1992 Energy Policy and Conservation Report

TRANSITION INTO THE 21ST CENTURY

Pursuant to Mn Stat 216C.18

Minnesota Department of Public Service

1992 Energy Policy and Conservation Report: Transition into the 21st Century

December 1992

PREPARED BY

Minnesota Department of Public Service

Suite 200
121 East 7th Place
St. Paul, Minnesota 55101-2145
(612) 296-5120

TABLE OF CONTENTS

Executive Summary

EXECUTIVE SUMMARY

Minnesota is at a crossroads in deciding our energy future. Over the last 30 years energy use in Minnesota has doubled. If we continue current trends, we will increase our energy use over the next 30 years by an additional 40 percent. That magnitude of increase would mean more power plants, more pipelines, more traffic, more air pollution, and higher energy costs. The Department of Public Service believes it is time for Minnesota to choose a new energy path: one that maintains a balance of our environmental and economic interests; one that sustains the quality of life Minnesotans have come to expect.

A few recent facts and figures illustrate the importance of choices about energy use. In 1990, our state consumed over 1.3 quadrillion Btus of various energy types to provide the 930 trillion Btus ultimately used by Minnesota consumers. The economic cost to consumers for this energy use was a record 6.8 billion dollars. The cost to the environment was 840,000 tons of carbon monoxide, 250,000 tons of nitrogen oxides, 350,000 tons of sulphur dioxide, 335,000 tons of volatile organic compounds, and 157,000 tons of particulate matter.

It is clear that our energy use patterns affect both the economy and environment of our state. It is also clear that we need future energy policies that balance and sustain both our need for a strong economy and a clean environment. This Report outlines what the Department of Public Service considers to be a sustainable future energy policy, one that both strengthens our economy and improves our environment. It outlines a broad statewide energy policy goal. It also presents five more specific, quantifiable goals for the future and strategies by which to achieve these goals. The results of achieving these goals are also presented, as is a discussion of the current status and future outlook for all of our major energy sources.

STATEWIDE ENERGY POLICY GOAL

Assure continued access to reliable, reasonably priced, efficient, and economically sound energy services to Minnesotans now and into the future through environmentally responsible resource use.

MEASURABLE GOALS FOR THE FUTURE

GOAL 1: Ensure that the U.S. Department of Energy (DOE) begins to remove Minnesota's nuclear waste by 2000, and hold DOE to its schedule for operation of a nuclear waste repository by 2010.

GOAL 2: Protect a strong state role in future nuclear licensing and pipeline siting decisions.

GOAL 3: At a minimum, double the total amount of renewable based energy used within the state by 2020.

GOAL 4: Improve the efficiency of our energy use, measured in Btus per real dollar of gross state product, by at least 30 percent, by the year 2020, while maintaining or improving our comfort and productivity.

GOAL 5: Create a self supporting, innovative, sustainable energy industry in Minnesota.

RESULTS OF ACHIEVING THESE GOALS

As Minnesotans implement the policies and decisions necessary to achieve these goals, both the economy and environment of the state will improve. Department forecasts comparing a goal achievement scenario to a baseline projection (i.e. continuation of present trends) indicate the following:

- 20 percent greater energy efficiency by 2020;
- stabilizing per capita energy consumption at 1990 levels compared to a 25 percent increase under baseline;
- doubling of total renewable energy resource use by 2020;
- energy expenditure, as a percent of gross state product, will only increase half as much as under baseline;
- growth in per capita gross state product will be just as strong as baseline; and
- much smaller growth in emission of energy related air pollutants, some stabilizing at 1990 levels.

We are at a crossroads in deciding our energy future. Minnesota needs a strong and dynamic energy policy, but government action alone is not enough to meet this future challenge. An effective new partnership between government, utilities, business, and consumers is needed to forge new solutions. Actions are needed now to begin down this new path.

Introduction

1

INTRODUCTION

"The role of the Department of Public Service is to protect the public in utility rate and quality of service matters, and to ensure that responsible, economically justifiable use of renewable resources and energy conservation is incorporated into the decision making of industrial, commercial, and individual citizens of Minnesota. It is from this perspective that this Report has been prepared and presented."

Krista Sanda
Commissioner
Minnesota Department of Public Service

The Department's 1992 Energy Policy and Conservation Report: Transition into the 21st Century, as required by Minnesota Statutes 216C.18, assesses the critical energy issues facing Minnesotans and discusses actions required to implement a sound and effective state energy policy. Topics covered within the Report include:

- our current energy use patterns and how we arrived here.
- major issues associated with Minnesota's energy sources, including electricity, natural gas, petroleum, and renewables.
- an energy goals statement for the state of Minnesota and a set of guiding principles for decision making.
- aggressive, yet attainable, energy objectives that are specific and measurable through the year 2020.
- recommendations for federal, state, local, and consumer actions to achieve these objectives.

THE NEED FOR A LONG-TERM ENERGY POLICY

The need for a long-term energy policy is demonstrated by reviewing our historical demand levels, examining our present energy use, and projecting our future energy use based on reliable assumptions. For example, recall the 1970s and 1980s, when major international, national, and local events highlighted the critical role energy plays in our lives:

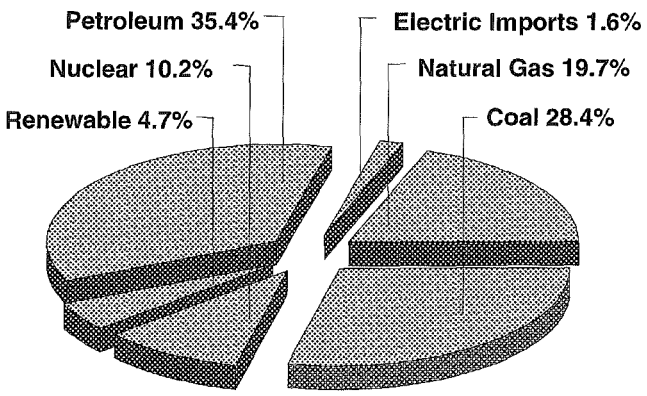
- two oil embargoes and the resulting lines and rising prices at Minnesota gasoline stations;
- the natural gas shortages and fears of whether Minnesotans would be able to heat their homes in the winter;
- the nuclear power plant accidents at Three Mile Island and Chernobyl;
- the concern and violence during the powerline protest; and
- the construction of major coal-fired electric generating plants and the resulting electric rate increases.

Consider also our current energy status, which presents a mixed picture.

- We have seen passage of major national legislation on energy and the environment, but we have also seen the Gulf War, Desert Storm, when much of the free world went to war to pro-

FIGURE 1-1

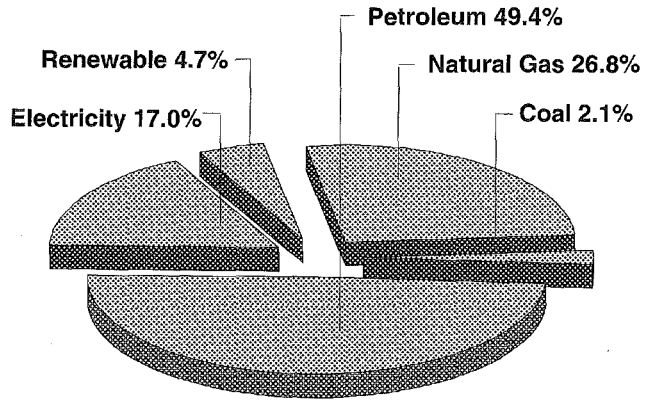
1990 Primary Energy Use by Fuel Type



Total = 1.4 Quadrillion Btus

FIGURE 1-2

1990 Consumer End-Use Energy Consumption



Total = 930 Trillion Btus

tect the free market flow of oil. While dire predictions of major supply and price disruptions did not materialize in this instance, the War underscores the continuing volatility of the Middle East and the vulnerability of our nation's increasing dependence on foreign oil.

- Although Minnesota has increased investment in conservation, the projected growth in our energy demand will outstrip our current supply. Without change, major capacity additions and price increases are likely.
- We are part of the most mobile society on earth, an important contributor to our economic success. However, that success has a significant downside, as economic and environmental costs of our transportation system continue to mount.
- And while Minnesota witnessed the state's first operable, commercial wind farm located in Marshall, we will soon see construction of above-ground storage of nuclear waste at Prairie Island.

In Minnesota we are at a crossroads in deciding our energy future. The Department's current baseline forecasts project our state's energy use to grow by more than 40 percent by the year 2020. At that time Minnesota's utilities and energy industries will be consuming almost 1.9 quadrillion Btus in primary energy sources to create the almost 1.4 quadrillion Btus of end-use energy required by Minnesota consumers. This is projected to cost Minnesota consumers more than $60 billion (nominal). This energy increase will affect both our economy and our environment. How we handle the many crucial current and future energy issues will determine in large part just how bright our future will be. The issues and challenges ahead include:

- How should we handle relicensing and recertification of our nuclear power plants?
- Although nuclear generation is free of the harmful air emissions associated with coal-fired plants, it presents serious concerns about future safety, costs, and the failure of the federal government to meet its own deadlines on nuclear waste disposal.
- How much should we rely on natural gas in our energy future, given that it is less environmentally damaging than other fuels, yet prone to supply and price fluctuations?
- What role should renewable energy play in meeting our future energy needs and how can we best tap that resource in a cost-effective manner?
- How can we focus the attention of government, industry, and individuals on transportation and transit energy issues to find creative ways to meet our transportation needs in an energy efficient, environmentally sound, and cost-effective manner?

