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FEDERAL ENERGY RESOURCES MODERNIZATION
COORDINATING COMMITTEE

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PREFACE

This document fulfills the formal reporting requirements set forth in the charter of the Federal Energy Resources Modernization (FERM) Coordinating Committee. The purpose of the FERM Coordinating Committee is to assist the U.S. Department of Energy Federal Energy Management Program (DOE-FEMP) to coordinate and evaluate the development and implementation of tools, methods, approaches and procedures for understanding, characterizing and modernizing energy resources in the federal sector, and to disseminate information and experiences among federal energy managers to help them better manage their energy resources.

The Committee is composed of a non-voting Chairman from FEMP and one representative each from the U.S. Air Force, U.S. Army and U.S. Navy and two representative from other (civilian) federal agencies. The Committee is also supported by a non-voting Executive Secretary from Pacific Northwest Laboratory (PNL).^(a)

The goal of DOE-FEMP is to facilitate energy-efficiency improvements at federal facilities. This is accomplished by a balanced program of technology development, energy efficiency resource and energy supply assessment, and facility modernization. Technology development focuses upon the tools and procedures used to identify and evaluate efficiency improvements, such as the federal life-cycle cost analyses. For efficiency resource and energy supply assessment, FEMP provides metering equipment and trained analysts to federal agencies exhibiting a commitment to understand and improve energy use efficiency and reduce energy costs. The FERM Coordinating Committee is a critical element of the overall FEMP strategy for assisting federal energy managers.

The DOE-FEMP provides the support to PNL to produce this report for the FERM Coordinating Committee. The Energy Systems Modernization Office (ESMO) at PNL supports the FEMP mission as the lead laboratory for energy systems

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modernization. Under this charter, PNL works with federal facility energy managers to assess and implement energy-efficiency improvements at federal facilities nationwide.

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EXECUTIVE SUMMARY

This report summarizes the broad range of activities supported by FEMP and other federal agencies focused on meeting the President's Executive Order on Federal Energy Management promulgated to meet energy savings goals and encourage more efficient management of all federal energy resources.¹ These activities are reported semiannually under the auspices of the FERM Coordinating Committee, and as such include activities undertaken from October 1, 1991, through March 31, 1992. Previous semiannual reports are available from the Executive Secretary of the FERM Coordinating Committee.^(a)

The activities reported are classified into four major categories: 1) technology-base support, which includes development of processes, software, metering and monitoring equipment and strategies, and other tools for the federal energy manager to better understand and characterize their energy resources; 2) federal energy systems testing and monitoring; 3) federal energy systems modernization projects at federal installations in cooperation with the utilities serving the sites; and 4) energy supply, distribution and end-use conservation assessment for federal agencies and/or facilities. The following is the significant activity in each category during the reporting period.

TECHNOLOGY-BASE SUPPORT ACTIVITIES

Federal Relighting Initiative (FRI)

- The FRI team developed two recommended approaches for retrofitting the lighting systems in the Mary Switzer Building in Washington, D.C., based upon life-cycle cost economics and good design practices.
- FEMP/PNL agreed in October to develop energy-efficiency lighting replacement guidance for the Defense Logistics Agency (DLA). This guidance will be developed from information supplied by DLA on costs and volume for lighting components currently in the DLA supply line.
- A peer review copy of the *Master Specification for Energy-Efficient Lighting Technologies for Existing Federal Facilities* was distributed in

(a) Contact: Graham Parker, PNL (509) 375-3805.

December 1991 to a selected list of lighting and energy experts and users for comment. Suggested changes were received, and the master specifications are currently being modified.

- The latest version of the *Existing Lighting Characterization (ELC) Handbook* and forms was submitted to the FRI team for review in January 1992. The current plan calls for three building walkthroughs to be conducted at GSA buildings.
- The FRI Lighting Technology Selection Matrix (LTSM) DOS-based software program was released in February 1992 to selected federal users for evaluation. The LTSM quickly determines a menu of life-cycle-cost-effective retrofit fixtures for existing lighting technologies based on operation, energy economics and utility incentive programs.

Federal Energy Decision Screening (FEDS) System

- The FEDS software Level-1 (buildings and facilities only) alpha version 0.0 was compiled and operational in January 1992 with some expected minor problems. The Level-1 alpha release is scheduled for distribution to a few selected federal-sector testers for review and comment by April 1992.
- An outline was developed for documenting the FEDS process (the energy-efficiency project acquisition component of FEDS) and writing was initiated in anticipation of transferring the process to other federal technical support agencies.

Integrated Utility Resource Planning (IURP)

- A series of meetings was held in the first half of FY 1992 to define the scope of the DoD effort in IURP, to assign responsibilities to DoD support agencies, and to coordinate with DOE-FEMP activities in this area. The Navy (Navy Energy and Environmental Support Activity, NEESA) is taking the lead in identifying and testing software applicable to the IURP project. NEESA plans to test the software for this activity at the Naval Shipyard Puget Sound, WA, and the Naval Air Station Miramar, CA, the fourth quarter of FY 1992.

Federal Test Bed Demonstration Program (TBDP)

- In FY 1991, PNL issued a solicitation of interest for gas-cooling technologies to be demonstrated at a federal site. The solicitation was also intended to assist in targeting potential sites and fostering the selection of partners for the pilot test bed demonstration. Three manufacturers and five utilities responded to the solicitation with interest and potential contributions of equipment and/or financial and technical assistance. During the reporting period, PNL worked to match a federal site and utility to their equipment application.

Decision Support System for Operations and Maintenance (DSOM)

- Since FY 1991, the U.S. Marine Corps has been supporting the development of the DSOM technology that will be applied at Marine Corps Base (MCB) Twentynine Palms in California. During the reporting period, activity was focused on specification and procurement of calibration instrumentation and data acquisition computer hardware, operating software development, and design of the control room layout and component and instrument labeling. The Central Heating Plant Advisor (CHPA) platform development was also undertaken focusing on the requirements of the user graphics and analysis/feedback program.

Testing Equipment Development

- Modifications were made by PNL to the four-wire, three-phase power measurement using "phase imbalance" current transformers (CTs) in substation metering using C180 Synergistics Control Systems data logger equipment. This modification was developed to overcome previous problems experienced at Fort Irwin and Hunter Army Air Field (AAF) where the substation configurations have only two potential transformers (PTs)
- The use of a cellular phone for remote data collection was bench-tested by PNL for installation at sites where "hard" phone lines are not available.

Procedure Development

- Test Procedure #9, *Heating Ventilating and Air Conditioning (HVAC) Performance Evaluation*, was submitted and balloted at the subcommittee level by Subcommittee E06 on Performance of Building Constructions of the American Society for Testing and Materials (ASTM) in October 1991.
- An outline was prepared for a procedure for verifying the savings from the installation of energy-efficient technologies. The procedure will include the determination of the "baseline" and the appropriate testing/metering strategies for the installed technologies. The issue of persistence is also being addressed.

TESTING AND MONITORING

Fort Devens, Massachusetts

- In December 1991, electric and gas metering equipment installation was completed in 12 buildings at Fort Devens for the two active Mobile Energy Laboratory (MEL) Assignment Plans (MAPs), and data collection was initiated. Four data loggers were without dedicated phone lines until January. The condensate return bypass necessary for measuring flow was installed in January. The data collection activities continued through March 1992 for both the nighttime setback test (FTDEV-001) and the conservation incentive program test (FTDEV-002).

Federal Building, Richland, Washington

- Starting in FY 1992, a lighting survey of the entire building was initiated to determine if the use of motion sensors is economically justified. Occupancy sensors monitors are placed for a two-week period in selected areas of the building and data are analyzed to determine whether motion sensor installation is economical. Also initiated was a whole-building and selected end-use metering survey.

Hanford Personal Computer System Monitoring

- During the reporting period, 140 PCs were monitored in three buildings. Analysis of the data is under way. The analysis is directed toward comparison of the metered PC demand profile, development of an algorithm for calculation of a typical PC demand profile, and development of tables which list the typical demand for both whole workstations and individual equipment. The information will be used for estimating the energy savings potential of energy conservation options for PCs and for building designers of electrical services and HVAC equipment.

Department of Energy Forrestal Building, Washington, D.C.,

- In March 1992, PNL undertook a Live Test Demonstration (LTD) to evaluate the lighting retrofit strategies proposed under a solicitation for Shared Energy Savings (SES) Lighting Retrofit on the Department of Energy Forrestal Building in Washington D.C. Four lighting retrofit contractors were selected to participate in the demonstration. In the demonstration, each contractor was asked to retrofit a single room in the Forrestal Building with their proposed retrofit. PNL measured the real-time electrical power consumption of the retrofit and the lighting levels at selected locations in the room. The LTD was completed March 9 through March 20, 1992. All four proposed retrofits led to improved lighting levels and resulted in energy savings ranging from 50% to 70% over the baseline lighting. Final bids and selection of the SES contractor is expected by the third quarter of FY 1992.

Merchant Marine Academy (MMA), Long Island, NY

- The objective of the study for the MMA is to monitor the central plant and whole building loads to establish baseline energy consumption and to identify promising energy conservation opportunities at the MMA. The data will be used to help the Department of Transportation develop specifications for a SES procurement and evaluate the resultant proposals. Data collection was completed in September 1992. A thorough assessment of outside temperature-based electric consumption models proposed by the SES contractors was completed for the three monitored buildings. Based on PNL data, the MMA determined that the SES contractor models were unacceptable for the determination of savings and savings share.

Naval Aviation Depot Pensacola, FL

- A maintenance contract was set up for steam meters for the site and a plan was developed to meter the compressed air system in the repair facilities.

Naval Ship Yard (NSY) Norfolk, VA

- NEESA has developed a plan to meter steam, potable water, compressed air, salt water, and electricity at the entire site, to be implemented during FY 1992.

Naval Air Station (NAS) Adak, AK

- NEESA has developed a plan to meter steam, fuel oil, and electricity for the entire facility. The meters will be installed during the third quarter of FY 1992.

Naval Hospital San Diego, CA

- NEESA deployed an ultrasonic meter to determine peak and average water consumption over a brief period. Data will be used by the hospital energy management staff for developing water conservation programs.

Public Works Center (PWC) San Francisco and San Diego, CA, and Guam

- NEESA is assisting the PWC by writing specifications for supervisory control and data acquisition (SCADA) systems at these sites. The system in San Francisco uses radio transmission for the communication medium; the system in San Diego will use fiber optics for communications.

ENERGY SYSTEMS MODERNIZATION PROJECTS

There are currently modernization projects under way at six U.S. Army Forces Command (FORSCOM) installations, six U.S. Air Force bases, one Marine Corps Base, and two Department of Energy sites, all in cooperation with the servicing electrical utility.

Fort Lewis, Washington/Tacoma Public Utilities (TPU)

- The final report on the electric baseline and efficiency assessment for Fort Lewis was published and distributed in November 1991. The report will form the basis for the "deal" between TPU and Fort Lewis for demand-side management (DSM) programs to be implemented by an Energy Services Company (ESCO) under contract to TPU. Concurrently with the assessment, Fort Lewis and TPU staff developed a draft contract for the utility to implement the DSM projects at the site. During the reporting period, discussions continued between (TPU) and Fort Lewis on the terms

and conditions of the contract. TPU also developed a request for proposal (RFP) for an energy services company (ESCO) to install the technologies at the site. General agreement on the terms of the reimbursement that TPU will receive from Bonneville was reached in February. The release of the RFP is expected in April and the signing of the contract between TPU and Fort Lewis is expected in May. The draft of the fossil-fuel baseline and resource potential report was released in October 1991 and is being revised based on comments received from internal reviewers.

Fort Drum/Niagara Mohawk Power Company (NMPC)

- A second site visit to Fort Drum was made during the first week of October 1991 to verify the baseline information, and collect specific information for evaluation of the energy conservation options (ECOs), both electric and fossil. A representative sample of buildings was visited in order to assess the current condition of the shell, lights, and HVAC equipment. A project review was held at Fort Drum in October to present the preliminary results of the baseline analysis and brief the returning director of the Department of Engineering and Housing (DEH) on this program. The ECOs for both electric and fossil fuels were evaluated, and the life-cycle cost (LCC) analysis was initiated. The electric options were analyzed at two different incentive levels from NMPC, 0% and 50%. This is the cost share that NMPC would provide without reimbursement. The fossil fuel options assume no cost sharing by the gas utility.
- NMPC made a very general filing with the Public Service Commission (PSC) in October 1991 for a new program for commercial/industrial (C/I) customers called the "Energy Alliance Pilot." The program would allow NMPC the flexibility to design custom programs with C/I customers that could include: technical expertise (NMPC or a third party), comprehensive energy planning, financing, administrative flexibility (repayment schedule), and some degree of cost sharing by the utility. The Energy Alliance Pilot Program has not yet been approved by the PSC, although there are indications that it will be approved.

Fort Stewart-Georgia Power/Hunter AAF-Savannah Electric & Power Co.

- In June 1991, PNL initiated a FEDS assessment at Fort Stewart and Hunter AAF. In February 1992, PNL acquired the real property data from Stewart/Hunter AAF and began to formulate the project management plan (PMP) for the two sites.
- During the reporting period, PNL staff continued to meet with key Georgia Power and Savannah Electric and Power Company (SEPCO) DSM staff to discuss the type of DSM program the utilities could offer these sites, and the program that would be most attractive for federal customers. At the invitation of a staff engineer at the Georgia PSC, PNL provided a briefing to staff, commissioner and invited guests at the PSC in January. A third Department of Defense Energy Partnership (DEPP)

meeting sponsored by Georgia Power and SEPCO was held in January 1992. FEMP provided an overview of its model program and long-term strategy. Currently, as filed in the utility's Integrated Resource Plan (IRP), the maximum either utility will pay for DSM technologies is ~15%, and that is in a T-8 fixture retrofit. Other technologies offered include high-efficiency motors, heating, ventilation and air conditioning (HVAC) upgrades, insulation, and other lighting technologies (compact fluorescents, energy-efficiency ballasts, etc.). A major issue yet to be resolved is the amount of cost-sharing by the utility for its federal customers. In March, Georgia Power initiated a collaborative (working group) made up of representatives from the major industrial, commercial and federal customers, intervenors, environmental groups, and the State of Georgia, and a representative from the DOE Support Office in Atlanta.

Fort Hood/Texas Utilities (TU)

- In October 1991, FORSCOM requested that PNL take the lead role in working with the servicing utilities to Fort Hood and interface with the activities planned for Fort Hood by the Corps of Engineers Construction Engineering Research Laboratory (CERL) under their Model Installation Program (MIP) being applied at Fort Hood. This program is funded by the Department of Defense (DoD) with assistance from FORSCOM and is designed to identify and implement all cost-effective energy efficiency technologies at the site. Texas Utilities (TU), the servicing electric utility, offers DSM incentive programs that need to be factored into the model installation program.
- PNL, CERL and Huntsville Corps of Engineers staff met with Texas Utilities district DSM representatives in Waco to discuss DSM programs for their federal customers. The TU representatives were extremely interested in implementing DSM programs at Fort Hood (and other federal sites in their service territory) and expressed frustration in past dealings with federal customers. They agreed in principle with the FEMP model approach and endorsed the concept of including all federal customers under one program approach. The agreed-upon next step is to meet with TU DSM design staff at the TU headquarters in Dallas in April.

Fort Irwin/Southern California Edison (SEC)

- In January 1992, a briefing was given to staff at Fort Irwin explaining the FEDS/DSM model program and how it could be applied at Fort Irwin. The staff enthusiastically endorsed the program and committed staff support for the program. Southern California Edison (SCE) has well-developed DSM programs and has worked with the site in previous energy conservation program areas.

Vandenberg Air Force Base/Pacific Gas and Electric (PG&E)

- The FEDS activity at Vandenberg Air Force Base (VAFB) was initiated in July 1991. The project plan for the VAFB modernization project was developed and sent to SPACECOM and to the energy manager at VAFB in

November 1991. In support of the project, plans were made to increase the electrical feeder metering over that currently being conducted. This expansion was made possible by the existence of existing transducers at the base that will enable metering of many more channels of data for the same cost. Data collection is nearing completion for the resource assessment.

Griffiss AFB/NMPC

- The FEDS activity at Griffiss Air Force Base (AFB) was initiated in May 1991. Currently, the modernization project involves only an assessment of the electric resource potential. A briefing was held at Griffiss AFB in October 1991 to review the initial site characterization, and discuss plans for the electric assessment. Preliminary data for the electric assessment was provided by Griffiss staff, and the electric energy baseline evaluation began. The initial data provided by Griffiss have been reviewed, and additional data have been requested to complete the energy baseline characterization. Providing that these data are readily available from the base, an initial draft appendix on the electric energy baseline should be completed by the end of April.

Robins AFB/Georgia Power

- A meeting was held in October 1991 with staff at Robins AFB to begin to scope out the FEDS activity at the base. Civil engineering staff provided PNL material on site characteristics and energy usage. A site visit was conducted in January 1992 to begin the process for acquiring and archiving electrical distribution system data from the utility control system installed at the site. A meeting was held with the control equipment vendor to assess the complexity of the required equipment to obtain these data.

Patrick AFB/Cape Canaveral Air Force Station/Florida Power and Light

- In January, Air Force Space Command (SPACECOM), tasked PNL to initiate energy resources modernization projects at two sites--Patrick AFB and its northern neighbor, the Cape Canaveral Air Force Station (CCAFS). An initial visit to the two sites was conducted in January and initial contacts were made with the energy managers at the sites. A major portion of the PMP was prepared in February 1992. Some key facility data are still required for developing the resource savings estimates. Once these data are received, the PMP will be completed in the second quarter of FY 1992.

Travis AFB-David Grant Medical Center/PG&E

- PNL was tasked by the Air Combat Command in October 1991 to undertake a FEDS assessment of the David Grant Medical Center (DGMC) at Travis AFB. A project plan was developed in November to assess the resource potential at the DGMC and delivered to the ACC and to the new energy manager

at DGMCC. It was approved in December and baseline data collection activities initiated including end-use metering of the building.

Marine Corps Base Camp Pendleton/San Diego Gas and Electric (SDG&E)

- In November, PNL met with the Navy and FEMP to discuss the status of the utility DSM lighting program underway at the Marine Corps Base (MCB) Camp Pendleton. PNL was requested to identify the long-run avoided energy and capacity costs for SDG&E so that the U.S. Marine Corps (USMC) could construct the best financial arrangement on cost-sharing with the utility. PNL was also tasked to review the 300 building audit for lighting retrofits performed and proposed by SDG&E. This review was to assure that the utility was recommending technologies that were the most life-cycle cost-effective. PNL applied the LTSM to the 300 buildings and found that the technologies recommended by the utility were close to the most life-cycle cost-effective technologies available to the Marines.

Knolls Atomic Power Laboratory (KAPL)/NMPC

- The activity at KAPL was initiated in the fourth quarter of FY 1991. A briefing was held at KAPL in October 1991 to review the initial site characterization and discuss plans for the technical assessments to follow. The site characterization estimated the energy conservation potential and outlined a plan to complete the electric and fossil fuel technical assessments.

Hanford Site/Bonneville Power Administration (Bonneville)

- In December 1991, PNL submitted a scope of work to DOE to implement the FEDS model process at the Hanford site in cooperation with the site operator, Westinghouse-Hanford Company and Bonneville who directly serves electricity to the site. In January 1992, DOE In-House Energy Management (IHEM) indicated that the funding would be available in the third quarter of FY 1992 to initiate the development of the PMP.

ENERGY SUPPLY, DISTRIBUTION AND END-USE CONSERVATION ASSESSMENTS

Activity is reported for eight federal agencies at 17 buildings or facilities.

