mech	Cooling Turb Fan	EEM	RCS	46	1650		406	406	298	1,370	629	1.97	34
Mech	Chilled Water Pump	EEM	RCS	43.6	1650		731	809	298	1,370	629	1.97	34
Mech	Condenser Fan	EEM	RCS	40	1650		1,889	2,078	704	3,647	1,561	1.97	34
Mech	CABINE T HEATER	EEM	RCS	4	3200		440	346	68	891	400	1.97	34
Mech	Condensate Pump	EEM	RCS	4	3200		440	346	68	891	400	1.97	34
Lighting	BNW REC	CFL 16 CER FXT	RCS	2			6,217	6,217	1,007	12,483	6,807	1.97	34
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	2			402,839	83,411	22,646	140,018	88,376	1.96	46
Mech	2400 T 112 75W	2400 T 112 75W	RCS	97	800		209,372	166,870	87,196	497,644	229,208	1.86	46
Mech	Cooling Turb Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condenser Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condensate Water Pump	EEM	RCS	8	5000		249	321	39	609	316	1.96	46
Mech	Formosa Fan	EEM	RCS	10	5000		1,992	2,604	312	3,908	1,962	1.83	52
Mech	Cooling Turb Fan	EEM	RCS	39.6	2100		3,704	6,719	312	6,002	3,136	1.93	52
Mech	Chilled Water Pump	EEM	RCS	66.6	2100		1,370	3,704	434	2,228	1,007	1.83	52
Mech	Condenser Fan	EEM	RCS	17	2100		1,206	1,370	368	2,228	1,007	1.83	52
Mech	Formosa Fan	EEM	RCS	18	2100		140	129	39	348	168	1.83	52
Mech	Condensate Pump	EEM	RCS	3	3200		621	468	109	899	473	1.83	52
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.83	52
Trans & Dist	Transformer	EEM	RCS	11	1000		7,474	9,647	324	13,445	6,071	1.91	68
Mech	Air Compressor	EEM	RCS	19	800		4,407	1,689	2,416	3,911	6,071	1.91	68
Mech	Chilled Water Pump	EEM	RCS	68.6	2100		2,312	2,683	768	3,911	3,510	1.90	70
Lighting	BNW REC	CFL 16 CER FXT	RCS	61			87,483	94,410	24,453	4,170	1,798	1.78	70
Mech	Condenser Fan	EEM	RCS	60	1650		1,649	1,622	508	154,886	87,483	1.77	82
Mech	AHU	EEM	RCS	48.6	1650		1,206	908	68	2,803	1,214	1.76	89
Mech	Air Compressor	EEM	RCS	12	800		684	197	302	2,113	908	1.76	89
Mech	Cooling Turb Fan	EEM	RCS	24	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	24.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23	2100		217	168	46	1,078	436	1.74	89
Mech	Chilled Water Pump	EEM	RCS	21.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Fan	EEM	RCS	22	2100		888	621	180	378	191	1.74	89
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.74	89
Mech	2400 T 112 75W	2400 T 112 75W	RCS	97	800		209,372	166,870	87,196	497,644	229,208	1.86	46
Mech	Cooling Turb Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condenser Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condensate Water Pump	EEM	RCS	8	5000		249	321	39	609	316	1.96	46
Mech	Formosa Fan	EEM	RCS	10	5000		1,992	2,604	312	3,908	1,962	1.83	52
Mech	Cooling Turb Fan	EEM	RCS	39.6	2100		3,704	6,719	312	6,002	3,136	1.93	52
Mech	Chilled Water Pump	EEM	RCS	66.6	2100		1,370	3,704	434	2,228	1,007	1.83	52
Mech	Condenser Fan	EEM	RCS	17	2100		1,206	1,370	368	2,228	1,007	1.83	52
Mech	Formosa Fan	EEM	RCS	18	2100		140	129	39	348	168	1.83	52
Mech	Condensate Pump	EEM	RCS	3	3200		621	468	109	899	473	1.83	52
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.83	52
Trans & Dist	Transformer	EEM	RCS	11	1000		7,474	9,647	324	13,445	6,071	1.91	68
Mech	Air Compressor	EEM	RCS	19	800		4,407	1,689	2,416	3,911	6,071	1.91	68
Mech	Chilled Water Pump	EEM	RCS	68.6	2100		2,312	2,683	768	3,911	3,510	1.90	70
Lighting	BNW REC	CFL 16 CER FXT	RCS	61			87,483	94,410	24,453	4,170	1,798	1.78	70
Mech	Condenser Fan	EEM	RCS	60	1650		1,649	1,622	508	154,886	87,483	1.77	82
Mech	AHU	EEM	RCS	48.6	1650		1,206	908	68	2,803	1,214	1.76	89
Mech	Air Compressor	EEM	RCS	12	800		684	197	302	2,113	908	1.76	89
Mech	Cooling Turb Fan	EEM	RCS	24	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	24.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23	2100		217	168	46	1,078	436	1.74	89
Mech	Chilled Water Pump	EEM	RCS	21.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Fan	EEM	RCS	22	2100		888	621	180	378	191	1.74	89
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.74	89
Mech	2400 T 112 75W	2400 T 112 75W	RCS	97	800		209,372	166,870	87,196	497,644	229,208	1.86	46
Mech	Cooling Turb Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condenser Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condensate Water Pump	EEM	RCS	8	5000		249	321	39	609	316	1.96	46
Mech	Formosa Fan	EEM	RCS	10	5000		1,992	2,604	312	3,908	1,962	1.83	52
Mech	Cooling Turb Fan	EEM	RCS	39.6	2100		3,704	6,719	312	6,002	3,136	1.93	52
Mech	Chilled Water Pump	EEM	RCS	66.6	2100		1,370	3,704	434	2,228	1,007	1.83	52
Mech	Condenser Fan	EEM	RCS	17	2100		1,206	1,370	368	2,228	1,007	1.83	52
Mech	Formosa Fan	EEM	RCS	18	2100		140	129	39	348	168	1.83	52
Mech	Condensate Pump	EEM	RCS	3	3200		621	468	109	899	473	1.83	52
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.83	52
Trans & Dist	Transformer	EEM	RCS	11	1000		7,474	9,647	324	13,445	6,071	1.91	68
Mech	Air Compressor	EEM	RCS	19	800		4,407	1,689	2,416	3,911	6,071	1.91	68
Mech	Chilled Water Pump	EEM	RCS	68.6	2100		2,312	2,683	768	3,911	3,510	1.90	70
Lighting	BNW REC	CFL 16 CER FXT	RCS	61			87,483	94,410	24,453	4,170	1,798	1.78	70
Mech	Condenser Fan	EEM	RCS	60	1650		1,649	1,622	508	154,886	87,483	1.77	82
Mech	AHU	EEM	RCS	48.6	1650		1,206	908	68	2,803	1,214	1.76	89
Mech	Air Compressor	EEM	RCS	12	800		684	197	302	2,113	908	1.76	89
Mech	Cooling Turb Fan	EEM	RCS	24	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	24.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23	2100		217	168	46	1,078	436	1.74	89
Mech	Chilled Water Pump	EEM	RCS	21.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Fan	EEM	RCS	22	2100		888	621	180	378	191	1.74	89
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.74	89
Mech	2400 T 112 75W	2400 T 112 75W	RCS	97	800		209,372	166,870	87,196	497,644	229,208	1.86	46
Mech	Cooling Turb Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condenser Fan	EEM	RCS	7	5000		249	321	39	609	316	1.96	46
Mech	Condensate Water Pump	EEM	RCS	8	5000		249	321	39	609	316	1.96	46
Mech	Formosa Fan	EEM	RCS	10	5000		1,992	2,604	312	3,908	1,962	1.83	52
Mech	Cooling Turb Fan	EEM	RCS	39.6	2100		3,704	6,719	312	6,002	3,136	1.93	52
Mech	Chilled Water Pump	EEM	RCS	66.6	2100		1,370	3,704	434	2,228	1,007	1.83	52
Mech	Condenser Fan	EEM	RCS	17	2100		1,206	1,370	368	2,228	1,007	1.83	52
Mech	Formosa Fan	EEM	RCS	18	2100		140	129	39	348	168	1.83	52
Mech	Condensate Pump	EEM	RCS	3	3200		621	468	109	899	473	1.83	52
Lighting	FL 1100 2 00 ELC REC	FL 1100 2 00 ELC REC	RCS	93			1,737	1,916	762	1,043	1,93	1.83	52
Trans & Dist	Transformer	EEM	RCS	11	1000		7,474	9,647	324	13,445	6,071	1.91	68
Mech	Air Compressor	EEM	RCS	19	800		4,407	1,689	2,416	3,911	6,071	1.91	68
Mech	Chilled Water Pump	EEM	RCS	68.6	2100		2,312	2,683	768	3,911	3,510	1.90	70
Lighting	BNW REC	CFL 16 CER FXT	RCS	61			87,483	94,410	24,453	4,170	1,798	1.78	70
Mech	Condenser Fan	EEM	RCS	60	1650		1,649	1,622	508	154,886	87,483	1.77	82
Mech	AHU	EEM	RCS	48.6	1650		1,206	908	68	2,803	1,214	1.76	89
Mech	Air Compressor	EEM	RCS	12	800		684	197	302	2,113	908	1.76	89
Mech	Cooling Turb Fan	EEM	RCS	24	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	24.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23.6	2100		217	168	46	1,078	436	1.74	89
Mech	Condenser Water Pump	EEM	RCS	23	2100		217	168	46	1,078	436	1.74	89
Mech	Chilled Water Pump	EEM	RCS	21.6	2								

Table 3.7
ECOs: Calculating the Minimum Life Cycle Cost Reductions

END Category	Equipment	Description of EMC	RF	IC	CF	Project Number	Project Value of Investment (1993 \$)	Project Value of Energy Savings (1993 \$)	Project Value of Other Savings (1993 \$)	Project Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Payback Period (Years)
Motors	AMU	FL 244 2 TB ELC	22	1000	1000	000	220	74	0	1012	340	1.2
Motors	Chilled Water Pump	FL 244 2 TB ELC	12	1000	1000	102	220	74	0	1012	340	1.2
Motors	Furnace Fan	FL 244 2 TB ELC	16	1000	1000	640	220	74	0	1012	340	1.2
Motors	Condenser Fan	FL 244 2 TB ELC	14	1000	1000	720	220	74	0	1012	340	1.2
Motors	AMU	FL 244 2 TB ELC	20	1000	1000	294	220	74	0	1012	340	1.2
Lighting	2440 T 12	FL 244 2 TB ELC	31	1000	1000	3 311	220	74	0	1012	340	1.2
Motors	Condenser Water Pump	VSD to existing one	30	1000	1000	3 704	4 770	54	0	6 942	1 920	1.4
Motors	CABINET HEATER	FL 244 2 TB ELC	7	1000	1000	230	220	74	0	1012	340	1.2
Motors	Condenser Pump	FL 244 2 TB ELC	9	1000	1000	5 400	2 400	902	0	8 801	2 800	1.4
Motors	Chilled Water Pump	FL 244 2 TB ELC	27	1000	1000	602	102	0	0	8 801	2 800	1.4
Lighting	2440 T 12	FL 244 2 TB ELC	13	1000	1000	24 513	22 057	0	0	30 060	11 063	1.4
Motors	BLAST HEATER	VSD to existing one	42	1000	1000	7 052	5 212	0	0	11 063	3 402	1.4
Lighting	100W MC	FL 2 15 CER FLX	7	1000	1000	30 013	52 234	14 110	0	94 405	17 792	1.4
Motors	Condenser Pump	FL 244 2 TB ELC	3	1000	1000	820	315	0	0	777	1 200	1.4
Motors	CABINET HEATER	FL 244 2 TB ELC	6	1000	1000	2 062	1 024	0	0	3 020	1 234	1.4
Motors	Condenser Water Pump	FL 244 2 TB ELC	4	1000	1000	1 000	01	0	0	1 000	244	1.4
Motors	Chilled Water Pump	FL 244 2 TB ELC	0	1000	1000	1 000	01	0	0	1 000	244	1.4
Motors	Cooling Tower Fan	FL 244 2 TB ELC	0	1000	1000	204	06	0	0	204	70	1.4
Motors	AMU	FL 244 2 TB ELC	9	1000	1000	204	06	0	0	204	70	1.4
Motors	Condenser Fan	FL 244 2 TB ELC	0	1000	1000	497	06	0	0	497	70	1.4
Motors	AMU	FL 244 2 TB ELC	13	1000	1000	1 200	202	0	0	1 402	720	1.4
Motors	Condenser Fan	FL 244 2 TB ELC	13	1000	1000	2 071	066	747	0	2 818	1 420	1.4
Motors	Cooling Tower Fan	FL 244 2 TB ELC	24	1000	1000	333	103	0	0	436	142	1.4
Motors	Condenser Fan	FL 244 2 TB ELC	23	1000	1000	333	103	0	0	436	142	1.4
Motors	Condenser Fan	FL 244 2 TB ELC	21	1000	1000	647	102	0	0	749	242	1.4
Lighting	100W MC	FL 2 15 CER FLX	0	1000	1000	10 302	13 117	3 000	0	14 087	4 200	1.4
Motors	Condenser Fan	FL 244 2 TB ELC	10	1000	1000	102	02	23	0	172	200	1.4
Motors	Furnace Fan	FL 244 2 TB ELC	13	1000	1000	102	02	23	0	172	200	1.4
Motors	Chilled Water Pump	FL 244 2 TB ELC	10	1000	1000	204	124	0	0	204	70	1.4
Motors	Cooling Tower Fan	FL 244 2 TB ELC	12	1000	1000	304	124	0	0	304	70	1.4
Motors	Condenser Water Pump	FL 244 2 TB ELC	11	1000	1000	304	124	0	0	304	70	1.4
Motors	Cooling Tower Fan	FL 244 2 TB ELC	16	1000	1000	3 010	3 203	2 400	0	5 613	1 400	1.4
Motors	Condenser Water Pump	VSD to existing one	16	1000	1000	3 010	3 203	2 400	0	5 613	1 400	1.4
Motors	Chilled Water Pump	FL 244 2 TB ELC	20									

Table 3.7
EROs Contributing the Minimum Life Cycle Cost Reduction Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	PS or RPS	Q	Q2	Facility or Number	Present Value of Installed Cost (\$1993 \$)	Present Value of Energy Savings (\$1993 \$)	Present Value of Demand Savings (\$1993 \$)	Present Value of Old Savings (\$1993 \$)	Present Value of Resource Savings (\$1993 \$)	Present Value of Total Savings (\$1993 \$)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Present Value (\$1993 \$)
Motors	Furnace Fans	EM	RPS	8	1000		18,886	1,243	1,080	0	17,708	20,571	1,918	1.10	14.17
Motors	CABINET HEATER	EM	RPS	3	1000		1,243	128	77	0	1,166	1,309	129	1.10	14.18
Motors	Small Package	EM	R	92	1000	700	4,374	798	219	0	3,787	4,784	410	1.09	14.28
Motors	Furnace Fans	EM	RPS	4	1000		25,891	2,178	1,325	0	24,708	28,211	2,350	1.09	14.32
Motors	Furnace Fans	EM	RPS	1	800		6,383	430	327	0	6,056	6,886	473	1.07	14.55
Trains & Duct	Capacitors	EM	RPS	8	1000	Subsum	21,412	21,560	2,098	872	0	22,987	1,576	1.07	14.86
Motors	Transformers	EM	RPS	7	1000		728	48	42	0	686	778	62	1.07	14.88
Trains & Duct	Small Package	EM	R	2	1000		818	105	6	0	713	808	52	1.06	14.89
Motors	CABINET HEATER	EM	RPS	73	1000	324	28,679	2,166	1,334	0	24,898	28,787	1,608	1.06	14.73
Motors	Condenser Fan	EM	RPS	9	1000		1,151	88	54	0	1,065	1,207	60	1.05	14.90
Motors	Condenser Fan	EM	RPS	8	1000		378	25	16	0	362	398	18	1.05	14.92
Motors	Condenser Fan	EM	RPS	10	1000		182	12	7	0	172	190	9	1.05	14.92
Motors	Condenser Fan	EM	RPS	16	1000	108	4,382	315	182	0	4,053	4,854	192	1.04	14.98
Motors	Condenser Fan	EM	RPS	3	800		394	18	14	0	344	378	12	1.03	15.10
Motors	Condenser Fan	EM	RPS	4	800		50,398	2,560	1,948	0	47,820	52,127	1,729	1.03	15.10
Motors	Condenser Fan	EM	RPS	2	800		232	14	11	0	213	238	8	1.03	15.12
Motors	Condenser Fan	EM	RPS	84	800	272	3,253	201	117	0	2,978	3,294	91	1.03	15.18
Motors	Condenser Fan	EM	RPS	64	800	240	13,117	828	418	0	12,140	13,420	318	1.02	15.26
Motors	Condenser Fan	EM	RPS	68	800	778	6,723	406	232	0	6,247	6,886	182	1.02	15.26
Motors	Condenser Fan	EM	RPS	107	800	504	10,938	141	80	0	10,838	11,558	222	1.02	15.31
Motors	Condenser Fan	EM	RPS	87	800	46	16,878	213	124	0	16,678	17,318	337	1.02	15.31
Motors	Condenser Fan	EM	RPS	27	800	920	4,374	53	31	0	4,374	4,467	83	1.02	15.32
Motors	Condenser Fan	EM	RPS	119	800	787	1,053	11	8	0	1,053	1,110	17	1.02	15.38
Motors	Condenser Fan	EM	RPS	99	800		9,031,467	16,017,873	3,889,508	3,179,734	1,365,890	23,242,886	14,211,395	2.57	9.07
Non-Generating Subtotals															
Generating ERO	Generator	DGEN.4	R	4		8,748	173,327	876,888	2,703,703	615,817	0	1,312,000	1,138,873	7.57	2.08
Peak Share (a)	Generator		R				9,204,794	14,141,787	6,393,271	2,883,917	1,365,890	24,654,886	16,360,072	2.87	5.88
Total															

3.80

(a) Energy savings for Peak sharing EROs are calculated as generated electricity less diesel consumed in generating. Diesel energy is expressed in kWh for natural consistency. Conversion factor used was (1 MWh/7 2048 gal/MMBtu)*(11 kWh/3.412 Btu).

EROs Contributing the Minimum Life-Cycle Cost Reduction Annualized Value of Costs and Savings

Table 3.8

ERO Category	Equipment	Description of ERO	Pr or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$1993 \$)	Annualized Energy Savings (\$1993 \$)	Annualized Demand Savings (\$1993 \$)	Annualized O&M Savings (\$1993 \$)	Annualized Replacement Savings (\$1993 \$)	Annualized Total Savings (\$1993 \$)	Annualized Net Savings (\$1993 \$)	Savings to Investment Ratio
Non-Generating EROs														
Trans & Dist	CVR	CVR	Pr	MX11w 3		Subm	13	14,697	11,660	0	0	26,277	26,265	2,052.54
Trans & Dist	CVR	CVR	Pr	MX11w 2		Subm	13	6,776	1,366	0	0	8,142	8,151	837.66
Lighting	HPS 200 PEMD	HPS 200 PEMD	Pr	99		Subm	508	8,279	1,296	0	0	20,476	19,968	116.77
Trans & Dist	Transformer	Transformer	Pr	5	1 Pha		102	2,990	147	0	93	3,128	3,128	40.24
Lighting	HPS 400 POLE	HPS 400 POLE	Pr	103		Str Ltg	1,186	12,470	4,203	3,802	0	20,274	19,105	17.34
Trans & Dist	Transformer	Transformer	Pr	7	1 Pha		150	1,800	88	0	136	2,024	1,874	13.53
Trans & Dist	Transformer	Transformer	Pr	8	1 Pha		188	2,019	100	0	171	2,290	2,102	12.19
Trans & Dist	Transformer	Transformer	Pr	6	1 Pha		127	1,057	52	0	116	1,224	1,097	9.61
Motors	Condenser Water Pump	Condenser Water Pump	Pr	14.5	8760		192	1,463	111	10	42	1,622	1,330	7.93
Motors	Cooling Tower Fan	Cooling Tower Fan	Pr	15.5	8760		192	1,463	111	10	42	1,622	1,330	7.93
Lighting	150W INC	CFL 2 15 CER FIXT	Pr	76		C	86	646	614	0	0	1,260	862	7.89
Lighting	90W INC	CFL 2 11 CER FIXT	Pr	42		H	582	3,156	478	31	0	4,252	3,670	7.31
Motors	Condenser Water Pump	VSD to existing mtr	Pr	21.5	6000		357	2,382	262	10	58	2,576	2,220	7.22
Motors	Cooling Tower Fan	VSD to existing mtr	Pr	22.5	6000		357	2,382	262	10	58	2,576	2,220	7.22
Lighting	400W Merc Vapor	HPS 200 PEMD	Pr	100		J	967	6,785	1,064	966	0	6,894	6,917	7.12
Lighting	150W INC	CFL 2 15 CER FIXT	Pr	86		I	262	1,641	373	63	0	1,862	1,590	7.06
Motors	AHU	EEM	Pr	12	8760		58	338	38	0	22	389	341	6.83
Motors	AHU	EEM	Pr	12.5	8760		58	338	38	0	22	389	341	6.83
Lighting	300W INC	HPS 70 PEMD	Pr	90		I	268	1,196	290	325	0	1,811	1,545	6.82
Trans & Dist	Transformer	Transformer	Pr	34	3 Pha		804	4,420	218	0	710	5,347	4,543	8.86
Motors	Condenser Water Pump	VSD to existing mtr	Pr	25.5	5000		232	1,313	180	10	34	1,430	1,198	6.17
Motors	Cooling Tower Fan	VSD to existing mtr	Pr	26.5	5000		232	1,313	180	10	34	1,430	1,198	6.17
Motors	Condenser Water Pump	VSD to existing mtr	Pr	17.5	4000		381	2,071	316	55	20	2,321	1,940	6.09
Motors	Cooling Tower Fan	VSD to existing mtr	Pr	18.5	4000		381	2,071	316	55	20	2,321	1,940	6.09
Lighting	75W INC	CFL 2 11 CER FIXT	Pr	74		H	110	448	116	116	0	631	521	5.76
Lighting	2x50W INC PAR	2 CFL 11 INTEG W REF	Pr	19	8760		38	174	41	2	0	213	176	5.66
Motors	Furnace Fan	EEM	Pr	11		B	87	413	31	0	46	468	401	5.61
Lighting	150W PAR SPOT	HPS 50 FLD	Pr	44		C	66	186	37	146	0	289	289	5.43
Lighting	150W PAR FLOOD	HPS 50 FLD	Pr	43		C	278	720	160	0	0	1,612	1,233	5.43
Lighting	150W INC	CFL 2 15 CER FIXT	Pr	23		B	2,221	9,977	2,345	263	0	12,029	9,818	5.42
Lighting	Transformer	Transformer	Pr	4	1 Pha		77	323	16	0	70	409	332	5.34
Trans & Dist	Circ Pump	HPS 70 PEMD	Pr	17	6000		378	1,411	311	0	298	2,021	1,841	5.33
Motors	300W INC	VSD to existing mtr	Pr	27		B	1,982	6,748	1,566	2,003	0	10,337	8,378	5.27
Motors	Power Ventilator	VSD to existing mtr	Pr	28.5	4000		1,387	5,683	1,612	230	199	7,164	5,797	5.24
Lighting	90W INC	CFL 2 11 CER FIXT	Pr	40		C	619	2,270	503	469	0	3,233	2,814	5.22
Motors	AHU	EEM	Pr	15	6000		29	116	19	0	11	146	117	5.01
Motors	AHU	EEM	Pr	15.5	6000		29	116	19	0	11	146	117	5.01
Trans & Dist	Transformer	Transformer	Pr	9	1 Pha		221	853	42	0	200	1,085	874	4.96
Lighting	150W PAR SPOT	HPS 50 FLD	Pr	88		I	46	104	25	94	0	223	177	4.86
Lighting	150W PAR FLOOD	HPS 50 FLD	Pr	87		I	196	442	107	402	0	950	765	4.86
Motors	Cooling Tower Fan	VSD to existing mtr	Pr	42.5	3200		308	1,118	212	10	167	1,487	1,181	4.86
Motors	Chilled Water Pump	VSD to existing mtr	Pr	16.5	6000		29	116	13	0	11	140	111	4.78
Motors	Circ Pump	EEM	Pr	13			65	202	44	0	65	311	246	4.77
Lighting	150W INC FLOOD	HPS 50 FLD	Pr	104		Str Ltg	198	272	92	0	16	336	298	4.68
Motors	AHU	EEM	Pr	21.5	5000		29	103	19	0	16	137	107	4.68
Motors	AHU	EEM	Pr	21	5000		29	103	19	0	16	137	107	4.68
Lighting	90W INC	CFL 2 11 CER FIXT	Pr	84		I	434	1,383	337	301	0	2,031	1,597	4.68
Motors	Condenser Water Pump	VSD to existing mtr	Pr	18.5	6000		116	511	56	10	18	638	423	4.64
Motors	Cooling Tower Fan	VSD to existing mtr	Pr	19.5	6000		116	511	56	10	18	638	423	4.64
Motors	3x40 T 12	FL2X4 2 18 ELC REF	Pr	38.5	3200		247	856	163	10	134	1,142	896	4.63
Lighting	150W PAR FLOOD	HPS 50 FLD	Pr	80		H	2,412	8,010	1,213	1,829	0	11,051	8,640	4.63
Lighting	150W PAR SPOT	HPS 50 FLD	Pr	62		D	178	370	84	348	0	1,068	824	4.60
Lighting	2x75W INC	CFL 2 15 CER FIXT	Pr	63		D	42	87	20	82	0	198	147	4.50
Motors	Condenser Water Pump	VSD to existing mtr	Pr	35.5	3200		294	2,501	678	1,348	0	4,526	3,518	4.49
Motors	Condenser Fan	EEM	Pr	22	5000		29	105	13	20	38	1,301	1,007	4.42
Lighting	90W INC	CFL 15 CER FIXT	Pr	38		C	1,277	3,682	794	1,267	0	6,833	4,358	4.41
Motors	Condenser Water Pump	VSD to existing mtr	Pr	41.5	3200		298	1,101	208	10	42	1,258	971	4.37
Motors	AHU	EEM	Pr	23.5	5000		140	466	84	0	68	611	470	4.35
Motors	AHU	EEM	Pr	23	5000		47	163	28	0	23	204	167	4.35
Motors	2x75W INC	CFL 2 15 CER FIXT	Pr	64		G	1,692	3,817	1,135	2,186	0	7,247	5,666	4.28
Lighting	90W INC	CFL 2 11 CER FIXT	Pr	50		D	396	1,188	266	266	0	1,891	1,295	4.27
Lighting	100W INC	CFL 2 15 CER FIXT	Pr	78		H	637	3,468	524	1,265	0	2,716	2,080	4.27
Motors	AHU	EEM	Pr	14.5	6000		28	76	12	0	21	109	83	4.23

Table 3.8
EROs Constituting the Minimum Life Cycle Cost Resource Annualized Value of Costs and Savings

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$1993 \$)	Annualized Energy Savings (\$1993 \$)	Annualized Demand Savings (\$1993 \$)	Annualized O&M Savings (\$1993 \$)	Annualized Replace. Savings (\$1993 \$)	Annualized Total Savings (\$1993 \$)	Annualized Net Savings (\$1993 \$)	Savings to Investment Ratio
Motors	AHU	EEM	Ri	20.5	8000		177	578	95	0	68	740	563	4.18
Motors	AHU	EEM	Ri	20	6000		89	289	48	0	33	370	281	4.18
Lighting	200W INC	HPS 50 PEND	Ri	89			1 108	3 096	760	778	0	4 823	3 616	4.17
Motors	Chilled Water Pump	EEM	Ri	23.6	8000	I	102	347	38	0	37	423	321	4.16
Lighting	4x40 T 12	FL 2x4 J TB ELC REF	Ri	81			4 948	16 888	2 406	2 187	0	20 479	16 631	4.14
Motors	Condenser Water Pump	VSD to existing mtr	Ri	38.6	3200	H	232	841	180	0	34	967	726	4.13
Motors	AHU	EEM	Ri	9	8780		19	65	7	0	8	78	69	4.12
Motors	AHU	EEM	Ri	9.5	8780		19	65	7	0	8	78	69	4.12
Motors	Power Ventilator	VSD to existing mtr	Ri	27.5	4000		316	1 012	292	60	59	1 303	987	4.12
Lighting	75W INC	CFL 2 11 CEIL FIXT	Ri	39		C	17 322	47 680	10 689	12 866	0	71 084	63 782	4.10
Trans & Dist	Transformer	Amorphous	ROF		1-Ph		81	184	9	0	58	249	188	4.08
Motors	POWER VENT	EEM	Ri	27	4000		65	154	44	0	65	284	198	4.04
Motors	AHU	EEM	Ri	17	5000		44	128	23	0	22	174	130	3.99
Motors	Furnace Fans	EEM	Ri	10	8780		171	587	44	0	61	883	612	3.99
Motors	AHU	EEM	Ri	10.5	4000		146	421	96	0	56	672	428	3.92
Motors	AHU	EEM	Ri	10.5	4000		98	262	58	0	33	343	256	3.92
Motors	AHU	EEM	Ri	17.5	5000		48	111	20	0	63	186	137	3.87
Motors	Condenser Water Pump	VSD to existing mtr	ROF				1 384	4 327	1 263	30	194	5 358	3 972	3.87
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	84.5	2100		481	1 442	388	10	66	1 786	1 324	3.87
Lighting	150W PAR FLOOD	HPS 50 FLD	Ri	85.5	2100		224	387	91	0	21	858	2 898	3.82
Lighting	150W PAR SPOT	HPS 50 FLD	Ri	24		B	956	1 649	388	1 818	0	3 653	2 898	3.82
Motors	Furnace Fans	EEM	Ri	26	8780	B	224	387	91	379	0	858	833	3.82
Trans & Dist	Transformer	Amorphous	ROF		3-Ph		631	1 785	87	0	567	2 409	1 778	3.82
Lighting	2x40 T 12	FL 2x4 2 TB ELC	Ri	32		H	792	2 224	337	431	0	2 991	2 199	3.78
Motors	Chilled Water Pump	EEM	Ri	24.5	5000		63	181	23	0	22	237	174	3.76
Motors	POWER VENT	EEM	Ri	28	4000		308	886	198	0	268	1 142	833	3.70
Lighting	75W INC	CFL 2 11 CEIL FIXT	Ri	83		I	39	96	23	27	0	146	106	3.68
Motors	AHU	EEM	Ri	11.5	4000		182	430	98	0	60	588	428	3.63
Motors	AHU	EEM	Ri	11	4000		81	216	49	0	30	294	213	3.63
Motors	90W INC	CFL 2 11 CEIL FIXT	Ri	21		B	2 123	5 201	1 222	1 234	0	7 658	6 536	3.61
Lighting	2x25W INC EXIT	LED	Ri	37		B	312	815	93	412	0	1 120	808	3.59
Lighting	2x25W INC EXIT	LED	Ri	48		C	91	178	27	120	0	327	238	3.59
Lighting	2x25W INC EXIT	LED	Ri	98		I	84	128	19	84	0	229	166	3.59
Lighting	2x25W INC EXIT	LED	Ri	18		A	332	664	99	439	0	1 192	880	3.59
Lighting	2x25W INC EXIT	LED	Ri	68		D	58	116	17	77	0	209	151	3.59
Lighting	2x25W INC EXIT	LED	Ri	82		H	88	168	26	113	0	307	221	3.59
Lighting	6x40 T 12	FL 2x4 4 TB ELC REF	Ri	35		B	7 199	17 498	4 112	4 203	0	26 812	18 812	3.59
Motors	AHU	EEM	Ri	24.5	3200		148	314	90	0	116	519	373	3.56
Motors	AHU	EEM	Ri	24	3200		98	189	64	0	89	312	224	3.56
Motors	Chilled Water Pump	EEM	Ri	20.5	5000		28	72	9	0	11	91	68	3.55
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	36.5	3200		181	571	109	10	28	642	481	3.55
Motors	Condenser Water Pump	VSD to existing mtr	Ri	31.5	3200		140	438	83	10	17	494	364	3.54
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	32.5	3200		140	438	83	10	17	494	364	3.54
Trans & Dist	Transformer	Amorphous	ROF		3-Ph		456	1 143	58	0	402	1 801	1 148	3.52
Motors	Condenser Water Pump	VSD to existing mtr	Ri	29	2100		381	1 087	316	10	56	1 337	958	3.51
Lighting	4x50W INC PAR	4 CFL 11 INTEGRAL W REF	Ri	81.5		A	2 703	8 908	1 887	654	0	9 427	6 723	3.48
Motors	Condenser Water Pump	VSD to existing mtr	Ri	56.5	2100		518	1 445	418	20	60	1 784	1 288	3.48
Motors	Cooling Twr Fan	EEM	Ri	53.5	4000		391	1 103	319	20	51	1 362	981	3.48
Motors	AHU	EEM	Ri	16.5	4000		203	466	104	0	142	702	489	3.46
Motors	AHU	EEM	Ri	18	4000		102	228	62	0	344	351	249	3.46
Motors	Condenser Fan	EEM	Ri	13	4000		140	377	67	0	60	484	344	3.46
Motors	Condenser Fan	EEM	Ri	12	4000		40	107	16	0	15	139	98	3.43
Motors	Circ. Pump	EEM	Ri	10	8000		456	1 029	227	0	306	1 561	1 104	3.42
Motors	AHU	EEM	Ri	9	4000		44	103	23	0	22	148	106	3.41
Motors	AHU	EEM	Ri	9.5	4000		87	206	47	0	46	296	209	3.41
Motors	AHU	EEM	Ri	8	8000		33	89	16	0	28	113	80	3.39
Motors	Circ. Pump	EEM	Ri	49		D	4 231	8 362	2 118	2 780	0	14 228	9 998	3.36
Lighting	75W INC	CFL 2 11 CEIL FIXT	Ri	25	3200		204	440	84	0	161	686	481	3.36
Motors	BLAST HEATER	EEM	Ri	102		Sir Ltg	1 764	4 464	1 501	74	0	5 881	4 127	3.35
Lighting	250W MERC	HPS 100 POLE	Ri	41		C	677	2 486	551	784	0	2 242	1 664	3.31
Lighting	100W INC	CFL 2 15 CEIL FIXT	Ri	11.5			44	78	22	0	43	144	100	3.30
Motors	AHU	EEM	Ri	11	3200		22	39	11	0	22	72	50	3.30
Motors	AHU	EEM	Ri	8	8000		19	43	7	0	13	63	44	3.30
Motors	AHU	EEM	Ri	33.5	3200		516	1 014	289	0	391	1 884	1 180	3.29
Motors	AHU	EEM	Ri	33	3200		234	461	131	0	178	770	638	3.29
Motors	AHU	EEM	Ri	62.5	2100		818	2 176	630	20	113	2 672	1 853	3.26
Lighting	Cooling Twr Fan	VSD to existing mtr	Ri	28		B	8 182	17 488	4 106	5 079	0	28 650	18 488	3.26
Lighting	200W INC	HPS 50 PEND	Ri											

