



A Study of the  
ENERGY-FUEL NEEDS  
of the  
Rochester, New York, area

Prepared as a Public Service  
for the  
Rochester City Council  
by the  
Industrial Management Council of Rochester

Merritt D. Barker  
Donald R. Barry  
Robert W. Baschnagel  
Edward M. Belknap  
William H. Corwin  
Guy C. FitzPatrick  
William J. Kingston

Industrial Management Council of Rochester, New York, Inc.

John D. Hostutler, General Manager

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## INTRODUCTION

Energy is absolutely essential to the welfare of our country and the region in which we live. Recently, the general public has become aware through the press and government statements that there is a potential "energy crisis." We all should have a sense of urgency about the reality that increased fuel consumption and diminishing reserves could threaten the future fuel supply for our residential, commercial and industrial needs.

This study of energy and fuel needs includes Rochester and the related eight counties in the Genesee/Finger Lakes Region. It was conducted by an Energy-Fuel Task Force of the Industrial Management Council of Rochester, N.Y., at the request of the Rochester City Council.

A 30-day time limit was placed on the study so that information contained in it might assist in resolving a local controversy about a Port Authority proposal to contract for facilities to bring large quantities of #6 (residual) oil through the port. Since this oil is primarily used by industry, the IMC, as the local association of industries, was asked to conduct the study. Several representatives of local industrial firms were assigned to the task force and collected the data that forms the basis of the report's conclusions.

The depth of investigation and the methods of research necessarily were limited by the 30-day period and the report should therefore be considered an overview. However, it does:

/Provide a listing of the fuel consumption in the region that can be used as a basis for evaluating community alternatives.

/Identify the major factors outside our area that influence the fuel situation and, where possible, relate them to our community.

/Provide a perspective to these major factors, where possible, by evaluation and explanation.

/Present some conclusions.

This report confines itself to the four main fuels used here for the generation of heat and power. They are coal; natural gas and propane; residual oil, principally #6 and to a lesser extent #4 for large industry, and distillate oil, mainly #2 and small amounts of #1 for home, light industrial and commercial uses.

Some potential energy sources have not been included. Both hydroelectric power and the combustion of refuse are of minor impact. Nuclear fuel requires a highly complex process and no new nuclear power stations are planned for the area within the period to 1980. Gasoline and diesel oil, principally used for transportation power, are not included as such.

The study deals with fuel usage in two time periods. First, to 1975, when present and proposed environmental regulations and combustion processes are fairly well known, and second, from 1975 to 1980, where these factors are less well known.

Since other groups are conducting various environmental impact studies, the committee has not addressed itself to the environmental aspects of particular facilities and locations except as they pertain to the combustion process.

It is the hope of the task force that this report will assist the Rochester community by supplying a greater insight into energy and fuel needs. It represents the best estimate of the task force as to the impact of continuing environmental regulations, technological developments and economic considerations on the adequacy of our supply of energy in the years ahead.

#### Energy Use, Supply and Delivery

An evaluation of estimated 1971 figures show that of the fuel used in the eight county region, 37% was natural gas, 32% was coal, 22% was distillate fuel oil and 7% residual fuel oil. Total usage was one billion, 600 million therms (one therm equals 100,000 BTU). See chart in Appendix C for details.

Natural Gas. In this area Rochester Gas & Electric distributes natural gas. It is supplied by the Consolidated Gas Supply Corporation through pipelines from gathering points in West Virginia, Louisiana and Texas. Consolidated is the major supplier to upstate utilities including RG&E, New York State Electric and Gas, and Niagara Mohawk.

Our area has not felt the full impact of national shortages of natural gas other than in restricted use for new customers. The primary reason is because of Consolidated's operation of major storage areas in Pennsylvania. Because of large volume storage capability, Consolidated can supply the necessary gas needed in peak winter months. They purchase it from other suppliers, who lack comparable storage, during summer months.

Other factors also contribute to relatively little curtailment of natural gas here. They are the mild winters the last two years, and restrictions in gas sales to industrial and commercial users ordered by the New York State Public Service Commission.