Social Security Administration, MD - SES Support

- PNL is providing technical support to the Social Security Administration to prepare an SES solicitation for a relighting project in the SSA's nine-building complex. The SSA onsite project manager submitted a generic description of the proposed lighting retrofit to the environmental planning group at SSA and PNL in February 1992. Clearance for the project was obtained in March from the SSA Environmental Compliance Section

for the majority of buildings in the Woodland Complex. Relevant elements of their report were incorporated into Exhibit 1 of Section C of the SES.

Department of Agriculture Forest Products Laboratory, WI - Site Assessment

- In FY 1991, FEMP tasked PNL to perform a preliminary assessment of energy conservation opportunities at the Forest Products Laboratory (FPL). Based on the assessment and recommendations, PNL prepared a statement of work (SOW) that included specific retrofit project identification and metering of major buildings and steam distribution systems and discussions with the servicing utility, Madison Gas and Electric (MG&E), concerning DSM programs available to their federal customers. The SOW was discussed with the FPL and Department of Agriculture, and in February 1992 the FPL agreed to fund the study. Onsite activity is scheduled to begin the second week of May 1992.

**National Aeronautics and Space Administration White Sand Test Facility, NM
- Site Assessment**

- A site assessment was conducted at the White Sands Test Facility (WSTF), Las Cruces, NM, in August 1991. The site visit also included a meeting with El Paso Electric to discuss potential utility DSM programs and incentives that may be available to the site. The report on the site assessment findings and recommendations was submitted to the WSTF in October 1991. PNL found considerable energy-saving opportunities at WSTF. Though the electric utility offers little in the way of incentive programs, these projects can be cost-effective for the site to institute through either self-funded projects or through third-party-financed projects (such as SES).
- Recommended energy-efficient retrofit projects included upgrading and denergizing transformers, retrofitting with high-efficiency lighting, replacing motors when they fail with high-efficiency motors, and selected load-shedding. The estimated potential energy and dollar savings from these recommended projects are over 2,000,000 kWh/yr and nearly \$140,000/yr.

**National Aeronautics and Space Administration Ames Research Center, CA
- Site Assessment**

- The information for the assessment was collected during a site visit to the NASA Ames Research Center, Moffet Field, CA, in February 1992. The draft report was issued to the site in March 1992. PNL found considerable energy-saving opportunities at the site. Even though the recommendations were only for non-mission-variable facilities, the findings can be extended to mission-variable facilities, particularly in office and administrative facilities. The energy savings can be obtained from mission-variable facilities with little impact on research activities.

- The major energy saving opportunities were found in office and other facilities lighting energy use. This includes improving lighting efficiency through a retrofit combined with meeting federal illumination levels and lighting controls. The estimated energy and cost savings from a lighting retrofit and control strategy for non-mission-variable facilities were over 6,600,000 kWh/yr and nearly \$300,000/yr.

Department of Treasury Bureau of Public Debt Building, WV - Site Assessment

- A one-day site inspection was conducted in July 1991 at the Bureau of Public Debt Building, Parkersburg, WV. The report on the findings was delivered to FEMP in September 1991. The site visit also included meetings with the servicing gas and electric utilities, Hope Gas, Inc. and Monongahela Power Company, respectively. PNL recommended that a building-wide lighting retrofit (interior and exterior) should be carried out using technologies that comply with federal life-cycle cost criteria. Lighting energy consumption savings due to LCC retrofit were estimated to be 1,500 MWh/yr (\$72,500/yr), at an installed cost of \$478,500. Since no electric utility DSM incentive program is available, this retrofit would need to be funded by GSA.
- Motors on pumps, fans and chillers should be tested for efficiency improvement in drives, windings and controls, and inefficient equipment replaced with high-efficiency equipment on failure. In addition, the chillers and the boiler should be monitored to determine the efficiency of the equipment and the potential for cost-effective improvements. Discussion between the gas utility and the Bureau should be initiated to further explore the opportunity for installing a cogeneration system and possibly gas-driven chillers.

Internal Revenue Service National Computer Center, WV - Site Assessment

- A two-day site inspection was conducted in February 1992 at the National Computer Center, Martinsburg, WV. A draft report was delivered to FEMP in March 1992. The site visit also included meeting with the local servicing utilities, Shenandoah Gas and The Potomac Edison Company (electricity) to assess the potential utility DSM incentives available. A retrofit of the existing lighting fixtures on a fixture-equivalent basis (one-for-one replacement) with the most life-cycle-cost technology will result in an estimated energy and cost savings of over 1,000,000 kWh/yr and nearly \$56,000/yr.
- Other recommendations for reducing the energy consumption at the facility included determining if additional lighting controls are feasible and cost-effective in those areas where 24 hour/day lighting is not necessary; tuning the four boilers for maximum combustion and delivery efficiency; evaluating the motors on pumps, fans and air conditioning units for efficiency improvement in drives, windings and controls, and replace inefficient units with high-efficiency equipment on failure; assessing the life-cycle cost associated with upgrading HVAC controls and the distribution system, including the air handlers and coils;

evaluating the heat recovery strategy for the building and optimize to provide maximum benefit for conditioning needs; and review the operations and maintenance (O&M) practices for the HVAC system and modify if necessary to insure that the entire system is properly maintained.

National Park Service Ellis Island, Long Island, NY - Site Assessment

- PNL conducted a one-day site visit in October to Ellis Island, NY, and was accompanied by staff from the regional DOE Support Office in New York City. Several energy-efficiency opportunities were identified, primarily in lighting retrofit. The preliminary estimate of cost-effective conservation opportunities is over 2,600,000 kWh/yr, representing over \$193,000/yr in cost savings. The draft report is expected to be completed by mid-June 1992.

National Park Service Independence National Historic Park, PA - Utility Upgrade

- PNL undertook a review of a study to upgrade the chiller and central steam system at the Independence National Historic Park (INHP) in Philadelphia, PA. The purpose was to examine some of the assumptions and parameters used in the study, primarily the central steam contingency plant and the central cooling plant analysis. PNL recommended a number of alternative approaches to upgrading the utility systems in an integrated approach, including modifications to operations and maintenance, fuel switching, and end-use conservation projects to reduce heating/cooling load. PNL also recommended exploring potential utility (gas and electric) incentive/cost-sharing programs for equipment upgrades and acquiring important baseline operating data prior to designing any retrofit.

Naval Underwater Systems Center, CT - Central Plant Upgrade

- Since early FY 1991, PNL has been providing engineering and technical assistance to the Naval Underwater Systems Center (NUSC), New London, CT, to determine the modifications necessary to upgrade NUSC's central plant to maximize efficiency and minimize fuel and operations and maintenance costs. The design package (drawings and specifications) for the in-plant modifications for dual-fuel (coal and gas) operation at the heating plant facility was submitted for final review in November 1991. The final design and bid specification package was sent to NUSC as a 100% design submittal in March. The environmental modeling task for the lower steam load case is under way and should be completed in April.

National Naval Medical Center, MD - SES Baseline

- The Chesapeake Division Naval Facilities Engineering Command (CHESDIV) entered into an interagency agreement with FEMP to provide technical assistance for an SES project at the National Naval Medical Center (NNMC). PNL was tasked by FEMP to undertake this assessment and the report was finalized in March 1992, giving metered and surveyed baseline

data and recommendations to the CHESDIV and NNMC staff for viable energy-efficiency projects. This report also provided estimates of costs and potential energy savings of the recommended projects.

- PNL identified three primary energy savings project opportunities. These were: 1) replace incandescent and fluorescent fixtures with life-cycle cost-effective energy-efficient fixtures; 2) install lighting controls; and 3) incorporate thermal energy storage system with the existing chilled water production and distribution systems to reduce electrical consumption during periods of peak demand. Although the site is space-limited for a thermal energy storage system sized to serve the entire complex, a smaller system could be designed to serve a percentage of the load and still be life-cycle cost-effective. These three projects are particularly cost-effective because of the availability of the servicing electric utility (Potomac Electric Power Company) rebates and financial incentives for these technologies.

Marine Corps Base (MCB) Quantico, VA - Cogeneration Evaluation

- A site visit was made by PNL in November 1991 to MCB Quantico, VA, to discuss the various options for expanding its landfill versus participating in a waste-to-energy plant design with the local county. In January, PNL submitted a draft report evaluating the potential of a municipal solid waste (MSW) cogeneration facility at Quantico. The analyses results showed that under existing conditions, an MSW plant did not appear to be economically viable for the site.

Fort Drum, NY - Gas Supply Analyses

- A study was undertaken in October 1991 to determine the best strategy for meeting the current and future gaseous fuels (natural gas or propane equivalent) needs of Fort Drum. In the study, PNL evaluated and recommended the optimal mix of supply scenarios for the Fort. The viable options are analyzed in terms of their costs and availability to meet the Fort's projected needs. The data collection for the existing supply and new supply analyses was completed in February 1992. A draft of the analysis report was prepared and submitted for internal review the last week of March. A final draft of the document will be submitted to FORSCOM and the site for review in April 1992. The analysis shows a significant energy cost savings potential through several gas supply scenarios available to the site in the near term with additional savings in the long-term, depending upon the terms of the DoD area-wide supply contract and completion of the Iroquois pipeline.

Hunter Army Air Field (AAF), GA - HVAC System Upgrade Analyses

- In October 1991, PNL was requested to independently analyze a planned heating system upgrade in family housing at Hunter AAF. The LCC analysis of several heating/cooling technologies for the planned heating system upgrade (from fuel oil) was completed in November 1991. The analysis showed a difference in net present value (NPV) between an upgrade to

a heat pump and a gas heat/electric air conditioning upgrade of over \$2 million in favor of the heat pump upgrade. The final analysis was provided to the utility consultant and site energy engineers for evaluation in December 1992.

Advanced Meter Reading

- PNL is preparing a report for FORSCOM summarizing the capabilities of advanced metering reading (AMR) systems and the opportunities it can provide to meet the future metering needs of FORSCOM and other federal installations where there is a dearth of metering and metered data available and where there is limited staff available for manual meter reading. Compared with regular meters, advanced meters include both advanced metering features and communications techniques. A final report on the findings and applications is expected to be issued in the third quarter of FY 1992.

Boiler Guide Specifications and Upgrades

- During the reporting period, NEESA developed and published guide specifications for digital boiler controls and for steam boilers, procured a vibration analyses system at the PWC Guam, and evaluated the feasibility of converting boilers from coal to wood burning at the NSY Puget Sound, WA.

Robins Air Force Base (AFB), GA - O&M Project

- In October 1991, PNL initiated an operations and maintenance (O&M) improvement project at Robins AFB that is designed to demonstrate the potential energy and efficiency improvements from O&M activities in selected facilities and systems at the site and to assist the site personnel in transferring the technology throughout the entire site. A project work scope and plan was developed by PNL and reviewed and approved by the Base Civil Engineering during a site visit by the PNL project manager in December 1991.
- In the work scope, PNL suggested the development of a steam trap documentation, testing, and scheduled maintenance program as one part of the O&M improvement program. The steam distribution loop that supplies the avionics buildings was suggested as a good candidate for implementation and evaluation of the steam trap O&M program. This loop contains 150-200 steam traps. The work scope calls for the maintenance, staff training in maintenance and calibration of the steam traps and metering to be initiated in May 1992.
- The second part of the program is to assess the energy and operations impact associated with HVAC system operations and maintenance and to demonstrate the application of direct digital control (DDC) technology using recently-developed DDC specifications.

Vandenberg Air Force Base (VAFB), CA - Power Plant and Control System Evaluation

- VAFB requested that PNL help the base decide what to do with the South Vandenberg Power Plant: whether to close it down because of the enormous environmental permitting costs that are incurred each year, or to expand its use for peak-shaving purposes. Data gathering and analysis was initiated for this project in March. VAFB also requested in March that PNL help the base characterize and justify additional site energy management and control system (EMCS) projects.

Griffiss AFB, NY - Central Plant Assessment

- In February 1991, the staff at Griffiss AFB requested that PNL undertake an evaluation of the co-generation potential and/or gas conversion at the central steam plant, steam plant efficiency improvements, steam distribution upgrades (repair, abandon and replace with package boilers), and building weatherization.

Patrick Air Force Base (AFB), FL - Transmission and Distribution System Evaluation

In conjunction with the FEDS modernization activity under way at the Patrick AFB, PNL has been asked to assess the cost-effectiveness of privatizing the electrical transmission and distribution (T&D) system at the site.

1.0 MOBILE ENERGY LABORATORY USE COMMITTEE

The fall semiannual meeting of the Mobile Energy Laboratory (MEL) Use Committee was held November 11-12, 1991, in Las Vegas, Nevada. Six members and seven guests were in attendance. A meeting agenda is attached (Attachment 1).

The key item discussed at the meeting was changing the Committee name and charter to better reflect the expanded scope and activities of the Committee beyond primarily testing and metering of energy systems using the MEL capabilities to provide more broad technical assistance to federal energy managers. (Note: no consensus was reached on a new name during this meeting; however, this report reflects the new name and revised charter agreed upon at the spring 1992 semiannual Committee meeting.)

Other discussion items included a revision to the Committee brochure on testing/metering capabilities, deciding upon the purchase of new testing equipment, the status of the Federal Relighting Initiative (FRI) and the tool development within that initiative, the status of demand-side management (DSM) programs, policies and activities within the U.S. Army and U.S. Air Force, an approach taken by the U.S. Postal Service in San Diego to relighting projects through a combination of shared energy savings (SES) and utility DSM, testing and metering activities undertaken by PNL at Robins Air Force Base and the Forrestal Building and by the Navy Energy And Environmental Support Activity (NEESA) at U.S. Navy facilities, and the status of the Model Installation Program (MIP) being jointly developed by the Corps of Engineers Construction Engineering Research Laboratory (CERL) and the U.S. Army Forces Command (FORSCOM). The next meeting of the Committee was scheduled for Pensacola, Florida, in late April or early May 1992.

2.0 TECHNOLOGY-BASE SUPPORT ACTIVITIES

This section of the report describes the development of processes, software, metering and monitoring equipment and strategies, and other tools for federal energy managers to better understand and characterize their energy resources. This activity is primarily supported by FEMP with contributions from other federal agencies.

2.1 FEDERAL RELIGHTING INITIATIVE

The Federal Relighting Initiative (FRI) is designed by FEMP to provide technical support to federal agencies to affect improved energy efficiency in the lighting systems of all federal facilities. This includes the development of a process, software tools and evaluation of the application of the tools and methods. Most importantly it includes transfer of the developed methodologies to federal agencies through technical assistance, relighting demonstration projects, and related efforts such as the development of energy-efficient lighting specifications.

Contact: Chuck Purcell, PNL (202) 646-5206.

During the reporting period, the FRI team developed two recommended approaches for retrofitting the lighting systems in the Mary Switzer Building in Washington, D.C., based upon life-cycle cost economics and good design practices. The recommendations were sent to the General Services Administration (GSA) in October 1991 for review and consideration. The Switzer building manager agreed to the installation of special advanced occupancy sensors and the proposal for monitoring efforts to clearly quantify the retrofit results. The lighting design for Switzer was accepted in February 1992 for implementation in the fourth quarter of fiscal year (FY) 1992.

FEMP/ESMO agreed in October to develop energy-efficiency lighting replacement guidance for the Defense Logistics Agency (DLA). This guidance will be developed from information supplied by DLA on costs and volume for lighting components currently in the DLA supply line. PNL will develop simplified guidance, in the form of nomographs, for DLA to use in its catalogs as a way of helping purchasers decide upon the most life-cycle cost-effective technologies when ordering replacement lamps and ballasts.

A peer review copy of the *Master Specification for Energy-Efficient Lighting Technologies for Existing Federal Facilities* was distributed in December 1991 to a selected list of lighting and energy experts and users for comment. Suggested changes were received, and the master specifications are currently being modified.

The latest version of the *Existing Lighting Characterization (ELC) Handbook* and forms was submitted to the FRI team for review in January 1992. The current plan calls for three building walkthroughs to be conducted at GSA buildings. The handbook will be modified to include more discussion of room-by-room inventory and includes worksheets to assist the federal manager in the process.

The FRI Lighting Technology Selection Matrix (LTSM) DOS-based software program was released in February 1992 to selected federal users for evaluation. The LTSM quickly determines a menu of life-cycle cost-effective retrofit fixtures for existing lighting technologies based on operation, energy economics and utility incentive programs. It was demonstrated to the FEMP staff and the Environmental Protection Agency (EPA) *Green Lights* program manager and staff at a joint meeting in March to discuss areas of mutual interest and potential cooperation. The *Green Lights* software was also demonstrated, and a future meeting was scheduled for April 1992 to discuss the sharing of databases for future projects in energy-efficient buildings.

2.2 FEDERAL ENERGY DECISION SCREENING (FEDS) SYSTEM

The FEDS system is a comprehensive fuel-neutral, technology-independent approach for analyzing energy needs, identifying the highest value energy projects, and implementing those projects. The system consists of a systematic fuel-neutral top-down process for resource acquisition at federal facilities supported by user-friendly software for characterizing energy efficiency projects. It can be utilized to plan agency-wide energy modernization, to characterize and prioritize energy-related opportunities at large federal sites, or to plan for a single facility. FEDS is being designed to improve the federal energy acquisition process by providing energy managers with an integrated support system for all energy planning and acquisition activities. The system comprises a formal analytic framework, analysis methodologies, implementation tools, and the combined expertise of staff from the DOE and other federal technical support agencies.

Contact: Ray Reilly, PNL (509) 375-3741.

The FEDS software Level-1 (buildings and facilities only) alpha-version 0.0 was compiled and operational in January 1992 with some expected minor problems. One of the problems encountered was that the commercial menu-driver was found to have significant "bugs." In the course of the FEDS Level-1 alpha release development, the development of additional retrofit options and revision of simplifying assumptions occurred. The Level-1 alpha release is scheduled for distribution to a few selected federal-sector testers for review and comment by April 1992.

An outline was developed for documenting the FEDS process (the energy efficiency project acquisition component of FEDS) and writing was initiated in anticipation of transferring the process to other federal agencies. Parallel with this effort, PNL is applying the FEDS process at four large U.S. Army Forces Command (FORSCOM) installations and four large and one small U.S. Air Force bases in cooperation with the utilities serving these sites. These activities are discussed in detail in a separate section of this report.

2.3 INTEGRATED UTILITY RESOURCE PLANNING

The Department of Defense (DoD) central utility systems are 1950s vintage and in need of upgrading. DoD desires to make intelligent decisions on replacement or retrofit. Therefore, in late-FY 1991 DoD technical support agencies initiated the Integrated Utility resource Planning (IURP) project. The first phase of the IURP is to develop and test a model of base thermal systems. The model will be used to assess whether central steam systems should be decentralized, and/or converted to hot water systems. Successive phases of this project will integrate modeling software for other utilities so decisions will be optimized.

Contact: Jim Heller, NEESA (805) 982-3486.

A series of meetings was held in the first half of FY 1992 to define the scope of the DoD effort, to assign responsibilities to DoD agencies, and to coordinate with DOE/FEMP activities in this area. The Navy (NEESA) is taking the lead in testing software developed by the Washington State Energy Office, and Army Construction Engineering Research Lab (CERL), and identifying other

software applicable to the IURP project. Coordination with DOE is currently limited to communication on the progress of the related FEDS development effort.

NEESA plans to test the software for this activity at the Naval Shipyard (NSY) Puget Sound, WA, and the Naval Air Station Miramar, CA, the fourth quarter of FY 1992.