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Resource: Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (1993 \$)	Annualized Energy Savings (1993 \$)	Annualized Demand Savings (1993 \$)	Annualized O&M Savings (1993 \$)	Annualized Replic. Savings (1993 \$)	Annualized Total Savings (1993 \$)	Annualized Net Savings (1993 \$)	Savings to Investment Ratio
Lighting	150W INC.	CFL 2 15 CEIL FIXT	Ri	8		A	248	815	188	17	0	798	550	3.22
Motors	Condensate Pump	EEM	Ri	12	3200		22	39	7	0	22	68	46	3.13
Motors	Chilled Water Pump	EEM	Ri	26	3200		29	67	13	0	11	81	62	3.12
Motors	Chilled Water Pump	EEM	Ri	26.5	3200		58	135	26	0	22	182	124	3.12
Motors	Condenser Fan	EEM	Ri	27	3200		29	67	13	0	11	91	62	3.12
Motors	Condenser Water Pump	EEM	Ri	28	3200		29	67	13	0	11	91	62	3.12
Motors	Cooling Tower Fan	EEM	Ri	29	3200		29	67	13	0	11	91	62	3.12
Motors	AHU	EEM	Ri	15.5	4000		164	304	69	0	108	479	325	3.11
Motors	AHU	EEM	Ri	15	4000		77	162	35	0	53	240	163	3.11
Motors	AHU	EEM	Ri	30.5	3200		121	258	74	0	45	378	255	3.10
Motors	Chilled Water Pump	EEM	Ri	18.5	3200		40	88	26	0	16	125	85	3.10
Motors	EEM	EEM	Ri	11	5000		533	1,007	48	0	48	391	285	3.10
Motors	Cooling Tower Fan	EEM	Ri	57.5	2100		288	723	209	-10	449	1,839	1,108	3.08
Lighting	4x40 T-12	VSD to existing mtr	Ri	48		C	9,667	20,981	4,848	3,842	0	29,252	19,586	3.03
Lighting	100W INC	CFL 2 15 CEIL FIXT	Ri	85		I	475	1,525	369	-485	0	1,429	953	3.01
Motors	BLAST HEATER	EEM	ROF	18	3200		500	844	160	0	477	1,481	982	2.97
Lighting	Condensate Pump	EEM	Ri	15	5000		19	39	5	0	13	58	37	2.98
Motors	3x40 T-12	FL 2X4 2-TB ELC REF	Ri	95		I	21,935	43,013	10,422	11,041	0	84,478	42,541	2.94
Motors	Chilled Water Pump	EEM	Ri	34	3200		47	100	19	0	17	136	90	2.91
Motors	Chilled Water Pump	EEM	Ri	34.5	3200		94	201	38	0	34	273	179	2.91
Motors	Cooling Tower Fan	EEM	Ri	38	3200		47	100	19	0	17	136	90	2.91
Motors	Chilled Water Pump	EEM	Ri	9.5	8000		19	45	5	0	6	55	36	2.91
Motors	Condenser Water Pump	EEM	Ri	11.5	8000		19	45	5	0	6	55	36	2.91
Motors	Cooling Tower Fan	EEM	Ri	12.5	8000		19	45	5	0	6	55	36	2.91
Motors	POWER VENT.	EEM	Ri	24	4000		183	292	84	0	154	530	347	2.89
Lighting	Condenser Water Pump	VSD to existing mtr	Ri	52.5	2100		232	552	160	10	-34	686	438	2.88
Lighting	2x40W INC	CFL 15 CEIL FIXT	Ri	59		G	3,036	4,395	1,273	2,995	0	8,684	5,628	2.85
Lighting	75W INC	CFL 2 11 CEIL FIXT	Ri	20		B	206	378	89	120	0	587	381	2.85
Motors	BLAST HEATER	EEM	Ri	18	3200		540	912	173	0	451	1,538	998	2.84
Motors	BLAST HEATER	EEM	Ri	18.5	3200		1,028	1,737	330	0	859	2,927	1,897	2.84
Lighting	2x60W INC	CFL 2 15 CEIL FIXT	Ri	3		A	5,920	10,679	2,886	3,178	0	16,741	10,821	2.83
Motors	Condenser Fan	EEM	Ri	7	8000		17	38	4	0	7	47	30	2.83
Motors	AHU	EEM	Ri	14	5000		228	486	89	0	68	643	415	2.82
Motors	AHU	EEM	Ri	14.5	5000		418	891	183	0	125	1,178	781	2.82
Motors	AHU	EEM	Ri	36.5	2100		1,188	1,651	717	0	921	3,290	2,122	2.82
Motors	AHU	EEM	Ri	36	2100		584	826	369	0	481	1,645	1,061	2.82
Lighting	FL 2X4 4-40 STD	FL 2X4 3-TB ELC REF + SENSRI	Ri			B	3,792	7,113	1,738	1,752	0	10,801	6,809	2.80
Lighting	FL 2X4 3-40 STD	FL 2X4 2-TB ELC REF + SENSRI	Ri			B	8,322	15,111	3,827	4,322	0	23,280	14,938	2.80
Motors	Condenser Water Pump	VSD to existing mtr	Ri	28.5	3200		116	298	58	-10	-18	325	208	2.79
Motors	Cooling Tower Fan	EEM	Ri	29.5	3200		116	298	58	-10	-18	325	208	2.79
Motors	Furnace Fan	EEM	Ri	4	8760		74	183	12	0	29	204	131	2.77
Lighting	6 8 Amp Series INC	HPS 100 POLE	Ri	101		Str. Ltg	7,420	3,219	1,085	2,397	0	6,700	4,280	2.77
Motors	Condenser Fan	EEM	Ri	13	3200		65	123	23	0	34	180	116	2.76
Motors	Furnace Fan	EEM	Ri	18	3200		131	248	47	0	67	380	229	2.76
Motors	Condenser Water Pump	EEM	Ri	14.5	3200		22	41	8	0	11	80	38	2.78
Motors	Cooling Tower Fan	EEM	Ri	15.5	3200		22	41	8	0	11	80	38	2.78
Trans. & Dist.	Transformer	Amorphous	ROF	36		I	974	1,729	88	0	880	2,875	1,701	2.75
Lighting	4x40 T-12	FL 2X4 3-TB ELC REF	Ri	95			44,989	85,235	20,852	18,257	0	122,144	77,175	2.72
Motors	AHU	EEM	Ri	17.5	3200		51	92	26	0	21	140	88	2.71
Motors	AHU	EEM	Ri	17	3200		28	46	13	0	11	70	44	2.71
Motors	AHU	EEM	Ri	41	2100		486	827	272	0	895	1,315	830	2.71
Motors	2x60W INC	CFL 2 15 CEIL FIXT	Ri	41.5	2100		1,011	1,307	588	0	895	2,740	1,729	2.71
Lighting	100W INC	CFL 2 15 CEIL FIXT	Ri	62		G	12,843	21,615	6,281	8,990	0	34,768	21,923	2.71
Lighting	3x40 T-12	FL 2X4 2-TB ELC REF	Ri	E1		D	434	1,279	280	-398	0	1,173	739	2.70
Motors	Furnace Fan	EEM	Ri	55	5000		5,927	10,682	2,419	2,852	0	16,952	10,026	2.69
Motors	CABINET HEATER	EEM	Ri	18	5000		114	243	30	0	34	307	193	2.69
Motors	Chilled Water Pump	EEM	Ri	5	8760		32	66	5	0	14	85	53	2.67
Motors	Condensate Pump	EEM	Ri	37.5	3200		63	122	23	0	22	188	105	2.66
Motors	Chilled Water Pump	EEM	ROF	27	2100		40	48	14	0	45	107	66	2.66
Motors	Chilled Water Pump	EEM	Ri	43.5	3200		89	188	32	0	33	233	144	2.62
Motors	Chilled Water Pump	EEM	Ri	12	5000		17	33	4	0	7	44	27	2.62
Motors	Furnace Fan	EEM	Ri	13	5000		17	33	4	0	7	44	27	2.62
Motors	Condenser Fan	EEM	Ri	6	8760		32	66	5	0	12	84	52	2.62
Motors	Furnace Fan	EEM	Ri	7	8760		32	66	5	0	12	84	52	2.62
Motors	AHU	EEM	Ri	40.5	3200		77	134	38	0	28	200	123	2.60
Motors	Circ. Pump	EEM	ROF	5	8000		1,081	1,452	320	0	982	2,764	1,693	2.60

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Resources: Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$1993 \$)	Annualized Energy Savings (\$1993 \$)	Annualized Demand Savings (\$1993 \$)	Annualized O&M Savings (\$1993 \$)	Annualized Replace. Savings (\$1993 \$)	Annualized Total Savings (\$1993 \$)	Annualized Net Savings (\$1993 \$)	Savings to Investment Ratio
Motors	Condenser Water Pump	VSD to existing mtr	R	48.5	2100		1,214	2,824	780	-70	-175	3,139	1,924	2.58
Motors	Cooling Twr Fan	VSD to existing mtr	R	49.5	2100		1,395	2,999	868	-80	-203	3,584	2,189	2.57
Lighting	2x40 T-12	FL 2X4 2-T8 ELC	R	84		I	7,204	11,941	2,993	3,832	0	18,466	11,261	2.58
Lighting	1x40 T-12	FL 1X4 1-T8 ELC	R	78		H	12	23	3	5	0	31	19	2.58
Motors	BLAST HEATER	EEM	R	7	4000		152	248	38	0	102	388	238	2.55
Motors	Condensate Pump	EEM	R	7.5	4000		38	497	78	0	204	778	472	2.55
Motors	Chilled Water Pump	EEM	R	8	4000		82	48	9	0	26	97	69	2.56
Motors	Chilled Water Pump	EEM	R	19.5	3200		28	48	9	0	11	86	40	2.54
Motors	Condenser Water Pump	EEM	R	19	3200		28	48	9	0	11	86	40	2.54
Motors	Cooling Twr Fan	EEM	R	21	3200		28	48	9	0	11	86	40	2.54
Motors	Furnace Fans	EEM	R	22	3200		28	48	9	0	11	86	40	2.54
Motors	Condenser Fan	EEM	R	23	3200		208	389	70	0	84	623	318	2.54
Motors	Condenser Water Pump	VSD to existing mtr	R	20	3200		138	28	28	0	32	198	119	2.54
Motors	AHU	EEM	R	47.5	1850		288	588	209	-10	-42	726	437	2.52
Motors	AHU	EEM	R	33	1850		58	86	38	0	48	147	88	2.51
Motors	EXH. FAN	EEM	R	33.5	1850		58	86	38	0	48	147	88	2.51
Motors	FL 2X4 2-40 STD	FL 2X4 2-T8 ELC + SENS	R	25	4000		228	417	120	0	33	570	342	2.50
Lighting	4x40 T-12	FL 2X4 3-T8 ELC REF	R	58		B	828	896	200	388	0	1,595	837	2.48
Lighting	Circ. Pump	EEM	R	3	6000	D	1,904	3,318	761	876	0	4,742	2,839	2.48
Trans. & Dist.	Transformer	VSD to existing mtr	ROF	10	1-Ph:		455	472	104	0	348	924	663	2.49
Motors	Condenser Water Pump	EEM	R	42.5	2100		140	287	83	-10	-402	1,124	670	2.47
Motors	Furnace Fans	EEM	R	191	8780		100	191	14	0	40	344	204	2.46
Lighting	FL 2X4 4-40 STD	FL 2X4 3-T8 ELC REF + SENS	R	3		B	210	344	83	87	0	514	304	2.45
Motors	BLAST HEATER	EEM	R	45	2100		187	242	70	0	142	454	267	2.43
Motors	AHU	EEM	R	6.5	4000		78	130	30	0	23	182	106	2.39
Motors	AHU	EEM	R	6	4000		38	65	15	0	11	81	53	2.39
Lighting	150W PAR FLOOD	HPS 60 FLD	R	8		A	1,018	988	282	1,198	0	2,428	1,413	2.39
Lighting	150W PAR SPOT	HPS 60 FLD	R	10		A	239	227	61	281	0	670	332	2.39
Motors	BLAST HEATER	EEM	ROF	32.5	2100		119	132	38	114	0	284	185	2.38
Motors	POWER VENT.	EEM	ROF	32	4000		71	78	23	0	68	170	99	2.38
Motors	AHU	EEM	R	44.5	2100		14	16	4	0	13	32	18	2.38
Motors	AHU	EEM	R	44	2100		234	330	143	0	84	657	323	2.38
Lighting	2x40 T-12	FL 2X4 2-T8 ELC	R	54			140	188	86	0	60	334	194	2.38
Motors	Cooling Twr Fan	VSD to existing mtr	R	43.5	2100	D	6,372	9,706	2,187	3,184	0	15,086	8,715	2.37
Trans. & Dist.	Transformer	VSD to existing mtr	ROF	27	3-Ph:		288	676	168	-20	-38	883	394	2.37
Lighting	FL 2X4 3-40 STD	FL 2X4 2-T8 ELC REF + SENS	R	26		B	387	590	148	171	0	908	522	2.36
Motors	POWER VENT.	EEM	ROF	26	4000		299	385	105	0	232	702	403	2.36
Motors	BLAST HEATER	EEM	ROF	8.5	3200		53	68	13	0	41	123	71	2.34
Motors	BLAST HEATER	EEM	ROF	8.5	3200		141	186	36	0	109	329	188	2.34
Motors	Condensate Pump	EEM	ROF	8	3200		18	23	4	0	14	41	24	2.34
Motors	Chilled Water Pump	EEM	R	38.5	2100		29	44	13	0	11	68	39	2.33
Motors	Cooling Twr Fan	EEM	R	39	2100		29	44	13	0	11	68	39	2.33
Motors	Condenser Fan	EEM	R	37	2100		321	496	141	0	122	748	427	2.33
Motors	Furnace Fans	EEM	R	40	2100		88	132	141	0	33	204	116	2.33
Lighting	100W INC	CFL 2-15 CFL FIXT	R	22		B	2,324	5,894	1,338	-1,820	0	6,412	3,088	2.33
Motors	Condensate Pump	EEM	ROF	6	5000		182	201	24	0	160	376	213	2.32
Motors	AHU	EEM	ROF	27	1850		62	71	34	0	68	165	93	2.31
Motors	150W PAR FLOOD	HPS 60 FLD	R	68		G	167	145	80	0	159	384	218	2.31
Motors	150W PAR SPOT	HPS 60 FLD	R	87		G	167	145	80	0	159	384	218	2.31
Motors	AHU	EEM	R	41	1850		94	57	17	0	0	827	364	2.29
Motors	AHU	EEM	R	41.5	1850		187	193	107	0	129	429	242	2.29
Motors	AHU	EEM	R	28.5	2100		22	387	214	0	267	857	483	2.29
Motors	3x40 T-12	FL 2X4 2-T8 ELC REF	R	33		B	42,499	83,877	14,368	18,428	0	97,089	54,570	2.28
Lighting	POWER VENT.	EEM	ROF	23	4000		74	77	22	0	88	187	94	2.27
Motors	BLAST HEATER	EEM	ROF	42	1850		87	88	32	0	78	195	109	2.26
Motors	Power Ventilator	VSD to existing mtr	R	28.5	4000		1,596	3,002	867	-330	48	3,587	1,991	2.26
Motors	AHU	EEM	R	60.5	2100		203	264	116	0	75	454	250	2.23
Motors	Condensate Pump	EEM	R	60	2000		203	264	116	0	75	454	250	2.23
Motors	Condensate Pump	EEM	ROF	45.5	1850		27	31	4	0	25	59	33	2.23
Motors	Cooling Twr Fan	VSD to existing mtr	R	45.5			336	589	217	-20	-46	741	404	2.20
Lighting	FL 2X4 2-40 STD	FL 2X4 2-T8 ELC + SENS	R	21		B	333	488	96	189	0	732	389	2.20
Motors	POWER VENT.	EEM	ROF	1	5000		318	308	89	0	298	698	378	2.19
Motors	CABINET HEATER	EEM	R	387			387	308	89	0	348	645	458	2.18
Motors	Chilled Water Pump	EEM	R	48	2100		47	88	19	0	17	102	55	2.18

Table 3.8
ERDs Constituting the Minimum Life-Cycle Cost Resource: Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$1993 \$)	Annualized Energy Savings (\$1993 \$)	Annualized Demand Savings (\$1993 \$)	Annualized O&M Savings (\$1993 \$)	Annualized Repairs Savings (\$1993 \$)	Annualized Total Savings (\$1993 \$)	Annualized Net Savings (\$1993 \$)	Savings to Investment Ratio
Motors	Condenser Fan	EEM	RI	47	2100		374	527	163	0	135	815	440	2.18
Motors	Cooling Tower Fan	EEM	RI	48	2100		187	284	78	0	67	407	220	2.18
Motors	Chilled Water Pump	EEM	RI	46.5	2100		140	188	67	0	50	305	165	2.18
Motors	Condenser Water Pump	EEM	RI	48	2100		140	188	67	0	50	305	165	2.18
Motors	AHU	EEM	RI	50.5	2100		252	322	140	0	98	548	297	2.17
Motors	AHU	EEM	RI	50	2100		128	181	70	0	44	276	148	2.17
Lighting	90W INC	CFL 2.11 CEN FIXT	RI	6			2,258	3,065	828	1,026	0	4,905	2,647	2.17
Motors	Condenser Water Pump	EEM	RI	42	2100	A	40	56	18	0	15	88	47	2.17
Motors	Cooling Tower Fan	EEM	RI	43	2100		40	56	18	0	15	88	47	2.17
Motors	Condenser Fan	EEM	ROF	26.5	1850		16	12	5	0	18	34	19	2.17
Motors	Condenser Water Pump	EEM	ROF	26.5	1850		16	12	5	0	18	34	19	2.17
Motors	Cooling Tower Fan	EEM	ROF	28.5	1850		18	12	5	0	18	34	19	2.17
Motors	AHU	EEM	RI	58	2100		177	220	98	0	66	382	204	2.16
Motors	AHU	EEM	RI	58.5	2100		354	440	191	0	132	763	408	2.15
Trans. & Dist	Transformer	Amorphous	ROF	25	3-Phs.	B	141	188	8	0	129	302	181	2.14
Lighting	4x40 T-12	FL 2X4 3 TB ELC REF	RI	34	3200		91,387	132,353	31,107	31,103	0	194,563	103,178	2.13
Motors	BLAST HEATER	VSD to existing mtr	RI	26.5	2100		2,110	4,188	792	140	0	4,471	2,361	2.12
Motors	Chilled Water Pump	EEM	RI	45.5	2100		1,899	3,377	978	90	0	4,006	2,107	2.11
Motors	Chilled Water Pump	EEM	RI	28	2100		22	27	8	0	11	48	24	2.11
Motors	Condenser Fan	EEM	RI	28.5	2100		22	27	8	0	11	48	24	2.11
Motors	Condenser Water Pump	EEM	RI	29.5	2100		22	27	8	0	11	48	24	2.11
Motors	Cooling Tower Fan	EEM	RI	30.5	2100		22	27	8	0	11	48	24	2.11
Motors	AHU	EEM	ROF	18	2100		185	147	64	0	178	389	205	2.11
Motors	AHU	EEM	RI	31.5	2100		26	30	13	0	11	64	28	2.10
Motors	AHU	EEM	RI	31	2100		26	30	13	0	11	64	28	2.10
Motors	Cooling Tower Fan	EEM	RI	32.5	1850		28	32	12	0	11	64	28	2.10
Motors	Cooling Tower Fan	EEM	RI	32	1850		28	32	12	0	11	64	28	2.10
Trans. & Dist	Transformer	Amorphous	ROF	30	3-Phs.	G	551	634	31	0	488	1,152	601	2.09
Lighting	90W INC	CFL 2.11 CEN FIXT	RI	66			608	787	222	278	0	1,265	667	2.08
Motors	AHU	EEM	RI	4	5000		84	80	16	0	37	133	69	2.08
Motors	Furnace Fan	EEM	RI	4	6000		15	22	2	0	6	31	16	2.08
Motors	AHU	EEM	RI	38.5	1850		121	133	74	0	45	252	130	2.07
Motors	AHU	EEM	RI	38	1850		40	44	25	0	15	84	43	2.07
Motors	CABINET HEATER	EEM	ROF	4	4000		88	88	13	0	82	183	94	2.07
Motors	Condensate Pump	EEM	ROF	5	4000		88	88	13	0	82	183	94	2.07
Lighting	2x40 T-12	FL 2X4 2 TB ELC	RI	32		B	15,688	19,843	4,884	7,830	0	32,336	16,887	2.07
Lighting	2x40 T-12 75W	FL 1X8 2.80 ELC REF	RI	47		C	506	773	171	94	0	1,038	533	2.06
Motors	Cooling Tower Fan	EEM	RI	62	2100		203	264	78	0	75	416	212	2.04
Motors	AHU	EEM	RI	23.5	1850		108	108	58	0	58	220	111	2.02
Motors	AHU	EEM	RI	23	1850		44	42	23	0	22	88	44	2.02
Motors	Condenser Water Pump	EEM	RI	44.5	1850		181	295	109	10	28	385	184	2.02
Motors	AHU	EEM	ROF	19.5	2100		88	78	33	0	68	177	89	2.01
Motors	AHU	EEM	ROF	19	2100		63	46	20	0	41	106	53	2.01
Motors	Lq. Transfer Pump	EEM	ROF	33	1000		1,049	635	851	0	923	2,109	1,060	2.01
Motors	Chilled Water Pump	EEM	RI	34.5	1850		29	35	13	0	11	58	29	2.01
Motors	Chilled Water Pump	EEM	RI	34	1850		29	35	13	0	11	58	29	2.01
Motors	Condenser Water Pump	EEM	RI	38	1850		29	35	13	0	11	58	29	2.01
Motors	Condenser Fan	EEM	RI	36	1850		88	104	38	0	33	178	88	2.01
Motors	CABINET HEATER	EEM	ROF	1	4000		27	24	4	0	25	53	27	2.00
Motors	AHU	EEM	RI	54.5	2100		308	352	153	0	111	616	308	2.00
Motors	AHU	EEM	RI	54	2100		77	88	38	0	28	154	77	2.00
Lighting	1x40 T-12	FL 1X4 1 TB ELC	RI	45		C	12,888	18,077	3,585	5,717	0	25,380	12,884	2.00
Motors	Chilled Water Pump	EEM	RI	61	2100		189	241	70	0	88	377	187	1.99
Motors	Chilled Water Pump	EEM	RI	61.5	2100		378	482	140	0	132	754	376	1.99
Motors	Condenser Water Pump	EEM	RI	18.5	5000		98	188	24	10	16	196	97	1.98
Motors	Cooling Tower Fan	EEM	RI	19.5	5000		99	198	24	10	18	198	97	1.98
Motors	Chilled Water Pump	EEM	RI	69.5	2100		89	110	32	0	33	176	88	1.97
Motors	Condenser Fan	EEM	ROF	2	4000		11	10	1	0	10	21	10	1.97
Motors	Chilled Water Pump	EEM	RI	63.5	2100		378	472	137	0	137	746	388	1.97
Motors	Chilled Water Pump	EEM	RI	63	2100		252	315	81	0	91	497	246	1.97
Motors	Condenser Water Pump	EEM	RI	64	2100		252	315	81	0	91	497	246	1.97
Motors	Chilled Water Pump	EEM	ROF	28.5	1850		19	14	5	0	18	37	18	1.96
Motors	Chilled Water Pump	EEM	ROF	28	1850		19	14	5	0	18	37	18	1.96
Motors	Condenser Fan	EEM	ROF	28	1850		19	14	5	0	18	37	18	1.96
Motors	Condenser Water Pump	EEM	ROF	30.5	1850		19	14	5	0	18	37	18	1.96
Motors	Cooling Tower Fan	EEM	ROF	31.5	1850		19	14	5	0	18	37	18	1.96

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Resource Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	PI or ROF	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$)	Annualized Energy Savings (\$)	Annualized Demand Savings (\$)	Annualized O&M Savings (\$)	Annualized Replicability Savings (\$)	Annualized Total Savings (\$)	Annualized Net Savings (\$)	Savings to Investment Ratio
Motors	AHU	ERM	ROF	3	4000		12	10	2	0	11	23	11	1.98
Trans & Dist	Transformer	Amorphous	ROF	18	1-Phe		804	821	41	0	710	1,572	708	1.96
Motors	AHU	ERM	PI	48	1850		102	104	57	0	37	189	97	1.96
Motors	AHU	ERM	PI	49	1850		102	104	57	0	37	189	97	1.96
Lighting	2x196 T 12 75W	FL 1X8 2.98 ELC	PI	36		8	16,885	20,806	4,843	7,009	0	32,457	16,772	1.96
Motors	AHU	ERM	ROF	14	1850		82	38	21	0	59	119	58	1.94
Motors	Condenser Fan	ERM	PI	3	5000		15	20	2	0	6	28	14	1.94
Motors	Condenser Fan	ERM	PI	33	2100		208	242	70	0	84	387	191	1.93
Motors	Cooling Tower Fan	ERM	PI	34	2100		26	30	9	0	11	50	24	1.93
Motors	Cooling Tower Fan	ERM	PI	34	2100		26	30	9	0	11	50	24	1.93
Motors	Furnace Fan	ERM	PI	10	3200		247	337	64	0	74	475	228	1.92
Motors	Condenser Water Pump	VSD to existing mtr	PI	38	6		116	195	58	-10	18	223	108	1.92
Motors	Furnace Fan	ERM	PI	7	3200		150	189	36	0	62	287	137	1.91
Motors	CABINET HEATER	ERM	PI	5	5000		548	714	87	0	253	1,054	496	1.89
Motors	BLAST HEATER	ERM	ROF	20	2100		176	161	44	0	136	332	156	1.89
Motors	BLAST HEATER	ERM	ROF	20	2100		176	161	44	0	136	332	156	1.89
Motors	Liq. Transfer Pump	ERM	ROF	32	1000		334	288	83	0	259	620	296	1.89
Motors	Chilled Water Pump	ERM	PI	43	1850		658	297	361	0	584	1,242	584	1.89
Motors	Cooling Tower Fan	ERM	PI	45	1850		47	52	19	0	17	88	41	1.87
Motors	Condenser Fan	ERM	PI	40	1850		121	133	49	0	46	227	108	1.87
Motors	CABINET HEATER	ERM	ROF	4	3200		29	23	4	0	27	56	28	1.87
Motors	Condensate Pump	ERM	ROF	6	3200		427	339	64	0	396	799	372	1.87
Lighting	2x196 T 12 75W	CFL 15 CEE FIXT	PI	2		A	5,162	6,338	1,443	2,757	0	9,538	4,377	1.86
Lighting	2x196 T 12 75W	FL 1X8 2.80 ELC REF	PI	97		I	17,235	23,037	5,582	3,231	0	31,849	14,614	1.86
Motors	Air Compressor	ERM	ROF	10	800		24	8	13	0	23	44	20	1.85
Motors	Condenser Fan	ERM	PI	7	5000		16	21	2	0	6	29	13	1.83
Motors	Condenser Water Pump	ERM	PI	8	5000		16	21	2	0	6	29	13	1.83
Motors	Cooling Tower Fan	ERM	PI	9	5000		16	21	2	0	6	29	13	1.83
Motors	Furnace Fan	ERM	PI	10	5000		128	164	20	0	50	234	106	1.83
Motors	Cooling Tower Fan	VSD to existing mtr	PI	39	5		241	388	113	-20	-40	442	201	1.83
Motors	Chilled Water Pump	ERM	PI	55	2100		77	88	26	0	28	141	64	1.83
Motors	Condenser Water Pump	ERM	PI	54	2100		77	88	26	0	28	141	64	1.83
Motors	Condenser Fan	ERM	ROF	17	2100		12	8	2	0	12	22	7	1.83
Motors	Furnace Fan	ERM	ROF	18	2100		38	24	7	0	38	67	30	1.83
Motors	Condensate Pump	ERM	ROF	3	3200		40	29	8	0	37	72	32	1.82
Trans & Dist	Transformer	FL 1X4 1.78 ELC	PI	83		I	111	123	30	48	0	200	90	1.81
Motors	Air Compressor	ERM	ROF	11	800		478	420	21	0	423	894	386	1.81
Motors	Chilled Water Pump	ERM	ROF	19	800		282	102	156	0	250	507	225	1.80
Motors	Condenser Fan	CFL 15 CEE FIXT	PI	61	2100		148	170	49	0	44	263	116	1.78
Lighting	2x196 T 12 75W	FL 1X8 2.80 ELC REF	PI	61		G	6,589	5,404	1,585	2,944	0	9,913	4,315	1.77
Motors	Condenser Fan	ERM	PI	50	1850		102	104	38	0	37	179	76	1.76
Motors	AHU	ERM	PI	48	1850		77	88	38	0	28	136	58	1.75
Motors	Air Compressor	ERM	ROF	12	800		37	13	19	0	33	85	28	1.74
Motors	Chilled Water Pump	ERM	ROF	21	2100		14	10	3	0	11	24	10	1.74
Motors	Condenser Fan	ERM	ROF	22	2100		58	40	12	0	48	97	41	1.74
Motors	Condenser Water Pump	ERM	ROF	23	2100		14	10	3	0	11	24	10	1.74
Motors	Condenser Water Pump	ERM	ROF	23	2100		14	10	3	0	11	24	10	1.74
Motors	Cooling Tower Fan	ERM	ROF	24	2100		14	10	3	0	11	24	10	1.74
Motors	Cooling Tower Fan	ERM	ROF	24	2100		14	10	3	0	11	24	10	1.74
Lighting	75W INC	CFL 2-11 CEE FIXT	PI	4		A	2,017	2,048	653	915	0	3,515	1,488	1.74
Motors	Liq. Transfer Pump	ERM	ROF	25	1000		270	100	122	0	244	467	197	1.73
Motors	Furnace Fan	ERM	ROF	6	3200		118	77	15	0	70	201	86	1.73
Motors	AHU	ERM	ROF	31	5		82	35	32	0	73	141	58	1.72
Motors	Chilled Water Pump	ERM	PI	39	1850		40	48	17	0	6	89	29	1.71
Motors	Chilled Water Pump	ERM	PI	39	1850		40	48	17	0	6	89	29	1.71
Motors	Chilled Water Pump	ERM	PI	48	1850		89	88	32	0	33	151	63	1.71
Motors	BLAST HEATER	ERM	ROF	17	1850		18	12	4	0	14	30	12	1.70
Motors	AHU	ERM	ROF	26	5		37	16	14	0	33	84	26	1.70
Lighting	2x196 T 12 75W	FL 1X8 2.80 ELC REF	PI	57		D	615	754	171	119	0	1,046	431	1.70
Motors	AHU	ERM	ROF	16	1850		28	18	9	0	23	47	19	1.69
Motors	Condenser Fan	ERM	ROF	15	1850		42	23	13	0	34	71	29	1.69
Motors	Transformer	ERM	ROF	21	3-Phe		90	86	7	0	38	82	26	1.69
Trans & Dist	Transformer	Amorphous	PI	13		G	848	801	232	384	0	1,417	571	1.67
Lighting	75W INC	CFL 2-11 CEE FIXT	PI	63			570	1,073	81	-10	-196	949	379	1.67
Motors	Chilled Water Pump	VSD to existing mtr	PI	13			114	183	36	0	10	188	74	1.65
Motors	Condenser Water Pump	VSD to existing mtr	PI	21			114	183	36	-10	-20	188	74	1.65

Table 3.8
EROs Constituting the Maximum Life-Cycle Cost Reduction Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Annualized Increased Cost (\$/1993 \$)	Annualized Energy Savings (\$/1993 \$)	Annualized Demand Savings (\$/1993 \$)	Annualized O&M Savings (\$/1993 \$)	Annualized Reliability Savings (\$/1993 \$)	Annualized Total Savings (\$/1993 \$)	Annualized Net Savings (\$/1993 \$)	Savings to Investment Ratio
Motors	CABINET HEATER	EEM	ROF	11	2100		103	54	16	0	96	165	82	1.80
Motors	Condensate Pump	EEM	ROF	13	2100		501	261	76	0	484	800	298	1.80
Motors	Chilled Water Pump	EEM	ROF	18.5	1850		14	8	3	0	11	22	8	1.58
Motors	Condenser Fan	EEM	ROF	19	1850		26	16	6	0	23	44	16	1.58
Motors	Condenser Water Pump	EEM	ROF	20.5	1850		14	8	3	0	11	22	8	1.58
Motors	Cooling Tower Fan	EEM	ROF	21.6	1850		14	8	3	0	11	22	8	1.58
Motors	Furnace Fan	EEM	ROF	22	1850		181	101	37	0	148	287	104	1.58
Motors	Condensate Pump	EEM	ROF	7	2100		80	38	11	0	75	124	45	1.58
Motors	CABINET HEATER	EEM	ROF	6	2100		331	160	46	0	311	618	186	1.58
Lighting	4x40 T 12	EEM	RI	18		A	3,244	3,148	951	1,081	0	5,080	1,816	1.58
Motors	FL 2X4.4 TB ELC	EEM	RI	37.6	1850		116	153	54	10	18	181	86	1.58
Motors	VSD to existing mtr	EEM	RI	8	2100		11	5	1	0	10	17	6	1.55
Motors	Condenser Water Pump	EEM	ROF	8	2100		11	5	1	0	10	17	6	1.55
Motors	Cooling Tower Fan	EEM	ROF	9	2100		11	5	1	0	10	17	6	1.55
Motors	Furnace Fan	EEM	ROF	10	2100		32	15	4	0	31	50	18	1.55
Motors	Air Compressor	EEM	ROF	11	800		64	18	24	0	59	99	35	1.55
Motors	AHU	EEM	ROF	5	2100		21	8	4	0	20	32	11	1.53
Motors	Air Compressor	EEM	ROF	14	800		88	17	26	0	62	104	36	1.52
Motors	AHU	EEM	ROF	22.5	1000		43	13	12	0	40	65	22	1.52
Motors	Chilled Water Pump	EEM	ROF	12	2100		12	5	1	0	11	17	6	1.50
Motors	Condenser Fan	EEM	ROF	14	2100		47	20	6	0	44	70	23	1.50
Motors	Furnace Fan	EEM	ROF	15	2100		36	15	4	0	33	52	18	1.50
Motors	AHU	EEM	ROF	20.5	1000		19	5	5	0	18	28	9	1.50
Lighting	1x40 T 12	EEM	RI	31		B	251	212	50	112	0	374	123	1.49
Motors	Condenser Water Pump	EEM	ROF	38.5	1850		241	306	113	20	40	358	117	1.48
Motors	CABINET HEATER	EEM	ROF	7	1850		15	8	2	0	14	22	7	1.48
Motors	Condensate Pump	EEM	ROF	9	1850		383	167	58	0	355	589	198	1.48
Motors	Chilled Water Pump	EEM	ROF	27.5	1000		30	10	6	0	27	44	14	1.48
Lighting	4x40 T 12	EEM	RI	73		G	1,595	1,444	418	478	0	2,340	745	1.47
Lighting	BLAST HEATER	EEM	RI	42.5	1850		483	590	217	20	81	706	223	1.46
Motors	100W INC	EEM	RI	7		A	2,472	3,344	904	637	0	3,811	1,338	1.46
Motors	CABINET HEATER	EEM	ROF	2	1850		172	88	24	0	182	251	79	1.46
Motors	Condensate Pump	EEM	ROF	3	1850		53	20	7	0	60	77	24	1.46
Motors	Chilled Water Pump	EEM	ROF	4	1850		11	4	1	0	10	16	6	1.45
Motors	Condenser Fan	EEM	ROF	6	1850		11	4	1	0	10	16	6	1.45
Motors	AHU	EEM	ROF	9.5	800		19	4	5	0	18	27	8	1.45
Motors	Condenser Fan	EEM	ROF	8	800		32	8	4	0	35	46	14	1.44
Motors	AHU	EEM	ROF	13	800		88	17	19	0	62	88	29	1.43
Motors	Condenser Water Pump	EEM	ROF	13.6	800		171	42	48	0	154	244	73	1.43
Motors	Cooling Tower Fan	EEM	ROF	23.6	1000		21	7	4	0	20	30	9	1.42
Motors	Condenser Fan	EEM	ROF	24.5	1000		21	7	4	0	20	30	9	1.42
Motors	Condensate Pump	EEM	ROF	21	1000		38	10	8	0	36	53	16	1.41
Lighting	100W INC	EEM	RI	68		G	885	840	243	165	0	938	273	1.41
Motors	Chilled Water Pump	EEM	ROF	8	1850		23	8	3	0	22	33	10	1.41
Motors	Condenser Fan	EEM	ROF	10	1850		12	4	1	0	11	16	5	1.41
Motors	Condenser Water Pump	EEM	ROF	11	1850		23	8	3	0	22	33	10	1.41
Motors	Cooling Tower Fan	EEM	ROF	12	1850		23	8	3	0	22	33	10	1.41
Motors	Furnace Fan	EEM	ROF	13	1850		12	4	1	0	11	16	5	1.41
Motors	Condenser Water Pump	EEM	RI	15.5	800		232	210	180	10	34	326	96	1.41
Motors	Cooling Tower Fan	EEM	RI	18.5	800		232	210	180	10	34	326	96	1.41
Motors	Chilled Water Pump	EEM	ROF	28.5	1000		34	10	8	0	31	48	14	1.40
Trans & Dist	Transformer	EEM	ROF	28	3-Ph		397	191	9	0	351	551	154	1.38
Motors	Condenser Water Pump	EEM	ROF	29.5	1000		181	178	109	10	28	249	88	1.38
Motors	Cooling Tower Fan	EEM	RI	30.5	1000		181	178	109	10	28	249	88	1.38
Trans & Dist	Transformer	EEM	ROF	33	3-Ph		786	361	17	0	675	1,044	279	1.38
Motors	Chilled Water Pump	EEM	ROF	16	800		58	13	10	0	58	903	240	1.38
Motors	Condenser Fan	EEM	ROF	17.6	800		58	13	10	0	58	903	240	1.38
Motors	FL 2X4.2 TB ELC REF	EEM	RI	18	800		57	13	10	0	51	74	18	1.31
Motors	Transformer	EEM	ROF	16	1-Ph		57	13	10	0	51	74	18	1.31
Motors	Condenser Water Pump	EEM	ROF	1	1000		42	15	1	0	39	64	13	1.31
Motors	3x40 T 12	EEM	ROF	18	1000		176	42	51	0	136	228	53	1.30
Motors	Transformer	EEM	ROF	13	1-Ph		579	220	11	0	511	742	183	1.28
Motors	Air Compressor	EEM	ROF	12	1-Ph		521	184	10	0	480	688	145	1.28
Motors	2x40 T 12	EEM	RI	14	800		545	103	157	0	423	682	137	1.26
Lighting	FL 2X4.2 TB ELC	EEM	RI	14		A	4,092	2,881	773	1,438	0	5,070	978	1.24
Motors	AHU	EEM	ROF	11	1000		12	2	1	0	12	15	3	1.22

Table 3.8
EROs Contributing the Minimum Life-Cycle Cost Resource: Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	PI or POF	ID	Q12	Facility or Facility Number	Annualized Installed Cost (1993 \$)	Annualized Energy Savings (1993 \$)	Annualized Demand Savings (1993 \$)	Annualized O&M Savings (1993 \$)	Annualized Repairs Savings (1993 \$)	Annualized Total Savings (1993 \$)	Annualized Net Savings (1993 \$)	Savings to Investment Ratio
AC		ERR New High Eff. AC Chiller	PI	88		510	9,393	888	823	0	8,383	10,214	1,821	1.22
AC		ERR New High Eff. AC Chiller	PI	80		240	551	88	55	0	512	668	115	1.21
Lighting	2x50W INC PAR	2 CFL 11 INTEG W/REF	PI	80		G	187	121	35	43	0	200	33	1.20
Motors	AHU	EEM	POF	13.6	1000		14	3	2	0	11	17	3	1.20
Motors	AHU	EEM	POF	13	1000		14	3	2	0	11	17	3	1.20
Motors	Condenser Fan	EEM	POF	12	1000		24	3	2	0	24	29	4	1.18
AC		ERR New High Eff. AC Chiller	PI	16		3	22,670	3,842	2,004	0	21,068	28,712	4,042	1.18
Lighting	2x598 T-12 75W	FL 1X8 2 96 ELC	PI	17		A	632	431	118	187	0	714	103	1.18
Lighting	2x540 T-12	FL 2X4 2 18 ELC	PI	72		G	462	301	87	147	0	536	73	1.16
AC		ERR New High Eff. AC Chiller	PI	81		700	10,277	5,875	1,581	0	4,865	11,860	1,613	1.16
Motors	Furnace Fans	EEM	POF	5	800		24	2	2	0	24	28	4	1.16
Motors	BLAST HEATER	EEM	POF	14.5	1000		18	4	3	0	14	20	3	1.16
Motors	BLAST HEATER	EEM	POF	14	1000		18	4	3	0	14	20	3	1.16
AC		ERR New High Eff. AC Chiller	PI	13.4		798	5,881	3,200	880	0	2,684	6,735	874	1.16
Motors	Chilled Water Pump	EEM	POF	15.5	1000		14	3	2	0	11	18	2	1.14
Motors	Condenser Water Pump	EEM	POF	18.5	1000		14	3	2	0	11	18	2	1.14
Motors	Cooling Tower Fan	EEM	POF	17.5	1000		14	3	2	0	11	18	2	1.14
Motors	Furnace Fans	EEM	POF	18	1000		28	5	3	0	23	32	4	1.14
Motors	AHU	EEM	POF	2	1000		10	1	1	0	10	12	1	1.12
Trans. & Dist.	Transformer	Amorphous	POF	22	3-Ph		102	18	1	0	93	112	11	1.11
Motors	Condenser Fan	EEM	POF	6	1000		11	1	1	0	10	12	1	1.10
Motors	Furnace Fans	EEM	POF	6	1000		1194	112	88	0	1,137	1,317	123	1.10
Motors	CABINET HEATER	EEM	POF	3	1000		80	8	5	0	75	89	8	1.10
AC		ERR New High Eff. AC Chiller	PI	82		700	280	51	14	0	241	308	28	1.09
Motors	Furnace Fans	EEM	POF	4	1000		1,855	139	85	0	1,582	1,808	150	1.09
Motors	Furnace Fans	EEM	POF	1	800		408	28	21	0	380	438	30	1.07
Trans. & Dist.	Capacitors	Power Factor Correction to Unit	POF	8		Substation	1,371	1,380	134	-43	0	1,471	101	1.07
Motors	AHU	EEM	POF	7	1000		47	3	3	0	44	50	3	1.07
Trans. & Dist.	Transformer	Amorphous	POF	2	1-Ph		52	7	0	0	48	58	3	1.06
AC		ERR New High Eff. AC Chiller	PI	73		324	1,701	138	85	0	1,581	1,804	103	1.06
Motors	Condensate Pump	EEM	POF	9	1000		74	6	3	0	68	77	4	1.05
Motors	CABINET HEATER	EEM	POF	8	1000		24	2	1	0	23	25	1	1.05
Motors	Condenser Fan	EEM	POF	10	1000		12	1	0	0	11	12	1	1.05
AC		ERR New High Eff. AC Chiller	PI	38		108	278	20	12	0	268	291	12	1.04
Motors	Condenser Fan	EEM	POF	3	800		23	1	1	0	22	24	1	1.03
Motors	Furnace Fans	EEM	POF	4	800		3,226	164	175	0	3,049	3,337	111	1.03
Motors	Condensate Pump	EEM	POF	2	900		15	1	1	0	14	16	0	1.03
AC		ERR New High Eff. AC Chiller	PI	84		272	205	13	7	0	191	211	8	1.03
AC		ERR New High Eff. AC Chiller	PI	54		240	8,383	514	283	0	7,788	8,506	203	1.02
AC		ERR New High Eff. AC Chiller	PI	107		778	430	28	15	0	400	441	19	1.02
AC		ERR New High Eff. AC Chiller	PI	87		504	700	9	5	0	700	714	14	1.02
AC		ERR New High Eff. AC Chiller	PI	27		46	1,088	14	8	0	1,088	1,088	22	1.02
AC		ERR New High Eff. AC Chiller	PI	119		820	280	3	2	0	280	285	5	1.02
AC		ERR New High Eff. AC Chiller	PI	89		787	70	1	0	0	70	71	1	1.02
Non-Generating Subtotals														
							578,122	981,311	238,178	203,541	88,793	1,487,821	908,700	2.57
Generating ERO		DGEN-4	PI	10										
Peak Shave Int	Generator					8,748	11,085	-58,087	173,088	-33,018	0	83,884	72,868	7.57
Total							589,217	905,244	408,248	170,523	88,793	1,571,805	982,568	2.57

1a) Energy savings for Peak shaving EROs are calculated as generated electricity less diesel consumed in generating internal consistency. Conversion factor used was 1 MWh/7,204.6 gallons*110.8 Btu/1MWh*(1 kWh/3,412 Btu).

