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July 1976

Load Management Survey for Large Commercial and Industrial Customers

PREPARED BY
RATE RESEARCH DEPARTMENT

Consumers Power Company

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Purpose of Survey

The purpose of this survey was to determine customer thinking on some very important matters related to recently advanced proposals to accomplish various objectives through changes in rate structure. Specifically, the survey was designed to determine what commercial and industrial customers served on primary rates had done within the past year or two to reduce their use of electricity, specific plans they had for further reduction, the extent of their use of demand control equipment and to determine how many customers were considering this equipment. The survey was also designed to determine the propensity of these customers to reduce or shift on-peak load, the reaction of customers to time-of-day pricing, their interest in an interruptible rate and finally, the implications of load shifting efforts on their business.

Summary of Major Findings

Energy Conservation

Some 63% of the customers who answered the questionnaire said electric energy cost represented 5% or less of their total product or operating cost. A rather surprising number specifically said 1%. This should be kept in mind when considering other information obtained from the survey and definitely not taken to mean these customers have little interest in this cost item.

About 12% of the respondents said they had done nothing to reduce their use of electricity during the last year or two. Four additional customers had limited their efforts to installing capacitors. Action on the part of other customers ranged from reducing lighting requirements to comprehensive energy conservation efforts dating back many years. Just under 76% of the respondents

who estimated their reduction said it was less than 10% during the last year or two. This is in line with what might be expected keeping in mind that the question dealt with electric use rather than the much broader area of energy conservation.

About 58% of the concerns outline action they plan to take to further reduce their use of electricity. Most estimate reduction of 5% or less.

Load Management

Electric Demand Control Equipment

Eighteen customers report they have electric demand control equipment. Four concerns manually control major loads such as arc furnaces or large motors. One customer has semi-automatic control equipment for lighting and heating. Thirteen customers have automatic control equipment for compressors, condensers, arc furnaces, or other large loads. Several concerns report they do not have demand control equipment but schedule major loads in off-peak hours.

Thirty-four customers report they are considering demand control equipment or a programmable control energy conservation system which would include demand control capability. Others have considered control equipment and concluded it was not economically justified. Most of the sample customers appear to be familiar to some extent with control equipment. Representatives of one major equipment supplier have done a thorough job of contacting potential customers. The name of this supplier is mentioned frequently.

Reduction in Use and Load Shifting

Overall, the survey gives little reason for optimism about the prospects of customers reducing usage or shifting load significantly. From a practical

standpoint, the vast majority of the respondents are unable to reduce usage appreciably during the period specified. Thirty companies either have continuous process operations or run 24 hours a day, five or six days per week, due to the nature of the operation. These companies cannot reasonably reduce use during certa hours. Other customers who reply they could reduce usage indicate this could be accomplished by changing working hours or shifts but cite major problems that would be involved. Still other customers who reply they could reduce their use during the periods mentioned state the amount would be modest. These customers indicate they would turn off unneeded lights and turn off air conditioning in office areas, for example. While helpful, such measures would not be very productive if there had been previous efforts to reduce use. Finally, some customers say they could reduce their use by cutting back on production - a most unlikely prospect.

Substantially the same prospects are indicated with respect to load shifting. Again, continuous process operations have little potential for shifting load. A number of customers who could shift load say the amount would be small. Others say the cost of shifting would be very substantial and the incentive to do so would have to be large. The amounts mentioned by some customers make the economics of the shift completely impractical.

The basic economics involved argue very strongly against significant reduction in use or load shifting from on-peak periods. The survey results clearly show there would be open opposition to any attempt to induce reduction in use or load shifting through use of rates that were not cost justified.

Interruptible Rates

Only seven customers thought they could adjust their operation to an interruptible rate and most of them qualified their response in some way. One customer thought the plant might possibly be able to adjust to an interruptible rate during the months of July - October. Another said possibly depending on the frequency, length and times of interruption. A third replied it would be possible when the plant was operating one shift. Another customer indicated that economic considerations and production requirements would have to be weighed. Two firms said they could adjust if given 24-hours notice.

Procedure

Sample Selection

Sample customers were purposefully selected to represent the various types of business served by the Company on primary rates. Small, medium and large concerns were included in each business category containing customers with a significant range in annual kWh use to insure representation of business units which might have different viewpoints attributable to size. The sample intentionally included 22 of the Company's largest electric customers as measured by billing. A total of 139 customers comprised the sample. Table 1 gives details of the sample composition together with information about customer response.

Data Collection

Copies of the Load Management Survey (Exhibit 1) were hand delivered to each customer by Energy Consulting Service Department personnel. The survey form was given, in each instance, to the individual best qualified to answer

the questions in the judgment of the company employee(s) involved. The importance of the survey to the customer was explained and the customer was requested to do his best to answer all questions fully. Customers were told their replies would be treated confidentially. General Motors Corporation asked that the corporate response be included in the reported results. The request was honored (see Exhibit II). Arrangements were made with the customer to pick up the questionnaire when it was completed. Questionnaires were returned by 118 customers (84.9% response). One of these contained no useful information. Table 1 gives additional information about customer response.

Discussion of Findings

Energy Conservation

Most business firms that have attempted to reduce their use of electricity have acted to cut back on lighting. They have removed light fixtures or fluorescent tubes from service, upgraded lighting to a more efficient type, reduced lighting levels, discontinued decorative lighting, reduced hours of use of outside lighting and made an effort to have employees turn off lights that weren't needed. Some concerns have rescheduled janitors to daytime hours in order to reduce lighting requirements at night.

Electric energy use for ventilation has been reduced by at least 22 sample customers. Typical actions in this area include turning off some exhaust fans, installing timers on air handling equipment and reduction in use of outside air.