2.4 FEDERAL TEST BED PROGRAM

FEMP has initiated a federal test bed demonstration program (TBDP) to demonstrate U.S. energy-related technology at a federal site. Through this demonstration, the potential for the technology will be documented and the time to application of that new technology by the federal sector reduced. Through a partnership with a federal site, the servicing utility, a manufacturer of an energy-using technology, PNL, and other organizations associated with these interests, new technologies can be cooperatively evaluated and showcased. The partnership of these interests is secured through a Cooperative Research and Development Agreement (CRADA). Within the CRADA, PNL will be tasked to provide the independent assessment and analyses of the performance, applicability and acceptability of the technology.

Contact: Dave Conover, PNL (202) 646-5252.

In 1991, PNL issued a solicitation of interest for gas-cooling technologies to be demonstrated at a federal site. The solicitation was also intended to assist in targeting potential sites and fostering the selection of partners for the pilot test bed demonstration.

Three manufacturers and five utilities responded to the solicitation with interest and potential contributions of equipment and/or financial and technical assistance. During the reporting period, PNL worked to match a federal site and utility to their equipment application. This match will affect which manufacturer is chosen for initial negotiation of the CRADA for a demonstration. Contact was also made with the American Gas Cooling Center as a possible trade association participant.

Based on the response to the solicitation, the most likely technologies to be demonstrated are a gas-engine-driven central chiller and a rooftop gas-engine-driven air conditioning unit. It is anticipated that the demonstration

partners will be selected for final negotiations and signing of the CRADA in the second quarter of FY 1992, with the demonstration to be under way in the third quarter of FY 1992.

2.5 DECISION SUPPORT SYSTEM FOR OPERATIONS AND MAINTENANCE

PNL is developing an artificial intelligence-based decision support system for operations and maintenance (DSOM) of central heating plants at federal installations. The system relies upon real-time data collection coupled to a computer-based model of the heating plant and how it operates to provide the plant operators with three major functions: 1) real-time optimization of plant efficiency, 2) predictive maintenance, and 3) an administrative/analytic capability. DSOM provides the plant operator continuous guidance in each of these three areas via several computer stations. The project is designed to identify the plant-specific as well as the pervasive problems encountered at central heating plants. It involves the plant operators in all decisions and provides a training and qualifications program to keep the system and plant operating at peak efficiency.

Contact: Ray Reilly, PNL (509) 375-3741.

Since FY 1991, the U.S. Marine Corps has been supporting the development of the DSOM technology that will be applied at Marine Corps Base (MCB) Twentynine Palms in California. It is estimated that the payback for their investment is 5-6 years *from plant efficiency improvements alone.*

During the reporting period, activity was focused on specification and procurement of calibration instrumentation and data acquisition computer hardware, operating software development, and design of the control room layout and component and instrument labeling. Instrument installation will be coordinated with NEESA who is providing onsite technical support throughout this phase of the project.

The Central Heating Plant Advisor (CHPA) platform development was also undertaken focusing on the requirements of the user graphics and analysis/feedback program. A parallel development effort was focused on the drafting and review of the operational test plan, operations training manual and acquainting site operators and maintenance staff with the system.

It is anticipated that the complete system will be installed and tested during the fourth quarter of FY 1992.

2.6 TESTING EQUIPMENT DEVELOPMENT

The scope of this activity includes the development and field testing of equipment and strategies for monitoring and metering energy systems. This activity enhances the capabilities embodied in the Mobile Energy Laboratory testing program. It is supported primarily by FEMP with significant contributions from other federal agencies engaged in testing activities. In addition, PNL provides support for a comprehensive metering laboratory, and NEESA provides internal support for test development activities.

Contacts: Richard Szydlowski, PNL (509) 375-3753
Jim Heller, NEESA (805) 982-3486

Modifications were made by PNL to the four-wire, three-phase power measurement using "phase imbalance" current transformers (CTs) in substation metering using C180 Synergistics Control Systems^(a) data logger equipment. This modification was developed to overcome previous problems experienced at Fort Irwin and Hunter Army Air Field (AAF) where the substation configurations have only two potential transformers (PTs). Documentation was prepared and recommendations made to add phase-imbalance CTs when bringing the data loggers back into service at Hunter AAF in early summer.

The use of a cellular phone for remote data collection was bench-tested by PNL for installation at sites where "hard" phone lines are not available. This strategy will be tested in the field at Hunter AAF in the third quarter of FY 1992. Previous data collection at Hunter AAF used a portable computer operated by site staff. This strategy resulted in significant data loss from numerous computer failures.

Synergistic Control Systems loaned PNL a prototype C180E data logger for evaluation. The C180E has power quality analysis capability at a low marginal cost compared with the C180. A comparison of the C180E power quality analysis capabilities with a BMI Power Analyzer^(b) indicated that the C180E is an accurate power quality survey tool. All of the MEL/PNL C180s are scheduled to be upgraded to C180Es during FY 1992.

(a) Synergistics Control Systems, Inc., New Orleans, LA.
(b) BMI Inc., Schenectady, New York.

2.7 PROCEDURE DEVELOPMENT

Test procedures are developed to properly configure, conduct and document energy system testing. These procedures are peer-reviewed and submitted to appropriate standardizing societies for adoption as standard energy-efficiency testing procedures. The procedures document the step-by-step process for testing as well as the documentation to be completed as part of the testing activities.

Contact: Don Hadley, PNL (509) 375-3708.

Test Procedure #9, *Heating Ventilating and Air Conditioning (HVAC) Performance Evaluation*, was submitted and balloted at the subcommittee level by Subcommittee E06 on Performance of Building Constructions of the American Society for Testing and Materials (ASTM) in October 1991. The results were 12 affirmative, 0 negative, and 26 abstaining. Constructive comments were included with the returned ballots and the procedure will be revised accordingly and resubmitted for final balloting at the next meeting in April 1992.

An outline was prepared for a procedure for verifying the savings from the installation of energy-efficient technologies. The procedure will include the determination of the "baseline" and the appropriate testing/metering strategies for the installed technologies. The issue of persistence is also being addressed. These issues are important to the issue of the retention of savings. This procedure development is currently supported by FORSCOM and will first be applied at a FORSCOM site; however, it is anticipated that the procedure will be applicable across all federal sites.

3.0 TESTING AND MONITORING

This section describes the testing and monitoring conducted at federal facilities using the capabilities embodied in the Mobile Energy Laboratory (MEL). Where appropriate, testing is conducted under the guidance of the Mobile Energy Laboratory Use Plan (PNL-6861).²

3.1 PNL TESTING ACTIVITIES

The following testing activities were conducted by PNL during the reporting period. Testing activities are supported by the federal agency identified.

Contact: Richard Szydlowski, PNL (509) 375-3753.

3.1.1 Fort Devens, Massachusetts - FORSCOM

In December 1991, electric and gas metering equipment installation was completed in 12 buildings at Fort Devens for the two active Mel Assignment Plans (MAPs) at the site (FTDEV-001 and FTDEV-002), and data collection was initiated. Four data loggers were without dedicated phone lines until January. The condensate return bypass necessary for measuring flow was installed in January. These two monitoring projects being undertaken by PNL were reported in the post newspaper in February 1992.

The data collection activities continued through March 1992 for both the nighttime setback test (FTDEV-001) and the conservation incentive program test (FTDEV-002). PNL staff have begun the data analysis, and preliminary results will be presented at the FORSCOM program review at the end of April 1992.

3.1.2 Fort Ord - FORSCOM

The data collection equipment for the Electrical Distribution System Profile (MAPs FTORD-003) was removed in October. Data collection equipment for the Hospital End Use Characterization (MAPs FTORD-004) was removed in December and returned to PNL for calibration and use in work at Fort Devens.

3.1.3 Richland Federal Building-Hanford Energy Conservation Project (HECP)

This joint study with Westinghouse-Hanford Company (WHC) was initiated in FY 1991 and is designed to examine the energy use in the Richland Federal Buildings to produce energy conservation opportunity economic evaluations and recommendations. In FY 1991, floor-by-floor end-use energy monitoring was undertaken in the spring and summer to obtain end-use profiles.

Starting in FY 1992, a lighting survey of the entire building was initiated to determine if the use of motion sensors is economically justified. Occupancy sensors monitors are placed for a two-week period in selected areas of the building and data are analyzed (by the type of space) to determine whether motion sensor installation is economical. Also initiated was a whole-building and selected end-use metering survey.

A detailed analyses of the metering and lighting monitoring will be completed and reported in the third quarter of FY 1992.

3.1.4 Hanford Personal Computer System Monitoring - HECP

This study was initiated in FY 1992 and involves the measurement of the electricity use of personal computers (PCs) and associated auxiliary equipment (printers, etc.) at Hanford. A prewired multiply outlet monitor (MOM) has been designed to mate with a C180 portable data logger for real-time monitoring of the equipment.

During the reporting period, 140 PCs were monitored in three buildings. Analysis of the data is under way. The analysis is directed toward comparison of the metered PC demand profile, development of an algorithm for calculation of a typical PC demand profile, and development of tables which list the typical demand for both whole workstations and individual equipment. The information will be used for estimating the energy savings potential of energy conservation options for PCs and for building designers of electrical services and HVAC equipment. A publication is scheduled for the third quarter of FY 1992.

3.1.5 Forrestal Building - FEMP

In March, PNL undertook a Live Test Demonstration (LTD) to evaluate the lighting retrofit strategies proposed under a solicitation for Shared Energy Savings (SES) Lighting Retrofit on the Department of Energy Forrestal Building in Washington, D.C. Four lighting retrofit contractors were selected to participate in the demonstration. In the demonstration, each contractor was asked to retrofit a single room in the Forrestal Building with their proposed retrofit. PNL measured the real-time electrical power consumption of the retrofit and the lighting levels at selected locations in the room. The electrical consumption for each retrofit was compared to the baseline electrical consumption for the room as it currently exists. A 20% reduction in electrical consumption was required for a retrofit to pass the LTD. The lighting levels measured in the room had to meet minimum requirements of 50 footcandles on the desktop or wall furniture surfaces and 30 footcandles anywhere else in the room (at 30" from floor).

The LTD was completed March 9 through March 20, 1992. All four proposed retrofits led to improved lighting levels and resulted in energy savings ranging from 50% to 70% over the baseline lighting. Final bids and selection of the SES contractor is expected by the third quarter of FY 1992.

3.1.6 Merchant Marine Academy - Department of Transportation

The activity at the Merchant Marine Academy (MMA), Kings Point, Long Island, New York, was initiated by PNL in the second quarter of FY 1991. The objective of the study is to monitor the central plant and whole-building loads to establish baseline energy consumption and to identify promising energy conservation opportunities at the MMA. The data will be used to help the Department of Transportation develop specifications for an SES procurement and evaluate the resultant proposals.

Data collection was completed in September 1992 and the data loggers and peripheral equipment were removed in October 1992. A thorough assessment of outside temperature-based electric consumption models proposed by the SES contractors was completed for the three monitored buildings. Based on PNL data, the MMA determined that the SES contractor models were unacceptable for

the determination of savings and savings share. The final draft report was submitted to the Department of Transportation in March for review and will be published the third quarter of FY 1992.

3.2 NEESA ACTIVITIES

The following metering and data collection activities were conducted by NEESA during the reporting period. Activities are supported by the site or command.

Contact: Jim Heller, NEESA (805) 982-3486.

3.2.1 Metering and Metering Support

- **Naval Aviation Depot Pensacola, FL** - A maintenance contract was set up for steam meters for the site and a plan was developed to meter the compressed air system in the repair facilities.
- **MCB Twentynine Palms, CA** - NEESA provided support to PNL to install a maintenance management system in the High Temperature Hot Water Plant. NEESA is installing instrumentation, and setting up an onsite calibration lab.
- **NSY Norfolk, VA** - NEESA has developed a plan to meter steam, potable water, compressed air, salt water, and electricity at the entire site, to be implemented during FY 1992.
- **Naval Air Station (NAS) Adak, AK** - NEESA has developed a plan to meter steam, fuel oil, and electricity for the entire facility. The meters will be installed during the third quarter of FY 1992.
- **Naval Hospital San Diego, CA** - NEESA deployed an ultrasonic meter to determine peak and average water consumption over a brief period. Data will be used by the hospital energy management staff for developing water conservation programs.
- **Public Works Center (PWC) San Francisco, CA** - NEESA is assisting the PWC by writing specifications for a contractor to connect steam meters to the supervisory control and data acquisition (SCADA) system. The system uses radio transmission for the communication medium.
- **PWC San Diego, CA** - The design specification for a SCADA system at the PWC was completed and a contractor to design the SCADA will be selected by the end of FY 1992. The system will use fiber optics for communications.
- **PWC Guam** - NEESA is nearing completion of the design of a SCADA system for this site.

3.2.2 Control Systems

NEESA installed two direct digital control (DDC) systems the first half of FY 1992 and has developed a DDC design guide specification and videotape targeted for O&M personal at Navy sites.

4.0 FEDERAL ENERGY SYSTEMS MODERNIZATION PROJECTS

FEMP is developing and applying an approach for federal facility energy systems modernization. This approach is embodied within the FEDS system and involves integrated energy resources planning and acquisition of all cost-effective efficiency resources. The key features include:

- Understanding and characterizing all requirements for energy services. Energy services are those benefits provided by energy systems such as lighting, space heating, and refrigeration - not electricity, natural gas and/or fuel oil.
- Understanding and characterizing how these energy service requirements will change over time. This takes into account the changing mission of the sites and anticipated growth.
- Understanding and characterizing the cost-effective energy efficiency opportunities at the installations. These opportunities are "assets" that can be "sold" to the utility in need of additional energy capacity, to the federal government as a means to reduce annual energy expenditures, and potentially to private sector companies who will invest capital in return for a share of the energy cost savings. It is essential that this characterization is done on a fuel-blind basis. The intent of this activity is to identify the least-cost way of providing the service, whether this be an improved configuration of an existing energy source, or through a fuel-switching opportunity. The fuel-blind approach will assure the "best price" for the resources when sold.
- Understanding and characterizing all potential sources of implementation funding for energy system modernization projects.
- Understanding, characterizing, and prioritizing alternative energy projects. Projects can be anything that can improve the cost, reliability, or usefulness of energy systems.
- Implementing the projects. It is important, regardless of the funding source, that the installations retain control of what technologies are installed and how and when they are installed.

These projects are funded primarily by the federal agency and/or installation. For many of the projects, FEMP provides co-funding, primarily to work with the utilities serving the installation or facility and the utility regulatory agencies to promote and develop a custom DSM program for their federal customers.

4.1 U.S. ARMY MODERNIZATION PROJECTS

The following modernization projects using the FEDS process are being undertaken for the U.S. Army FORSCOM in cooperation with the servicing utility. In all projects, the objectives are to 1) identify all electric and non-electric cost-effective energy projects at the installation; 2) develop a schedule for each installation for project acquisition considering project type, size, timing, capital requirements, and energy and dollar savings; and 3) secure 100 percent of the financing required to implement electric energy efficiency projects from the servicing utility and have the utility procure the contractor(s) to perform the detailed audits and install the technologies.

Contact: Graham Parker, PNL (509) 375-3805.

4.1.1 Fort Lewis - Tacoma Public Utilities

Since March 1991, PNL has been undertaking a FEDS assessment that includes the major non-mobility fuels used at the installation. The acquisition of the electric resource will be through a DSM program with Tacoma Public Utilities, (TPU), the servicing utility, in cooperation with Bonneville Power Administration (Bonneville) who sells federal power to TPU. The non-electric (fossil-fuel) resource acquisition projects will be likely be financed with federal funding, SES and/or third-party funding mechanisms. Attachment 2 gives a synopsis of the project.

The final report on the electric baseline and efficiency assessment for Fort Lewis was published and distributed in November 1991. The report will form the basis for the "deal" between TPU and Fort Lewis for DSM programs to be implemented by an Energy Services Company (ESCO) under contract to TPU. Concurrently with the assessment, Fort Lewis and TPU staff developed a draft contract for the utility to implement the DSM projects at the site. During the reporting period, discussions continued between (TPU) and Fort Lewis on the terms and conditions of the contract.

TPU also developed a request for proposal (RFP) for an ESCO to install the technologies at the site. TPU delayed the release of the RFP until a contract was in place with the Fort, and DSM cost reimbursement terms are confirmed with Bonneville. General agreement on the terms of the reimbursement

that TPU will receive from Bonneville was reached in February. The release of the RFP is expected in April and the signing of the contract between TPU and Fort Lewis is expected in May.

The draft of the fossil-fuel baseline and resource potential report was released in October 1991 and is being revised based on comments received from internal reviewers.

4.1.2 Fort Drum - Niagara Mohawk Power Corporation

A FEDS assessment was initiated at Fort Drum in May 1991 at which time baseline data were acquired from the site. A second site visit to Fort Drum was made during the first week of October 1991 to verify the baseline information and collect specific information for evaluation of the energy conservation options (ECOs), both electric and fossil. A representative sample of buildings was visited in order to assess the current condition of the shell, lights, and HVAC equipment. This information will be used to evaluate the impact of the various ECOs. A synopsis of the project is given in Attachment 2.

A project review was held at Fort Drum in October to present the preliminary results of the baseline analysis and brief the returning director of the Department of Engineering and Housing (DEH) on this program. Both the electric and fossil baseline results were reviewed, and the remaining information requirements (occupancy records, lamp replacement data, etc.) were identified to complete the baseline work.

The ECOs for both electric and fossil fuels were evaluated, and the life-cycle cost (LCC) analysis was initiated. The electric options were analyzed at two different incentive levels from Niagara Mohawk Power Corporation (NMPC), 0% and 50%. This is the cost share that NMPC would provide without reimbursement. The fossil fuel options assume no cost sharing by the gas utility.

The complete summary of the electric and fossil fuel assessments will be documented in the Integrated Resource Assessment (IRA) Report, which will consist of two volumes. Volume one is a detailed executive summary that contains a high-level overview of volume two. Volume two will contain detailed

technical appendixes that cover the baseline results, the energy resource assessment (ECOs and fuel switching), the LCC data sources, and glossary of terms. The first two appendixes of the IRA report are moving through the review process and should be available for review by Fort Drum staff by mid-April 1992.

NMPC made a very general filing with the Public Service Commission (PSC) in October 1991 for a new program for commercial/industrial (C/I) customers call the "Energy Alliance Pilot." The program would allow NMPC the flexibility to design custom programs with C/I customers that could include: technical expertise (NMPC or a third party), comprehensive energy planning, financing, administrative flexibility (repayment schedule), and some degree of cost sharing by the utility. The Energy Alliance Pilot Program has not yet been approved by the PSC, although there are indications that it will be approved.

PNL is preparing a summary of the cost-effective electric energy savings potential at Fort Drum for the utility. This estimate will be used in planning the 1993/1994 DSM program that NMPC will file in May 1992. PNL has encouraged NMPC to consider the resource potential at federal sites as they evaluate their electric resource needs over the next 5 to 10 years.

4.1.3 Fort Stewart - Georgia Power/Hunter AAF - Savannah Electric & Power Co.

In June 1991, PNL initiated a FEDS assessment at Fort Stewart and Hunter AAF. In February 1992, PNL acquired the real property data from Stewart/Hunter AAF and began to formulate the project management plan (PMP) for the two sites. At the same time, PNL made a request to the Engineering and Housing Support Center for access to the mainframe data set where all DoD real property data are centralized. The request was granted in March and will streamline this process for future sites. A synopsis of the modernization project at Fort Stewart/Hunter AAF is provided in Attachment 2.

During the reporting period, PNL staff continued to meet with key Georgia Power and Savannah Electric and Power Company (SEPCO) DSM staff to discuss the type of DSM program the utilities could offer these sites, and the program that would be most attractive for federal customers. In November, a meeting was held with representatives from Georgia Power, SEPCO, Southern

Electric International, PNL, and FORSCOM to discuss the federal/utility partnership program. The focus of the meeting was the issue of financing and contracting. The discussion in the meeting centered around the particulars of the kind of contract a federal site could enter into with Georgia Power using Southern Electric as the financing and contracting organization.