Table 3.9
EROs Contributing the Minimum Life-Cycle Cost Resource Cumulative Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	PS or NOF	ID	ID2	Facility or Facility Number	Cumulative First Year Energy Savings (\$/yr)	Cumulative First Year Demand Savings (\$/yr)	Cumulative Full Year Energy Savings (\$/yr)	Cumulative Full Year Demand Savings (\$/yr)	Cumulative Net Present Value (\$/yr)	Cumulative Savings to Investment Ratio	Cumulative Discounted Payback Period (Years)	Individual ERO Savings to Investment Ratio
Non-Generating EROs														
Trans & Dist		CVR	PS	ME/line 3		Subm	298,217	540	298,217	540	410,307	2,052.54	0.01	2,052.54
Trans & Dist		CVR	PS	ME/line 2		Subm	432,823	818	432,823	818	537,840	1,345.10	0.01	1,345.10
Lighting		CVR	PS	ME/line 1		Subm	457,884	845	457,884	845	560,793	935.84	0.02	935.84
Lighting	750W INC	HPS 200 PEND	PS	39		Subm	827,446	1,107	827,446	1,107	827,446	1,033.07	0.16	1,033.07
Trans & Dist	Transformer	HPS 200 PEND	NOF	5	1 Pse	Str Ltg	827,446	1,107	827,446	1,107	921,597	91.90	0.17	31.77
Lighting	1600W QUARTZ	HPS 400 POLE	PS	103			900,784	1,889	1,053,459	1,960	1,220,056	43.86	0.36	17.34
Trans & Dist	Transformer	Amorphous	NOF	7	1 Pse		900,784	1,889	1,053,459	1,960	1,220,056	43.86	0.36	17.34
Trans & Dist	Transformer	Amorphous	NOF	8	1 Pse		900,784	1,889	1,053,459	1,960	1,220,056	43.86	0.36	17.34
Trans & Dist	Transformer	Amorphous	NOF	8	1 Pse		900,784	1,889	1,053,459	1,960	1,220,056	43.86	0.36	17.34
Trans & Dist	Transformer	Amorphous	NOF	8	1 Pse		900,784	1,889	1,053,459	1,960	1,220,056	43.86	0.36	17.34
Motors	Cooling Tower Fan	VSD & EEM	PS	15.5	8780		931,641	1,910	1,302,405	2,076	1,299,319	37.43	0.42	9.61
Motors	Condenser Water Pump	VSD & EEM	PS	14.5	8780		942,488	1,931	1,364,120	2,117	1,340,868	35.14	0.44	7.93
Lighting	1600W INC	CFL 2 1/2 CER FIXT	PS	42			974,963	1,958	1,378,575	2,144	1,351,212	32.30	0.47	7.93
Lighting	900W INC	CFL 2 1/2 CER FIXT	PS	76			1,039,878	2,017	1,441,587	2,233	1,408,648	27.96	0.48	7.89
Motors	Condenser Water Pump	VSD to existing mtr	PS	21.5	8000		1,088,814	2,096	1,490,442	2,281	1,443,226	25.96	0.64	7.31
Motors	Cooling Tower Fan	VSD to existing mtr	PS	22.5	8000		1,137,662	2,146	1,538,298	2,330	1,477,904	24.31	0.64	7.22
Lighting	400W Merc Vapor	HPS 200 PEND	PS	100			1,278,642	2,343	1,678,278	2,528	1,670,325	21.00	0.74	7.12
Lighting	1600W INC	CFL 2 1/2 CER FIXT	PS	86			1,304,540	2,413	1,709,174	2,589	1,695,173	20.31	0.77	7.06
Motors	AHU	EEM	PS	12	8780		1,314,353	2,421	1,715,988	2,608	1,600,484	20.17	0.77	7.06
Motors	3000W INC	HPS 70 PEND	PS	12.5			1,328,074	2,433	1,727,709	2,618	1,608,474	19.96	0.77	6.83
Lighting	Transformer	Amorphous	NOF	90			1,349,271	2,487	1,760,906	2,872	1,632,616	19.34	0.81	6.83
Trans & Dist	Cooling Tower Fan	VSD to existing mtr	PS	34	3 Pse		1,349,271	2,487	1,760,906	2,872	1,632,616	19.34	0.81	6.83
Motors	Condenser Water Pump	VSD to existing mtr	PS	28.5	6000		1,374,036	2,516	1,792,543	2,908	1,703,584	17.77	0.89	6.86
Motors	Condenser Water Pump	VSD to existing mtr	PS	25.5	6000		1,388,800	2,548	1,808,146	2,940	1,722,300	17.37	0.90	6.17
Motors	Cooling Tower Fan	VSD & EEM	PS	17.5	4000		1,437,870	2,805	1,848,221	2,984	1,771,317	16.43	0.92	6.17
Lighting	750W INC	CFL 2 1/2 CER FIXT	PS	74	4000		1,479,286	2,867	1,908,838	3,068	1,802,048	16.88	0.96	6.09
Lighting	2x50W INC PAR	CFL 2 1/2 CER FIXT	PS	11			1,488,487	2,879	1,915,948	3,080	1,810,194	16.74	0.98	5.84
Motors	Furnace Fan	EEM	PS	18	8780		1,491,889	2,887	1,919,238	3,087	1,812,534	16.68	1.00	5.81
Lighting	1600W PAR SPOT	HPS 50 FLD	PS	44			1,501,140	2,893	1,928,490	3,093	1,818,205	16.58	1.00	5.81
Lighting	1600W INC	CFL 2 1/2 CER FIXT	PS	43			1,518,288	2,900	1,945,819	3,102	1,823,726	16.50	1.01	5.43
Trans & Dist	Transformer	Amorphous	NOF	23			1,712,551	3,167	2,338,902	3,466	1,996,382	13.11	1.03	6.43
Motors	Circ Pump	HPS 70 PEND	PS	17	1 Pse		1,747,338	3,238	2,391,172	3,466	2,001,854	11.86	1.19	6.42
Lighting	3000W INC	HPS 70 PEND	PS	27	6000		1,878,748	3,531	2,622,581	3,829	2,158,042	12.79	1.22	5.33
Motors	Power Ventilator	VSD to existing mtr	PS	28.5	4000		1,978,205	3,824	2,622,581	3,829	2,158,042	11.86	1.34	5.27
Lighting	900W INC	CFL 2 1/2 CER FIXT	PS	40			2,019,854	3,917	2,688,517	4,223	2,289,436	10.90	1.46	5.24
Motors	AHU	EEM	PS	15.5	6000		2,022,630	3,921	2,698,182	4,227	2,291,285	10.79	1.46	5.01
Trans & Dist	Transformer	Amorphous	NOF	8	1 Pse		2,026,308	3,926	2,715,408	4,231	2,293,086	10.79	1.46	5.01
Lighting	1600W PAR SPOT	HPS 50 FLD	PS	88			2,027,317	3,930	2,717,417	4,251	2,308,753	10.68	1.48	4.98
Motors	Cooling Tower Fan	VSD & EEM	PS	87			2,036,884	3,960	2,725,984	4,278	2,321,318	10.60	1.47	4.88
Motors	Chilled Water Pump	EEM	PS	13	6000		2,080,208	4,003	2,765,068	4,345	2,346,338	10.48	1.48	4.79
Motors	1600W INC FLOOD	HPS 50 FLD	PS	104			2,070,911	4,024	2,761,011	4,345	2,346,338	10.48	1.48	4.79
Motors	AHU	EEM	PS	21.5	5000	Str Ltg	2,076,371	4,028	2,765,068	4,345	2,346,338	10.48	1.48	4.79
Motors	900W INC	CFL 2 1/2 CER FIXT	PS	21	5000		2,102,388	4,091	2,792,471	4,353	2,360,220	10.37	1.51	4.69
Lighting	Cooling Tower Fan	VSD to existing mtr	PS	19.5	6000		2,112,797	4,101	2,803,023	4,418	2,386,182	10.21	1.53	4.68
Motors	Condenser Water Pump	VSD to existing mtr	PS	18.5	6000		2,129,773	4,112	2,813,557	4,437	2,391,776	10.18	1.54	4.64
Motors	Cooling Tower Fan	VSD & EEM	PS	38.5	3200		2,204,842	4,368	2,904,993	4,688	2,412,378	10.14	1.54	4.64
Lighting	3x40 T 12	FL 2x4 2 1/2 ELC REF	PS	90			2,308,356	4,372	2,998,707	4,698	2,547,347	9.38	1.55	4.63
Lighting	1600W PAR SPOT	HPS 50 FLD	PS	63			2,313,657	4,398	3,004,007	4,714	2,548,837	9.37	1.57	4.58
Lighting	2x 75W INC	CFL 2 1/2 CER FIXT	PS	52			2,344,322	4,514	3,064,873	4,838	2,614,345	9.32	1.68	4.50
Motors	Condenser Fan	VSD to existing mtr	PS	36.5	3200		2,386,838	4,557	3,078,251	4,883	2,630,079	9.09	1.72	4.48
Lighting	600W INC	CFL 1/2 CER FIXT	PS	22	6000		2,457,102	4,704	3,147,517	4,963	2,631,638	9.02	1.73	4.42
Motors	Condenser Water Pump	VSD to existing mtr	PS	38			2,477,938	4,744	3,168,258	5,030	2,688,887	8.76	1.78	4.41
Motors	AHU	EEM	PS	23.5	5000		2,488,212	4,762	3,178,529	5,088	2,714,852	8.70	1.80	4.37
Motors	2x 75W INC	CFL 2 1/2 CER FIXT	PS	23	5000		2,491,637	4,768	3,181,963	5,088	2,722,187	8.67	1.80	4.36
Lighting	900W INC	CFL 2 1/2 CER FIXT	PS	64			2,572,740	4,978	3,283,058	5,305	2,811,419	8.66	1.80	4.35
Lighting	1000W INC	CFL 2 1/2 CER FIXT	PS	76			2,586,783	5,029	3,298,078	5,354	2,831,850	8.29	1.89	4.27
Lighting		CFL 2 1/2 CER FIXT	PS				2,604,938	5,126	3,357,255	5,452	2,864,137	8.19	1.91	4.27

Table 3.9
EROs Constituting the Minimum Life Cycle Cost Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	W or R/F	ID	ID2	Facility or Facility Number	Cumulative First Year Energy Savings (\$/kW)	Cumulative First Year Demand Savings (\$/kW)	Cumulative Full Implementation Energy Savings (\$/kW)	Cumulative Full Implementation Demand Savings (\$/kW)	Cumulative Present Value (\$1993 \$)	Cumulative Savings to Investment Ratio	Cumulative Discounted Payback Period (Years)	Individual ERO Savings to Investment Ratio
Motors	AHU	EEM	W	14.5	8000		2,688,764	5,129	3,358,071	5,455	2,895,434	8.19	1.91	4.23
Motors	AHU	EEM	W	20	8000		2,875,996	5,140	3,388,312	5,465	2,889,832	8.17	1.91	4.18
Motors	AHU	EEM	W	20.5	8000		2,890,478	5,191	3,390,796	5,487	2,878,827	8.15	1.92	4.18
Motors	2000W INC	MPS 50 PEND	W	89			2,750,615	5,301	3,440,832	5,627	2,933,541	7.98	1.96	4.17
Motors	Chilled Water Pump	EEM	W	23.5	8000		2,758,205	5,310	3,448,522	5,636	2,928,669	7.97	1.96	4.16
Lighting	4x40 T-12	FL 2X4 3 TB ELC REF	W	81			3,098,203	5,768	3,776,520	6,083	3,181,183	7.38	2.12	4.14
Motors	Condenser Water Pump	VSD to existing mtr	W	38.5	3200		3,102,052	5,787	3,792,398	6,113	3,192,513	7.35	2.12	4.13
Motors	AHU	EEM	W	9	8760		3,103,488	5,788	3,793,832	6,116	3,193,440	7.35	2.13	4.12
Motors	Power Ventilator	VSD to existing mtr	W	9.5	8760		3,104,844	5,790	3,795,278	6,118	3,194,385	7.35	2.13	4.12
Motors	750W INC	CFL 2 11 CER FIXT	W	27.5	4000		3,122,481	5,843	3,812,448	6,171	3,209,779	7.32	2.13	4.12
Trans. & Dist.	Transformer	Amorphous	W	38			4,041,013	7,810	4,732,002	8,138	4,048,862	6.20	2.52	4.10
Motors	POWER VENT	EEM	W	3	1 Phe		4,041,013	7,810	4,741,402	8,143	4,052,583	6.20	2.52	4.08
Motors	AHU	EEM	W	27	4000		4,044,181	7,820	4,744,570	8,162	4,055,891	6.19	2.52	4.04
Motors	Furnace Fans	EEM	W	17	5000		4,048,822	7,825	4,747,210	8,167	4,057,727	6.19	2.52	3.98
Motors	AHU	EEM	W	10	8760		4,059,832	7,834	4,760,271	8,168	4,065,718	6.18	2.53	3.95
Motors	AHU	EEM	W	10.5	4000		4,068,762	7,864	4,768,141	8,188	4,072,389	6.18	2.53	3.92
Motors	AHU	EEM	W	10	4000		4,074,104	7,868	4,774,483	8,198	4,078,369	6.18	2.53	3.92
Motors	Condenser Water Pump	VSD to existing mtr	W	17.5	5000		4,074,104	7,868	4,774,483	8,198	4,078,369	6.18	2.53	3.92
Motors	1500W PAR SPOT	VSD to existing mtr	W	85.5	2100		4,101,294	7,943	4,802,278	8,277	4,109,182	6.04	2.59	3.87
Lighting	1500W PAR FLOOD	MPS 50 FLD	W	81.5	2100		4,182,743	8,178	4,894,005	8,510	4,181,232	6.08	2.54	3.87
Motors	Furnace Fans	EEM	W	25			4,190,203	8,183	4,891,544	8,527	4,171,125	6.08	2.57	3.82
Trans. & Dist.	Transformer	Amorphous	W	24			4,222,400	8,285	4,923,081	8,589	4,213,270	6.04	2.59	3.82
Lighting	2x40 T-12	FL 2X4 2 TB ELC	W	32			4,226,897	8,285	4,927,168	8,589	4,213,270	6.04	2.59	3.82
Motors	POWER VENT	EEM	W	79			4,271,888	8,330	5,003,048	8,706	4,243,240	6.01	2.60	3.82
Motors	750W INC	CFL 2 11 CER FIXT	W	24.5	4000		4,276,948	8,335	5,007,351	8,711	4,280,317	5.98	2.61	3.76
Motors	AHU	EEM	W	8	8760		4,280,478	8,378	5,081,889	8,756	4,283,332	5.97	2.62	3.70
Lighting	2x40 T-12	FL 2X4 2 TB ELC	W	32			4,282,321	8,383	5,083,723	8,766	4,284,995	5.96	2.62	3.68
Motors	POWER VENT	EEM	W	83			4,298,948	8,384	5,088,348	8,768	4,294,314	5.96	2.62	3.63
Motors	AHU	EEM	W	11.5	4000		4,308,198	8,416	5,097,600	8,790	4,304,970	5.96	2.62	3.63
Lighting	2x25W INC EXT	CFL 2 11 CER FIXT	W	21			4,407,482	8,642	5,198,894	9,018	4,391,442	5.87	2.68	3.61
Lighting	2x25W INC EXT	LED	W	37			4,420,134	8,680	5,211,538	9,035	4,404,085	5.86	2.67	3.59
Lighting	2x25W INC EXT	LED	W	18			4,433,582	8,678	5,224,894	9,064	4,417,482	5.84	2.67	3.58
Lighting	2x25W INC EXT	LED	W	58			4,436,365	8,681	5,227,357	9,067	4,419,860	5.84	2.67	3.58
Lighting	2x25W INC EXT	LED	W	98			4,438,643	8,685	5,229,546	9,080	4,422,432	5.84	2.68	3.58
Lighting	2x25W INC EXT	LED	W	82			4,442,009	8,689	5,233,411	9,085	4,425,891	5.83	2.68	3.58
Lighting	2x25W INC EXT	LED	W	48			4,446,887	8,695	5,237,889	9,070	4,428,570	5.83	2.68	3.58
Lighting	2x25W INC EXT	LED	W	36			4,468,382	8,680	5,257,784	9,038	4,428,570	5.83	2.68	3.58
Motors	AHU	EEM	W	24.5	3200		4,793,528	9,480	5,577,784	9,838	4,770,336	5.68	2.89	3.58
Motors	AHU	EEM	W	24	3200		4,797,908	9,480	5,584,930	9,838	4,778,188	5.68	2.89	3.58
Motors	Chilled Water Pump	VSD to existing mtr	W	20.5	6000		4,797,908	9,482	5,584,930	9,838	4,778,188	5.68	2.89	3.58
Motors	Condenser Water Pump	VSD to existing mtr	W	38.5	3200		4,798,323	9,484	5,586,725	9,870	4,779,883	5.68	2.89	3.56
Motors	Condenser Water Pump	VSD to existing mtr	W	32.5	3200		4,810,078	9,514	5,601,514	9,890	4,792,883	5.57	2.89	3.56
Motors	Condenser Water Pump	VSD to existing mtr	W	31.5	3200		4,818,255	9,529	5,608,827	9,905	4,797,883	5.57	2.89	3.56
Trans. & Dist.	Transformer	Amorphous	W	29			4,826,430	9,545	5,618,138	9,921	4,743,434	5.57	2.81	3.54
Motors	Condenser Water Pump	VSD to existing mtr	W	81.5	2100		4,826,430	9,545	5,618,138	9,921	4,743,434	5.57	2.81	3.54
Lighting	4x40 T-12	FL 2X4 4 TB ELC REF	W	61.5			4,848,942	9,603	5,674,516	9,948	4,768,878	5.55	2.81	3.52
Motors	Condenser Water Pump	VSD to existing mtr	W	64.5	2100		4,848,942	9,603	5,674,516	9,948	4,768,878	5.55	2.81	3.52
Motors	Condenser Water Pump	VSD to existing mtr	W	63.5	2100		4,868,853	9,651	5,694,941	10,007	4,781,811	5.54	2.82	3.51
Motors	Condenser Water Pump	VSD to existing mtr	W	63.5	2100		4,868,853	9,651	5,694,941	10,007	4,781,811	5.54	2.82	3.51
Motors	Condenser Water Pump	VSD to existing mtr	W	18	4000		5,036,004	10,029	5,804,161	10,432	4,988,855	5.44	2.87	3.48
Motors	AHU	EEM	W	18.5	4000		5,040,788	10,102	5,809,988	10,491	4,992,855	5.44	2.87	3.48
Motors	Condenser Fan	EEM	W	13	4000		5,062,384	10,128	5,832,385	10,504	4,925,958	5.43	2.88	3.46
Motors	Condenser Fan	EEM	W	12	4000		5,080,807	10,140	5,850,594	10,543	4,938,721	5.42	2.88	3.46
Motors	Circ. Pump	EEM	W	10	6000		5,082,915	10,143	5,852,896	10,548	4,940,258	5.42	2.88	3.43
Motors	AHU	EEM	W	8	4000		5,088,880	10,191	5,858,881	10,584	4,946,258	5.41	2.88	3.43
Motors	AHU	EEM	W	9.5	4000		5,088,792	10,188	5,858,881	10,584	4,946,258	5.41	2.88	3.42
Motors	AHU	EEM	W	8	6000		5,082,016	10,205	5,852,773	10,608	4,940,429	5.40	2.88	3.41
Motors	AHU	EEM	W	8	6000		5,082,016	10,205	5,852,773	10,608	4,940,429	5.40	2.88	3.41
Motors	CFL 2 11 CER FIXT	EEM	W	49			5,278,901	10,603	6,138,882	11,005	5,119,854	5.29	2.95	3.38
Motors	BLU-EST HEATER	EEM	W	25	3200		5,278,901	10,603	6,138,882	11,005	5,119,854	5.29	2.95	3.36
Lighting	MPS 100 POLE	CFL 2 11 CER FIXT	W	102			5,398,515	10,901	6,238,488	11,304	5,127,387	5.24	2.98	3.35
Lighting	1000W INC	CFL 2 11 CER FIXT	W	41			5,434,483	11,000	6,284,394	11,408	5,178,271	5.22	2.98	3.31
Motors	AHU	EEM	W	11	3200		5,436,248	11,000	6,284,394	11,408	5,178,271	5.22	2.98	3.30
Motors	AHU	EEM	W	11.5	3200		5,438,837	11,012	6,288,919	11,413	5,178,818	5.22	2.98	3.30
Motors	AHU	EEM	W	8.5	6000		5,437,927	11,012	6,288,919	11,413	5,178,818	5.22	2.98	3.30
Motors	AHU	EEM	W	33.5	3200		5,482,035	11,089	6,312,816	11,453	5,237,728	5.21	2.99	3.28
Motors	AHU	EEM	W	33	3200		5,472,983	11,111	6,322,974	11,513	5,248,182	5.21	3.00	3.28

Table 3.9
EEOs Containing the Minimum Life Cycle Cost Elements: Cumulative Annual Energy and Demand Reductions

EEO Category	Equipment	Description of EEO	W or REF	ED	ED2	Facility or Number	Cumulative First Year Energy Savings kBtu/yr	Cumulative First Year Demand Reduction kW/yr	Cumulative First Year Energy Savings kBtu/yr	Cumulative First Year Demand Reduction kW/yr	Cumulative Present Value (\$1993 \$)	Cumulative Savings to Investment Rate	Cumulative Present Value (\$1993 \$)	Individual EEO Savings to Investment Rate
Motors	Cooling Tower Fan	VSD to existing unit	RE	82.5	2100		5,514,017	11,228	6,384,003	11,821	5,276,056	5.19	5,276,056	3.28
Lighting	1500W BIC	MPS 50 PENDING	RE	26		B	5,854,127	11,982	6,204,113	12,386	5,643,674	6.01	5,643,674	3.28
Motors	Condensate Pump	CFL 2 15 CER FIXT	RE	32	3200	A	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Fan	EEM	RE	27	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Cooling Tower Fan	EEM	RE	29	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Water Pump	EEM	RE	28	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	26	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	26	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	24.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	15	4000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	15	4000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	30	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	18.5	4000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	11	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	67.5	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	Cooling Tower Fan	VSD to existing unit	RE	48			5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	1000W BIC	CFL 2 15 CER FIXT	RE	86		C	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	BLAST HEATER	EEM	REF	18	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Pump	EEM	RE	15	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	3x40 T 12	FL 2X4 2 TB ELC REF	RE	96		I	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Cooling Tower Fan	EEM	RE	36	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	34	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Cooling Tower Fan	EEM	RE	12.5	6000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Water Pump	EEM	RE	11.5	6000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	9.5	6000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	POWER VENT	EEM	RE	24	4000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	2x40W BIC	VSD to existing unit	RE	62.5	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	75W BIC	CFL 2 11 CER FIXT	RE	20		G	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	BLAST HEATER	EEM	RE	18	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	2x40W BIC	CFL 2 15 CER FIXT	RE	3		A	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Fan	EEM	RE	14.5	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	35	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	25.5	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	FL 2X4 4.40 STD	FL 2X4 3 TB ELC REF + SENSOR	RE	101			5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	FL 2X4 4.40 STD	FL 2X4 2 TB ELC REF + SENSOR	RE	29.5			5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Cooling Tower Fan	VSD to existing unit	RE	28.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Furnace Fan	EEM	REF	4	8700		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	6.6 Amp Series BIC	MPS 100 POLE	RE	101		See 14	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Fan	EEM	RE	13	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Furnace Fan	EEM	RE	16	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Water Pump	EEM	RE	14.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Cooling Tower Fan	EEM	RE	15.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Trans. & Dist	Transformer	Amorphous	REF	35	3-Phase		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	4x40 T 12	FL 2X4 3 TB ELC REF	RE	96		I	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	17	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	17.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	41	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	AMU	EEM	RE	41.5	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	2x40W BIC	CFL 2 15 CER FIXT	RE	62		G	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	1000W BIC	CFL 2 15 CER FIXT	RE	51		D	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Lighting	3x40 T 12	FL 2X4 2 TB ELC REF	RE	65		D	5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Furnace Fan	EEM	RE	16	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	CABINET HEATER	EEM	RE	6	8700		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	REF	37.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Pump	EEM	REF	27	2100		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	43.5	3200		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Furnace Fan	EEM	RE	13	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Chilled Water Pump	EEM	RE	12	5000		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12
Motors	Condensate Fan	EEM	RE	8	8700		5,887,428	12,023	6,711,649	12,428	6,672,189	6.00	6,672,189	3.12

Table 29
EROs Contributing to Maximum Life Cycle Cost Resources: Cumulative Annual Energy and Demand Reductions

[illegible]

Table 3.9
WDOs Considering the Minimum Life-Cycle Cost Measures: Cumulative Annual Energy and General Reductions

[illegible]

Table 3.9
EEOs Contributing the Minimum Life Cycle Cost Reductions: Cumulative Annual Energy and Demand Reductions

EEO Category	Equipment	Description of EEO	PS or RDF	ID	ID2	Facility or Facility Number	Cumulative First Year Energy Savings (kWh)	Cumulative First Year Demand Savings (kW)	Cumulative Full Implementation Energy Savings (kWh)	Cumulative Full Implementation Demand Savings (kW)	Cumulative Net Present Value (\$1993 \$)	Cumulative Displaced Project Power Pct	Individual EEO Savings to Investment Ratio
Motors	Coasting Fan	EEM	RDF	31.6	1860		18,487,763	34,933	17,641,062	37,630	13,172,287	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	30.6	1860		18,487,763	34,933	17,641,134	37,630	13,172,569	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	28.6	1860		18,487,763	34,933	17,641,216	37,630	13,172,851	6.29	1.96
Motors	Condenser Fan	EEM	RDF	29	1860		18,487,763	34,933	17,641,288	37,631	13,173,132	6.29	1.96
Motors	AMU	EEM	RDF	3	4000		18,487,763	34,933	17,641,381	37,631	13,173,414	6.29	1.96
Trans. & Dist.	Transformer	Amorphous	RDF	18	1-Ph		18,487,763	34,933	17,641,429	37,631	13,173,688	6.29	1.96
Motors	AMU	EEM	RDF	49.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	2x596 T 12 76W	EEM	RDF	49.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	FL 1X8 2 96 ELC	RDF	49.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	36	5000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	14	5000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	34	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	34.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	33	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	10	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	30.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	7	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	5	6000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	CABINET HEATER	EEM	RDF	20	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	BLAST HEATER	EEM	RDF	20.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	L: Transfer Pump	EEM	RDF	32	1000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	46	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	43.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	40	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	CABINET HEATER	EEM	RDF	4	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Pump	EEM	RDF	6	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	2x596 T 12 76W	EEM	RDF	97	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	60W INC	EEM	RDF	10	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	7	6000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	8	6000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	8	6000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	10	6000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	30.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	55.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	64	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	17	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	16	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condensate Pump	EEM	RDF	3	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	1x240 T 12	EEM	RDF	93	1-Ph		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Trans. & Dist.	Transformer	Amorphous	RDF	11	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	19	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	84.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	60W INC	EEM	RDF	81	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	50	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	48.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	12	800		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Coasting Fan	EEM	RDF	24	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	23.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Water Pump	EEM	RDF	23	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	21.6	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Condenser Fan	EEM	RDF	22	2100		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	76W INC	EEM	RDF	4	1000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Lq Transfer Pump	EEM	RDF	26	3200		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Furnace Fan	EEM	RDF	6	1000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	31.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	38	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	Chilled Water Pump	EEM	RDF	48.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	BLAST HEATER	EEM	RDF	17.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	28.6	1000		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Lighting	2x596 T 12 76W	EEM	RDF	57	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	FL 1X8 2 80 ELC REF	RDF	18	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96
Motors	AMU	EEM	RDF	18.6	1860		18,487,763	34,933	17,641,520	37,631	13,173,968	6.29	1.96

Table 3.9
ERDs Contributing the Minimum Life-Cycle Cost Reduction Cumulative Annual Energy and Demand Reduction

ERD Category	Equipment	Description of ERD	IR or RPF	ID	ED	Facility or Facility Number	Cumulative First Year Energy Savings (kWh)	Cumulative First Year Demand Savings (kW)	Cumulative Full Year Energy Savings (kWh)	Cumulative Full Year Demand Savings (kW)	Cumulative Present Value (\$1000)	Cumulative Savings to Investment Ratio	Cumulative Discounted Payback Period (Years)	Individual ERD Savings to Investment Ratio
Motors	Condenser Fan Transformer	EEM	RPF	16	1650	G	17,688,173	38,768	18,814,243	40,471	13,808,021	2.84	5.51	1.89
Trans & Dist	75W MC	CFL 2 11 CER FIXT	RPF	21	3 Pks		17,688,173	38,768	18,814,243	40,471	13,808,021	2.84	5.51	1.89
Lighting	Chilled Water Pump	VSD to existing mtr	RPF	63	8760		17,704,762	38,810	18,834,183	40,515	13,818,903	2.83	5.51	1.87
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	13.5	3200		17,727,805	38,825	18,857,038	40,531	13,824,829	2.83	5.51	1.87
Motors	Condenser Water Pump	VSD to existing mtr	RPF	22.5	3200		17,730,995	38,832	18,860,520	40,538	13,826,987	2.83	5.51	1.86
Motors	CABINET HEATER	EEM	RPF	21.5	3200		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	11	2000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	VSD to existing mtr	RPF	13	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	18.5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Water Pump	VSD to existing mtr	RPF	21.5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Fan	EEM	RPF	20.5	1650	A	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Furnace Fan	EEM	RPF	19	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	22	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	CABINET HEATER	EEM	RPF	7	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	4x140 T 12	FL 214 4 TB ELC	RPF	22	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	6	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Water Pump	EEM	RPF	18	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	37.5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	8	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Furnace Fan	EEM	RPF	9	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	10	2100	B	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Air Compressor	EEM	RPF	11	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Air Compressor	EEM	RPF	5	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Air Compressor	EEM	RPF	14	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	AHU	EEM	RPF	22.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	AHU	EEM	RPF	22	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	EEM	RPF	12	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Furnace Fan	EEM	RPF	15	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Fan	EEM	RPF	16	2100		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	4x140 T 12	FL 214 4 TB ELC	RPF	20.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Lighting	Condensate Water Pump	EEM	RPF	31	1650	G	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	CABINET HEATER	EEM	RPF	38.5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	7	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	VSD to existing mtr	RPF	8	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	4x140 T 12	FL 214 4 TB ELC	RPF	27.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	BLAST HEATER	EEM	RPF	73	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Lighting	100W MC	CFL 2 15 CER FIXT	RPF	42.5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	3	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	CABINET HEATER	EEM	RPF	2	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	VSD to existing mtr	RPF	5	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	EEM	RPF	4	1650	A	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	AHU	EEM	RPF	6	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Pump	EEM	RPF	9.5	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Fan	EEM	RPF	8	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	AHU	EEM	RPF	13	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	EEM	RPF	12.5	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Water Pump	VSD to existing mtr	RPF	24.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Fan	EEM	RPF	23.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	100W MC	CFL 2 15 CER FIXT	RPF	21	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Lighting	Condensate Pump	EEM	RPF	88	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Fan	EEM	RPF	10	1650	G	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Furnace Fan	EEM	RPF	13	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	EEM	RPF	12	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condensate Water Pump	VSD to existing mtr	RPF	11	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	EEM	RPF	8	1650		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Water Pump	VSD to existing mtr	RPF	15.5	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	EEM	RPF	18.5	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	EEM	RPF	28.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Transformer	EEM	RPF	28	3 Pks		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Cooling Tower Fan	VSD to existing mtr	RPF	30.5	10000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Trans & Dist	Condensate Water Pump	VSD to existing mtr	RPF	29.5	10000	A	17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Transformer	EEM	RPF	33	3 Pks		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Condenser Fan	EEM	RPF	16	1 Pks		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	Chilled Water Pump	EEM	RPF	18	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Motors	3x140 T 12	FL 214 2 TB ELC REF	RPF	17.5	8000		17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
Lighting			RPF	16			17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
			RPF				17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
			RPF				17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
			RPF				17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86
			RPF				17,734,385	38,838	18,864,005	40,544	13,827,146	2.83	5.51	1.86

Table 3.9

EROs Constituting the Minimum Life Cycle Cost Resource Cumulative Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Cumulative First Year Energy Savings (kWh)	Cumulative First Year Demand Savings (kW-mol)	Cumulative Full Implement Energy Savings (kWh)	Cumulative Full Implement Demand Savings (kW-mol)	Cumulative Present Value (\$1000)	Cumulative Savings to Investment Ratio	Cumulative Discounted Payback (Years)	Individual ERO Savings to Investment Ratio
Trans. & Dist	Transformer	Amorphous	ROF	1	1 Phe		17,952,571	40,471	18,132,017	41,235	14,037,488	2.79	5.59	1.31
Motors	Liq. Transformer Pump	EEM	ROF	19	1000		17,952,571	40,471	18,132,215	41,237	14,038,311	2.79	5.60	1.30
Trans. & Dist	Transformer	Amorphous	ROF	13	1 Phe		17,952,571	40,471	18,143,437	41,242	14,040,855	2.79	5.60	1.28
Motors	Transformer	Amorphous	ROF	12	1 Phe		17,952,571	40,471	18,153,444	41,247	14,043,117	2.79	5.60	1.29
Lighting	Air Compressor	EEM	ROF	7	800		17,952,571	40,471	18,153,935	41,254	14,045,284	2.77	5.61	1.26
Motors	2x F40 T 12	FL 2x4 2 TB ELIC	RI	14		A	18,010,530	40,815	18,211,894	41,398	14,080,587	2.77	5.63	1.22
AC	AHU	EEM	ROF	11	1000		18,010,530	40,815	18,211,909	41,398	14,080,587	2.77	5.63	1.22
AC	Small Centrifugal	New High Eff. AC Chiller	RI	88		610	18,107,805	41,393	18,309,153	42,177	14,080,040	2.75	5.68	1.22
AC	Room Window	AC Chiller	RI	60		240	18,138,012	41,554	18,339,391	42,338	14,089,837	2.75	5.68	1.21
Lighting	2x50W INC PAR	2 CFL 11 INTEG W-REF	RI	60		G	18,140,528	41,560	18,341,905	42,344	14,091,357	2.75	5.69	1.20
Motors	AHU	EEM	ROF	13	1000		18,140,528	41,560	18,341,925	42,344	14,091,357	2.75	5.69	1.20
Motors	Condenser Fan	EEM	ROF	13.5	1000		18,140,528	41,560	18,341,944	42,345	14,091,442	2.75	5.69	1.20
AC	Large Centrifugal	New High Eff. AC Chiller	RI	15	1000		18,140,528	41,560	18,341,975	42,345	14,091,442	2.75	5.69	1.18
Lighting	2x F96 T 12 76W	FL 1x8 2 96 ELIC	RI	16		3	19,248,230	47,488	20,449,679	48,253	14,154,652	2.83	5.83	1.18
Lighting	2x F40 T 12	FL 2x4 2 TB ELIC	RI	72		A	19,258,954	47,490	20,459,403	48,274	14,156,254	2.83	5.83	1.16
Motors	Large Reciprocating	New High Eff. AC Chiller	RI	91		G	19,283,195	47,508	20,464,644	48,291	14,157,451	2.83	5.83	1.18
Motors	Furnace Fans	EEM	ROF	5	800		19,492,159	48,117	20,693,608	48,901	14,182,598	2.85	5.90	1.18
Motors	BLAST HEATER	EEM	ROF	14.5	1000		19,492,159	48,117	20,693,633	48,901	14,182,657	2.85	5.90	1.18
Motors	BLAST HEATER	EEM	ROF	14	1000		19,492,159	48,117	20,693,652	48,901	14,182,700	2.85	5.90	1.18
Motors	Large Reciprocating	New High Eff. AC Chiller	RI	114		788	19,621,274	48,481	20,822,787	49,248	14,182,742	2.83	5.93	1.16
Motors	Condenser Water Pump	EEM	ROF	18.5	1000		19,621,274	48,481	20,822,807	49,248	14,182,742	2.83	5.93	1.14
Motors	Cooling Tower Fan	EEM	ROF	17.5	1000		19,621,274	48,481	20,822,827	49,248	14,182,742	2.83	5.93	1.14
Motors	Chilled Water Pump	EEM	ROF	15.5	1000		19,621,274	48,481	20,822,848	49,248	14,182,742	2.83	5.93	1.14
Motors	Furnace Fans	EEM	ROF	18	1000		19,621,274	48,481	20,822,868	49,248	14,182,742	2.83	5.93	1.14
Motors	AHU	EEM	ROF	2	1000		19,621,274	48,481	20,822,888	49,248	14,182,742	2.83	5.93	1.12
Trans. & Dist	Transformer	Amorphous	ROF	22	3 Phe		19,621,274	48,481	20,822,902	49,248	14,182,742	2.83	5.93	1.11
Motors	Condenser Fan	EEM	ROF	5	1000		19,621,274	48,481	20,822,939	49,247	14,182,742	2.83	5.93	1.10
Motors	Furnace Fans	EEM	ROF	6	1000		19,621,274	48,481	20,822,959	49,247	14,182,742	2.83	5.93	1.10
Motors	CABINET HEATER	EEM	ROF	3	1000		19,621,274	48,481	20,822,975	49,247	14,182,742	2.83	5.93	1.10
AC	Small Package	New High Eff. AC Chiller	RI	92		700	19,621,274	48,481	20,822,988	49,247	14,182,742	2.83	5.93	1.09
Motors	Furnace Fans	EEM	ROF	4	1000		19,621,274	48,481	20,822,992	49,247	14,182,742	2.83	5.93	1.09
Motors	Furnace Fans	EEM	ROF	1	800		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.09
Trans. & Dist	Capacitors	Power Factor Correction to Unif. Power	ROF	8		Substr	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.07
Trans. & Dist	AHU	EEM	ROF	7	1000		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.07
Trans. & Dist	Transformer	Amorphous	ROF	2	1 Phe		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.07
AC	Small Reciprocating	New High Eff. AC Chiller	RI	73		324	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.06
Motors	Condenser Pump	EEM	ROF	8	1000		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.06
Motors	CABINET HEATER	EEM	ROF	8	1000		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.06
Motors	Condenser Fan	EEM	ROF	10	1000		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.06
AC	Room/Window	New High Eff. AC Chiller	RI	38		108	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.04
Motors	Condenser Fan	EEM	ROF	3	800		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.03
Motors	Furnace Fans	EEM	ROF	4	800		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.03
Motors	Furnace Fans	EEM	ROF	2	800		19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.03
AC	Room/Window	New High Eff. AC Chiller	RI	64		272	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.03
AC	Small Centrifugal	New High Eff. AC Chiller	RI	58		240	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
AC	Room/Window	New High Eff. AC Chiller	RI	107		778	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
AC	Small Package	New High Eff. AC Chiller	RI	87		504	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
AC	Small Package	New High Eff. AC Chiller	RI	27		46	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
AC	Small Package	New High Eff. AC Chiller	RI	119		820	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
AC	Small Package	New High Eff. AC Chiller	RI	99		787	19,621,274	48,481	20,822,994	49,247	14,182,742	2.83	5.93	1.02
Non-Generating Subtotals							19,875,412	48,707	21,082,818	50,524	14,211,399	2.57	6.07	
Generating ERO	Generator	DGEN 4	RI	4		8748	10,758,388	81,927	11,965,795	82,744	15,350,072	2.87	5.88	7.57
Peak Shave (a)							10,758,388	81,927	11,965,795	82,744	15,350,072	2.87	5.88	
Total														

(a) Energy savings for Peak shaving EROs are calculated as generated electricity less diesel consumed in generating internal consistency Conversion factor used was (1 MBtu/7.2048 gallons)*(10⁶ Btu/1MBtu)*(1 kWh/3.412 Btu).