During the 1973-74 heating season no further restriction on new gas sales nor any curtailment to present customers is anticipated. However, minor curtailment may occur in the following two year period, but it should not affect present customers unless the winters are abnormally cold.

In the latter part of this decade it is expected that supplies of liquified natural gas (LNG) and synthetic natural gas (SNG) will enable both suppliers and distributors to supply consumer demands without trouble. Both of these sources will substantially increase gas costs to the consumer, perhaps to the extent of doubling present costs in the early 1980's.

National actions could affect area natural gas supplies. President Nixon's Energy Control Board will have a major impact on national fuel supplies. The Federal Power Commission's action on producer's prices, national priorities for natural gas use and the expansion of potential gas and oil producing areas for drilling could radically change both the national and local supply picture.

Environmental groups that have already delayed proposed construction of LNG and SNG plants could, through continued action, reduce forecasted supplies of these fuels. And, the Environmental Protection Agency, through its rulings, can effect changes in the overall fuel consumption mix of coal, oil and gas. The natural gas supply feeding into our area could be increased or decreased by such rulings.

Coal. During recent years, most of the coal used in the Genesee/Finger Lakes region was obtained from mines located in West Virginia or southern Pennsylvania in the Pittsburgh seam. This coal is of a high heat value (13,200 to 13,600 BTU/lb.) and has a sulfur content of 2.5 to 3.2% by weight. The combination of its relatively high sulfur content and the inability of many small mines in the area to participate in unit train shipping has meant a shift in the source of supply.

A unit train shipment of 7,000 tons of coal in a single train reduced freight costs by 70 cents a ton to this area. In the Pittsburgh seam, many small mines with single-car shipments were prevalent. The small producers did not have the facilities to load a unit train in the required time of 24 hours. Seventy-five percent of the coal shipped here comes by unit train.

Today, coal still comes from West Virginia, but new supply areas are central Pennsylvania and Ohio. The coal from these new sources has a lower heat value (12,700 to 13,000 BTU/lb.), but also has a lower sulfur content (1.4 to 1.8%), which meets current environmental standards.

There appears to be adequate supplies of coal available, although the quality continues to deteriorate. Storage facilities enable area users to maintain reserves ranging from 30 to 80 days.

It should be evident that as sulfur restrictions become more stringent, more and more central Pennsylvania and Ohio coals must be used and less of the high heat quality from West Virginia. Present regulations allow such a blend of the two types of coal, but any additional lowering of the sulfur restrictions will cause serious supply problems.

Residual Oil. Residual oil is a product of the refinement of crude oil, a significant portion of which originates in areas outside of the continental United States such as Libya, Venezuela and western Canada. This foreign crude oil moves by pipeline or large tanker to the ports of entry of the United States. In some instances, the oil may be refined into its residual form prior to shipment or may be subjected to refining after its delivery. Residual oils are delivered to the Genesee/Finger Lakes Region by canal barge, rail and motor truck. Some residual oil is delivered to the Port of Albany by water where it is transhipped to high capacity rail cars for delivery to a tank farm in Pittsford. Other supplies are delivered by truck from Buffalo and Syracuse or by canal barge from east coast ports. At the present time, local storage facilities for residual oil amount to 23,700,000 gallons.

The United States imported approximately 25% of its fuel needs in 1971. It is estimated that this year we will import approximately 35%. Our import supplies of all fuels, but particularly crude oil and secondarily natural gas, become more and more dependent on foreign sources where security of supply and cost are most uncertain. "Nationalism" creates political and economic problems for our imports. For example, Canada has recently restricted the export of crude oil by 6% in a move to conserve her own resources.

U.S. government regulations of prices on both gas and oil have contributed to our crisis. They have kept the price of gas far below the market value, thereby encouraging increased consumption and discouraging investment for new sources. Also, by stabilizing the price of gasoline on the high side and the price of residuals on the low side, regulations have encouraged a relative overproduction of gasoline and an underproduction of residuals.