At the invitation of a staff engineer at the Georgia PSC, PNL provided a briefing to staff, commissioner and invited guests at the PSC in January. The PSC staff (and commissioner) are relatively new to the DSM concepts even though they are responsible for evaluating the Georgia Power/SEPCO Integrated Resource Plan (IRP) filings. The presentation focused on the DOE-FEMP approach to energy modernization in the federal sector in partnership with servicing utilities. An emphasis was placed on the "level playing field" concept as a means of emphasizing that the utility should acquire DSM resources equally with generation resources up to the long-run avoided costs of the generation resources.

A third Department of Defense Energy Partnership (DEPP) meeting sponsored by Georgia Power and SEPCO was held in January 1992. FEMP provided an overview of their model program and long-term strategy. PNL made a presentation on long-term strategies in IRP for FEMP. Discussion centered around the newly filed IRPs by Georgia Power and SEPCO and the proposed programs/incentives; the ongoing/pilot programs; and the financing/contracting. Currently, as filed in the IRP, the maximum either utility will pay for DSM technologies is ~15% and that is in a T-8 fixture retrofit. Other technologies offered include high efficiency motors, heating, ventilation and air conditioning (HVAC) upgrades, insulation, and other lighting technologies (compact fluorescents, energy efficiency ballasts etc.). The IRP has several shortcomings/inconsistencies that we pointed out to the utility. A major issue yet to be resolved is the amount of cost-sharing by the utility for its federal customers.

Georgia Power is currently undertaking a pilot project in family housing at the Marine Corps Logistics Base in Albany. Housing units are being retrofitted with new HVAC systems and thermal upgrades. The cost-sharing has yet to be determined, and the contract is still under development. This pilot

project may become the model for future federal projects. When the analyses and contract are completed, the information will be shared with PNL.

In March, GSA provided consolidated comments from several agencies on the proposed contract modification to the Georgia GSA Areawide Contract proposed by Georgia Power as a method of providing DSM services to its federal customers. Based on these comments, Georgia Power will likely modify aspects of their proposal concerning payment of energy efficiency "grants" to the site and move more toward proposing a lump-sum payment by the utility to the site for energy efficiency technologies with the site paying back their share in the form of payments over an agreed-upon time period.

In March, Georgia Power initiated a collaborative (working group) made up of representatives from the major industrial, commercial and federal customers, intervenors, environmental groups, and the State of Georgia, and a representative from the DOE Support Office in Atlanta. The purpose of the group is to identify issues from the recent IRP filing that should be further studied and investigated and to raise these issues with the power company and PSC. A ruling on the IRP is expected from the PSC in mid-July.

4.1.4 Fort Hood - Texas Utilities

In October 1991, FORSCOM requested that PNL take the lead role in working with the servicing utilities to Fort Hood and interface with the activities planned for Fort Hood by CERL under the MIP. The MIP is funded by the Department of Defense (DoD) with assistance from FORSCOM and is designed to identify and implement all cost-effective energy efficiency technologies at the site. Texas Utilities (TU), the servicing electric utility, offers DSM incentive programs that need to be factored into the model installation program.

PNL met with CERL staff to discuss the applicability of the FEDS process to the MIP at Fort Hood. CERL agreed that the FEDS process could be applied to the MIP effort. The next step is for CERL and Huntsville staff to visit PNL the end of April to work with PNL staff to organize and begin analyzing Fort Hood data using the FEDS process.

PNL, CERL and Huntsville staff met with Texas Utilities district DSM representatives in Waco to discuss DSM programs for their federal customers. The Waco district includes Fort Hood, their largest federal customer; Shepard AFB (Air Training Command) in Wichita Falls is their second largest customer.

The TU representatives were extremely interested in implementing DSM programs at Fort Hood (and other federal sites in their service territory) and expressed frustration in past dealings with federal customers. They agreed in principle with the FEMP model approach and endorsed the concept of including all federal customers under one program approach. Their "standard" DSM programs are primarily targeted toward demand savings (e.g., thermal energy storage), but will cost-share lighting programs as well. Cost sharing for their standard programs ranges from \$50 to \$150/kW.

PNL requested a copy of TU's Energy Efficiency Plan filed with the Texas Public Utility Commission in December 1991. The next "Plan" filing is due in 1993. The next step is for PNL to present a briefing to the staff of Texas Utilities at their headquarters in Dallas describing the model program for energy modernization at federal facilities served by Texas Utilities. Staff from the Air Force Civil Engineering Support Agency (AFCESA), the lead federal rate intervention agency for this region, Huntsville Corps of Engineers, CERL, and DOE Regional Support Office in Dallas will attend this briefing scheduled for April 1992.

4.1.5 Fort Irwin - Southern California Edison

In January 1992, a briefing was given to DEH staff at Fort Irwin explaining the FEDS/DSM model program and how it could be applied at Fort Irwin. The DEH staff enthusiastically endorsed the program and committed staff support for the program. Southern California Edison (SCE) has well-developed DSM programs and has worked with the site in previous energy conservation program areas.

A site visit was also conducted at the time of the briefing to the nearby China Lake Geothermal Plant. Fort Irwin is exploring geothermal potential at the site and has engaged the services of the China Lake Naval Weapons

Center Geothermal Program Office to assess geothermal feasibility. Preliminary findings indicate a high potential for geothermal activity at the site.

SCE is currently working with Fort Irwin DEH staff to undertake a residential ground-coupled heat pump evaluation. The intent of the study is to acquire energy use data from a "matched" pair of unoccupied homes with and without the new heat pumps. The goal is to determine the energy savings per square foot over the current propane forced air heat/cool and domestic hot water systems. The study is critical to the site for developing the request for proposal for a major residential housing renovation in the late summer.

A meeting with SCE DSM design staff to discuss federal energy system modernization through utility DSM programs was scheduled for April. This meeting will include rate intervention staff from AFCEA and staff from the Southwest Division of the Naval Facilities Engineering Command. The Navy is the lead rate intervention agency for federal agencies in the SCE service territory.

4.2 U.S. AIR FORCE MODERNIZATION PROJECTS

The following modernization projects using the FEDS process are being undertaken for the U.S. Air Force in cooperation with the utilities serving the bases. The projects are being conducted for the Air Force Material Command (AFMC), Space Command (SPACECOM), and Air Combat Command (ACC).

Contact: Ray Reilly, PNL (509) 375-3741.

4.2.1 Vandenberg AFB - Pacific Gas and Electric

The FEDS activity at Vandenberg Air Force Base (VAFB) was initiated in July 1991. The project plan the VAFB modernization project was developed and sent to SPACECOM and to the energy manager at VAFB in November 1991. A synopsis of the project is given in Attachment 2.

In support of the project, plans were made to increase the electrical feeder metering over that currently being conducted. This expansion was made possible by the existence of existing transducers at the base that will enable metering of many more channels of data for the same cost. Data collection is nearing completion for the resource assessment. A PNL team is expected to be

onsite in mid-April to collect information to continue analysis. A meeting with Pacific Gas and Electric (PG&E) is also scheduled during the time of the next site visit.

4.2.2 Griffiss AFB - Niagara Mohawk Power Corporation

The FEDS activity at Griffiss AFB was initiated in May 1991. Currently, the modernization project involves only an assessment of the electric resource potential. A briefing was held at Griffiss AFB in October 1991 to review the initial site characterization, and discuss plans for the electric assessment. Because funding had already been provided for the electric assessment, data logging equipment was installed on the primary electric feeders during the visit. A synopsis of the project is given in Attachment 2.

Preliminary data for the electric assessment were provided by Griffiss staff, and the electric energy baseline evaluation began. The initial data provided by Griffiss have been reviewed, and additional data have been requested to complete the energy baseline characterization. Providing that these data are readily available from the base, an initial draft appendix on the electric energy baseline should be completed by the end of April. This report is only the first of several appendices that will make up the complete electric resource assessment report. After this baseline appendix is completed, a visit will be scheduled to review this document and to conduct the site surveys required to identify and evaluate ECOs. The evaluation of the ECOs will be documented in the electric energy resource assessment appendix.

The activity with the servicing utility, NMPC, is given in Section 4.1.2 above.

4.2.3 Robins AFB - Georgia Power

A meeting was held in October 1991 with staff at Robins AFB to begin to scope out the energy resource modernization and other related activities (see below) being conducted by PNL at the base. Civil engineering staff provided PNL material on site characteristics and energy usage. See Attachment 2 for a synopsis of the project.

A "driving" tour was taken of the site, and a walkthrough was conducted in the avionics repair facility. The site is served by Georgia Power (90%)

A site visit was conducted in January 1992 to begin the process for acquiring and archiving electrical distribution system data from the utility control system installed at the site. A meeting was held with the control equipment vendor to assess the complexity of the required equipment to obtain these data. The PMP for the modernization project was drafted in March and submitted to the site and major command for review.

The activity with the servicing utility, Georgia Power, is given in Section 4.1.3 above.

In January, SPACECOM tasked PNL to initiate energy resources modernization projects at two sites--Patrick AFB and its northern neighbor, the Cape Canaveral Air Force Station (CCAFS). An initial visit to the two sites was conducted in January and initial contacts were made with the energy managers at the sites. A visit was also made to the Kennedy Space Center, adjacent to CCAFS, to meet with the National Aeronautics and Space Administration (NASA) energy managers there.

The servicing utility, Florida Power & Light (FP&L), offers a DSM program for thermal energy storage (TES). PNL talked to various vendors about their products and reviewed information regarding similar programs offered by

other utilities. FP&L provides an incentive payment based on the size of the unit and funds 50% of the feasibility study, up to \$5,000.

4.2.5 Travis AFB - Pacific Gas & Electric

PNL was tasked by the Air Combat Command in October 1991 to undertake a FEDS assessment of the David Grant Medical Center (DGMC) at Travis AFB. A project plan was developed in November 1991 to assess the resource potential at the DGMC and delivered to the ACC and to the new energy manager at DGMC. It was approved in December 1991 and baseline data collection activities initiated including end-use metering of the building.

Data collection is nearing completion for the resource assessment. PNL staff will make a site visit in mid-April to review progress with DGMC staff.

4.3 U.S. NAVY MODERNIZATION PROJECTS

The following modernization project is being led by the Southwest Division of the Naval Facilities Engineering Command with technical assistance provided by PNL under contract to the U.S. Marine Corps (USMC) Headquarters.

**Contact: Ralph Torres, NAVFAC (619) 532-3978.
Ray Reilly, PNL (509) 375-3741.**

4.3.1 Marine Corps Base Camp Pendleton - San Diego Gas and Electric

In November 1991, PNL met with the Navy and FEMP to discuss the status of the utility DSM lighting program underway at MCB Camp Pendleton. PNL was requested to identify the long-run avoided energy and capacity costs for San Diego Gas and Electric (SDG&E) so that the USMC could construct the best financial arrangement on cost-sharing with the utility.

PNL was also tasked to review the 300 building audit for lighting retrofits performed and proposed by SDG&E. This review was to ensure that the utility was recommending technologies that were the most life-cycle cost effective.

PNL received much of the information necessary to perform the analysis from the California Public Utilities Commission and the California Energy Commission. Data were collected on the following: utility system requirements,

utility system peak demand, utility system load resource balance, utility assumptions of discount rate and retrofit life, utility projected long-term stream of nominal avoided energy and capacity costs, and Camp Pendleton total electricity consumption by month since 1978.

PNL applied the LTSM to the 300 buildings and found that the technologies recommended by the utility were close to the most life-cycle cost-effective technologies available to the Marines.

4.4 DEPARTMENT OF ENERGY MODERNIZATION PROJECTS

The following modernization projects using the FEDS process are being undertaken for the Department of Energy in cooperation with the servicing utility. The projects are being conducted at Knolls Atomic Power Laboratory (KAPL) and the Hanford site.

Contact: Graham Parker, PNL (509) 375-3805.

4.4.1 Knolls Atomic Power Laboratory - Niagara Mohawk Power Corporation

The activity at KAPL was initiated in the fourth quarter of FY 1991. A briefing was held at KAPL in October 1991 to review the initial site characterization and discuss plans for the technical assessments to follow. The site characterization estimated the energy conservation potential and outlined a plan to complete the electric and fossil fuel technical assessments. See Attachment 2 for a project synopsis.

The PMP was completed in November including a detailed description of the metering required, the cost associated with conducting the electric and fossil-fuel assessments, and the timeline for accomplishment of these tasks. KAPL is currently reviewing the PMP.

The activity with the servicing utility, NMPC, is given in Section 4.1.2 above.

4.4.2 Hanford Site - Bonneville Power Administration

In December 1991, PNL submitted a scope of work to DOE to implement the FEDS model process at the Hanford site in cooperation with the site operator, Westinghouse-Hanford Company and Bonneville Power Administration, who directly

serves electricity to the site. In January 1992, DOE In-House Energy Management (IHEM) indicated that the funding would be available in the third quarter of FY 1992 to initiate the development of the PMP. A synopsis of the site is given in Attachment 2.

5.0 ENERGY SUPPLY, DISTRIBUTION AND CONSERVATION POTENTIAL ASSESSMENTS

This section reports on activities involving the assessment of energy supply and distribution systems and the potential for energy-efficiency projects and energy saving opportunities at federal installations. This activity is normally accomplished through examination of documentation and studies, onsite surveys, limited empirical data collection and analysis, and discussions with site energy managers. In addition, where appropriate, discussions are held with the servicing utility(s) to ascertain the demand-side management/energy conservation programs available to the sites.

Contact: Graham Parker, PNL (509) 375-3805.

5.1 SOCIAL SECURITY ADMINISTRATION

PNL is providing technical support to the Social Security Administration Woodlawn Complex in Baltimore, MD, to prepare an SES solicitation for a relighting project in the SSA's nine-building complex.

The SSA onsite project manager submitted a generic description of the proposed lighting retrofit to the environmental planning group at SSA and PNL in February 1992. Clearance for the project was obtained in March from the SSA Environmental Compliance Section for the majority of buildings in the Woodland Complex. Relevant elements of their report were incorporated into Exhibit 1 of Section C of the SES.

The SSA obtained a specification guide for building interior fluorescent lights from an SSA energy manager in California. SSA would like to see some of the performance and warrantee specification language incorporated into Section C and may require assistance from PNL in this regard.

The PNL project manager likewise contacted the Forrestal Building energy manager to discuss the SES project at the Forrestal Building and obtain revisions to the Forrestal Building SES solicitation. Lessons learned from the Forrestal project will be used to improve the SSA SES process.

5.2 DEPARTMENT OF AGRICULTURE

In FY 1991, FEMP tasked PNL to perform a preliminary assessment of energy conservation opportunities at the Forest Products Laboratory (FPL) in Madison, WI. Based on the assessment and recommendations, PNL prepared a statement of work (SOW) in October 1992 for continued technical assistance to the FPL. The SOW included specific retrofit project identification and metering of major buildings and steam distribution systems and discussions with the servicing utility, Madison Gas and Electric (MG&E), concerning DSM programs available to its federal customers.

The SOW was discussed with the FPL and Department of Agriculture in November 1991, and issues concerning timing and onsite assistance requirements were resolved. In February 1992, the FPL agreed to fund the study, and onsite activity is scheduled to begin the second week of May 1992.

5.3 NATIONAL AERONAUTICAL AND SPACE ADMINISTRATION

FEMP tasked PNL to perform initial site energy assessment activities at two NASA sites and to prepare reports describing the findings, efficiency opportunities and make recommendations for further actions.

5.3.1 NASA White Sands Test Facility

A site assessment was conducted at the White Sands Test Facility (WSTF), Las Cruces, NM, in August 1991. The site visit also included a meeting with El Paso Electric to discuss potential utility demand-side management (DSM) programs and incentives that may be available to the site. The report on the site assessment findings and recommendations was submitted to the WSTF in October 1991.

The site is having difficulty meeting the current federal energy reduction goals. The consumption of electricity has increased each year since FY 1985. During FY 1985, the WSTF consumed 7.318 million kWh of electrical energy (61,200 Btu/ft²). In FY 1990, the consumption was 10.457 million kWh (82,700 Btu/ft²) and is projected to increase to 11.5 million kWh in FY 1991. The FY 1990 levels show an increase of 43% in kWh consumption and 35% in Btu/ft² consumption compared to the FY 1985 levels. The average demand has

increased 21% from FY 1985 levels compared to FY 1990 levels. For July 1991 the peak billing demand was 2,061 kW and is expected to average 2,050 throughout FY 1991. Though WSTF is a mission-variable site with facilities exempt from federal energy reduction goals, the engineering office responsible for energy is committed to making progress toward reducing energy usage and costs.

The site has experienced a commensurate increase in electricity costs. Since FY 1985, costs have increased 45% and have increased nearly 13% since FY 1989 and are projected to be nearly \$800K in FY 1991. In addition, the demand billing rate has increased 100% (from \$9.30 to \$19.30/kW) over this time period with nine rate increases in the last 12 years.

PNL found considerable energy-saving opportunities at WSTF. Though the electric utility offers little in the way of incentive programs, these projects can be cost-effective for the site to institute through either self-funded projects or through third-party-financed projects (such as SES).

Recommended energy efficient retrofit projects included upgrading and dennergizing transformers, retrofitting with high-efficiency lighting, replacing motors when they fail with high-efficiency motors, selected load shedding. The estimated potential energy and dollar savings from these recommended projects is over 2,000,000 kWh/yr and nearly \$140,000/yr.

To better characterize the opportunities, PNL recommended that a more in-depth systematic assessment be performed to better define energy savings and economic benefits obtainable through modification of operating procedures, facility renovations, or equipment replacement or upgrading.

5.3.2 NASA Ames Research Center

The information for the assessment was collected during a site visit to the NASA Ames Research Center, Moffet Field, CA, in February 1992. The draft report was issued to the site in March 1992.

The Ames Research Center is served electricity by the federal Western Area Power Authority (WAPA) and electricity and natural gas by PG&E. PG&E "wheels" the WAPA power to the site and WAPA serves the first 80 MW with PG&E serving in excess of 80 MW. The estimated connected load at the site is slightly in excess of 544 MW; the estimated base load is between 20 and 25 MW.

The annual electrical bills for fiscal years 1990 and 1991 were between \$11 and \$12 million. These were the net yearly costs after utility credits and rebates of several million dollars each year for a demand reduction program.

Depending on research activities and equipment activated (such as the large wind tunnels), the monthly electric bills can vary by a factor of five. As an example, in January 1991 the net electric energy cost was \$281,379 and in June of the same year the bill was \$1,720,450. The energy used to power the wind tunnels often accounts for well over one-half the monthly electric energy consumed.

Natural gas consumption at the site for FY 1991 was 315,900 MMBtu at a cost of \$1,200,000. As expected, monthly natural gas consumption was variable ranging from a low of 14,000 MMBtu to a high of 38,000 MMBtu. Average price paid for natural gas in FY 1991 was \$0.38/therm.

The facilities and buildings are classified into two categories: mission variable and non-mission variable. Research activities are mission variable and very energy dependent and the mission variable facilities also have significantly more office area than the non-mission variable facilities.

There are considerable energy-saving opportunities at the site. Even though the recommendations were only for non-mission variable facilities, the findings can be extended to mission variable facilities, particularly in office and administrative facilities. The energy savings can be obtained from mission variable facilities with little impact on research activities.

The major energy saving opportunities were found in office and other facilities lighting energy use. This includes improving lighting efficiency through a retrofit combined with meeting federal illumination levels, and lighting controls. The estimated energy and cost savings from a lighting retrofit and control strategy for non-mission variable facilities were over 6,600,000 kWh/yr and nearly \$300,000/yr.