Many customers report that building temperatures have been reduced during the winter - typically to 68 degrees - and increased during the summer -

generally to 78 degrees. Efforts to reduce air conditioning usage have been extensive.

A number of respondents report action to reduce unnecessary operation of equipment. Equipment is shut down during breaks, lunch periods and sooner at the end of shifts. Timers are used for this purpose in some cases. Equipment startup is delayed and efforts made to turn off any nonproductive equipment.

Process changes have been made in some plants resulting in the operation of less equipment and significant reductions in electricity usage. Equipment use has been rescheduled to off-peak hours when possible. Compressed air pressure has been reduced and usage trimmed.

Other measures taken to reduce use include removing elevators from service, reducing electric water heater temperature, preventative maintenance programs to insure efficient operation of equipment, formation of committees to set goals and evaluate suggestions and promotion of conservation by various means.

Very few customers estimate reduction in usage exceeding 10%. This is in line with expectations. Reduction in the electrically intensive plants was generally smaller than in the less electrically intensive ones. This also could be expected. A plant which uses a high percentage of its electricity for process purposes has little opportunity for conservation. Electricity consumption is reduced significantly only at the cost of production. Electrochemical and air reduction plants are good examples. In contrast is the plant in which lighting or other uses not directly related to production predominate. Here conservation opportunities are more numerous and also easier to identify.

Progress in conservation over time is a matter of diminishing returns. The first conservation gains are the easiest and cheapest. Succeeding steps are more difficult. The opportunities are not as obvious and must be found through analysis of use. Many survey customers have achieved the easier gains and therefore expect modest reduction in use as a result of action planned in the future. Most estimate reduction of 5% or less. Customers plan to follow through on continuing programs such as upgrading lighting or reducing lighting levels where feasible, changes in ventilating systems to improve efficiency and reduce power use, replacing motors with smaller ones when possible as older ones wear out and making changes in processes.

Load Management

Electric Demand Control Equipment

Some 34 sample customers indicate they are considering computer demand control systems. This group includes a number of major accounts. The survey results suggest the possibility of a significant amount of load being controlled if customers conclude the equipment is cost justified.

Reduction In Use

A total of 66 respondents report they are unable to reduce their use to any appreciable extent between 11:00 AM and 7:00 PM during the months of March - September. This group includes 30 customers who either have continuous process operations or run 24 hours a day five or six days per week due to the nature of the product.

Thirty-seven customers either indicate they could or might be able to reduce their use during this period while 15 customers did not say what they

could do. Numbered among the 37 who could or might be able to do something to reduce use are 17 who say they would reschedule operations or change working hours. Some of these companies cite major problems this would involve. Foremost among these is the formidable task of getting employees to agree to working nights. The need to negotiate changes in working hours with unions, substantial cost considerations due to shift differentials, communication problems with customers and suppliers, complications with shipping and receiving schedules and far-reaching social implications of shift changes were the most frequently mentioned problems that would have to be worked out. Considering the nature of these problems, there is certainly reason to question the likelihood of significant reduction in use through changing work schedules.

Even more questionable is the possibility of significant reduction by changing the hours of operation of department stores, grocery stores, office buildings, restaurants, schools and all the other businesses that serve the public directly. Only one respondent of this type gives any indication of even considering the possibility of such changes. We would not expect the public to adjust shopping habits to any large extent as a result of time-of-day pricing. Since merchants must respond to public desires, we would not anticipate that commercial customers would exhibit much elasticity to such pricing.

Also numbered among the 37 respondents who could or might be able to reduce use during this period are 11 that say they would try to reduce lighting and/or air-conditioning requirements. The effort, while helpful, would not be very productive if there had been a determined move to conserve previously in their buildings.

One-half (59) of the customers who returned the questionnaire said they could do little or nothing to reduce use between 5:00 and 9:00 PM during the months of October - February. This includes 32 customers who either have continuous process operations or run 24 hours a day five or six days per week. Most of these continuous process operations are the same ones cited previously. There are some differences in the groups which are attributable to seasonal factors, however.

Thirty-eight customers indicate they could or might be able to reduce their use between 5:00 and 9:00 PM during the specified months. Twenty-one respondents did not address this question. Included in the 38 who could or might reduce use are 18 that would try to reschedule operations and change employee working hours. Again, the likelihood of significant reduction in use through this approach is open to question. Ten customers would try to reduce their lighting or heating requirements. The effect of this effort would be small provided they had taken previous action to reduce use.

Customers were asked to estimate what it would cost to reduce their use. Several replied that they had no idea at this time. Dollar estimates by others ranged from no cost to $135,000. These dollar figures have little or no meaning in and by themselves. They need to be considered together with the savings the expected reduction would produce. A cost/benefit analysis would be required in each situation. More meaningful than the dollar cost estimates were the replies of several customers who said their shift differential alone was ten cents per hour or more. An offsetting saving would be required before these customers would give any thought to rescheduling operations. In fact, there would have to be more than an offset. A cost advantage would be needed

or there would be no reason to try to change. This raises a real question as to whether any cost justified rate would prompt customers to consider rescheduling operations to reduce use during any particular time period.

An effort was made to get a rough measure of the pricing which would be required to produce change in customers usage patterns. Three questions were posed which involved progressively greater differentials between the on-peak and off-peak hours associated with one typical time based rate structure. The differentials were four mills, a two-to-one ratio and a five-to-one ratio. The questions served to rile some customers considerably. They prompted the following replies among others: "You're never going to get away with it." (2 to 1 differential). "The general tone of your survey is one of impending increase in operating costs and a reduction in operating flexibility. We feel such changes can only jeopardize the economic position of the _____(Company facility name) with respect to other _____(Company facilities) and our competitors.", and "Challenge a rate structure of this type." (5 to 1 differential). Attention is also called to General Motors Position on Time Differentiated Rates (Exhibit II) in this connection.