The government is also responsible for the rising direct taxes that are taking an increased amount from the fuel industry's revenues. Chase Manhattan Bank commented in its recent "Outlook for Energy in the United States to 1985," "The group has not achieved sufficient recovery (through adequate prices) for many years. Indeed, despite rapidly rising taxes, the group's average unit price was actually lower in 1970 than 1960. And its poor earnings performance was the inevitable result."

Because of the lack of economic incentives, exploratory drilling in the U.S. for new supplies has declined from 15,000 wells annually in 1955 to fewer than 7,000 wells in 1971. And, from 1960 to 1970, the cost of drilling the average U.S. well rose from \$55,000 to almost \$95,000 each.

The same is true of refineries. Only one was built in 1972. However, there have been indications of interest in constructing fuel treatment plants in the upper New York State area. These plants would modify crude oil into residual and refined oils and produce naphtha as a supply for synthetic natural gas. Within a month construction of such a plant will begin at Oswego and plans are being developed for similar plants in the Buffalo and Syracuse area.

With the growing demand for fuel, this lack of new facilities only makes us depend more on foreign sources.

Distillate Oils. Distillate oil involves many complex factors of production, refining, transportation and storage. Presently all distillate oil is delivered to storage facilities in this area by two private and one common carrier pipelines. These "clean" product pipe lines transport various grades of gasoline, kerosene, commercial Jet "A" fuel, turbine oil and distillate oils #1 and #2.

The lines do not have to be used constantly. They may be stopped and can be restarted in from 30 minutes to an hour. Shutdown could result from a lack of product or of storage facilities at destination. Capacity of these existing lines can be increased by as much as 50% by the construction of additional pumping stations.

The lines serving Rochester originate in the New Jersey tidewater area, the Philadelphia area and Buffalo. Movement through the lines is planned as much as 90 days in advance. Delivery to the consumer could depend upon the supply of the product at origin and/or need for the product at other outlets of the lines. Ultimate delivery is made by motor trucks operated by independent distributors or oil company fleets.

Approximately 50% of distillate oil brought into this area is used for residential heating. The remaining half is used in relatively small heating plants in industrial, governmental and commercial buildings. Local storage facilities are approximately 53,000,000 gallons.

Although area storage and pipeline capabilities for the area are adequate, it is entirely possible that we could experience a shortage of distillate oil because of dislocations of production, refining and transportation on a national or international basis.

#### Energy Cost Trends

In reporting upon energy use, supply and demand, this study has pointed out the complex variables that interact nationally and internationally to influence the ultimate ability of this area to receive fuel.

It appears inevitable that the cost of energy will go up.

It will go up because of some of the elements we have already outlined -- and some new factors.

Natural gas prices have been kept below the level necessary to stimulate production. Oil depletion allowances were cut resulting in decreased investment in the U.S. for exploration. No one really knows how much of an upward adjustment in prices and favorable tax treatment will be needed to produce an adequate level of investment in the U.S.

Several spokesmen for the petroleum industry have identified the need for greatly expanded refining capacity in the U.S. in the next 10 years. The only one under construction was completed this past year. No plans have been approved for any new facilities. Several superports are needed in the U.S. to handle supertankers. None has been approved. Difficulties are being encountered in getting approval for SNG plants, LNG facilities, and oil and gas pipelines. Many needed facilities are being delayed, which will result in higher costs when they finally are built. No one knows what it will mean to new facilities if the courts rule that "no significant deterioration of air quality can be allowed anywhere."

Staggering amounts of money are needed to finance the new facilities and no one knows at what price money will be made available, or if it will be made available at all under current uncertain conditions.

No off-shore exploration currently is being allowed on either the U.S. Atlantic or Pacific coasts where large supplies of gas and oil are believed to be. Federally-held lands hold large deposits of low sulfur coal and geothermal energy, but there is uncertainty if exploration of these areas will be allowed.

The U.S. is having difficulty in adjusting to shifting demands for fuel caused by environmental standards. The demand for natural gas, low sulfur coal and low sulfur oil has been hard to meet. Consideration is being given to relaxing fuel composition standards to allow more burning of high sulfur coal and oil. There is at least one recent example of such relaxation.

