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Methodology for Assessing The Impacts of Alternative Rate Designs on Industrial Energy Use

January 11, 1980

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1. INTRODUCTION

The "Public Utility Regulatory Policies Act of 1978" directs the Secretary of Energy to study gas utility rate design and, based on the study, to make recommendations to improve rate design and to encourage conservation of natural gas. The Economic Regulatory Agency, DOE, is charged with the responsibility to conduct this study. EEA was hired in a consulting capacity to provide analytical support and expertise to ERA. The first task undertaken in this support role was to develop a method for analyzing industrial user responses to alternative rate designs. The method described herein considers the fuel switching and conservation responses of industrial users and the impacts to a hypothetical utility regarding revenue stability, annual gas demand and seasonal fluctuations.

Twenty-seven hypothetical industrial plant types have been specified. For each combustor in the plant, the fuel consumption by season, initial fuel type, fuel switching costs, conservation costs and amount of fuel conservable is provided. The mix and number of the plants is variable to allow for the simulation of the industrial demand for different utilities. The decision-making takes place at the plant level and is aggregated to determine the impact to the utility.

Section 2 of this report is a discussion of the factors affecting an industrial user's response to alternative rate designs. Section 3 describes the methodology, including an overview of the model and an example industrial user's response to a set of fuel prices. The data describing the 27 hypothetical firms is included as an appendix.

2. FACTORS AFFECTING AN INDUSTRIAL USER'S RESPONSE TO ALTERNATIVE RATE DESIGNS

2.1 DECISION FRAMEWORK

A reasonably good analysis of many industrial energy issues can be accommodated by comparing the technologies available to satisfy the energy requirement. The comparison is made at the combustor level, competing the several technologies capable of providing a particular service, e.g., steam, direct heat, indirect heat, etc. Competition takes place on a least cost basis, given equipment, installation, fuel and O&M costs.

The decision to burn gas in one combustor is not independent of the decision to burn gas in another combustor, particularly if the plant faces a different price for different levels of consumption. Declining block rates and inverted block rates provide these price differentials for different levels of consumption. Therefore, to adequately analyze the issues of natural gas rate design, a modeling framework which takes the plant perspective is necessary. The model must consider whether other combustors are using or can use natural gas because the decision-maker will choose to use natural gas in the context of the cost to the entire plant.

The analytical framework outlined in this document will demonstrate a method to analyze industrial decision-making under alternative rate designs and natural gas prices. It is based on the concept that these decisions are made in light of the entire plant's fuel requirements and the alternative means of satisfying those requirements including conservation.

2.2 DECISION ISSUES

2.2.1 Fuel Switching

The fuel choice questions facing the plant manager are numerous and complex. Given a rate for natural gas he must determine whether to burn gas in his several combustors or switch to some alternate fuel in some or all of them. The value of burning natural gas is represented by the cost of burning the next cheapest alternative. This value is determined by the price of the alternate fuel, the capital, installation and operating and maintenance costs necessary to convert to and operate with the alternate fuel. The cost of fuel switching was obtained from EEA's "Industrial Fuel Choice Analysis Model". Both boilers and non-boilers are examined.

2.2.1.1 Boiler Fuel Switching

EEA examined the effect of retrofitting on the important components of the boiler: burner/stoker, heat exchanger tubes, refractories, soot-blowers, economizers, air blowers, and the fuel control system (valves, metering devices, return flow equipment). The extent of change required for each of the possible retrofit cases was estimated. The installed cost of new components considered necessary was estimated from costs provided by vendors. Estimates of retrofit costs were made using this information. This procedure was repeated for various boiler sizes being studied.

Every retrofit requires burners to be replaced or stokers to be installed. Heat exchanger tubes need to be replaced if the boiler is retrofitted to burn residual oil or coal. These tubes prevent ash accumulation on the ribbed tubes and increase the surface area exposed to combustion products. The amount of refractory brick replaced depends on the type of fuel the boiler is retrofitted for. The change is nominal when the boiler is retrofitted to burn gas or distillate oil.

However, retrofitting to coal requires extensive refractory change to prevent eutectic formations and significant deterioration of the refractory. A change to residual oil and coal requires installation of high-quality refractory.

Accumulated ash can reduce significantly heat transfer through tubes; ash deposition can be severe when burning residual oil and coal. Therefore, sootblowers, devices that use steam/air to dislodge ash accumulation, are installed when boilers are retrofitted to these two fuels. Typically, residual oil and coal require greater percentages of excess air for complete combustion. Therefore, additional air blower capacities also are installed for these fuels.

When considering the above retrofits, no site specific data on retrofit requirements were examined. We could, therefore be under- or over estimating retrofit costs. We also assume that boiler efficiency remains unaffected by retrofitting. For some boilers, this probably will not be the case. When retrofitting to residual oil from gas, there is a fundamental change in heat transfer mechanisms. The combustion of residual oil produces luminous flames which increase the radiation heat transfer in the radiation section of the boiler. The flue gases passing through the convection section and the superheating section of the boiler are, therefore, at a lower temperature. This lower flue gas temperature may pose a problem in some boilers, where the steam is superheated to high temperatures and pressures in the convection zone. A rearrangement, by installing superheating tubes in the radiation section, may be necessary.

Table 1 details the eight retrofit options for a 175 MMBtu/hr boiler. For a particular retrofit, the blanks in the boiler-related direct costs suggest that no change was considered necessary.

TABLE 1
RETROFIT COSTS OF A 175 MMBtu/HR BOILER (1975 \$)

Direct Costs (Boiler Related)	Conversions ^{a/}							
	G→D	G→R	G→C	D→R	D→C	R→C	D→G	R→G
Burners/Stokers	28,230	30,787	423,320	30,787	423,320	423,320	25,674	25,674
Heat exchanger tubes	-	181,800	181,800	181,800	181,800	-	-	-
Refractory	806	1,320	68,320	1,320	68,320	68,320	806	806
Sootblowers	-	49,145	49,145	49,145	49,145	-	-	-
Air blowers	-	15,077	15,077	15,077	15,077	-	-	-

^{a/} Conversion Key

G = Natural Gas
D = Distillate Fuel Oil
R = Residual Fuel Oil
C = Coal

Boiler O&M costs are assumed to be a function of size (firing rate), current boiler load factor, and fuel type. These O&M costs do not include O&M costs of fuel handling, ash handling, and pollution control systems. Boiler O&M costs are higher for large boilers than for small units and increase with the amount of time the boiler is operated. O&M costs have been classified into four categories: labor, supplies, maintenance materials, and general and administrative (G&A).

Labor costs include all employee costs related to an operation, including any part-time work and supervision. Supplies cover those costs related to items used in daily unit operations, such as water, chemicals, electricity, lubricants, and other supplies. Maintenance materials are items needed for replacing worn parts in a system during both planned and unexpected shutdowns. G&A expenses include direct costs such as management and overhead attributable to a system.

Labor costs vary directly with the size of the boiler and the number of shifts it is operated (independent of the firing rate during a shift). Determining typical labor requirements of a boiler is difficult because of many plant-specific factors. The mix of boiler sizes and fuel types at a steam plant makes assigning labor costs to a particular boiler difficult. Also separating labor requirements for a boiler from those for fuel handling and pollution control systems is difficult. Labor requirements for a coal-fired boiler are greater than those for a gas/oil-fired boiler because of more complex combustion mechanisms, larger furnace volumes, and flame stabilization problems. The total labor cost includes the salaries and benefits (30 percent of salary) of the operators, maintenance team, and supervisors.

The cost of supplies is variable, and includes the cost of water, feed-water treatment, power, and atomization steam (for residual oil only).

This cost is directly proportional to the size of the boiler and its load factor. The amount of make-up water added depends on the quantity and quality of the condensate returns and the blowdown losses. In our analysis, 90 percent of the water entering the boiler is from uncontaminated condensate returns and 10 percent is make-up water. The feedwater treatment costs are primarily the costs of chemicals and electricity. These costs vary directly with the quantity of water that flows through the softening system and inversely with the initial hardness of the water. To burn residual oil efficiently, steam atomization is required. Typically, two pounds of steam (250 psig/400⁰ F) are used to atomize one gallon of residual oil; in practice, the amount and pressure/temperature of the steam can vary significantly. The power requirements are greater for coal than for gas or oil. A significant portion of the power is expended in preparing the solid fuel for combustion in equipment such as pulverizers, FD fans, and stokers. Soot-blowers are used when the fuel fired is coal or residual oil.

The cost of maintenance materials is a function of fuel type because this cost varies according to the degree of corrosion/erosion produced by a fuel. The fuel types, in decreasing order of corrosiveness, are coal, residual oil, distillate oil, and gas. The fly ash produced when burning coal can adhere to the heat exchanging tubes and reduce heat transfer. This reduces the efficiency of the boiler and can cause localized overheating which may lead to tube rupture. Non-fouling, non-slagging coals, therefore, are preferred to help reduce maintenance costs of coal use. Ash problems also exist with residual fuel oil, but are much smaller in magnitude. In addition to varying with fuel type, the cost of maintenance materials also will vary indirectly with the boiler's size and load factor.

2.2.1.2 Non-boiler Fuel Switching

Because most non-boilers have been designed for specific conditions, are replaced very slowly, and have burned only one or two fuels, there are

no readily available equipment costs for most processes. For a few processes which are becoming obsolete (for example, open hearth and vertical shaft furnaces), no new capital costs were estimated. When possible, new capital costs were obtained from furnace equipment vendors and users. For example, direct vendor quotations were used for 50 and 200 MMBtu/hr regenerative glass melters, rotary cement kilns, and several direct-fired iron and steel industry furnaces. In the iron and steel industry, some furnace users were visited and others were contacted by phone to determine equipment costs. A petroleum industry consultant also was referred to in establishing petroleum industry costs. In a few cases when costs seemed unavailable, published data from cost estimating manuals were used to determine base costs.

Like new capital costs, retrofit capital costs strongly depend on the specific non-boiler conditions existing before retrofitting and on the fuel to be fired. Estimating retrofit costs is difficult because, in many cases, the process being considered never has been fired by other fuels, especially coal. It is not known, for example, whether firing residual oil in a regenerative glass melter will significantly reduce the length of its campaign. Although there is one coal-fired steel reheat furnace in England, it is unique, and there is no simple, reliable way to estimate the cost of retrofitting other reheat furnaces.

The first step in estimating non-boiler retrofit costs was to determine which fuels could not be burned in certain furnaces. A technical review of each process determined that retrofitting to a specific fuel was infeasible if burning that fuel would result in unacceptable heat distribution, furnace deterioration, or product quality degradation. If a process was considered infeasible with a certain fuel, that fuel is not considered in the fuel choice decision for that process.

For most processes, retrofitting is more a question of cost than technical feasibility. The cost of retrofitting non-boilers was estimated by determining, on the average, what changes must be made, and what their costs would be. The cost of retrofitting any specific process was calculated by summing the costs of replacing and adding specific equipment.

2.2.2 Conservation

An additional consideration is the use of conservation devices, that is air/fuel ratio controls, economizers and recuperators among others. Each of these will cut fuel consumption for some capital, installation and O&M cost. The decision to employ these devices will be determined on the basis of their profitability as determined by the differential in fuel savings versus capital and auxiliary costs. This can be determined with standard capital budgeting techniques, such as net-present value or internal rate of return. Conservation options demonstrating profitability will be adopted.

For example, consider a boiler which EEA recently examined. The unit consists of two 48 MMBtu/hr boilers venting to a common stack. Since the boilers are used on a shift operation, the capacity utilization is only about 23 percent. The current price of gas is a flat \$2.63/MMBtu.

It was found that the most efficient energy conservation option was to install an "economizer" on the common stack of the two boilers. An economizer is an air-to-liquid heat exchanger that extracts heat from the flue gas and preheats the boiler feedwater. By preheating the feedwater, the energy required to raise the water to a given temperature is reduced. In this particular installation, it was found that the installed cost of the economizer was about \$72,000 which would decrease

the fuel consumption by about four percent. Based on 2000 hours per year of operation, the installation of the economizer would reduce fuel consumption by about 7.680×10^9 Btus.

The method used in this model to evaluate the economic viability of a conservation device is to annualize the capital cost on a before tax \$/MMBtu basis. Assuming a 10 year life remaining on the boilers (and several other financial parameters) the annualized cost of the economizer is estimated to be \$12,240. Given the annual fuel savings of 7.680×10^9 Btus the cost on a million Btu basis is \$1.59. Since the price of natural gas exceeds the cost to conserve, then the user would choose to install the conservation device.

2.2.3 Firm Versus Interruptible Service

There are alternative service agreements the plant manager must choose from in the securing of natural gas supplies. Firm service ensures delivery to the industrial customer free from curtailment of supply (barring unusual circumstances). Interruptible service allows the natural gas distributor to cut the industrial customer's supply in the event of increased demand by other customers. These other customers are typically residential customers whose gas demands for space heating requirements rise rapidly during extremely cold periods. Firm service costs the customer a premium for the privilege of the ensured supply. The industrial customer sometimes has the option to choose how much of his demand is firm and how much is interruptible. As in fuel switching and conservation, this decision is based on the fuel savings versus the necessary capital and O&M charges necessary to secure the fuel switching capability for interrupted periods.

2.2.4 Seasonal Rates

If the firm faces seasonal rates, the decision to fuel switch becomes somewhat more complex. For instance, consider the interruptible service

decision. Given a high seasonal commodity charge and the capability to easily switch to the backup fuel, the industrial customer may choose to burn the backup fuel in the high price season, and natural gas in the low price season. In this case, the decision is based upon the differences in the fuel prices and whatever differences exist in the O&M cost for burning the backup fuel. No capital equipment or installation costs are incurred because the combustor is already fitted with the appropriate equipment given its interruptible status.