Table 3.10 EROs Constituting the Minimum Life Cycle Cost Resource: Cumulative Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Cumulative Present Value of Installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Value of Replaces Savings (1993 \$)	Cumulative Present Total Savings (1993 \$)	Cum Present Value (1993 \$)	Net Present Value (1993 \$)	Cumulative Savings SRR	Cum. Discount Period (Years)	Single ERO SRR
Non-Generating EROs																	
Trans. & Dist.	CVR	CVR	RI	MXfmr 3		Substn	200	229,803	190,904	0	0	0	410,507	410,307	2,052.54	0.01	2,052.54
Trans. & Dist.	CVR	CVR	RI	MXfmr 2		Substn	400	335,486	202,554	0	0	0	538,040	537,640	1,345.10	0.01	637.66
Trans. & Dist.	750W INC	HPS 200 PEND	RI	99		Substn	800	354,896	206,498	0	0	0	560,793	560,793	935.86	0.02	116.77
Lighting	Transformer	HPS 200 PEND	ROF	5	1 Phe	Sw Ltg	8,550	484,230	226,784	170,265	0	1,454	881,279	872,729	103.07	0.15	40.24
Lighting	Transformer	HPS 400 POLE	RI	103			10,138	530,943	229,074	170,265	0	1,454	931,735	921,597	91.90	0.17	31.77
Trans. & Dist.	Transformer	Amorphous	RI	1 Phe			28,408	725,743	296,113	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Trans. & Dist.	Transformer	Amorphous	ROF	6	1 Phe		30,746	753,858	296,113	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Trans. & Dist.	Transformer	Amorphous	ROF	8	1 Phe		33,680	785,405	296,113	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Trans. & Dist.	Transformer	Amorphous	ROF	15.5	8760		35,670	801,912	298,480	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	Cooling Tower Fan	VSD & EEM	RI	14.5	8760		41,668	824,771	298,480	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	Condenser Water Pump	VSD & EEM	RI	42			41,668	824,771	298,480	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Lighting	90W INC	CFL 2.15 CEIL FIXT	RI	75		C	41,668	824,771	298,480	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	Condenser Water Pump	VSD to existing mtr	RI	21.5	6000		52,255	857,725	304,173	226,531	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	Cooling Tower Fan	VSD to existing mtr	RI	22.5	6000		57,827	944,283	311,648	235,172	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Lighting	400W Merc Vapor	HPS 200 PEND	RI	100			57,827	944,283	311,648	235,172	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Lighting	150W INC	CFL 2.15 CEIL FIXT	RI	86		J	78,504	1,087,959	336,471	235,172	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	AHU	EEM	RI	12		I	83,511	1,116,881	342,904	235,172	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Motors	300W INC	HPS 70 PEND	RI	90		I	84,879	1,124,792	343,803	235,172	1,454	1,248,464	1,248,464	1,220,056	43.95	0.38	17.34
Trans. & Dist.	Transformer	Amorphous	ROF	34	3 Phe		101,550	1,212,516	351,730	224,028	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Motors	Cooling Tower Fan	VSD to existing mtr	RI	26.5	5000		105,209	1,233,035	354,225	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Motors	Condenser Water Pump	VSD to existing mtr	RI	25.5	5000		108,827	1,253,554	356,719	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Motors	Condenser Water Pump	VSD to existing mtr	RI	17.5	4000		114,779	1,285,907	361,629	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Motors	Cooling Tower Fan	VSD & EEM	RI	14.5	4000		121,129	1,319,309	366,717	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Lighting	75W INC	CFL 2.11 CEIL FIXT	RI	74		H	122,846	1,326,301	367,776	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Lighting	2x50W INC PAR	2-CFL 11 INTEG. W/ REF	RI	19		B	123,434	1,323,021	368,415	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Motors	Furnace Fan	HPS 50 FLD	RI	11		C	124,794	1,335,466	369,902	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Lighting	150W PAR SPOT	HPS 50 FLD	RI	44		C	125,815	1,338,106	369,902	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	43		C	130,165	1,349,351	371,981	223,872	16,900	1,805,174	1,805,174	1,722,300	17.37	0.80	6.65
Lighting	150W INC	CFL 2.15 CEIL FIXT	RI	23		B	164,862	1,505,216	408,614	232,792	14,602	1,973,154	1,973,154	1,823,726	15.58	1.01	5.43
Trans. & Dist.	Transformer	Amorphous	ROF	17	1 Phe		166,059	1,510,259	408,614	232,792	14,602	1,973,154	1,973,154	1,823,726	15.58	1.01	5.43
Motors	Circ Pump	EEM	RI	4			171,987	1,532,295	413,714	232,792	14,602	1,973,154	1,973,154	1,823,726	15.58	1.01	5.43
Lighting	300W INC	HPS 70 PEND	RI	27		B	202,630	1,637,720	438,492	232,792	14,602	1,973,154	1,973,154	1,823,726	15.58	1.01	5.43
Motors	Power Ventilator	VSD to existing mtr	RI	28.5	4000		223,984	1,724,937	463,670	260,488	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	90W INC	CFL 2.11 CEIL FIXT	RI	40		C	233,651	1,760,398	471,534	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	AHU	EEM	RI	15	6000		234,563	1,764,025	472,133	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Trans. & Dist.	Transformer	Amorphous	ROF	9	1 Phe		238,726	1,778,965	473,185	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	150W PAR SPOT	HPS 50 FLD	RI	87		I	241,762	1,785,864	474,856	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	88		I	246,568	1,803,327	478,174	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	Cooling Tower Fan	VSD & EEM	RI	42.5	3200		246,568	1,803,327	478,174	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	Chilled Water Pump	EEM	RI	16.5	6000		247,024	1,805,140	478,374	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	150W INC FLOOD	HPS 50 FLD	RI	13		Sw Ltg	248,044	1,808,295	479,069	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	AHU	EEM	RI	104			251,144	1,812,537	480,459	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	90W INC	CFL 2.11 CEIL FIXT	RI	21.5	5000		251,800	1,814,147	480,793	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	AHU	EEM	RI	21		I	252,056	1,815,757	481,086	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	150W PAR SPOT	HPS 50 FLD	RI	84			258,841	1,837,514	486,358	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	Cooling Tower Fan	VSD to existing mtr	RI	19.5	8000		262,470	1,853,492	488,118	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	Condenser Water Pump	VSD to existing mtr	RI	18.5	8000		266,325	1,864,953	490,657	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Motors	Cooling Tower Fan	VSD & EEM	RI	39.5	3200		267,399	1,869,981	491,981	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	3x40 T-12	FL 2x4 2.18 ELC REF	RI	80		H	267,399	1,869,981	491,981	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	150W PAR SPOT	HPS 50 FLD	RI	53		D	267,399	1,869,981	491,981	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	52		D	267,399	1,869,981	491,981	267,661	23,494	2,472,588	2,472,588	2,248,403	11.04	1.42	5.24
Lighting	2x75W INC	CFL 2.15 CEIL FIXT	RI	5		A	323,195	2,038,199	511,727	344,803	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	Condenser Water Pump	VSD to existing mtr	RI	35.5	3200		327,791	2,056,045	525,179	344,803	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	Condenser Fan	EEM	RI	22	5000		328,247	2,057,888	525,179	344,803	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Lighting	60W INC	CFL 15 CEIL FIXT	RI	38		C	348,196	2,113,646	537,788	364,120	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	Condenser Water Pump	VSD to existing mtr	RI	41.5	3200		352,692	2,130,850	541,057	364,120	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	AHU	EEM	RI	23.5	5000		354,885	2,138,022	542,366	364,120	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	AHU	EEM	RI	23		G	355,616	2,140,412	542,366	364,120	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Lighting	2x75W INC	CFL 2.15 CEIL FIXT	RI	64			382,056	2,201,596	580,525	398,270	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Lighting	90W INC	CFL 2.11 CEIL FIXT	RI	50		H	388,250	2,219,848	584,658	402,310	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Lighting	100W INC	CFL 2.15 CEIL FIXT	RI	76			398,195	2,273,866	572,840	402,310	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	AHU	EEM	RI	14.5	6000		398,557	2,275,037	573,033	402,310	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	AHU	EEM	RI	20	6000		399,981	2,279,557	573,780	402,310	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Motors	AHU	EEM	RI	20.5	6000		420,054	2,288,599	575,274	402,310	32,750	2,937,540	2,937,540	2,614,345	9.09	1.72	4.49
Lighting																	

Table 3.10
EROs Constituting the Minimum Life Cycle Cost Resource. Cumulative Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or DOE	ID	ID2	Facility or Number	Cumulative Present Value of Installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Value of Replication Savings (1993 \$)	Cumulative Present Value of Total Savings (1993 \$)	Cum. Net Present Value (1993 \$)	Cum. Savings SRR	Cum. Payback Period (Years)	Single ERO SRR
Motors	AHU	EEM	RI	9	8760		502,864	2,604,699	627,787	428,707	35,111	3,696,303	3,193,440	7.35	2.13	4.12
Motors	AHU	EEM	RI	9.5	8760		503,161	2,605,718	627,902	428,707	35,200	3,697,527	3,194,366	7.35	2.13	4.12
Motors	Power Ventilator	VSD to existing mtr	RI	27.5	4000		508,104	2,621,528	632,466	427,769	36,120	3,717,884	3,209,779	7.32	2.13	4.10
Lighting	75W INC	CFL 2.11 CEIL FIXT	RI	39		C	778,718	3,366,076	797,580	828,594	36,120	4,828,370	4,095,652	6.20	2.52	4.10
Trans. & Dist	Transformer	Amorphous	ROF	3	1 Phr		779,674	3,368,953	797,719	828,594	37,001	4,832,267	4,052,953	6.19	2.52	4.08
Motors	AHU	EEM	RI	27	4000		780,694	3,371,360	798,414	828,594	38,016	4,836,981	4,055,691	6.19	2.52	4.04
Motors	POWER VENT	EEM	RI	17	5000		781,374	3,373,362	798,780	828,594	38,365	4,839,100	4,057,727	6.19	2.52	3.99
Motors	Furnace Fans	EEM	RI	10	8760		784,047	3,382,532	799,472	828,594	39,167	4,845,718	4,065,718	6.19	2.53	3.99
Motors	AHU	EEM	RI	10.5	4000		785,327	3,389,101	800,970	828,594	40,030	4,858,695	4,072,369	6.18	2.53	3.92
Motors	AHU	EEM	RI	10	4000		787,695	3,393,043	801,969	828,594	40,548	4,864,054	4,076,359	6.18	2.53	3.92
Motors	Cooling Tower Fan	VSD to existing mtr	RI	17.5	5000		788,440	3,394,781	802,186	828,594	41,378	4,866,939	4,078,439	6.17	2.53	3.87
Motors	Condenser Water Pump	VSD to existing mtr	RI	65.5	2100		795,647	3,417,312	808,710	828,594	43,700	4,894,829	4,099,182	6.15	2.54	3.87
Lighting	150W PAR SPOT	HPS 50 FLD	RI	64.5	2100		817,268	3,484,304	827,969	828,594	43,700	4,978,500	4,161,232	6.09	2.56	3.87
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	25		B	820,771	3,490,953	829,703	833,895	37,346	4,991,897	4,171,125	6.08	2.57	3.82
Trans. & Dist	Furnace Fans	EEM	RI	24	8760		835,655	3,516,719	835,759	835,759	37,346	5,048,964	4,213,720	6.04	2.59	3.82
Lighting	Transformer	Amorphous	ROF	8	3 Phr		836,475	3,519,192	835,946	835,946	37,668	5,051,946	4,215,471	6.04	2.59	3.82
Lighting	2x40 1.12	FL 2X4 2 TB ELC	RI	32		H	848,337	3,548,771	837,300	837,300	46,375	5,089,587	4,243,249	6.01	2.60	3.82
Motors	Chilled Water Pump	2x40 1.12	RI	79			858,712	3,581,508	842,561	842,561	46,375	5,136,318	4,277,906	5.98	2.61	3.78
Motors	POWER VENT	EEM	RI	24.5	5000		859,658	3,584,498	842,925	842,925	46,718	5,140,014	4,280,317	5.97	2.62	3.75
Lighting	75W INC	CFL 2.11 CEIL FIXT	RI	28	4000		864,522	3,595,216	846,019	846,019	50,745	5,157,853	4,293,332	5.97	2.62	3.70
Motors	AHU	EEM	RI	83		I	865,139	3,596,700	846,378	846,378	50,745	5,160,124	4,294,985	5.96	2.62	3.68
Motors	AHU	EEM	RI	11	4000		866,403	3,600,057	847,144	847,144	51,215	5,164,716	4,298,314	5.96	2.62	3.63
Lighting	90W INC	CFL 2.11 CEIL FIXT	RI	11.5	4000		868,931	3,606,772	848,675	848,675	52,153	5,173,900	4,304,970	5.95	2.62	3.63
Lighting	2x25W INC EXIT	LED	RI	21		B	902,094	3,688,028	867,772	865,582	52,153	5,293,535	4,391,442	5.87	2.66	3.61
Lighting	2x25W INC EXIT	LED	RI	37		B	906,970	3,693,831	869,227	869,227	52,153	5,311,035	4,404,065	5.86	2.67	3.59
Lighting	2x25W INC EXIT	LED	RI	18		A	912,157	3,707,844	870,774	868,878	52,153	5,329,649	4,417,492	5.84	2.67	3.59
Lighting	2x25W INC EXIT	LED	RI	58		D	913,067	3,709,638	871,045	870,081	52,153	5,332,917	4,419,850	5.84	2.67	3.59
Lighting	2x25W INC EXIT	LED	RI	98		I	914,065	3,714,233	871,343	870,359	52,153	5,336,497	4,422,432	5.84	2.67	3.59
Lighting	5x40 1.12	FL 2X4 4 TB ELC REF	RI	48		H	915,401	3,714,233	871,343	870,359	52,153	5,336,497	4,422,432	5.84	2.67	3.59
Motors	AHU	EEM	RI	35		C	916,822	3,717,032	872,185	870,042	52,153	5,341,292	4,425,891	5.83	2.68	3.59
Motors	Chilled Water Pump	EEM	RI	24.5	3200		1,029,288	3,990,358	936,404	770,707	53,952	5,749,623	4,720,335	5.59	2.80	3.59
Motors	AHU	EEM	RI	24	3200		1,031,568	3,995,271	937,805	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Cooling Tower Fan	VSD to existing mtr	RI	20.5	5000		1,032,936	3,998,219	938,045	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Cooling Tower Fan	VSD to existing mtr	RI	36.5	3200		1,033,338	3,998,346	938,045	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Cooling Tower Fan	VSD to existing mtr	RI	32.5	3200		1,038,162	4,008,289	940,477	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Transformer	Amorphous	ROF	31.5	3200		1,040,522	4,015,109	941,777	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Trans. & Dist	Condenser Water Pump	VSD to existing mtr	RI	61.5	2100		1,042,625	4,021,949	943,077	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Lighting	4x50W INC PAR	4-CFL 11 INTEGRAL W. REF	RI	29		A	1,053,578	4,056,795	943,951	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Condenser Water Pump	VSD to existing mtr	RI	1			1,055,811	4,064,689	948,689	770,707	55,032	5,762,903	4,730,693	5.58	2.80	3.56
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		1,103,873	4,187,269	984,570	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.51
Motors	Cooling Tower Fan	EEM	RI	53.5	2100		1,109,986	4,204,505	989,500	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	AHU	EEM	RI	16	4000		1,111,575	4,215,190	991,957	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	Condenser Fan	EEM	RI	16.5	4000		1,114,753	4,215,190	991,957	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	Condenser Fan	EEM	RI	13	4000		1,116,946	4,221,074	992,891	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	Circ Pump	EEM	RI	12	4000		1,117,578	4,222,752	993,147	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	AHU	EEM	RI	10	6000		1,124,706	4,238,823	996,687	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	AHU	EEM	RI	9	4000		1,125,368	4,240,425	997,052	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	AHU	EEM	RI	9.5	4000		1,128,746	4,243,628	997,782	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Motors	Circ Pump	EEM	RI	8	6000		1,127,266	4,244,713	998,022	779,981	58,709	6,010,528	4,896,845	5.48	2.82	3.49
Lighting	CFL 2.11 CEIL FIXT	EEM	RI	49		D	1,193,368	4,390,808	1,031,102	822,785	88,526	6,312,221	5,119,854	5.29	2.96	3.36
Motors	BLAST HEATER	HPS 100 POLE	RI	25			1,196,558	4,397,686	1,032,409	822,785	88,526	6,312,221	5,119,854	5.29	2.96	3.36
Lighting	250W MERC	CFL 2.15 CEIL FIXT	RI	102		C	1,223,964	4,467,259	1,055,860	821,632	71,045	6,415,798	5,127,367	5.23	2.98	3.35
Motors	100W INC	EEM	RI	41			1,234,545	4,506,076	1,064,468	809,228	71,045	6,450,816	5,216,371	5.24	2.98	3.35
Motors	AHU	EEM	RI	11	3200		1,234,885	4,506,076	1,064,468	809,228	71,045	6,450,816	5,216,371	5.24	2.98	3.35
Motors	AHU	EEM	RI	11.5	3200		1,235,565	4,507,905	1,064,969	809,228	72,059	6,454,161	5,218,616	5.22	2.99	3.30
Motors	AHU	EEM	RI	8.5	6000		1,235,862	4,508,574	1,065,100	809,228	72,059	6,454,161	5,218,616	5.22	2.99	3.30
Motors	AHU	EEM	RI	33.5	3200		1,243,903	4,524,414	1,069,611	809,228	72,059	6,454,161	5,218,616	5.22	2.99	3.30
Motors	AHU	EEM	RI	33	3200		1,247,558	4,531,616	1,071,667	809,228	72,059	6,454,161	5,218,616	5.22	2.99	3.30
Motors	Cooling Tower Fan	VSD to existing mtr	RI	62.5	2100		1,260,343	4,595,588	1,081,504	809,228	72,059	6,454,161	5,218,616	5.22	2.99	3.30
Lighting	200W INC	HPS 50 PEND	RI	26		B	1,368,159	4,836,445	1,145,632	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Condensate Pump	CFL 2.15 CEIL FIXT	RI	8		A	1,392,032	4,848,051	1,148,229	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Condensate Pump	EEM	RI	12	3200		1,392,372	4,848,051	1,148,229	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Condensate Fan	EEM	RI	27	3200		1,392,828	4,848,051	1,148,229	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Cooling Tower Fan	EEM	RI	29	3200		1,393,284	4,850,763	1,148,544	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Condenser Water Pump	EEM	RI	28	3200		1,393,740	4,851,814	1,148,944	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Chilled Water Pump	EEM	RI	26	3200		1,394,196	4,852,865	1,149,143	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	Chilled Water Pump	EEM	RI	26.5	3200		1,395,108	4,854,967	1,149,543	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	AHU	EEM	RI	15	4000		1,396,313	4,857,342	1,150,084	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	AHU	EEM	RI	15.5	4000		1,398,723	4,862,091	1,151,167	888,264	79,392	6,535,398	5,246,102	5.21	3.00	3.29
Motors	AHU	EEM	RI	30.5	3200		1,400,619	4,866,120	1,152,316	888,264	79,392	6,535,398	5,246,102	5.21</		

Table 3.10
EROs Constituting the Minimum Life Cycle Cost Resource Cumulative Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	Rt or ROF	ID	IC2	Facility or Factory Number	Cumulative Present Value of Installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Repairs Savings (1993 \$)	Cumulative Present Total Savings (1993 \$)	Cum. Present Value (1993 \$)	Cum. Net Present Value (1993 \$)	Cum. Payback Period (Years)	Single ERO SR
Motors	AHU	FL 2X4 3 TB ELC REF	RI	11	5000		1,411,541	4,987,873	1,158,279	888,529	91,915	7,024,597	5,613,055	4,98	3.14	3.08
Motors	FL 2X4 3 TB ELC REF		RI	57.5	2100		1,416,038	4,989,163	1,159,548	888,373	91,915	7,024,597	5,613,055	4,98	3.14	3.08
Lighting	100W INC	FL 2X4 3 TB ELC REF	RI	48			1,567,058	5,276,823	1,232,187	945,270	91,260	7,171,539	5,722,308	4,97	3.27	3.03
Lighting	BLAST HEATER	FL 2X4 3 TB ELC REF	RI	95			1,574,484	5,250,439	1,231,937	938,003	91,260	7,171,539	5,722,308	4,97	3.27	3.03
Motors	Condensate Pump	FL 2X4 3 TB ELC REF	ROF	18	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	3x4-40 T 12	FL 2X4 3 TB ELC REF	RI	15	5000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Pump	FL 2X4 3 TB ELC REF	RI	95			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	36	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	34.5	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	12.5	6000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	11.5	6000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	9.5	6000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	POWER VENT	FL 2X4 3 TB ELC REF	RI	24	4000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	52.5	2100		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	FL 2X4 3 TB ELC REF		RI	20			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	FL 2X4 3 TB ELC REF		RI	18			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	BLAST HEATER	FL 2X4 3 TB ELC REF	RI	18.5	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	2x60W INC	FL 2X4 3 TB ELC REF	RI	3			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	Condensate Fan	FL 2X4 3 TB ELC REF	RI	7			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	14	5000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	14.5	5000		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	35	2100		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	FL 2X4 4.40 STD		RI	35.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	FL 2X4 4.40 STD		RI	29.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	28.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	4			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	6.6 Amp Severe INC		RI	101			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	13	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	16	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	14.5	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	15.5	3200		1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	98			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Transform & Dist	Transformer	FL 2X4 3 TB ELC REF	ROF	35			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	4x4-40 T 12	FL 2X4 3 TB ELC REF	RI	98			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	17			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	17.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	41			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	41.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	2x60W INC	FL 2X4 3 TB ELC REF	RI	62			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	100W INC	FL 2X4 3 TB ELC REF	RI	51			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	3x4-40 T 12	FL 2X4 3 TB ELC REF	RI	55			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	16			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	CABINET HEATER	FL 2X4 3 TB ELC REF	RI	5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	37.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	43.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	13			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	12			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	6			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	7			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	40.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Ced. Pump	FL 2X4 3 TB ELC REF	RI	48.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	49.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	78			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	BLAST HEATER	FL 2X4 3 TB ELC REF	RI	8			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	BLAST HEATER	FL 2X4 3 TB ELC REF	RI	7			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	7.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Water Pump	FL 2X4 3 TB ELC REF	RI	21			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	19.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	22			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Chilled Water Pump	FL 2X4 3 TB ELC REF	RI	23			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Furnace Fan	FL 2X4 3 TB ELC REF	RI	20			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	Condensate Fan	FL 2X4 3 TB ELC REF	RI	47.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	33.5			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	AHU	FL 2X4 3 TB ELC REF	RI	33			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Motors	FL 2X4 2.40 STD		RI	25			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97
Lighting	FL 2X4 2.40 STD		RI	RE/SENSED			1,582,299	5,253,623	1,240,442	938,003	98,713	7,540,781	5,958,492	4,77	3.28	2.97

Table 3.10
EROs Constituting the Minimum Life-Cycle Cost Resource

Cumulative Present Value of Costs and Savings																
ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Cumulative Present Value of Installed Cost (\$1993 \$)	Cumulative Present Value of Energy Savings (\$1993 \$)	Cumulative Present Value of Demand Savings (\$1993 \$)	Cumulative Present Value of O&M Savings (\$1993 \$)	Cumulative Present Value of Replication Savings (\$1993 \$)	Cumulative Present Value of Total Savings (\$1993 \$)	Cum. Net Present Value (\$1993 \$)	Cumulative Savings (\$1993 \$)	Cum. Payback Period (Years)	Single ERO SR
Lighting	4x4-40 T-12	FL 2X4 3 T8 ELC REF	RI	56		D	3,660,099	9,053,979	2,191,818	1,811,237	204,779	13,281,812	9,801,712	3,62	4.31	2.49
Motors	Circ. Pump	AMPHOUS	ROF	3	6000		3,665,898	9,061,355	2,193,441	1,811,237	210,219	13,276,252	9,810,353	3,62	4.31	2.49
Transformers	Transformer	VSD to existing mtr	ROF	10	1-Phe		3,673,002	9,072,116	2,193,971	1,811,237	216,492	13,263,817	9,820,816	3,62	4.31	2.47
Motors	Condenser Water Pump	FL 2X4 3 T8 ELC REF + SENSRI	RI	42.5	2100		3,676,182	9,076,605	2,195,271	1,811,081	216,605	13,259,184	9,824,003	3,62	4.32	2.46
Motors	Furnace Fans	FL 2X4 3 T8 ELC REF + SENSRI	RI	3	8760		3,676,750	9,076,590	2,195,496	1,811,081	216,852	13,251,048	9,831,014	3,62	4.32	2.45
Lighting	FL 2X4 4.40 STD	FL 2X4 3 T8 ELC REF + SENSRI	RI	45	2100		3,680,033	9,088,142	2,196,792	1,812,440	218,952	13,241,444	9,838,187	3,62	4.32	2.43
Motors	BLAST HEATER	FL 2X4 3 T8 ELC REF + SENSRI	RI	6	4000		3,682,957	9,088,142	2,196,792	1,812,440	219,253	13,231,566	9,838,015	3,62	4.32	2.39
Motors	AHU	HPS 50 FLD	RI	6.5	4000		3,684,729	9,091,755	2,198,118	1,812,440	219,610	13,222,409	9,837,871	3,62	4.32	2.39
Lighting	150W PAR SPOT	HPS 50 FLD	RI	10			3,688,465	9,091,755	2,198,118	1,812,440	219,610	13,222,409	9,837,871	3,62	4.32	2.39
Motors	150W PAR FLOOD	HPS 50 FLD	RI	32.5	2100		3,704,339	9,110,463	2,203,630	1,835,556	221,384	13,373,690	9,867,493	3,61	4.33	2.39
Motors	BLAST HEATER	FL 2X4 3 T8 ELC REF + SENSRI	ROF	32	2100		3,707,312	9,113,759	2,204,594	1,835,556	222,448	13,376,348	9,869,038	3,61	4.33	2.38
Motors	POWER VENT.	FL 2X4 3 T8 ELC REF + SENSRI	ROF	44.5	2100		3,711,180	9,113,759	2,204,594	1,835,556	222,448	13,376,348	9,869,038	3,61	4.33	2.38
Motors	AHU	FL 2X4 2 T8 ELC	RI	44	2100		3,713,373	9,122,236	2,208,231	1,835,556	223,962	13,365,554	9,874,374	3,61	4.33	2.38
Lighting	2x4-40 T-12	FL 2X4 2 T8 ELC	RI	54			3,812,911	9,273,845	2,242,559	1,885,296	224,750	13,390,773	9,877,400	3,61	4.33	2.38
Motors	Cooling Tower Fan	VSD to existing mtr	RI	43.5	2100		3,817,424	9,282,822	2,245,159	1,884,964	224,750	13,390,773	9,877,400	3,61	4.33	2.38
Transformers	Transformer	FL 2X4 2 T8 ELC REF + SENSRI	ROF	27	3-Phe		3,820,358	9,286,872	2,245,358	1,884,964	226,825	13,644,042	9,873,884	3,57	4.37	2.37
Lighting	FL 2X4 3.40 STD	FL 2X4 2 T8 ELC REF + SENSRI	ROF	26			3,826,398	9,296,032	2,247,670	1,887,652	226,825	13,658,240	9,873,884	3,57	4.37	2.36
Motors	POWER VENT.	FL 2X4 2 T8 ELC REF + SENSRI	ROF	26	4000		3,831,068	9,302,789	2,249,315	1,887,652	230,447	13,689,202	9,873,884	3,57	4.38	2.35
Motors	BLAST HEATER	FL 2X4 2 T8 ELC REF + SENSRI	ROF	8	3200		3,832,165	9,303,231	2,249,315	1,887,652	231,086	13,671,129	9,873,884	3,57	4.38	2.34
Motors	CONDENSATE PUMP	FL 2X4 2 T8 ELC REF + SENSRI	ROF	8.5	3200		3,834,361	9,306,115	2,250,137	1,887,652	233,004	13,676,908	9,873,884	3,57	4.38	2.34
Motors	BLAST HEATER	FL 2X4 2 T8 ELC REF + SENSRI	ROF	36.5	2100		3,834,817	9,306,115	2,250,137	1,887,652	233,004	13,676,908	9,873,884	3,57	4.38	2.34
Motors	Chilled Water Pump	FL 2X4 2 T8 ELC REF + SENSRI	ROF	39	2100		3,835,273	9,306,115	2,250,137	1,887,652	233,004	13,676,908	9,873,884	3,57	4.38	2.34
Motors	Cooling Tower Fan	FL 2X4 2 T8 ELC REF + SENSRI	ROF	37	2100		3,840,269	9,315,062	2,252,733	1,887,652	235,248	13,690,718	9,843,759	3,57	4.38	2.33
Motors	Condenser Fan	FL 2X4 2 T8 ELC REF + SENSRI	ROF	40	2100		3,841,657	9,315,062	2,252,733	1,887,652	235,248	13,690,718	9,843,759	3,57	4.38	2.33
Motors	Furnace Fan	FL 2X4 2 T8 ELC REF + SENSRI	ROF	22			3,847,978	9,317,152	2,253,332	1,887,652	235,786	13,778,444	9,900,485	3,56	4.40	2.33
Lighting	100W INC	CFL 2.15 CEIL FIXT	RI	22			3,847,978	9,317,152	2,253,332	1,887,652	235,786	13,778,444	9,900,485	3,56	4.40	2.33
Motors	Condensate Pump	FL 2X4 2 T8 ELC REF + SENSRI	ROF	6	5000		3,880,491	9,409,237	2,274,619	1,882,343	238,110	13,784,309	9,903,818	3,55	4.40	2.32
Motors	AHU	HPS 50 FLD	ROF	27	1850		3,881,608	9,410,208	2,275,156	1,882,343	239,174	13,788,881	9,905,278	3,55	4.40	2.31
Motors	150W PAR SPOT	HPS 50 FLD	ROF	27.5			3,884,207	9,412,387	2,276,867	1,882,343	241,658	13,792,864	9,908,677	3,55	4.40	2.29
Lighting	150W PAR FLOOD	HPS 50 FLD	ROF	68	1850		3,885,210	9,412,387	2,276,867	1,882,343	241,658	13,792,864	9,908,677	3,55	4.40	2.29
Motors	AHU	HPS 50 FLD	ROF	67			3,889,482	9,420,187	2,279,737	1,888,386	241,658	13,804,378	9,915,496	3,55	4.40	2.29
Motors	AHU	HPS 50 FLD	ROF	41	1850		3,892,408	9,420,187	2,279,737	1,888,386	241,658	13,804,378	9,915,496	3,55	4.40	2.29
Motors	AHU	HPS 50 FLD	ROF	41.5	1850		3,898,554	9,426,228	2,282,776	1,888,386	243,686	13,811,878	9,918,270	3,55	4.40	2.29
Motors	AHU	HPS 50 FLD	ROF	25.5	2100		3,898,554	9,426,228	2,282,776	1,888,386	243,686	13,811,878	9,918,270	3,55	4.40	2.29
Lighting	3x4-40 T-12	FL 2X4 2 T8 ELC REF	ROF	33			4,582,523	10,421,419	2,517,103	2,156,242	247,857	15,342,274	10,779,751	3,36	4.65	2.28
Motors	POWER VENT.	FL 2X4 2 T8 ELC REF	ROF	23	4000		4,583,674	10,422,821	2,517,103	2,156,242	248,522	15,347,941	10,782,915	3,36	4.65	2.27
Motors	BLAST HEATER	FL 2X4 2 T8 ELC REF	ROF	42	1850		4,585,952	10,470,885	2,531,145	2,151,087	250,104	15,347,941	10,782,915	3,36	4.65	2.26
Motors	Power Ventilator	FL 2X4 2 T8 ELC REF	ROF	26.5	2100		4,589,952	10,470,885	2,531,145	2,151,087	250,104	15,347,941	10,782,915	3,36	4.65	2.25
Motors	AHU	HPS 50 FLD	ROF	60	2100		4,596,308	10,479,139	2,534,788	2,151,087	253,192	15,411,080	10,817,330	3,36	4.68	2.23
Motors	Condensate Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	2	5000		4,596,722	10,479,139	2,534,788	2,151,087	253,192	15,411,080	10,817,330	3,36	4.68	2.23
Motors	Cooling Tower Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	45.5			4,601,973	10,488,819	2,538,179	2,150,774	253,580	15,419,072	10,821,350	3,35	4.68	2.23
Lighting	FL 2X4 2.40 STD	FL 2X4 2 T8 ELC REF + SENS	ROF	21	1850		4,607,178	10,488,819	2,538,179	2,150,774	253,580	15,419,072	10,821,350	3,35	4.68	2.23
Motors	POWER VENT.	FL 2X4 2 T8 ELC REF + SENS	ROF	43			4,612,149	10,500,953	2,541,909	2,153,411	252,987	15,420,082	10,824,804	3,35	4.68	2.20
Motors	CABINET HEATER	FL 2X4 2 T8 ELC REF + SENS	ROF	21	5000		4,618,197	10,507,878	2,541,909	2,153,411	252,987	15,420,082	10,824,804	3,35	4.68	2.20
Motors	Chilled Water Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	46	2100		4,618,928	10,508,905	2,542,207	2,153,411	262,971	15,466,167	10,847,970	3,35	4.66	2.19
Motors	Cooling Tower Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	49	2100		4,621,852	10,513,024	2,543,400	2,153,411	263,294	15,467,757	10,848,830	3,35	4.67	2.18
Motors	Chilled Water Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	47	2100		4,627,700	10,521,261	2,545,765	2,153,411	264,285	15,474,120	10,852,268	3,35	4.67	2.18
Motors	Condenser Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	46.5			4,629,893	10,524,350	2,546,679	2,153,411	267,177	15,496,389	10,861,724	3,35	4.67	2.18
Motors	Condensate Water Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	48	2100		4,632,086	10,529,951	2,548,865	2,153,411	268,851	15,509,254	10,868,619	3,34	4.67	2.17
Motors	AHU	HPS 50 FLD	ROF	50	2100		4,634,058	10,534,944	2,550,846	2,153,411	270,023	15,509,254	10,868,619	3,34	4.67	2.17
Motors	AHU	HPS 50 FLD	ROF	50.5			4,637,277	10,542,892	2,563,744	2,153,411	270,023	15,509,254	10,868,619	3,34	4.67	2.17
Lighting	90W INC	CFL 2.11 CEIL FIXT	RI	6			4,673,909	10,582,892	2,563,744	2,153,411	270,023	15,509,254	10,868,619	3,34	4.67	2.17
Motors	Cooling Tower Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	43	2100		4,673,909	10,582,892	2,563,744	2,153,411	270,023	15,509,254	10,868,619	3,34	4.67	2.17
Motors	Condensate Water Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	42	2100		4,674,541	10,584,455	2,564,325	2,153,411	270,492	15,568,619	10,914,078	3,33	4.68	2.17
Motors	Cooling Tower Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	26.5	1850		4,674,789	10,584,455	2,564,325	2,153,411	270,492	15,568,619	10,914,078	3,33	4.68	2.17
Motors	Condensate Water Pump	FL 2X4 2 T8 ELC REF + SENS	ROF	25	1850		4,675,038	10,584,455	2,564,325	2,153,411	270,492	15,568,619	10,914,078	3,33	4.68	2.17
Motors	Condensate Fan	FL 2X4 2 T8 ELC REF + SENS	ROF	24	1850		4,675,286	10,584,455	2,564,325	2,153,411	270,492	15,568,619	10,914,078	3,33	4.68	2.17
Motors	AHU	HPS 50 FLD	ROF	58	2100		4,678,054	10,588,468	2,565,980	2,153,411	271,322	15,590,234	10,914,947	3,33	4.68	2.17
Motors	AHU	HPS 50 FLD	ROF	58.5			4,683,590	10,595,347	2,568,947	2,153,411	272,350	15,596,195	10,918,141	3,33	4.68	2.15
Transformers	Transformer	FL 2X4 3 T8 ELC REF	ROF	25	3-Phe		4,685,794	10,597,946	2,569,074	2,153,411	274,406	15,606,117	10,924,527	3,33	4.69	2.15
Lighting	4x4-40 T-12	FL 2X4 3 T8 ELC REF	ROF	34			4,685,794	10,597,946	2,569,074	2,153,411	274,406	15,606,117	10,924,527	3,33	4.69	2.15
Motors	BLAST HEATER	VSD to existing mtr	RI	25.5	3200		6,113,495	12,665,568	3,065,023	2,653,317	276,415	18,652,323	12,538,868	3,05	5.12	2.13
Motors	BLAST HEATER	VSD to existing mtr	RI	45.5	2100		6,114,420	12,730,852	3,067,389	2,653,317	276,415	18,652,323	12,538,868	3,05	5.12	2.12
Motors	Chilled Water Pump	FL 2X4 3 T8 ELC REF														