The questions also furnished information which raises great doubt about the wisdom of trying to induce changes in customer usage patterns through artificial pricing structures. Over half - 61% - of the respondents flatly say they would not change their operation in response to a four mill differential. A number of the industrial firms included in this group explain that the cost of rescheduling employees would exceed the energy costs involved. Only eight customers state they would make changes and two of these would be seasonal only. The balance of the customers who replied were either doubtful they would make

changes or did not indicate what they would do. Most of the businesses that would try to make adjustments in response to a four mill differential indicate they would attempt to cut usage or change working hours if economic analysis indicated this was prudent. Two firms say they would consider relocating their operation to another state.

A two-to-one differential increases the number of replies indicating that serious consideration would be given to relocating the operation to another state - especially when companies have plants elsewhere - or closing the facility. Eleven customers are in this group. Fifty-five firms would not or could not change their operation. A number of them say the increased costs would have to be passed on to their customers or to the public. Hospitals, grocery stores, government buildings, restaurants, hospitals and others that serve the public directly are included in this group along with manufacturing plants that operate continuously. Twenty-eight customers say changes would be likely. In some instances, the changes mentioned (e.g., cut back class 2, reduce services to the public) would inconvenience people and be very unpopular albeit effective in reducing usage. Others would try to change working hours but anticipate problems with employees. Some would try to reduce usage during the day through conservation measures. One customer would investigate the possibility of on-site generation.

A differential of five-to-one adds 19 customers to the list of those that feel they would move the operation or be forced out of business. This brings the total of those who say they would leave Michigan or probably be forced to close to 30, or a fourth of all respondents. Twenty-five customers still say they could make no change. This number includes ten firms that have a continuous

process operation plus two hospitals. About 25% of the respondents would try to reschedule their operations. Some of them express doubt about the outcome of the action. They believe they would have difficulty getting enough qualified help to operate and are concerned about the effect of shift changes on employee morale, efficiency and safety.

In summary, the survey results indicate the differential between on-peak and off-peak rates would have to be two-to-one or greater to cause significant change in customer usage patterns. Such differentials would lead a substantial number of customers to seriously consider relocating their business to another state or to closing. They would also increase costs that would have to be passed on to customers by businesses that could do little or nothing to change in response and create many problems for others that tried to adapt. The net effect of such rates cannot be predicted.

Load Shifting

Forty-nine customers say they could shift little or no load from the hours between 5:00 and 9:00 PM December - February given an incentive. Forty-nine could shift little or no load from the period 11:00 AM - 3:00 PM during the months of July and August. These groups include the manufacturing plants that operate 24 hours per day five or more days per week, a TV broadcasting station which operates 20-1/4 hours per day every day, two grocery stores, two hospitals and various establishments that serve the public directly.

Forty-seven customers indicate they could shift load from the 5:00 to 9:00 PM period and 46 from the 11:00 AM to 3:00 PM period. Some of these customers could shift very little load, some give no indication of how much, others qualify their answer by saying they could shift load if production requirements

permitted, and some attach a reduction in cost of electricity that effectively removes them from consideration (e.g., "If rates were reduced sufficiently, we could schedule our manufacturing requirements on weekends.", "Energy would need to be at no cost.", "Decrease one-half of present rate.") It is also problematical whether customers who indicate they would reschedule operations could be offered sufficient incentive to make this economically feasible.

There is absolutely no way to quantify the information obtained through this survey in order to determine how much load might be shifted at what cost. In fact, an estimate might well represent the ultimate achievement in trying to measure the amount of load which would be shifted. No business could do anything except guess at the answers to questions about load shifting without extensive analysis based on very specific energy cost information. Even then the analysis would have to deal with imponderables such as the outcome of shift changes or public response to changes in hours of operation. It seems abundantly clear that ratemaking based on such information would be unsound.

Interruptible Rate

Very little interest was expressed in an interruptible rate. This might be due to the fact no details were given which customers could evaluate. Cost/benefit analysis based on a specific rate could produce a different result. Interruptible and curtailable rates have potential for load management which needs to be fully explored. More customers might find they could respond to an occasional incident of actual peak load or generating capacity shortage than could respond to the broad periods covering all possibilities that are typically associated with peak load pricing. This would be beneficial to all concerned since demand cutback when it isn't essential causes loss to everyone.

Social and Economic Implications

Some of the implications of trying to shift electric load to night-time hours have been mentioned previously. The selected excerpts from questionnaires included in Exhibit 3 call attention to many more. Even cursory consideration of the obstacles to be overcome in this approach to load management would lead one to conclude that there must be a better way. Fortunately there are other approaches which appear to be more promising.