In the case of firm service combustors, the combustor would have to be fitted with all of the capital equipment necessary to burn the alternate fuel. If fuel switching were to take place for only the high price season, then the capital cost is spread over that portion of the year in which gas is at its higher price.

3. METHODOLOGY

3.1 INTRODUCTION TO THE MODEL

This example has been prepared to demonstrate the method used to model an individual industrial customer's response to alternative natural gas rate designs. The response options considered are fuel switching and conservation. The primary purpose of this section is to describe the model and the data necessary to reflect the decision-making process of a single industrial customer. The model contains 27 hypothetical plants. Each will be represented with data regarding the fuel type, annual consumption, fuel switching costs on a \$/MMBtu basis (this includes the cost of environmental controls when necessary), the cost of conservation, and the amount conserved, for each combustor in the plant.

This information is used, in conjunction with the relevant fuel prices to obtain the "value of using natural gas" for each combustor. Given a rate for natural gas, the model will determine fuel choice and conservation decisions for an industrial customer. By aggregating the decisions of the 27 plants in the model, the impacts of various rates can be analyzed for a hypothetical natural gas distributor.

The numbers provided in this example are for illustrative purposes only. The data used for calibrating the model are presented in the appendix. The figures contained in this section were chosen strictly for illustrative purposes.

3.2 THE BASIC MODEL

The first step in constructing the model was to specify hypothetical plants. EEA has data from several States which indicate, by plant, the

size and number of combustors, their fuel types and consumption levels and seasonal fluctuations. The data, which are organized by SIC, were used to determine the hypothetical plant profiles.

Twenty-seven profiles have been constructed to accommodate energy use patterns in three size categories for nine industries. To represent the total natural gas demand for a hypothetical utility, the relative contribution of each of the 27 plant profiles is required.

The mix of industrial customers is determined on a regional basis. The data is taken from EEA's updated Energy Consumption Data Base, which contains functional use data, by fuel type, by region. From this information, the demand for a typical natural gas distributor can be constructed by region.

3.2.1 Value of Burning Natural Gas

As was pointed out in Section 2, the value of burning natural gas is represented by the costs of switching to and operating with the next cheapest alternate fuel. It can be stated as an annualized price in dollars per million Btu. Figure 1 illustrates a hypothetical firm's natural gas consumption for four combustors and the value of using natural gas in each of those combustors. As the figure shows; gas is valued highest in combustor #1. This would be the case if the furnace required a clean burning fuel (i.e., distillate oil) to avoid product contamination or fouling of the furnace's refractory or burners. By comparison, the value of gas in the boilers is much lower, due to lower conversion and operating costs. Lower cost residual oil could be used to fire the boilers.

3.2.2 Fuel Switching

To analyze the fuel switching decision for a hypothetical plant, the natural gas rate to be evaluated is superimposed over the "value of

natural gas" for each combustor in Figure 1. If the price of gas exceeds the "value", as illustrated by the vertical dimension in the graphical representation of each combustor, then the combustor is switched to the next cheapest fuel. If the price does not exceed the value of natural gas in a given combustor, then it fires gas.

3.2.3 Conservation

In the model the decision to conserve is considered after the fuel choice has been made. The cost to conserve (the annualized capital cost of an economizer or recuperator) is compared to the benefits, represented by the dollar value of the fuel savings. If the cost to conserve is less than the benefit, the conservation device is installed.

3.3 THE DATA

Table 2 contains all of the information necessary to specify an individual industrial customer's value for natural gas by combustor, with the exception of the prices of alternate fuels. Similar data are provided for each of the 27 hypothetical plants in the Appendix. In this example there are three combustors. Combustors #1 and #3 already burn natural gas, #3 is on firm service, #1 is on interruptible service. Combustor #2 burns distillate, and does not presently have the capability to burn natural gas. The fuel switching premiums are given for each of the fuel switch options under consideration.

The capital costs and O&M costs used to calculate the fuel switch premiums are presented separately. They represent the before tax costs of switching to the alternate fuel, annualized on \$/MMBtu basis. To calculate the value of natural gas in a combustor which is currently using gas, the premiums are added to the price of the alternate fuel. If the combustor did not burn natural gas originally, the premium is

FIGURE 1
VALUE OF NATURAL GAS

F_n = Price of fuel in combustor n

P_n = Premium for gas over cheapest alternate fuel in combustor n

TABLE 2

Combustor	Fuel Type	Fuel Switch Premiums Capital Cost (Annualized Per MMBtu)					Fuel Switch Premiums O&M Costs (Annualized Per MMBtu)				
		G→D	G→R	G→C	D→G	D→R	G→D	G→R	G→C	D→G	D→R
1	G	.000	1.200	999.000	1.020*	1.560*	.431	.267	999.000	.162*	.184*
2	D	.000*	1.400*	999.000*	-.302	.420	.016*	.380*	999.000*	.000	.140
3	G	.335	.41	3.200	1.250*	1.420*	.012	.151	1.300	.230*	.420*

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	Gas Capable	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Annual Fuel Consumption (Btu's x 10 ⁹)	Energy Conservable (Btu's x 10 ⁹)	% Summer
1	I	N	1.35	11.107	.555	.41
2	N	N	2.20	9.380	.938	.42
3	F	N	2.50	63.000	9.45	.51

I = Interruptible

F = Firm

N = No

Y = Yes

* = Fuel choice is not currently applicable

G = Gas

D = Distillate Oil

R = Residual Oil

C = Coal

presented as the cost to switch to gas. In these cases the premiums will be presented in the cost matrix as negative numbers, so that all "premiums" are added to the alternate fuel prices.

The annual fuel consumption is given by combustor. The percentage consumed in each season is provided (for consideration of seasonal rates), as well as eligibility with respect to incremental pricing. To consider conservation, the installed cost of conservation equipment is presented on an annualized \$/MMBtu basis. The amount of natural gas conserved is also provided.

3.4 THE DECISION PROCESS

3.4.1 Introduction

In this section the data in Table 2 will be applied to illustrate the model's decision framework. The value of natural gas to a given combustor is a function of the prices of alternative fuels and the premiums as described previously. The premiums are based on constant real O&M and capital costs. It should be noted that the model will never switch fuels unless the alternate is cheaper at the time the decision is made (i.e., no anticipation of higher future prices). For each model run the premiums will be added to the alternate fuel prices and the least cost alternative will be chosen as the fuel switch option available for each combustor. The combustors will be sorted in descending order of the value of natural gas.

3.4.2 Value of Natural Gas

Table 3 shows the image file constructed with the data from Table 2 and the fuel prices, which are exogenous. The differences from Table 2

include the "value of natural gas" column, specification of the alternate fuel (the least cost alternative) and the calculation of winter gas consumption and total gas consumption.

To determine the value of natural gas in a combustor, the fuel switch premiums are added to the price of the fuel. For combustor #1 the figures for the two fuels are:

	capital cost	+	O&M	+	fuel price	=	value of natural gas
Distillate	\$.000	+	\$.431	+	\$4.40	=	4.831
Residual	1.200	+	.267	+	3.25	=	4.717

The cost of coal is considered to be infinite in this combustor because it is technically infeasible (product contamination, critical heat distribution requirements, etc.). The least cost fuel switch is designated the alternative. In this case it is residual oil. This routine is followed for each combustor.

Three fuel switch options are considered at a time for a single combustor. For example, in a natural gas fired combustor, only gas to distillate, residual, or coal fuel switch options should be considered. All other options are irrelevant.

In Tables 2 and 3 the irrelevant fuel switch premiums are indicated by an asterisk. For combustors burning a fuel other than natural gas originally, the premium for the primary fuel to gas switch is the cost of converting to natural gas. This premium is subtracted from the price of the primary fuel to represent the value of natural gas. The premiums in these cases are assigned negative values. Combustor #2 is an example of this situation. The premium for natural gas in the "Distillate

TABLE 3

Combustor	Fuel Type	Gas Capable	Fuel Switch Premium (Annualized CC/MMBtu)					Fuel Switch Premium (Annualized O&M/MMBtu)				
			G→D	G→R	G→C	D→G	D→R	G→D	G→R	G→C	D→G	D→R
1	G	I	.000	1.200	999.000	1.020*	1.560*	.431	.267	999.000	.162*	.184*
2	D	N	.000*	1.400*	999.000*	-.302	.420	.016*	.380*	999.000*	.000	.140
3	G	F	.335	.41	3.200	1.250*	1.420*	.012	.151	1.300	.230*	.420*

Combustor	Annual Fuel Consumption (Btu's x 10 ⁹)	% Summer	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)	Gas Conserved ⁹ (Btu's x 10 ⁹)
1	11.107	.41	N	1.35	.555	0.0
2	9.308	.42	N	2.20	.938	0.0
3	63.000	.51	N	2.50	9.450	0.0

Combustor	Winter Gas Consumption (Btu's x 10 ⁹)	Total Gas Consumption (Btu's x 10 ⁹)	Value of Natural Gas (\$/MMBtu)	Least Cost Full Time Alternate Fuel
1	6.553	11.107	4.717	Residual Oil
2	-	-	4.098	Natural Gas
3	30.870	63.000	3.811	Residual Oil

Combustor	Cost of Interruptible (Annualized \$/MMBtu)	Fuel Prices (\$/MMBtu)
1	.127	Distillate \$4.40
2	.106	Residual 3.25
3	.470	Coal 1.50
		Firm 2.75 (first 25 x 10 ⁹ Btu's), 4.00 thereafter
		Interruptible 2.30 (first 25 x 10 ⁹ Btu's), 3.55 thereafter

to Gas" column is a negative value. The negative premium is added to the price of distillate. The premium for natural gas in the "Distillate to Residual" column is a positive value because the "value of natural gas" is the cost to burn residual oil, which is the price of residual oil plus the cost to obtain residual firing capability.

3.4.3 Firm Versus Interruptible Service

The model determines if a combustor fires natural gas on interruptible service by comparing the costs and benefits of doing so. The costs are the capital and O&M charges necessary for securing backup fuel capability. The difference in price between firm and interruptible service represents the savings. This calculation is also performed for units that currently do not consume natural gas. It is calculated in order to determine which rate class would be chosen for the unit if converted to gas.

The cost of interruptible service is calculated by adding the capital costs necessary to obtain backup fuel firing capability to the adjusted sum of O&M and the difference between the price of the backup fuel and gas. The O&M and price differential are multiplied by the expected percentage of consumption for which the supply of natural gas will be interrupted. In this example, five percent interruption will be assumed. For combustor #1, which is already on interruptible service, with distillate as the backup fuel, there are no capital costs. The fuel price differential is \$4.40 (backup fuel) -\$2.30 (interruptible gas) = \$2.10. Adding the O&M charge of \$.43 leaves an unadjusted backup cost of \$2.53/MMBtu. Adjusted for the five percent rate of interruption (.05 x 2.53), the cost of interruptible service is \$.127/MMBtu (although residual fuel is less expensive on a full-time basis, it costs .05 [\$.267/ MMBtu + .95] + 1.20 = \$1.26/MMBtu as a backup fuel).

For combustor #2, the capital equipment for backup fuel capability already exists. Therefore backup costs are $.05 [\$0.016/\text{MMBtu} + \$2.10/\text{MMBtu}] = \$0.11/\text{MMBtu}$. In combustor #3 which currently has no backup fuel capability the backup costs are $\$.410/\text{MMBtu} + .05 [.151 + .95] = \$.47/\text{MMBtu}$.

As shown in Table 3, for this example the price differential between firm and interruptible service is $\$.45/\text{MMBtu}$. Therefore combustors #1 and #2 will choose interruptible service, because the savings exceed the cost. Combustor #3 will choose firm service because the costs are greater.

This approach assumes the differential in the price in the first block is equal the differential in the second block. It is not necessarily the case that the two differentials are equal. However, it is felt that this assumption will not effect the results significantly.

3.4.4 The Fuel Choice

With the appropriate natural gas rate service structure selected for each combustor, the next step is to determine which fuels will be chosen. The firm rate is applied to all combustors designated as firm service candidates. As indicated in the previous step, combustor #3 fits this description.

3.4.4.1 Firm Service Fuel Choice

Figure 2 illustrates how the cost of natural gas (within an inverted block rate) compares to the value of natural gas in this combustor. If the cost of using gas is less than its value, then the combustor will be fired with gas. Area A represents the consumer surplus, and Area B represents the consumer deficit. The consumer surplus is found by taking the difference between the value and the price of gas in this

FIGURE 2
FIRM SERVICE FUEL CHOICE

combustor and multiplying by the volume consumed at this price. In this case the differential is \$1.061/MMBtu and the volume is 25×10^9 Btus, which equals \$26,525. The deficit, calculated the same way, is $-.189/\text{MMBtus}$ multiplied by the remaining volume of 38×10^9 Btu's (the volume consumed in the second block), which equals $-\$7,182$. The comparison of these two shows a net surplus. Therefore, this combustor will fire natural gas. As indicated above, firm service will be chosen. Since this combustor fired natural gas with firm service in the original data file, no changes are necessary to the image file. For seasonal rates, the weighted average price is used in the fuel choice logic.