- What actions do Minnesotans need to take individually and at the national, state, and local levels to effectively implement sound energy policies?

Our progress and ultimate success is as ill-served by simplistic solutions as by complacency.

Minnesota needs a strong and dynamic energy policy, but government action alone is not enough to meet this future challenge. Individuals must also take responsibility in meeting these challenges and shaping our energy future. An effective partnership is needed to forge new solutions. Actions are needed now to begin down a new path.

Development of a State Energy Policy

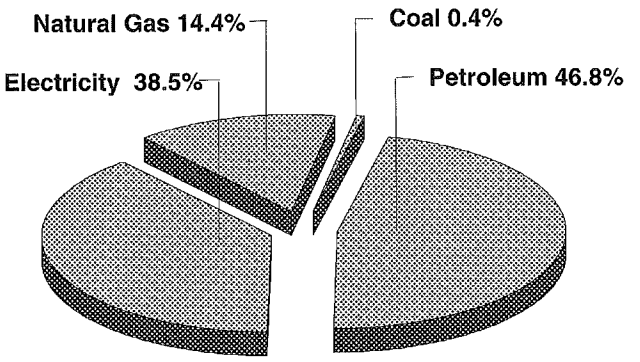
In developing a statewide energy policy, DPS identified two crucial needs. First, it is imperative that we have a clear and accurate picture of our current energy consumption levels and how we arrived here. The data presented in this report on 1990 energy consumption and cost as well as the consumption trends of the last 30 years are primarily taken from the Minnesota Energy Data Book: Energy Trends From 1960 Through 1990, December 1991. The second important need is to develop a clear and easy-to-follow "roadmap" to guide policy development.

The Current Energy Picture. In 1990, Minnesotans — including residential, commercial, industrial, agricultural, and transportation consumers — used 930 trillion Btus of energy to heat homes, light stores, operate industrial processes, and fuel autos, trucks, and tractors. To make this energy — what we call end-use energy — available to consumers, Minnesota utilities and energy suppliers had to generate or buy more than 1.3 quadrillion Btus of what is called primary energy. The difference between these two numbers — end-use energy and primary energy — is approximately the amount of energy lost in electrical generation and transmission. This 371 trillion Btus amounted to 28.5 percent of the primary energy consumed within the state.

Petroleum products provided 35.4 percent of the 1990 primary energy use and 49.4 percent of consumer end-use energy. Coal provided 28.4 percent of Minnesota's primary energy use, but since it is almost exclusively used in electrical generation, it provides for very little of consumer end-use.

FIGURE I-3

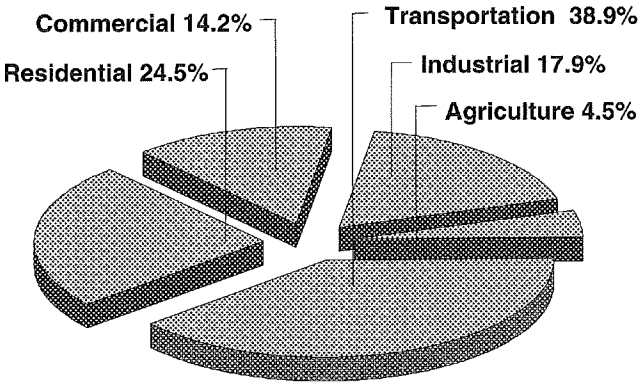
1990 Consumer Energy Expenditures



Total = $6.8 Billion

FIGURE I-4

1990 Energy End-Use by Sector



Total = 930 Trillion Btus

FIGURE I-5

1990 Statewide Energy Use Associated with Electricity Production

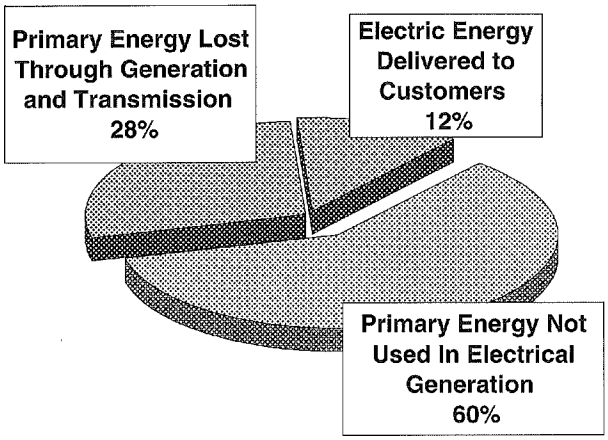


FIGURE I-6

Primary Energy Consumption

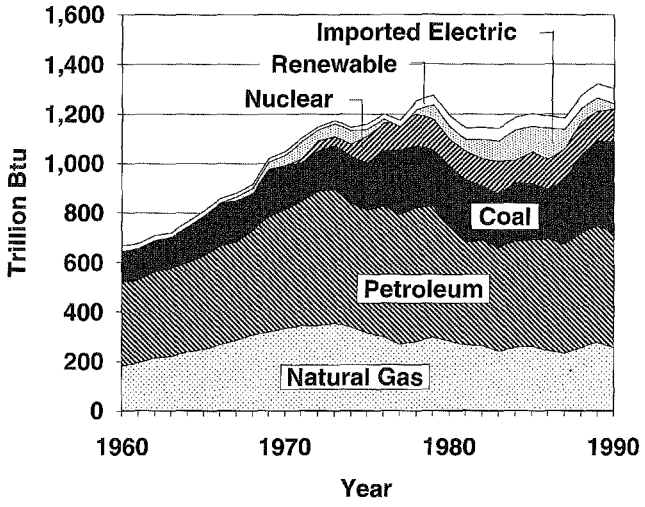
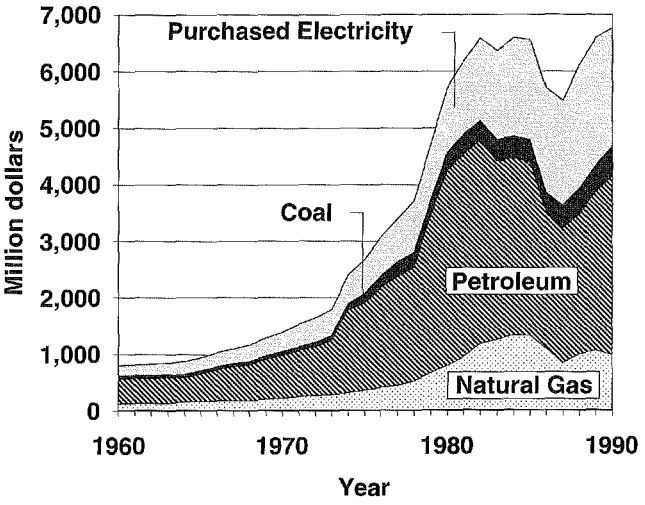


FIGURE I-7

Consumer Energy Expenditures



Natural gas was the source of 19.7 percent of the primary energy use and 26.8 percent of consumer end-use.

Energy-expenditure data generally include only consumer end-use expenditures, since the costs of electrical generation fuels such as nuclear and coal are passed through to consumers. In 1990, Minnesota consumers paid over $6.8 billion for energy. The largest portion of expenditures, 46.8 percent, went for petroleum products. The second largest expenditure, 38.5 percent, went for electricity, despite the fact electricity provided only 17 percent of end-use energy. This discrepancy shows that electricity is a high cost, premium energy source.

Transportation is the largest consuming sector within Minnesota, accounting for 38.9 percent of 1990 end-use energy consumption. Next is residential at 24.5 percent, industrial at 17.9 percent, commercial at 14.2 percent, and finally, agriculture at 4.5 percent. Since all of these figures are presented as end-use values they exclude electrical generating and transmission losses. As mentioned earlier, electrical generation and transmission "lose" approximately 371 trillion Btus of the state's total primary energy consumption of 1.3 quadrillion Btus. If these losses were considered a "sector," electrical generation and transmission losses would become one of the largest consuming sectors at 28.5 percent of statewide primary energy use as illustrated in Figure I-5.

Figures I-6 and I-7 show trends in energy consumption and expenditures over the past 30 years. Major shifts in energy consumption and expenditure coincided with the Arab oil embargoes and associated price shocks of the 1970s. The peak in primary energy consumption came in 1989, caused partially by the rise in demand for heating fuels during a colder than normal winter. Consumer expenditures, on the other hand, reached their highest level in 1990. The growth rate in spending, however, slowed between 1989 and 1990, when compared to the previous two years. This is an example of higher fuel prices being partially offset by weaker consumer demand.