Table 1

Load Management Survey
Sample Composition and Customer Response

Type of Business	Number of Sample Customers	Number of Replies
Industrial		
Poultry Farm	1	1
Apparel Furnishing	2	2
Chemicals & Allied Products	9	7
Electrical Machinery & Equipment	6	6
Fabricated Metal Products	9	8
Food & Kindred Products	8	7
Furniture & Fixtures	6	5
Leather and Leather Products	2	1
Lumber & Wood Products	3	3
Machinery (Except Electrical)	7	6
Miscellaneous Manufacturing	6	5
Paper & Allied Products	4	3
Primary Metal Industries	9	7
Printing & Publishing	3	2
Prof. Sci. & Cont. Instruments	1	1
Products of Petroleum & Coal	3	3
Rubber Products	3	3
Stone, Clay & Glass Products	5	3
Transportation Equipment	12	12
Commercial		
Agricultural Services	1	1
Architects & Consulting Engineers	1	1
Auto Dealers	2	2
Churches & Synagogues	1	1
Dept. Stores & Gen. Merchandise	4	2
Drug Stores & Pharmacies	1	0
Financial Institutions	2	2
Food & Beverage Serving Establishments	1	1
Food Stores	2	2
Government, State, Local	2	1
Hospitals & Convalescent Homes	3	2
Hotels & Motels	2	2
Household Furnishings	1	1
Miscellaneous Commercial	2	2
Office & Professional Services	1	0
Radio & TV Broadcasting	1	1
Recreation	3	3
Schools	3	3
Public Utilities, Trans., Comm.	3	2
Wholesalers	2	2
Federal Government	2	2
Total	139	118

Exhibit 1

Consumers Power Company
Load Management Survey

Customer Name _____ Division _____

Address _____

I. Type of Business

Business Code _____

A. Industrial

Manufacturing or Processing of: (Finished product(s) produced)

_____

_____

B. Commercial

Type of Commercial Customer (Department Store, Hospital, etc.)

_____

II. Business Operating Characteristics

Number of Employees (Total and No. per shift if applicable) _____

_____

A. Industrial

Normal Number of Work Shifts _____

Hours: 1st Shift _____ 2nd Shift _____

3rd Shift _____ Other _____

Normal Operating Days Per Week _____

B. Commercial

Business Days Per Week _____

Business Hours Per Day _____ AM to _____ PM

_____

Additional Information (e.g., seasonal changes) _____

_____

III. Gross Area of Plant or Building

Office _____

Merchandising _____

Plant _____

Storage _____

Other (Classroom, gym, etc.) Description or Type & Area _____

_____

Total _____

IV. Major Electrical Uses (Approximate percent of total annual use and estimated connected load)

Use	% of Total	Connected Load Kw	Describe Process or Other Use(s)
Lighting			
Air Conditioning			
Space Heating			
Water Heating			
Cooking			
Processing or Other			

V. Size of Electric Water Heater (Where applicable)

Upper Element Size _____

Lower Element Size _____

Gallons _____

VI. Energy Conservation

Electric energy cost represents approximately what percent of your total product or operating cost?

0-5 _____ 5-10 _____ 10-20 _____ 20-30 _____ 30-50 _____ over 50 _____

What has been done in the past year or two to reduce electric energy use in your building?

By how much do you estimate you have reduced your use during this period?

_____

_____

Describe any specific action you plan to take to further reduce your use of electric energy.

_____

_____

_____

_____

_____

_____

By how much do you estimate you can reduce your use as a result of this action?

_____

_____

_____

VII. Load Management

Demand for electricity is greater during the day than at night and greater during some months of the year than others. Economic advantages would result if the demand could be more evenly spread throughout each 24 hour period of the year. The following questions deal with some of the issues involved in attaining this objective.

Do you have electric demand control equipment? (If the answer is yes, indicate whether it is manual, semi-automatic or automatic. If no, skip the next two questions.) _____

_____

What load(s) do you control? _____

_____

_____

_____

_____

How much have you been able to reduce peak demand with your equipment? _____

_____

If you do not have demand control equipment now, are you considering it? _____

_____

_____

_____

What could you do to reduce your use of electricity between 11:00 AM and 7:00 PM during the months of March - September? _____

What could you do to reduce your use between 5:00 and 9:00 PM during the months of October - February? _____

How much could you reduce your use during these hours? March - September _____ October - February _____

What do you estimate it would cost to do this? _____

Would the energy "saved" between 11:00 AM and 7:00 PM or 5:00 PM - 9:00 PM be used later at night? _____

If electric energy used between 11:00 AM and 7:00 PM Monday through Friday cost 0.4¢/Kwh more than during the rest of the day, would you change your operation in any way? (If your answer is yes, what would you do?)

Suppose the electric energy used between 11:00 AM and 7:00 PM Monday - Friday cost twice as much as that used at other times. What changes would you make in your operation? _____

What changes would you make if the electric energy used between 11:00 AM and 7:00 PM Monday - Friday cost five times as much as that used at other times? _____

How much load could you shift from the hours between 5:00 - 9:00 PM December - February given an incentive?

To what time period would you shift this load? _____

What incentive would be required? _____

How much load could you shift from the hours of 11:00 AM - 3:00 PM July - August given an incentive? _____

To what time period would you shift this load? _____

What incentive would be required? _____

Some electric utilities have an interruptible rate for large primary customers. Service is subject to interruption by the power company when necessary. Could you adjust your operation to an interruptible rate in exchange for lower cost power? _____

_____

_____

_____

_____

If your answer is yes, how much advance notice would you require? _____

_____

What portion of your load could be interrupted? _____

_____

_____ For how long could service be interrupted? _____

_____

_____

The vast majority of human activity is daytime oriented. Therefore, it is anticipated that social and economic implications are connected with efforts to shift electric load to nighttime hours. Please comment on any of these implications you feel are especially significant to your business. _____

_____

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_____

Questionnaire completed by _____

Date _____

General Motors Position on Time Differentiated Rates

Introduction

The utility and its regulatory agency both have the responsibility for assuring that the company is able to provide an adequate and reliable electric supply. In meeting this obligation, the fundamental guideline that should be followed by the regulatory agency is to establish utility revenues based on the cost to serve each customer class. This approach avoids class discrimination or subsidy between or within classes and provides fair and reasonable prices. It should be noted that the electric utility is "providing a service" having unique cost, availability, and reliability or quality of service features, and not a "commodity."