3.4.4.2 Interruptible Service Fuel Choice

The fuel choice for interruptible combustors is made identically to those for firm combustors. The interruptible rate is compared to the value of natural gas in each combustor. Since, as Figure 3 illustrates, the value of gas exceeds its price for both combustors, both will fire natural gas on interruptible service. The image file will be adjusted to reflect the change in the status of combustor #2. The fuel type, gas capable status, winter gas consumption and total gas consumption are all changed to reflect the move to interruptible natural gas. The "Gas to Alternate" fuel switch premiums become operational, and those representing the move from distillate are no longer operational. The "Distillate to Gas" capital cost premium is reduced to .000. The asterisks indicate non-operational (inactive) fuel switch premiums which are ignored unless the combustor's fuel is changed again. The values of natural gas for the several alternate fuels are:

	<u>Distillate</u>	<u>Residual</u>	<u>Coal</u>
Premium	.016	1.78	999.00
Fuel Price	<u>4.400</u>	<u>3.25</u>	<u> </u>
	4.416	5.03	999.00

FIGURE 3
INTERRUPTIBLE FUEL CHOICE

Since distillate oil is the least cost alternate fuel for combustor #2 it becomes the alternate and its conversion costs define the value of natural gas. These changes to the image file appear in Table 4.

It is important to note that because of the way the methodology is structured the percentage of curtailment for an interruptible customer is not relevant to the fuel choice after the firm-interruptible service decision has been made. The reason is that the methodology first determines if a user is better off using an alternate fuel on a full time basis. If gas is cheaper than an alternate fuel on a full time basis, then any amount of gas the user can receive will lower his cost. This, of course, ignores all non-economic issues.

3.4.5 Seasonal Rates

Figures 4 through 7 demonstrate how gas consumption is broken up for winter-summer quantities. If seasonal rates exist, they are applied in the same way as described previously. If the winter rates are sufficiently high, many interruptible combustors may be switched to the backup fuel. The cost to do so will not be much higher than the backup fuel price since these combustors already have the capability to burn a backup fuel. For firm service combustors the rise in the price of natural gas would have to be sufficient to overcome the costs of installing alternate fuel burning capability.

Calculating the "value of natural gas" under seasonal rate structures is somewhat more complex than without seasonal rates. It is important to note that the backup fuel on interruptible service is not necessarily the alternate fuel for the fuel switch decision. Combustor #2 illustrates this point. The backup fuel is distillate, but the alternate (for full time use) is residual. For this analysis it is assumed that

TABLE 4

Combustor	Fuel Type	Gas Capable	Fuel Switch Premium (Annualized CC/MMBtu)					Fuel Switch Premium (Annualized O&M/MMBtu)				
			G→D	G→R	G→C	D→G	D→R	G→D	G→R	G→C	D→G	D→R
1	G	I	.000	1.200	999.000	1.020*	1.560*	.431	.267	999.000	.162*	.184*
2	G	I	.000	1.400	999.000	.000	.420*	.016	.380	999.000	.000*	.140*
3	G	F	.335	.41	3.200	1.250*	1.420*	.012	.151	1.300	.230*	.420*

Combustor	Annual Fuel Consumption (Btu's x 10 ⁹)	% Summer	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)	Gas Conserved ⁹ (Btu's x 10 ⁹)
1	11.107	.41	N	1.35	.555	0.0
2	9.308	.42	N	2.20	.938	0.0
3	63.000	.51	N	2.50	9.450	0.0

Combustor	Winter Gas Consumption (Btu's x 10 ⁹)	Total Gas Consumption (Btu's x 10 ⁹)	Value of Natural Gas (\$/MMBtu)	Least Cost Full Time Alternate Fuel
1	6.553	11.107	4.717	Residual Oil
2	5.399	9.308	4.416	Distillate Oil
3	30.870	63.000	3.811	Residual Oil

Combustor	Cost of Interruptible (Annualized \$/MMBtu)	Fuel Prices (\$/MMBtu)
1	.127	Distillate \$4.40
2	.106	Residual 3.25
3	.470	Coal 1.50
		Firm 2.75 (first 25 x 10 ⁹ Btu's), 4.00 thereafter
		Interruptible 2.30 (first 25 x 10 ⁹ Btu's), 3.55 thereafter

FIGURE 4

WINTER FUEL CONSUMPTION AND VALUE OF GAS FOR FIRM COMBUSTOR

FIGURE 5

SUMMER FUEL CONSUMPTION AND VALUE OF GAS FOR FIRM COMBUSTOR

FIGURE 6

WINTER FUEL CONSUMPTION AND VALUE OF GAS FOR INTERRUPTIBLE COMBUSTORS

\$/MMBTU

FIGURE 7

SUMMER FUEL CONSUMPTION AND VALUE OF GAS FOR INTERRUPTIBLE COMBUSTORS

seasonal interruptible combustors would switch to the backup fuel if the price of gas were too high, since only O&M costs are incurred. The backup fuel is used to calculate the value of natural gas for interruptible combustors under seasonal rates. Firm combustors have no backup fuel, and therefore the alternate fuel is used to define the value of natural gas. This is illustrated below for the example case.

Interruptible:

<u>Combustor</u>	<u>Season</u>	<u>O&M (\$/MMBtu)</u>		<u>Backup Fuel Price (\$/MMBtu)</u>		<u>Value of Gas (\$/MMBtu)</u>
#1	Summer	.431	+	4.40	=	4.831
#1	Winter	.431	+	4.40	=	4.831
#2	Summer	.016	+	4.40	=	4.416
#2	Winter	.016	+	4.40	=	4.416

Firm:

<u>Combustor</u>	<u>Season</u>	<u>Total Premium (\$/MMBtu)</u>		<u>Total Fuel as a % of Seasonal</u>		<u>Price of Fuel (\$/MMBtu)</u>		<u>Value of Gas (\$/MMBtu)</u>
#3	Summer	.561	x	1.96	+	3.25	=	4.35
#3	Winter	.561	x	2.04	+	3.25	=	4.39

To determine if a firm user will switch fuels for the winter season only, the fuel switch premium must be adjusted so that the capital costs are spread over a small number of Btus. This is done by multiplying the premium times the ratios of annual consumption to winter consumption.

Figure 4 shows the fuel consumption and the value of gas for the firm combustor under winter rates. The fuel consumption is 51 percent of the total annual fuel consumption and the value of natural gas is calculated as discussed above at \$4.39/MMBtu. The summer consumption is valued at \$4.35/MMBtu, as illustrated in Figure 5. Winter interruptible consumption is represented in Figure 6. The winter value of natural gas

is \$4.83/MMBtu and 4.42/MMBtu for combustors #1 and #2 respectively. The same values of natural gas apply to the summer consumption, illustrated in Figure 7.

If the gas consumption changes in response to seasonal rates, adjustments will be made to the image file. The gas consumption for the appropriate combustor will be changed to reflect the lower quantity consumed. For example, if the price of natural gas were \$4.50/MMBtu for interruptible combustors during the winter season, then combustor #2 would switch to the backup fuel (distillate) during the winter season.

Table 5 summarizes the changes to be made to the image file. The winter consumption for combustor #2 drops to zero. This change in natural gas usage is also shown in the Total Gas Consumption column.

3.4.6 Conservation

To determine whether the plant will install conservation devices (economizers and recuperators) on its combustors, a comparison is made of the annualized before tax cost of the conservation device to the price of the fuel. As Table 5 shows, the cost to conserve in combustor #1 is \$1.35/MMBtu's saved. Since the cost is lower than the price of natural gas used in this combustor (\$2.30/MMBtu), the conservation device will be installed. It is important to compare the cost of the device against the price of the last increment of fuel purchased for the combustor. The last $.555 \text{ Btu's} \times 10^9$ in combustor #1 are consumed at the \$2.30 price of gas. The last $9.45 \text{ Btu} \times 10^9$ in combustor #3 are consumed at the \$4.00 price.

If a combustor switches to an alternate fuel in response to seasonal rates, then the decision becomes more complex. The fuel price used in the conservation decision should be a weighted average of the two

TABLE 5

Combustor	Fuel Type	Gas Capable	Fuel Switch Premium (Annualized CC/MMBtu)					Fuel Switch Premium (Annualized O&M/MMBtu)				
			G→D	G→R	G→C	D→G	D→R	G→D	G→R	G→C	D→G	D→R
1	G	I	.000	1.200	999.000	1.020	1.560	.431	.267	999.000	.162	.184
2	G	I	.000	1.400	999.000	.000	.420	.016	.380	999.000	.000	.140
3	G	F	.335	.41	3.200	1.250	1.420	.012	.151	1.300	.230	.420

Combustor	Annual Fuel Consumption (Btu's x 10 ⁹)	% Summer	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)	Gas Conserved ⁹ (Btu's x 10 ⁹)
1	11.107	.41	N	1.35	.555	0.0
2	9.308	.42	N	2.20	.938	0.0
3	63.000	.51	N	2.50	9.450	0.0

Combustor	Winter Gas Consumption (Btu's x 10 ⁹)	Total Gas Consumption (Btu's x 10 ⁹)	Value of Natural Gas (\$/MMBtu)		Least Cost Full Time Alternate Fuel
			Winter	Summer	
1	6.553	11.107	4.83	4.83	Residual Oil
2	0.0	3.909	4.42	4.42	Distillate Oil
3	30.870	63.000	4.39	4.35	Residual Oil

Combustor	Cost of Interruptible (Annualized \$/MMBtu)	Fuel Prices (\$/MMBtu)	
1	.127	Distillate	\$4.40
2	.106	Residual	3.25
3	.470	Coal	1.50
		Firm	2.75 (first 25 x 10 ⁹ Btu's), 4.00 thereafter
		Interruptible	2.30 (first 25 x 10 ⁹ Btu's), 3.55 thereafter

fuels. If combustor #2 is switched during the winter months, then the appropriate fuel price for conservation becomes:

$$(\% \text{ gas consumed}) \times (\text{price of gas}) + (\% \text{ alternate consumed}) (\text{price of alternat}$$

$$.42(2.20) + .58(4.40) = \$3.30$$

Given the costs and prices set forth in Table 6, all three combustors are fitted with conservation devices.

TABLE 6
COSTS VERSUS SAVINGS OF CONSERVATION

<u>Cost to Conserve</u> <u>\$/MMBtu Saved</u>	<u>Price of Fuel</u> <u>\$/MMBtu</u>	<u>Decision</u>
\$1.35	\$2.30	Conserve
2.20	3.30	Conserve
2.50	4.00	Conserve

Table 7 shows the changes to the image file. The annual fuel consumption, winter gas consumption and total gas consumption are all reduced by the amount indicated in the "Natural Gas Conservable" column. The "Conservable" column is changed to contain only zeros, preventing the one time opportunity from incorrectly occurring a second time. The Conservation Cost column is given very high values for the same reason.

The plant decision process is now complete for the year in question. To obtain utility wide gas consumption the number of firms with these characteristics (this size and SIC code) is multiplied by the gas consumption figure for the hypothetical plant. This is added to the

total gas consumption for the other 26 hypothetical plant types to be represented in the model. Revenues can be calculated by multiplying the appropriate price times the gas consumed in each block and class of service.

3.4.7 Iterations

If this is not the last year of analysis for this model run, then the fuel switch premiums are increased to account for inflation. The elements in the vector describing the utility also have growth rates applied to them, reflecting the growth in industrial activity over time. For the next year, the process is followed in the same way.

To properly represent the difference in new and retrofit installations, growth in the utility's industrial demand will have to be separated from existing facilities. For all new plants the premiums and costs to conserve will reflect the costs for new installations, rather than retrofitting existing installations. These costs are also provided in the data in the appendix.

TABLE 7

Combustor	Fuel Type	Gas Capable	Fuel Switch Premium (Annualized CC/MMBtu)					Fuel Switch Premium (Annualized O&M/MMBtu)				
			G→D	G→R	G→C	D→G	D→R	G→D	G→R	G→C	D→G	D→R
1	G	I	.000	1.200	999.000	1.020	1.560	.431	.267	999.000	.162	.184
2	G	I	.000	1.400	999.000	.000	.420	.016	.380	999.000	.000	.140
3	G	F	.335	.41	3.200	1.250	1.420	.012	.151	1.300	.230	.420

Combustor	Annual Fuel Consumption (Btu's x 10 ⁹)	% Summer	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)	Gas Conserved ⁹ (Btu's x 10 ⁹)
1	10.552	.41	N	999.000	0.0	.555
2	8.370	.42	N	999.000	0.0	.394
3	53.550	.51	N	999.000	0.0	9.450

Combustor	Winter Gas Consumption (Btu's x 10 ⁹)	Total Gas Consumption (Btu's x 10 ⁹)	Value of Natural Gas (\$/MMBtu)	Least Cost Full Time Alternate Fuel
1	6.226	10.552	4.717	Residual Oil
2	0.0	3.515	4.416	Distillate Oil
3	26.240	53.550	3.811	Residual Oil

Fuel Prices (\$/MMBtu)

Distillate	\$4.40
Residual	3.25
Coal	1.50
Firm	2.75 (first 25 x 10 ⁹ Btu's), 4.00 thereafter
Interruptible	2.30 (first 25 x 10 ⁹ Btu's), 3.55 thereafter

APPENDIX A

APPENDIX A

The data representing the 27 hypothetical industrial plants are listed in this appendix. The mix of combustors, their fuel type, firing rates and capacity utilization were determined from point source data files in the State Implementation Plans (SIP) for the States of Wisconsin and Michigan. These SIP files provide detailed fuel consumption information for each combustor in every industrial plant in these two States. For industries that were not well represented in Wisconsin and Michigan (e.g., petroleum refining and aluminum) a variety of alternate sources were used to construct the plant profiles.