International negotiations with OPEC (Organization of Petroleum Exporting Countries) will affect price. U.S. policy in regard to importing refined petroleum products (#2 oil, residual oil, naptha) and liquified natural gas also will affect price.

Taking into consideration the potentiality of each of these trends, the Energy-Fuel Task Force arrived at a composite estimate of percent increase. It shows an average fuel price increase for 1980 using 1972 as the base year and including transportation costs into the area, but not to specific customers:

Coal, 20% to 35%; Natural Gas, 100% to 150%, and Oil, 60% to 100%.

These estimates were drawn from the Dec. 11, 1972, Guide to National Petroleum Council Report, a Nov. 15, 1972, Electrical World article and the Oct. 1972, Office of Emergency Preparedness Report.

#### Environmental Regulations and Fuel Consumption

The Federal Clean Air Act, amended in 1970, forced a sequence of events that led to regulating and controlling emissions and setting air quality standards (for details, see Appendix D). Dating back to 1967, New York is a leader in air quality regulations.

According to the Monroe County Department of Health, in the past five years the ambient SO<sub>2</sub> (sulfur dioxide) concentrations have dropped from .031 ppm to .022 ppm -- essentially the more stringent secondary standard. Recent data from EPA indicates that we are well under the NO<sub>x</sub> (nitrogen oxide) air quality standard of 100mg/m<sup>3</sup>. It is not likely that NO<sub>x</sub> concentrations will exceed the present standard through 1980.

If the sulfur oxide emissions remain stable, the existing fuel composition rule should be adequate to maintain acceptable ambient air quality. This is not a rigorous assumption, as we should consider source concentrations, diffusion, and meteorology. If we find that the regional SO<sub>2</sub> emissions are stable, it is possible that ambient SO<sub>2</sub> concentrations also will remain stable.

Appendix E shows estimates of the annual SO<sub>2</sub> emissions for 1971, 1975 and 1980.

The total SO<sub>2</sub> emissions suggest that the existing environmental regulation (as regards fuel composition sulfur content) will provide adequate environmental protection through 1980.

The interaction and/or independence of several factors affect an environmental evaluation. The Environmental Protection Agency is preparing a fine particulate (dust) criteria. Dust and ash of sub-micron size are felt to be the most significant. New air quality criteria and emission standards probably will be issued before 1975. It is not obvious what the effects of such emission standards will be on fuel use. The emphasis probably will be placed on emission control, such as add-on devices. Simple conversion to oil alone has already been found by some not to be the ultimate panacea to solving particulate emission problems. Conversion to very low sulfur oil may be suitable, however, in 1975 very low sulfur oil will be a rare commodity.

There are many improvements under development in fuel technology and in emission control technology. It is felt they will not be significant until sometime after our study period that ends in 1980.

For example, it is possible that legislation will be adopted in Congress to place air quality control on the same basis legislated for water quality. If this occurs, it would require the application of the current "state of the art" technology to existing sources during the 1980's (see Appendix F). In our region, many are not waiting for new rules, but are attempting to do the best possible job of control as the new technologies become available.

The existence of large quantities of higher sulfur coals combined with feasible flue gas cleaning techniques will yield an upsurge in coal use. We would guess that when adequate emission control systems are available for coal-fired units that total coal and residual oil fuel costs would be similar.

It does not appear that environmental aspects will be important in the energy balance within the eight county region before 1980.

#### Estimated Future Fuel Consumption

Several factors formed the basis for fuel consumption estimates for 1975 and 1980. These estimates are based on the following assumptions:

1. No changes in fuel composition or use regulations through 1980.
2. That major users fuel will continue to meet federal and state new source standards and operate within their present projections.
3. Natural gas and No. 2 oil remain mutually competitive, that is, they are subject to similar restrictions as to supply, price, and distribution through 1980.
4. Boiler flue gas cleaning ( $\text{SO}_2$ ,  $\text{NO}_x$  removal) and coal/oil gasification do not have a significant impact. (see Appendix E).
5. Population and employment projections are similar to the medium rates used by the Genesee/Finger Lakes Regional Planning Board.
6. Residential fossil fuel use follows population growth.
7. Commercial and smaller industrial fossil fuel use follows employment projections.
8. No changes in environmental regulations was assumed because in order to make a judgment as to the need for more restrictive environmental regulations it is necessary to determine the impact of increased use of present fossil fuels on the environment based on present regulations.