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Table 3.10
EROs Constituting the Minimum Life Cycle Cost Resource Cumulative Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Factory Number	Cumulative Present Value of Installed Cost (\$1993 \$)	Cumulative Present Value of Energy Savings (\$1993 \$)	Cumulative Present Value of Demand Savings (\$1993 \$)	Cumulative Present Value of Old Savings (\$1993 \$)	Cumulative Present Replication Savings (\$1993 \$)	Cumulative Present Value of Savings (\$1993 \$)	Cum. Net Present Value (\$1993 \$)	Cumulative Savings (\$1993 \$)	Cum. Discounted Payback Period (Years)	Single ERO SR
Motors	Chilled Water Pump	EEM	RI	55.5	2100		7,408,047	14,302,825	3,458,022	3,071,230	359,648	21,191,726	13,783,680	2,98	5.48	1.83
Motors	Condenser Water Pump	EEM	RI	56	2100		7,409,252	14,304,201	3,458,451	3,071,230	360,083	21,193,935	13,784,683	2,98	5.48	1.83
Motors	Condenser Fan	EEM	ROF	17	2100		7,409,442	14,304,327	3,458,451	3,071,230	360,269	21,194,202	13,784,841	2,98	5.48	1.83
Motors	Furnace Fan	EEM	ROF	18	2100		7,410,011	14,304,704	3,458,566	3,071,230	360,824	21,195,325	13,785,314	2,98	5.48	1.83
Motors	Condensate Pump	EEM	ROF	3	3200		7,410,633	14,305,162	3,458,653	3,071,230	361,407	21,196,453	13,785,820	2,98	5.48	1.82
Lighting	1x40 T-12	FL 1x4 T-12 ELC	RI	93			7,412,363	14,307,078	3,459,116	3,071,980	361,407	21,198,583	13,787,219	2,98	5.48	1.81
Trane & Duct	Transformer	Amorphous	ROF	11	1 Phs		7,412,837	14,311,644	3,459,442	3,071,980	368,008	21,199,584	13,793,237	2,98	5.48	1.81
Motors	Air Compressor	EEM	ROF	19	800		7,424,265	14,315,284	3,461,958	3,071,980	371,919	21,220,951	13,798,746	2,98	5.47	1.80
Motors	Chilled Water Pump	EEM	RI	66.5	2100		7,426,557	14,317,837	3,462,626	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	50W IRC	CFL 15 CFL FIXT	RI	61			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condenser Fan	EEM	RI	50	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	RI	48.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Air Compressor	EEM	ROF	12	800		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	24	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	24.5	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	23.5	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	23.5	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	21.5	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Fan	EEM	ROF	22	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	75W IRC	CFL 2 T-12 CFL FIXT	RI	4			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Liq. Transfer Pump	EEM	ROF	25	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Furnace Fan	EEM	ROF	31.5	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	39	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	39.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	39.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	BLAST HEATER	EEM	ROF	17.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	26.5	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	2x40 T-12 75W	FL 1x8 2.00 ELC REF	RI	57			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	16	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condenser Fan	EEM	ROF	16.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Transformer	EEM	ROF	15	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	75W IRC	Amorphous	RI	63	3 Phs		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	21			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	13.5	8780		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	22.5	3200		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	21.5	3200		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CABINET HEATER	EEM	ROF	11	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	13	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	18.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	21.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Fan	EEM	ROF	20.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Furnace Fan	EEM	ROF	19	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CABINET HEATER	EEM	ROF	22	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Pump	EEM	ROF	7	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CABINET HEATER	EEM	ROF	6	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	4x40 T-12	FL 2x4 4-T8 ELC	RI	37.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	8	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	9	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Cooling Tower Fan	EEM	ROF	10	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Furnace Fan	EEM	ROF	11	800		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Air Compressor	EEM	ROF	5	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	14	900		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	22.5	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	12	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Furnace Fan	EEM	ROF	15	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Fan	EEM	ROF	14	2100		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	AHU	EEM	ROF	20.5	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	1x40 T-12	FL 1x4 T-12 ELC	RI	31			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	36.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CABINET HEATER	EEM	ROF	7	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Pump	EEM	ROF	9	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	27.5	1000		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Chilled Water Pump	EEM	ROF	73			7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Lighting	4x40 T-12	FL 2x4 4-T8 ELC	RI	42.5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CFL 2 T-12 CFL FIXT	EEM	ROF	3	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	CABINET HEATER	EEM	ROF	2	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101	13,798,544	2,98	5.47	1.78
Motors	Condensate Water Pump	EEM	ROF	5	1850		7,431,020	14,322,303	3,467,079	3,071,980	372,807	21,225,101				

Table 3.10
EROs Considering the Minimum Life Cycle Cost Business Condition Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	Rt or Rof	ID	ID2	Facility or Facility Number	Cumulative Present Value of Installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Value of Savings (1993 \$)	Cum. Present Value (1993 \$)	Cum. Present Value (1993 \$)	Current Value \$M	Dec. Payback Period (Years)	Single ERO \$M
Motor	AHU	EEM	ROF	9.5	800		7,768,675	14,654,251	3,557,954	3,154,731	415,184	21,782,120	14,013,445	2.80	5.57	1.44
Motor	Condenser Fan	EEM	ROF	8	800		7,769,172	14,654,340	3,558,021	3,154,731	415,737	21,782,829	14,013,657	2.80	5.57	1.43
Motor	AHU	EEM	ROF	13	800		7,770,240	14,654,852	3,558,320	3,154,731	416,101	21,783,354	14,013,870	2.80	5.57	1.43
Motor	Condenser Fan	EEM	ROF	13.5	800		7,772,311	14,655,007	3,559,067	3,154,731	416,101	21,783,354	14,013,870	2.80	5.57	1.43
Motor	Condenser Fan	EEM	ROF	24.5	1000		7,773,244	14,655,360	3,559,192	3,154,731	419,420	21,788,641	14,015,359	2.80	5.57	1.42
Motor	Condenser Fan	EEM	ROF	23.5	1000		7,773,517	14,655,463	3,559,192	3,154,731	419,730	21,788,641	14,015,359	2.80	5.57	1.42
Lighting	100W INC	EEM	ROF	21	1000		7,774,165	14,655,625	3,559,291	3,154,731	420,259	21,789,546	14,015,781	2.80	5.57	1.41
Motor	Condenser Fan	EEM	ROF	66	1000	G	7,774,556	14,656,000	3,559,390	3,154,731	420,259	21,789,546	14,015,781	2.80	5.57	1.41
Motor	Condenser Fan	EEM	ROF	10	1650		7,784,738	14,668,803	3,563,113	3,152,472	420,471	21,804,602	14,020,048	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	13	1650		7,784,920	14,668,803	3,563,113	3,152,472	420,471	21,804,602	14,020,048	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	12	1650		7,785,264	14,668,966	3,563,181	3,152,472	420,987	21,805,115	14,020,195	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	11	1650		7,785,648	14,669,112	3,563,227	3,152,472	421,331	21,805,628	14,020,344	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	8	1650		7,789,630	14,672,518	3,563,272	3,152,472	421,331	21,806,141	14,020,493	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	15.5	800		7,789,630	14,672,518	3,563,272	3,152,472	421,331	21,806,141	14,020,493	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	16.5	800		7,793,793	14,675,905	3,568,283	3,152,472	420,927	21,816,850	14,022,122	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	28.5	1000		7,793,793	14,675,905	3,568,283	3,152,472	420,927	21,816,850	14,022,122	2.80	5.58	1.41
Motor	Condenser Fan	EEM	ROF	30.5	1000		7,799,981	14,678,546	3,568,303	3,152,472	421,109	21,817,596	14,022,818	2.80	5.58	1.40
Motor	Condenser Fan	EEM	ROF	29.5	1000		7,802,828	14,681,736	3,570,203	3,152,472	421,109	21,817,596	14,022,818	2.80	5.58	1.40
Motor	Condenser Fan	EEM	ROF	33	1000		7,805,628	14,684,925	3,572,169	3,151,847	425,711	21,833,581	14,028,352	2.80	5.58	1.38
Motor	Condenser Fan	EEM	ROF	15	800		7,827,942	14,694,742	3,572,169	3,151,847	425,711	21,833,581	14,028,352	2.80	5.58	1.38
Motor	Condenser Fan	EEM	ROF	18	800		7,828,822	14,694,948	3,572,169	3,151,847	425,711	21,833,581	14,028,352	2.80	5.58	1.38
Motor	Condenser Fan	EEM	ROF	17.5	800		7,830,587	14,695,885	3,572,169	3,151,847	425,711	21,833,581	14,028,352	2.80	5.58	1.38
Motor	Condenser Fan	EEM	ROF	15	800		7,831,240	14,696,121	3,572,169	3,151,847	425,711	21,833,581	14,028,352	2.80	5.58	1.38
Motor	Condenser Fan	EEM	ROF	13	1000		7,833,968	14,697,704	3,573,714	3,152,078	448,998	21,866,714	14,037,012	2.79	5.59	1.31
Motor	Condenser Fan	EEM	ROF	19	1000		7,843,023	14,700,204	3,573,714	3,152,078	448,998	21,866,714	14,037,012	2.79	5.59	1.31
Motor	Condenser Fan	EEM	ROF	17	800		7,859,685	14,704,704	3,574,036	3,152,078	448,998	21,866,714	14,037,012	2.79	5.59	1.31
Motor	Condenser Fan	EEM	ROF	14	1000		7,859,685	14,704,704	3,574,036	3,152,078	448,998	21,866,714	14,037,012	2.79	5.59	1.31
Motor	Condenser Fan	EEM	ROF	11	1000		7,923,803	14,748,570	3,588,582	3,174,511	471,314	21,904,569	14,043,117	2.79	5.60	1.28
Motor	Condenser Fan	EEM	ROF	88	1000		8,054,920	14,785,184	3,601,445	3,174,511	471,314	21,904,569	14,043,117	2.79	5.60	1.28
Motor	Condenser Fan	EEM	ROF	60	1000		8,054,920	14,785,184	3,601,445	3,174,511	471,314	21,904,569	14,043,117	2.79	5.60	1.28
Motor	Condenser Fan	EEM	ROF	13	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	12	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	15	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	15	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75	5.69	1.21
Motor	Condenser Fan	EEM	ROF	17	1000		8,068,127	14,788,732	3,602,302	3,175,189	610,811	22,154,358	14,089,837	2.75</		

Table 3.10
EROs Contributing the Minimum Life-Cycle Cost Resource Cumulative Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	Rt or ROF	ID	ID2	Facility or Facility Number	Cumulative Present Value of Incremental Cost			Cumulative Present Value of Demand Savings			Cumulative Present Value of Dispatch Savings			Cum. Net Present Value (\$1993 \$)	Cumulative Savings (\$M)	Cum. Dispatch Period (Years)	Single ERO SR
							(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)	(\$1993 \$)				
A/C	Small Package	New High Eff. A/C/Chiller	Rt	119		820	9,030,374	15,017,673	3,680,542	3,179,734	1,354,797	23,241,795	14,211,382	2.57	6.07	1.02			
A/C	Small Package	New High Eff. A/C/Chiller	Rt	99		767	9,031,467	15,017,673	3,680,548	3,179,734	1,355,800	23,242,895	14,211,389	2.57	6.07	1.02			
Non-Generating Subtotals																			
Generating ERO							9,031,467	15,017,673	3,680,548	3,179,734	1,355,800	23,242,895	14,211,389	2.57	6.07				
Peak Share (all)	Generator	DGEN-4	Rt	4		8748	9,204,794	14,141,787	6,393,271	2,883,917	1,355,800	24,954,895	15,350,072	2.87	5.86	7.57			
Total							9,204,794	14,141,787	6,393,271	2,883,917	1,355,800	24,954,895	15,350,072	2.97	5.86				

(a) Energy savings for Peak-shaving EROs are calculated as generated electricity less demand contained in generating internal consistency. Conversion factor used was (1 MBtu/7,2046 gallons) * (110° F Btu/1188Btu) * (1.11876/2,412 Btu)

Demand savings is expressed in kWh for

Table 3.11
Summary of Total Minimum Life-Cycle Cost Resource

Summary of Energy And Demand Reductions

	Non-Generating EROs	Generating ERO (a)	Total
First Year Energy Savings (kWh/Yr)	19,875,412	-9,117,023	10,758,388
First Year Demand Savings (kW-mo)	49,707	32,220	81,927
Full Implementation Energy Savings (kWh/Yr)	21,082,818	-9,117,023	11,965,795
Full Implementation Demand Savings (kW-mo)	50,524	32,220	82,744

Summary of Costs and Savings

	Non-Generating EROs		Generating ERO (a)		Total
	Present Value (1992 \$)	Annualized Value (1992 \$)	Present Value (1992 \$)	Annualized Value (1992 \$)	Present Value (1992 \$)
Installed Cost	9,031,467	578,122	173,327	11,095	9,204,794
Value of Energy Savings	15,017,673	961,311	-875,886	-56,067	14,141,787
Value of Demand Savings	3,689,568	236,176	2,703,703	173,069	6,393,271
Value of O&M Savings	3,179,734	203,541	-515,817	-33,018	2,663,917
Value of Replacement Cost Savings	1,355,890	86,793	0	0	1,355,890
Value of Total Savings	23,242,865	1,487,821	1,312,000	83,984	24,554,865
Net Value of Savings	14,211,399	909,700	1,138,673	72,889	15,350,072
Savings to Investment Ratio	2.57	2.57	7.57	7.57	2.67
Discounted Payback Period (Years)	6.07	6.07	2.06	2.06	5.86
					Annualized Value (1992 \$)
					589,217
					905,244
					409,246
					170,523
					86,793
					1,571,805
					982,588
					2.67
					5.86

(a) Energy savings for Peak-shaving EROs are calculated as generated electricity less diesel consumed in generating. Diesel energy is expressed in kWh for internal consistency. Conversion factor used was (1 MBtu/7,2046 gallons)*(10⁻⁶ Btu/1MBtu)*(1 kWh/3,412 Btu).

Table 3.12
EROs Considering the Minimum Life-Cycle Cost Resource: Present Values Aggregated By ERO Category

ERO Category	First Year Energy Savings (\$/kWh)	First Year Demand Savings (\$/kW-yr)	Full Implement Energy Savings (\$/kWh)	Full Implement Demand Savings (\$/kW-yr)	Present Value of Included Cost (\$1993 \$)	Present Value of Energy Savings (\$1993 \$)	Present Value of Demand Savings (\$1993 \$)	Present Value of O&M Savings (\$1993 \$)	Present Value of Replication Savings (\$1993 \$)	Present Value of Total Savings (\$1993 \$)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Non-Generating EROs													
AC	1 819 754	9 023	1 819 754	9 023	955 427	225 005	89 890	0	779 053	1 083 948	138 521	1.14	13.84
Lighting	15 405 153	34 599	15 405 153	34 599	6 806 701	12 246 013	2 503 444	3 205 245	0	18 354 702	11 488 000	2.87	5.84
Motors	2 164 992	5 195	2 216 419	5 478	1 037 081	1 816 510	470 231	24 839	443 483	2 705 368	1 888 305	2.81	5.98
Trains & Duct	485 512	890	1 641 492	1 424	172 258	730 145	228 003	-872	133 353	1 088 830	916 572	8.32	2.47
Non-Generating Sub-totals	19 875 412	49 707	21 082 818	50 524	9 031 467	15 017 673	3 688 548	3 179 734	1 355 890	23 242 885	14 211 399	2.57	8.07
Generating ERO													
Peak Shave (a)	9 117 023	32 220	9 117 023	32 220	173 327	875 886	2 703 703	515 617	0	1 312 000	1 138 673	7.57	2.08
Total	10 758 388	81 927	11 995 795	82 744	9 204 794	16 141 787	6 392 271	2 693 917	1 355 890	24 554 885	15 350 072	2.67	5.88

(a) Energy savings for Peak shaving EROs are calculated as generated electricity less diesel consumed in generating internal consistency. Conversion factor used was (1 kWh/7 204.6 gallons) * (10 * 6 lbs/gallon) * (1 kWh/3 412 Btu). Diesel savings is expressed in kWh/lb.

Table 3.13
EROs Contributing the Minimum Life-Cycle Cost Reduction: Annualized Values Aggregated By ERO Category

ERO Category	First Year Energy Savings (\$/hr)	First Year Demand Savings (\$/hr net)	Full Implement. Energy Savings (\$/hr)	Full Implement. Demand Savings (\$/hr net)	Annualized Installed Cost (\$/hr)	Annualized Value of Energy Savings (\$/hr)	Annualized Value of Demand Savings (\$/hr)	Annualized Value of O&M Savings (\$/hr)	Annualized Value of Replicability Savings (\$/hr)	Annualized Total Savings (\$/hr)	Annualized Net Savings (\$/hr)	Savings to Investment Ratio
Non-Generating EROs												
AC	1 818 754	9 023	1 818 754	9 023	61 158	14 403	5 754	0	48 888	70 028	8 887	1 14
Lighting	15 405 153	34 588	15 405 153	34 588	439 551	783 891	185 855	205 174	0	1 174 920	735 388	2 67
Motors	2 164 982	5 195	2 216 419	5 478	68 388	116 278	30 100	1 580	28 388	173 177	108 791	2 61
Trans. & Dist.	485 512	880	1 041 482	1 424	11 027	46 738	14 487	-43	8 538	68 888	58 672	6 32
Non-Generating Sub-totals	19 875 412	49 707	21 082 818	50 534	578 122	981 311	238 176	203 541	88 783	1 487 821	908 700	2 57
Generating ERO												
Peak Shaver (a)	9 117 023	32 220	9 117 023	32 220	11 085	58 087	173 088	-33 018	0	83 884	72 888	7 57
Total	10 758 388	81 927	11 985 795	82 744	589 217	905 244	408 248	170 523	88 783	1 571 805	982 588	2 67

(a) Energy savings for Peak shaving EROs are calculated as generated electricity less diesel consumed in generating. Diesel energy is expressed in kWh for external consistency. Conversion factor used was (1 MWh/7,204.6 gallons)*(10^-6 Btu/gallon)*(1 Btu/3.412 Btu)

Table 3.14
Raccoon Lake EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	QD	Facility or Facility Number	First Year Energy Savings (kW-hr)	First Year Demand Savings (kW-peak)	Full Implementation Energy Savings (kW-hr)	Full Implementation Demand Savings (kW-peak)	Net Present Value (\$1993 \$)	Savings to Ratepayers	Discounted Payback Period (Years)
AC	Large Centrifugal	New High Eff AC Chiller	RI	15		3	1 107 704	5 908	1 107 704	5 908	63 141	1 18	13 26
AC	Large Reciprocating	New High Eff AC Chiller	RI	16		3	107 487	573	107 487	573	6 560	0 95	16 43
AC	Large Reciprocating	New High Eff AC Chiller	RI	17		3	80 355	429	80 355	429	2 246	0 98	16 00
AC	Small Package	New High Eff AC Chiller	RI	18		3	813	4	813	4	303	0 94	16 59
AC	Room Windows	New High Eff AC Chiller	RI	19		3	188	1	188	1	353	0 89	22 80
AC	Large Reciprocating	New High Eff AC Chiller	RI	32		104	44 819	252	44 819	252	695	0 99	15 80
AC	Small Package	New High Eff AC Chiller	RI	33		104	2 560	14	2 560	14	854	0 94	16 56
AC	Large Reciprocating	New High Eff AC Chiller	RI	34		108	179 276	1 008	179 276	1 008	2 283	0 99	15 77
AC	Small Package	New High Eff AC Chiller	RI	35		106	16 356	92	16 356	92	5 351	0 94	16 56
AC	Room Windows	New High Eff AC Chiller	RI	36		106	6 096	34	6 096	34	192	1 04	14 96
AC	Room Windows	New High Eff AC Chiller	RI	46		120	194	2	194	2	248	0 83	18 75
AC	Small Centrifugal	New High Eff AC Chiller	RI	56		240	156 242	833	156 242	833	3 164	1 02	15 25
AC	Large Reciprocating	New High Eff AC Chiller	RI	57		240	107 487	573	107 487	573	6 560	0 95	16 43
AC	Small Package	New High Eff AC Chiller	RI	58		240	82 403	439	82 403	439	11 392	0 96	16 38
AC	Room Windows	New High Eff AC Chiller	RI	59		240	3 855	21	3 855	21	757	0 95	16 45
AC	Large Reciprocating	New High Eff AC Chiller	RI	60		247	30 207	161	30 207	161	1 797	1 21	12 92
AC	Small Package	New High Eff AC Chiller	RI	61		247	102 138	575	102 138	575	1 377	0 99	15 78
AC	Small Package	New High Eff AC Chiller	RI	62		247	6 442	36	6 442	36	2 102	0 94	16 56
Lighting	200W BAC	NPS 50 PEND	RI	89		1	60 036	140	60 036	140	54 914	4 17	3 74
Lighting	1x40 T 12	FL 1X4 1 T8 ELC	RI	93		1	2 379	6	2 379	6	1 389	1 81	8 64
Lighting	100W BAC	OFL 2 11 CEL FIXT	RI	94		1	27 017	63	27 017	63	24 942	4 68	3 34
Lighting	150W BAC	OFL 2 15 CEL FIXT	RI	95		1	29 573	69	29 573	69	14 893	3 01	5 20
Lighting	150W PAR FLOOD	OFL 2 15 CEL FIXT	RI	96		1	29 573	70	29 573	70	24 898	7 06	2 21
Lighting	75W BAC	NPS 50 FLD	RI	87		1	8 567	20	8 567	20	11 795	4 86	3 21
Lighting	300W BAC	OFL 2 11 CEL FIXT	RI	88		1	2 011	5	2 011	5	2 789	4 86	3 21
Lighting	2x40 T 12	NPS 70 PEND	RI	90		1	23 196	54	23 196	54	1 654	3 68	4 24
Lighting	4x40 T 12	FL 2X4 2 T8 ELC REF	RI	94		1	231 633	539	231 633	539	175 928	6 82	2 29
Lighting	2x40 T 12	FL 2X4 3 T8 ELC REF	RI	95		1	834 389	1 940	834 389	1 940	684 574	2 94	5 31
Lighting	2x40 T 12	FL 2X4 3 T8 ELC REF	RI	96		1	1 053 441	3 845	1 053 441	3 845	1 205 631	2 72	5 75
Lighting	2x40 T 12	FL 1X8 2 60 ELC REF	RI	97		1	448 875	1 039	448 875	1 039	278 305	1 85	8 45
Motors	Circ Pump	LED	RI	98		1	2 588	4	2 588	4	2 583	3 59	4 35
Motors	Circ Pump	EEM	ROF	3	6000		0	0	0	0	926	2 49	6 77
Motors	Circ Pump	EEM	ROF	3	6000		1 223	2	1 223	2	915	2 36	6 82
Motors	Circ Pump	EEM	ROF	5	6000		0	0	0	0	1 470	2 80	6 82
Motors	Circ Pump	EEM	ROF	5	6000		2 005	4	2 005	4	1 484	2 47	6 32
Motors	Air Compressor	EEM	ROF	7	800		83	1	83	1	43	1 15	13 63
Motors	Air Compressor	EEM	ROF	7	800		0	0	0	0	69	1 25	12 48
Motors	Condensate Pump	EEM	ROF	7	2100		143	0	143	0	98	1 44	10 86
Motors	Condensate Pump	EEM	ROF	7	2100		0	0	0	0	116	1 56	10 00
Motors	Condensate Pump	EEM	ROF	9	1650		889	3	889	3	454	1 36	11 45
Motors	Condensate Pump	EEM	ROF	9	1650		0	0	0	0	559	1 49	10 52
Motors	Furnace Fans	EEM	ROF	10	2100		170	0	170	0	32	1 14	13 70
Motors	Furnace Fans	EEM	ROF	10	2100		0	0	0	0	93	1 55	10 06
Motors	CABINET HEATER	EEM	ROF	11	2100		0	0	0	0	687	1 80	9 78
Motors	CABINET HEATER	EEM	ROF	11	2100		877	3	877	3	593	1 48	10 56
Motors	Condensate Pump	EEM	ROF	13	2100		1 754	5	1 754	5	1 185	1 48	10 56
Motors	Condensate Pump	EEM	ROF	13	2100		0	0	0	0	1 374	1 80	9 78
Motors	BLAST HEATER	EEM	ROF	20 5	2100		0	0	0	0	244	1 89	8 28
Motors	BLAST HEATER	EEM	ROF	20 5	2100		347	1	347	1	230	1 78	8 80
Motors	BLAST HEATER	EEM	ROF	20 5	2100		812	2	812	2	1 463	0 18	84 58
Motors	BLAST HEATER	EEM	ROF	20 5	2100		500	3	500	3	1 496	0 20	84 58
Motors	Furnace Fans	VSD to existing motor	RI	22	1650		2 178	8	2 178	8	623	1 26	12 38
Motors	Furnace Fans	VSD & EEM	RI	22	1650		0	0	0	0	1 024	1 59	9 83
Motors	Condenser Fan	EEM	ROF	22	2100		0	0	0	0	161	1 74	8 96
Motors	Condenser Fan	EEM	ROF	22	2100		347	1	347	1	135	1 45	10 74
Motors	POWER VENT	EEM	ROF	22	4000		325	1	325	1	289	2 26	6 92
Motors	POWER VENT	EEM	ROF	22	4000		0	0	0	0	294	2 38	6 55
Motors	Power Ventilator	VSD to existing motor	RI	26 5	4000		3 094	9	3 270	10	1 885	2 25	6 95

Table 3.14

Bonne Lake EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-yr)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-yr)	Net Present Value (\$1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Power Ventilator	VSD & EEM	RI	26 S	4000		3,429	10	3,429	10	1,858	2.21	7.08
Motors	POWER VENT	EEM	ROF	26 S	4000		0	0	158	0	1,100	3.00	5.20
Motors	POWER VENT	EEM	RI	26 S	4000		1,320	4	1,320	4	1,121	2.89	5.41
Motors	Power Ventilator	VSD to existing mtr	RI	27 S	4000		8,759	26	9,086	27	7,707	4.12	3.79
Motors	POWER VENT	EEM	ROF	27 S	4000		9,520	29	9,520	29	7,873	4.08	3.85
Motors	POWER VENT	EEM	RI	27 S	4000		0	0	435	1	2,959	4.18	3.74
Motors	AHU	EEM	ROF	27 S	4000		3,168	10	3,168	10	3,058	4.04	3.87
Motors	AHU	EEM	RI	33	1650		0	0	132	1	687	2.63	5.94
Motors	AHU	EEM	RI	33	1650		736	4	736	4	691	2.51	6.21
Motors	AHU	EEM	ROF	33 S	1650		0	0	265	1	1,374	2.63	5.94
Motors	AHU	EEM	RI	33 S	1650		1,472	8	1,472	8	1,381	2.51	6.21
Motors	AHU	VSD to existing mtr	RI	33 S	1650		4,087	22	4,256	23	50,185	-0.25	-62.79
Motors	AHU	VSD & EEM	RI	33 S	1650		4,521	25	4,521	25	50,268	-0.25	-62.88
Motors	Condenser Fan	EEM	RI	33	2100		5,085	15	5,085	15	2,979	1.93	8.11
Motors	Condenser Fan	EEM	ROF	33	2100		0	0	836	2	2,715	2.16	7.25
Motors	AHU	EEM	RI	35	2100		9,368	40	9,368	40	8,287	2.82	5.54
Motors	AHU	EEM	ROF	35	2100		0	0	1,885	7	8,148	2.93	5.33
Motors	AHU	EEM	RI	35 S	2100		17,795	76	17,795	76	15,746	2.82	5.54
Motors	AHU	EEM	ROF	35 S	2100		0	0	3,201	14	15,481	2.93	5.33
Motors	AHU	VSD to existing mtr	RI	35 S	2100		49,416	212	51,480	221	300,859	-0.14	-108.40
Motors	AHU	VSD & EEM	RI	35 S	2100		54,861	234	54,861	234	301,215	-0.14	-108.48
Motors	Condenser Fan	EEM	RI	37	2100		2,810	8	2,810	8	1,818	2.33	6.71
Motors	Condenser Fan	EEM	ROF	37	2100		0	0	505	1	1,440	2.44	6.40
Motors	Condenser Fan	EEM	RI	40	1650		0	0	192	1	493	2.07	7.58
Motors	Condenser Fan	EEM	ROF	40	1650		954	3	954	3	550	1.87	8.35
Motors	AHU	EEM	RI	41	2100		6,071	26	6,071	26	5,401	2.71	5.77
Motors	AHU	EEM	ROF	41	2100		0	0	1,219	5	5,068	2.67	5.94
Motors	AHU	EEM	RI	41 S	2100		13,358	57	13,358	57	11,881	2.71	5.77
Motors	AHU	EEM	ROF	41 S	2100		0	0	2,883	11	11,107	2.68	5.87
Motors	AHU	VSD to existing mtr	RI	41 S	2100		42,118	180	44,210	189	242,284	-0.13	-121.63
Motors	AHU	VSD & EEM	RI	41 S	2100		46,892	201	46,892	201	241,891	-0.13	-123.29
Motors	AHU	EEM	ROF	44	2100		0	0	634	3	1,532	2.43	6.42
Motors	AHU	EEM	RI	44	2100		2,878	12	2,878	12	2,017	2.38	6.56
Motors	AHU	EEM	ROF	44 S	2100		0	0	1,268	5	3,084	2.43	6.42
Motors	AHU	EEM	RI	44 S	2100		5,753	25	5,753	25	4,035	2.38	6.58
Motors	AHU	VSD to existing mtr	RI	44 S	2100		20,146	88	20,637	88	123,201	-0.16	-98.80
Motors	AHU	VSD & EEM	RI	44 S	2100		21,904	94	21,904	94	124,034	-0.16	-100.03
Motors	Condensing Turb Fan	EEM	RI	45 S	1650		2,280	8	2,280	8	1,278	1.87	8.34
Motors	Condensing Turb Fan	EEM	ROF	45 S	1650		0	0	498	2	1,123	2.05	7.82
Motors	Condensing Turb Fan	VSD to existing mtr	RI	45 S	1650		11,093	40	11,126	40	6,317	2.20	7.08
Motors	Condensing Turb Fan	VSD & EEM	RI	45 S	1650		11,824	42	11,824	42	5,780	2.03	7.70
Motors	Chilled Water Pump	EEM	RI	48	2100		1,438	4	1,438	4	880	2.18	7.18
Motors	Chilled Water Pump	EEM	ROF	48	2100		0	0	317	1	683	2.28	6.85
Motors	Chilled Water Pump	VSD to existing mtr	RI	48 S	2100		5,038	14	5,159	15	6,083	0.29	53.07
Motors	Chilled Water Pump	VSD & EEM	RI	48 S	2100		5,478	16	5,478	16	6,278	0.28	54.99
Motors	Condenser Water Pump	EEM	ROF	47 S	1650		0	0	488	2	698	1.79	9.94
Motors	Condenser Water Pump	EEM	RI	47 S	1650		1,593	6	1,593	6	709	1.59	9.94
Motors	Condenser Water Pump	VSD to existing mtr	RI	47 S	1650		10,744	39	10,893	39	8,832	2.52	8.20
Motors	Condenser Water Pump	VSD & EEM	RI	47 S	1650		11,182	41	11,182	41	8,364	2.33	6.71
Motors	Condenser Fan	EEM	RI	47	2100		10,088	29	10,088	29	6,017	2.18	7.18
Motors	Condenser Fan	EEM	ROF	47	2100		0	0	2,218	6	4,784	2.28	6.85
Motors	Chilled Water Pump	EEM	RI	48 S	2100		0	0	585	2	897	1.89	8.28
Motors	Chilled Water Pump	VSD to existing mtr	RI	48 S	1650		1,991	7	1,991	7	979	1.71	9.15
Motors	Chilled Water Pump	VSD & EEM	RI	48 S	1650		9,577	35	9,755	35	16,589	0.19	82.37
Motors	Chilled Water Pump	EEM	RI	48 S	1650		10,340	38	10,340	38	17,003	0.18	85.50
Motors	Condenser Water Pump	EEM	ROF	48	2100		0	0	317	1	683	2.28	6.85
Motors	Condenser Water Pump	EEM	RI	48	2100		1,438	4	1,438	4	880	2.18	7.18
Motors	Condenser Water Pump	VSD to existing mtr	RI	48 S	2100		7,059	20	7,059	20	4,294	2.58	6.05
Motors	Condenser Water Pump	VSD & EEM	RI	48 S	2100		7,397	21	7,397	21	4,039	2.40	6.51
Motors	AHU	EEM	ROF	49	1650		0	0	702	4	1,232	2.08	7.58
Motors	AHU	EEM	RI	49	1650		2,380	13	2,380	13	1,513	1.95	8.00