To better characterize the opportunities, PNL recommended a more in-depth systematic assessment be performed to better define energy savings and quantify economic benefits obtainable through modification of operating procedures, facility renovations, or equipment replacement and/or upgrading.

5.4 DEPARTMENT OF TREASURY

FEMP tasked PNL to perform initial site energy assessment activities at two Department of Treasury buildings and prepare reports describing the findings, efficiency opportunities and make recommendations for further actions.

5.4.1 Bureau of Public Debt Building

A one-day site inspection was conducted in July 1991 at the Bureau of Public Debt Building, Parkersburg, WV. The report on the findings was delivered to FEMP in September 1991. The site visit also included meetings with the servicing gas and electric utilities, Hope Gas, Inc. and Monongahela Power Company, respectively.

The overall energy usage at the site (not normalized to heating and cooling degree days) has decreased from a high of 39,000 million (MM) Btu in FY 1988 to 31,000 MMBtu in FY 1990. This level is similar to the level in FY 1985. Although the site is making significant progress towards reducing energy usage from the peak in FY 1988, total energy usage has not been significantly reduced compared with the FY 1985 levels. This trend is of concern to the building manager since the federal-mandated energy usage reduction goals are not being achieved.

The electrical energy use intensity (EUI) of this building in FY 1990 (22 kWh/ft²/yr) calculated from utility billing information is characteristic of similar office buildings in this climate zone (20 to 30 kWh/ft²/yr). Highly efficient buildings have EUIs ranging from 15 to 20 kWh/ft²/yr. Therefore, there appears to be a significant opportunity for electrical energy-efficiency improvement.

Building lighting in both office and non-office space was found to be inefficient. Lighting levels in hallways are generally above recommended levels, and the levels in offices are uneven and vary considerably. Lights are generally left on in unoccupied spaces and during a portion of non-working hours. Considerable opportunity exists for improving the lighting system efficiency.

The EUI for natural gas usage (28,000 Btu/ft²/yr) for space and hot water heating is also characteristic of similar office buildings in this climate zone. There is, however, likely significant heat loss through the building envelope and through the HVAC system and therefore cost-effective energy savings potential.

Based on the building survey, contact with the servicing utilities and the findings given above, the following recommendations were made for reducing the energy consumption and energy costs:

- A building-wide lighting retrofit (interior and exterior) should be carried out using technologies that comply with federal life-cycle cost criteria. Installation of lighting controls (room switches, and daylighting and occupancy sensors) is also recommended as part of the lighting retrofit (not quantified). The most life-cycle cost-effective interior lighting retrofit is replacing the 3,843 existing 2x4 4-tube 40W fluorescent fixtures with 2x4 2-tube T8 fixtures with electronic ballast and parabolic reflector. Lighting energy consumption savings are estimated to be 1,500 MWh/yr (\$72,500/yr), at an installed cost of \$478,500. This retrofit would result in a 22% savings in electricity use at the facility. The net present value of this retrofit is \$807,200. With this retrofit, there will be a noticeable increase the quality of the light delivered in the work space. Since no electric utility DSM incentive program is available, this retrofit would need to be funded by GSA.
- Motors on pumps, fans, and chillers should be tested for efficiency improvement in drives, windings, and controls. Inefficient equipment should be replaced with high-efficiency equipment on failure. In addition, the chillers and the boiler should be monitored to determine the efficiency of the equipment and the potential for cost-effective improvements.
- Discussion between the gas utility and the Bureau should be initiated to further explore the opportunity for installing a cogeneration system and possibly gas-driven chillers. The discussions should focus on financing, cost-sharing, and contracting issues as well as the feasibility and technology selection.

5.4.2 Internal Revenue Service National Computer Center

A two-day site inspection was conducted in February 1992 at the IRS National Computer Center, Martinsburg, WV. A draft report was delivered to FEMP in March 1992. The site visit also included meeting with the local

servicing utilities, Shenandoah Gas and The Potomac Edison Company (electricity) to assess the potential utility demand-side management (DSM) incentives available.

The electric bill for the Center during calendar year 1991 was \$959,907, and the average blended rate paid by the Center during calendar year 1991 was \$0.053/kWh. The peak demand and use period for the facility is during the summer months due to the increased demand for air conditioning. However, electricity use is relatively constant throughout the entire year due to the continuous operation of the computing equipment and lights.

The electrical energy consumption and demand have increased 21% and 30%, respectively, from FY 1988 to FY 1991. The electrical energy use intensity (EUI) for this facility based on FY 1991 consumption is approximately 180 kWh/ft²/year. This high compared with other commercial buildings of this type in this region, primarily due to the 24-hour operation of the facility and high density of computer equipment. For comparison, the electrical EUI for the Bureau of Public Debt Building in Parkersburg, WV, is ~22 kWh/ft²/year. This facility operates 10 hours/day 4 days/week.

Other energy sources used at the facility are #2 fuel oil used in the boiler and diesel fuel for the generator sets. There is also a battery room for 15 minutes of power for computer use or until the UPS comes on line. There is no natural gas at the facility, and the nearest gas pipeline is over three miles away.

The function of the facility demands constant operation and commensurate electrical consumption. The overall energy usage at the site is driven by the need to keep the computers active and the rooms air conditioned 24 hours per each of the 365 days in the year. However, the calculated EUI would appear to offer significant opportunities for electrical energy efficiency in both retrofit technologies and controls.

Facility lighting energy consumption is still somewhat significant, even though the site has undergone a recent lighting retrofit program to replace incandescent lamps with fluorescent lamps. New efficient technologies are

currently available that allow a cost-effective retrofit at the site, particularly since most lights are on 24 hours/day.

A retrofit of the existing fixtures on a fixture-equivalent basis (one-for-one replacement) with the most life-cycle cost-effective technology will result in an estimated energy and cost savings of over 1,000,000 kWh/yr and nearly \$56,000/yr.

Other recommendations for reducing the energy consumption at the IRS computer center facility included:

- determining if additional lighting controls are feasible and cost-effective in those areas where 24 hour/day lighting is not necessary.
- tuning the four boilers for maximum combustion and delivery efficiency. There currently is no fuel-switching opportunity (oil to natural gas) for these boilers since natural gas is not readily available to the site.
- evaluating the motors on pumps, fans, and air conditioning units for efficiency improvement in drives, windings, and controls. Replace inefficient units with high-efficiency equipment on failure.
- assessing the life-cycle cost associated with upgrading HVAC controls and the distribution system, including the air handlers and coils.
- evaluating the heat-recovery strategy for the building and optimize to provide maximum benefit for conditioning needs.
- review the operations and maintenance (O&M) practices for the HVAC system and modify if necessary to ensure that the entire system is properly maintained. Based on experience at other federal facilities, a savings of 20% to 30% in HVAC system energy use can be realized through a comprehensive O&M program.

Because there is no utility incentive or cost-sharing available, any retrofit or technology improvement would need to be fully funded by the federal government or through an SES or third-party-funded project.

5.5 NATIONAL PARK SERVICE

FEMP tasked PNL to perform site energy efficiency assessment activities at two National Park Service sites, Ellis Island and Independence National Historic Park.

5.5.1 Ellis Island

PNL conducted a one-day site visit in October to Ellis Island, NY, and was accompanied by staff from the regional DOE Support Office in New York City. Several energy efficiency opportunities were identified, primarily in lighting retrofit. The lighting fixture count was received in December 1991, and preliminary findings were provided to the site energy management staff.

The preliminary estimate of cost-effective conservation opportunities is over 2,600,000 kWh/yr, representing over \$193,000/yr in cost savings. This is an approximately 30% electrical energy savings. Over one-third of this savings is in lighting. The draft report is expected to be completed by mid-June 1992.

5.5.2 Independence National Historic Park

PNL undertook a review of a study to upgrade the chiller and central steam system at the Independence National Historic Park (INHP) in Philadelphia, PA. The purpose was to examine some of the assumptions and parameters used in the study, primarily the central steam contingency plant and the central cooling plant analysis.

The analyses alternatives proposed for the INHP central plants lacked an integrated resource planning approach. The study also (apparently by design) excluded much of the energy efficiency and conservation opportunities at the end-use (i.e., lighting, building envelope, HVAC distribution system, etc.). Even at the utility level, the chiller, steam, HVAC central unit, and emergency power systems were treated as independent components that interact very little.

PNL recommended a number of alternative approaches to upgrading the utility systems in an integrated approach, including modifications to operations and maintenance, fuel switching, and end-use conservation projects to

reduce heating/cooling load. PNL also recommended exploring potential utility (gas and electric) incentive/cost-sharing programs for equipment upgrades and acquiring important baseline operating data prior to designing any retrofit.

5.6 U.S. NAVY

PNL is providing technical assistance to assess and optimize energy supply at two U.S. Navy base facilities and has provided baseline data and information for a potential SES project at a Naval hospital facility.

5.6.1 Naval Underwater Systems Center

Since early FY 1991, PNL has been providing engineering and technical assistance to the Naval Underwater Systems Center (NUSC), New London, CT, to determine the modifications necessary to upgrade its central plant to maximize efficiency and minimize fuel and operations and maintenance costs.

The design package (drawings and specifications) for the in-plant modifications for dual-fuel (coal and gas) operation at the heating plant facility was submitted for final review in November. At the same time, NUSC requested that we assess the other two locations on the steam-distribution system where the steam line needs to be repaired. A new project scope and cost statement were submitted in December for four new subtasks under the amended SOW.

The work involves the design for repairing and upgrading the two segments in the steam distribution system for better operation, as well as re-running the environmental analysis program to determine the ground-level ambient concentration of pollutants from the existing stack for the lower 20,000 lb/hr steam load case. The lower loads are anticipated because the site anticipates consolidation in the near future. The final design and bid specification package was sent to NUSC as a 100% design submittal in March.

The environmental modeling task for the lower steam load case is underway and should be completed in April 1992.

5.6.2 National Naval Medical Center

The Naval Facilities Engineering Command (NAVFACENGCOM) directed that Chesapeake Division Naval Facilities Engineering Command (CHESDIV) and the

other engineering field divisions develop and implement an SES program. CHESDIV selected several possible sites and is working to implement the program. CHESDIV is also developing the contracts for the proposed projects that require an energy usage baseline for current energy consumption be developed for the SES project sites. CHESDIV is managing the development of this project at the National Naval Medical Center (NNMC), Bethesda, MD, and entered into an interagency agreement with FEMP to provide technical assistance. PNL was tasked by FEMP to undertake this assessment.

The report was finalized in March 1992 giving metered and surveyed baseline data and recommendations to the CHESDIV and NNMC staff for viable energy efficiency projects funded with assistance from the utility in the form of rebates and incentives available through their DSM programs and through SES projects. This report also provided estimates of costs and potential energy savings of the recommended projects.

The project recommendations were based upon an analysis of utility billing and central plant records, energy audit data, short duration individual building electrical profile data, National Climate Center weather data from the Washington National Airport, and knowledge of other SES projects.

Seven buildings were metered to estimate their individual usage (both base [non-work period] and peak load) for periods ranging from 2 to 9 days. The results of the metering are summarized below.

From the metering data there was a significant non-work period baseload compared with the workday peak load in Buildings 4, 6, 10, and 12, indicating that either lights are left on during non-working hours or that there is a significant plug load from equipment left on. A detailed equipment usage schedule audit was not performed. For Buildings 10 and 12, the activities in those building related to 24-hour operation may explain this observation.

From these metered data and historical energy consumption data, PNL identified three primary energy savings project opportunities: 1) replace incandescent and fluorescent fixtures with life-cycle cost-effective energy-efficient fixtures; 2) install lighting controls; and 3) incorporate thermal energy storage system with the existing chilled water production and

distribution systems to reduce electrical consumption during periods of peak demand. Although the site is space-limited for a thermal energy storage system sized to serve the entire complex, a smaller system could be designed to serve a percentage of the load and still be life-cycle cost-effective.

These three projects are particularly cost-effective because of the availability of the servicing electric utility (Potomac Electric Power Company) rebates and financial incentives for these technologies.

An additional opportunity exists for the use of gas-driven prime movers for chillers to meet additional demand as it occurs. This opportunity may or may not be attractive, depending upon the future need to replace existing chillers and the future demand requirements. This option was recommended for thorough evaluation to better assess feasibility and cost-effectiveness.

5.6.3 Marine Corps Base Quantico

A site visit was made in November to the MCB Quantico, VA, to discuss the various options for expanding its landfill versus participating in a waste-to-energy plant design with the local county.

The base is in the process of replacing three existing coal-fired boilers to dual-fuel fired (with natural gas and #6 fuel oil as backup) boilers. This changes the entire fuel and cost option scenarios for the base in the future. Cogeneration system assessment for the base becomes a real possibility in addition to others.

In January, PNL submitted a draft report evaluating the potential of a municipal solid waste (MSW) cogeneration facility at Quantico. The analyses results showed that under existing conditions, an MSW plant did not appear to be economically viable for the site.

5.6.4 Boiler Guide Specifications and Upgrades

During the reporting period, NEESA developed and published guide specifications for digital boiler controls and for steam boilers. Other work in boilers included: 1) procuring a vibration analysis system at PWC Guam; 2) determining the feasibility of installing predictive maintenance equipment at PWC Pearl Harbor and NAS Alameda; 3) assessing maintainability and upgrade

requirements for the 30-year-old power plant at NCU Cutler; 4) conducting boiler efficiency tests at two Navy sites; 5) calibrating controllers and recorders at a third Navy site; and 6) evaluating the feasibility of converting pneumatic controls to electronic controls at a fourth Navy site.

In addition, NEESA evaluated feasibility of converting boilers from coal to wood burning at NSY Puget Sound, WA.

5.7 U.S. ARMY - FORSCOM

PNL is providing technical assistance to assess and optimize energy supply and end-use for FORSCOM and FORSCOM installations.

5.7.1 Fort Drum Gas Supply

A study was undertaken in October 1991 to determine the best strategy for meeting the current and future gaseous fuels (natural gas or propane equivalent) needs of Fort Drum. In the study, PNL evaluated and recommended the optimal mix of supply scenarios for the Fort. The viable options are analyzed in terms of their costs and availability to meet the Fort's projected needs.

Work began with a site visit and discussions were held with Niagara Mohawk Power Corp. (NMPC) gas supply staff. A second trip was made to NMPC to explore the range of potential gas-supply options that may be offered by NMPC on a short-term contract basis.

An initial forecast of gas consumption was produced for the Fort in December using historical new post consumption data and historical climate data. The data were used to estimate a statistical model of consumption coupled with long-term average climate data. The expected consumption from the old post was added to derive a final "total" estimated gas consumption forecast.

PNL then contacted the Iroquois pipeline, a potential new supplier of natural gas, and made several requests for information on the possibility of the pipeline supplying Fort Drum. We received a commitment in January for the pipeline to provide cost estimates for hooking Fort Drum directly to the pipeline. We also collected information on two other potential supply options:

propane-air mixing station and liquefied natural gas. This information is being incorporated into our analysis.

In addition, PNL examined the Fort Drum contracts with Hudson Bay and Niagara Mohawk to extract cost and capacity as inputs into the overall analyses. PNL also refined the forecast of our best estimate of gas demand required by the Fort.

The data collection for the existing supply and new supply analyses was completed in February 1992. A draft of the analysis report was prepared and submitted for internal review the last week of March. A final draft of the document will be submitted to FORSCOM and the site for review in April 1992.

The analysis shows a significant energy cost savings potential through several gas supply scenarios available to the site in the near term with additional savings in the long-term depending upon the terms of the DoD area-wide supply contract and completion of the Iroquois pipeline.

5.7.2 Hunter AAF HVAC System Upgrade Analysis

In October 1991, PNL was requested to independently analyze a planned heating system upgrade in family housing at Hunter Army Air Facility (AAF). The original proposed upgrade was for new gas furnaces and a new distribution system to serve family housing. The bidder submitted a change to the original bid to upgrade with heat pumps instead of gas furnaces. The analysis for the change/modification was conducted by a consultant to the utility. A life-cycle cost analysis was therefore undertaken to compare various scenarios.

The LCC analysis of several heating/cooling options for the planned heating system upgrade (from fuel oil) was completed in November 1991. The analysis showed a difference in net present value (NPV) between an upgrade to heat pumps and a gas heat/electric cooling upgrade of over \$2 million in favor of the heat pump upgrade. The final analysis was provided to the utility consultant and the site energy engineer for evaluation in December 1992.

5.7.3 Advanced Meter Reading

PNL is preparing a report for FORSCOM summarizing the capabilities of advanced metering reading (AMR) systems and the opportunities they can provide

to meet the future metering needs of FORSCOM and other federal installations where there is a dearth of metering and metered data available and where there is limited staff available for manual meter reading. Compared to regular meters, advanced meters include both advanced metering features and communications techniques. Advanced features may include: 1) increased data recording, 2) tamper and outage detection, 3) load control and scheduling, and 4) time-of-use and dispatchable rate structures. Advanced communications may include: 1) more accurate manual read methods, 2) remote meter reading, and 3) automatic meter reading (AMR) systems.

Results of the initial investigation show that AMR systems provide an opportunity to totally redesign conventional revenue billing and customer relations processes. Remote and fully automatic meter reading systems can substantially reduce manpower costs and speed up the revenue billing cycle.

The advantages of advanced metering include:

- reduction of manual meter readings
- reduction of meter rereads through improved meter reading accuracy
- electronic access to hard-to-read meters
- elimination of estimated readings based on bi-monthly/quarterly/yearly meter readings
- collection of profile and load survey information (monthly, daily, or near real time)
- implementation of innovative rate structures (time-of-use, real-time pricing, interruptible rates, or demand charges)
- improved customer service
- detection of meter tampering and reduce lost revenue
- detection of mains leaks (water)
- assistance in outage detection.

A final report on the findings and applications is expected to be issued in the third quarter of FY 1992.

5.8 U.S. AIR FORCE

PNL is providing technical assistance to assess and optimize energy supply and end-use for several commands within the U.S. Air Force.

5.8.1 Robins AFB - AFMC

In October 1991, PNL initiated an operations and maintenance (O&M) improvement project at Robins Air Force Base (AFB), which is designed to demonstrate the potential energy and efficiency improvements from operations and maintenance activities in selected facilities and systems at the site and to assist the site personnel in transferring the technology throughout the entire site.

A project work scope and PMP was developed by PNL and reviewed and approved by the Base Civil Engineering during a site visit by the PNL project manager in December 1991.

In the work scope, PNL suggested the development of a steam trap documentation, testing, and scheduled maintenance program as one part of the O&M improvement program. The steam distribution loop that supplies the avionics buildings was suggested as a good candidate for implementation and evaluation of the steam trap O&M program. This loop contains 150 to 200 steam traps. The work scope calls for the initial upgrade, maintenance, staff training in maintenance and calibration of the steam traps and metering of the program impact to be initiated in May 1992.

The second part of the program is to assess the energy and operations impact associated with HVAC system O&M and to demonstrate the application of direct digital control (DDC) technology using recently-developed DDC specifications.

Two buildings were selected for this project in February 1992. Building 300, a 475,000-ft² warehouse that has been converted to office space, is one of the candidate buildings. The building has separate air handlers for six "identical" 40,000-ft² bays. The original four-row face-and-bypass cooling coils had been replaced with four-row straight drawthrough coils. A 1985 project replaced the cooling coils with six-row straight drawthrough coils and replaced the pneumatic controls with electronic controls that

operated both electronic and pneumatic actuators. The new electronic-to-pneumatic controls were replaced within a few months with the original pneumatic controls.

The second building selected for the O&M/DDC demonstration project is a Precision Measurement Equipment Laboratory (PMEL), Building 162. PMEL laboratories require narrow acceptable temperature and humidity ranges. If the temperature or humidity are out of limits, the operating contractor goes home with pay, and a minimum 24-hour period is required to re-establish acceptable temperature and humidity conditions. De-humidification and subsequent re-heat requires large chilled water and steam energy consumption.