For the estimated fuel growth rates see Appendix G.

The chart in Appendix H contains the estimate of future fossil fuel use in our eight county region.

In total fuel consumption, we estimate an increase of about 100 million therms in 1975 as compared with 1971 and another increase of about 100 million therms for 1980 over 1975.

In summary, coal's impact is estimated to be less important -- 31% of total fuel in 1971, 24% in 1975 and 23% in 1980. Distillate fuel is estimated to have about the same relative importance in the total fuel picture here -- 22% in 1971, 23% in 1975 and 23% in 1980 -- although an increase of about 20 million gallons both -- between 1971 and 1975 and between 1975 and 1980 -- will be necessary to maintain that balance.

Both residual fuel oil and natural gas are estimated as being more important in the total picture -- residual fuel oil, 7% in 1971, 12% in 1975 and 12% in 1980, and natural gas, 37% in 1971, 41% in 1975 and 42% in 1980.

#### Potential Use of #6 Oil

The estimates for future use of residual fuel oil (primarily #6) indicates an increase in the period up to 1980 as shown in Appendix H.

Several sections of this report state the task force belief that coal probably will not be eliminated as a major fuel source in the area, specifically through 1980, due to environmental restrictions. This judgment also is based on the continuation of the relative economics of the two fuels. If this should change, coal users may be forced to increase their use of oil based on the relative cost of the two fuels and unforeseen environmental factors. The availability of ample low cost sources of residual fuel oil that might be obtained through the Port of Rochester or other facilities would be a strong factor in the consideration to change.

It is the policy of major fuel users in the region to maintain multiple sources of supply and not commit more than 50% of their consumption to one source. This is particularly true in the case of residual fuel oil. Its availability is dependent to a great extent on factors beyond the control of the users in our region such as foreign government policy, strikes and others. Smaller users would probably secure their fuel needs from a single supplier. It should be noted that if the two largest fuel users in the area converted totally to oil (which we have indicated they are not likely to do), it is estimated that the range in barrels used would be seven to ten million in 1980.

Major users would undoubtedly provide storage on their own property for emergency and back-up supplies. Transportation within this area of residual fuel oil would be by truck in most instances until the quantities were large enough to justify pipelines and/or rail delivery. We do not see the demand for residual fuel oil increasing enough between now and 1980 to require pipeline or rail delivery.

Based upon the information in this study and within its scope, assuming there are no major conversions from coal to oil, it is likely that the demands for residual fuel oil can be met by the present suppliers. However, if a lower cost source of energy is possible by including suppliers not presently serving the area, an overall savings in the cost of fuel may result. The Industrial Management Council Task Force does not feel that these potential savings are sufficient at this time to cause industry to urge use of public facilities to provide a new supply of residual oil if it is not in the best interests of the total community.

It is difficult to assess the effects of the energy crisis in this area. The existing suppliers feel they can satisfy area coal and residual fuel needs. However the factors that could cause us to have a shortage of fuel are outlined in this study and, as we report, are almost entirely beyond the control of the local community.

For this reason, users of fuel must continue to examine their sources and must provide the maximum feasible flexibility in supply.

## CONCLUSIONS

The study conducted by this Energy-Fuel Task Force provides an overview of the fuel needs of our eight county region. It has presented some specific figures and some future estimates on the major stationary fossil fuels that we use. We have discussed energy use, supply and delivery. We also have outlined our energy needs as they relate to future cost trends, environmental considerations. The analysis of the task force in each of the specific areas has been presented. The data and the analysis form the basis for five summary conclusions.

1. There is a national energy crisis. The people of our region -- industrial, commercial and individual home users -- are not islands unto themselves in matters of energy. We are affected by each and every world problem that influences the supply of energy. There is an interaction of supply and demand, almost all of which we cannot control, that will influence our ability to bring fuel into the area and use it.