Table 3.14
Rome Lab EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	ROF	49.5	1650		0	0	702	4	1,232	2.06	7.58
Motors	AHU	EEM	RI	49.5	1650		2,390	13	2,390	13	1,513	1.95	8.00
Motors	AHU	VSD to existing mtr	RI	49.5	1650		11,492	63	11,706	64	-92,448	-0.19	-80.51
Motors	AHU	VSD & EEM	RI	49.5	1650		12,408	68	12,408	68	-92,852	-0.19	-80.79
Motors	Cooling Twr Fan	EEM	RI	49	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Cooling Twr Fan	EEM	ROF	49.5	2100		0	0	317	1	683	2.28	6.85
Motors	Cooling Twr Fan	EEM	RI	49.5	2100		2,876	8	2,876	8	1,719	2.18	7.18
Motors	Cooling Twr Fan	EEM	ROF	49.5	2100		0	0	634	2	1,367	2.28	6.85
Motors	Cooling Twr Fan	VSD to existing mtr	RI	49.5	2100		14,118	40	14,161	40	8,548	2.57	6.08
Motors	Cooling Twr Fan	VSD & EEM	RI	49.5	2100		14,794	42	14,794	42	8,037	2.39	6.55
Motors	Cooling Twr Fan	EEM	RI	50	2100		3,598	15	3,598	15	2,316	2.17	7.18
Motors	AHU	EEM	ROF	50	2100		0	0	918	4	1,791	2.24	6.96
Motors	AHU	EEM	RI	50.5	2100		3,598	15	3,598	15	2,316	2.17	7.18
Motors	AHU	EEM	ROF	50.5	2100		0	0	918	4	1,791	2.24	6.96
Motors	AHU	VSD to existing mtr	RI	50.5	2100		14,837	64	15,142	65	-91,251	-0.16	-98.52
Motors	AHU	VSD & EEM	RI	50.5	2100		16,060	69	16,060	69	91,756	-0.16	-98.87
Motors	Chilled Water Pump	EEM	ROF	51	2100		0	0	918	3	1,594	2.11	7.42
Motors	Chilled Water Pump	EEM	RI	51	2100		3,598	10	3,598	10	1,953	1.99	7.85
Motors	Chilled Water Pump	VSD to existing mtr	RI	51.5	2100		14,837	42	15,142	43	-17,179	0.31	51.01
Motors	Chilled Water Pump	VSD & EEM	RI	51.5	2100		16,060	46	16,060	46	-17,740	0.30	52.59
Motors	Cooling Twr Fan	EEM	ROF	53.5	2100		0	0	918	3	1,594	2.11	7.42
Motors	Cooling Twr Fan	EEM	RI	53.5	2100		3,598	10	3,598	10	1,953	1.99	7.85
Motors	Cooling Twr Fan	VSD to existing mtr	RI	53.5	2100		20,825	59	20,802	59	15,009	3.46	4.52
Motors	Cooling Twr Fan	VSD & EEM	RI	53.5	2100		21,743	62	21,743	62	14,864	3.34	4.68
Motors	AHU	EEM	ROF	54	2100		0	0	596	3	960	2.09	7.47
Motors	AHU	EEM	RI	54	2100		2,028	9	2,028	9	1,203	2.00	7.82
Motors	AHU	EEM	ROF	54.5	2100		0	0	2,383	10	3,839	2.09	7.47
Motors	AHU	EEM	RI	54.5	2100		8,111	35	8,111	35	4,810	2.00	7.82
Motors	AHU	VSD to existing mtr	RI	54.5	2100		39,004	167	39,382	169	-171,434	-0.09	-181.94
Motors	AHU	VSD & EEM	RI	54.5	2100		41,765	179	41,765	179	-172,121	-0.08	-185.42
Motors	Condenser Water Pump	EEM	RI	56.5	2100		4,055	12	4,055	12	2,007	1.83	8.52
Motors	Condenser Water Pump	EEM	ROF	56.5	2100		0	0	1,192	3	1,709	1.97	7.93
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		27,349	78	27,220	78	19,810	3.46	4.52
Motors	Condenser Water Pump	VSD & EEM	RI	56.5	2100		28,411	81	28,411	81	18,946	3.19	4.89
Motors	Cooling Twr Fan	EEM	ROF	57.5	2100		0	0	596	2	854	1.97	7.93
Motors	Cooling Twr Fan	EEM	RI	57.5	2100		2,028	6	2,028	6	1,003	1.83	8.52
Motors	Cooling Twr Fan	VSD to existing mtr	RI	57.5	2100		13,675	39	13,610	39	9,251	3.06	5.11
Motors	Cooling Twr Fan	VSD & EEM	RI	57.5	2100		14,206	41	14,206	41	8,819	2.84	5.50
Motors	Chilled Water Pump	EEM	RI	59.5	2100		2,535	7	2,535	7	1,348	1.97	7.91
Motors	Chilled Water Pump	EEM	ROF	59.5	2100		0	0	745	2	1,092	2.08	7.51
Motors	Chilled Water Pump	VSD to existing mtr	RI	59.5	2100		12,189	35	12,415	35	-14,402	0.30	52.69
Motors	Chilled Water Pump	VSD & EEM	RI	59.5	2100		13,160	38	13,160	38	-14,749	0.29	53.68
Motors	AHU	EEM	ROF	60	2100		0	0	894	4	1,467	2.26	6.90
Motors	AHU	EEM	RI	60	2100		3,041	13	3,041	13	1,955	2.23	7.00
Motors	AHU	EEM	ROF	60.5	2100		0	0	1,788	8	2,933	2.26	6.90
Motors	AHU	EEM	RI	60.5	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	AHU	VSD to existing mtr	RI	60.5	2100		29,253	125	29,796	128	-282,789	-0.24	-65.73
Motors	AHU	VSD & EEM	RI	60.5	2100		31,584	135	31,584	135	-284,295	-0.24	-65.62
Motors	Condenser Water Pump	EEM	RI	61.5	2100		3,041	9	3,041	9	1,656	2.04	7.65
Motors	Condenser Water Pump	EEM	ROF	61.5	2100		0	0	894	3	1,308	2.13	7.35
Motors	Condenser Water Pump	VSD to existing mtr	RI	61.5	2100		20,512	59	20,515	59	14,934	3.51	4.45
Motors	Condenser Water Pump	VSD & EEM	RI	61.5	2100		21,408	61	21,408	61	14,445	3.28	4.76
Motors	Cooling Twr Fan	EEM	ROF	62	2100		0	0	1,788	5	2,617	2.13	7.35
Motors	Cooling Twr Fan	EEM	RI	62	2100		6,083	17	6,083	17	3,313	2.04	7.65
Motors	Cooling Twr Fan	EEM	ROF	62.5	2100		0	0	1,788	5	2,617	2.13	7.35
Motors	Cooling Twr Fan	EEM	RI	62.5	2100		6,083	17	6,083	17	3,313	2.04	7.65
Motors	Cooling Twr Fan	VSD to existing mtr	RI	62.5	2100		41,024	117	41,029	117	28,953	3.26	4.79
Motors	Cooling Twr Fan	VSD & EEM	RI	62.5	2100		42,817	122	42,817	122	27,118	2.95	5.30
Motors	Chilled Water Pump	EEM	ROF	63	2100		0	0	2,351	7	3,033	2.05	7.61
Motors	Chilled Water Pump	EEM	RI	63	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Chilled Water Pump	EEM	ROF	63.5	2100		0	0	3,527	10	4,549	2.05	7.81

Table 3.14
Rome Labs EROs: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Water Pump	EEM	RI	63 5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Chilled Water Pump	VSD to existing mtr	RI	63 5	2100		58,094	166	59,473	170	-62,921	0.33	47.96
Motors	Chilled Water Pump	VSD & EEM	RI	63 5	2100		63,001	180	63,001	180	-64,091	0.32	48.29
Motors	Condenser Water Pump	EEM	RI	64	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Condenser Water Pump	EEM	ROF	64	2100		0	0	2,351	7	3,033	2.05	7.61
Motors	Condenser Water Pump	EEM	RI	64 5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Condenser Water Pump	EEM	ROF	64 5	2100		0	0	3,527	10	4,549	2.05	7.61
Motors	Condenser Water Pump	VSD to existing mtr	RI	64 5	2100		81,479	233	81,727	234	62,050	3.87	4.04
Motors	Condenser Water Pump	VSD & EEM	RI	64 5	2100		85,254	244	85,254	244	60,414	3.62	4.31
Motors	Condenser Water Pump	EEM	ROF	65 5	2100		0	0	1,176	3	1,516	2.05	7.61
Motors	Cooling Twr Fan	EEM	RI	65 5	2100		3,692	11	3,692	11	1,915	1.97	7.92
Motors	Cooling Twr Fan	VSD to existing mtr	RI	65 5	2100		27,160	78	27,242	78	20,683	3.87	4.04
Motors	Cooling Twr Fan	VSD & EEM	RI	65 5	2100		28,418	81	28,418	81	20,138	3.62	4.31
Motors	Chilled Water Pump	EEM	ROF	66 5	2100		0	0	1,447	4	1,428	1.85	8.47
Motors	Chilled Water Pump	EEM	RI	66 5	2100		4,093	12	4,093	12	1,798	1.78	8.79
Motors	Chilled Water Pump	VSD to existing mtr	RI	66 5	2100		24,008	69	24,281	69	-26,684	0.31	50.19
Motors	Chilled Water Pump	VSD & EEM	RI	66 5	2100		25,728	74	25,728	74	-27,223	0.31	50.85
Trans. & Dist.	Transformer	Amorphous	ROF	8	1-Phs:		0	0	10,486	5	3,340	12.19	1.28
Trans. & Dist.	Transformer	Amorphous	ROF	35	3-Phs:		0	0	11,038	5	3,321	2.75	5.69
Trans. & Dist.	Transformer	Amorphous	ROF	34	3-Phs:		0	0	29,434	14	9,257	6.65	2.35
Trans. & Dist.	Transformer	Amorphous	ROF	27	3-Phs:		0	0	2,208	1	664	2.36	6.63
Trans. & Dist.	Transformer	CVR	RI	MXfmr-1		Substn	4,382	8	4,382	8	4,052	116.77	0.13
Trans. & Dist.	Transformer	Amorphous	ROF	29	3-Phs:		0	0	10,302	5	3,160	3.52	4.44
Trans. & Dist.	Transformer	Amorphous	ROF	32	3-Phs:		0	0	19,316	9	5,952	3.82	4.09
Trans. & Dist.	Transformer	Amorphous	ROF	10	1-Phs:		0	0	8,793	4	2,616	2.47	6.32
Trans. & Dist.	Capacitors	Power Factor Correction to 0.9	RI	A		Substn	1,174	1	1,174	1	-184	0.84	18.60
Trans. & Dist.	Transformer	Power Factor Correction to 0.9	RI	B		Substn	7,050	6	7,050	6	402	1.07	14.55
Trans. & Dist.	Transformer	Amorphous	ROF	9	1-Phs:		0	0	13,061	8	4,098	4.96	3.15
Trans. & Dist.	Transformer	CVR	RI	MXfmr-2		Substn	41,801	79	41,801	79	38,964	637.66	0.02
Trans. & Dist.	Transformer	CVR	RI	MXfmr-3		Substn	91,827	174	91,827	174	127,195	2,052.54	0.01
Trans. & Dist.	Transformer	Amorphous	ROF	30	3-Phs:		0	0	10,792	5	3,128	2.09	7.47
Trans. & Dist.	Transformer	Amorphous	ROF	12	1-Phs:		0	0	10,007	5	2,262	1.28	12.23
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Phs:		0	0	15,453	7	3,748	1.36	11.47

Table 3.15
Rome Labs EROs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Value of Installed Cost (1993 \$)	Value of Energy Savings (1993 \$)	Demand Savings (1993 \$)	Value of O&M Savings (1993 \$)	Value of Repairs Savings (1993 \$)	Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)	
AC	Large Centrifugal	New High Eff. AC/Chiller	RI	15		3	354,154	56,898	31,300	0	329,097	417,296	83,141	1.18	13.28	
AC	Large Reciprocating	New High Eff. AC/Chiller	RI	16		3	133,194	33,717	18,648	0	74,370	126,834	-8,580	0.95	16.43	
AC	Small Reciprocating	New High Eff. AC/Chiller	RI	17		3	94,534	22,076	12,143	0	58,070	92,288	-2,246	0.98	16.00	
AC	Room/Window	New High Eff. AC/Chiller	RI	18		3	5,194	42	23	0	4,827	4,892	-303	0.94	16.59	
AC	Large Reciprocating	New High Eff. AC/Chiller	RI	19		3	1,120	51	28	0	688	767	-353	0.89	22.80	
AC	Small Reciprocating	New High Eff. AC/Chiller	RI	32		104	61,822	2,343	1,336	0	57,448	61,127	-896	0.99	15.80	
AC	Large Reciprocating	New High Eff. AC/Chiller	RI	33		104	16,038	134	76	0	13,974	14,184	-854	0.94	16.56	
AC	Small Package	New High Eff. AC/Chiller	RI	34		106	240,251	9,372	5,343	0	223,253	237,968	-2,283	0.99	15.77	
AC	Room/Window	New High Eff. AC/Chiller	RI	35		106	94,806	865	487	0	87,912	89,256	-5,351	0.94	16.66	
AC	Room/Window	New High Eff. AC/Chiller	RI	36		106	4,362	319	182	0	4,053	4,554	-192	1.04	14.98	
AC	Small Centrifugal	New High Eff. AC/Chiller	RI	48		120	1,488	29	27	0	1,183	1,239	-248	0.83	18.75	
AC	Large Reciprocating	New High Eff. AC/Chiller	RI	56		240	131,117	8,026	4,415	0	121,840	134,280	-3,164	1.02	16.25	
AC	Small Package	New High Eff. AC/Chiller	RI	57		240	133,194	33,717	18,648	0	74,370	126,834	-8,580	0.96	16.43	
AC	Small Package	New High Eff. AC/Chiller	RI	58		240	253,742	4,233	2,328	0	235,769	242,360	-11,392	0.98	16.38	
AC	Room/Window	New High Eff. AC/Chiller	RI	59		240	16,038	198	109	0	13,974	14,281	-757	0.95	16.45	
AC	Large Reciprocating	New High Eff. AC/Chiller	RI	60		240	8,803	1,552	854	0	7,994	10,399	-1,797	1.21	12.92	
AC	Small Package	New High Eff. AC/Chiller	RI	61		247	137,952	5,340	3,044	0	128,192	136,575	-1,377	0.99	15.78	
Lighting	200W INC	HPS 50 PEND	RI	82		247	37,186	337	192	0	34,555	35,063	-2,102	0.94	16.58	
Lighting	1x40 T-12	FL 1X4 1-T8 ELC	RI	89		1	17,305	48,349	11,714	12,157	0	72,219	54,914	4,17	3.74	3.74
Lighting	90W INC	CFL 2-11 CEIL FIXT	RI	93		1	1,731	1,916	464	760	0	3,130	1,399	1.81	8.04	
Lighting	100W INC	CFL 2-11 CEIL FIXT	RI	84		1	6,785	21,757	5,272	4,898	0	31,727	24,842	4.68	3.34	3.34
Lighting	150W INC	CFL 2-15 CEIL FIXT	RI	85		1	7,427	23,816	5,770	-7,287	0	22,320	14,893	3.01	5.20	5.20
Lighting	150W PAR FLOOD	CFL 2-15 CEIL FIXT	RI	86		1	4,095	24,078	5,834	-978	0	28,934	24,838	7.08	2.21	2.21
Lighting	150W PAR SPOT	HPS 50 FLD	RI	87		1	3,053	6,899	1,672	6,278	0	14,849	11,795	4.88	3.21	3.21
Lighting	75W INC	CFL 2-11 CEIL FIXT	RI	88		1	717	1,620	392	1,474	0	3,486	2,769	4.88	3.21	3.21
Lighting	300W INC	HPS 70 PEND	RI	90		1	617	1,484	380	427	0	2,271	1,954	3.68	4.24	4.24
Lighting	2x40 T-12	FL 2X4 2-T8 ELC	RI	93		1	4,149	18,681	4,526	5,083	0	28,290	24,141	8.82	2.28	2.28
Lighting	3x40 T-12	FL 2X4 2-T8 ELC REF	RI	94		1	112,549	186,539	45,197	56,742	0	288,477	175,928	2.56	6.09	6.09
Lighting	2x40 T-12	FL 2X4 3-T8 ELC REF	RI	95		1	342,671	871,951	182,808	172,486	0	1,007,245	664,574	2.94	5.31	5.31
Lighting	2x40 T-12 75W	FL 1X8 2-80 ELC REF	RI	96		1	702,608	1,331,551	322,822	253,985	0	1,908,139	1,205,631	2.72	5.75	5.75
Lighting	2x25W INC EXIT	LED	RI	97		1	269,239	359,878	87,195	50,470	0	497,644	228,305	1.86	8.45	8.45
Motors	Circ. Pump	EEM	ROF	3	6000		998	1,965	298	1,318	0	3,580	2,583	3.59	4.35	4.35
Motors	Circ. Pump	EEM	RI	3	6000		821	790	174	0	583	1,547	926	2.49	6.27	6.27
Motors	Circ. Pump	EEM	ROF	5	6000		672	849	187	0	551	1,587	915	2.36	6.82	6.82
Motors	Circ. Pump	EEM	RI	5	6000		921	1,261	278	0	852	2,390	1,470	2.60	6.02	6.02
Motors	Air Compressor	EEM	RI	7	800		996	1,357	299	0	904	2,480	1,484	2.47	6.32	6.32
Motors	Condensate Pump	EEM	ROF	7	800		297	56	85	0	199	340	43	1.15	13.83	13.83
Motors	Condensate Pump	EEM	RI	7	2100		276	52	79	0	213	344	69	1.25	12.48	12.48
Motors	Condensate Pump	EEM	RI	7	2100		224	108	31	0	184	322	98	1.44	10.88	10.88
Motors	Condensate Pump	EEM	ROF	7	2100		207	100	29	0	194	323	116	1.56	10.00	10.00
Motors	Condensate Pump	EEM	RI	9	1850		1,245	507	187	0	1,006	1,699	454	1.36	11.45	11.45
Motors	Condensate Pump	EEM	ROF	9	1850		1,151	471	174	0	1,065	1,710	559	1.49	10.62	10.62
Motors	Furnace Fans	EEM	RI	10	2100		230	133	38	0	91	262	32	1.14	13.70	13.70
Motors	Furnace Fans	EEM	ROF	10	2100		168	78	23	0	180	261	93	1.55	10.06	10.06
Motors	CABINET HEATER	EEM	ROF	11	2100		1,151	599	174	0	1,065	1,838	687	1.66	9.78	9.78
Motors	CABINET HEATER	EEM	RI	11	2100		1,245	645	187	0	1,006	1,838	593	1.48	10.68	10.68
Motors	Condensate Pump	EEM	RI	13	2100		2,490	1,291	374	0	2,011	3,675	1,186	1.48	10.58	10.58
Motors	Condensate Pump	EEM	ROF	13	2100		2,302	1,199	347	0	2,131	3,678	1,374	1.60	9.78	9.78
Motors	BLAST HEATER	EEM	ROF	20.5	2100		275	237	69	0	213	518	244	1.89	8.28	8.28
Motors	BLAST HEATER	EEM	RI	20.5	2100		297	255	74	0	199	527	230	1.78	8.80	8.80
Motors	VSD to existing mtr	VSD to existing mtr	RI	20.5	2100		1,818	708	206	-156	-403	356	-1,463	0.20	80.04	80.04
Motors	VSD & EEM	VSD & EEM	RI	20.5	2100		1,835	713	206	-156	-424	339	-1,496	0.18	84.58	84.58
Motors	Furnace Fans	EEM	ROF	22	1850		2,378	1,071	616	0	713	2,999	623	1.28	12.38	12.38
Motors	Furnace Fans	EEM	ROF	22	1850		1,736	975	359	0	1,425	2,780	1,024	1.59	9.83	9.83
Motors	Condenser Fan	EEM	RI	22	2100		217	155	45	0	178	378	181	1.74	8.96	8.96
Motors	Condenser Fan	EEM	ROF	22	2100		297	266	77	0	89	432	135	1.45	10.74	10.74
Motors	POWER VENT.	EEM	RI	22	4000		230	257	74	0	188	519	289	2.26	6.92	6.92
Motors	POWER VENT.	EEM	ROF	22	4000		239	239	69	0	199	507	294	2.38	6.55	6.55
Motors	VSD to existing mtr	VSD to existing mtr	RI	26.5	4000		1,511	2,842	820	-312	46	3,396	1,885	2.25	7.06	7.06
Motors	VSD & EEM	VSD & EEM	RI	26.5	4000		1,534	2,861	826	-312	17	3,391	1,858	2.21	7.06	7.06
Motors	Power Ventilator	EEM	ROF	26.5	4000		549	949	274	0	426	1,649	1,100	3.00	5.20	5.20
Motors	POWER VENT.	EEM	RI	26.5	4000		594	1,022	295	0	398	1,715	1,121	2.89	5.41	5.41
Motors	Power Ventilator	EEM	ROF	27.5	4000		2,472	7,905	2,282	-469	490	10,179	7,707	4.12	3.79	3.79
Motors	POWER VENT.	VSD & EEM	RI	27.5	4000		2,511	7,947	2,294	-469	411	10,184	7,873	4.08	3.85	3.85
Motors	POWER VENT.	EEM	ROF	27.5	4000		943	2,233	645	0	1,064	3,942	2,999	4.18	3.74	3.74
Motors	POWER VENT.	EEM	RI	27.5	4000		1,020	2,408	695	0	1,016	4,118	3,098	4.04	3.87	3.87
Motors	AHU	EEM	ROF	33	1850		422	468	259	0	382	1,109	687	2.63	5.94	5.94
Motors	AHU	EEM	RI	33	1850		456	507	280	0	380	1,147	691	2.51	6.21	6.21

Table 3.15

Rumbe Labs ERDs: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	ROF	33.5	1950		843	939	518	0	764	2,218	1,374	2.63	5.94
Motors	AHU	EEM	RI	33.5	1950		912	1,013	560	0	720	2,293	1,381	2.51	6.21
Motors	AHU	VSD to existing mtr	RI	33.5	1950		40,186	3,516	1,943	0	15,145	10,079	-60,186	-0.25	-82.79
Motors	AHU	VSD & EEM	RI	33.5	1950		40,239	3,538	1,956	-312	15,210	10,098	-60,268	-0.25	-82.68
Motors	Condenser Fan	EEM	RI	33	2100		3,216	3,785	1,096	0	1,314	6,195	2,979	1.93	8.11
Motors	Condenser Fan	EEM	ROF	33	2100		2,782	2,762	626	0	2,278	5,095	2,716	2.16	7.25
Motors	AHU	EEM	RI	35	2100		4,560	6,448	2,801	0	3,599	12,847	8,297	2.82	5.54
Motors	AHU	EEM	ROF	35	2100		4,216	6,959	2,588	0	3,818	12,364	8,148	2.93	5.33
Motors	AHU	EEM	RI	35.5	2100		8,964	12,252	5,321	0	6,837	24,410	16,746	2.82	5.64
Motors	AHU	EEM	ROF	35.5	2100		8,010	11,321	4,917	0	7,253	23,492	15,481	2.93	5.33
Motors	AHU	VSD to existing mtr	RI	35.5	2100		262,964	42,503	18,460	-2,988	-95,890	37,896	-300,859	-0.14	-108.40
Motors	AHU	VSD & EEM	RI	35.5	2100		263,297	42,777	18,579	-2,988	-96,308	37,918	-301,215	-0.14	-108.48
Motors	Condenser Fan	EEM	RI	37	2100		1,368	2,069	599	0	518	3,186	1,818	2.33	6.71
Motors	Condenser Fan	EEM	ROF	37	2100		1,000	1,172	339	0	928	2,440	1,440	2.04	6.40
Motors	Condenser Fan	EEM	RI	40	1950		462	388	143	0	424	956	493	2.07	7.56
Motors	AHU	EEM	RI	41	2100		3,160	4,084	255	0	235	1,182	550	1.87	8.36
Motors	AHU	EEM	ROF	41	2100		3,027	3,754	1,630	0	2,708	8,581	5,401	2.71	6.77
Motors	AHU	EEM	RI	41.5	2100		8,964	8,984	3,902	0	5,947	18,833	11,881	2.71	5.77
Motors	AHU	EEM	ROF	41.5	2100		8,268	8,268	3,587	0	5,947	17,792	11,107	2.86	5.87
Motors	AHU	VSD to existing mtr	RI	41.5	2100		214,888	36,493	16,960	-1,718	-78,200	27,576	-242,284	-0.13	-121.83
Motors	AHU	VSD & EEM	RI	41.5	2100		214,888	36,763	16,963	-1,718	-78,200	27,203	-241,891	-0.13	-123.29
Motors	AHU	EEM	ROF	44	2100		1,068	1,141	496	0	904	2,600	1,532	2.43	6.42
Motors	AHU	EEM	RI	44	2100		1,462	2,059	894	0	528	3,479	2,017	2.38	6.66
Motors	AHU	EEM	ROF	44.5	2100		2,137	2,282	991	0	1,928	5,201	3,064	2.43	6.42
Motors	AHU	EEM	RI	44.5	2100		2,924	4,119	1,786	0	1,051	6,959	4,035	2.38	6.56
Motors	AHU	VSD to existing mtr	RI	44.5	2100		106,577	18,931	7,353	-625	-40,343	16,684	-123,281	-0.16	-99.80
Motors	AHU	VSD & EEM	RI	44.5	2100		107,279	17,492	7,597	-625	-41,220	16,756	-124,034	-0.16	-100.03
Motors	Cooling Tower Fan	EEM	RI	45.5	1950		1,462	1,818	596	0	528	2,740	1,278	1.87	8.34
Motors	Cooling Tower Fan	EEM	ROF	45.5	1950		1,068	897	330	0	904	2,600	1,532	2.05	7.62
Motors	Cooling Tower Fan	VSD to existing mtr	RI	45.5	1950		1,068	9,203	3,391	-312	1,123	11,508	6,317	2.20	7.09
Motors	Cooling Tower Fan	VSD & EEM	RI	45.5	1950		5,802	9,372	3,454	-312	1,161	11,382	5,780	2.03	7.70
Motors	Chilled Water Pump	EEM	RI	48	2100		1,030	298	731	0	283	1,591	880	2.18	7.18
Motors	Chilled Water Pump	EEM	ROF	48	2100		534	570	166	0	482	1,218	683	2.28	6.86
Motors	Chilled Water Pump	VSD to existing mtr	RI	48.5	2100		8,591	4,233	1,226	-156	-2,773	2,629	-6,063	0.29	53.07
Motors	Chilled Water Pump	VSD & EEM	RI	48.5	2100		8,787	4,373	1,266	-156	-2,992	2,491	-6,278	0.28	54.99
Motors	Condenser Water Pump	EEM	RI	47.5	1950		880	672	211	0	795	1,579	698	1.79	8.71
Motors	Condenser Water Pump	EEM	ROF	47.5	1950		1,206	1,081	398	0	434	1,914	709	1.59	9.94
Motors	Condenser Water Pump	VSD to existing mtr	RI	47.5	1950		4,497	8,871	3,269	166	-665	11,329	6,832	2.52	6.20
Motors	Condenser Water Pump	VSD & EEM	RI	47.5	1950		4,788	9,004	3,318	-166	-1,016	11,150	6,364	2.33	8.71
Motors	Condenser Fan	EEM	RI	47	2100		5,117	7,208	2,087	0	1,840	11,134	6,017	2.18	7.18
Motors	Condenser Fan	EEM	ROF	47	2100		3,993	3,993	1,156	0	3,374	8,623	4,784	2.28	6.86
Motors	Chilled Water Pump	EEM	RI	48.5	1950		1,011	715	284	0	929	1,908	897	1.89	8.28
Motors	Chilled Water Pump	EEM	ROF	48.5	1950		1,384	1,361	498	0	514	2,363	979	1.71	9.15
Motors	Chilled Water Pump	VSD to existing mtr	RI	48.5	1950		20,472	8,021	2,956	-156	-6,938	3,883	-16,589	0.19	82.37
Motors	Chilled Water Pump	VSD & EEM	RI	48.5	1950		20,804	8,266	3,045	-156	-7,352	3,801	-17,003	0.18	85.50
Motors	Condenser Water Pump	EEM	RI	48	2100		534	570	166	0	482	1,218	683	2.28	6.86
Motors	Condenser Water Pump	EEM	ROF	48	2100		731	1,030	298	0	283	1,591	880	2.18	7.18
Motors	Condenser Water Pump	VSD to existing mtr	RI	48.5	2100		2,710	5,956	1,096	-156	-391	7,004	4,294	2.58	6.06
Motors	Condenser Water Pump	VSD & EEM	RI	48.5	2100		2,888	5,964	1,127	-156	-410	6,924	4,039	2.40	6.61
Motors	AHU	EEM	RI	49	1950		1,161	1,589	475	0	1,060	2,394	1,232	2.06	7.58
Motors	AHU	EEM	ROF	49	1950		1,161	1,822	896	0	584	3,102	1,513	1.96	8.00
Motors	AHU	EEM	RI	49.5	1950		1,689	1,822	896	0	584	3,102	1,513	1.96	8.00
Motors	AHU	VSD to existing mtr	RI	49.5	1950		77,426	9,925	5,320	-156	-29,813	15,024	-92,448	-0.19	-80.51
Motors	AHU	VSD & EEM	RI	49.5	1950		77,806	9,917	5,482	-156	-30,289	15,046	-92,862	-0.18	-80.79
Motors	Cooling Tower Fan	EEM	RI	49	2100		731	1,030	298	0	283	1,591	880	2.18	7.18
Motors	Cooling Tower Fan	EEM	ROF	49	2100		534	570	166	0	482	1,218	683	2.28	6.86
Motors	Cooling Tower Fan	EEM	RI	49.5	2100		1,068	2,059	596	0	526	3,181	1,719	2.18	7.18
Motors	Cooling Tower Fan	EEM	ROF	49.5	2100		8,449	11,712	3,391	0	964	2,436	1,367	2.28	6.95
Motors	Cooling Tower Fan	VSD to existing mtr	RI	49.5	2100		5,800	11,928	3,454	-312	-793	13,997	8,648	2.57	6.08
Motors	Cooling Tower Fan	VSD & EEM	RI	49.5	2100		1,972	2,512	1,091	0	688	1,232	13,837	2,29	6.55
Motors	AHU	EEM	RI	50	2100		1,441	1,363	592	0	1,277	4,288	2,316	2.17	7.18
Motors	AHU	EEM	ROF	50	2100		1,972	2,512	1,091	0	1,277	4,288	2,316	2.24	6.96
Motors	AHU	EEM	RI	50.5	2100		1,363	1,363	592	0	1,277	4,288	2,316	2.17	7.18
Motors	AHU	EEM	ROF	50.5	2100		1,441	1,441	592	0	1,277	4,288	2,316	2.24	6.96
Motors	AHU	VSD to existing mtr	RI	50.5	2100		78,763	12,440	5,403	-312	-30,020	12,489	-91,251	-0.16	-98.52
Motors	AHU	VSD & EEM	RI	50.5	2100		79,236	12,831	5,673	-312	-30,611	12,520	-91,766	-0.16	-98.87
Motors	Chilled Water Pump	EEM	RI	51	2100		1,441	1,363	596	0	1,277	3,035	1,594	2.11	7.42
Motors	Chilled Water Pump	EEM	RI	51	2100		1,972	2,512	727	0	688	3,925	1,953	2.19	7.86

Table 3.15
Rome Lab EROs: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replacement Savings (1993 \$)	Present Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	Chilled Water Pump	VSD to existing mtr	RI	51.5	2100		24,763	12,440	3,002	-312	-8,148	7,594	-17,179	0.31	51.01
Motors	Chilled Water Pump	VSD & EEM	RI	51.5	2100		25,236	12,831	3,715	312	-8,738	7,496	-17,740	0.30	52.59
Motors	Cooling Tower Fan	EEM	ROF	53.5	2100		1,441	1,363	395	0	1,277	3,036	1,594	2.11	7.42
Motors	Cooling Tower Fan	VSD to existing mtr	RI	53.5	2100		1,972	2,512	727	0	696	3,926	1,963	1.99	7.86
Motors	Cooling Tower Fan	VSD & EEM	RI	53.5	2100		8,113	17,239	4,951	-312	-792	21,123	15,009	3.48	4.52
Motors	Cooling Tower Fan	EEM	ROF	53.5	2100		6,360	17,538	5,078	-312	-1,087	21,214	14,894	3.34	4.68
Motors	AHU	EEM	RI	54	2100		880	728	316	0	795	1,840	980	2.09	7.47
Motors	AHU	EEM	RI	54	2100		1,205	1,376	598	0	434	2,408	1,203	2.00	7.82
Motors	AHU	EEM	RI	54.5	2100		3,522	2,914	1,266	0	3,182	7,361	3,839	2.09	7.47
Motors	AHU	EEM	RI	54.5	2100		4,820	5,503	2,390	0	1,737	9,630	4,810	2.00	7.82
Motors	AHU	VSD to existing mtr	RI	54.5	2100		157,878	32,488	14,111	-625	-59,530	-13,566	-171,434	-0.09	186.42
Motors	AHU	VSD & EEM	RI	54.5	2100		168,748	33,370	14,493	-625	-60,613	-13,375	-172,121	-0.08	186.42
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		2,410	1,457	797	0	868	4,417	2,007	1.83	8.52
Motors	Condenser Water Pump	VSD & EEM	RI	56.5	2100		8,062	22,580	4,422	0	1,591	3,470	1,709	1.97	7.93
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		8,841	22,919	6,538	-312	-1,058	27,872	19,810	3.48	4.52
Motors	Condenser Water Pump	VSD & EEM	RI	56.5	2100		880	728	211	0	795	1,735	864	3.19	4.89
Motors	Cooling Tower Fan	EEM	RI	57.5	2100		1,376	1,376	398	0	434	2,208	1,003	1.83	7.93
Motors	Cooling Tower Fan	VSD to existing mtr	RI	57.5	2100		4,497	11,290	3,269	-158	-655	13,748	9,251	3.06	5.11
Motors	Cooling Tower Fan	VSD & EEM	RI	57.5	2100		4,789	11,459	3,318	-158	-614	13,606	8,819	2.84	5.50
Motors	Chilled Water Pump	EEM	ROF	59.5	2100		1,384	1,720	498	0	514	2,732	1,348	1.97	7.91
Motors	Chilled Water Pump	EEM	RI	59.5	2100		1,011	911	264	0	929	2,103	1,092	2.08	7.51
Motors	Chilled Water Pump	VSD to existing mtr	RI	59.5	2100		20,472	10,208	2,966	-158	-6,938	6,070	-14,402	0.30	52.69
Motors	Chilled Water Pump	VSD & EEM	RI	59.5	2100		20,804	10,518	3,045	-158	-7,352	6,056	-14,749	0.29	53.68
Motors	AHU	EEM	ROF	60	2100		1,801	1,093	476	0	1,080	2,828	1,487	2.28	6.90
Motors	AHU	EEM	RI	60	2100		1,589	2,064	896	0	584	3,544	1,956	2.23	7.00
Motors	AHU	EEM	ROF	60.5	2100		2,322	2,185	949	0	2,121	6,256	2,933	2.28	6.90
Motors	AHU	EEM	RI	60.5	2100		3,178	4,127	1,793	0	1,168	7,088	3,910	2.23	7.00
Motors	AHU	VSD to existing mtr	RI	60.5	2100		228,485	24,499	10,640	-312	-89,131	-54,304	-282,789	-0.24	66.73
Motors	AHU	VSD & EEM	RI	60.5	2100		229,829	25,243	10,964	-312	-90,606	-54,066	-284,295	-0.24	66.73
Motors	Condenser Water Pump	EEM	ROF	61.5	2100		1,589	2,064	598	0	584	3,248	1,656	2.04	7.66
Motors	Condenser Water Pump	VSD to existing mtr	RI	61.5	2100		6,363	16,986	4,918	-158	-882	20,886	14,934	3.51	4.46
Motors	Condenser Water Pump	VSD & EEM	RI	61.5	2100		6,334	17,272	5,001	-158	-1,338	20,779	14,446	3.28	4.78
Motors	Cooling Tower Fan	EEM	ROF	62	2100		3,178	4,127	1,195	0	2,121	4,939	2,617	2.13	7.36
Motors	Cooling Tower Fan	EEM	RI	62	2100		2,322	2,185	633	0	2,121	4,939	2,617	2.13	7.36
Motors	Cooling Tower Fan	VSD to existing mtr	RI	62.5	2100		2,322	2,185	633	0	2,121	4,939	2,617	2.13	7.36
Motors	Cooling Tower Fan	EEM	ROF	62.5	2100		3,178	4,127	1,195	0	2,121	4,939	2,617	2.13	7.36
Motors	Cooling Tower Fan	VSD & EEM	RI	62.5	2100		12,786	33,971	9,836	-312	-1,168	45,339	26,177	2.04	7.66
Motors	Cooling Tower Fan	EEM	RI	62.5	2100		13,929	34,544	10,002	-312	-3,187	41,738	28,963	3.29	4.79
Motors	Chilled Water Pump	EEM	ROF	63	2100		2,879	2,560	741	0	2,610	5,912	3,033	2.95	5.30
Motors	Chilled Water Pump	EEM	RI	63	2100		4,318	3,940	1,424	0	1,429	7,771	3,831	2.06	7.61
Motors	Chilled Water Pump	VSD to existing mtr	RI	63.5	2100		5,910	7,377	2,136	0	3,915	8,668	4,549	2.06	7.61
Motors	Chilled Water Pump	VSD & EEM	RI	63.5	2100		93,321	48,806	14,131	-469	-32,087	30,400	-82,921	0.33	47.99
Motors	Condenser Water Pump	EEM	RI	63.5	2100		3,940	4,918	1,424	0	1,429	7,771	3,831	1.97	7.92
Motors	Condenser Water Pump	EEM	ROF	64	2100		2,879	2,560	741	0	2,610	5,912	3,033	2.95	5.30
Motors	Condenser Water Pump	VSD to existing mtr	RI	64.5	2100		6,910	7,377	2,136	0	3,915	8,668	4,549	2.06	7.61
Motors	Condenser Water Pump	VSD & EEM	RI	64.5	2100		4,318	3,940	1,424	0	1,429	7,771	3,831	1.97	7.92
Motors	Condenser Water Pump	EEM	RI	64.5	2100		21,621	87,592	19,571	-469	-3,024	83,671	62,060	3.87	4.04
Motors	Condenser Water Pump	VSD to existing mtr	RI	64.5	2100		23,040	88,797	19,920	-469	-4,796	83,464	60,414	3.82	4.31
Motors	Condenser Water Pump	VSD & EEM	RI	65.5	2100		1,439	1,280	371	0	1,306	2,956	1,516	2.06	7.61
Motors	Cooling Tower Fan	EEM	RI	65.5	2100		1,970	2,469	712	0	714	3,886	1,916	1.97	7.92
Motors	Cooling Tower Fan	VSD to existing mtr	RI	65.5	2100		7,207	22,631	6,524	-158	-1,008	27,890	20,663	3.87	4.04
Motors	Cooling Tower Fan	VSD & EEM	RI	65.5	2100		7,980	22,932	6,640	-158	-1,598	27,818	20,138	3.82	4.31
Motors	Chilled Water Pump	EEM	ROF	66.5	2100		1,689	1,346	390	0	1,381	3,118	1,428	1.85	8.47
Motors	Chilled Water Pump	EEM	RI	66.5	2100		2,312	2,653	768	0	688	4,110	1,798	1.78	8.79
Motors	Chilled Water Pump	VSD to existing mtr	RI	66.5	2100		38,742	20,018	5,798	-158	-13,600	12,068	-26,694	0.31	50.19
Motors	Chilled Water Pump	VSD & EEM	RI	66.5	2100		39,297	20,567	5,955	-158	-14,253	12,074	-27,223	0.31	50.19
Motors	Transformer	Amorphous	ROF	8	1-Pha:		298	3,208	169	0	1,679	5,224	3,340	12.19	1.28
Motors	Transformer	Amorphous	ROF	35	3-Pha:		1,903	3,377	169	0	1,679	5,224	3,340	12.19	1.28
Motors	Transformer	Amorphous	ROF	34	3-Pha:		1,639	9,009	444	0	1,448	10,896	9,257	5.69	2.36
Motors	Transformer	Amorphous	ROF	27	3-Pha:		489	675	33	0	444	1,153	664	2.36	2.36
Motors	Transformer	CVR	RI	MXMtr-1			35	3,397	690	0	0	4,087	4,087	116.77	0.13
Motors	Transformer	Amorphous	ROF	29	3-Pha:		1,264	3,152	164	0	1,107	4,413	3,160	3.52	4.44
Motors	Transformer	Amorphous	ROF	32	3-Pha:		2,113	5,910	290	0	1,806	8,006	5,952	3.82	4.09
Motors	Transformer	Amorphous	ROF	10	1-Pha:		1,776	2,690	133	0	1,568	4,391	2,818	2.47	6.32
Motors	Power Factor Capacitors	Power Factor Connection to Un	RI	A			1,149	916	88	-36	0	965	-184	0.84	18.60
Motors	Power Factor Capacitors	Power Factor Connection to Un	RI	B			5,460	6,498	535	-171	0	6,862	402	1.07	14.55