"Roadmap" to Statewide Energy Policy. In developing a roadmap toward a comprehensive statewide energy policy, DPS used a systematic process that included a four-step framework:

- An energy goal statement;
- A set of broad guiding principles for judging energy policy decisions;
- A set of long-term quantifiable objectives; and

- A set of specific actions or strategies designed to meet the long-term objectives.

Developing the broad energy goal statement was the first step. The Department examined existing state policy as set forth in Minnesota statutes, primarily 216B and 216C. These statutes incorporate several policy principles relating to energy: increasing the efficiency of energy use, developing renewable energy sources, minimizing the need for electric generating plants, proportionally reducing the use of fossil fuels, providing reliable service to energy customers, providing energy education, enhancing energy planning skills, and planning for energy emergencies.

To this foundation the Department added several emerging issues related to energy. The first is the growing recognition of the critical links between energy use and adverse environmental effects. The second is the recognition of the significant economic effects of energy use, especially on the poor. And lastly, the growing acceptance that energy providers are selling energy services, not just energy. Wes Birdsall, manager of the Osage, Iowa, municipal utility which has implemented one of the nation's most effective community-wide conservation efforts, states it this way: ".... we sell warm houses and cold beer, not electricity."

Combining these components, the Department developed the following goal statement for Minnesota energy policy:

Ensure continued access to reliable, reasonably priced, efficient, and economically sound energy services to Minnesotans now and into the future through environmentally responsible resource use.

The next step was to develop a set of broad, guiding principles that would become the yardstick by which energy policy decisions could be discussed and evaluated. Through internal discussion, the Department came up with the following set of 12 guiding principles that are specific enough to clarify intent, yet general enough to allow consensus.

1. Maximize the efficiency of energy use.

2. Strive for a greater percentage of Minnesota's energy consumption to be supplied by Minnesota-produced, renewable energy sources.

3. Develop sustainable energy sources, technologies, industries, and practices.

4. Adopt flexible strategies that recognize and adapt to uncertainty and risk.

5. Enhance consumer access to information about energy use and efficiency.

6. Develop energy planning and management skills throughout state and local government.

7. Develop delivery systems that maximize consumer access to reliable and cost-effective energy services.

8. Adopt energy policies that complement Minnesota's economic competitiveness.

9. Enhance Minnesota's preparedness for possible future energy emergencies.

10. Pursue an effective relationship with the federal government, national standards organizations, and other governmental entities regarding energy policy matters.

11. Create opportunities for participation in state energy policy making by all interested parties, including the general public.

12. Base public policy actions related to energy on a set of specific, measurable, long-range policy objectives.

Public Participation. The Department believes that public participation in the development of state energy policy is critical, as stated in principle 11 above. To receive feedback on the proposed policy framework and test the validity of the goal statement and guiding principles, the Department initiated a series of public meetings throughout the state in March of 1992. The Department also wanted to hear the public's concerns regarding energy and their ideas on quantifiable objectives and strategies for state energy policy.

TABLE 1

Participants in Public Meetings

Affiliation	Number	Percentage
Private Citizens	37	35%
Utility Officials	20	19%
Environmental Organizations	18	17%
Building Industry	8	8%
Individual Entrepreneurs	8	8%
Government Agencies	8	8%
Large Businesses	5	5%
Industry Association	1	1%

At these meetings, the Department received 105 oral or written statements. The background of the people who participated is shown in Table 1.

The small turnout at these meetings was a disappointment to the Department, given the great importance of energy policy to the state. The low number of comments received does not allow us to draw inferences regarding public sentiment on the topics. The comments are summarized here, however, and were taken into consideration in formulating the body of this Report.

Nearly all participants voiced support for the DPS energy policy goal statement and guiding principles. They differed, however, on the emphasis that should be given to "reliable" and "reasonably priced" as compared to "environmentally sound" energy sources. Their views can be broadly characterized into one of the following three groups.

The largest group, about half of the participants, stressed that environmental concerns must be satisfactorily addressed before cost and reliability are considered. They expressed concern about the effects of acid rain, nuclear wastes, metropolitan air quality issues, and the potential impacts of global climate change. They also thought that a transition to greater efficiency and renewable resources would help rather than hurt the state economy in the long run by providing more jobs within the state and greater profitability to businesses. These views were represented at all of the meetings, but were dominant in Rochester and St. Paul.

About 30 percent of the participants chose to focus on specific strategies for reducing traditional energy use. Their support for environmental concerns was either explicit or implicit, but their message emphasized specific strategies, such as carbon taxes, mass transit programs, or renewable energy development strategies. Again, these people were represented at all of the meetings.

Approximately 20 percent of the participants stressed the importance of low cost, reliable energy sources over environmental concerns. These were by and large the utility representatives. This message was especially strong in the western part of the state, where electricity is generated primarily by coal-fired plants in Minnesota. They voiced serious doubts about the threat of global climate change and they were opposed to including environmental externalities in pricing until costs were accurately determined and all cause and effect relationships proven. They wanted minimal government intervention and believed any environmental

mandates or tax polices related to energy should be made at the national level to prevent inequities between the states and regions.

Approval for conservation was widespread, especially if the words "cost-effective" were added to the phrase. Many spoke of the utilities' unique position to play a vital role in conservation and renewables and the state's unique role in setting strong energy efficiency standards and codes.

Support for renewable energy sources was widespread, with more than half of the participants speaking on behalf of further development. Wind energy received the most attention. A small number singled out biomass and energy crop farming as potential sources. There were also some negative views on renewables, all from utility representatives who objected to the high cost and questioned the reliability. They wanted the cost of experimentation and development of renewable energy sources to be supplied by government or industry, not by utility customers. They did say, however, that utilities should receive tax benefits or accelerated depreciation schedules if they do invest in renewable energy sources.

ELECTRICITY

2

ELECTRICITY

"An effective state energy policy must also require that the entire, true cost of energy be recognized and paid up front... including disposal of residue, government subsidies, health impacts, crop losses, military costs, and corrosion to name a few."

Dr. J.D. Jones
Izaak Walton League
Rochester Public Meeting
March 18, 1992

"The main concern of our customers is the desire for reasonable electric rates that are relatively stable over the long run with no big increases or surprises."

Don Boyce
East Grand Forks Water & Light
Moorhead Public Meeting
March 5, 1992

The way we produce, use, and regulate electricity has dominated energy issues over the past four years. Heightened awareness of the economic and environmental consequences of electricity production has played a key role in focusing debate on electric issues. Our rapidly growing demand for electricity ensures that this debate will continue, as Minnesota faces crucial choices in how to supply that demand. Continued failure of the federal government to make progress in developing a nuclear waste disposal facility makes us acutely aware of how the energy choices we make now have serious consequences for the future.

This chapter examines our energy past, present, and future with respect to electricity. A review of Minnesota's historic trends in electricity production and use is followed by a discussion of current electricity issues and trends, focusing on developments of the past four years. Finally, we identify concerns for the future and directions Minnesota should pursue in charting its electric energy future.

HISTORIC TRENDS: GROWTH IN ELECTRIC USE

Except for the periods of recession in the 1980s, electricity consumption has grown consistently across all customer sectors since 1960, as shown in Figure II-1.

Although the average growth rate during the 1980s was 3.2 percent, this figure is skewed due to decline in consumption during recession years. Excluding the 1982 and 1986 years, consumption grew by 4 percent during this period, a strong growth rate.

The rate of growth in electricity consumption parallels changes in the price of electricity, demonstrating an elastic relationship between the two. (Figure II-2) This relationship demonstrates the importance of pricing when implementing policies on electricity.

As demand has continued to grow and prices have changed, Minnesotans' expenditures for electricity have increased by an average annual rate of 8.8 percent from 1960 to 1990, reaching a level of $2.6 billion in 1990. (Figure II-3)

Finally, the mix of fuels used to generate electricity for Minnesotans has changed over the past 30 years. While renewable energy (most notably, hydroelectric power) contributed 1.4 percent in 1960, its relative share has declined, due to both a depletion of available hydro sites and the addition of traditional power plants to meet increased demand. During the 1970s, Northern States Power Company (NSP) added three nuclear generating units to its system, making nuclear fuel a large contributor to our generation mix. (Figures II-4 and II-5)

CURRENT TRENDS:
CONTINUING GROWTH IN DEMAND

Our current electricity picture looks much like our past: rapid growth in consumption; plans for new, traditional coal-fired baseload plants and gas-fired peaking plants; and traditional utilities delivering electricity services.