2. The cost of fuels will be higher. Some sources of energy are in short supply. Technological advancements that will utilize synthetic processes for fuel are some years away and also more expensive than current sources of supply.

3. We need a more reasonable national policy on the supply and use of fuel as it relates to the dual concern of economic versus environmental considerations. The uncertain status of future environmental standards combined with the continuing improvement under existing regulations points out the complexity of this situation in the total fuel picture.

4. As the text indicates there are great unforeseeable factors affecting future fuel usage in the Rochester area. It is the judgment of the task force that there will not be a necessity for a significant conversion from coal to residual oil between now and 1980. Therefore, we do not foresee significant changes for fuel requirements that will warrant substantial additional fuel delivery and storage capabilities.

5. However, the period beyond 1980 is less clear and, therefore, the community should not foreclose any options that would facilitate additional supplies by port, rail and pipeline.

APPENDIX A

TASK FORCE MEMBERSHIP

The task force members are:

Merritt D. Barker	Purchasing Manager	The Gleason Works
Donald R. Barry	Director of Industrial Relations	Industrial Management Council
Robert W. Baschnagel	Vice President	Rochester Gas & Electric Corp.
Edward M. Belknap	Traffic Manager	Rochester Products Division, GMC
William H. Corwin	Community Relations Manager	Sybron Corporation
Guy C. FitzPatrick	Manager - Potentials Planning/ Marketing Analysis	Xerox Corporation, Information Systems Group
William J. Kingston	Superintendent, Utilities	Kodak Park Division, Eastman Kodak Company

## APPENDIX B

### RESEARCH SOURCES

Members of the committee met with many individuals and groups representing a wide range of interests. Data were gathered from local manufacturers, a physics professor, the Center for Governmental Research Inc., the Rochester Chamber of Commerce, the Associated Industries of New York State, Inc., and the Charlotte Citizens Group Action to Save the Genesee.

The fuel and power industry was represented by the Oil Heat Institute, Rochester Gas & Electric Corporation, bank trust officer specializing in analysis of the oil industry, and local and state oil and coal distributors.

Governmental sources included representatives of the City Fire and Planning Bureaus, the Genesee/Finger Lakes Regional Planning Board, the New York State Department of Labor, the Department of Environmental Conservation, Division of Air Resources, and a City councilman.

Numerous published materials were reviewed from these and other sources, including the Environmental Protection Agency.

APPENDIX C

ESTIMATED 1971 EIGHT COUNTY REGION FOSSIL  
FUEL CONSUMPTION, STATIONARY USERS ONLY

Anthracite Coal

Tons		73,000
Therms	*1%	18,000,000

Bituminous Coal

Tons		2,000,000
Therms	31%	500,000,000

Distillate Fuel Oil

Barrels		6,200,000
Therms	22%	360,000,000

Residual Fuel Oil

Barrels		1,800,000
Therms	7%	110,000,000

Natural Gas

1000 Cubic Feet		57,000,000
Therms	37%	590,000,000

TOTAL		1,600,000,000 THERMS
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1 Therm = 100,000 BTU

1 Barrel = 42 Gallons

\* % of Total

## APPENDIX C (cont.)

The source of most of the fossil fuel consumption data is the New York State Department of Environmental Conservation (DEC), Division of Air Resources (DAR). The Division's director, Alexander Rihm, Jr., and his head of abatement planning, Ted Davis, have been extremely helpful throughout this study. Much of the data is gathered, checked and summarized at the Avon, N.Y., office of DEC. A review of the residual fuel oil data was made with William Hartenstein, who is in charge of the fuels monitoring program in that office.

The Division is required by the Federal Environmental Protection Agency to monitor, record, and report the use of fossil fuels and their probable emissions. Large fuel users may be required to file monthly fuel composition and consumption reports with the Division. For instance, residual fuel oil users consuming more than 100,000 gallons per year are considered large users. Of 59 regional fuel oil users replying to the 1972 survey of Monroe County and surrounding counties, 43 exceeded 100,000 gallons per year.

Small users consumption is based on extrapolations of partial vendor reports.