In March, PNL prepared a simulation of the air-handling units used in Building 162. The simulation will be used to evaluate different control strategies for the building. The Civil Engineering staff agreed to have dedicated telephone lines installed in Buildings 300 and 162 for the data collection equipment to be installed in the buildings scheduled for June 1992.

5.8.2 Vandenberg Air Force Base - SPACECOM

VAFB requested that PNL help the base decide what to do with the South Vandenberg Power Plant: whether to close it down because of the enormous environmental permitting costs that are incurred each year, or to expand its use for peak-shaving purposes. Data gathering and analysis was initiated for this project in March.

VAFB also requested in March that PNL help the base characterize and justify additional site energy management and control system (EMCS) projects. This work is expected to be conducted in parallel with the FEDS assessment currently ongoing at the site.

5.8.3 Griffiss AFB - ACC

In February 1991, the staff at Griffiss AFB requested that PNL undertake an evaluation of the co-generation potential and/or gas conversion at the central steam plant, steam plant efficiency improvements, steam distribution upgrades (repair, abandon and replace with package boilers), and building weatherization. A feasibility study for this work was initiated in March 1992 and is expected to be complete in June 1992.

5.8.4 Patrick Air Force Base - SPACECOM

In conjunction with the FEDS modernization activity under way at Patrick AFB, PNL has been asked to assess the cost-effectiveness of privatizing the electrical transmission and distribution (T&D) system at Patrick AFB. FP&L is developing one or more proposals for assuming ownership and operation of the existing electrical T&D system, and PNL will assist the Air Force in evaluating those proposals. A meeting is scheduled for early April with utility and Air Force representatives to scope the project.

6.0 MEETINGS, WORKSHOPS AND PRESENTATIONS

The following meetings, workshops, briefings and presentations took place during the reporting period:

- Federal Energy Decision Support (FEDS) System Workshop, November 21-22, 1991, Las Vegas, Nevada.
- Federal Relighting Initiative (FRI) Prototype Workshop, December 11-12, 1991, Washington, D.C.
- Briefing by J. W. Currie, PNL. *Energy Systems Modernization Office, Pacific Northwest Laboratory*. Presented to Lou Divone, OBT, and Mark Ginsburg, FEMP, January 10, 1992, Richland, Washington.
- Briefing by G. B. Parker, PNL. *Federal Energy Decision Screening (FEDS) for Acquiring Energy Efficiency and Cost Savings at Fort Irwin, California*. Presented to the Fort Irwin DEH, January 16, 1992, Fort Irwin, California.
- Briefing by L. Harris, FEMP. *Federal-Utility Demand-Side Management Partnership*. Presented at the Program Development Meeting, January 28, 1992, New York City.
- Briefing by G. B. Parker, PNL. *Federal-Utility Demand-Side Management Partnership Program*. Presented to the Georgia Public Service Commission Energy Committee, January 1992, Atlanta, Georgia.
- Georgia Power/Savannah Electric and Power Company Department of Defense Energy Partnership Program (DEPP) Meeting, January 30-31, 1992, Jekyll Island, Georgia.
- Briefing by J. W. Currie, PNL. *FEMP Model DSM Program for Federal Facilities*. Presented at the 1992 DOE Public Utilities In-House Energy Management Conference, February 1992, Las Vegas, Nevada.
- Briefing by R. W. Reilly, PNL. *Analysis Activities and Tool Development in Support of the Federal Energy Management Program*. Presented to the OBT Analysis Reviewing Meeting, February 19-20, 1992, Washington, D.C.
- Briefing by J. W. Currie, R. W. Reilly, PNL. *FEMP Model Program for Federal Energy-System Modernization*. Presented to Bonneville Power Administration, March 9, 1992, Portland, Oregon.

7.0 DOCUMENTATION

The following documents were prepared during the reporting period:

T. J. Secrest, J. W. Currie, J. G. DeSteeese, J. A. Dirks, T. J. Marseille, G. B. Parker, E. E. Richman, and S. A. Shankle. *Fort Lewis Electric Energy Baseline and Efficiency Resource Assessment*. PNL-7763, Pacific Northwest Laboratory, Richland, Washington. October 1991.

Rosoff, D., and G. B. Parker. *DRAFT REPORT: Inspection and Assessment of Energy Conservation Opportunities at the Bureau of Public Debt Building Parkersburg, West Virginia*.

Hoffman, L., and G. B. Parker. *DRAFT REPORT: Preliminary Assessment of Energy Conservation Opportunities at the White Sands Test Facility Las Cruces, New Mexico*.

Parker, G. B. *Mobile Energy Laboratory Energy-Efficiency Testing Programs Semiannual Report: April 1, 1991 through September 30, 1991*. PNL-8026, Pacific Northwest Laboratory, Richland, Washington, March 1992.

Hoffman, L., and G. B. Parker. *DRAFT REPORT: Preliminary Assessment of Energy Conservation Opportunities at the NASA Ames Research Center Moffett Field, California*.

Rosoff, D., and G. B. Parker. *DRAFT REPORT: Preliminary Assessment of Energy Conservation Opportunities at the Internal Revenue Service's National Computer Center Martinsburg, West Virginia*.

Parker, G. B., and M. A. Halverson. *Energy Use Baseline Study for the National Naval Medical Center*. PNL-8058, Pacific Northwest Laboratory, Richland, Washington, April 1992.

8.0 REFERENCES

1. Executive Order on Federal Energy Management, E.O. 12759. *Federal Register*, Vol. 58, No. 76, April 19, 1991.
2. *Mobile Energy Laboratory Use Plan*. PNL-6861. Pacific Northwest Laboratory, Richland, Washington. April 1989.

ATTACHMENT 1

**MOBILE ENERGY LABORATORY USE COMMITTEE
SEMIANNUAL MEETING**

November 19, 1991, Las Vegas, Nevada

FINAL AGENDA
11/19/91

0900	CONVENE MEETING, REVIEW AGENDA, INTRODUCE GUESTS (K. Dean Devine)
0915	REVIEW AND APPROVAL OF MINUTES FROM SPRING 1991 MEETING (G. Parker)
0930	DISCUSSION OF ACTION ITEMS AND STATUS (G. Parker)
1000	DISCUSSION OF REPLACEMENT MEMBER(S) OF COMMITTEE (K. Dean DeVine)
1030	BREAK
1050	COMMITTEE NAME CHANGE (G. Parker)
1120	REVIEW OF MEL USE COMMITTEE CHARTER (G. Parker)
1200	LUNCH -- <i>SERVED IN MEETING ROOM</i>
1315	MEL USE PLAN REVISIONS FINALIZATION (G. Parker)
1415	MEL BROCHURE AND APPLICATIONS SUMMARY REVISIONS (G. Parker)
1500	BREAK
1520	MEL BROCHURE AND APPLICATIONS SUMMARY REVISIONS (Cont.)
1600	NEW MEL EQUIPMENT PURCHASE REVIEW AND APPROVAL (R. Szydlowski)
1630	DOE/PNL, MARINES AND AIR FORCE O&M PROJECT ACTIVITIES (R. Szydlowski)
1730	ADJOURN

**MOBILE ENERGY LABORATORY USE COMMITTEE
SEMI-ANNUAL MEETING
FALL 1991**

**FINAL AGENDA
11/19/91**

WEDNESDAY NOVEMBER 20, 1991

0830	ENERGY RESOURCE MANAGEMENT/DSM PROGRAM STRATEGY AND DIRECTION ♦ DOE/FEMP (K. Dean DeVine) ♦ ARMY/DoD (R. Karney) ♦ NAVY/NEESA (J. Heller) ♦ AIR FORCE/AFLC (G. DeVeny)
1000	TEST PROCEDURES, TESTING AND REPORTING -- STATUS (R. Szydlowski)
1020	BREAK
1040	SELECTED PNL ENERGY EFFICIENCY TESTING (R. Szydlowski)
1120	SELECTED NEESA ENERGY EFFICIENCY TESTING (J. Heller)
1200	LUNCH -- <i>ON YOUR OWN</i>
1300	U.S POSTAL SERVICE DSM/SES EXPERIENCES (Martin Nelson)
1345	CERL MODEL INSTALLATION PROGRAM -- SCOPE & STATUS (Donald Fournier)
1430	BREAK
1450	UTILITY DSM/FEDERAL PARTNERSHIP PROGRAMS UPDATE (G. Parker)
1530	FUTURE ACTIVITIES AND PRIORITIES (G. Parker/J. Heller/R. Karney/G. DeVeny)
1600	ACTION ITEM REVIEW, AGREEMENT AND NEXT MEETING (G. Parker)
1600	ADJOURN

ATTACHMENT 2

BRIEF SHEETS

Brief Sheet

FORT LEWIS, WASHINGTON **Integrated Resource Assessment and Acquisition**

1. Characteristics:

Major Command: Army Forces Command (FORSCOM)

Electric Utility: Tacoma Public Utilities (TPU)

Gas Utility: Washington Natural Gas

Full-time residents: 25,000

Commercial buildings: 2,252 with 18,000,000 ft²

Residential housing: 2,205 with 5,900,000 ft²

Total energy bill (FY91): \$13,000,000 for 2,600,000 MMBtu

Electric: \$ 4,500,000 for 208,000 MWh (demand @ 36MW)

Natural gas: \$ 4,500,000 for 1,300,000 MMBtu

Fuel oil (#2, #6): \$ 3,800,000 for 3,800,000 gallons

Weather: Heating degree days - 5339
Cooling degree days - 110

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
Ongoing	Project Management	Project Plan Monthly Reports
Ongoing to 07/92	Implementation support: develop and provide information, facilitate interactions, and other support to develop facility-utility partnership.	Attend meetings; develop/provide information as needed
10/91	Electricity Baseline and Resource Assessment: baseline electricity use and efficiency improvement potential for major sectors and end uses.	Assessment Report
07/92	Fossil-Fuel Baseline and Resource Potential: baseline fossil energy use and efficiency improvement potential for major sectors and end uses.	Assessment Report

07/92	All Fuel Baseline and Resource Potential: combine the electricity and fossil fuel reports into a single summary report.	Assessment Report
07/92	ESCO selection complete for electric technologies	Contract Award
10/92	Initiate electric technologies installation	Project Start

3. Utilities - Tacoma Public Utilities: TPU is a municipal utility serving the greater Tacoma, WA area having a 180 square mile service area, more that 2,000 miles of T&D system and more than 70 substations. In 1988, TPU's total electricity sales of 5.4 gWh (5,447,483,894 kWh) representing 622 MWa of capacity were distributed among its three customer classes as follows:

<u>Sector</u>	<u>Number of Customers</u>	<u>Percent of Total Load</u>
Residential	112,488	32
Commercial	9,919	26
Industrial	1,057	43
Total	123,464	100

The two large DoD sites served by TPU, Fort Lewis and McChord AFB, are classified as commercial-sector customers.

TPU's resource base includes ownership of six hydroelectric facilities, part interest in a coal thermal plant, and a Refuse-Derived Fuel (RDF) plant. Approximately 40% of TPU's load is met through electricity purchases from Bonneville and options are maintained for purchases from other suppliers in the region. Efficiency programs provided an estimated 10 MWa of capacity in 1988.

Washington Natural Gas: No information is available at this time.

4. DSM Program Description - Tacoma Public Utilities: TPU is an municipal utility and therefore is not regulated. However they have a least cost plan in place for acquiring resources. DSM program offerings are a part of that plan and include residential weatherization, the Northwest Power Planning Council's recommended Model Conservation Standards for new homes and new commercial construction, and a variety of rebate/incentive/assistance programs supported by the Bonneville Power Administration for all three sectors.

Washington Natural Gas: A draft least cost plan dated December 15, 1989 presents the utilities' perspective of least cost planning. First, is to minimize purchase and T&D costs. Second is to rely on the price mechanism to induce market demand to promote energy efficiency.

5. PUC Climate - The Washington Transportation and Utilities Committee (WTUC) is supportive of energy conservation, although Washington State Energy Office is has a more visible presence in the State with respect to energy conservation policy and programs. The WTUC requires the state's investor-owned utilities to develop least cost plans for supply and demand acquisitions.

6. ROR/Incentive for Conservation Investments - The WTUC does not provide financial incentives for efficiency acquisition. The Bonneville Power Administration is the financial driver in the Pacific Northwest for the acquisition of electric energy efficiency. Bonneville offers numerous programs that provide a payment to the provider of the resource (supply or demand) with the payment generally tied to the estimated price of the regions marginal supply resource, which is estimated to be approximately 5 cents per kWh.

7. Method to determine incentive - For the Fort Lewis modernization/DSM project, TPU is discussing the terms of the agreement with Bonneville for determining the level of the incentive payment. The region's marginal cost of electricity, (~4 cents per kWh), will be the ceiling price that Bonneville will provide to TPU.

8. Contacts

-DOE/FEMP	Louis Harris (202) 586-9794
-Fort Lewis	Newell Flood (206) 967-5237
-FORSCOM	Adrian Gillespie (404) 669-6741
-TPU	Dalene Moore (206) 383-9652
-PNL	Tom Secrest (509) 375-3873

9. Estimated Investment - The investment in electrical energy efficiency projects at Fort Lewis is estimated at between \$15 and 25 million. The minimum electrical energy efficient resource is 43,000 MWh/yr (21%) and 4MW resulting in a \$500,000/yr reduction in the electric bill. The agreement for the project was signed on May 13, 1992. In this agreement TPU will provide the up-front financing and the energy services company to install the technologies. The cost sharing agreement is for Fort Lewis to pay 15%, TPU 15%, and Bonneville 70% of the installed capital cost.

The minimum fossil fuel savings is 342,000 MMBtu/yr (18%) with a cost savings \$1,300,000/yr. The initial capital cost for fossil fuel technologies is estimated at \$7.7 million with a net present value of \$46.2 million.

Brief Sheet

FORT DRUM, NEW YORK Integrated Resource Assessment and Acquisition

1. Characteristics:

Major Command: Army Forces Command (FORSCOM)

Electric Utility: Niagara Mohawk Power Corporation (NMPC)
Philadelphia Electric Utility (off-post housing area)

Gas Utility: Niagara Mohawk Power Corporation (NMPC)
Hudson Bay Natural Gas Corporation

Full-time residents: 25,000-30,000

Commercial buildings: 894 with 6,456,000 ft²

Residential housing: 2,272 with 3,183,000 ft² (on-post)
2,000 with 2,937,000 ft² (off-post)

Total energy bill (FY90): \$11,900,000 for 1,599,000 MMBtu

Electric: \$ 5,500,000 for 106,000 MWh (demand @15MW)

Natural gas: \$ 2,340,000 for 386,000 MMBtu

Fuel oil (#2): \$ 1,700,000 for 2,400,000 gallons

Propane: \$ 360,000 for 652,000 gallons

Purchased HTHW: \$ 2,000,000 for 460,000 MMBtu

Weather: Heating degree days - 7200
Cooling degree days - 400

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
03/91 05/91	Site visits	Baseline/charact. data
07/91	Program Management Plan submitted to Fort Drum and FORSCOM for concurrence	Program Plan
04/92	Baseline and Resource Assessment (Electric and Fossil-Fuel Assessments; Fuel Switching)	Technical Report
05/92	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
Ongoing	Utility Partnership: coordinate interactions between utility and sites	Utility funding/ financing package and contract

3. Utilities - Niagara Mohawk Power Corporation: (NMPC) is an investor owned utility with headquarters in Syracuse NY. It serves the central Mohawk Valley (Syracuse to Albany), most of the northern/upstate region, and the far western and southwestern parts of NY state. This encompasses more than 24,000 square miles, and about 3.5 million people. NMPC has two separate business units for electricity and natural gas, but only have DSM incentive programs on the electric side. Fort Drum is the largest federal customer of NMPC, while Griffiss AFB is the second largest.

Niagara Mohawk is the second largest utility in NY State (second to Consolidated Edison), and is part of the NY State Power Pool which acts as a broker for surplus capacity throughout the state. Unlike most of the other utilities in NY, NMPC is a winter peaking utility, and has a capacity surplus at present that may extend well beyond the year 2000, based on the current economic growth forecasts. NMPC has had DSM programs for several years in the residential arena, but really did not aggressively pursue DSM until the PSC ordered them to implement a full-scale program in 1989. At the same time, the Public Service Commission (PSC) authorized new rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts.

4. DSM Program Description - NMPC has a wide variety of DSM programs at present, with a growing focus on the commercial/industrial (C/I) customers. These include C/I programs in lighting, HVAC, motors and adjustable speed drives, water heating, small commercial audits, and other custom incentives. A new program was proposed in the 1991-1992 DSM filing called the *Energy Alliance Pilot Program*. The goal of this program is to develop a mechanism (or mechanisms) which will allow NMPC to overcome the barriers to DSM implementation not addressed by standard rebate programs. By identifying and implementing alternative strategies employing energy service companies (ESCOs), NMPC can help overcome technical, financial, and institutional barriers and acquire significant portions of untapped energy and demand savings from C/I customers. Current NMPC programs were not designed (nor expected) to capture all of the economically viable energy efficiency opportunities in the C/I markets.

The general program approach for the energy alliance pilot is for NMPC to match ESCOs with participating customers based upon the needs of the customer and the expertise of the ESCO. The ESCO will perform a detailed energy analysis of the customers facility, estimating the costs and benefits of all feasible energy efficiency improvements. An attempt will be made to build upon previously existing audits and analysis whenever possible. NMPC will provide financial incentives consistent with their other DSM programs (up to 50%) with the remainder of project's cost to be born by the participant. Shared savings arrangements with the ESCOs may be proposed as a potential financing methodology. NMPC will coordinate all activities between the ESCOs and the C/I customers.

5. PSC Climate - The NY State PSC has been very pro-DSM, and ordered NMPC to implement full-scale DSM programs in 1989. Recently, it appears that the PSC is encouraging DSM activities that reduce energy usage, rather than demand reduction. This is primarily in response to forecasts of lower economic growth in NY that will reduce the need for additional capacity.

6. ROR/Incentive for Conservation Investments - The PSC has authorized rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts. NMPC has to demonstrate that the customers would not have implemented the energy conservation measures without the incentives provided by the utility. Recently, NMPC has become increasingly concerned about the rate impacts of their investments in DSM. Intervenor groups and large C/I customers that had implemented conservation measures prior to the DSM programs, are the cause of this concern.

7. Method to determine incentive - The utility has issued "standard" incentive/rebate programs for current and pilot program offerings, but is developing the *Energy Alliance Pilot Program* to customize incentives and overcome barriers to participation in DSM programs.

8. Lighting - Niagara Mohawk's lighting program for C/I customers includes: T-8 and T-12 electronic ballasts; screw-in and hard-wire fluorescent lamps; low watt fluorescent exit lights; high pressure sodium/metal halide fixtures; fluorescent reflectors; and occupancy sensors (wall or ceiling). Incentives range from \$0.40 for a 40-watt fluorescent lamp to \$60 for a high pressure sodium/metal halide fixture. Other high efficiency lighting products will be evaluated for rebates on a customized basis.

9. Contacts

-DOE	Lou Harris (202) 586-9794
-Fort Drum	Steve Rowley (315) 772-5433
-FORSCOM	Adrian Gillespie (404) 669-6741
-PNL	Doug Dixon (509) 376-5832
-Niagara Mohawk	Steve Molodetz (315) 428-5776

10. Estimated Investment - The preliminary investment in electric energy efficiency at Fort Drum is estimated to be \$6 to \$12 million. The minimum electrical energy reduction is 30,000 MWh/yr (28%) and (3.5 MW) with an estimated cost reduction of \$1,570,000/yr. The minimum fossil fuel efficiency resource is 202,000 MMBtu (16%) with a cost reduction of \$1,144,000/yr.