Minnesotans currently spend about 30 percent of their energy dollars on electricity, for a total of $2.6 billion in 1990. These expenditures are divided fairly evenly among the various customer sectors. (Figure II-6)

FIGURE II-1

Electricity Consumption by Sector

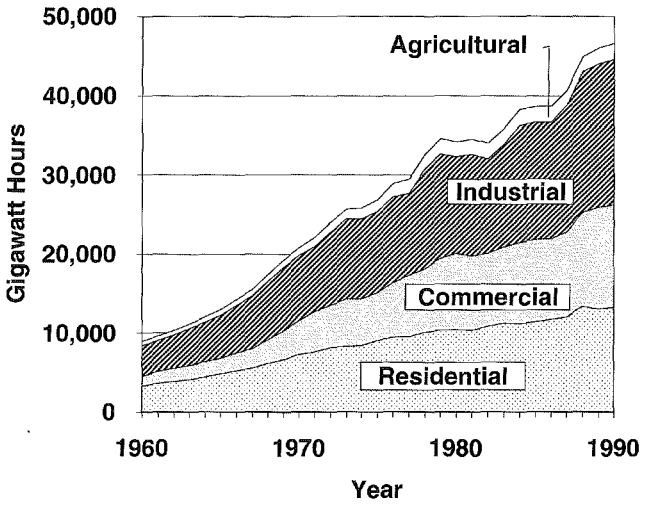
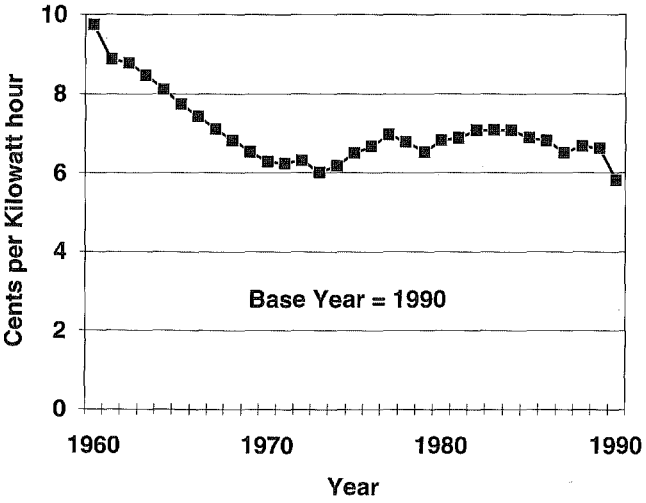


FIGURE II-2

Average Real Electricity Prices



In each customer sector, electricity accounts for roughly the same proportion of total energy use. Due to the economies of serving larger customers, the industrial class has generally lower rates for electricity and, therefore, its percentage of total expenditures is lower than its percentage of consumption. The opposite is true for the residential customer. (Figure II-7)

Different types of consumers use electricity in a variety of ways, with lighting and cooling as major uses. (Figures II-8, II-9, II-10)

Use of electricity reached an all-time high of 46,627 GWH in 1990, and utilities experienced record peaks during the summer heat wave. Utilities project that electricity consumption will continue to grow, due primarily to the increase of air-conditioning in the residential market and increased use of office equipment in the commercial market. (Figure II-11)

Minnesota utilities meet demand for electricity primarily through generation from coal and nuclear power plants, as shown in Figure II-4. The environmental impact of this generation mix is high, as coal-fired plants emit significant pollutants and nuclear generation creates highly radioactive material that remains dangerous for thousands of years. Meanwhile, renewable based generating sources such as wind and photovoltaics do not provide the consistent availability needed for base load generation.

Finally, electricity is supplied to Minnesotans through several types of utilities: investor-owned, municipal-owned, and cooperatives. As shown in Figure II-12, investor-owned utilities supply the vast majority of Minnesota's electricity.

Of these utilities, only the four investor-owned utilities and one cooperative distribution utility are subject to rate regulation by the Minnesota Public Utilities Commission (PUC). Most cooperatives and all municipal utilities, although pri-

marily accountable only to their member- or citizen-customers, are subject to some state oversight, most notably on construction of large, new power plants or transmission lines, determination of service territories, quality of service issues, and minimum investments in demand-side resources.

CURRENT ISSUES AND DEVELOPMENTS: NUCLEAR WASTE STORAGE AND DEMAND-SIDE INITIATIVES

Electricity is no longer "penny cheap." Increased awareness of both the economic and environmental costs has brought new regulatory processes and goals designed to encourage conservation/efficiency and initiate use of renewable resources.

Nuclear Waste Storage

The urgency of need for permanent nuclear waste storage and alternate energy sources was brought home to Minnesotans in 1991 when Northern States Power filed for a Certificate of Need from the PUC to construct additional storage facilities for waste from its Prairie Island nuclear plant. NSP, the only Minnesota utility using nuclear generation, will exhaust its current capacity for storing spent fuel at Prairie Island in 1995. (NSP's other nuclear plant, at Monticello, will run out of storage capacity in 2006.) Key to this issue is the federal government's management of the Civilian Radioactive Waste Disposal Program, a program designed to meet the federal government's legal obligation to dispose of nuclear waste from plants such as Prairie Island and Monticello beginning in 1998. Significant delays in implementing the program raise substantial doubts regarding the ultimate success of the program and whether the deadline will be met. Based on these and other concerns expressed by the Department, the PUC voted to limit significantly NSP's additional storage capacity and to require NSP to seek approval for additional required capacity when more information on the federal program is available.

FIGURE II-3

Electricity Expenditures by Sectors

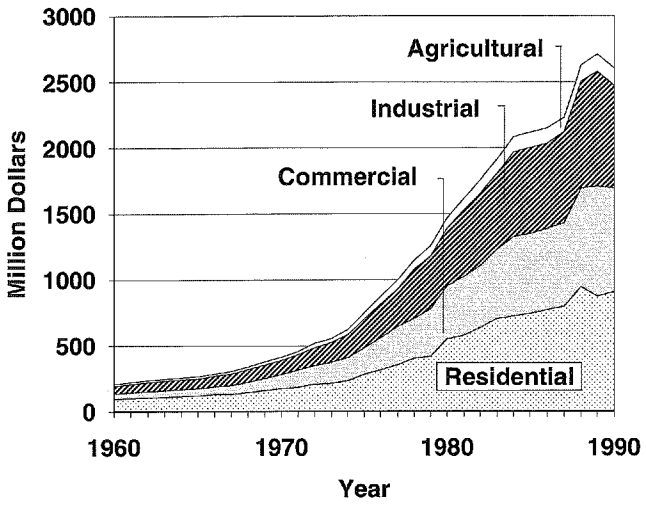
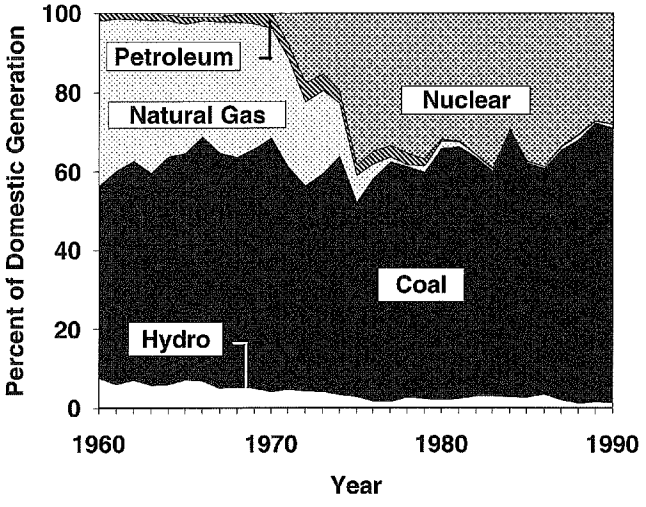


FIGURE II-4

Electrical Generation Energy Source Mix



Recent Demand-Side Initiatives, Developments

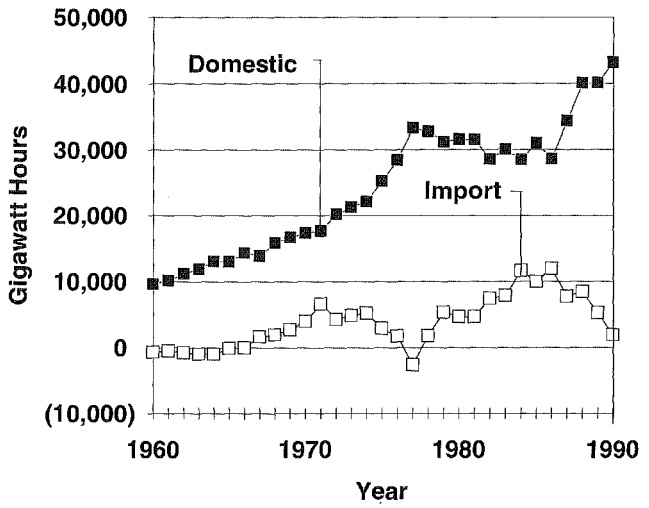
The ability to solve the problem of nuclear waste storage and other environmental problems associated with electricity use depends to a considerable extent on finding non-traditional sources of electricity supply, including demand-side resources. Demand-side initiatives are designed to meet future capacity needs by reducing or modifying consumer demand for electricity rather than creating new supply options. Electricity conservation programs providing efficient lighting and demand management programs

such as off-peak water heating, both extend the usefulness of existing supply capacity and delay construction of new supply options. Significant new regulatory policies and procedures implemented by Minnesota during the past four years, as well as federal initiatives and developments, should help this effort. These are described below:

Integrated Resource Planning (IRP). In 1990, the PUC adopted rules requiring investor-owned electric utilities to submit integrated resource plans. These plans project consumer demand over a 15-year period and provide the utility's assessment and selection of resources to meet that demand. The plan must assess both supply-side resources (including traditional power plants, renewable energy, life-extension of existing power plants, and power purchases) and demand-side resources (conservation and load-management) in light of reliability, dispatchability, and costs, both direct monetary investment and environmental costs. Interested parties (intervenors) can comment on the utility's plan or propose alternative plans. After reviewing the plans and comments, the PUC issues findings regarding the suitability of the utility's resource plan. PUC findings may include designation of a prepared plan as well as critiques of the utility's or intervenor's alternative plans.