Fuel choice costs (both new and retrofit) were taken from EEA's Industrial Fuel Choice Analysis Model (IFCAM). Retrofit costs were based on several technical feasibility studies undertaken at EEA and equipment cost quotes from vendors. The technical studies determined what equipment is necessary to retrofit an existing combustor to burn an alternate fuel. With the individual components identified, equipment and installation costs were acquired from the vendors. Fuel choice costs for new combustors are relatively easy to determine since the technical constraints of retrofit are not at issue. These new combustor fuel choice costs came primarily from vendors.

The conservation costs and fuel savings were based on a study by EEA for the Environmental Protection Agency's Industrial Environment Research Lab in Cincinnati, Ohio. Volume I of this work "Industrial Energy Conservation and the Attainment and Maintenance of Ambient Air Quality", is an extensive review of the installed cost and fuel savings of energy conservation equipment in a large variety of industrial boilers and furnaces. Based on the methodologies and data developed in this study,

conservation costs (including installation) and the resulting fuel savings were assigned to each combustor in which conservation is technically feasible.

The size determination of each hypothetical plant was determined by data from the Census of Manufactures. The same census data were used to determine the mix of plants for the five regions under study. All costs in the profiles are given in 1975 dollars.

SIC 20 (FOOD)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁶)
						1	2	3	4			
1	1	1	G	Y	10	15	25	30	50	N	1.94	.75
2	1	1	G-D	Y	15	15	25	30	50	N	1.25	1.13

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	5.99	.00	18.03	3.99
2	.00	.22	3.99	.00	.22	5.99	.00	18.03	3.99

OGM COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36

SIC 20 (FOOD)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁶)
						1	2	3	4			
1	1	1	G-D	Y	35	15	25	30	30	N	.92	2.59
2	1	2	G	Y	35	15	25	30	20	N	.67	2.20
3	1	5	G	Y	66	15	25	30	30	N	.69	1.31

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.00	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.05	.13	2.23	.00	.13	2.23	.00	18.03	2.23
3	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	.69	.76	1.46	-.31	.76	1.46	-.31	98.00	1.46
3	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00

SIC 20 (FOOD)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost, \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G	Y	25	15	25	30	30	N	.98	1.58
2	2	1	G-D	Y	115	15	25	30	30	Y	.66	5.87
3	3	3	G-R	Y	218	15	25	30	30	Y	.23	21.24
4	1	5	D	N	66	15	25	30	30	N	.69	1.31
5	1	5	G	Y	66	15	25	30	30	N	.69	1.31

ANNUALIZED FUEL SWITCH PREMIUMS

CAPITAL COSTS (\$/MMBtu)									
Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.00	.35	2.26	.00	.35	2.26	-.04	18.03	2.26
3	.05	.00	.90	-.01	.15	.90	.00	18.03	.90
4	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06
5	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06

O&M COSTS (\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	.60	.66	1.36	-.33	.66	1.36	-.33	98.00	1.36
3	.27	.31	.60	-.18	.31	.60	-.18	98.00	.60
4	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00
5	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00

SIC 22 (TEXTILES)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	1	2	G	Y	35	25	25	25	25	N	.60	2.66
2	1	5	G	Y	66	25	25	25	25	N	.69	1.31

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.13	2.23	.00	.13	2.23	.00	18.03	2.23
2	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.69	.76	1.46	-.31	.76	1.46	-.31	98.00	1.46
2	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00

SIC 22 (TEXTILES)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G	Y	5	25	25	25	25	N	3.66	.36
2	1	1	G	Y	15	25	25	25	25	N	1.41	1.10
3	1	2	G-R	Y	50	25	25	25	25	N	.58	3.85
4	1	5	G	Y	66	25	25	25	25	N	.69	1.31
5	1	1	G	Y	15	25	25	25	25	N	1.41	1.10

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
3	.05	.00	2.23	.00	.13	2.23	.00	18.03	2.23
4	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06
5	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36
2	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36
3	.69	.76	1.46	-.31	.76	1.45	-.31	98.00	1.46
4	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00
5	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36

SIC 22 (TEXTILES)

SIZE: LARGE

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Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	D	N	5	25	25	25	25	N	3.68	.37
2	1	1	R	N	10	25	25	25	25	N	1.86	.76
3	1	1	G-D	Y	20	25	25	25	25	N	.98	1.53
4	1	3	G-D	Y	48	25	25	25	25	N	.43	3.65
5	1	5	G	Y	66	25	25	25	25	N	.69	1.31
6	1	5	G	Y	66	25	25	25	25	N	.69	1.31
7	1	5	G	Y	66	25	25	25	25	N	.69	1.31
8	1	3	G-D	Y	48	25	25	25	25	N	.43	3.65
9	1	3	G-D	Y	48	25	25	25	25	N	.43	3.65

ANNUALIZED FUEL SWITCH PREMIUMS

CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
3	.00	.22	3.99	.00	.22	3.99	.00	18.03	3.99
4	.00	.11	1.83	.00	.11	1.83	.00	18.03	1.83
5	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06
6	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06
7	18.03	18.03	36.06	-.05	18.03	36.06	-.05	18.03	36.06
8	.00	.11	1.83	.00	.11	1.83	.00	18.03	1.83
9	.00	.11	1.83	.00	.11	1.83	.00	18.03	1.83

SIC 22 (TEXTILES) (Continued)
SIZE: LARGE

Combusitor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.21	2.35	-.48	98.00	2.36
2	1.16	1.24	2.36	-.48	1.21	2.35	-.48	98.00	2.36
3	1.16	1.24	2.36	-.48	1.21	2.35	-.48	98.00	2.36
4	.59	.65	1.26	-.27	.65	1.25	-.27	98.00	1.26
5	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00
6	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00
7	98.00	98.00	98.00	-.24	98.00	98.00	-.24	98.00	98.00
8	.59	.65	1.26	-.27	.65	1.25	-.27	98.00	1.26
9	.59	.65	1.26	-.27	.65	1.25	-.27	98.00	1.26

SIC 26 (PAPER)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G	Y	40	25	25	25	25	N	.61	4.08
2	2	3	G	Y	144	25	25	25	25	Y	.25	14.56
3	1	5	G	Y	66	25	25	25	25	N	.69	1.31

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.06	.17	1.08	-.02	.17	1.08	-.02	18.03	1.08
3	.10	.25	36.06	-.05	.25	36.06	-.05	18.03	36.06

OGM COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	.34	.38	.76	-.20	.38	.76	-.20	98.00	.76
3	.50	.56	98.00	-.24	.56	98.00	-.24	98.00	98.00

SIC 26 (PAPER)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁶)
						1	2	3	4			
1	2	1	G	N	70	25	25	25	25	N	.61	6.18
2	3	3	C	Y	336	25	25	25	25	Y	.24	39.83
3	4	2	G-R	Y	345	25	25	25	25	Y	.22	34.94
4	1	5	G	Y	66	25	25	25	25	N	.69	1.31

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.09	.00	2.26	-.04	.35	2.26	.00	18.03	2.26
2									
3	.05	.00	.95	-.01	.15	.95	.00	18.03	.95
4	.10	.25	36.06	-.05	.25	35.06	-.05	18.03	36.06

ORM COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.60	.66	1.36	-.33	.66	1.36	-.33	98.00	1.36
2									
3	.26	.29	.55	-.19	.29	.55	-.19	98.00	.55
4	.50	.56	98.00	-.24	.56	98.00	-.24	98.00	98.00

SIC 26 (PAPER)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	4	1	G-R	Y	315	25	25	25	25	Y	.29	31.73
2	4	3	G	Y	550	25	25	25	25	Y	.16	55.32
3	5	5	C	N	1300	25	25	25	25	Y	.14	153.07
4	4	3	R	N	550	25	25	25	25	Y	.16	55.32
5	1	5	G-R	Y	66	25	25	25	25	N	.69	1.31
6	1	5	G	Y	66	25	25	25	25	N	.69	1.31
7	4	1	G-R	Y	315	25	25	25	25	Y	.29	31.73
8	4	3	G	Y	550	25	25	25	25	Y	.16	55.32
9	5	5	G-R	Y	1300	25	25	25	25	Y	.10	130.50

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.00	1.64	-.23	.25	1.64	.00	18.03	1.64
2	.04	.13	.79	-.01	.13	.79	-.01	18.03	.79
3									
4	.04	.13	.79	-.01	.13	.79	-.01	18.03	.79
5	.10	.00	36.06	-.05	.25	36.06	.00	18.03	36.06
6	.10	.25	36.06	-.05	.25	36.06	-.05	18.03	36.06
7	.07	.00	1.64	-.23	.25	1.64	.00	18.03	1.64
8	.04	.13	.79	-.01	.13	.79	-.01	18.03	.79
9	.04	.00	.54	-.01	.09	.54	.00	18.03	.54

SIC 26 (PAPER) (Continued)
SIZE: LARGE

Combustor	O&M COSTS (\$/MMBtu)								
	G -- D	G -- R	G -- C	D -- G	D -- R	D -- C	R -- G	R -- D	R -- C
1	.38	.42	.82	-.27	.42	.82	-.27	98.00	.82
2	.23	.27	.49	-.17	.27	.49	-.17	98.00	.49
3									
4	.23	.27	.49	-.17	.27	.49	-.17	98.00	.49
5	.50	.56	98.00	-.24	.56	98.00	-.24	98.00	98.00
6	.50	.56	98.00	-.24	.56	98.00	-.24	98.00	98.00
7	.38	.42	.82	-.27	.42	.82	-.27	98.00	.82
8	.23	.27	.49	-.17	.27	.49	-.17	98.00	.49
9	.18	.21	.36	-.14	.21	.36	-.14	98.00	.36

50

SIC 28 (CHEMICALS)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ^g (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G	Y	21	26	27	23	24	N	.64	1.84
2	1	1	G	Y	6	26	27	23	24	N	.97	.52

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36
2	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36

SIC 28 (CHEMICALS)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁶)
						1	2	3	4			
1	1	1	G-R	Y	45	26	27	23	24	N	.45	3.92
2	2	1	G	Y	90	26	27	23	24	N	.56	7.88
3	2	4	G-D	Y	135	26	27	23	24	Y	.42	11.97
4	3	5	G	Y	470	26	27	23	24	Y	1.07	9.50

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.00	3.99	.00	.22	3.99	.00	18.03	3.99
2	.09	.35	2.26	-.04	.35	2.26	-.04	18.03	2.26
3	.00	.15	.93	.00	.15	.93	-.01	18.03	.93
4	.05	.22	36.06	-.02	.22	36.06	-.03	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.35	-.48	98.00	2.36
2	.60	.66	1.37	-.33	.66	1.37	-.33	98.00	1.37
3	.30	.34	.69	-.18	.34	.69	-.18	98.00	.69
4	.19	.22	98.00	-.13	.22	98.00	-.13	98.00	98.00

SIC 28 (CHEMICALS)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservability (Btu's x 10 ⁹)
						1	2	3	4			
1	3	4	C	N	221	26	27	23	24	Y	.31	16.30
2	3	1	G-D	Y	793	26	27	23	24	Y	.64	6.95
3	5	5	G-R	Y	974	26	27	23	24	Y	.14	73.50
4	3	5	G	Y	470	26	27	23	24	Y	1.07	9.50

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1									
2	.00	.29	1.86	.00	.29	1.86	-.03	18.03	1.86
3	.04	.00	.54	-.01	.09	.54	.00	18.03	.54
4	.05	.22	36.06	-.02	.22	36.06	-.03	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1									
2	.46	.50	1.03	-.30	.50	1.03	-.30	98.00	1.03
3	.18	.21	.36	-.14	.21	.36	-.14	98.00	.36
4	.19	.22	98.00	-.13	.22	98.00	-.13	98.00	98.00

SIC 29 (PETROLEUM)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	2	5	G	Y	200	10	25	50	15	Y	.20	17.6
2	1	5	G	Y	78	10	25	50	15	N	4.36	3.9
3	1	5	G	Y	78	10	25	50	15	N	4.36	3.9

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.13	.82	-.01	.13	.82	-.01	18.03	.82
2	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
3	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.28	.32	.63	-.17	.32	.63	-.17	98.00	.63
2	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
3	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00

SIC 29 (PETROLEUM)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
						1	2	3	4			
1	4	5	G	Y	865	25	25	25	25	Y	.11	76.40
2	5	5	G	Y	1337	25	25	25	25	Y	.10	118.00
3	6	5	G	Y	1650	25	25	25	25	Y	1.77	84.80
4	4	5	G	Y	778	25	25	25	25	Y	1.06	117.11
5	4	5	G	Y	778	25	25	25	25	Y	1.20	62.40
6	1	5	G	Y	78	25	25	25	25	N	2.72	6.30
7	4	5	G	Y	778	25	25	25	25	Y	1.20	62.40
8	4	5	G	Y	778	25	25	25	25	Y	1.20	62.40
9	4	5	G	Y	778	25	25	25	25	Y	1.20	62.40
10	4	5	G	Y	778	25	25	25	25	Y	1.20	62.40
11	4	5	G	Y	778	25	25	25	25	Y	1.22	101.50
12	4	5	G	Y	778	25	25	25	25	Y	1.22	101.50

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.04	.10	.59	-.01	.10	.59	-.01	18.03	.59
2	.04	.09	.54	-.01	.09	.54	-.01	18.03	.54
3	.04	.06	.33	-.01	.06	.33	-.02	18.03	.33
4	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
5	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
6	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
7	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
8	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
9	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
10	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
11	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
12	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06