Table 3.15
Reme Lab ERDs: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID.2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace. Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Trans. & Dist.	Transformer	Amorphous	ROF	9	1-Phe:	Substation	1,036	3,998	198	0	938	5,132	4,098	4.90	3.16
Trans. & Dist.		CVR	RI	MX15m-2		Substation	81	32,400	6,626	0	0	39,026	38,984	637.88	0.02
Trans. & Dist.			RI	MX15m-3		Substation	82	71,177	58,080	0	0	127,257	127,196	2,062.64	0.01
Trans. & Dist.	Transformer	Amorphous	ROF	30	3-Phe:		2,869	3,302	181	0	2,633	5,997	3,128	2.09	7.47
Trans. & Dist.	Transformer	Amorphous	ROF	12	1-Phe:		8,140	3,002	182	0	7,188	10,401	2,262	1.28	12.23
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Phe:		10,363	4,728	236	0	9,148	14,110	3,748	1.36	11.47

Table 3.16
Rome Lab EROs Constituting the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	Ri or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Trans. & Dist.		CVR	Ri	MXfmr-3		Substn	91,827	174	91,827	174	127,195	2,052.54	0.01
Trans. & Dist.		CVR	Ri	MXfmr-2		Substn	41,801	79	41,801	79	38,964	637.66	0.02
Trans. & Dist.		CVR	Ri	MXfmr-1	1-Pha:	Substn	4,382	8	4,382	8	116.77	116.77	0.13
Lighting	Transformer	Amorphous	ROF	86			0	0	10,486	5	3,340	12.19	1.28
Lighting	150W INC	CFL 2-15 CEIL FIXT	Ri	90			29,898	70	29,898	70	24,838	7.06	2.21
Lighting	300W INC	HPS 70 PEND	Ri	34			23,196	54	23,196	54	24,141	6.82	2.29
Trans. & Dist.	Transformer	Amorphous	ROF	9	3-Pha:		0	0	29,434	14	9,257	6.65	2.35
Trans. & Dist.	150W PAR SPOT	Amorphous	ROF	88	1-Pha:		0	0	13,061	6	4,098	4.96	3.15
Lighting	150W PAR FLOOD	HPS 50 FLD	Ri	87			2,011	5	2,011	5	2,769	4.86	3.21
Lighting	90W INC	CFL 2-11 CEIL FIXT	Ri	84			8,567	20	8,567	20	11,795	4.86	3.21
Lighting	200W INC	HPS 50 PEND	Ri	89			27,017	63	27,017	63	24,942	4.68	3.34
Motors	Power Ventilator	HPS 50 PEND	Ri	27.5	4000		60,036	140	60,036	140	54,914	4.17	3.74
Motors	Condenser Water Pump	VSD to existing mtr	Ri	64.5	2100		8,759	26	9,086	27	7,707	4.12	3.79
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	65.5	2100		81,479	233	81,727	234	62,050	3.87	4.04
Trans. & Dist.	Transformer	Amorphous	ROF	32	3-Pha:		0	0	27,242	78	20,683	3.87	4.04
Lighting	75W INC	CFL 2-11 CEIL FIXT	Ri	83			1,843	4	19,316	9	5,952	3.82	4.09
Lighting	2x25W INC EXIT	LED	Ri	98			2,588	4	1,843	4	1,954	3.68	4.24
Trans. & Dist.	Transformer	Amorphous	ROF	29	3-Pha:		0	0	2,588	4	2,583	3.59	4.35
Motors	Condenser Water Pump	VSD to existing mtr	Ri	61.5	2100		20,512	59	10,302	5	3,160	3.52	4.44
Motors	Condenser Water Pump	VSD to existing mtr	Ri	58.5	2100		27,349	78	20,515	59	14,934	3.51	4.45
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	53.5	2100		20,825	59	27,220	78	19,810	3.46	4.52
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	62.5	2100		41,024	117	20,825	59	15,009	3.46	4.52
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	57.5	2100		13,675	39	41,029	117	28,953	3.26	4.79
Lighting	100W INC	CFL 2-15 CEIL FIXT	Ri	85			29,573	69	13,610	39	9,251	3.08	5.11
Lighting	3x40 T-12	FL 2X4 2-18 ELC REF	Ri	95			834,389	1,940	29,573	69	14,893	3.01	5.20
Motors	AHU	Amorphous	Ri	35	2100		9,366	40	834,389	1,940	664,574	2.94	5.31
Motors	AHU	Amorphous	Ri	35.5	2100		17,795	76	9,366	40	8,287	2.82	5.54
Trans. & Dist.	Transformer	Amorphous	ROF	35	3-Pha:		0	0	17,795	76	15,746	2.82	5.54
Lighting	4x40 T-12	FL 2X4 3-18 ELC REF	Ri	96			1,653,441	3,845	11,038	5	3,321	2.75	5.69
Motors	AHU	EEM	Ri	41	2100		6,071	26	6,071	26	5,401	2.72	5.75
Motors	AHU	EEM	Ri	41.5	2100		13,356	57	13,356	57	11,881	2.71	5.77
Motors	Circ. Pump	EEM	ROF	5	6000		0	0	239	0	1,470	2.60	6.02
Motors	Condenser Water Pump	VSD to existing mtr	Ri	48.5	2100		7,059	20	7,080	20	4,294	2.58	6.05
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	49.5	2100		14,118	40	14,161	40	8,548	2.57	6.08
Lighting	2x40 T-12	FL 2X4 2-18 ELC	Ri	94			231,633	539	231,633	539	175,928	2.56	6.09
Motors	Condenser Water Pump	VSD to existing mtr	Ri	47.5	1650		10,744	39	10,693	39	8,832	2.52	6.20
Motors	AHU	EEM	Ri	33	1650		736	4	736	4	691	2.51	6.21
Motors	AHU	EEM	Ri	33.5	1650		1,472	8	1,472	8	1,381	2.51	6.21
Motors	Circ. Pump	EEM	ROF	3	6000		0	0	116	0	926	2.49	6.27
Trans. & Dist.	Transformer	Amorphous	ROF	10	1-Pha:		0	0	8,793	4	2,616	2.47	6.32
Motors	POWER VENT.	EEM	ROF	22	4000		0	0	32	0	294	2.38	6.55
Motors	AHU	EEM	Ri	44.5	2100		5,753	25	5,753	25	4,035	2.38	6.56
Motors	AHU	EEM	Ri	44.5	2100		2,876	12	2,876	12	2,017	2.38	6.56
Trans. & Dist.	Transformer	Amorphous	ROF	27	3-Pha:		0	0	2,208	1	664	2.36	6.63
Motors	Condenser Fan	EEM	Ri	37	2100		2,810	8	2,810	8	1,818	2.33	6.71
Motors	Power Ventilator	VSD to existing mtr	Ri	26.5	4000		3,094	9	3,270	10	1,885	2.25	6.95
Motors	AHU	EEM	Ri	60	2100		3,041	13	3,041	13	1,955	2.23	7.00
Motors	AHU	EEM	Ri	60.5	2100		6,083	26	6,083	26	3,910	2.23	7.00
Motors	AHU	EEM	Ri	45.5	1650		11,093	40	11,093	40	6,317	2.20	7.09
Motors	Cooling Twr Fan	VSD to existing mtr	Ri	46	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Chilled Water Pump	EEM	Ri	47	2100		10,068	29	10,068	29	6,017	2.18	7.18
Motors	Condenser Fan	EEM	Ri	49	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Cooling Twr Fan	EEM	Ri	48	2100		1,438	4	1,438	4	860	2.18	7.18
Motors	Condenser Water Pump	EEM	Ri	48	2100		3,598	15	3,598	15	2,316	2.17	7.18
Motors	AHU	EEM	Ri	50	2100		3,598	15	3,598	15	2,316	2.17	7.18
Trans. & Dist.	Transformer	Amorphous	ROF	30	3-Pha:		0	0	10,792	5	3,128	2.09	7.47
Motors	Cooling Twr Fan	EEM	Ri	62	2100		6,083	17	6,083	17	3,313	2.04	7.65
Motors	AHU	EEM	Ri	54.5	2100		8,111	35	8,111	35	4,810	2.00	7.82

Table 3.16
Renee Lake EROs Contributing the Minimum Life-Cycle Cost Resource: Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Facility Number	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement Energy Savings (kWh)	Full Implement Demand Savings (kW-mo)	Net Present Value (\$1993)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	AHU	EEM	RI	54	2100		2,028	9	2,028	9	1,203	2.00	7.82
Motors	Chilled Water Pump	EEM	RI	51	2100		3,598	10	3,598	10	1,953	1.99	7.85
Motors	Chilled Water Pump	EEM	RI	59.5	2100		2,535	7	2,535	7	1,348	1.97	7.91
Motors	Chilled Water Pump	EEM	RI	63.5	2100		11,076	32	11,076	32	5,746	1.97	7.92
Motors	Chilled Water Pump	EEM	RI	63	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	Condenser Water Pump	EEM	RI	64	2100		7,384	21	7,384	21	3,831	1.97	7.92
Motors	AHU	EEM	RI	49.5	1650		2,390	13	2,390	13	1,513	1.95	8.00
Motors	AHU	EEM	RI	49	1650		2,390	13	2,390	13	1,513	1.95	8.00
Motors	Condenser Fan	EEM	RI	33	2100		5,085	15	5,085	15	2,979	1.93	8.11
Motors	BLAST HEATER	EEM	ROF	20.5	2100		0	0	0	0	244	1.89	8.28
Motors	Condenser Fan	EEM	RI	40	1650		954	3	954	3	550	1.87	8.35
Lighting	2x9/96 T-12 75W	FL 1X8 2-60 ELC REF	RI	97			446,875	1,039	446,875	1,039	228,305	1.85	8.45
Lighting	1x40 T-12	FL 1X4 1-18 ELC	RI	93			2,379	6	2,379	6	1,399	1.81	8.64
Motors	Chilled Water Pump	EEM	RI	66.5	2100		4,093	12	4,093	12	1,798	1.78	8.79
Motors	Condenser Fan	EEM	ROF	22	2100		0	0	0	0	161	1.74	8.96
Motors	Chilled Water Pump	EEM	RI	48.5	1650		1,991	7	1,991	7	979	1.71	9.15
Motors	Condensate Pump	EEM	ROF	13	2100		0	0	209	1	1,374	1.60	9.78
Motors	CABINET HEATER	EEM	ROF	11	2100		0	0	104	0	687	1.60	9.78
Motors	Furnace Fans	EEM	ROF	22	1650		0	0	261	1	1,024	1.59	9.83
Motors	Condensate Pump	EEM	ROF	7	2100		0	0	13	0	116	1.58	10.00
Motors	Furnace Fans	EEM	ROF	10	2100		0	0	17	0	93	1.55	10.06
Motors	Condensate Pump	EEM	ROF	9	1650		0	0	82	0	559	1.49	10.52
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Phs:		0	0	15,453	7	3,748	1.36	11.47
Trans. & Dist.	Transformer	Amorphous	ROF	12	1-Phs:		0	0	10,007	5	2,262	1.28	12.23
Motors	Air Compressor	EEM	ROF	7	800		0	0	16	0	69	1.25	12.48
AC	Room/Window	New High Eff AC/Chiller	RI	60		240	30,207	161	30,207	161	1,797	1.21	12.92
AC	Large Centrifugal Capacitors	New High Eff AC/Chiller	RI	15		3	1,107,704	5,908	1,107,704	5,908	63,141	1.18	13.26
Trans. & Dist.	Room/Window	Power Factor Correction to Unit	RI	8		Substn	7,050	6	7,050	6	402	1.07	14.55
AC	Room/Window	New High Eff AC/Chiller	RI	36		106	6,096	34	6,096	34	192	1.04	14.96
AC	Small Centrifugal	New High Eff AC/Chiller	RI	56		240	156,242	833	156,242	833	3,164	1.02	15.25
Totals							5,241,605	16,420	5,384,441	16,490	3,037,824	2.39	6.55

Table 3.17
 Name Label ERDs Constituting the Minimum Life Cycle Cost Resource: Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	10.2	Facility or Subsystem	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Trans & Dist	Transformer	CVR	R	MX100 3		Submain	62	71,177	56,080	0	127,257	127,195	2,062.54	0.01
Trans & Dist	Transformer	CVR	R	MX100 2		Submain	61	32,400	6,625	0	39,025	39,994	637.99	0.02
Trans & Dist	Transformer	CVR	R	MX100 1		Submain	36	3,397	690	0	4,087	4,052	119.77	0.13
Lighting	150W INC	CFL 2-15 CEIL FIXT	ROF	88	1 Phe		298	3,208	159	0	3,368	3,340	12.19	1.28
Lighting	300W INC	HPS 70 PEND	R	90			4,095	24,078	5,834	978	28,834	24,838	7,09	2.21
Trans & Dist	Transformer	Amorphous	ROF	34	3 Phe		4,148	18,881	4,526	5,083	28,290	24,141	6,82	2.29
Trans & Dist	Transformer	Amorphous	ROF	9			1,039	9,006	444	0	10,895	9,257	6,05	2.35
Lighting	150W PAR SPOT	HPS 50 FLD	R	88	1 Phe		1,036	3,998	198	0	5,132	4,098	4,90	3.16
Lighting	90W INC	HPS 50 FLD	R	87			717	1,820	392	1,474	3,489	2,789	4,88	3.21
Lighting	150W PAR FLOOD	CFL 2-11 CEIL FIXT	R	84			3,053	6,899	1,972	6,278	11,949	11,795	4,88	3.21
Motors	Power Ventilator	VSD to existing mtr	R	89	4000		6,785	21,757	5,272	4,898	31,727	24,942	4,88	3.34
Motors	Condenser Water Pump	VSD to existing mtr	R	84.5	2100		17,305	48,349	11,714	12,157	72,219	54,914	4,17	3.74
Motors	Cooling Tower Fan	VSD to existing mtr	R	85	2100		2,472	7,905	2,282	469	10,179	8,077	4,12	3.79
Trans & Dist	Transformer	Amorphous	R	65.5	3 Phe		21,821	87,592	19,571	489	123,871	82,060	3,87	4.04
Lighting	75W INC	CFL 2-11 CEIL FIXT	ROF	83			2,113	22,531	6,524	156	27,890	20,883	3,87	4.04
Lighting	2-25W INC EXIT	LED	R	83			617	5,910	290	0	8,069	5,952	3,82	4.09
Trans & Dist	Transformer	Amorphous	R	98			998	1,484	380	427	2,271	1,654	3,69	4.24
Motors	Condenser Water Pump	VSD to existing mtr	ROF	29	3 Phe		1,965	1,965	298	1,318	3,580	2,583	3,59	4.35
Motors	Condenser Water Pump	VSD to existing mtr	R	61.5	2100		1,254	3,152	154	0	4,413	3,180	3,52	4.44
Motors	Cooling Tower Fan	VSD to existing mtr	R	59.5	2100		5,953	18,989	4,918	159	20,889	14,934	3,51	4.45
Motors	Cooling Tower Fan	VSD to existing mtr	R	63.5	2100		8,082	22,580	6,539	312	27,872	19,810	3,46	4.52
Motors	Cooling Tower Fan	VSD to existing mtr	R	62.5	2100		6,113	17,236	4,991	312	21,123	15,009	3,46	4.52
Motors	Cooling Tower Fan	VSD to existing mtr	R	62.5	2100		12,785	33,971	9,838	312	41,738	28,953	3,28	4.78
Lighting	100W INC	CFL 2-15 CEIL FIXT	R	85			4,497	11,290	3,269	156	17,148	14,853	3,09	5.11
Lighting	3-4-40 T-12	FL 2X4 2-T8 ELC REF	R	98			7,427	23,816	6,770	7,287	32,320	22,320	2,94	6.20
Motors	AHU	EEM	R	36	2100		4,860	671,951	182,808	172,488	1,007,245	684,574	6,31	6.31
Motors	Transformer	Amorphous	ROF	36.5	2100		8,804	12,252	5,321	0	12,847	8,287	2,82	6.54
Trans & Dist	Transformer	FL 2X4 3-T8 ELC REF	ROF	98	3 Phe		1,903	3,377	188	0	5,837	4,410	2,82	6.54
Lighting	AHU	EEM	R	41	2100		702,508	1,331,551	322,822	253,965	6,224	1,205,631	2,72	6.77
Motors	Circ. Pump	EEM	R	41.5	2100		3,180	4,084	1,774	0	8,691	6,401	2,71	6.77
Motors	Condenser Water Pump	VSD to existing mtr	ROF	5	8000		8,962	8,964	3,902	0	18,833	11,881	2,71	6.77
Motors	Cooling Tower Fan	VSD to existing mtr	R	48.5	2100		921	1,281	278	0	2,390	1,470	2,60	6.02
Lighting	2-4-40 T-12	FL 2X4 2-T8 ELC	R	49.5			5,449	1,865	1,096	169	7,004	4,294	2,58	6.05
Motors	Condenser Water Pump	VSD to existing mtr	R	47.5	1850		112,449	180,539	46,197	56,742	13,997	8,548	2,57	6.08
Motors	AHU	EEM	R	33	1850		4,497	8,871	3,289	168	28,477	17,528	2,58	6.09
Motors	AHU	EEM	R	33.5	1850		456	507	280	0	1,147	891	2,51	6.20
Motors	Circ. Pump	EEM	R	33.5	1850		912	1,013	560	0	2,293	1,381	2,51	6.21
Trans & Dist	Transformer	Amorphous	ROF	22	4000		1,776	2,880	133	0	4,351	3,228	2,49	6.27
Motors	POWER VENT	EEM	R	44.5	2100		213	228	79	0	507	294	2,38	6.32
Motors	AHU	EEM	R	44			2,924	4,119	1,789	0	6,959	4,036	2,38	6.56
Trans & Dist	Transformer	Amorphous	ROF	27	3 Phe		1,462	2,069	594	0	3,479	2,017	2,38	6.56
Motors	Condenser Fan	EEM	R	37	2100		489	676	33	0	1,163	684	2,38	6.60
Motors	Power Ventilator	VSD to existing mtr	R	28.5	4000		1,388	2,069	596	0	3,109	1,818	2,35	6.71
Motors	AHU	EEM	R	80	2100		3,178	1,588	2,084	312	3,544	1,885	2,23	6.86
Motors	Cooling Tower Fan	VSD to existing mtr	R	45.5	1850		5,251	9,203	3,391	0	13,848	9,310	2,23	7.00
Motors	Condenser Fan	EEM	R	47	2100		731	1,030	296	0	2,831	1,551	2,20	7.09
Motors	Cooling Tower Fan	EEM	R	45			5,117	7,208	2,087	0	11,134	8,017	2,18	7.18
Motors	Condenser Water Pump	EEM	R	48	2100		731	1,030	296	0	2,831	1,551	2,18	7.18
Motors	AHU	EEM	R	50.5	2100		1,972	2,512	1,091	0	4,288	2,318	2,17	7.18
Trans & Dist	Transformer	Amorphous	ROF	30	3 Phe		2,809	3,302	181	0	6,997	3,128	2,09	7.47
Motors	Cooling Tower Fan	EEM	R	62	2100		3,178	4,127	1,195	0	8,491	3,313	2,04	7.65
Motors	AHU	EEM	R	64.5	2100		4,820	5,603	2,390	0	13,813	8,600	2,00	7.82
Motors	Chilled Water Pump	EEM	R	51	2100		1,972	2,512	1,091	0	4,288	2,318	2,17	7.18
Motors	Chilled Water Pump	EEM	R	59.5	2100		1,972	2,512	1,091	0	4,288	2,318	2,17	7.18
Motors	Chilled Water Pump	EEM	R	63.5	2100		6,910	7,377	2,136	0	11,658	6,748	1,97	7.82
Motors	Chilled Water Pump	EEM	R	63	2100		3,940	4,918	1,424	0	7,771	3,831	1,97	7.82
Motors	Condenser Water Pump	EEM	R	49.5	1850		1,589	1,822	896	0	3,102	1,513	1,95	8.00
Motors	AHU	EEM	R	49			3,218	3,785	1,090	0	8,195	2,979	1,93	8.11

Table 3.17
 Same Life EROs Considering the Minimum Life-Cycle Cost Measures: Present Values of Costs and Savings

ERO Category	Equipment	Description of ERO	R or ROF	ID	RO2	Facility or Facility Number	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Repairs (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
Motors	BLAST HEATER	EEM	ROF	20.6	2100		275	237	88	0	213	918	244	1.89	8.28
Motors	Condenser Fan	EEM	R	40	1850		632	683	265	0	236	1,182	560	1.87	8.35
Lighting	2x40 1-12 T5W	FL 1X8 2-80 ELC REF	R	57		1	208,239	359,878	87,195	50,470	0	487,844	228,305	1.85	8.45
Motors	1x40 1-12	FL 1X4 1-18 ELC	R	53		1	1,731	1,916	484	760	0	3,130	1,398	1.81	8.64
Motors	Chilled Water Pump	EEM	R	88.6	2100		2,312	2,853	708	0	888	4,110	1,798	1.78	8.78
Motors	Condenser Fan	EEM	ROF	22	2100		217	186	46	0	178	378	161	1.74	8.96
Motors	Chilled Water Pump	EEM	R	48.6	1850		1,384	1,351	498	0	614	2,363	979	1.71	9.16
Motors	Condensate Pump	EEM	ROF	13	2100		2,302	1,199	347	0	2,131	3,878	1,374	1.60	9.78
Motors	CABINET HEATER	EEM	ROF	11	2100		1,151	599	174	0	1,085	1,838	687	1.60	9.78
Motors	Furnace Fans	EEM	ROF	22	1850		1,738	875	358	0	1,425	2,780	1,024	1.58	9.83
Motors	Condensate Pump	EEM	ROF	7	2100		207	100	29	0	184	323	116	1.58	10.00
Motors	Furnace Fans	EEM	ROF	10	2100		188	78	23	0	160	291	53	1.55	10.09
Motors	Condensate Pump	EEM	ROF	9	1850		1,151	471	174	0	1,085	1,710	559	1.49	10.52
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Ph:		10,383	4,728	235	0	9,148	14,110	3,748	1.38	11.47
Trans. & Dist.	Transformer	Amorphous	ROF	12	1-Ph:		8,140	3,082	162	0	7,188	10,401	2,262	1.28	12.23
Motors	Air Compressor	EEM	ROF	7	800		276	52	79	0	213	344	69	1.25	12.48
AC	Room/Window	New High Eff. A/C/Chiller	R	60		240	8,803	1,652	854	0	7,984	10,398	1,797	1.21	12.52
AC	Large Centrifugal	New High Eff. A/C/Chiller	R	15		3	354,154	64,898	31,300	0	329,097	417,295	63,141	1.18	13.28
AC	Coil/Window	Power Factor Correction to Un	R	8		Subs	5,480	5,488	536	-171	0	6,882	402	1.07	14.86
Trans. & Dist.	Room/Window	New High Eff. A/C/Chiller	R	38		108	4,382	319	182	0	4,053	4,854	192	1.04	14.98
AC	Small Centrifugal	New High Eff. A/C/Chiller	R	58		240	131,117	8,028	4,415	0	121,840	134,280	3,164	1.02	15.25
Totals							2,190,489	3,274,807	885,818	553,840	529,847	5,228,313	3,037,824	2.39	8.85

Table 2-18
Nameplate EROs Contributing to the Minimum Life-Cycle Cost Resource: Annualized Values of Costs and Savings

ERO Category	Equipment	Description of ERO	PS or ROF	ID	ID2	Facility or - Facility Number	Annualized Installed Cost (1983 \$)	Annualized Energy Savings (1983 \$)	Annualized Demand Savings (1983 \$)	Annualized O&M Savings (1983 \$)	Annualized Repairs Savings (1983 \$)	Annualized Total Savings (1983 \$)	Annualized Net Savings (1983 \$)	Savings to Investment Ratio
Trans & Dist		CVR	PS	MX100-3		Submain	4	4,554	3,580	0	0	8,148	8,142	2,052.54
Trans & Dist		CVR	PS	MX100-2		Submain	4	2,074	424	0	0	2,498	2,494	637.66
Trans & Dist		Amorphous	PS	MX100-1		Submain	2	217	44	0	0	262	260	116.77
Lighting	Transformer	CFL 2-15 CEL FIXT	ROF	8	1-PH		18	205	10	0	17	223	214	12.19
Lighting	150W INC		PS	86			282	1,541	373	0	0	1,853	1,590	7.08
Lighting	300W INC		PS	90			288	1,194	290	325	0	1,811	1,545	6.82
Trans & Dist	Transformer	Amorphous	ROF	34	3-PH		105	576	28	0	83	687	683	6.86
Trans & Dist	Transformer	Amorphous	ROF	9	1-PH		86	254	13	0	80	329	292	4.96
Lighting	150W PAR SPOT	HPS 50 FLD	PS	88			48	104	26	94	6	177	177	6.86
Lighting	150W PAR FLOOD	HPS 50 FLD	PS	87			195	442	107	402	0	950	755	4.89
Lighting	300W INC	CFL 2-11 CEL FIXT	PS	84			434	1,393	337	301	0	2,031	1,597	4.88
Lighting	200W INC	HPS 50 PEND	PS	89			1,108	3,095	750	778	0	4,623	3,515	4.17
Motors	Power Ventilator	VSD to existing mtr	PS	27.5	4000		158	508	148	30	29	862	483	4.12
Motors	Condenser Water Pump	VSD to existing mtr	PS	64.5	2100		1,384	4,327	1,263	30	19	6,354	3,972	3.87
Motors	Cooling Tower Fan	VSD to existing mtr	PS	65.5	2100		461	1,442	418	10	0	1,795	1,324	3.87
Trans & Dist	Transformer	Amorphous	ROF	32	3-PH		135	378	18	0	119	516	381	3.82
Lighting	75W INC	CFL 2-11 CEL FIXT	PS	83			38	95	23	27	0	145	108	3.88
Lighting	2x25W INC EXIT	LED	PS	98			64	126	19	84	0	229	185	3.69
Trans & Dist	Transformer	Amorphous	ROF	29	3-PH		80	202	10	0	71	283	202	3.52
Motors	Condenser Water Pump	VSD to existing mtr	PS	61.5	2100		381	1,087	316	10	66	1,337	954	3.51
Motors	Condenser Water Pump	VSD to existing mtr	PS	64.5	2100		616	1,446	419	10	60	1,784	1,288	3.48
Motors	Cooling Tower Fan	VSD to existing mtr	PS	63.5	2100		391	1,103	319	20	51	1,352	961	3.48
Motors	Cooling Tower Fan	VSD to existing mtr	PS	62.5	2100		816	2,175	630	20	113	2,622	1,853	3.28
Motors	Cooling Tower Fan	VSD to existing mtr	PS	67.5	2100		288	723	208	10	42	880	582	3.08
Lighting	100W INC	CFL 2-15 CEL FIXT	PS	85			475	1,525	388	485	0	1,429	853	3.01
Lighting	3x4-60 T-12	FL 2X4 2-18 ELC REF	PS	95			21,836	43,013	10,422	11,041	0	64,476	42,841	2.94
Motors	AHU	EEM	PS	35	2100		292	413	179	0	230	822	520	2.82
Motors	AHU	EEM	PS	35.5	2100		555	794	341	0	438	1,543	1,008	2.82
Trans & Dist	Transformer	Amorphous	ROF	36	3-PH		122	218	11	0	107	334	213	2.75
Lighting	4x4-60 T-12	FL 2X4 3-18 ELC REF	PS	94			44,989	85,235	20,852	18,257	0	122,146	77,176	2.72
Motors	AHU	EEM	PS	41	2100		202	281	114	0	173	548	348	2.71
Motors	Circ Pump	EEM	PS	41.5	2100		445	676	250	0	381	1,208	781	2.60
Motors	Condenser Water Pump	VSD to existing mtr	ROF	6	6000		59	81	18	0	55	153	94	2.58
Motors	Cooling Tower Fan	VSD to existing mtr	PS	48.5	2100		173	375	109	10	25	448	275	2.58
Lighting	2x4-60 T-12	FL 2X4 2-18 ELC	PS	48.5	2100		349	750	217	20	51	886	647	2.57
Motors	Condenser Water Pump	VSD to existing mtr	PS	94			7,204	11,941	2,883	3,832	0	18,405	11,281	2.54
Motors	AHU	EEM	PS	47.5	1850		288	548	209	0	42	775	437	2.52
Motors	AHU	EEM	PS	33	1850		29	32	18	0	44	73	44	2.51
Motors	AHU	EEM	PS	33.5	1850		58	85	38	0	48	147	88	2.51
Trans & Dist	Transformer	Amorphous	ROF	3	8000		40	51	11	0	37	98	58	2.49
Motors	POWER VENT	EEM	PS	114	1-PH		114	172	8	0	100	281	167	2.47
Motors	AHU	EEM	PS	44.5	2100		187	264	116	0	87	445	258	2.38
Motors	AHU	EEM	PS	44	2100		84	132	67	0	34	223	129	2.38
Trans & Dist	Transformer	Amorphous	ROF	27	3-PH		31	43	2	0	28	74	43	2.36
Motors	Condenser Fan	EEM	PS	37	2100		88	132	38	0	33	204	116	2.33
Motors	Power Ventilator	VSD to existing mtr	PS	24.5	4000		97	182	53	20	3	217	127	2.25
Motors	AHU	EEM	PS	80	2100		102	132	67	0	37	227	125	2.23
Motors	AHU	EEM	PS	80.5	2100		203	264	116	0	75	464	254	2.23
Motors	Cooling Tower Fan	VSD to existing mtr	PS	46.5	1850		326	588	217	20	48	741	494	2.20
Motors	Chilled Water Pump	EEM	PS	46	2100		47	68	19	0	17	102	65	2.18
Motors	Condenser Fan	EEM	PS	47	2100		328	461	134	0	118	713	385	2.18
Motors	Cooling Tower Fan	EEM	PS	48	2100		47	68	19	0	17	102	65	2.18
Motors	Condenser Water Pump	EEM	PS	48	2100		47	68	19	0	17	102	65	2.18
Motors	AHU	EEM	PS	50	2100		126	161	70	0	44	275	148	2.17
Trans & Dist	Transformer	Amorphous	ROF	50.5	2100		126	161	70	0	44	275	148	2.17
Motors	Cooling Tower Fan	EEM	PS	30	3-PH		184	211	10	0	182	384	200	2.09
Motors	AHU	EEM	PS	62	2100		203	264	78	0	75	415	212	2.04
Motors	AHU	EEM	PS	64.5	2100		308	382	153	0	111	616	388	2.00
Motors	Chilled Water Pump	EEM	PS	54	2100		77	98	38	0	28	154	77	1.89
Motors	Chilled Water Pump	EEM	PS	51	2100		126	161	47	0	44	251	125	1.89
Motors	Chilled Water Pump	EEM	PS	58.5	2100		88	110	32	0	33	176	88	1.97
Motors	Chilled Water Pump	EEM	PS	63.5	2100		378	472	137	0	137	746	388	1.97
Motors	Condenser Water Pump	EEM	PS	63	2100		252	315	91	0	91	487	245	1.97
Motors	Condenser Water Pump	EEM	PS	64	2100		252	315	91	0	91	487	245	1.97

Table 3.18
 Runas Lake ERDs Contributing the Minimum Life-Cycle Cost Reduction: Annualized Values of Costs and Savings

ERD Category	Equipment	Description of ERD	W or R or R/F	ID	ID2	Facility or Facility Number	Annualized Installed Cost (\$1993 \$)	Annualized Energy Savings (\$1993 \$)	Annualized Demand Savings (\$1993 \$)	Annualized O&M Savings (\$1993 \$)	Annualized Repairs Savings (\$1993 \$)	Annualized Total Savings (\$1993 \$)	Annualized Net Savings (\$1993 \$)	Savings to Investment Ratio
Motors	AMU	EEM	R	49.5	1850		102	104	57	0	37	189	97	1.86
Motors	AMU	EEM	R	49	1850		102	104	57	0	37	189	97	1.86
Motors	Condenser Fan	EEM	R	33	2100		208	242	70	0	94	397	191	1.93
Motors	BLAST HEATER	EEM	R	20.5	2100		18	16	4	0	14	33	16	1.89
Motors	Condenser Fan	EEM	R	40	1850		40	44	16	0	16	76	36	1.87
Motors	24F96 T 12 76W	EEM	R	97	1850		17,236	23,037	5,842	3,721	0	31,849	14,814	1.86
Lighting	FL 1148 2 60 ELC REF					1	111	123	30	49	44	200	90	1.81
Lighting	FL 1148 1 18 ELC					1	148	170	48	0	44	263	116	1.78
Motors	Chilled Water Pump	EEM	R	86.5	2100		14	10	3	0	11	24	10	1.74
Motors	Condenser Fan	EEM	R	22	2100		89	88	32	0	33	151	63	1.71
Motors	Chilled Water Pump	EEM	R	48.5	1850		147	77	27	0	138	236	88	1.69
Motors	Condensate Pump	EEM	R	13	2100		74	38	11	0	88	118	44	1.69
Motors	CABINET HEATER	EEM	R	11	2100		111	62	23	0	91	177	66	1.69
Motors	Furnace Fans	EEM	R	22	1850		13	6	2	0	12	21	7	1.65
Motors	Condensate Pump	EEM	R	7	2100		11	5	1	0	10	17	6	1.65
Motors	Furnace Fans	EEM	R	10	2100		74	30	11	0	88	109	38	1.49
Motors	Condensate Pump	EEM	R	15	1850		883	303	16	0	848	903	340	1.38
Trains & Dist	Transformer	Amorphous	R	15	1Phs		621	198	10	0	480	888	146	1.28
Trains & Dist	Transformer	Amorphous	R	12	1Phs		18	3	6	0	14	22	4	1.26
Trains & Dist	Transformer	Amorphous	R	7	8000		18	3	6	0	14	22	4	1.26
Motors	Air Compressor	EEM	R	60			551	98	56	0	512	668	116	1.21
AC	Room Windows	None High Eff AC Chiller	R	16			22,870	3,842	2,004	0	21,088	26,712	4,042	1.18
AC	Large Centrifugal Compressors	None High Eff AC Chiller	R	3			360	362	34	11	0	376	28	1.07
Trains & Dist	Room Windows	Power Factor Correction to Unity	R	38			279	20	12	0	268	291	12	1.04
AC	Small Centrifugal	None High Eff AC Chiller	R	54			8,383	514	283	0	7,799	8,598	203	1.02
Totals							140,217	208,827	66,879	36,462	33,917	334,876	194,457	2.39

Table 3 19
Phase Late ESDs Constituting the Maximum Life Cycle Cost Reserves
Computation Annual Events and Annual Reserves

ENO Category	Equipment	Description of ENO	PR or RPOF	ID	ED	Facility or Facility Number	Comprehensive First Year Energy Savings (\$/HR)	Comprehensive First Year Demand Savings (\$/HR)	Comprehensive Full Implementation Energy Savings (\$/HR)	Comprehensive Full Implementation Demand Savings (\$/HR)	Comprehensive Present Value (\$1993 \$)	Comprehensive Savings to Investment Ratio	Comprehensive Payback Period (Years)	Individual ENO Savings to Investment Ratio
Trans & Dist	Transformer	CVR	PR	MAXtime 3		Substation	91,827	174	91,827	174	127,185	2,052.54	0.01	2,052.54
Trans & Dist	Transformer	CVR	PR	MAXtime 2		Substation	133,629	253	133,629	253	168,169	637.06	0.01	637.06
Trans & Dist	Transformer	CVR	PR	MAXtime 1		Substation	138,011	261	138,011	261	170,211	1,076.92	0.04	1,076.92
Lighting	1500W BAC	CFL 2 16 CER FXT	RPOF	8	1 Pw		138,011	261	138,011	261	170,211	381.11	0.04	381.11
Lighting	3000W BAC	MPS 70 PEND	PR	80			187,909	330	187,909	330	198,389	44.58	0.36	44.58
Trans & Dist	Transformer	Amorphous	RPOF	34	3 Pw		191,106	364	191,106	364	222,530	28.68	0.58	28.68
Trans & Dist	Transformer	Amorphous	RPOF	9	1 Pw		191,106	364	191,106	364	222,530	23.42	0.87	23.42
Lighting	1500W PAR SPOT	MPS 60 FLD	PR	88			191,106	364	191,106	364	222,530	21.74	0.72	21.74
Lighting	1500W PAR FLOOD	MPS 60 FLD	PR	87			191,106	364	191,106	364	222,530	20.74	0.76	20.74
Lighting	300W BAC	CFL 2 11 CER FXT	PR	84			201,083	409	201,083	409	250,448	17.54	0.89	17.54
Lighting	2000W BAC	MPS 60 PEND	PR	89			208,737	472	208,737	472	276,391	13.56	1.16	13.56
Motors	Power Ventilator	VSD to existing mtr	PR	27.6	4000		287,696	639	287,696	639	328,003	9.42	1.08	9.42
Motors	Condenser Water Pump	VSD to existing mtr	PR	64.5	2100		378,974	870	378,974	870	432,529	9.10	1.12	9.10
Motors	Cooling Tower Fan	VSD to existing mtr	PR	65.5	2100		406,134	948	406,134	948	460,043	7.32	2.13	3.87
Trans & Dist	Transformer	Amorphous	RPOF	32	3 Pw		406,134	948	406,134	948	479,087	6.97	2.24	3.87
Lighting	250W BAC	CFL 2 11 CER FXT	PR	83			407,977	952	407,977	952	480,830	6.86	2.27	3.87
Lighting	LED	LED	PR	83			410,585	956	410,585	956	483,519	5.87	2.28	3.88
Trans & Dist	Transformer	Amorphous	RPOF	29	3 Pw		431,077	1014	431,077	1014	493,820	6.75	2.31	3.52
Motors	Condenser Water Pump	VSD to existing mtr	PR	61.5	2100		458,427	1082	458,427	1082	514,326	6.51	2.40	3.61
Motors	Condenser Water Pump	VSD to existing mtr	PR	53.5	2100		479,229	1152	479,229	1152	541,556	6.24	2.60	3.46
Motors	Cooling Tower Fan	VSD to existing mtr	PR	82.6	2100		502,753	1209	502,753	1209	572,800	6.73	2.68	3.46
Motors	Cooling Tower Fan	VSD to existing mtr	PR	67.6	2100		533,928	1308	533,928	1308	612,000	6.62	2.78	3.04
Lighting	1000W BAC	CFL 2 16 CER FXT	PR	86			563,501	1377	563,501	1377	648,582	5.48	2.86	3.01
Lighting	300W T 12	FL 244 2 TB ELC REF	PR	96			1,397,090	3,317	1,397,090	3,317	1,600,981	3.58	4.36	3.94
Motors	AHU	Amorphous	RPOF	35.5	2100		1,407,258	3,357	1,407,258	3,357	1,600,981	3.58	4.36	3.94
Trans & Dist	Transformer	Amorphous	RPOF	35.5	3 Pw		1,426,051	3,433	1,426,051	3,433	1,608,142	3.57	4.37	3.95
Lighting	400W T 12	FL 244 3 TB ELC REF	PR	98			3,378,482	7,278	3,378,482	7,278	3,978,872	3.76	4.38	3.76
Motors	AHU	Amorphous	PR	41	2100		3,084,543	7,304	3,084,543	7,304	3,434,504	3.08	6.10	2