FIGURE II-5

Domestic Generation and Net Import of Electricity



Integrated resource planning is an important regulatory tool, as it involves regulators early in the utility planning process. This involvement is necessary to provide the most socially beneficial resource choices. By allowing demand-side resources to be considered along with more traditional supply-side resources, integrated resource planning encourages conservation and load-management. Finally, integrated resource planning can ensure that environmental and social issues are considered in resource evaluation and decision making. Traditionally, only investment, fuel, and operation and maintenance costs have been considered.

Conservation Improvement Programs. Minnesota statutes empower the Commissioner of the Department of Public Service to oversee investor-owned electric utilities' demand-side management programs. These programs, called Conservation Improvement Programs (CIP), contain a variety of projects designed to reduce energy consumption and improve energy efficiency in Minnesota households, businesses, and industries. The 1990 Legislature significantly expanded CIP by establishing minimum spending requirements of 1.5 percent of operating revenues for investor-owned electric utilities. Further, municipal and cooperative electric utilities, although not subject to Commissioner oversight through CIP, are required to supply annual reports on their demand-side management efforts for legislative review. These programs are discussed in detail in a later chapter.

Financial Incentives. To encourage investment in conservation and demand-side management, the PUC established financial incentives for electric utilities. These incentives, which can be designed in a variety of ways, reward utilities for good performance in implementing demand-side programs and compensate them for any losses they experience from reduced

sales due to successful programs. With these incentives, regulators attempt to level the playing field between supply- and demand-side resources.

Renewable Energy. Minnesota is placing increased priority on developing renewable energy for electric generation. This is shown by the opening of Minnesota's first commercial wind farm in Marshall, and Northern States Power's recent announcement that it plans on developing 100 megawatts (MW) of wind power within the state prior to the year 2000. Northern States Power is also increasing its use of hydroelectric power by entering into long-term contracts with Manitoba Hydro to supply up to 800 MW of capacity through the year 2004.

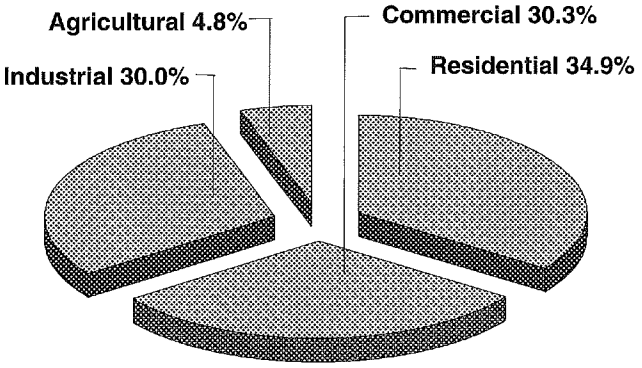
The 1991 Legislature amended Minnesota's Certificate of Need law to require electric utilities to demonstrate that increased demand cannot be satisfied by renewable resources before the utilities are allowed to construct a more traditional power plant. The 1991 Legislature also required that utilities reflect environmental benefits in the rates paid to qualifying facilities (QFs) and cogenerators, thus further encouraging development of these generating sources. The PUC is drafting rules for implementing this requirement. During this rules development process and the IRP process, regulators are developing methods for quantifying the environmental costs of various generation options, thus improving Minnesota's ability to evaluate fairly and compare resources.

Energy Efficiency Technology Advancements. Important to the success of policies encouraging conservation is the marked improvement in development and availability of energy-efficient products. Federal legislation contributed to this advancement by requiring higher efficiency standards for major appliances on the market, improving over time the efficiency of appliances in use. The efficiency, availability, and quality of lighting technology also has improved. As the market for energy-efficient products develops, the price of the technology — currently fairly high — should decline.

Federal Initiatives. The federal government has advanced many energy-related initiatives. In 1990 Congress passed, and the President signed, the Clean Air Act, major legislation that will greatly influence future energy policy. Congress is working on National Energy Strategy (NES) legislation likely to be completed and passed this year. Federal agencies, most notably the Nuclear Regulatory Commission (NRC), the Department of Energy (DOE), and the Federal Energy Regulatory Commission (FERC), have been develop-

FIGURE II-6

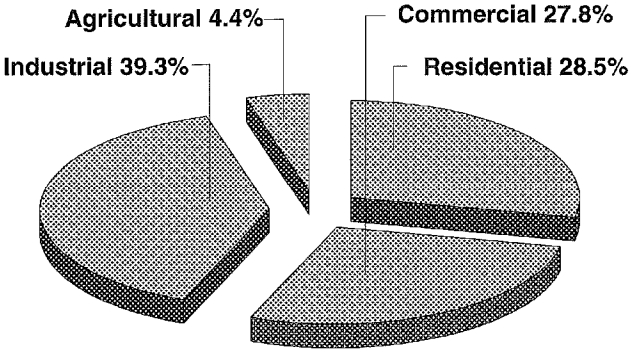
1990 Electricity Expenditure by Sector



Total = $2.6 Billion

FIGURE II-7

1990 Electricity Consumption by Sector



Total = 46,600 Gigawatt hours

FIGURE II-8

Residential Demand for Electricity by End-Use

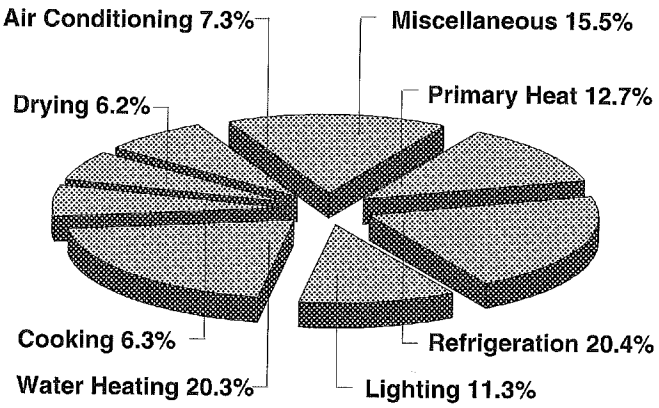


FIGURE II-9

Commercial Demand for Electricity by End-Use

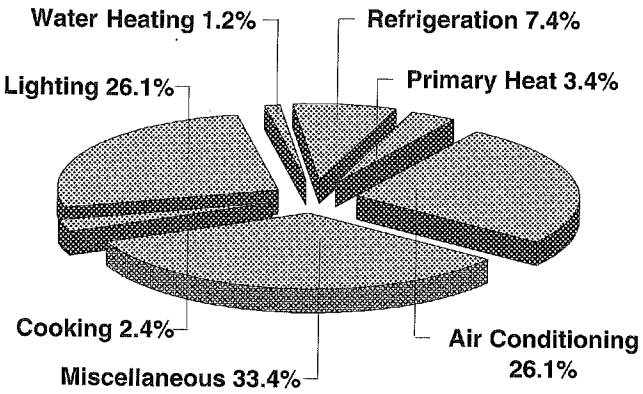
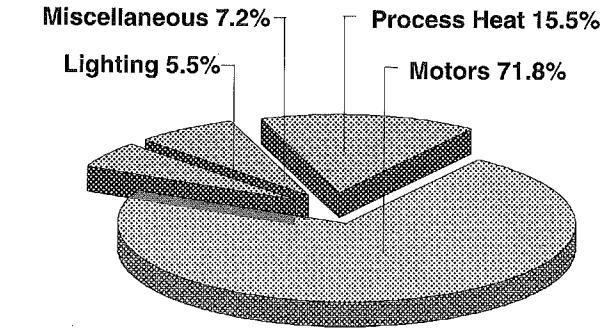


FIGURE II-10

Industrial Demand for Electricity by End-Use



ing rules and regulations to implement these and other federal initiatives. These initiatives and their likely effects on Minnesota are discussed in the following section on future concerns and issues.

FUTURE CONCERNS AND ISSUES: HOW TO PROVIDE REASONABLY PRICED, SAFE ENERGY

The state faces many complex electric energy issues. Although regulatory processes established during the past four years help resolve these issues, the challenges ahead pose critical choices for Minnesota's energy future.