Time Differentiated Rates

The time differentiated rate concept is supported to the extent that it is applied on the basis of the properly determined cost of service. On this basis, customers clearly served on the utility's peaks are held responsible for both fixed (capacity) and variable (energy) costs and those clearly served only during off-peak periods are held responsible only for variable (energy) costs. These costs would be properly applied to all classes to accurately reflect the peak and off-peak demand contribution made by each class.

Time differentiated rates can be applied on a seasonal basis (utility's peak loads in summer or winter), on a daily basis (utility's peak time-of-day period), or on both a seasonal and daily

basis. However, the concept remains the same regardless of the time period.

Benefits Should be Proven

Time related rates should only be applied by utilities which can demonstrate proven benefits. Utilities vary in their load and generation characteristics; and it may well be that time related rates would be justified for some utilities and not for others. For this reason, such rates should not be universally mandated.

Potential benefits are best demonstrated through public hearings by the regulatory agency using cost-of-service, load, and cost-benefit studies for each utility.

Indiscriminate improvement in a utility's load factor may have serious impact on the system involving greatly increasing costs and decreasing reliability. Since utilities vary in their load pattern and plant mix, it may be uneconomical to increase load factor beyond some specific level because the existing plants are operated to match the load characteristics, and not a theoretically optimum load pattern. This is best determined for each individual system.

Many Problems Require Resolution

There are several problems with time-related rates that must be resolved before they are implemented. These include: (1) method of allocating fixed and variable costs among customer classes and between high and low load factor customers; (2) measurement of the social and economic impact on society, if such rates do

influence customer usage patterns; (3) funding for small user metering costs; (4) customer reaction to a flexible pricing scheme; (5) measurement of the time frame involved in achieving any significant benefit from the concept; (6) the potential for creating severe revenue instability if the cost differentials and effects are incorrectly judged, and (7) the creation of "needle peaks" at certain times caused by customers reacting differently at different times to higher peak rates (i.e., turning off air conditioning during moderate weather, but running it during hot weather).

Preferred Approaches Using Time-Related Rates

There are several preferred approaches to the usual time-related rate proposals that have proven benefits and offer no major problems for implementation at this time. These should be offered on an optional basis.

These applications involve rates based on both off-peak forgiveness (off-peak demands are charged at lower rates than on-peak demands) features combined with load-factor blocking) decreasing rate changes for increasing unit usage per unit of demand). Such rate differentials reflect actual running costs. Although the peak periods reflect the customer's load factor, the effect of such rates is very similar to time differentiated rates based on the utility's peak periods.

The optional interruptible rate offers lower rates to users who can withstand occasional power interruptions at the utility's option. This concept can be especially appealing to low labor-high electricity intensive industries.

Load management rates offer an incentive to the customer (including residential) to let the utility control the operating time of certain equipment or appliances. Such controls are most effective because the utility can shed load at times of its peak, thereby improving its load factor and overall operating efficiency.

May 20, 1975
Energy Management Section

GENERAL MOTORS CORPORATE RESPONSE TO
CONSUMERS POWER COMPANY'S ELECTRIC LOAD MANAGEMENT SURVEY

Introduction

In response to a request by Consumers Power Company, GM offers the following comments given in the same general order as the questions appear in the survey.

ENERGY CONSERVATION (VI)

Electric Energy Costs

In 1975, direct electric energy costs represented approximately 1% of General Motors total product sales for the U.S. and Canadian operations. If the cost of electric energy used to produce all raw materials and components is considered, the total electric energy cost is a larger proportion.

Conservation of Electricity

Corporate Conservation Program

General Motors has had corporate energy conservation programs since the 1950's. Its latest formal program began in February 1973. Reducing electrical usage where possible has always been an important part of every energy conservation program. The cost of electricity is a production cost like other costs and, regardless of level of cost, provides an incentive to continually seek improvements in the utilization of electricity.

Corporate Goals Achieved

Through 1975, GM has reduced its total energy consumption 17.7% compared with 1972. Approximately 10% of this amount is due to the energy conservation program. Improvements in reducing electricity usage, although important, represents a small portion of total energy savings.

A corporate goal of 5% savings in total energy use, adjusted for production and other major variables, has been established for 1976.

GM Load Represents High Load Factor

Normal plant operations generally place a high load factor on utility systems. This means lower costs because of higher hours use of demand. For the utility, it means more efficient production because a more level demand permits more base load equipment operation.

As an example, information furnished by Consumers Power Company shows that on the utility's peak days in 1972 and 1974 (data for 1973 and 1975 were not furnished), General Motors' operations served by Consumers Power exhibited load factors of approximately 86% and 91% respectively.

Electrical Usage

Improvements in the efficient use of electricity have been made and are continuing to be made. Examples are: solid state power

controls for ovens and furnaces; lighting levels have been reduced; central monitoring and control systems have been and are being installed; staggered motor and production start-up; power factor improvements; more efficient metal halide and high pressure sodium lamp lighting systems are being installed.

In the 1960's, GM developed several corporation specifications that have contributed significantly to GM's more efficient utilization of electricity. Specifications for long life lighting ballasts and improved power transformers were developed together with an electric motor specification (7EQ). Specification 7EQ set new and higher standards for extended motor life, high power factor, and higher operating efficiency. This specification established new industrial motor standards, which many companies subsequently adopted for their own use due to the operating advantages 7EQ--designed motors offered.

In purchasing new equipment, electrical efficiency is always considered to be important. However, such considerations must be based on a cost/benefit analysis. Gradually, as new, more efficient equipment replaces older, less efficient equipment, improvements in electrical utilization efficiency may be expected.