Brief Sheet

FORT STEWART/HUNTER ARMY AIR FIELD, GEORGIA Integrated Resource Assessment and Acquisition

1. Characteristics:

Major Command: Army Forces Command (FORSCOM)

Electric Utility: Fort Stewart - Georgia Power
Hunter AAF - Savannah Electric & Power Company (SEPCO)

Gas Utility: Fort Stewart - Atlanta Gas Light
Hunter AAF - Savannah Gas

	<u>Fort Stewart</u>	<u>Hunter AAF</u>
Full-time residents:	33,000	5,500
Commercial buildings:	2,325 (11MM ft ²)	699 (3.1MM ft ²)
Residential housing:	2,525	531

Total energy bill (FY90):	\$11,880,000	for 1,600,000 MMBtu
Electric:	\$ 9,400,000	for 195,360 MWh (demand @ 30MW)
Natural gas:	\$ 850,000	for 164,500 MMBtu
Fuel oil (#2, #5):	\$ 970,000	for 1,750,000 gallons
Propane:	\$ 80,000	for 545,900 gallons
Wood Chips:	\$ 580,000	for 66,700 tons

Weather: Heating degree days - 1300
Cooling degree days - 2600

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
September November	Site visits	Baseline/charact. data
03/92	Prepare program plan to be submitted to Fort Stewart/Hunter and FORSCOM for concurrence	Program Plan
TBD	Baseline and Resource Assessment (Electric and Fossil-Fuel Assessments; Fuel Switching)	Technical Report
TBD	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan

Ongoing

Utility Partnership: coordinate interactions between utility and sites

Utility funding/ financing package and contract

3. Utilities - Georgia Power/Savannah Electric Power Company: Georgia Power with headquarters in Atlanta GA and Savannah Electric Power Company with headquarters in Atlanta GA are utilities within The Southern Electric System and therefore have similar characteristics. There are approximately 12 large federal customers in the service territory, the largest being Fort Stewart in Hinesville. Hunter AAF is the second largest customer of Savannah Electric, located in Savannah. These utilities forecast adequate baseload resource but a deficit in capacity of over 1100 MW by 1995. Since 1977, they have offered demand side options, primarily in energy efficient residential construction. Only recently have these utilities begun to institute conservation pilot programs in the commercial and industrial customer base.

Both companies filed an IRP on January 10, 1992 in which new DSM programs were introduced for PSC approval. The utilities estimated avoided cost for baseload is 2 cents/kWh and \$350/kW. Therefore, DSM program incentives are designed based on the avoided cost of capacity. The current maximum incentive is about 15% of the installed capital costs for a T-8 lighting system.

Georgia Power has organized a Department of Defense Energy Partnership Program (DEPP) to work with all of its federal customers. The purpose of the program is to develop DSM programs acceptable by the DoD and other federal agencies, and the schedule under which this development process would be conducted. PNL is working with Georgia Power and federal facilities to define the potential resources (energy and demand) and the type of programs attractive to their federal customers.

A key feature of the program is the development of a construct for the utility to up-front finance projects. A proposal for this construct has been prepared for federal review. It is designed to be an addendum to the current GSA Areawide Utilities contract currently in place at every federal installation in the state of Georgia.

Atlanta Gas Light - The gas utility has no DSM/incentive programs but has been requested by the Georgia Public Service Commission to file an IRP within the next year.

4. DSM Program Description - The Georgia Power IRP filing included a mix of current pilot program and "new" program offerings. The SEPCO filing only included only the first three of the programs listed below.

- *Residential Good Cents and Super Good Cents Program:* This program involves new and existing homes and includes in-house energy audits, conservation "grants" and "Good Cents" energy efficiency certification. It provides cash incentives to encourage extensive energy efficiency including the installation of heat recovery units with electric water heaters and free water heater jackets.
- *High Efficiency Lighting Program:* Incentives are available either under a standard or "customized" approach. Under the standard approach a prescribed amount is paid for each unit installed, ranging from \$0.50

for a 40-watt fluorescent lamp to \$15 for a T-8 system. Under the "customized" program, the customer presents a lighting system plan to Georgia Power for review. If approved, the customer is paid \$150/kW reduction relative to the old system. The maximum incentive offered is about 15% of the installed cost for a T-8 system. This is the largest incentive offered in any of the proposed DSM programs.

- *Interruptible Service Program/Standby Generation:* This involves the startup of process or backup generators at a site (minimum of 200 kW) to clip peak. This program is in conjunction with a modified rate structure providing load credit, energy credit and penalties. The incentive paid to the customer is \$10/kW/year
- *Motors Program:* This program encourages industrial customers to install motors with high-efficiency motors. A rebate schedule has been established for motors ranging from 1 to 200 hp. The rebate is approximately 10% of the cost of a new high-efficiency motor.
- *Air Conditioning Control Pilot:* This program provides cash incentive to customers who allow the utility to control equipment at times of peak demand.
- *New Construction Program:* Georgia Power will pay for part of the incremental cost of technical assistance based on a building's size. The Company will also pay a portion of the incremental cost of each installed measure, relative to the cost of standard practices.
- *HVAC:* The utility pays a portion of the incremental installed cost of each measure. The incentive is determined as the smallest of the following: 1) a two-year payback; 2) 80% of the utility's avoided cost; or 3) 50% of the participants incremental cost.
- *Custom Programs:* The utility proposed a custom program for the C&I and residential sector (which will be applicable to federal facilities) These include HVAC, water heating and other "customized programs" that can be proposed by the customer. The utility pays a portion of the incremental installed cost of each measure. The incentive is determined as the smallest of the following: 1) a two-year simple payback; 2) 80% of the utility's avoided cost; or 3) 25% of the participants incremental cost.

5. PSC Climate - The Georgia PSC is an appointed body of regulators who are relatively new to the IRP/DSM process. The PSC has directed Georgia Power to acquire 1100 megawatts of conservation by 1995. The forecasted load growth is over 3000 MW by 1995. The PSC has yet to rule on Georgia Power's request to recover costs or earn a profit on the savings from DSM programs and will likely deal with this issue once they rule on the completeness of the IRP in July 1992 (see below). PNL has developed an interface with the PSC and presented material on the FEMP/ESMO model program. The PSC has also provided PNL with a list of the intervenors who are active in the state.

6. ROR/Incentive for Conservation Investments - The utility proposes to recover all DSM program costs on a dollar for dollar basis. The company also

proposes to recover lost revenue resulting from implementation of the programs in the same manner as program costs. For load management-type programs (e.g. interruptible service programs), the company proposes to recover an additional 10% of the payments to participating customers. For conservation-type programs the company proposes to share with its customers the net benefits that the DSM programs are expected to produce. The proposed mechanism would provide Georgia Power's customers 60% of the benefits, with the remaining 40% retained by the company. The estimated DSM program costs in CY 1991 is \$3.8MM

7. Method to determine incentive - The utility has issued "standard" incentive/rebate program for current and pilot program offerings, but is willing to develop custom programs with variable incentives depending upon type and size of program.

8. Lighting - Georgia Power and SEPCO have proposed identical lighting programs: These include: T-8 system; energy-efficient tubular and compact fluorescent lamps; low watt fluorescent exit lights; electronic ballasts; reflectors or new fixtures with delamping; and occupancy sensors. Incentives range from \$0.50 for a 40-watt fluorescent lamp to \$15 for a T-8 system. Other systems will be evaluated on a case-by-case basis under the "customized" program. If approved, the customer is paid \$150/kW reduction relative to the old system. For new buildings, the incentive will be paid for systems that exceed a preestablished standard.

9. Contacts

-DOE	Louis Harris	(202)	586-9794
-Fort Stewart/Hunter AAF	Randy Jones	(912)	767-7919
-FORSCOM	Adrian Gillespie	(404)	669-6741
-PNL	Chip Larson	(509)	375-6740
-Georgia Power	Ken Rosanski	(404)	526-4668
-SEPCO	Joel Edwards	(912)	238-2213

10. Estimated Investment - The preliminary investment in energy efficiency at Fort Stewart and Hunter AAF is estimated to be \$11 to \$20 million. The minimum electrical energy savings at Fort Stewart is 28,000 MWh/yr (19%) and 6.7MW and 9,000 MWh/yr (20%) and 2MW at Hunter AAF. This represents an electrical energy cost savings of \$1,700,000/yr at the two sites. The estimated fossil fuel energy savings at Fort Stewart is 332,000 MMBtu/yr (22%) and 31,000 MMBtu/yr (25%) at Hunter AAF. The estimated fossil fuel cost savings is \$600,000/yr at the two sites.

Brief Sheet

VANDENBERG AIR FORCE BASE, CALIFORNIA Integrated Resource Planning and Acquisition

1. Characteristics:

Major Command: Air Force Space Command (AFSPACECOM)
Electric Utility: Pacific Gas and Electric (PG&E)
Gas Utility: Southern California Gas (SCG)
Full-time residents: 6,500
Commercial buildings: 900 with 6,528,000 ft²
Residential housing: 2460 with 2,977,000 ft²
Total energy bill (FY90): \$13,970,000 for 1,300,000 MMBtu
Electric: \$10,435,000 for 190,000 MWh (demand @ 27MW)
Natural gas: \$ 3,095,000 for 570,000 MMBtu
Fuel oil (#2): \$ 280,000 for 10,300 gallons
Propane: \$ 160,000 for 240,000 gallons
Weather: Heating degree days - 2700
Cooling degree days - 25

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
09/91	Three day site visit	Baseline/charact. data
10/91	Prepare program plan to be submitted to VAFB and AFSPACECOM for concurrence	Program Plan
06/92	Baseline and Resource Assessment (Electric and Fossil-Fuel Assessments; Fuel Switching) Utility Programs/Activities/Interface	Technical Reports
07/92	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
Ongoing	Utility Partnership: coordinate interactions between PG&E and VAFB, influence PG&E to expand upon their programs for federal customers, and assist in negotiating the best arrangement for VAFB to implement the above project plan	Utility funding/financing package and contract

3. Utilities - Pacific Gas and Electric Company: PG&E offers several energy conservation and load shifting programs for their larger customers. PG&E is running out of conservation funding for this year (1991) and they are avoiding any large activities in these programs. PG&E has filed a request with the commission to support more conservation activities. To date, PG&E has not been receptive to the major points of our proposed federal customer program.

Southern California Gas - No information is currently available on the gas company characteristics.

4. DSM Program Description - PG&E offers two energy conservation programs and a load shifting program for its larger customers:

- *Customized Electric Program* - The incentive is \$.06 per kilowatt hour of first-year savings for electric projects, up to 50 percent of the direct project cost. Customer can collect up to \$300,000 per account. Qualifying projects include lighting, HVAC, and refrigeration. Offer ends 10/31/92
- *Direct Rebate Program* - Install energy-efficient equipment as pre-qualified by PG&E and receive a rebate per each item. End uses covered are lighting, space conditioning, controls, refrigeration, and efficient motors. The total rebate per customer is \$26,500. Offer ends 10/31/91.
- *Load Shift Program* - Projects such as thermal energy storage and load curtailment are under this program. The incentive (\$/kW) varies with the specific type and size of the equipment. PG&E is not presently accepting new participants in this program; furthermore, there are no funds available for this year.

5. PUC Climate - The California PUC is very supportive of energy conservation. The PUC has authorized a PG&E goal of 2500 MW of conservation by the year 2000. PG&E sees this 2500 MW as an integral part of the forecasted load growth of 3300 MW by 2000. The PUC sponsors the Collaborative Group to advise/direct PG&E in creating these programs for its ratepayers. PG&E expects the present conservation programs to be extended by the PUC.

6. ROR/Incentive for Conservation Investments - The charter from the PUC is that 15% of the net present avoided cost value of the kW/kWh saved go to the PG&E stockholders, and the remaining 85% will go the ratepayers in the form of avoided rate increases. To obtain the net benefit, the cost of operating the conservation programs is subtracted from the total value of the avoided cost savings. The conservation programs are funded from the rate base, either within the residential category or the non-residential category.

7. Method to determine incentive - For the VAFB case, John Chin calculated three screening values: total resource cost ratio, shareholder ratio, and a program cost (\$/kWh of savings). Input was the cost to PG&E, the demand reduction, and the energy reduction on an annual basis. His input values resulted in a marginal investment for their Customized Electric Program.

For the equipment rebates, the pre-determined values (such as \$20 for each LED EXIT sign) are agreed to by the Collaborative Group, thus may not totally reflect the value PG&E would have offered.

8. Lighting - The lighting is incandescent and fluorescent that was installed in the mid-1960s (some is older). A small amount of high-pressure sodium lighting is also used. No evidence of modern equipment such as T-8s, electronic ballasts, or reflectors was found. On a facility-wide basis, the major electric energy conservation retrofit for VAFB will be the lighting representing ~46% of the total electrical energy efficiency resource.

9. Contacts

-DOE	Louis Harris	(202) 586-9794
-VAFB	Ken Padilla	(805) 866-8538
-AFSPACECOM	Craig Miller	(719) 554-5376
-PNL	Ray Reilly	(509) 375-3741

10. Estimated Investment - The investment in energy efficiency at VAFB is estimated at between \$10 million and \$20 million. The minimum electrical energy savings is 45,000 MWh/yr (24%) and 4MW with an estimated cost reduction of \$2,500,000/yr. The minimum fossil fuel savings is 174,300 MMBtu/yr (27%) with an estimated energy savings \$400,000/yr.

Brief Sheet

GRIFFISS AIR FORCE BASE, NEW YORK Integrated Resource Assessment and Acquisition

1. Characteristics:

Major Command: Air Force Air Combat Command (ACC)

Electric Utility: Niagara Mohawk Power Corporation (NMPC)

Gas Utility: Niagara Mohawk Power Corporation (NMPC)

Steam Utility: Oneida County Department of Public Works

Full-time residents: 10,000-12,000

Commercial buildings: 394 with 5,950,000 ft²

Residential housing: 735 with 1,020,000 ft²

Total energy bill (FY90): \$8,620,000 for 1,250,000 MMBtu

Electric: \$5,400,000 for 85,000 MWh (demand @14MW)

Natural gas: \$ 600,000 for 111,000 MMBtu

Fuel oil (#2): \$ 120,000 for 214,000 gallons

Propane: Negligible

Purchased steam: \$1,400,000 for 170,000 MMBtu

Coal: \$1,100,000 for 650,000 MMBtu

Weather: Heating degree days - 5920
Cooling degree days - 454

2. Tasks

<u>Dates</u>	<u>Description</u>	<u>Output</u>
08/91 10/91	Site visits	Baseline/charact. data
07/91	Program Management Plan submitted to Griffiss AFB and ACC for concurrence	Program Plan
06/92	Baseline and Resource Assessment (Electric Assessment only)	Technical Report
09/92	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
Ongoing	Utility Partnership: coordinate interactions between utility and sites	Utility funding/ financing package and contract

3. Utilities - Niagara Mohawk Power Corporation: NMPC is an investor owned utility with headquarters in Syracuse NY. It serves the central Mohawk Valley (Syracuse to Albany), most of the northern/upstate region, and the far western and southwestern parts of NY state. This encompasses more than 24,000 square miles, and about 3.5 million people. NMPC has two separate business units for electricity and natural gas, but only have DSM incentive programs on the electric side. Fort Drum is the largest federal customer of NMPC, while Griffiss AFB is the second largest.

Niagara Mohawk is the second largest utility in NY State (second to Consolidated Edison), and is part of the NY State Power Pool which acts as a broker for surplus capacity throughout the state. Unlike most of the other utilities in NY, NMPC is a winter peaking utility, and has a capacity surplus at present that may extend well beyond the year 2000, based on the current economic growth forecasts. NMPC has had DSM programs for several years in the residential arena, but really did not aggressively pursue DSM until the PSC ordered them to implement a full-scale program in 1989. At the same time, the Public Service Commission (PSC) authorized new rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts.

4. DSM Program Description - NMPC has a wide variety of DSM programs at present, with a growing focus on the commercial/industrial (C/I) customers. These include C/I programs in lighting, HVAC, motors and adjustable speed drives, water heating, small commercial audits, and other custom incentives. A new program was proposed in the 1991-1992 DSM filing called the *Energy Alliance Pilot Program*. The goal of this program is to develop a mechanism (or mechanisms) which will allow NMPC to overcome the barriers to DSM implementation not addressed by standard rebate programs. By identifying and implementing alternative strategies employing energy service companies (ESCOs), NMPC can help overcome technical, financial, and institutional barriers and acquire significant portions of untapped energy and demand savings from C/I customers. Current NMPC programs were not designed (nor expected) to capture all of the economically viable energy efficiency opportunities in the C/I markets.

The general program approach for the energy alliance pilot is for NMPC to match ESCOs with participating customers based upon the needs of the customer and the expertise of the ESCO. The ESCO will perform a detailed energy analysis of the customers facility, estimating the costs and benefits of all feasible energy efficiency improvements. An attempt will be made to build upon previously existing audits and analysis whenever possible. NMPC will provide financial incentives consistent with their other DSM programs (up to 50%) with the remainder of project's cost to be born by the participant. Shared savings arrangements with the ESCOs may be proposed as a potential financing methodology. NMPC will coordinate all activities between the ESCOs and the C/I customers.

5. PSC Climate - The NY state PSC has been very pro-DSM, and ordered NMPC to implement full-scale DSM programs in 1989. Recently, it appears that the PSC is encouraging DSM activities that reduce energy usage, rather than demand reduction. This is primarily in response to forecasts of lower economic growth in NY that will reduce the need for additional capacity.

6. ROR/Incentive for Conservation Investments - The PSC has authorized rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts. NMPC has to demonstrate that the customers would not have implemented the energy conservation measures without the incentives provided by the utility. Recently, NMPC has become increasingly concerned about the rate impacts of their investments in DSM. Intervenor groups and large C/I customers that had implemented conservation measures prior to the DSM programs, are the cause of this concern.

7. Method to determine incentive - The utility has issued "standard" incentive/rebate programs for current and pilot program offerings, but is developing the *Energy Alliance Pilot Program* to customize incentives and overcome barriers to participation in DSM programs.

8. Lighting - Niagara Mohawk's lighting program for C/I customers includes: T-8 and T-12 electronic ballasts; screw-in and hard-wire fluorescent lamps; low watt fluorescent exit lights; high pressure sodium/metal halide fixtures; fluorescent reflectors; and occupancy sensors (wall or ceiling). Incentives range from \$0.40 for a 40-watt fluorescent lamp to \$60 for a high pressure sodium/metal halide fixture. Other high efficiency lighting products will be evaluated for rebates on a customized basis.

9. Contacts

-DOE	Louis Harris	(202)	586-9794
-Griffiss AFB	Dick Petkovsek	(315)	330-2273
-ACC	Wayne Hudson	(804)	764-3237
-PNL	Doug Dixon	(508)	376-5832
-Niagara Mohawk	Steve Molodetz	(315)	428-5776

10. Estimated Investment - The preliminary investment in electric energy efficiency at Griffiss AFB is estimated to be \$5 to \$8 million. The minimum electrical energy reduction is 22,000 MWh/yr (26%) and (3MW) with an estimated cost reduction of \$1,400,000/yr. Though not part of the project at this time, the minimum fossil fuel efficiency at Griffiss is 262,500 MMBtu/yr (27%) with an estimated cost reduction of \$851,000/yr.