SIC 29 (PETROLEUM) (Continued)
SIZE: MEDIUM

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.20	.23	.41	-.15	.23	.41	-.15	98.00	.41
2	.18	.21	.35	-.14	.21	.36	-.14	98.00	.36
3	.15	.18	.28	-.12	.18	.28	-.12	98.00	.28
4	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
5	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
6	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
7	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
8	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
9	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
10	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
11	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
12	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00

SIC 29 (PETROLEUM)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
						1	2	3	4			
1	5	5	R	N	1310	25	25	25	25	Y	.09	116.00
2	6	5	G	Y	1660	25	25	25	25	Y	.09	142.00
3	6	5	G	Y	1660	25	25	25	25	Y	.09	147.00
4	6	5	G	Y	1660	25	25	25	25	Y	.09	147.00
5	7	5	G	Y	2862	25	25	25	25	Y	1.71	143.50
6	6	5	G	Y	1690	25	25	25	25	Y	.97	254.26
7	6	5	G	Y	1690	25	25	25	25	Y	1.04	237.31
8	4	5	G	Y	778	25	25	25	25	Y	1.22	101.47
9	4	5	G	Y	778	25	25	25	25	Y	1.13	109.27
10	4	5	G	Y	778	25	25	25	25	Y	1.13	109.27
11	4	5	G	Y	778	25	25	25	25	Y	1.20	62.44
12	4	5	G	Y	778	25	25	25	25	Y	1.07	70.25
13	1	5	G	Y	79	25	25	25	25	N	2.42	7.09
14	1	5	G	Y	79	25	25	25	25	N	2.73	6.30
15	1	5	G	Y	79	25	25	25	25	N	2.73	6.30
16	4	5	G	Y	778	25	25	25	25	Y	1.93	39.02
17	4	5	G	Y	778	25	25	25	25	Y	1.93	39.02
18	1	5	G	Y	79	25	25	25	25	N	2.27	11.83
19	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
20	1	5	G	Y	79	25	25	25	25	N	3.11	5.52
21	1	5	G	Y	79	25	25	25	25	N	2.62	10.25
22	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
23	4	5	G	Y	778	25	25	25	25	Y	1.07	70.25
24	6	5	G	Y	1690	25	25	25	25	Y	1.15	33.90
25	6	5	G	Y	1690	25	25	25	25	Y	1.15	33.90
26	1	5	G	Y	79	25	25	25	25	N	3.78	7.09

SIC 29 (PETROLEUM) (Continued)
SIZE: LARGE

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

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Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.04	.39	.54	-.01	.09	.54	-.01	18.03	.54
2	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
3	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
4	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
5	.04	.05	.30	-.01	.05	.30	-.02	18.03	.30
6	.04	.26	36.06	-.01	.26	36.06	-.02	18.03	36.06
7	.04	.26	36.06	-.01	.26	36.06	-.02	18.03	36.06
8	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
9	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
10	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
11	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
12	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
13	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
14	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
15	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
16	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
17	.04	.07	.38	-.01	.07	.38	-.02	18.03	.38
18	.07	.29	36.06	-.03	.29	35.06	-.05	18.03	36.06
19	.07	.29	36.06	-.03	.29	35.06	-.05	18.03	36.06
20	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
21	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
22	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06
23	.04	.32	36.06	-.01	.32	36.06	-.02	18.03	36.06
24	.04	.26	36.06	-.01	.26	36.06	-.02	18.03	36.06
25	.04	.26	36.06	-.01	.26	36.06	-.02	18.03	36.06
26	.07	.29	36.06	-.03	.29	36.06	-.05	18.03	36.06

SIC 29 (PETROLEUM) (Continued)
SIZE: LARGE

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.18	.21	.36	-.14	.21	.36	-.14	98.00	.36
2	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
3	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
4	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
5	.14	.16	.25	-.11	.16	.25	-.11	98.00	.25
6	.15	.18	98.00	-.12	.18	98.00	-.12	98.00	98.00
7	.15	.18	98.00	-.12	.18	98.00	-.12	98.00	98.00
8	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
9	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
10	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
11	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
12	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
13	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
14	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
15	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
16	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
17	.18	.21	.35	-.13	.21	.35	-.13	98.00	.35
18	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
19	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
20	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
21	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
22	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00
23	.18	.21	98.00	-.13	.21	98.00	-.13	98.00	98.00
24	.15	.18	98.00	-.12	.18	98.00	-.12	98.00	98.00
25	.15	.18	98.00	-.12	.18	98.00	-.12	98.00	98.00
26	.41	.47	98.00	-.20	.47	98.00	-.20	98.00	98.00

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SIC 32 (SCG)
SIZE: SMALL

Combustor	FR	CH	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G-D	Y	11	20	27	2E	25	N	1.78	.82
2	1	5	G	Y	87	20	27	2E	25	N	*	*

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → F	D → C	R → G	R → D	R → C
1	.00	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.11	.20	1.43	-.06	.20	1.43	-.06	18.03	1.38

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	.42	.49	.90	-.22	.49	.90	-.22	98.00	.90

*Most combustors of this type use furnace exhausts to preheat product and would not be able to use additional conservation equipment.

SIC 32 (SCG)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁶)
						1	2	3	4			
1	1	3	G-R	Y	44	20	27	28	25	N	.48	3.32
2	3	5	G	Y	393	20	27	28	25	Y	1.36	51.25
3	1	5	D	N	78	20	27	28	25	N	2.62	10.20
4	1	5	G	Y	38	20	27	28	25	N	4.19	5.10

ANNUALIZED FUEL SWITCH PREMIUMS

Combustor	CAPITAL COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.00	1.83	.00	.11	1.83	.00	18.03	1.83
2	.04	.05	.43	-.01	.05	.43	-.01	18.03	.43
3	.08	.17	36.06	-.03	.17	36.06	-.03	18.03	36.06
4	18.03	18.03	36.06	-.24	18.03	36.06	-.24	18.03	36.06

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.59	.65	1.26	-.27	.65	1.26	-.27	98.00	1.26
2	.24	.28	.48	-.18	.28	.48	-.18	98.00	.48
3	.43	.48	98.00	-.21	.48	98.00	-.21	98.00	98.00
4	98.00	98.00	98.00	-.23	98.00	98.00	-.23	98.00	98.00

SIC 32 (SCG)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁶)
						1	2	3	4			
1	1	3	G	Y	61	20	27	28	25	N	.34	4.63
2	1	5	G-R	Y	78	20	27	28	25	N	5.45	3.20
3	7	5	C	Y	2618	20	27	28	25	Y	2.15	105.00
4	4	5	G	N	755	20	27	28	25	Y	2.41	30.30

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.11	1.83	.00	.11	1.83	.00	18.03	1.83
2	.08	.00	36.06	-.03	.17	36.06	.00	18.03	36.06
3									
4	.04	.04	.30	-.01	.04	.30	-.01	18.03	.30

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.59	.65	1.26	-.27	.65	1.26	-.27	98.00	1.26
2	.43	.48	98.00	-.21	.48	98.00	-.21	98.00	98.00
3									
4	.20	.23	.37	-.15	.23	.37	-.15	98.00	.37

SIC 3312 (STEEL)

SIZE: SMALL

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Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁶)
						1	2	3	4			
1	1	1	G-D	Y	5	25	25	25	25	N	1.40	.36
2	2	1	G	Y	70	25	25	25	25	N	.52	5.25
3	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81

ANNUALIZED FUEL SWITCH PREMIUMS

CAPITAL COSTS (\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.00	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.09	.35	2.26	-.04	.35	2.26	-.04	18.03	2.26
3	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47

O&M COSTS (\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	.60	.66	1.36	-.33	.66	1.36	-.33	98.00	1.36
3	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47

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[illegible]

SIC 3312 (STEEL) (Continued)
SIZE: MEDIUM

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.23	.27	.49	-.17	.27	.49	-.17	98.00	.49
2	.27	.30	.47	-.23	.30	.48	-.23	98.00	.47
3	.27	.30	.47	-.23	.30	.48	-.23	98.00	.47
4	.27	.30	.47	-.23	.30	.48	-.23	98.00	.47
5	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
6	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
7	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
8	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
9	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
10	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
11									

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SIC 3312 (STEEL)

SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ^g (Btu's x 10 ⁹)
						1	2	3	4			
1	4	5	C	N	629	25	25	25	25	Y	.20	46.54
2	7	4	G	Y	4202	25	25	25	25	Y	2.31	210.68
3	1	3	G	Y	4.8	25	25	25	25	N	245.29	.05
4	1	4	G	Y	28.4	25	25	25	25	N	24.53	.57
5	1	4	G	Y	28.4	25	25	25	25	N	24.53	.57
6	1	4	G	Y	28.4	25	25	25	25	Y	24.53	.57
7	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
8	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
9	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
10	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
11	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
12	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
13	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
14	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81
15	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81
16	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81
17	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81
18	1	3	G	Y	48	25	25	25	25	N	3.71	7.23
19	1	3	G	Y	48	25	25	25	25	N	3.71	7.23
20	1	3	G	Y	48	25	25	25	25	N	3.71	7.23
21	1	3	G	Y	48	25	25	25	25	N	3.71	7.23
22	1	3	G	Y	48	25	25	25	25	N	3.71	7.23
23	2	4	G	Y	227	25	25	25	25	Y	3.71	7.23
24	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
25	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
26	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
27	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
28	2	4	G	Y	227	25	25	25	25	Y	1.78	20.50
29	6	3	G	Y	961	25	25	25	25	Y	2.16	163.81
30	4	5	C	N	629	25	25	25	25	Y	.20	46.54
31	2	5	G	Y	200	25	25	25	25	Y	.20	17.60
32	3	3	G	Y	240	25	25	25	25	Y	.26	18.21

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SIC 3312 (STEEL) (Continued)
SIZE: LARGE

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1									
2	.06	.06	36.06	-.02	.06	36.06	-.02	18.03	36.06
3	.12	1.38	11.43	-.04	1.38	11.43	-.04	18.03	10.57
4	.05	.06	1.41	-.01	.06	1.41	-.01	18.03	1.41
5	.05	.06	1.41	-.01	.06	1.41	-.01	18.03	1.41
6	.05	.06	1.41	-.01	.06	1.41	-.01	18.03	1.41
7	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
8	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
9	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
10	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
11	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
12	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
13	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
14	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47
15	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47
16	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47
17	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47
18	.08	.24	1.99	-.02	.24	1.99	-.02	18.03	1.91
19	.08	.24	1.99	-.02	.24	1.99	-.02	18.03	1.91
20	.08	.24	1.99	-.02	.24	1.99	-.02	18.03	1.91
21	.08	.24	1.99	-.02	.24	1.99	-.02	18.03	1.91
22	.08	.24	1.99	-.02	.24	1.99	-.02	18.03	1.91
23	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
24	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
25	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
26	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
27	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
28	.05	.09	.70	-.01	.09	.70	-.01	18.03	.67
29	.05	.06	.49	-.01	.06	.49	-.01	18.03	.47
30									
31	.05	.13	.82	-.01	.13	.82	-.01	18.03	.82
32	.05	.15	.90	-.01	.15	.90	-.01	18.03	.90

SIC 3312 (STEEL) (Continued)
SIZE: LARGE

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1									
2	.14	.16	98.00	-.12	.16	98.00	-.12	98.00	98.00
3	6.41	5.44	6.05	-2.48	5.44	6.05	-2.48	98.00	6.05
4	.35	.39	.67	-.26	.39	.67	-.26	98.00	.67
5	.35	.39	.67	-.26	.39	.67	-.26	98.00	.67
6	.35	.39	.67	-.26	.39	.67	-.26	98.00	.67
7	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
8	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
9	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
10	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
11	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
12	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
13	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
14	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47
15	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47
16	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47
17	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47
18	.93	.99	1.66	-.59	.99	1.66	-.59	98.00	1.66
19	.93	.99	1.66	-.59	.99	1.66	-.59	98.00	1.66
20	.93	.99	1.66	-.59	.99	1.66	-.59	98.00	1.66
21	.93	.99	1.66	-.59	.99	1.66	-.59	98.00	1.66
22	.93	.99	1.66	-.59	.99	1.66	-.59	98.00	1.66
23	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
24	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
25	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
26	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
27	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
28	.48	.52	.81	-.38	.52	.81	-.38	98.00	.81
29	.27	.30	.47	-.23	.30	.47	-.23	98.00	.47
30									
31	.28	.32	.63	-.17	.32	.63	-.17	98.00	.63
32	.27	.31	.60	-.18	.31	.60	-.18	98.00	.60

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SIC 3334 (ALUMINUM)

SIZE: SMALL

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Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal 2 3 4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
1	1	5	G	Y	79	25	25 25 25	N	2.27	11.83
2	1	5	G	Y	39	25	25 25 25	N	4.43	3.15
3	4	5	G	Y	708	25	25 25 25	Y	.12	62.6

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.10	.82	-.01	.10	.82	-.01	18.03	.75
2	.04	.07	.52	-.01	.07	.52	-.01	18.03	.50
3	.04	.10	.59	-.01	.10	.59	-.01	18.03	.59

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.85	.89	1.81	-.73	.89	1.18	-.73	98.00	1.18
2	.27	.30	.52	-.19	.30	.52	-.19	98.00	.52
3	.20	.23	.41	-.15	.23	.41	-.15	98.00	.41