Nuclear Waste Disposal

Minnesota generates 28 percent of its electricity from nuclear power plants. Nuclear generation has environmental advantages over coal-fired plants: power generated by Minnesota's nuclear plants has avoided annual coal-generated emissions of approximately 61,000 tons of sulphur dioxide, 12,000 tons of nitrogen oxides, 25,000 tons of suspended particulates, and 1,000 tons of carbon monoxide. Nuclear generation, however, causes continued accumulation of high-level nuclear waste. Over the last five years, Minnesota's nuclear plants generated an average of 43 tons (39 metric tons) annually of spent uranium fuel. As noted above, the U.S. Department of Energy is obligated under the Nuclear Waste Policy Act to dispose of nuclear waste from the nation's power plants beginning in 1998. DOE's efforts to develop a permanent below-ground repository at Yucca Mountain in Nevada have been delayed by opposition from Nevada and extensive delays, cost over-runs, and other problems. DOE's projections to have an operating repository in 2010 are seriously questioned. To provide interim above-ground storage, DOE developed a Monitored Retrievable Storage System (MRS). Volunteers to host an MRS site are being sought. To date, nineteen have expressed interest; seven of those have withdrawn and two have progressed to phase two of the siting process. If no volunteers are available, DOE will attempt to site an MRS without the consent of the host state or tribal nation. To meet the 1998 date, the MRS must be sited in 1992. The many delays and problems raise serious concerns about the federal government's ability to manage and complete the waste program. This, in turn, raises questions about Minnesota's continued reliance on nuclear energy.

Continued Growth in Demand

Current projections by the Minnesota-Wisconsin Power Supply group in their 1992 Advance Forecast show electric demand rising at 1.8 percent per year, given current levels of investment in demand-side management. At this rate, our region's generating capacity, which has been in surplus during recent years, will be fully used by 1993 at the earliest, or by 2000 at the latest. The Department's own forecasts show consumer demand for electricity growing by almost 40 percent, to 61,350 gigawatt hours, by the year 2020. The baseline forecast shows increasing dependence on coal and natural gas for generation, with hydro remaining almost constant and reliance on nuclear power decreasing. Although the Department sees growth in renewable-based generation, the amounts are too small to show on the baseline analysis.Consequently, Minnesota faces crucial choices on how to meet future demand — whether by new traditional power plants, renewable energy, increased demand-side management, or purchases from outside the region. The choices we make will dramatically affect both Minnesota's economy and the environment.

TABLE 1

DPC and IPC Expected Plant Retirements

Plant name	Projected year of retirement
DPC Alma Units 1-3	2000
IPC Dubuque Steam Unit 2	2000
IPC Fox Lake Units 1 & 2	2001
DPC Stoneman Units 1 & 2	2002
IPC Kapp Unit 1	2002
IPC Lansing Coal Units 1 & 2	2003
IPC Dubuque Steam Units 3 & 4	2004
IPC Dubuque Diesel Units 1 & 2	2004
IPC Fox Lake Unit 3	2005
IPC Lansing Coal Unit 3	2005
IPC Lansing Diesel Units 1 & 2	2005
IPC New Albin Diesel Unit 1	2005

Maintaining Current Capacity

The projected lives of the power plants serving Minnesota indicate that major new investment will be required in the years 2000 to 2020. Most notably, the state's nuclear plants will reach the end of their operating licenses, Monticello in 2011 and Prairie Island's two generators in 2013 and 2014, respectively. Even if NSP seeks and obtains relicensing of these plants, major new investment will be required, raising questions as to whether the benefits of continued operation will be worth the cost. During the period 2000 to 2020, Dairyland Power Cooperative (DPC) and Interstate Power Company (IPC) also expect to retire electric generating plants. These plants, listed in Table 1 with projected retirement dates, combined with NSP's nuclear plants have a total capacity of 1,925 MW, representing 16 percent of total peak demand in 1990.

Nuclear Plant Relicensing

The Nuclear Regulatory Commission (NRC), a federal agency, oversees relicensing of nuclear power plants. If NSP seeks relicensing of its nuclear plants, Minnesota's regulatory and environmental agencies should actively participate to represent Minnesota's interests. How effectively these interests are represented, however, will be affected by rules the NRC is preparing to govern relicensing. The NRC proposed rules that would apply to certain broad, generic environmental issues and would allow very few issues to be considered on a case-by-case basis. The Department of Public Service opposes these rules because they would severely limit state and public participation in decisions on environmental issues. The NRC is considering substantial alterations to its initial proposal and may issue a new proposal that addresses our concerns.

Impact of Federal Energy Initiatives

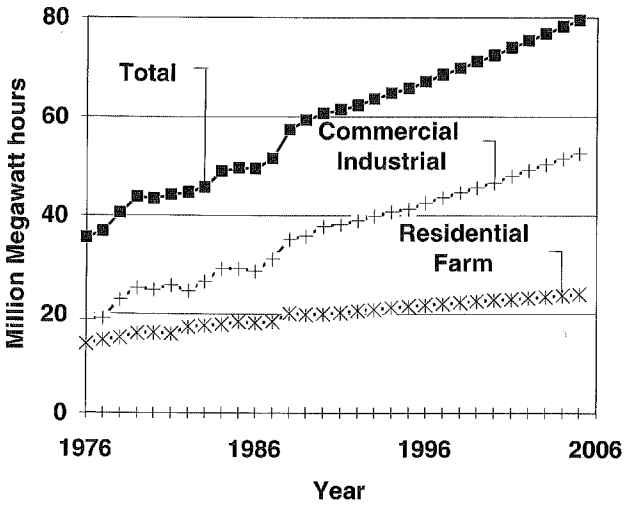
Implementing major federal initiatives poses challenges for Minnesota electric utilities, con-

sumers, and regulators. The Clean Air Act will affect Minnesota electric utilities by limiting power plant emissions, most notably sulphur dioxide (SO_2). The emissions limits will be implemented in two phases. Although Minnesota utilities already comply with the first phase requirements, some plant modifications will be required to meet 1995 limits. Rates in Minnesota could possibly be reduced in the near term due to the provision that allows owners of "cleaner" plants to sell pollution credits to plants not meeting emission restrictions; the long-term effect on rates, however, is unclear.

The National Energy Strategy legislation will affect utilities' choices of new supply-side resources, as natural gas becomes more readily available and licensing procedures for nuclear plants are streamlined. The legislation is expected to set minimum standards for certain lighting, heating, and air conditioning systems. Other provisions promote electric vehicles and encourage clean coal technologies.

FIGURE II-11

Minnesota/ Wisconsin Power Supply Group Sales Forecast (1991 Advance Forecast)



Two of the most enduring and substantial effects of federal initiatives on Minnesota's electric industry will be increased competition in the generation of electricity and more open access to transmission facilities. These, in turn, will profoundly affect the entire industry from prices to planning and regulation. Increased competition could lower wholesale rates for a period; it could also increase rates for residential users as wholesale and large volume retail customers buy discounted power from other suppliers. Competition among suppliers and open access to transmission lines also will spur regional planning, including integrated resource planning.

Adapting to these changes, while maintaining strong oversight of the electric industry, will challenge Minnesota's decision makers.

Affordable Rates vs. True Cost of Service

Clearly, rates play a major role in our current electric picture of rapid growth in demand and coal- and nuclear-based generation: comparatively low rates encourage consumption. The Department believes, however, that current rates do not adequately reflect the true social cost of the electricity because environmental and other social costs have not historically been included in resource selection and rate making. One effect of many of the new federal and state initiatives will be to reflect more accurately all costs in decision making and rates. As this happens, rates will gradually rise, affecting consumer demand and utility resource selection. Although it may be appropriate to reflect the true social cost of providing electric service, increased rates also raise affordability concerns for residents and businesses. How to balance these interests will challenge the state in the coming years.

Electric Vehicles

Air pollution from our current, petroleum-based transportation system causes major concern. To reduce this pollution, many advocate using alternative fuel vehicles (AFVs), including elec-

tric vehicles. Although electric vehicles run more cleanly than traditional gasoline vehicles, they are also a source of pollution if they are charged through traditional electric generation. They also could strain the region's tightening electric supply. To the extent that a market develops for electric AFVs, utility planning and investment will be affected.

FUTURE DIRECTIONS AND ACTIONS

Minnesota is at a crossroads in deciding the state's energy future with respect to electricity. How we handle these critical issues, described below, will determine in large part just how bright our future will be.

Federal Action on Nuclear Waste Disposal

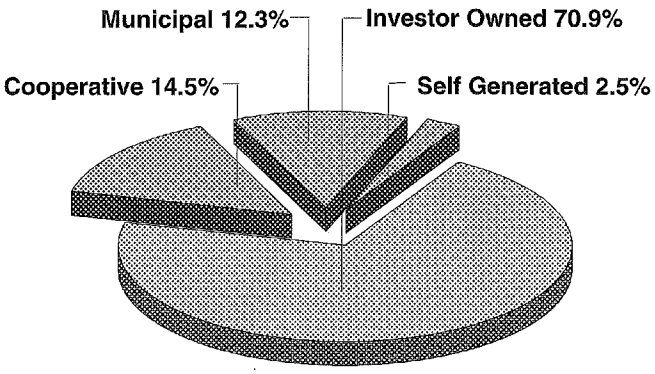
Holding the federal government accountable for its obligations to remove and dispose of Minnesota's nuclear waste must continue to be a top state priority. Regardless of whether NSP continues to operate its nuclear power plants beyond 2003, Minnesota has tons of nuclear waste in need of disposal. Actions the state can consider include litigation, coalition-building with other states and utilities, and cutting off contributions to the Nuclear Waste Fund which supports the federal program.