LOAD MANAGEMENT (VIII)

Introduction

This section includes comments on those questions not answered by the plants. These questions include: load shifts, load reductions and changes in plant operations that would be made as a result of making such load changes; using arbitrary pricing

schemes to achieve certain load shifts; and the social and economic impact of making such changes.

Cost of Service Among Classes of Customers

It is important to note that Consumers' rate of return index for the various customer classes represents a significant cross subsidization and departure from rates based on the "cost of customer service." A preliminary analysis indicates that the utility's current rate of return is approximately 80% for the residential class, 105% for the industrial class, and 127% for the commercial class.

Achieving Load Shifts Through Artificial Pricing

The solution to the utility expansion problem implied by this survey is to make artificial pricing changes in the rate structures. Such changes would allegedly inhibit and shift demand, thereby reducing need for new plant expansion by the utility.

General Motors believes that this approach is simplistic, inaccurate, and dangerously misleading, if accepted as the solution for reducing the need for new capacity. The damand-supply balance for electricity is much too complex and important for this narrow view.

The pricing schemes in this survey are totally without cost basis and, instead, relate to artificially established levels. These levels, and the associated questions, are designed to measure the so-called theoretical, economic price elasticity of each plant.

It should be noted that, for General Motors' plants, the so-called theoretical price elasticity, if it exists, may vary between the different plants producing different products under different economic conditions, at different times. There may be no composite elasticity for any one product.

General Motors favors a cost to serve basis for rate design and is yet to be convinced any departures from the proven "cost-of-service" structure have any justification. Being non-cost related, such charges simply become a means of pricing certain users of electricity out of the market (if they are price sensitive) or a means by which certain users subsidize other users (if the first have little price sensitivity). In either event, such an approach is clearly price discriminatory. Drastic policy changes should not be undertaken unless conclusive proof of their validity and total cost effectiveness can be demonstrated.

General Motors' Present Electric Rates Reflect Time Based Structure

All the electric power GM purchases from Consumers Power is bought under what essentially is a time differentiated rate structure with cost-related energy and demand differentials. GM plants are served by Consumers Power under Rate Schedules D and J, which are schedules for primary customers having monthly demands in excess of 25 and 500 kilowatts respectively. Our analysis of these rate schedules, using actual charges and usage for one of our plants, indicates that these structures generally reflect energy and demand cost differentials to as full an extent as appears cost justified.

This analysis is based on the power cost during both on-peak and off-peak hours, using the rates previously set in MPSC Case No. U-4576 and the peak hour definitions proposed by Consumers Power in Case No. U-4840. The analysis was also done for the new rates and peak hour definitions just set in the final order of Case No. U-4840.

Demand charges have been calculated by associating them only with the kilowatthours purchased during on-peak hours. In the analysis, demand charges have been divided by the product of the billing demand and the number of on-peak hours. An equivalent demand charge per kilowatthour consumed during on-peak hours is then obtained for both winter and summer peaks.

A preliminary analysis indicates that an energy cost differential of about 0.2¢ per kilowatthour reflects actual running cost differentials between on-peak and off-peak usage for Consumers Power Company system. Since the actual energy charge differentials are 0.2¢/kilowatthour in the new rates D, J, and F, as set in Case No U-4840, these new rates also reflect actual energy cost differentials for Consumers' system.

Energy charges in the previous rate D were analyzed by considering the cost for the first block of energy purchased as reflective of on-peak cost and the next to the last block as reflective of off-peak cost. This analysis provides an on-peak and off-peak differential of about 0.2¢ per kilowatthour. Since actual cost differentials for Consumers system are about 0.2¢/kilowatthour, the energy charge differentials in the previous rate closely reflected actual cost differentials. Although the energy cost differential would be less for small plants, their corresponding demand charges

would be higher. The analysis indicates that the total energy and demand cost differential between on-peak and off-peak would remain about the same. The ratio of on-peak to off-peak costs was approximately 5-1 in the winter months and 3-1 in the summer months for General Motors for the previous rates. These ratios seem to reflect an essentially cost based on-peak and off-peak differential to the full extent which is cost justified.

The analysis for new rates D, J, and F as set in Case U-4840 for General Motors indicates that the ratio of on-peak to off-peak costs is approximately 4.3-1 in the winter months and 3-1 in the summer months. These ratios also seem to reflect an essentially cost-based on-peak and off-peak differential to the full extent which is cost justified.

Majority of Industrial Customers are Served Under These Rates

Information indicates that the vast majority of Consumers' industrial customers are served under a cost based time differentiated rate structure. Accordingly, approximately 72% of the industrial kilowatthour sales made in 1975 by the utility were under Rate Schedule D and J. Furthermore, Schedule F has been analyzed and found to reflect similar, essentially cost based energy and demand differentials. In 1975, 87% of the utility's industrial sales were made under these three (3) schedules (D, J, and F).

Of further interest is the fact that about 43% of the utility's total 1975 sales were made under these schedules, including approximately 31% of the commercial sales.

In view of this, it seems strangely disquieting for the commission to propose and the utility to conduct a study regarding time related rates for industrial customers when the vast majority of such customers have been and are already served under time differentiated rates. The only conclusion General Motors can reach is that any further change toward time differentiated rates will have no connection with actual costs and will instead, represent shifting of additional and unjustified costs from other classes to the primary industrial and commercial classes, which are the utility's highest load factor customers.

Considering the relatively high load factor characteristic of industrial customers, this whole approach seems completely counter productive in assisting the utility with its peaking problems. Attention might better be directed to those lower load factor customers who actually create the peaking problems.

Meeting Future Needs

Rather than attempting to minimize consumption and demand through discriminatory, non-cost related rates, attention should be directed towards meeting demand by construction of the required facilities for the major utilities in Michigan. Rate structures should be based on the cost of service principles among and within customer classes to raise the needed capitol and not used as a means of limiting demand and restricting growth. General Motors urges that prompt action be taken to allow the utilities to resume necessary construction. The Public Service Commission should grant adequate and timely rate increases to both major utilities to allow needed construction.