Brief Sheet

ROBINS AIR FORCE BASE, GEORGIA Integrated Resource Assessment and Acquisition

1. Characteristics:

Major Command: Air Force Material Command (AFMC)

Electric Utility: Georgia Power
Flint Electric Membership Co-op (off-post housing)

Gas Utility: Atlanta Gas Light (AGL)
City of Warner-Robins
Access Energy Corporation

Full-time residents: 25,600
Commercial/Industrial buildings: 668 with 11,400,000 ft²
Residential housing: 822 with 1,800,000 ft²

Total energy bill (FY90): \$15,400,000 for 1,945,000 MMBtu
Electric: \$12,200,000 for 269,000 MWh (demand @ 49MW)
Natural gas: \$ 2,900,000 for 993,000 MMBtu
Fuel oil (#2): \$ 200,000 for 249,000 gallons
Propane: \$ 5,000 for 6,200 gallons

Weather: Heating degree days - 1739
Cooling degree days - 2472

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
12/91 01/92	Site visits	Baseline/charact. data
03/92	Prepare Program Management Plan to be submitted to Robins AFB and AFLC for concurrence	Program Plan
10/92	Baseline and Resource Assessment (Electric and Fossil-Fuel Assessments; Fuel Switching)	Technical Report
11/92	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
Ongoing	Utility Partnership: coordinate interactions between utility and sites	Utility funding/ financing package and contract

3. Utilities - Georgia Power: Georgia Power is a utility within The Southern Electric System with headquarters in Atlanta GA. There are approximately 12 large federal customers in its service territory, the largest being Fort Stewart in Hinesville GA. Robins is the 3rd largest industrial customer of Georgia Power. The utility forecasts adequate baseload resource but a deficit in capacity of over 1100 MW by 1995. Since 1977, the utility has offered demand side options, primarily in energy efficient residential construction. Only recently has Georgia Power begun to institute conservation pilot programs in the commercial and industrial customer base.

Georgia Power filed an Integrated Resource Plan (IRP) on January 10, 1992 in which new DSM programs were introduced for PSC approval. The estimated avoided cost for baseload is 2 cents/kWh and \$350/kW. Therefore, DSM program incentives are designed based on the avoided cost of capacity. The current maximum incentive is about 15% of the installed capital costs for a T-8 lighting system.

Georgia Power has organized a Department of Defense Energy Partnership Program (DEPP) to work with all of its federal customers. The purpose of the program is to develop DSM programs acceptable by the DoD and other federal agencies, and the schedule under which this development process would be conducted. PNL is working with Georgia Power and federal facilities to define the potential resources (energy and demand) and the type of programs attractive to their federal customers.

A key feature of the program is the development of a construct for the utility to up-front finance projects. A proposal for this construct has been prepared for federal review. It is designed to be an addendum to the current GSA Areawide Utilities contract currently in place at every federal installation in the state of Georgia.

Atlanta Gas Light/City of Warner Robins/Access Energy Corp. - The gas utilities have no DSM/incentive programs but Atlanta Gas Light has been requested by the Georgia Public Service Commission to file an IRP within the next year. Robins AFB is also a gas transporter.

4. DSM Program Description - The Georgia Power IRP filing included a mix of current pilot program and "new" program offerings. These are listed below.

- *Residential Good Cents and Super Good Cents Program:* This program involves new and existing homes and includes in-house energy audits, conservation "grants" and "Good Cents" energy efficiency certification. It provides cash incentives to encourage extensive energy efficiency including the installation of heat recovery units with electric water heaters and free water heater jackets.
- *High Efficiency Lighting Program:* Incentives are available either under a standard or "customized" approach. Under the standard approach a prescribed amount is paid for each unit installed, ranging from \$0.50 for a 40-watt fluorescent lamp to \$15 for a T-8 system. Under the "customized" program, the customer presents a lighting system plan to Georgia Power for review. If approved, the customer is paid \$150/kW reduction relative to the old system. The maximum incentive offered is

about 15% of the installed cost for a T-8 system. This is the largest incentive offered in any of the proposed DSM programs.

- *Interruptible Service Program/Standby Generation:* This involves the startup of process or backup generators at a site (minimum of 200 kW) to clip peak. This program is in conjunction with a modified rate structure providing load credit, energy credit and penalties. The incentive paid to the customer is \$10/kW/year
- *Motors Program:* This program encourages industrial customers to replace motors on failure with high-efficiency motors. A rebate schedule has been established for motors ranging from 1 to 200 hp. The rebate is approximately 10% of the cost of a new high-efficiency motor.
- *Air Conditioning Control Pilot:* This program provides an incentive to customers who allow the utility to control equipment at times of peak demand.
- *New Construction Program:* Georgia Power will pay for part of the incremental cost of technical assistance based on a building's size. The Company will also pay a portion of the incremental cost of each installed measure, relative to the cost of standard practices.
- *HVAC:* The utility pays a portion of the incremental installed cost of each measure. The incentive is determined as the smallest of the following: 1) a two-year payback; 2) 80% of the utility's avoided cost; or 3) 50% of the participants incremental cost.
- *Custom Programs:* The utility proposed a custom program for the C&I and residential sector (which will be applicable to federal facilities). These include HVAC, water heating and other "customized programs" that can be proposed by the customer. The utility pays a portion of the incremental installed cost of each measure. The incentive is determined as the smallest of the following: 1) a two-year simple payback; 2) 80% of the utility's avoided cost; or 3) 25% of the participants incremental cost.

5. PSC Climate - The Georgia PSC is an appointed body of regulators who are relatively new to the IRP/DSM process. The PSC has directed Georgia Power to acquire 1100 megawatts of conservation by 1995. The forecasted load growth is over 3000 MW by 1995. The PSC has yet to rule on Georgia Power's request to recover costs or earn a profit on the savings from DSM programs and will likely deal with this issue once they rule on the completeness of the IRP in July 1992 (see below). PNL has developed an interface with the PSC and presented material on the FEMP/ESMO model program. The PSC has also provided PNL with a list of the intervenors who are active in the state.

6. ROR/Incentive for Conservation Investments - The utility proposes to recover all DSM program costs on a dollar for dollar basis. The company also proposes to recover lost revenue resulting from implementation of the programs in the same manner as program costs. For load management-type programs (e.g. interruptible service programs), the company proposes to recover an additional 10% of the payments to participating customers. For conservation-type programs the company proposes to share with its customers the net benefits

that the DSM programs are expected to produce. The proposed mechanism would provide Georgia Power's customers 60% of the benefits, with the remaining 40% retained by the company. The estimated DSM program costs in CY 1991 is \$3.8MM

7. Method to determine incentive - The utility has issued "standard" incentive/rebate program for current and pilot program offerings, but is willing to develop custom programs with variable incentives depending upon type and size of program.

8. Lighting - Georgia Power's lighting program includes: T-8 system; energy-efficient tubular and compact fluorescent lamps; low watt fluorescent exit lights; electronic ballasts; reflectors or new fixtures with delamping; and occupancy sensors. Incentives range from \$0.50 for a 40-watt fluorescent lamp to \$15 for a T-8 system. Other systems will be evaluated on a case-by-case basis under the "customized" program. If approved, the customer is paid \$150/kW reduction relative to the old system. For new buildings, the incentive will be paid for systems that exceed a preestablished standard.

9. Other - Georgia Power has been working closely with the site to cut a contract to allow Georgia Power to site two combustion turbines at the installation. The benefit to the installation is that the utility will tie the CTs into the Robins grid and allow the installation to have first call on the power if other supplies fail. The contract negotiations/discussions are continuing.

10. Contacts

-DOE	Lou Harris (202) 586-9794
-Robins AFB	Gerry Doddington (912) 926-5472
-AFLC	Gary DeVeney (513) 257-4107
-PNL	Chip Larson (509) 375-6740
-Georgia Power	Ken Rosanski (404) 526-4668

11. Estimated Investment - The investment in energy efficiency at Robins AFB is estimated to be \$12 to 25 million. The minimum electrical energy savings is 55,500 MWh/yr (20%) and 11MW with an estimated cost reduction of \$2,300,000/yr. The minimum fossil fuel energy savings is 238,000 MMBtu/yr (24%) with an estimated cost reduction of \$696,000/yr.

Brief Sheet

KNOLLS ATOMIC POWER LABORATORY, NEW YORK Electric Energy Efficiency Resource Assessment

1. Characteristics:

Federal Agency: Department of Energy (DOE)

Electric Utility: Niagara Mohawk Power Corporation (NMPC)

Gas Utility: Niagara Mohawk Power Corporation (NMPC)

Commercial/Industrial buildings: 30 with 669,000 ft²
Residential housing: None

Total energy bill (FY90): \$2,477,000 for 512,000 MMBtu
Electric - buildings: \$ 700,000 for 12,000 MWh (demand @ W)
Electric - process: \$1,400,000 for 23,000 MWh (demand @MW)
Natural gas: Negligible
Fuel oil (#2): \$ 377,000 for 736,000 gallons
Propane: None

Weather: Heating degree days - 6887
Cooling degree days - 572

2. Tasks

<u>Dates</u>	<u>Description</u>	<u>Output</u>
08/91	Site visit	Baseline/charact. data
11/91	Program Management Plan submitted to KAPL staff for review and cont. funding	Program Plan
If funded	Baseline and Resource Assessment (Electric Assessment only)	Technical Report
If funded	Implementation Plan: a custom project implementation plan to install selected technologies. This plan form the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
If funded	Utility Partnership: coordinate interactions between utility and sites	Utility funding/ financing package and contract

3. Utilities - Niagara Mohawk Power Corporation: NMPC is an investor owned utility with headquarters in Syracuse NY. It serves the central Mohawk Valley (Syracuse to Albany), most of the northern/upstate region, and the far western and southwestern parts of NY state. This encompasses more than 24,000 square miles, and about 3.5 million people. NMPC has two separate business units for electricity and natural gas, but only have DSM incentive programs on the electric side. Fort Drum is the largest federal customer of NMPC, while Griffiss AFB is the second largest.

Niagara Mohawk is the second largest utility in NY State (second to Consolidated Edison), and is part of the NY State Power Pool which acts as a broker for surplus capacity throughout the state. Unlike most of the other utilities in NY, NMPC is a winter peaking utility, and has a capacity surplus at present that may extend well beyond the year 2000, based on the current economic growth forecasts. NMPC has had DSM programs for several years in the residential arena, but really did not aggressively pursue DSM until the PSC ordered them to implement a full-scale program in 1989. At the same time, the Public Service Commission (PSC) authorized new rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts.

4. DSM Program Description - NMPC has a wide variety of DSM programs at present, with a growing focus on the commercial/industrial (C/I) customers. These include C/I programs in lighting, HVAC, motors and adjustable speed drives, water heating, small commercial audits, and other custom incentives. A new program was proposed in the 1991-1992 DSM filing called the *Energy Alliance Pilot Program*. The goal of this program is to develop a mechanism (or mechanisms) which will allow NMPC to overcome the barriers to DSM implementation not addressed by standard rebate programs. By identifying and implementing alternative strategies employing energy service companies (ESCOs), NMPC can help overcome technical, financial, and institutional barriers and acquire significant portions of untapped energy and demand savings from C/I customers. Current NMPC programs were not designed (nor expected) to capture all of the economically viable energy efficiency opportunities in the C/I markets.

The general program approach for the energy alliance pilot is for NMPC to match ESCOs with participating customers based upon the needs of the customer and the expertise of the ESCO. The ESCO will perform a detailed energy analysis of the customers facility, estimating the costs and benefits of all feasible energy efficiency improvements. An attempt will be made to build upon previously existing audits and analysis whenever possible. NMPC will provide financial incentives consistent with their other DSM programs (up to 50%) with the remainder of project's cost to be born by the participant. Shared savings arrangements with the ESCOs may be proposed as a potential financing methodology. NMPC will coordinate all activities between the ESCOs and the C/I customers.

5. PSC Climate - The NY state PSC has been very pro-DSM, and ordered NMPC to implement full-scale DSM programs in 1989. Recently, it appears that the PSC is encouraging DSM activities that reduce energy usage, rather than demand reduction. This is primarily in response to forecasts of lower economic growth in NY that will reduce the need for additional capacity.

6. ROR/Incentive for Conservation Investments - The PSC has authorized rate regulation practices which allow electric utilities to recover conservation program costs and net revenue losses, and also to earn an incentive on successful DSM efforts. NMPC has to demonstrate that the customers would not have implemented the energy conservation measures without the incentives provided by the utility. Recently, NMPC has become increasingly concerned about the rate impacts of their investments in DSM. Intervenor groups and large C/I customers that had implemented conservation measures prior to the DSM programs, are the cause of this concern.

7. Method to determine incentive - The utility has issued "standard" incentive/rebate programs for current and pilot program offerings, but is developing the *Energy Alliance Pilot Program* to customize incentives and overcome barriers to participation in DSM programs.

8. Lighting - Niagara Mohawk's lighting program for C/I customers includes: T-8 and T-12 electronic ballasts; screw-in and hard-wire fluorescent lamps; low watt fluorescent exit lights; high pressure sodium/metal halide fixtures; fluorescent reflectors; and occupancy sensors (wall or ceiling). Incentives range from \$0.40 for a 40-watt fluorescent lamp to \$60 for a high pressure sodium/metal halide fixture. Other high efficiency lighting products will be evaluated for rebates on a customized basis.

9. Contacts

-DOE	Louis Harris (202) 586-9794
-KAPL	Chet Watson (518) 395-4360
-PNL	Doug Dixon (509) 376-5832
-Niagara Mohawk	Steve Molodetz (315) 428-5776

10. Estimated Investment - The preliminary investment in electric energy efficiency at KAPL is estimated to be \$1-2 million. The minimum electrical energy reduction in the buildings (non-process facilities) is 3,200 MWh/yr (27%) with an estimated cost reduction of \$200,000/yr.

Brief Sheet

HANFORD SITE, WASHINGTON Integrated Resource Planning and Acquisition

1. Characteristics:

Agency: Department of Energy (DOE)
Operator: Westinghouse Hanford Company (WHC)

Electric Utility: Bonneville Power Administration
City of Richland

Gas Utility: Cascade Natural Gas Company

Site work force: 16,000
Commercial/Industrial buildings: 1,200 with 8,100,000 ft²
Residential housing: None

Total energy bill (FY91):	\$13,500,000	for 3,000,000 MMBtu
Electric:	\$ 8,900,000	for 390,000 MWh (demand @ 64MW)
Natural gas:	\$ 105,000	for 24,500 MMBtu
Fuel oil (#2):	\$ 1,400,000	for 2,500,000 gallons
Coal:	\$ 3,000,000	for 51,200 short tons
Propane	\$ 6,725	for 11,980 gallons

Weather: Heating degree days - 4700
Cooling degree days - 1300

2. Tasks:

<u>Dates</u>	<u>Description</u>	<u>Output</u>
04/92- 05/92	Site visit and inspection	Baseline/charact. data
06/92	Prepare Program Management Plan to be submitted to DOE and WHC for concurrence and continued funding	Program Management Plan
22 Months after funding	Baseline and Resource Assessment (Electric and Fossil-Fuel Assessments; Fuel Switching)	Integrated Resource Assessment
24 Months after funding	Implementation Plan: a custom project implementation plan to install selected technologies. This plan forms the basis for negotiations with the utility to gain a workable funding/financing package	Implementation Plan
Ongoing	Utility Partnership: coordinate interactions the utility and the site	Utility funding/ financing package and contract

3. **Utility DSM Programs** - Bonneville offers a significant number of 'standard' DSM programs for residential, commercial and industrial customers. These include:

- **Residential Weatherization Program:** This program involves existing homes and includes a free energy audits, arranging for measure installation (primarily wall, ceiling, floor and water heater insulation, storm windows and a low-flow shower head), and a rebate averaging 75% of measure costs.
- **Energy Smart Design:** Energy Smart Design is a free service providing design assistance and energy efficiency recommendations for new commercial buildings and building shells of industrial facilities. Major remodeling and renovation projects are also eligible. The buildings may use any heat source and do not have to be all-electric. A *Building Design Assistance Report* is provided that contains written recommendations specifying cost-effective energy efficiency strategies. Strategies commonly recommended include high efficiency lighting technologies, additional roof and wall insulation, low-emissivity window glazing, heat recovery, high efficiency heat pumps and motors, and more efficient HVAC systems. Incentive payments (up to 75% of installed cost) are available depending upon the measure and savings.
- **Motors Rebate Program:** In this program, Bonneville will offer its customers a predetermined rebate for purchase and installation of specific highly efficiency electric motors and be reimbursed by Bonneville. Bonneville will pay rebates in an amount not to exceed a payment schedule or 20% of the purchase price of the motor whichever is less. The rebates range from \$160 for a 10 hp motor to \$2,250 for a 200 hp motor.
- **Energy Savings Plan (ESP):** This program is a set of incentives for Industrial Efficiency in new and existing buildings and processes. It includes 'proven' technologies with incentive payments based on verified energy savings. These technologies are applicable to all plant loads including process, lighting and HVAC. They include:
 - high-efficiency motors
 - adjustable speed drives
 - heat recovery equipment
 - thermal storage
 - insulation
 - process heat changes including fuel switching
 - compressed air systems
 - lighting
 - material handling
 - cooling tower conversion
 - refrigeration
 - energy management systems
- **Custom Programs:** Bonneville is willing to develop custom programs with their customers as long as they meet the cost-effectiveness criteria and are energy efficient. An example of this type of program is replacement

of transformers with high efficiency transformers and conservation voltage reduction to reduce line loss.

5. Regulatory Climate - Bonneville is a Federal Power Marketing Agency [PMA] and therefore is not regulated by any state regulatory agency. The U.S. Department of Energy and Congress provides oversight to Bonneville and therefore Bonneville must be in compliance with federal regulations and regulatory agencies. In addition, Bonneville is required to implement actions that are consistent with the electrical power plan developed for the region by the Northwest Power Planning Council (the Council).

The Council was created as a result of the Pacific Northwest Electric Power Planning and Conservation Act (the Act) - Public Law 96-501 - which authorized the Northwest states of Idaho, Montana, Oregon and Washington to enter into an interstate compact for the purpose of long-range planning and protection of some specific shared resources. The Act required the Council to develop and adopt both a 20-year electrical power plan for the region and a program to protect, mitigate and enhance the fish and wildlife affected by hydroelectric development in the Columbia River Basin.

The 1991 Northwest Conservation and Electric Power Plan calls for the region to purchase more than 1500 MW of energy savings and 800 MW of low-cost generation resources by the year 2000. Energy savings will come through an aggressive mix of conservation and demand-side management programs to be undertaken by Bonneville through the utilities that purchase power from Bonneville.

6. ROR/Incentive for Conservation Investments - Bonneville conservation programs are funded either through borrowing from the federal treasury or from income from power sales to member utilities and power sales and exchange with investor-owned utilities within the region or other utilities outside the region.

7. Lighting - Lighting incentives are available through the *Energy Savings Plan (ESP)* and Customized DSM programs. Up to 75% of the installed cost of selected lighting technologies is available as a rebate. The potential for lighting energy efficiency at Hanford is 13,000 MWh/year (2.2 MW) with a cost savings of \$316,000/year.

8. Contacts

-DOE/FEMP	Lou Harris (202) 586-9794
-WHC	Bob Brown (509) 376-2397
-DOE/RL	Bill White (509) 376-5767
-PNL	Graham Parker (509) 375-3805
-Bonneville Area Office	Tom Osborne (509) 522-6262
-Bonneville HQ	John Pyrch (503) 230-5483

9. Estimated Investment - The investment in energy efficiency at Hanford is estimated to be \$13 to 25 million. The minimum electrical energy savings is 53,000 MWh/yr (14%) and (7.5 MW) with an estimated cost reduction of \$1,230,000/yr. The minimum fossil fuel energy savings is 258,000 MMBtu/yr (15%) with an estimated cost reduction of \$730,000/yr.

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