The eight county region of Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne and Yates was selected as the area within the reach of central fuel distribution facilities based in Monroe County.

APPENDIX D

AIR QUALITY REGULATIONS

The Federal Clean Air Act, and as amended in 1970, forced the following sequence of events:

1. The issuance by EPA of air quality criteria documents for various pollutants -- particulates, nitrogen oxides, sulfur dioxide, carbon monoxide, etc.
2. These criteria were followed by air quality standards (the allowable concentration in ambient air -- for instance, sulfur dioxide).

Primary Standard (to protect human health)	.03 ppm annual average
Secondary Standard (to protect welfare, social and economic well being)	.02 ppm annual average

3. EPA issued new source emission standards -- those emission limits applicable to new or modified sources and representing best practicable technology.
4. The States are expected to promulgate regulations controlling emissions from existing sources -- control to be complete by 1975. In New York State, the Department of Environmental Conservation has promulgated the following rules pertinent to this discussion.

R226 -- Fuel Composition and Use - Stationary Air Contamination Sources (3/16/73)

R227 -- Stationary Combustion Installations (Particulates, Smoke Emissions, NO<sub>x</sub> Emissions)

APPENDIX E

EIGHT COUNTY REGION, ESTIMATED SULFUR DIOXIDE EMISSIONS (in Tons/Year)

<u>From All Stationary Sources, by Fuels</u>	<u>1971</u>	<u>1975</u>	<u>1980</u>
Distillate Fuel Oil	65,000	70,000	75,000
Bituminous Coal	92,000	89,000	81,000
Residual Fuel Oil	6,000	11,000	12,000
TOTAL	161,000	160,000	168,000

The variations between the three totals probably are not significant. The 15% increase in emissions from distillate fuel users would probably only be significant if this increase in emissions is an increase in emission density -- tons/sq. mile. As most of this increase is likely to be in suburban areas, the emission density from this group probably will not increase. Note that this group is primarily a low level emission group -- typical chimney elevation of 20-25'. Ambient concentrations generally vary inversely as the square of the elevation of the gas or smoke plume.

## APPENDIX F

### LONG-RANGE BENEFITS OF TECHNOLOGY ON THE REGIONAL FUEL SUPPLY

There are several areas of technological impact which might cause a shift in fossil fuel supply and demand:

1. Boiler Flue Gas Scrubbing (SO<sub>2</sub> and NO<sub>x</sub> removal).
2. Gasification of Coal.
3. Gasification of various petroleum feedstocks.
4. Waste heat recovery from refuse.

#### BOILER FLUE GAS SCRUBBING

If reliable, economic commercial boiler flue gas clean up systems were available, especially those systems that did not generate a substantial solid waste problem, there would probably be a shift in the future fuel market for our region. A significant quantity of residual fuel oil now being burned by very large users might be replaced by coal. It is interesting to note that there are at least 14 firms who are offering commercial or demonstration sized sulfur oxide control systems. (Chemical Engineering Progress, August '72; Electrical World, December 1, '72; Power Engineering, October '72).

Most of the U.S.'s utilities are waiting for successful systems. At the present time reliable systems are not available at any cost. Therefore, a "draft study prepared by staff members of Environmental Protection Agency, Commerce Department, Federal Power Commission and White House Office of Science and Technology warns that as many as half the coal-fired plants needing sulfur removal equipment may still be lacking it by end of 1977". The delays "may lead to flood of orders that could exceed production capacity of the control system industry by the mid-1970's...".

Another reason cited for the delay in orders by utilities is "the need to find some means of disposing of 42-million tons/year of sulfur-containing sludge..." -- in a world where there is an oversupply of sulfur. (Air/Water Pollution Report, December 25, 1972).

This and similar information in EPA's "Implementation of State Implementation Plans on Fossil Fuels Availability and Requirements" indicate that SO<sub>2</sub> control systems will probably be applied only where existing air quality conditions are very poor or for new utility plants.

GASIFICATION OF COAL

There are at least eight processes for producing synthetic or substitute natural gas (SNG) from coal. One of these, the Lurgi, is commercially available in Europe where 12 plants are in operation. The cost is a very substantial increase over our cost for natural gas.