If such action is not taken, General Motors urges that there be a prompt evaluation of the effects of the construction delays on the utility's ability to meet system demands. The result of such evaluations should be made public since such cutbacks will have significant effects on employment, economic growth, and the social welfare of Michigan

Social and Economic Impact of Forcing Significant Daily Load Shifts

The social and economic impact of forcing significant shifts in General Motors electrical load demand through excessivly high pricing during certain daytime hours is unknown. However, there are some general areas that would appear to receive a noticeable impact from such a drastic change in current manufacturing operations.

If the assumption is made that electric demand during the daytime hours is reduced to the very minimum necessary to maintain only essential 24-hour operations, it may be possible to shift some primary manufacturing emphasis to a night-time basis insofar as plant facilities are concerned. However, this drastic a change would need much detail study on a plant-by-plant basis. Such a shift would also require suppliers and sub-suppliers and their transportation carriers to likewise shift to night-time operations.

Most important of all, it would require the work habits and life styles of most of the over two-hundred fifteen thousand people normally employed by GM in Michigan to change to reflect a night

oriented schedule. It is not known the extent of people's willingness to make such changes, or the cost incentives or penalties needed to make such a shift. Furthermore, working conditions as they relate to the assignment of employees to work schedules would be a major consideration.

Load Management Survey
Social and Economic Implications of Load Shifting

Survey Statement:

The vast majority of human activity is daytime oriented. Therefore, it is anticipated that social and economic implications are connected with efforts to shift electric load to nighttime hours. Please comment on any of these implications you feel are especially significant to your business.

Selected Responses:

- Students and professors would not be willing to change class hours from daytime weekdays to evenings and weekends. To make this change, financial incentive or government edict would be required.

- As stated before, our business is educating students and we do this from 8:00 AM to 10:00 PM. To shift these hours to a period of time other than these would undoubtedly reduce our number of students. I can't imagine a social and economic situation that would induce a large number of students to attend school between the hours of 10:00 PM and 8:00 AM. We already are educating students at close to 100% of capacity 16 hours per day.

- Since the paper has traditionally daytime operated, changing to a nighttime operation (i.e. morning) would make a difference to customers and would affect advertisers.

- I do believe legal business hours are established by statue so some accommodation would have to be made there. (County government building)

- It would be very difficult to get more housewives to shop for their groceries at night.

- Since physicians have a major role in many areas of the hospital where there are heavy electrical usage requirements, it will be most difficult to make changes within the organization operations that will have significant impact unless physicians can somehow be influenced to alter their own office work routines to devote their hospital activities to nighttime hours.

- _____ (Company name) deals almost exclusively with clients who use normal daytime working hours, making it mandatory for _____ _____ to be available to its clients during the same hours. (The vast majority of this company's clients are in other states.)

- Our peak period loads are between 9:30 AM and 4:30 PM Monday through Saturday and couldn't be changed unless the public would change their habits.

- Would a bank stay open until midnight? Would a law firm do likewise and ask their clients to come in at these hours? I believe this would pose a great problem in our business of operating a bank/office building.

- If and when our customers become nighttime oriented we will follow suit. (Automobile dealer)

- The restaurant business is dictated by the eating habits of people. People are accustomed to eating in the morning, at noon and at supper time.

- Electric usage at _____ is dictated by the demands of the customers and cannot be shifted to conform to regulations or rate incentives.

- Very difficult to encourage people to work second and third shifts.

- Because the plastic injection molding operation has to be on an "around the clock" basis, we could not consider shifting part of our work to nighttime hours.

- On night shifts absenteeism is higher, efficiency drops, more lights and heat are needed at night, must pay shift differential premiums.

- We use electric power for lighting and pumping. We really do not have much choice as to when a pump is operated. The process is continuous and cannot be started up and shut down on a short cycle basis, for both product quality and efficiency considerations.

- We are in a highly competitive industry and to shift production to off-peak periods would substantially increase labor costs. This would also reduce plant efficiency. The net result could precipitate a decline in our competitive advantage and would bring an eventual closing of the plant.

- Unless basic nighttime operation occurs concurrently in all other local industries, a loss of a certain number of key employees would be inevitable.

- The processing of sugar beets into sugar is not compatible with this philosophy of industrial activity and does not have within it the flexibilities that permit adjustments in work schedules due to the seasonal nature of beet processing - that is - the delivery of beets from the grower at a specified period of the year and the immediate necessity of processing these beets, on a continuous uninterrupted 24 hour basis, from time of delivery to completion of final product. This does not permit at anytime interruptions in this cycle. Therefore, serious consideration should be given both to sugar processing and the processing of other similar foodstuffs with the recognition that the basic philosophy of time of day, day of week pricing would not accomplish the desired results and would only result in increased cost to the producers, or in those product lines where the cost can be passed on to the consumer, an ultimate increase in the cost to the consumer.

- We concur that increasing the load factor of the Consumers Power system would have a positive cost impact on the rate payer, the Company and the stockholder. We do caution against any hasty large scale experimentation with existing rates since any significant changes could have an irreversible effect on existing high load factor customers. It should be noted that the existing high load factor customers are a positive force on the present system load factor.

- We are presently operating on a five day week twenty four hours per day. We are under contract to a union and we must pay our hourly workers $1\frac{1}{2}$ times the normal rate for Saturday work and 2 times the normal rate for Sunday work so it can be readily realized that your electric rates would have to be reduced considerably to make any change in our present work schedule feasible.