Recertification of Nuclear Power Plants

To maintain strong state oversight of operations of nuclear plants beyond their current licenses, the state should consider extending its Certificate of Need authority to relicensed plants. Requiring a Certificate of Need for relicensed nuclear power plants would ensure that all aspects of the project — including investment, environmental, health, and safety costs — are considered and that Minnesota retains strong oversight of its electric generation mix. Further, the state should continue active participation in proceedings before the Nuclear Regulatory Commission.

FIGURE II-12

1990 Electricity Sales by Utility Type



Total = 46,600 Gigawatt hours

Improved Resource Mix

Minnesota should build on its efforts to improve the electric generation resource mix, consistent with a social-cost approach to decision making. The likely consequence of this approach will be continued expansion of utility demand-side management programs, increased investment in renewable energy, and improved pollution control in both new and existing power plants.

Further Exploration of Financial Incentives

The PUC's current financial incentives reward utilities for good performance on their demand-side management projects and compensate them for revenue losses caused by effective programs. Regulators need to evaluate the effectiveness of the current incentives and continue to consider and implement other changes needed to level the playing field between supply- and demand-side resources.

Competitive Bidding

Because additional generating capacity will likely be needed in the coming years, the state should consider implementing a competitive process for supplying new capacity. Other states, notably Maine, have implemented bidding processes in lieu of traditional utility construction and ownership. With adequate safeguards to ensure reliability and environmental protection, competition could bring down the cost of new resources.

Regional Integrated Resource Planning

Minnesota and several surrounding states are implementing integrated resource planning for their local utilities. Because of the interconnections of the electric transmission grid and the multi-state jurisdictions over many utilities, it may be appropriate to implement integrated resource planning on a regional level. A study by MSB Energy Associates, in conjunction with the Legislative Task Force on Electric Utility Service Territories, found that some savings due to lower rates could be achieved if such regional planning were implemented. Regional planning also can give utilities greater assurance of recovering investments in selected resources, as all states would agree on the chosen plan. Questions remain, however, including whether the savings and benefits are worth the costs associated with the additional regulation. State regulators should further evaluate this issue and explore possibilities for collaboration with regulators throughout the region.

Further Advancement of Technology

State and federal initiatives should encourage future development of technology for renewable energy, energy-efficiency, and pollution control. To take full advantage of these technologies, the state should carefully monitor their development.

Natural Gas

3

NATURAL GAS

"If there is to be a future, then it must be one based on energy sources that are sustainable, that can't be owned by one nation or another, and that won't further degrade the world we live in."

Cherie Hales
Zumbro Falls
Rochester Public Meeting
March 18, 1992

"My family and I believe .... we must consider the impact on all future generations by choices made by us today."

Antoinette Gilchrist and family
Rochester
Written Comments

The promise and priority of natural gas in federal and state energy policy varied greatly during the past several decades. The 1970s saw shortages and rising prices, causing such great concern about our reliance on natural gas that the federal government banned it from use in electric generating plants and in some residential and new construction. The 1980s brought a dramatic turnaround, as changes in regulations opened new opportunities and resulted in a gas surplus, the so-called gas bubble, and low prices. Now, supply and demand are coming into balance, and environmental concerns about energy consumption and use are emerging as important issues. The extent to which we plan to rely on natural gas in our fuel mix will be a major issue in coming years. Environmental concerns call for increased natural gas use relative to coal, nuclear, and petroleum, while concerns about the long-term availability and cost call for a more moderate approach.

HISTORIC TRENDS: STRONG FLUCTUATIONS IN USE

Minnesota's natural gas supply comes from two primary locations: the southern United States and Canada. Gas moves from the production fields through the interstate pipeline system, which is regulated by the Federal Energy Regulatory Commission (FERC). Northern Natural Gas Company is the major pipeline supplier of southern U.S. gas to Minnesota, while Viking Gas Pipeline and Great Lakes Transmission Company transport gas to Minnesota from Canada. Once it reaches the state, gas is delivered to either local distribution companies (LDCs such as Minnesota's eight investor-owned utilities), municipal gas utilities, or, in a few cases, directly to an end-user. The Minnesota Public Utilities Commission (PUC) oversees the activities of the LDCs and regulates their prices and conditions of service.

In 1990, Minnesotans consumed approximately 256 trillion Btus of natural gas, with the residential sector consuming 44.1 percent of that total. The commercial sector consumed approximately 28.1 percent, while the industrial sector consumed approximately 21 percent. Electric utilities and transportation uses make up the remainder of natural gas consumption. (Figure III-1)

Consumption of natural gas grew rapidly during the 1960s. Since 1970, consumption has declined significantly, remaining fairly stable over the last several years. Since natural gas consumption partly depends on weather conditions, Figure III-2 presents both weather normalized and gross natural gas consumption.

Expenditures for natural gas declined over the last several years, as shown in Figure III-3. In

1990, Minnesota expenditures for natural gas amounted to approximately $970 million, 27 percent lower than peak expenditures in 1984. The recent decline in natural gas expenditures is partly due to reduced consumption. The reduction in the price of natural gas accounts for the rest of the decrease in expenditures. The net expenditures are presented in Figure III-3 while the real price trends of natural gas are presented in Figure III-4.

FIGURE III-1

Natural Gas Consumption by Sector

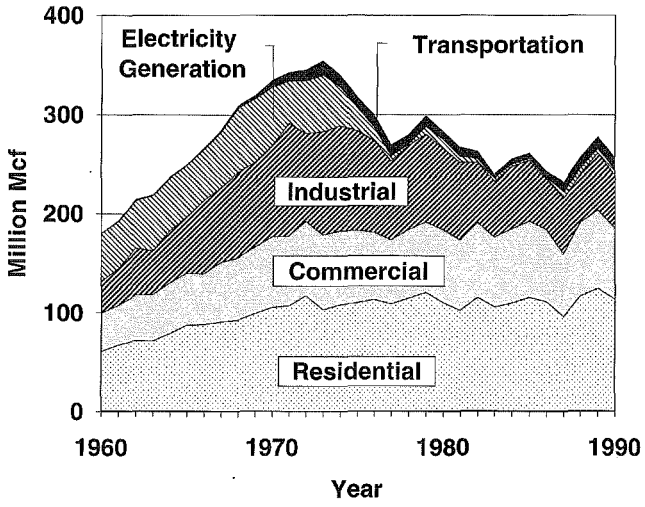
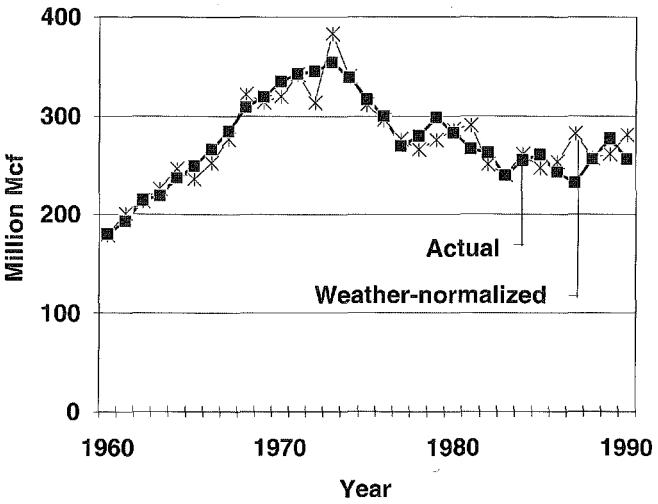


FIGURE III-2

Actual versus Weather Normalized Consumption



Minnesotans rely on natural gas primarily for space heating, water heating, and cooking fuel, as shown in Figures III-5 and III-6.

CURRENT ISSUES AND TRENDS: POTENTIAL FOR EXPANDED USE

Recent impacts on the natural gas industry have come from development and implementation of the major regulatory changes of the 1980s, and from a new environmental awareness that is causing natural gas to be considered for new applications. These impacts are discussed below.

Federal Initiatives

Federal initiatives drive most of the change in the natural gas industry. FERC Order 436 (discussed in our 1988 Report, Energy: Minnesota's Options for the 1990s) opened access to transportation on interstate pipelines, substantially changing the traditional monopoly structure of the pipeline industry. Now, both LDCs and retail consumers — particularly large consumers — have access to other suppliers of natural gas. This competition has probably been an important factor in keeping gas prices relatively low the past four years. Other recent federal initiatives on natural gas policy include:

The National Energy Strategy (NES). Although a final version of this legislation is not complete, the NES will include new procedures for developing and siting new interstate pipelines. The procedures are intended to streamline the current process and reduce the level of environmental review given to these projects. Since no new pipelines are currently planned for our region, this legislation will not significantly affect Minnesota's natural gas supply in the near future.