Various studies on proposed coal gasification plants for the U.S. suggest a minimum economic size of 250,000,000 cubic feet per day. Typical capital costs range from \$200,000,000 to \$280,000,000. (Oil & Gas Journal, February 12, 1973). A sizable investment will also be required to open, or re-open, coal mines as a typical coal gasification plant will require 16,000 tons/day of Bituminous coal. Use in such great volume would make it necessary for the plant to be located at a mine.

What is the status of coal gasification? The U.S. Department of Interior and the American Gas Association agreed in 1971 to commit themselves to a \$300,000,000 program to develop a process for producing "high quality, pollution-free gas from coal on a commercial basis by '80". (Chemical Week, October 27, 1971). At the present time three coal gasification pilot plants have been built and two others are committed.

It would seem that sometime in the future coal gasification will be a reality on a commercial scale. The impact on the Rochester area is unknown. On a national scale SNG production from both coal and petroleum is predicted to supply less than 10% of the nation's need by 1980.

SNG FROM PETROLEUM

Petroleum gasification plants have been relatively popular overseas. (Chemical Engineering Progress, December, 1972). There are almost 300 plants for producing gas from petroleum in operation. The only U.S. plant that we are aware of is a new 60,000,000 SCF/day Ashland Oil Plant in Buffalo. Petroleum fed SNG plants may be more economic in smaller capacities. Due to the high volume of oil required it is likely such plants would be constructed closer to the site of the oil and Rochester receive it by pipeline. It is difficult to predict if SNG from petroleum will have any impact on the Rochester area. A large plant (269,000,000 SCF/D) would require 2,500,000 gallons per day of crude oil.

WASTE HEAT RECOVERY FROM REFUSE

The amount of fossil fuel that could be displaced by refuse burned in an industrial or utility boiler depends on recycling efforts - of cardboard and fibers - and the geographic area from which the refuse is transported. Within Monroe County with minimal recycling up to 125,000 tons of coal or 22,000,000 gallons of residual fuel oil could be replaced by the burning of refuse. (This would be something less than 2% of the annual energy consumed in the region.) If burned in existing facilities this displacement of fossil fuels would also result in a decrease in sulfur oxides emitted, but a substantial increase in particulate emissions. Refuse has a relatively high ash content per unit of heat input.

APPENDIX F (cont.)

At the present time utilization of the energy in refuse is an unknown factor in future fuel consumption in the region.

APPENDIX G

FOSSIL FUEL GROWTH PROJECTION RATES

Growth

1972 through 1975

Residential	4%	For 4 Year Period
Commercial	5%	For 4 Year Period
Industrial	5%	For 4 Year Period

1976 through 1980

Residential	5%	For 5 Year Period
Commercial	10%	For 5 Year Period
Industrial	10%	For 5 Year Period

APPENDIX H

ESTIMATED FUTURE EIGHT COUNTY REGION FOSSIL FUEL CONSUMPTION

STATIONARY USERS ONLY

		<u>1971</u>		<u>1975</u>		<u>1980</u>
Anthracite Coal						
Tons		73,000		32,000		15,000
Therms	*1%	18,000,000		8,000,000		4,000,000
Bituminous Coal						
Tons		2,000,000		1,700,000		1,700,000
Therms	31%	500,000,000	*24%	420,000,000	*23%	420,000,000
Distillate Fuel Oil						
Barrels		6,200,000		6,800,000		7,200,000
Therms	22%	360,000,000	23%	390,000,000	23%	420,000,000
Residual Fuel Oil						
Barrels		1,800,000		3,100,000		3,600,000
Therms	7%	110,000,000	12%	200,000,000	12%	220,000,000
Natural Gas						
1000 Cubic Feet		57,000,000		69,000,000		73,000,000
Therms	37%	590,000,000	41%	710,000,000	42%	750,000,000
TOTAL		1,600,000,000 Therms		1,700,000,000 Therms		1,800,000,000 Therms

1 Therm = 100,000 BTU

1 Barrel = 42 Gallons

\* % of Total