SIC 3334 (ALUMINUM)
SIZE: MEDIUM

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
						1	2	3	4			
1	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
2	1	5	G-D	Y	79	25	25	25	25	N	2.27	11.83
3	3	5	G	Y	79	25	25	25	25	N	1.25	47.30
4	1	5	G	Y	39	25	25	25	25	N	4.43	3.15
5	1	5	G	Y	160	25	25	25	25	Y	1.87	12.61
6	6	5	G	Y	1493	25	25	25	25	Y	.10	132.00
7	4	5	G-D	Y	865	25	25	25	25	Y	.11	76.40

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.10	1.05	-.03	.10	1.05	-.03	18.03	1.03
2	.00	.10	.82	.00	.10	.82	-.01	18.03	.75
3	.05	.15	.92	-.01	.15	.92	-.01	18.03	.87
4	.04	.07	.52	-.01	.07	.52	-.01	18.03	.50
5	.12	.30	2.31	-.05	.28	2.31	-.05	18.03	2.21
6	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
7	.04	.10	.59	-.01	.10	.59	-.01	18.03	.59

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.30	.33	.59	-.18	.33	.59	-.18	98.00	.59
2	.85	.89	1.18	-.73	.89	1.18	-.73	98.00	1.18
3	.46	.51	.87	-.24	.51	.87	-.24	98.00	.87
4	.27	.30	.52	-.19	.30	.52	-.19	98.00	.52
5	.65	.69	1.10	-.26	.69	1.10	-.26	98.00	1.10
6	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
7	.20	.23	.41	-.15	.23	.41	-.15	98.00	.41

SIC 3334 (ALUMINUM)
SIZE: LARGE

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₀ (Btu's x 10 ⁶)
						1	2	3	4			
1	1	5	G	Y	79	25	25	25	25	N	4.36	3.94
2	1	5	G	Y	160	25	25	25	25	Y	3.00	7.88
3	3	5	G-R	Y	310	25	25	25	25	Y	1.25	47.30
4	1	5	G	Y	79	25	25	25	25	N	1.25	47.30
5	1	5	G	Y	79	25	25	25	25	N	2.27	11.83
6	3	5	G	Y	310	25	25	25	25	Y	2.27	11.83
7	6	5	G	Y	1651	25	25	25	25	Y	.10	145.90
8	6	5	G	Y	1494	25	25	25	25	Y	.10	132.00
9	5	5	G	Y	1337	25	25	25	25	Y	.10	118.00
10	3	5	G	Y	310	25	25	25	25	Y	2.27	47.30
11	1	5	G	Y	39	25	25	25	25	N	4.43	3.15
12	1	5	G	Y	39	25	25	25	25	N	4.43	3.15
13	1	5	G	Y	160	25	25	25	25	Y	1.87	12.61
14	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
15	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
16	1	5	G	Y	79	25	25	25	25	N	2.72	6.30
17	1	5	G	Y	79	25	25	25	25	N	2.72	6.30

SIC 3334 (ALUMINUM) (Continued)
SIZE: LARGE

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.04	.04	.30	-.003	.04	.30	-.003	18.03	.30
2	.06	.15	1.22	-.02	.15	1.22	-.02	18.03	1.12
3	.05	.00	.92	-.01	.15	.92	-.00	18.03	.87
4	.05	.10	.82	-.01	.10	.82	-.01	18.03	.75
5	.05	.10	.82	-.01	.10	.82	-.01	18.03	.75
6	.05	.15	.92	-.01	.15	.92	-.01	18.03	.87
7	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
8	.04	.09	.50	-.01	.09	.50	-.01	18.03	.50
9	.04	.09	.54	-.01	.09	.54	-.01	18.03	.54
10	.05	.15	.92	-.01	.15	.92	-.01	18.03	.87
11	.04	.07	.52	-.01	.07	.52	-.01	18.03	.50
12	.04	.07	.52	-.01	.07	.52	-.01	18.03	.50
13	.12	.30	2.31	-.05	.28	2.31	-.05	18.03	2.21
14	.07	.10	1.05	-.03	.10	1.05	-.03	18.03	1.03
15	.07	.10	1.05	-.03	.10	1.05	-.03	18.03	1.03
16	.07	.10	1.05	-.03	.10	1.05	-.03	18.03	1.03
17	.07	.10	1.05	-.03	.10	1.05	-.03	18.03	1.03

SIC 3334 (ALUMINUM) (Continued)
SIZE: LARGE

Combustor	O&M COSTS (\$/MMBtu)								
	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.20	.23	.37	-.15	.23	.37	-.15	98.00	.37
2	1.23	1.29	1.67	-1.02	1.29	1.67	-1.02	98.00	1.67
3	.46	.51	.87	-.24	.51	.87	-.24	98.00	.87
4	.85	.89	1.18	-.73	.89	1.18	-.73	98.00	1.18
5	.85	.89	1.18	-.73	.89	1.18	-.73	98.00	1.18
6	.46	.51	.87	-.24	.51	.87	-.24	98.00	.87
7	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
8	.18	.20	.33	-.14	.20	.33	-.14	98.00	.33
9	.18	.21	.36	-.14	.21	.36	-.14	98.00	.36
10	.46	.51	.87	-.24	.51	.87	-.24	98.00	.87
11	.27	.30	.52	-.19	.30	.52	-.19	98.00	.52
12	.27	.30	.52	-.19	.30	.52	-.19	98.00	.52
13	.65	.69	1.10	-.26	.69	1.10	-.26	98.00	1.10
14	.30	.33	.59	-.18	.33	.59	-.18	98.00	.59
15	.30	.33	.59	-.18	.33	.59	-.18	98.00	.59
16	.30	.33	.59	-.18	.33	.59	-.18	98.00	.59
17	.30	.33	.59	-.18	.33	.59	-.18	98.00	.59

SIC 37 (TRANSPORTATION EQUIPMENT)
SIZE: SMALL

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservability (Btu's x 10 ⁹)
						1	2	3	4			
1	1	1	G	Y	19	28	27	21	24	N	1.11	1.42
2	1	1	G-D	Y	5	28	27	21	24	N	3.34	.38
3	1	3	G	Y	48	28	27	21	24	N	1.31	1.93

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.07	.22	3.99	.00	.22	3.99	.00	18.03	3.99
2	.00	.22	3.99	.00	.22	3.99	.00	18.03	3.99
3	.08	.24	36.06	-.02	.24	36.06	-.02	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
2	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
3	98.00	98.00	98.00	-.59	98.00	98.00	-.59	98.00	98.00

SIC 37 (TRANSPORTATION EQUIPMENT)

SIZE: MEDIUM

75

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
						1	2	3	4			
1	3	3	G	Y	240	28	27	21	24	Y	.26	18.21
2	2	1	G-D	Y	38	28	27	21	24	N	1.40	2.79
3	1	1	G-R	Y	7	28	27	21	24	N	.97	.52
4	1	3	G	Y	48	28	27	21	24	N	1.31	1.93

ANNUALIZED FUEL SWITCH PREMIUMS

CAPITAL COSTS

(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.05	.15	.90	-.01	.15	.90	-.01	18.03	.90
2	.00	.35	2.26	.00	.35	2.26	-.04	18.03	2.26
3	.07	.00	3.99	.00	.22	3.99	.00	18.03	3.99
4	.08	.24	36.06	-.02	.24	36.06	-.02	18.03	36.06

O&M COSTS

(\$/MMBtu)

Combustor	G → D	G → R	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.27	.31	.60	-.18	.31	.60	-.18	98.00	.60
2	.60	.66	1.37	-.33	.66	1.36	-.33	98.00	1.36
3	1.16	1.24	2.36	-.48	1.24	2.36	-.48	98.00	2.36
4	98.00	98.00	98.00	-.59	98.00	98.00	-.59	98.00	98.00

SIC 37 (TRANSPORTATION EQUIPMENT)

SIZE: LARGE

76

Combustor	FR	CU	Fuel Type	Gas Capable	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
						1	2	3	4			
1	5	1	G-D	Y	261	28	27	21	24	Y	.58	16.81
2	2	3	C	N	157	28	27	21	24	Y	.39	11.64
3	2	4	G-R	Y	170	28	27	21	24	Y	.26	12.89
4	2	1	G	Y	69	28	27	21	24	N	.76	5.11
5	1	3	G	Y	48	28	27	21	24	N	1.31	1.93

ANNUALIZED FUEL SWITCH PREMIUMS
CAPITAL COSTS
(\$/MMBtu)

Combustor	G → D	C → E	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.00	.23	1.49	.00	.23	1.49	-.02	18.03	1.49
2									
3	.05	.00	.93	-.01	.15	.93	.00	18.03	.93
4	.09	.35	2.60	-.04	.35	2.25	-.04	18.03	2.26
5	.08	.24	36.06	-.02	.24	36.06	-.02	18.03	36.06

O&M COSTS
(\$/MMBtu)

Combustor	G → D	C → E	G → C	D → G	D → R	D → C	R → G	R → D	R → C
1	.34	.37	.70	-.26	.37	.70	-.26	98.00	.70
2									
3	.30	.34	.69	-.18	.34	.69	-.18	98.00	.69
4	.60	.66	1.37	-.33	.66	1.37	-.33	98.00	1.37
5	98.00	98.00	98.00	-.59	98.00	98.00	-.59	98.00	98.00

NEW COMBUSTORS

SIC 20 (FOOD)
SIZE: SMALL

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁶)
1	1	1	10	15	25	30	30		N	1.36	.75
2	1	1	15	15	25	30	30		N	.87	1.13

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu)			C	G	Fuel Switch Premium (Annualized OEM/MMBtu)			C
		R	D				R	D		
1	.63	.79	.69	3.09		.48	1.24	1.16	2.36	
2	.63	.79	.69	3.09		.48	1.24	1.16	2.36	

SIC 20 (FOOD)

SIZE: MEDIUM

79

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	1	35	15	25	30	30		N	.64	2.59
2	1	2	35	15	25	30	30		N	.47	2.20
3	1	5	66	15	25	30	30		N	.17	1.31

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu)			C	G	Fuel Switch Premium (Annualized O&M/MMBtu)			C
		R	D				R	D		
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36		
2	.35	.45	.39	1.73	.31	.76	.69	1.46		
3	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00		

SIC 20 (FOOD)
SIZE: LARGE

03

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	1	25	15	25	30	30	N	.69	1.58
2	2	1	115	15	25	30	30	Y	.46	5.87
3	3	3	218	15	25	30	30	Y	.16	21.24
4	1	5	66	15	25	30	30	N	.17	1.31
5	1	5	66	15	25	30	30	N	.17	1.31

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.48	.61	.52	1.92	.33	.66	.60	1.36
3	.23	.29	.26	.79	.18	.31	.27	.60
4	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00
5	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00

SIC 22 (TEXTILES)
SIZE: SMALL

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal 2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁶)
1	1	2	35	25	25	25	25	N	2.07	2.66
2	1	5	66	25	25	25	25	N	.17	1.31

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu) R	D	C	G	Fuel Switch Premium (Annualized O&M/MMBtu) R	D	C
1	.35	.45	.39	1.72	.31	.76	.70	1.46
2	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00

SIC 22 (TEXTILES)
SIZE: MEDIUM

82

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁶)
				1	2	3	4			
1	1	1	5	25	25	25	25	N	2.56	.36
2	1	1	15	25	25	25	25	N	.99	1.10
3	1	2	50	25	25	25	25	N	.40	3.85
4	1	5	66	25	25	25	25	N	.17	1.31
5	1	1	15	25	25	25	25	N	.99	1.10

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.63	.79	.69	3.09	.48	1.24	1.16	2.36
3	.35	.45	.39	1.72	.31	.76	.70	1.46
4	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00
5	.63	.79	.69	3.09	.48	1.24	1.16	2.36

SIC 22 (TEXTILES)

SIZE: LARGE

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
				1	2	3	4			
1	1	1	5	25	25	25	25	N	2.58	.37
2	1	1	10	25	25	25	25	N	1.30	.76
3	1	1	20	25	25	25	25	N	.69	1.53
4	1	3	48	25	25	25	25	N	.30	3.65
5	1	5	66	25	25	25	25	N	.17	1.31
6	1	5	66	25	25	25	25	N	.17	1.31
7	1	5	66	25	25	25	25	N	.17	1.31
8	1	3	48	25	25	25	25	N	.30	3.65
9	1	3	48	25	25	25	25	N	.30	3.65

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.63	.79	.69	3.09	.48	1.24	1.16	2.36
3	.63	.79	.69	3.09	.48	1.24	1.16	2.36
4	.29	.37	.32	1.42	.27	.65	.59	1.26
5	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00
6	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00
7	.39	10.89	10.89	21.78	.24	98.00	98.00	98.00
8	.29	.37	.32	1.42	.27	.65	.59	1.26
9	.29	.37	.32	1.42	.27	.65	.59	1.26

SIC 26 (PAPER)
SIZE: SMALL

78

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable (Btu's x 10 ⁹)
1	1	1	40	25	25	25	25	25	.4	.42	4.08
2	2	3	144	25	25	25	25	25	.7	.25	14.56
3	1	5	66	25	25	25	25	25	.4	.17	1.31

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.22	.28	.24	.91	.20	.38	.34	.76
3	.39	.54	.42	21.78	.24	.56	.50	98.00

SIC 26 (PAPER)
SIZE: MEDIUM

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
1	2	1	70	25	25	25	25	N	.43	6.17
2	3	3	336	25	25	25	25	Y	.11	39.83
3	4	2	345	25	25	25	25	Y	.16	34.94
4	1	5	66	25	25	25	25	N	.17	1.31