- Human relations problems. Costs, Availability of labor. Availability of services. Trucking companies delivery and shipments. Communications with other

business with other hours. Associates with community, school and church activities. Poor morale.

- The majority of our production supervisors would seek other employment rather than transfer to a second or third shift operation.

- Hiring and keeping qualified employees on the off shifts would be difficult, if not impossible.

- Current working hours are negotiated in union contract. Any attempts to change to nighttime hours would most certainly meet with opposition by the union despite all the arguments of energy conservation.

- We have three furnaces with molten glass at approximately 2700 degrees Fahrenheit. It is impossible to turn a switch and shut the process off between 8:00 AM and 4:00 PM.

- If more product has to be produced on the night shift, there will be the additional cost of night shift premium. The production costs of each plant located in the various parts of the United States are used as a guide in determining how much each plant is to produce. At the present time the cost of electric energy is highest in Michigan. As the cost of electric energy becomes more and more unfavorable, the incentive to shift the production in Michigan to other plants becomes more and more significant.

- The plant has a continuous process with very uniform electrical demand. The nature of the process does not permit time tailoring of electrical demand. Higher peak rates would be an economic adversity to running this plant. The loss of production and management problems would be increased all out of proportion to any energy savings that could be realized.

Exhibit 1

Consumers Power Company
Load Management Survey

Customer Name _____ Division _____

Address _____

I. Type of Business

Business Code _____

A. Industrial

Manufacturing or Processing of: (Finished product(s) produced)

_____

_____

B. Commercial

Type of Commercial Customer (Department Store, Hospital, etc.)

_____

II. Business Operating Characteristics

Number of Employees (Total and No. per shift if applicable) _____

_____

A. Industrial

Normal Number of Work Shifts _____

Hours: 1st Shift _____ 2nd Shift _____

3rd Shift _____ Other _____

Normal Operating Days Per Week _____

B. Commercial

Business Days Per Week _____

Business Hours Per Day _____ AM to _____ PM

_____

Additional Information (e.g., seasonal changes) _____

_____

III. Gross Area of Plant or Building

Office _____

Merchandising _____

Plant _____

Storage _____

Other (Classroom, gym, etc.) Description or Type & Area _____

_____

Total _____

IV. Major Electrical Uses (Approximate percent of total annual use and estimated connected load)

Use	% of Total	Connected Load Kw	Describe Process or Other Use(s)
Lighting			
Air Conditioning			
Space Heating			
Water Heating			
Cooking			
Processing or Other			

V. Size of Electric Water Heater (Where applicable)

Upper Element Size _____

Lower Element Size _____

Gallons _____

VI. Energy Conservation

Electric energy cost represents approximately what percent of your total product or operating cost?

0-5 _____ 5-10 _____ 10-20 _____ 20-30 _____ 30-50 _____ over 50 _____

What has been done in the past year or two to reduce electric energy use in your building?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

By how much do you estimate you have reduced your use during this period?

_____

_____

Describe any specific action you plan to take to further reduce your use of electric energy.

_____

_____

_____

_____

_____

_____

By how much do you estimate you can reduce your use as a result of this action?

_____

_____

_____

VII. Load Management

Demand for electricity is greater during the day than at night and greater during some months of the year than others. Economic advantages would result if the demand could be more evenly spread throughout each 24 hour period of the year. The following questions deal with some of the issues involved in attaining this objective.

Do you have electric demand control equipment? (If the answer is yes, indicate whether it is manual, semi-automatic or automatic. If no, skip the next two questions.) _____

_____

What load(s) do you control? _____

_____

_____

_____

_____

How much have you been able to reduce peak demand with your equipment? _____

_____

If you do not have demand control equipment now, are you considering it? _____

_____

_____

_____

What could you do to reduce your use of electricity between 11:00 AM and 7:00 PM during the months of March - September? _____

_____

_____

_____

_____

_____

What could you do to reduce your use between 5:00 and 9:00 PM during the months of October - February? _____

_____

_____

_____

_____

_____

_____

How much could you reduce your use during these hours? March - September _____ October - February _____

What do you estimate it would cost to do this? _____

_____

_____

_____

Would the energy "saved" between 11:00 AM and 7:00 PM or 5:00 PM - 9:00 PM be used later at night? _____

_____

If electric energy used between 11:00 AM and 7:00 PM Monday through Friday cost 0.4¢/Kwh more than during the rest of the day, would you change your operation in any way? (If your answer is yes, what would you do?)

_____

_____

_____

_____

_____

Suppose the electric energy used between 11:00 AM and 7:00 PM Monday - Friday cost twice as much as that used at other times. What changes would you make in your operation? _____

_____

_____

_____

_____

_____

_____

_____

What changes would you make if the electric energy used between 11:00 AM and 7:00 PM Monday - Friday cost five times as much as that used at other times? _____

How much load could you shift from the hours between 5:00 - 9:00 PM December - February given an incentive? _____

To what time period would you shift this load? _____

What incentive would be required? _____

How much load could you shift from the hours of 11:00 AM - 3:00 PM July - August given an incentive? _____

To what time period would you shift this load? _____

What incentive would be required? _____

Some electric utilities have an interruptible rate for large primary customers. Service is subject to interruption by the power company when necessary. Could you adjust your operation to an interruptible rate in exchange for lower cost power? _____

If your answer is yes, how much advance notice would you require? _____

What portion of your load could be interrupted? _____

_____ For how long could service be interrupted? _____

The vast majority of human activity is daytime oriented. Therefore, it is anticipated that social and economic implications are connected with efforts to shift electric load to nighttime hours. Please comment on any of these implications you feel are especially significant to your business. _____

Questionnaire completed by _____

Date _____