Table 3.18
Name Lake ERDs Contributing to Minimum Life Cycle Cost Reduction Cumulative Annual Energy and Demand Reductions

ERO Category	Equipment	Description of ERO	PI or ROF	ID	QD2	Facility or Number	Cumulative First Year Energy Savings (kWh)	Cumulative First Year Demand Savings (kW)	Cumulative Full Implement Energy Savings (kWh)	Cumulative Full Implement Demand Savings (kW)	Cumulative Present Value (\$1993 \$)	Cumulative Savings to Investment Ratio	Cumulative Discounted Payback Period (Years)	Individual ERO Savings to Investment Ratio
Motors	Condenser Water Pump	EEM	PI	64	2100		3,488,207	8,389	3,684,737	8,426	2,719,768	2.97	5.26	1.97
Motors	AHU	EEM	PI	49.5	1660		3,470,606	8,382	3,687,127	8,439	2,721,271	2.97	5.26	1.96
Motors	AHU	EEM	PI	49	1660		3,472,908	8,395	3,689,617	8,452	2,722,784	2.97	5.26	1.96
Motors	Condenser Fan	EEM	PI	33	2100		3,478,072	8,410	3,694,602	8,468	2,725,763	2.97	5.26	1.93
Motors	BLAST HEATER	EEM	ROF	20.5	2100		3,478,072	8,410	3,694,644	8,468	2,725,008	2.97	5.27	1.98
Motors	Condenser Fan	EEM	PI	40	1660		3,478,072	8,413	3,695,608	8,470	2,725,557	2.97	5.27	1.97
Lighting	2x150 T-12 T500	FL 1108 2 60 ELC REF	PI	97			3,825,901	9,462	4,042,473	9,509	2,964,881	2.78	5.61	1.96
Motors	1x1-60 T-12	FL 1114 1 TB ELC	PI	93			3,828,280	9,468	4,044,862	9,514	2,964,260	2.78	5.61	1.91
Motors	Chilled Water Pump	EEM	PI	88.5	2100		3,832,373	9,470	4,048,946	9,526	2,968,068	2.78	5.61	1.78
Motors	Condenser Fan	EEM	ROF	22	2100		3,832,373	9,470	4,048,987	9,526	2,968,219	2.78	5.62	1.74
Motors	Chilled Water Pump	EEM	PI	48.5	1660		3,834,365	9,477	4,050,978	9,534	2,968,189	2.78	5.62	1.71
Motors	Condensate Pump	EEM	ROF	13	2100		3,834,365	9,477	4,051,187	9,534	2,968,573	2.78	5.62	1.60
Motors	CABINET HEATER	EEM	ROF	11	2100		3,834,365	9,477	4,051,281	9,534	2,961,260	2.78	5.62	1.60
Motors	Furnace Fan	EEM	ROF	22	1660		3,834,365	9,477	4,051,853	9,536	2,962,283	2.78	5.62	1.58
Motors	Condensate Pump	EEM	ROF	7	2100		3,834,365	9,477	4,051,568	9,536	2,962,400	2.78	5.62	1.58
Motors	Furnace Fan	EEM	ROF	10	2100		3,834,365	9,477	4,051,583	9,536	2,962,483	2.78	5.62	1.55
Motors	Condensate Pump	EEM	ROF	8	1660		3,834,365	9,477	4,051,685	9,536	2,963,051	2.78	5.63	1.42
Trans & Dist	Transformer	Amorphous	ROF	15	1 Phe		3,834,365	9,477	4,057,117	9,543	2,968,789	2.77	5.64	1.38
Trans & Dist	Transformer	Amorphous	ROF	12	1 Phe		3,834,365	9,477	4,077,126	9,547	2,968,061	2.78	5.65	1.28
Motors	Air Compressor	EEM	ROF	7	800		3,834,365	9,477	4,077,141	9,548	2,968,130	2.78	5.65	1.25
AC	Room/Window	New High Eff AC Chiller	PI	60			3,864,672	9,638	4,107,348	9,708	2,970,927	2.75	6.08	1.21
AC	Large Centrifugal	New High Eff AC Chiller	PI	15			5,072,278	15,548	5,215,052	15,616	3,034,047	2.48	6.30	1.18
Trans & Dist	Capacitors	Power Factor Correction to Unity	PI	8			5,078,326	15,552	5,223,103	15,623	3,034,489	2.48	6.31	1.07
AC	Room/Window	New High Eff AC Chiller	PI	36			5,085,422	15,588	5,228,188	15,657	3,034,681	2.47	6.32	1.04
AC	Small Centrifugal	New High Eff AC Chiller	PI	56			5,241,685	16,420	5,384,441	16,490	3,037,824	2.39	6.56	1.02
Totals							5,241,685	16,420	5,384,441	16,490	3,037,824	2.39	6.56	1.02

Table 3.20
Rome Labs EROs Constituting the Minimum Life Cycle Cost Resources: Cumulative Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Number	Cumulative Present Value of Installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Total Savings (1993 \$)	Cum. Net Present Value (1993 \$)	Cum. SIR	Cum. Disc. Payback Period (Years)	ERO SIR	
Trans. & Dist.	CVR	CVR	RI	MXfmr-3		Substn	62	71,177	56,080	0	127,257	127,195	2,062.64	0.01	2,062.64	
Trans. & Dist.	CVR	CVR	RI	MXfmr-2		Substn	123	103,577	82,705	0	186,282	186,159	1,349.89	0.01	637.66	
Trans. & Dist.	CVR	CVR	RI	MXfmr-1		Substn	158	106,974	83,395	0	207,369	207,111	1,076.92	0.01	116.77	
Lighting	Transformer	Amorphous	ROF	B	1-Pha		457	110,182	63,554	0	271	174,007	173,551	381.11	0.04	12.19
Lighting	160W INC	CFL 2.16 CEIL FIXT	RI	86			4,562	134,260	69,388	-978	271	202,941	198,389	44.68	0.36	7.06
Lighting	300W INC	HPS 70 PEND	RI	90			8,701	152,940	73,914	4,106	271	231,231	222,630	20.68	0.59	6.82
Trans. & Dist.	Transformer	Amorphous	ROF	34	3-Pha		10,340	161,946	74,368	4,106	1,717	242,126	231,787	23.42	0.67	6.86
Trans. & Dist.	Transformer	Amorphous	ROF	9	1-Pha		11,374	165,942	74,555	4,106	2,656	247,259	235,885	21.74	0.72	4.96
Lighting	150W PAR SPOT	HPS 50 FLD	RI	88			12,091	167,662	74,948	5,680	2,656	250,745	238,064	20.74	0.75	4.86
Lighting	150W PAR FLOOD	HPS 50 FLD	RI	87			15,144	174,481	76,819	11,857	2,656	286,593	250,449	17.64	0.89	4.86
Lighting	90W INC	CFL 2.11 CEIL FIXT	RI	84			21,929	196,218	81,891	16,556	2,656	297,320	275,391	13.56	1.16	4.68
Motors	Power Ventilator	VSD to existing mtr	RI	27.5	4000		39,234	244,567	93,806	28,712	2,656	369,540	330,308	9.42	1.66	4.17
Motors	Condenser Water Pump	VSD to existing mtr	RI	64.5	2100		63,327	320,084	95,887	28,244	3,115	379,718	338,013	9.10	1.72	4.12
Motors	Cooling Twr Fan	VSD to existing mtr	RI	66.5	2100		70,534	342,556	121,983	27,775	91	463,389	400,063	7.32	2.13	3.87
Trans. & Dist.	Transformer	Amorphous	ROF	32	3-Pha		72,847	348,506	122,273	27,619	949	499,346	420,748	6.97	2.24	3.87
Lighting	76W INC	CFL 2.11 CEIL FIXT	RI	83			73,264	349,989	122,832	27,819	949	499,346	420,748	6.97	2.27	3.82
Trans. & Dist.	Transformer	Amorphous	ROF	98			74,262	351,953	122,930	28,046	949	501,616	428,352	6.86	2.28	3.68
Trans. & Dist.	Transformer	Amorphous	ROF	29	3-Pha		75,516	355,105	123,084	29,364	949	506,197	430,935	6.80	2.30	3.69
Motors	Condenser Water Pump	VSD to existing mtr	RI	61.5	2100		81,488	372,091	128,092	29,208	1,196	509,810	434,095	6.75	2.31	3.62
Motors	Condenser Water Pump	VSD to existing mtr	RI	56.5	2100		89,531	394,671	134,540	28,896	262	530,496	449,028	6.61	2.40	3.51
Motors	Cooling Twr Fan	VSD to existing mtr	RI	63.5	2100		95,844	411,907	139,531	28,583	530	568,368	488,838	6.24	2.50	3.46
Motors	Cooling Twr Fan	VSD to existing mtr	RI	62.5	2100		108,428	445,878	149,368	28,271	-2,288	621,229	483,847	6.06	2.58	3.46
Motors	Cooling Twr Fan	VSD to existing mtr	RI	57.5	2100		112,925	457,168	162,837	28,114	-2,943	634,978	522,061	5.73	2.73	3.26
Lighting	100W INC	CFL 2.16 CEIL FIXT	RI	85			120,352	480,984	168,407	20,848	2,943	654,978	522,061	5.62	2.78	3.06
Lighting	3x4FO T-12	FL 2X4 2-T8 ELC REF	RI	95			483,023	1,152,935	321,215	193,334	-2,943	1,664,541	1,201,518	3.59	4.36	2.94
Motors	AHU	Amorphous	RI	35	2100		487,583	1,159,384	324,016	193,334	656	1,677,388	1,209,805	3.69	4.36	2.94
Motors	AHU	Amorphous	RI	35.5	2100		476,247	1,171,635	329,338	193,334	7,493	1,701,799	1,225,551	3.67	4.37	2.82
Trans. & Dist.	Transformer	Amorphous	ROF	36	3-Pha		478,160	1,176,012	329,504	193,334	9,172	1,707,022	1,228,872	3.67	4.38	2.75
Lighting	4x4FO T-12	FL 2X4 3-T8 ELC REF	RI	96			1,180,958	2,506,563	662,127	447,299	11,875	3,616,181	2,434,604	3.06	5.10	2.72
Motors	AHU	Amorphous	RI	41	2100		1,183,818	2,510,847	663,900	447,299	11,875	3,623,722	2,439,904	3.06	5.10	2.71
Motors	Circ. Pump	VSD to existing mtr	RI	41.5	2100		1,190,770	2,519,631	667,802	447,299	17,823	3,642,555	2,451,786	3.06	5.11	2.71
Motors	Condenser Water Pump	VSD to existing mtr	ROF	5	6000		1,191,691	2,520,892	668,080	447,299	18,675	3,661,960	2,457,649	3.06	5.11	2.68
Motors	Cooling Twr Fan	VSD to existing mtr	RI	48.5	2100		1,194,401	2,526,747	659,776	447,143	18,284	3,661,960	2,457,649	3.06	5.11	2.68
Motors	Cooling Twr Fan	VSD to existing mtr	RI	49.5	2100		1,199,850	2,538,459	663,167	446,831	17,491	3,665,947	2,469,097	3.06	5.11	2.67
Lighting	2x4FO T-12	FL 2X4 2-T8 ELC	RI	94			1,312,399	2,724,998	708,363	603,573	17,491	3,954,424	2,642,025	3.01	5.18	2.56
Motors	Condenser Water Pump	VSD to existing mtr	RI	47.5	1650		1,316,896	2,733,889	711,832	603,416	16,836	3,966,753	2,648,867	3.01	5.19	2.62
Motors	AHU	Amorphous	RI	33	1650		1,317,362	2,734,376	711,912	603,416	17,196	3,968,900	2,649,648	3.01	5.19	2.61
Motors	AHU	Amorphous	RI	33.5	1650		1,318,284	2,736,389	712,472	603,416	17,916	3,970,740	2,651,856	3.01	5.19	2.49
Trans. & Dist.	Circ. Pump	Amorphous	ROF	3	6000		1,318,885	2,736,179	712,646	603,416	18,498	3,976,132	2,654,471	3.01	5.19	2.47
Motors	Transformer	Amorphous	RI	10	1-Pha		1,320,951	2,738,870	712,779	603,416	20,066	3,976,639	2,654,705	3.01	5.19	2.47
Motors	POWER VENT.	Amorphous	ROF	22	4000		1,320,873	2,739,109	712,848	603,416	20,266	3,976,639	2,654,705	3.01	5.19	2.47
Motors	AHU	Amorphous	RI	44.5	2100		1,323,797	2,743,228	714,637	603,416	21,316	3,982,697	2,658,800	3.01	5.19	2.38
Trans. & Dist.	Transformer	Amorphous	ROF	27	3-Pha		1,325,259	2,745,287	715,531	603,416	21,842	3,986,077	2,660,817	3.01	5.19	2.38
Motors	Condenser Fan	Amorphous	RI	27	2100		1,326,749	2,746,962	716,564	603,416	22,286	3,987,230	2,661,481	3.01	5.19	2.36
Motors	Power Ventilator	VSD to existing mtr	RI	37	2100		1,327,117	2,748,032	716,164	603,416	22,850	3,990,416	2,663,300	3.01	5.20	2.33
Motors	AHU	Amorphous	RI	28.5	4000		1,328,627	2,750,874	716,984	603,416	23,434	3,993,812	2,665,186	3.01	5.20	2.25
Motors	AHU	Amorphous	RI	60	2100		1,330,216	2,752,938	717,880	603,104	23,434	3,997,356	2,667,140	3.01	5.20	2.23
Motors	Cooling Twr Fan	VSD to existing mtr	RI	60.5	1650		1,333,394	2,757,065	717,880	603,104	23,434	3,997,356	2,667,140	3.01	5.20	2.23
Motors	Chilled Water Pump	VSD to existing mtr	RI	45.5	1650		1,338,645	2,766,268	723,064	602,792	24,602	4,004,444	2,671,050	3.00	5.20	2.23
Motors	Chilled Water Pump	VSD to existing mtr	RI	46	2100		1,339,376	2,767,297	723,362	602,792	24,152	4,016,013	2,677,387	3.00	5.21	2.20
Motors	Condenser Fan	Amorphous	RI	47	2100		1,344,493	2,774,506	725,449	602,792	25,992	4,028,738	2,684,244	3.00	5.21	2.18
Motors	Cooling Twr Fan	VSD to existing mtr	RI	49	2100		1,345,224	2,775,534	726,747	602,792	26,955	4,030,328	2,686,104	3.00	5.21	2.18
Motors	Condenser Water Pump	VSD to existing mtr	RI	48	2100		1,346,955	2,776,664	726,040	602,792	26,518	4,031,919	2,685,984	3.00	5.21	2.18
Motors	AHU	Amorphous	RI	50	2100		1,347,927	2,779,076	727,136	602,792	27,084	4,036,207	2,688,280	2.99	5.22	2.18
Trans. & Dist.	Transformer	Amorphous	ROF	30	3-Pha		1,349,899	2,781,587	728,227	602,792	27,204	4,040,496	2,690,596	2.99	5.22	2.17
Motors	Cooling Twr Fan	Amorphous	RI	62	2100		1,352,768	2,784,889	728,227	602,792	30,423	4,046,492	2,693,724	2.99	5.22	2.17
Motors	AHU	Amorphous	RI	62	2100		1,355,946	2,789,017	729,584	602,792	31,691	4,052,983	2,697,037	2.99	5.22	2.09
Motors	AHU	Amorphous	RI	54.5	2100		1,360,768	2,794,520	731,974	602,792	33,328	4,062,613	2,701,847	2.99	5.23	2.04
Motors	Chilled Water Pump	VSD to existing mtr	RI	64	2100		1,361,971	2,795,896	732,671	602,792	33,762	4,065,021	2,703,049	2.98	5.23	2.00
Motors	Chilled Water Pump	VSD to existing mtr	RI	61	2100		1,361,971	2,795,896	732,671	602,792	33,762	4,065,021	2,703,049	2.98	5.23	2.00
Motors	Chilled Water Pump	VSD to existing mtr	RI	59.5	2100		1,363,943	2,798,407	733,299	602,792	34,448	4,068,946	2,706,002	2.98	5.24	1.99
Motors	Chilled Water Pump	VSD to existing mtr	RI	63.5	2100		1,366,327	2,800,127	733,797	602,792	34,962	4,071,677	2,707,360	2.98	5.24	1.97
Motors	Chilled Water Pump	VSD to existing mtr	RI	63	2100		1,371,237	2,802,422	735,932	602,792	37,105	4,083,333	2,712,056	2.98	5.26	1.97
Motors	Chilled Water Pump	VSD to existing mtr	RI	63	2100		1,375,177	2,812,422	737,358	602,792	37,105	4,083,333	2,712,056	2.98	5.26	1.97
Motors	Chilled Water Pump	VSD to existing mtr	RI	64	2100		1,379,117	2,817,422	738,78,							

Table 3.20
Rome Lab EROs Constituting the Minimum Life-Cycle Cost Resource: Cumulative Present Value of Costs and Savings

ERO Category	Equipment	Description of ERO	RI or ROF	ID	ID2	Facility or Subsystem	Cumulative Present Value of installed Cost (1993 \$)	Cumulative Present Value of Energy Savings (1993 \$)	Cumulative Present Value of Demand Savings (1993 \$)	Cumulative Present Value of O&M Savings (1993 \$)	Cumulative Present Value of Replace. Savings (1993 \$)	Cumulative Present Total Savings (1993 \$)	Cum. Present Value (1993 \$)	Cum. Net Present Value (1993 \$)	Cum. SIR	Cum. Disc. Payback Period (Years)	ERO SIR
Motors	BLAST HEATER	EEM	ROF	20.5	2100		1,385,786	2,824,906	741,738	502,792	42,658	4,111,792	2,728,006	2,97	2.97	5.27	1.89
Motors	Condenser Fan	EEM	RI	40	1850		1,386,418	2,825,297	741,993	502,792	42,853	4,112,974	2,726,557	2.97	2.97	5.27	1.87
Lighting	2x40 T-12 75W	FL 1X8 2-80 ELC REF	RI	97			1,955,957	3,185,175	829,188	553,282	42,893	4,810,518	2,954,861	2.78	2.78	5.61	1.86
Motors	Chilled Water Pump	FL 1X4 1-18 ELC	RI	93			1,957,387	3,187,091	829,652	554,011	42,893	4,813,647	2,956,260	2.78	2.78	5.61	1.81
Motors	Condenser Fan	EEM	RI	66.5	2100		1,859,899	3,189,744	830,420	554,011	43,581	4,817,767	2,958,068	2.78	2.78	5.61	1.78
Motors	Chilled Water Pump	EEM	ROF	22	2100		1,859,916	3,189,899	830,466	554,011	43,759	4,818,135	2,958,219	2.78	2.78	5.62	1.74
Motors	Condensate Pump	EEM	RI	48.5	1850		1,861,300	3,191,251	830,983	554,011	44,273	4,820,499	2,959,198	2.78	2.78	5.62	1.71
Motors	CABINET HEATER	EEM	ROF	13	2100		1,864,754	3,192,449	831,310	554,011	46,404	4,824,175	2,960,573	2.78	2.78	5.62	1.60
Motors	Furnace Fans	EEM	ROF	11	2100		1,866,490	3,194,024	831,484	554,011	47,489	4,826,013	2,961,260	2.78	2.78	5.62	1.60
Motors	Condensate Pump	EEM	ROF	22	1850		1,866,697	3,194,125	831,872	554,011	48,894	4,828,773	2,962,383	2.78	2.78	5.62	1.59
Motors	Furnace Fans	EEM	ROF	7	2100		1,868,985	3,194,203	831,896	554,011	49,058	4,829,097	2,962,400	2.78	2.78	5.62	1.59
Motors	Condensate Pump	EEM	ROF	10	2100		1,868,016	3,194,874	832,089	554,011	49,248	4,829,368	2,962,493	2.78	2.78	5.62	1.56
Trans. & Dist.	Transformer	Amorphous	ROF	15	1-Pha:		1,878,378	3,199,402	832,303	554,011	50,314	4,831,067	2,963,051	2.78	2.78	5.63	1.49
Motors	Air Compressor	Amorphous	ROF	12	1-Pha:		1,886,518	3,202,494	832,456	554,011	59,481	4,846,178	2,968,799	2.77	2.77	5.64	1.36
AC	Room/Window	EEM	ROF	60	800		1,886,793	3,202,515	832,634	554,011	66,849	4,856,579	2,969,061	2.76	2.76	5.66	1.28
AC	Large Centrifugal Capacitors	New High Eff. AC/Chiller	RI	15		240	1,895,350	3,204,067	833,387	554,011	66,862	4,856,322	2,969,130	2.76	2.76	5.66	1.26
Trans. & Dist.	Room/Window	Power Factor Correction to Un	RI	8		Subs	2,049,550	3,280,985	864,687	554,011	74,857	4,863,818	2,970,927	2.75	2.75	5.68	1.21
AC	Room/Window	New High Eff. AC/Chiller	RI	36			2,055,010	3,286,483	865,222	553,840	403,954	5,089,478	3,034,569	2.48	2.48	6.30	1.18
AC	Small Centrifugal	New High Eff. AC/Chiller	RI	56			2,059,372	3,286,782	865,404	553,840	408,007	5,094,033	3,034,861	2.47	2.47	6.31	1.07
Totals							2,190,489	3,274,807	869,818	553,840	529,847	5,228,313	3,037,824	2.39	2.39	6.56	1.02

Table 3.21
Summary of Total Minimum Life-Cycle Cost Efficiency Resource in Rome Labs Buildings
Summary of Energy And Demand Savings

First Year Energy Savings (kWh/Yr)	5,241,665	
First Year Demand Savings (kW-mo)	16,420	
Full Implementation Energy Savings (kWh/Yr)	5,384,441	
Full Implementation Demand Savings (kW-mo)	16,490	
Summary of Costs and Benefits		
	Present Value (1992 \$)	Annualized Value (1992 \$)
Installed Cost	2,190,489	140,217
Value of Energy Savings	3,274,807	209,627
Value of Demand Savings	869,818	55,679
Value of O&M Savings	553,840	35,452
Value of Replacement Cost Savings	529,847	33,917
Value of Total Savings	5,228,313	334,675
Net Value of Savings	3,037,824	194,457
Savings to Investment Ratio	2.39	2.39
Discounted Payback Period (Years)	6.55	6.55

Table 3.22
 Rome Lab EROs Constituting the Minimum Life-Cycle Cost Resource: Present Values Aggregated By ERO Category

ERO Category	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Present Value of Installed Cost (1993 \$)	Present Value of Energy Savings (1993 \$)	Present Value of Demand Savings (1993 \$)	Present Value of O&M Savings (1993 \$)	Present Value of Replace. Savings (1993 \$)	Present Value of Total Savings (1993 \$)	Net Present Value (1993 \$)	Savings to Investment Ratio	Discounted Payback Period (Years)
AC	1,300,250	6,936	1,300,250	6,936	498,236	66,794	36,750	0	462,985	566,529	68,293	1.14	13.74
Lighting	3,353,447	7,795	3,353,447	7,795	1,473,843	2,700,482	654,123	557,605	0	3,912,210	2,438,366	2.65	5.89
Motors	442,906	1,421	444,794	1,427	180,914	351,953	112,889	-3,593	38,673	499,922	319,009	2.76	5.65
Trans. & Dist.	145,061	267	285,950	332	37,496	155,579	66,056	-171	28,189	249,652	212,156	6.66	2.35
Totals	5,241,665	16,420	5,384,441	16,490	2,190,489	3,274,807	869,818	553,840	529,847	5,228,313	3,037,824	2.39	6.55

Table 3.23
Rome Labs EROs Constituting the Minimum Life-Cycle Cost Resource: Annualized Values Aggregated By ERO Category

ERO Category	First Year Energy Savings (kWh)	First Year Demand Savings (kW-mo)	Full Implement. Energy Savings (kWh)	Full Implement. Demand Savings (kW-mo)	Annualized Installed Cost (1993 \$)	Annualized Energy Savings (1993 \$)	Annualized Demand Savings (1993 \$)	Annualized O&M Savings (1993 \$)	Annualized Replace. Savings (1993 \$)	Annualized Total Savings (1993 \$)	Annualized Net Savings (1993 \$)	Savings to Investment Ratio
AC	1,300,250	6,936	1,300,250	6,936	31,893	4,276	2,352	0	29,637	36,265	4,372	1.14
Lighting	3,353,447	7,795	3,353,447	7,795	94,344	172,863	41,872	35,693	0	250,428	158,085	2.65
Motors	442,906	1,421	444,794	1,427	11,581	22,529	7,226	-230	2,476	32,001	20,420	2.78
Trans. & Dist.	145,061	267	285,950	332	2,400	9,959	4,228	-11	1,804	15,981	13,581	6.66
Totals	5,241,665	16,420	5,384,441	18,490	140,217	209,627	55,679	35,452	33,917	334,675	194,457	2.39

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APPENDIX A

BUILDING TYPE ASSIGNMENTS

APPENDIX A

BUILDING TYPE ASSIGNMENTS

TABLE A.1. Assignment According to Principal Building Function. Each building number appears under one, and only one, type category.

<u>Type</u>	<u>Building Number(s)</u>
ADMIN	14, 19, 40, 42, 115, 131, 220, 223, 247, 248, 316, 750, 765, 770, 776, 778, 780, 788
ADMIN(F3&5)	102, 109, 301, 303, 310, 311, 428, 488, 738
BRK/ADM	41, 44, 430, 432, 438, 442, 444, 448, 450, 452, 468, 704, 712, 764, 793, 923
CHAPEL	517
CLUB	888
COM-OUT	34, 855, 878
COMCATN	246, 302, 629, 814, 6242
COMCATN(F1)	97, 128, 504, 858, 866
COMCATN(F6)	700, 702, 757
DET-RR	98, 132, 519, 762
DGR	143, 329, 337
DINING	272, 443, 724, 890
FUELDSP	771, 773, 775, 779, 781, 5732
GROCERY	346
HANGAR	100, 150, 221, 782, 783, 784, 785
HANGAR(F3)	101
HOSPITL	510
HOTEL	490, 491, 492
HSG-FAM	231, 232, 480, 880, 883
HSG-FAM(F8)	All 2000 series except 2000, 2615, 2645 and 2646; 177 buildings
HSG-FAM(F9)	All 3000 series except 3000, 3027 and 3200; 143 buildings
HUT	139, 511, 819, 5025
KENNEL	525
LAB-MED	123
MWR	305, 437, 439, 482, 520, 706
PLT-BLD	16, 24, 29, 30, 35, 36, 37, 118, 777, 2000, 2646, 3000
POOL-IN	6315
PRDCTN	823, 829, 832, 917
PUMP	21, 28, 31, 210, 211, 654, 717, 810, 818, 2615, 2645, 3027, 3200, 6385
R&D	3, 104, 105, 106, 240
R&D(F1)	112
REC	400, 440
RESTRNT	632
SECURTY	45, 49, 99, 119, 173, 274, 277, 308, 410, 434, 635, 741, 745, 751, 753, 754, 755, 758, 759, 767, 794, 799, 811, 820, 834
SHOP	126, 144, 212, 214, 215, 218, 219, 222, 255, 321, 786, 821, 822, 824, 825, 826, 896
SHOP-AIR	108, 127, 134, 168, 207
SHOP-ELC	1, 774
SHOP-HVY	20
SHOP-MV	11, 15
SHOP-WPN	145, 790, 791, 817, 838, 841, 846, 853, 854, 915
SIMULTR	133, 796
STA-UTL	27
STOR-HZ	4

STOR-UH	135, 259, 334, 509, 795, 807, 808, 813, 837, 839, 840, 843, 847, 848, 849, 850, 851, 885, 900, 901, 902, 903, 904, 905, 906, 907, 912, 913, 916, 925, 926, 927, 928, 929, 6323
TRAIING	435, 436, 446, 447
WHS	2, 7, 8, 9, 10, 23, 47, 110, 216, 245, 789, 1200, 1300
WHS(F3&5)	120
WHS-CLD	324

Table A.2. Assignment according to building subfunction. Each single-function building appears under one type category; a multi-function building may appear under more than one type category.

Type	Building Numbers
ADMIN	2, 8, 9, 10, 14, 19, 23, 40, 42, 100, 104, 106, 112, 115, 131, 220, 223, 247, 248, 316, 510, 760, 765, 770, 776, 778, 780, 788
ADMIN(F3&5)	1, 101, 102, 109, 120, 301, 303, 308, 310, 311, 428, 430, 488, 738
BRK/ADM	41, 44, 100, 430, 432, 438, 442, 444, 448, 450, 452, 468, 704, 712, 764, 793, 923
CHAPEL	510, 517
CLINIC	510
CLUB	888, 890
COM-OUT	34, 855, 878
COMCATN	246, 302, 629, 814, 6242
COMCATN(F1)	97, 100, 112, 128, 504, 858, 866
COMCATN(F6)	700, 702, 757
DET-RR	98, 132, 519, 762
DGR	1, 8, 143, 329, 337, 510
DINING	272, 443, 510, 724, 783, 890
FUELDSP	771, 773, 775, 779, 781, 5732
GROCERY	346
HANGAR	100, 150, 221, 782, 783, 784, 785
HANGAR(F3)	101
HOSPITL	510
HOTEL	490, 491, 492
HSG-FAM	231, 232, 480, 880, 883
HSG-FAM(F8)	All 2000 series except 2000, 2615, 2645 and 2646; 177 buildings
HSG-FAM(F9)	All 3000 series except 3000, 3027 and 3200; 143 buildings
HUT	139, 511, 819, 5025
KENNEL	525
KITCHEN	100
LAB-MED	123, 324, 510
MWR	305, 437, 439, 482, 510, 520, 706
PLT-BLD	16, 24, 29, 30, 35, 36, 37, 118, 777, 2000, 2646, 3000
POOL-IN	6315
PRDCTN	823, 829, 832, 917
PUMP	21, 28, 31, 210, 211, 654, 717, 810, 818, 2615, 2645, 3027, 3200, 6385
R&D	3, 104, 105, 106, 240, 247
R&D(F1)	112
REC	400, 440
RESTRNT	1, 632

SECURTY	14, 45, 49, 99, 100, 119, 150, 173, 274, 277, 308, 410, 434, 635, 741, 745, 751, 753, 754, 755, 758, 759, 767, 794, 799, 811, 820, 834
SHOP	9, 100, 101, 126, 144, 212, 214, 215, 218, 219, 222, 255, 301, 321, 334, 786, 821, 822, 824, 825, 826, 896
SHOP-AIR	100, 101, 108, 127, 134, 168, 207, 776
SHOP-ELC	1, 7, 10, 112, 770, 774, 776
SHOP-HVY	20
SHOP-MV	11, 15
SHOP-WPN	145, 790, 791, 817, 838, 841, 846, 853, 854, 915
SIMULTR	133, 316, 778, 796
STA-UTL	27
STOR-HZ	2, 4, 23
STOR-UH	1, 7, 135, 259, 301, 334, 428, 509, 795, 807, 808, 813, 837, 839, 840, 843, 847, 848, 849, 850, 851, 885, 900, 901, 902, 903, 904, 905, 906, 907, 912, 913, 916, 925, 926, 927, 928, 929, 6323
TRAING	106, 112, 115, 435, 436, 446, 447, 770
WHS	2, 7, 8, 9, 10, 23, 47, 100, 105, 110, 216, 245, 316, 510, 774, 789, 1200, 1300
WHS(F3&5)	1, 120
WHS-CLD	324

APPENDIX B

TRANSFORMER ANALYSIS METHODOLOGY

APPENDIX B

TRANSFORMER ANALYSIS METHODOLOGY

Transformers contribute to the monthly electric consumption (kWh) and to monthly demand (15-minute peak kW) through core and winding losses. In addition, transformers contribute to monthly excess reactive demand (15-minute peak kVAR) through stray inductance and magnetization current.

MONTHLY ENERGY LOSS:

Energy Loss in Rate Period 1 = $N_1(NLL + F_{ELS1}LL)$ in units of [Wh]

where

N_1 = Number of Hours in Rate Period 1

NLL = Transformer No-Load Loss [W]

LL = Transformer Load Loss [W], and

$F_{ELS1} = F_{DLS}(0.3F_{LD1} + 0.7F_{LD1}^2)$ = Energy Loss Factor for Rate Period 1

where

F_{DLS} = Demand Loss Factor

F_{LD1} = Load Factor for Rate Period 1.

The energy loss factor, F_{ELS} , converts the load loss at full nameplate capacity to the load loss under average load. The empirical equation, $0.3F_{LD} + 0.7F_{LD}^2$ (Gönen), is used to convert peak loss to average loss. The demand loss factor, F_{DLS} , used to convert the load loss at nameplate capacity to the load loss at full load, is given by:

$$F_{DLS} = \left(\frac{\text{Peak Transformer Load [kW]}}{(\text{Nameplate Capacity [kVA]})(\text{Power Factor Correction [kW/kVA]})} \right)^2$$

$$F_{LD1} = \frac{\text{Average Load During Rate Period 1 [kW]}}{\text{Peak Transformer Load [kW]}}$$

MONTHLY DEMAND:

Peak Power Loss = $NLL + F_{DLS} LL$ [W]

where NLL = Transformer No-Load Loss [W]

LL = Transformer Load Loss [W]

F_{DLS} = Demand Loss Factor (see previous page).

The transformers do not experience peak loads simultaneously. We account for this by applying a Coincident Demand Diversity Factor, i.e.:

Coincident Peak Loss = (Peak Power Loss) x (Coincident Demand Diversity Factor)

where Coincident Demand Diversity Factor = $\frac{\text{Aggregate Peak Load}}{\sum (\text{Individual Peak Loads})}$

The coincident demand diversity factor can be measured by recording meters but appropriate assumptions can be made in lieu of metered data.

REACTIVE DEMAND:

Peak Reactive Power = $NLL_R + F_{DLS} LL_R$ [VAR]

where

NLL_R = Reactive power with transformer no load [VAR]

LL_R = Additional reactive power with transformer loaded [VAR]

F_{DLS} = Demand Loss Factor (as before).

The coincident demand diversity factor is applied as before. The no-load and load components of reactive power are evaluated as follows.

$$NLL_R = \sqrt{(F_E S)^2 - (NLL)^2} \quad [\text{VAR}]$$

$$LL_R = \sqrt{(F_Z S)^2 - (LL)^2} \quad [\text{VAR}]$$

where

S = Transformer Nameplate Capacity [VA]

NLL = Transformer No-Load Loss [W]

LL = Transformer Load Loss [W]

F_E = (% Excitation Current)/100 = Excitation Current Fraction

F_Z = (% Impedance)/100 = Impedance Fraction.

The values of NLL, LL, F_E, and F_Z are listed for typical standard efficiency transformers in (Gönen). The expressions for NLL_R and LL_R are derived below.

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REACTIVE POWER SUPPORTING CALCULATIONS:

The standard equivalent circuit used to evaluate transformer losses is:

NO-LOAD LOSS COMPONENT:

The primary series impedance can be neglected in estimating a transformer's no-load reactive power. The no-load equivalent circuit is therefore:

V = Primary Voltage

R_C = Core Loss Equivalent Resistance

X_M = Core Magnetizing Equivalent Inductance

I_E = Excitation Current

The excitation current is given, in phasor notation, by:

$$I_E = I_C + I_M$$

Since I_E is the resultant of two currents, I_C and I_M , that are 90° out of phase, we can express the magnetizing current as:

$$|I_M| = \sqrt{|I_E|^2 - |I_C|^2}$$

$$|I_E| = \frac{\left(\frac{\% \text{ excitation current}}{100} \right) S}{V} = \frac{F_E S}{V}$$

$$|I_C| = \frac{NLL}{V}$$

$$|I_H| = \frac{1}{V} \sqrt{\left[\left(\frac{\% \text{ excitation}}{100} \right) S \right]^2 - [NLL]^2}$$

$$Q = V|I_H| = \sqrt{\left[\left(\frac{\% \text{ excitation}}{100} \right) S \right]^2 - [NLL]^2}$$

or, equivalently,

$$NLL_R = \sqrt{(F_E S)^2 - (NLL)^2}$$

LOAD LOSS COMPONENT:

In what follows, the equivalent transformer series resistance and inductance, X and R , can be viewed in terms of either primary-side or secondary-side impedance. In terms of primary-side impedance we would have:

$$X = X_p + N^2 X_s$$

and

$$R = R_p + N^2 R_s$$

where

$$N = \frac{N_p}{N_s} \text{ is the ratio of primary to secondary turns.}$$

Transformer series impedance
as viewed from primary.

In cartesian notation the series loss is $S = P + jQ$, thus:

$$LL_R = \sqrt{|P|^2 + |Q|^2}$$

where $P = I^2 R$ and $Q = I^2 X$. To get Q in terms of known quantities we make a series of substitutions as follows:

$$\text{Rearranging } Z = \sqrt{R^2 + X^2} \text{ gives } X = \sqrt{Z^2 - R^2}$$

$Z = \frac{\%Z}{100} (Z \text{ Base}), \text{ where } Z \text{ Base} = \frac{V^2}{S}, \text{ thus:}$

$$Z = \left(\frac{\%Z}{100} \right) \frac{V^2}{S}.$$

Substitution of the foregoing expressions for X and Z gives:

$$Q = I^2 X = I^2 \sqrt{\left[\left(\frac{\%Z}{100} \right) \frac{V^2}{S} \right]^2 - \left[\frac{P}{I^2} \right]^2}$$

Taking the I^2 term inside the radical leaves:

$$Q = \sqrt{\left[\left(\frac{\%Z}{100} \right) \frac{V^2 I^2}{S} \right]^2 - P^2}$$

At Full Load $I = \frac{S}{V}$ hence $\frac{V^2 I^2}{S} = S$, and $P = I^2 R$; these substitutions yield:

$$Q = \sqrt{\left[\left(\frac{\%Z}{100} \right) S \right]^2 - P^2}, \text{ where } P = \text{NLL, thus:}$$

$$LL_R = \sqrt{(F_Z S)^2 - LL^2}.$$

These equations apply to both single-phase and three-phase transformers.

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