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.48	.61	.52	1.92	.33	.66	.60	1.36
2	.23	.29	.26	.79	.18	.31	.27	.60
3	.30	.35	.32	.86	.19	.29	.26	.55
4	.39	.54	.42	21.78	.24	.56	.50	98.00

SIC 26 (PAPER)

SIZE: LARGE

98

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁶)
1	4	1	315	25	25	25	25	Y	.20	31.71
2	4	3	550	25	25	25	25	Y	.11	55.32
3	5	5	1300	25	25	25	25	Y	.07	130.50
4	4	3	550	25	25	25	25	Y	.11	55.32
5	1	5	66	25	25	25	25	N	.17	1.31
6	1	5	66	25	25	25	25	N	.17	1.31
7	4	1	315	25	25	25	25	Y	.20	31.71
8	4	3	550	25	25	25	25	Y	.11	55.32
9	5	5	1300	25	25	25	25	Y	.07	130.50

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.54	.62	.57	1.50	.27	.42	.38	.82
2	.25	.29	.27	.71	.17	.26	.23	.49
3	.18	.21	.20	.48	.14	.21	.18	.36
4	.25	.29	.27	.71	.17	.26	.23	.49
5	.39	.54	.42	21.78	.24	.56	.50	98.00
6	.39	.54	.42	21.78	.24	.56	.50	98.00
7	.54	.62	.57	1.50	.27	.42	.38	.82
8	.25	.29	.27	.71	.17	.26	.23	.49
9	.18	.21	.20	.48	.14	.21	.18	.36

SIC 28 (CHEMICALS)
SIZE: SMALL

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal		4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁹)
1	1	1	21	26	27	23	24	N	.45	1.84
2	1	1	6	26	27	23	24	N	.68	.52

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.63	.79	.69	3.09	.48	1.24	1.16	2.36

SIC 28 (CHEMICALS)
SIZE: MEDIUM

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	1	45	26	27	23	24	N	.31	3.92
2	2	1	90	26	27	23	24	N	.39	7.88
3	2	4	135	26	27	23	24	Y	.29	11.97
4	3	5	470	26	27	23	24	Y	.28	9.50

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.48	.61	.52	1.92	.33	.66	.60	1.36
3	.18	.24	.21	.78	.18	.34	.30	.69
4	.11	.14	.13	21.78	.13	.22	.19	98.00

SIC 28 (CHEMICALS)

SIZE: LARGE

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal 2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	3	4	221	26	27	23	24	Y	.17	19.40
2	3	1	793	26	27	23	24	Y	.45	6.95
3	5	5	974	26	27	23	24	Y	.10	73.50
4	3	5	470	26	27	23	24	Y	.28	9.50

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.20	.24	.22	.68	.17	.28	.24	.54
2	.51	.61	.54	1.65	.30	.50	.46	1.03
3	.18	.21	.20	.48	.14	.21	.18	.36
4	.11	.14	.13	21.78	.13	.22	.19	98.00

SIC 29 (PETROLEUM)
SIZE: SMALL

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ^g (Btu's x 10 ⁹)
1	2	5	200	10	25	50		15	Y	.14	17.60
2	1	5	78	10	25	50		15	N	1.09	3.94
3	1	5	78	10	25	50		15	N	1.09	3.94

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu)			C	G	Fuel Switch Premium (Annualized O&M/MMBtu)			C
		R	D				R	D		
1	.16	.21	.18		.69	.17	.32	.28		.63
2	.17	.22	.20		21.78	.20	.47	.41		98.00
3	.17	.22	.20		21.78	.20	.47	.41		98.00

SIC 29 (PETROLEUM)

SIZE: MEDIUM

16

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
				1	2	3	4			
1	4	5	865	25	25	25	25	Y	.08	76.40
2	5	5	1337	25	25	25	25	Y	.07	118.00
3	6	5	1690	25	25	25	25	Y	.44	84.75
4	4	5	778	25	25	25	25	Y	.40	46.83
5	4	5	778	25	25	25	25	Y	.40	46.83
6	1	5	78	25	25	25	25	M	.91	4.73
7	4	5	778	25	25	25	25	Y	.40	46.83
8	4	5	778	25	25	25	25	Y	.40	46.83
9	4	5	778	25	25	25	25	Y	.40	46.83
10	4	5	778	25	25	25	25	Y	.40	46.83
11	4	5	778	25	25	25	25	Y	.40	46.83
12	4	5	778	25	25	25	25	Y	.40	46.83

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.18	.22	.20	.53	.15	.23	.20	.41
2	.18	.22	.20	.53	.15	.23	.20	.41
3	.13	.16	.15	.22	.12	.18	.15	.28
4	.17	.21	.20	21.78	.13	.21	.18	98.00
5	.17	.21	.20	21.78	.13	.21	.18	98.00
6	.17	.24	.20	21.78	.20	.47	.41	98.00
7	.16	.21	.19	.25	.13	.21	.18	.35
8	.16	.21	.19	.25	.13	.21	.18	.35
9	.16	.21	.19	.25	.13	.21	.18	.35
10	.16	.21	.19	.25	.13	.21	.18	.35
11	.17	.21	.20	21.78	.13	.21	.18	98.00
12	.17	.21	.20	21.78	.13	.21	.18	98.00

SIC 29 (PETROLEUM)
SIZE: LARGE

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
					2	3	4			
1	5	S	1310	25	25	25	25	Y	.06	116.00
2	6	S	1660	25	25	25	25	Y	.06	147.00
3	6	S	1660	25	25	25	25	Y	.06	147.00
4	6	S	1660	25	25	25	25	Y	.06	147.00
5	7	S	2862	25	25	25	25	Y	.43	143.49
6	6	S	1690	25	25	25	25	Y	.43	143.49
7	6	S	1690	25	25	25	25	Y	.43	143.49
8	4	S	778	25	25	25	25	Y	.40	46.83
9	4	S	778	25	25	25	25	Y	.40	46.83
10	4	S	778	25	25	25	25	Y	.40	46.83
11	4	S	778	25	25	25	25	Y	.40	46.83
12	4	S	778	25	25	25	25	Y	.40	46.83
13	1	S	79	25	25	25	25	N	.91	4.73
14	1	S	79	25	25	25	25	N	.91	4.73
15	1	S	79	25	25	25	25	N	1.09	3.94
16	4	S	778	25	25	25	25	Y	.40	46.83
17	4	S	778	25	25	25	25	Y	.40	46.83
18	1	S	79	25	25	25	25	N	1.09	3.94
19	1	S	79	25	25	25	25	N	1.09	3.94
20	1	S	79	25	25	25	25	N	.91	4.73
21	1	S	79	25	25	25	25	N	.91	4.73
22	1	S	79	25	25	25	25	N	.91	4.73
23	4	S	778	25	25	25	25	Y	.40	46.83
24	6	S	1690	25	25	25	25	Y	.43	143.49
25	6	S	1690	25	25	25	25	Y	.43	143.49
26	1	S	79	25	25	25	25	N	1.09	3.94

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SIC 29 (PETROLEUM) (Continued)
SIZE: LARGE

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.18	.21	.20	.48	.14	.21	.18	.36
2	.19	.22	.21	.46	.14	.20	.18	.33
3	.19	.22	.21	.46	.14	.20	.18	.33
4	.19	.22	.21	.46	.14	.20	.18	.33
5	.11	.14	.13	.19	.11	.16	.14	.25
6	.13	.18	.17	21.78	.12	.18	.15	98.00
7	.13	.18	.17	21.78	.12	.18	.15	98.00
8	.17	.21	.20	21.78	.13	.21	.18	98.00
9	.17	.21	.20	21.78	.13	.21	.18	98.00
10	.17	.21	.20	21.78	.13	.21	.18	98.00
11	.16	.21	.19	.25	.13	.21	.18	.35
12	.17	.21	.20	21.78	.13	.21	.18	98.00
13	.17	.24	.20	21.78	.20	.47	.41	98.00
14	.17	.24	.20	21.78	.20	.47	.41	98.00
15	.17	.24	.20	21.78	.20	.47	.41	98.00
16	.16	.21	.19	.25	.13	.21	.18	.35
17	.16	.21	.19	.25	.13	.21	.18	.35
18	.17	.24	.20	21.78	.20	.47	.41	98.00
19	.17	.24	.20	21.78	.20	.47	.41	98.00
20	.17	.24	.20	21.78	.20	.47	.41	98.00
21	.17	.24	.20	21.78	.20	.47	.41	98.00
22	.17	.24	.20	21.78	.20	.47	.41	98.00
23	.17	.21	.20	21.78	.13	.21	.18	98.00
24	.13	.18	.17	21.78	.12	.18	.15	98.00
25	.13	.18	.17	21.78	.12	.18	.15	98.00
26	.17	.24	.20	21.78	.20	.47	.41	98.00

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SIC 32 (SCG)
SIZE: SMALL

76

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	1	11	20	27	28	25	N	1.24	.82
2	1	5	87	20	27	28	25	N	*	*

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)			C	Fuel Switch Premium (Annualized O&M/MMBtu)			C
	G	R	D		G	R	D	
1	.63	.79	.59	3.09	.48	1.24	1.16	2.36
2	.39	.58	.42	1.09	.22	.19	.42	.90

*In this type of combustor furnace exhausts are used to preheat product and additional conservation equipment would not be used.

SIC 32 (SCG)
SIZE: MEDIUM

95

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	3	44	20	27	28	25	N	.33	3.32
2	3	5	393	20	27	28	25	Y	.34	51.25
3	1	5	78	20	27	28	25	N	.65	10.20
4	1	5	38	20	27	28	25	N	1.05	5.10

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.29	.37	.32	1.42	.27	.65	.59	1.26
2	.39	.47	.41	.56	.18	.28	.24	.48
3	.30	.36	.33	21.78	.21	.48	.43	98.00
4	.16	10.89	10.89	21.78	.23	98.00	98.00	98.00

SIC 32 (SCG)
SIZE: LARGE

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal		4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	3	61	20	27	28	25	N	.24	4.63
2	1	5	78	20	27	28	25	N	1.36	3.20
3	7	5	2618	20	27	28	25	Y	.54	105.00
4	4	5	755	20	27	28	25	Y	.60	30.30

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	3	R	D	C
1	.29	.37	.32	1.42	.27	.65	.59	1.26
2	.30	.36	.33	21.78	.21	.48	.43	98.00
3	.28	.32	.30	.34	.14	.19	.16	.27
4	.31	.35	.33	.38	.15	.23	.20	.37

SIC 3312 (STEEL)
SIZE: SMALL

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁶)
1	1	1	5	25	25	25	25	25	N	.98	.36
2	2	1	70	25	25	25	25	25	N	.37	5.25
3	6	3	961	25	25	25	25	25	Y	.54	163.81

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.48	.61	.52	1.92	.33	.66	.60	1.36
3	.84	.88	.87	1.02	.23	.30	.27	.47

SIC 3312 (STEEL)

SIZE: MEDIUM

86

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	4	3	550	25	25	25	25	Y	.13	41.48
2	6	3	961	25	25	25	25	Y	.54	163.81
3	6	3	961	25	25	25	25	Y	.54	163.81
4	6	3	961	25	25	25	25	Y	.54	163.81
5	2	4	227	25	25	25	25	Y	.44	20.50
6	2	4	227	25	25	25	25	Y	.44	20.50
7	2	4	227	25	25	25	25	Y	.44	20.50
8	2	4	227	25	25	25	25	Y	.44	20.50
9	2	4	227	25	25	25	25	Y	.44	20.50
10	2	4	227	25	25	25	25	Y	.44	20.50
11	2	3	157	25	25	25	25	Y	.19	11.64

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)			C	Fuel Switch Premium (Annualized O&M/MMBtu)			C
	G	R	D		G	R	D	
1	.25	.29	.27	.71	.17	.26	.23	.49
2	.84	.88	.87	1.02	.23	.30	.27	.47
3	.84	.88	.87	1.02	.23	.30	.27	.47
4	.84	.88	.87	1.02	.23	.30	.27	.47
5	1.78	1.83	.81	1.92	.38	.52	.48	.81
6	1.78	1.83	.81	1.92	.38	.52	.48	.81
7	1.78	1.83	.81	1.92	.38	.52	.48	.81
8	1.78	1.83	.81	1.92	.38	.52	.48	.81
9	1.78	1.83	.81	1.92	.38	.52	.48	.81
10	1.78	1.83	.81	1.92	.38	.52	.48	.81
11	.22	.28	.24	.91	.20	.38	.34	.76

SIC 3312 (STEEL)

SIZE: LARGE

66

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal 2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
1	4	5	629	25	25	25	25	Y	.10	46.54
2	7	4	4202	25	25	25	25	Y	.58	210.68
3	1	3	4.8	25	25	25	25	N	61.32	.05
4	1	4	28.4	25	25	25	25	N	6.13	.57
5	1	4	28.4	25	25	25	25	N	6.13	.57
6	1	4	28.4	25	25	25	25	N	6.13	.57
7	2	4	227	25	25	25	25	Y	.44	20.50
8	2	4	227	25	25	25	25	Y	.44	20.50
9	2	4	227	25	25	25	25	Y	.44	20.50
10	2	4	227	25	25	25	25	Y	.44	20.50
11	2	4	227	25	25	25	25	Y	.44	20.50
12	2	4	227	25	25	25	25	Y	.44	20.50
13	2	4	227	25	25	25	25	Y	.44	20.50
14	6	3	961	25	25	25	25	Y	.54	163.81
15	6	3	961	25	25	25	25	Y	.54	163.81
16	6	3	961	25	25	25	25	Y	.54	163.81
17	6	3	961	25	25	25	25	Y	.54	163.81
18	1	3	48	25	25	25	25	N	.93	7.23
19	1	3	48	25	25	25	25	N	.93	7.23
20	1	3	48	25	25	25	25	N	.93	7.23
21	1	3	48	25	25	25	25	N	.93	7.23
22	1	3	48	25	25	25	25	N	.93	7.23
23	2	4	227	25	25	25	25	Y	.44	20.50
24	2	4	227	25	25	25	25	Y	.44	20.50
25	2	4	227	25	25	25	25	Y	.44	20.50
26	2	4	227	25	25	25	25	Y	.44	20.50
27	2	4	227	25	25	25	25	Y	.44	20.50
28	2	4	227	25	25	25	25	Y	.44	20.50
29	6	3	961	25	25	25	25	Y	.54	163.81
30	4	5	629	25	25	25	25	Y	.10	46.54
31	2	5	200	25	25	25	25	Y	.14	17.60
32	3	3	240	25	25	25	25	Y	.18	18.21

SIC 3312 (STEEL) (Continued)

SIZE: LARGE

001

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized OGM/MMBtu)			
	G	R	D	C	G	R	D	C
1	.18	.22	.20	.53	.15	.23	.20	.41
2	.17	.20	.19	21.78	.12	.16	.14	98.00
3	14.05	13.48	22.60	14.87	2.48	5.44	6.41	6.05
4	.84	.88	.86	.94	.26	.39	.35	.67
5	.84	.88	.86	.94	.26	.39	.35	.67
6	.84	.88	.86	.94	.26	.39	.35	.67
7	1.78	1.83	1.81	1.92	.38	.52	.48	.81
8	1.78	1.83	1.81	1.92	.38	.52	.48	.81
9	1.78	1.83	1.81	1.92	.38	.52	.48	.81
10	1.78	1.83	1.81	1.92	.38	.52	.48	.81
11	1.78	1.83	1.81	1.92	.38	.52	.48	.81
12	1.78	1.83	1.81	1.92	.38	.52	.48	.81
13	1.78	1.83	1.81	1.92	.38	.52	.48	.81
14	.84	.88	.87	1.02	.23	.30	.27	.47
15	.84	.88	.87	1.02	.23	.30	.27	.47
16	.84	.88	.87	1.02	.23	.30	.27	.47
17	.84	.88	.87	1.02	.23	.30	.27	.47
18	2.67	2.79	2.71	3.50	.59	.99	.93	1.66
19	2.67	2.79	2.71	3.50	.59	.99	.93	1.66
20	2.67	2.79	2.71	3.50	.59	.99	.93	1.66
21	2.67	2.79	2.71	3.50	.59	.99	.93	1.66
22	2.67	2.79	2.71	3.50	.59	.99	.93	1.66
23	1.78	1.83	1.81	1.92	.38	.52	.48	.81
24	1.78	1.83	1.81	1.92	.38	.52	.48	.81
25	1.78	1.83	1.81	1.92	.38	.52	.48	.81
26	1.78	1.83	1.81	1.92	.38	.52	.48	.81
27	1.78	1.83	1.81	1.92	.38	.52	.48	.81
28	1.78	1.83	1.81	1.92	.38	.52	.48	.81
29	.84	.88	.87	1.02	.23	.30	.27	.47
30	.18	.22	.20	.53	.15	.23	.20	.41
31	.16	.21	.18	.69	.17	.32	.28	.63
32	.23	.29	.26	.79	.18	.31	.27	.60

SIC 3334 (ALUMINUM)

SIZE: SMALL

101

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₀ (Btu's x 10 ⁶)
1	1	5	79	25	25	25	25	25	N	.57	11.83
2	1	5	39	25	25	25	25	25	N	1.11	3.15
3	4	5	708	25	25	25	25	25	Y	.08	62.6

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				G	Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C		R	D	C	
1	4.24	4.28	4.29	4.40	.73	.89	.85	1.18	
2	.46	.49	.49	.58	.19	.30	.26	.52	
3	.18	.22	.20	.53	.15	.23	.20	.41	

SIC 3334 (ALUMINUM)
SIZE: MEDIUM

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ₉ (Btu's x 10 ⁹)
1	1	5	79	25	25	25	25	N	.68	6.30
2	1	5	79	25	25	25	25	N	.57	11.83
3	3	5	79	25	25	25	25	N	.31	47.30
4	1	5	39	25	25	25	25	N	1.11	3.15
5	1	5	160	25	25	25	25	Y	.47	12.61
6	6	5	1493	25	25	25	25	Y	.07	132
7	4	5	865	25	25	25	25	Y	.08	76.4

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu)			C	G	Fuel Switch Premium (Annualized O&M/MMBtu)			C
		R	D				R	D		
1	.23	10.89	.26	21.78		.18	98.00	.30	98.00	
2	4.24	4.28	4.29	4.40		.73	.29	.85	1.18	
3	.53	.59	.56	.63		.24	.51	.46	.87	
4	.46	.49	.49	.58		.19	.50	.26	.52	
5	.34	10.89	.37	21.78		.26	98.00	.65	98.00	
6	.19	.22	.21	.46		.14	.20	.18	.33	
7	.18	.22	.20	.53		.15	.23	.20	.41	

SIC 3334 (ALUMINUM)

SIZE: LARGE

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Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
1	1	5	79	25	25	25	25	25	N	1.09	3.94
2	1	5	160	25	25	25	25	25	Y	.75	7.88
3	3	5	310	25	25	25	25	25	Y	.31	47.30
4	1	5	79	25	25	25	25	25	N	.31	47.30
5	1	5	79	25	25	25	25	25	N	.57	11.83
6	3	5	310	25	25	25	25	25	Y	.57	11.83
7	6	5	1651	25	25	25	25	25	Y	.07	145.9
8	6	5	1494	25	25	25	25	25	Y	.07	132
9	5	5	1337	25	25	25	25	25	Y	.07	118
10	3	5	310	25	25	25	25	25	Y	.57	47.30
11	1	5	39	25	25	25	25	25	N	1.11	3.15
12	1	5	39	25	25	25	25	25	N	1.11	3.15
13	1	5	160	25	25	25	25	25	Y	.47	12.61
14	1	5	79	25	25	25	25	25	N	.68	6.30
15	1	5	79	25	25	25	25	25	N	.68	6.30
16	1	5	79	25	25	25	25	25	N	.68	6.30
17	1	5	79	25	25	25	25	25	N	.68	6.30

SIC 3334 (ALUMINUM) (Continued)
SIZE: LARGE

CombuStor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized OGM/MMBtu)			
	G	R	D	C	G	R	D	C
1	.31	.35	.33	.40	.15	.23	.20	.37
2	6.16	6.22	6.20	6.44	1.02	1.29	1.23	1.67
3	.53	.59	.56	.63	.24	.51	.46	.87
4	4.24	4.28	4.29	4.40	.73	.89	.85	1.18
5	4.24	4.28	4.29	4.40	.73	.89	.85	1.18
6	.53	.59	.56	.63	.24	.51	.46	.87
7	.19	.22	.21	.46	.14	.20	.18	.33
8	.19	.22	.21	.46	.14	.20	.18	.33
9	.18	.21	.20	.48	.14	.21	.18	.36
10	.53	.59	.56	.63	.24	.51	.46	.87
11	.46	.49	.49	.58	.19	.30	.26	.52
12	.46	.49	.49	.58	.19	.30	.26	.52
13	.34	10.89	.37	21.78	.26	98.00	.65	98.00
14	.23	10.89	.26	21.78	.18	98.00	.30	98.00
15	.23	10.89	.26	21.78	.18	98.00	.30	98.00
16	.23	10.89	.26	21.78	.18	98.00	.30	98.00
17	.23	10.89	.26	21.78	.18	98.00	.30	98.00

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SIC 37 (TRANSPORTATION EQUIPMENT)

SIZE: SMALL

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Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal			4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁶)
1	1	1	19	28	27	21		24	N	.77	1.42
2	1	1	5	28	27	21		24	N	2.34	.38
3	1	3	48	28	27	21		24	N	.93	1.93

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)			C	Fuel Switch Premium (Annualized O&M/MMBtu)			C
	G	R	D		G	R	D	
1	.63	.79	.69	3.09	.48	1.24	1.16	2.36
2	.63	.79	.69	3.09	.48	1.24	1.16	2.36
3	2.67	21.78	21.78	21.78	.59	98.00	98.00	98.00

SIC 37 (TRANSPORTATION EQUIPMENT)
SIZE: MEDIUM

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁶)	1	Seasonal 2	3	4	Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable _g (Btu's x 10 ⁶)
1	3	3	240	28	27	21	24	✓	.18	18.21
2	2	1	38	28	27	21	24	✓	.98	2.79
3	1	1	7	28	27	21	24	✓	.68	.52
4	1	3	48	28	27	21	24	✓	.93	1.93

Combustor	G	Fuel Switch Premium (Annualized CC/MMBtu)			C	G	Fuel Switch Premium (Annualized O&M/MMBtu)			C
		R	D				R	D		
1	.23	.29	.26	.79		.18	.51	.27	.60	
2	.48	.61	.52	1.92		.33	.56	.60	1.36	
3	.63	.79	.69	3.09		.48	1.24	1.16	2.36	
4	2.67	21.78	21.78	21.78		.59	98.00	98.00	98.00	

SIC 37 (TRANSPORTATION EQUIPMENT)
SIZE: LARGE

Combustor	FR	CU	Annual Fuel Consumption (Btu's x 10 ⁹)	Seasonal				Subject to Incremental Pricing	Conservation Cost \$/MMBtu (Conserved)	Energy Conservable ⁹ (Btu's x 10 ⁹)
				1	2	3	4			
1	5	1	261	28	27	21	24	Y	.41	16.81
2	2	3	157	28	27	21	24	Y	.19	11.64
3	2	4	170	28	27	21	24	Y	.17	12.89
4	2	1	69	28	27	21	24	N	.53	5.11
5	1	3	48	28	27	21	24	N	.93	1.93

Combustor	Fuel Switch Premium (Annualized CC/MMBtu)				Fuel Switch Premium (Annualized O&M/MMBtu)			
	G	R	D	C	G	R	D	C
1	.54	.61	.57	1.36	.26	.37	.34	.70
2	.22	.28	.24	.91	.20	.38	.34	.76
3	.18	.24	.21	.78	.18	.34	.30	.69
4	.48	.61	.52	1.92	.33	.66	.60	1.36
5	2.67	21.78	21.78	21.78	.59	98.00	98.00	98.00

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APPENDIX B

REGIONAL FUEL DEMAND BREAKDOWN

The following table shows the amount of non-electric energy consumed in five U.S. geographical regions by nine major industries. The table shows the percent consumed in each region by each industry and breaks this down into small, medium, and large-sized plant percentages. The regional energy consumption for the industries under study was:

<u>Mid Atlantic</u>	<u>East North Central</u>	<u>West South Central</u>
1.79×10^{15} Btu/year	1.9×10^{15} Btu/year	1.11×10^{15} Btu/year
	<u>Mountain</u>	<u>Pacific</u>
	1.8×10^{14} Btu/year	9.3×10^{14} Btu/year

These figures were calculated from information presented in the 1972 Census of Manufactures and the special report Fuels and Electric Energy Consumed for the same year. The primary sources of information from the Census were Table 8, General Statistics by Employment Size of Establishment; Table 2, Manufacturing Employment: 1972 and Prior Census Years; Tables 3, Distribution of Establishments by Employment Size Class and Major Industry Group for the Relevant Regions; and Table 3, Quantity and Cost of Purchased Fuels Used for Heat and Power by Industry Group and Industry, 1971, from the special report.

PERCENT OF REGIONAL INDUSTRIAL FOSSIL FUEL CONSUMPTION BY MAJOR INDUSTRIES
INDICATED BY INDUSTRY AND PLANT SIZE (1972 DATA)

REGION	INDUSTRY SIC								
	<u>20</u>	<u>22</u>	<u>26</u>	<u>28</u>	<u>29</u>	<u>32</u>	<u>3312</u>	<u>3334</u>	<u>37</u>
<u>Mid Atlantic</u>									
Total	8	3	14	32	12	15	15	.3	1
Small	3	2	7	3	3	3	3	.1	.25
Medium	3	.6	5	9	4	6.5	6	.2	.37
Large	2	.4	2	20	5	5.5	6	0	.38
<u>East North Central</u>									
Total	11	.4	16	25	15	17	11	.2	4
Small	3	.16	7	3	4.7	4	3	0	1
Medium	5	.10	7	8	6.7	6	4	.2	1
Large	3	.14	2	14	3.6	7	4	0	2
<u>West South Central</u>									
Total	9	.4	3	23	43	10	3	3	1.2
Small	3	.34	3	2	7	3	.2	.4	.5
Medium	5	.05	3	6	17	6	2.3	1.0	.4
Large	1	.01	2	15	19	1	.5	1.6	.3
<u>Mountain</u>									
Total	20	.31	5	17	29	24	.4	2	2
Small	8	.07	3	3	15	9	.4	0	.7
Medium	9	.12	2	6	14	13	0	2	.5
Large	3	.12	0	8	0	2	0	0	.8
<u>Pacific</u>									
Total	15	.6	14	18	22	14	9	4	4
Small	4	.40	6	4	7	4	2.3	.7	1.5
Medium	7	.13	6	8	10	6	5.2	1.3	1.0
Large	4	.07	2	6	5	4	1.5	2.0	1.5

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