FERC Order 636, known as FERC's "Restructuring Rule" and superseding FERC Order 436, changes the ways interstate pipelines offer their services. Most important, the rule requires pipelines to separate fully — or "unbundle" — their transportation services from gas sales service. This is intend-

ed to ensure that pipelines provide the same quality of transportation service to all gas suppliers, thus improving consumer access to suppliers and increasing competition. The rule also allows pipelines to sell the gas at market-based prices, similar to the way unregulated suppliers operate, provided the pipeline complies with all other aspects of the rule. Two parts of this rule propose a change in the pipeline rate structures and how costs will be passed on to consumers, directly affecting those Minnesota residential consumers who totally depend on natural gas for heating.

Flexible Pricing

Responding to the low prices of petroleum and other alternative fuels during the 1980s, the Minnesota Legislature and the PUC allowed local natural gas utilities to be flexible in pricing services to their largest customers. This flexibility, allowing utilities to retain sales and revenue from customers who have the ability to switch among fuels, is typically not allowed under rate regulation due to concerns about discrimination among customers. Utilities have used this flexibility extensively, and argue that it has helped keep rates to other customers lower than they otherwise would be.

Conservation Improvement Programs

Gas utilities' investments in conservation and load management have typically been smaller than that of electric utilities, and have been primarily targeted to low-income customers to help meet their heating needs. The 1991 Legislature increased the required minimum investment by gas utilities to 0.5 percent of gross operating revenues. Further, through implementation of the Conservation Improvement Program, the Commissioner of the Department of Public Service has required additional investment in conservation for the utilities' commercial and industrial customers to help capture potential energy savings in those markets.

Financial Incentives

As with the electric utilities, the PUC is implementing financial incentives for Minnesota's LDCs. The purpose of the incentives is to encourage additional investment in demand-side resources, reward good performance in implementing demand-side projects, and compensate the LDCs for revenue losses they experience from effective programs. The Commission will implement financial incentives for each of Minnesota's eight LDCs within a year.

FIGURE III-3

Natural Gas Expenditures by Sector

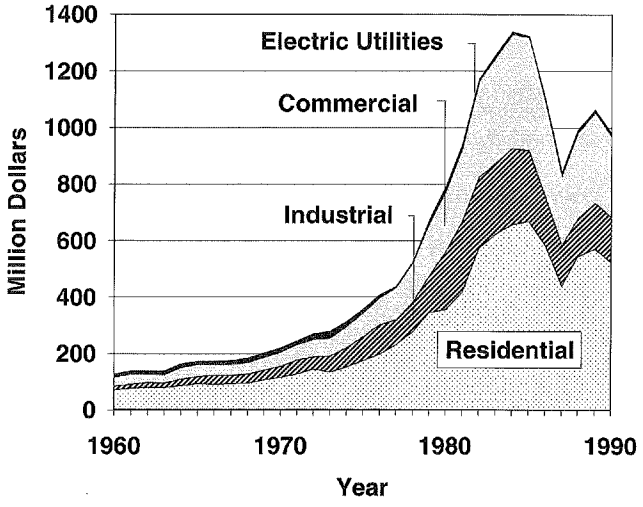
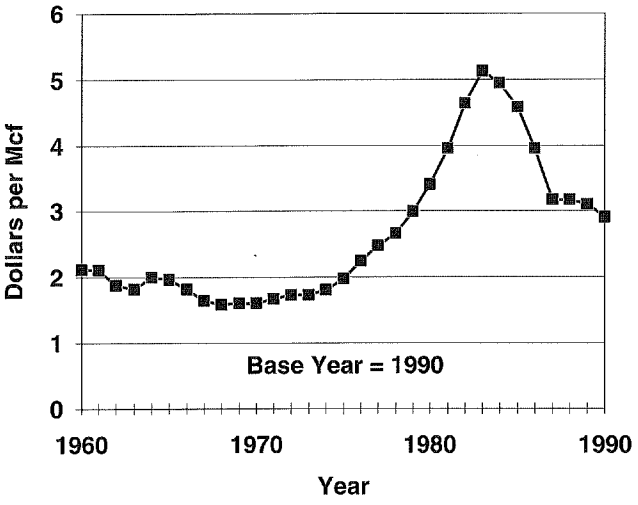


FIGURE III-4

Average Real Natural Gas Prices



Perceived Environmental Advantages

Because it burns more cleanly than coal and petroleum-based fuels, natural gas has gained support for greater use, not only in traditional applications such as heating, but also in more innovative ways such as alternative fuel vehicles (AFVs), cogeneration (the simultaneous production of heat and electricity), gas cooling, and electric generation.

Geographic Issues

Not all individuals or communities have access to natural gas. Given the routing of interstate pipelines, the cost of piping, and the availability of alternative fuels to meet the end-use needs of consumers, universal access to natural gas is not economically feasible. Small communities, however, are interested in obtaining natural gas service, as the current average rate for natural gas is significantly lower than the price of alternative fuels such as propane, fuel oil, and electricity. Meeting the energy and development needs of small communities in an economically sound way is an emerging policy issue for decision makers.

FIGURE III-5

Residential Demand for Natural Gas by End-Use

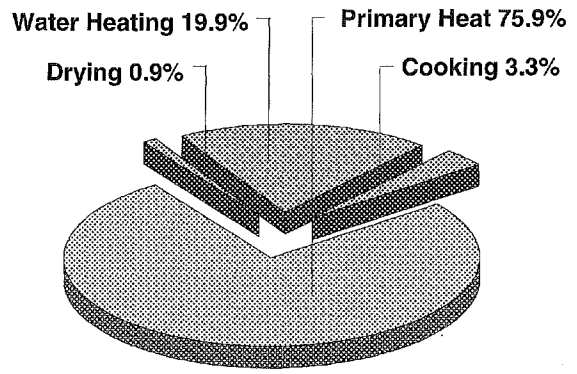
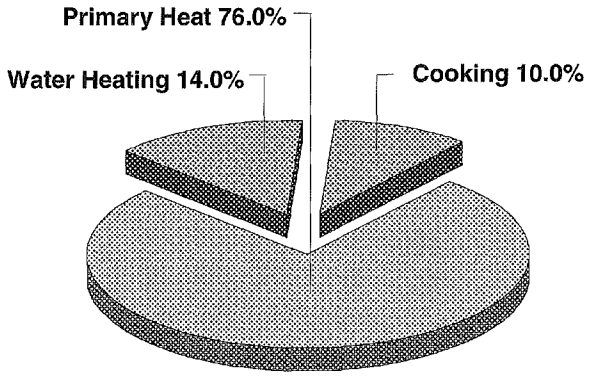


FIGURE III-6

Commercial Demand for Natural Gas by End-Use



Mergers

Several Minnesota LDCs were acquired by large, non-Minnesota, utility holding companies during the 1980s. The utilities argue that these mergers will reduce costs to Minnesota consumers, as the combined utilities will share administrative costs and be able to take advantage of other economies of scale. The actual effect of the mergers are now being evaluated in rate proceedings before the PUC.

FUTURE CONCERNS AND ISSUES: LONG-TERM AVAILABILITY AND PRICE

The Department's forecast projects expanded use of natural gas, growing almost 40 percent through the year 2010 and then beginning to moderate through 2020. Our past indicates that the market can dramatically change, however, which raises concerns about the long-term viability of this energy source. When developing a sound energy policy, decision makers need to take care not to repeat mistakes of the past by placing too heavy a reliance on any one fuel. A number of factors could adversely affect availability and price of natural gas. These are discussed below.

Continued Industry Restructuring

Given our heavy reliance on natural gas as a heating fuel,

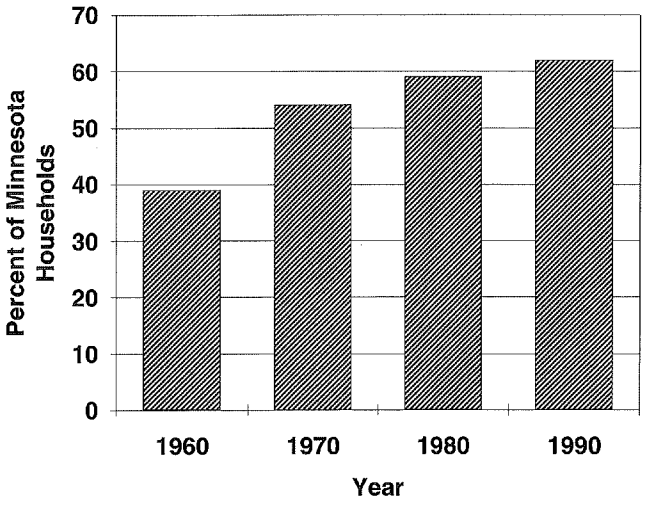
Minnesota needs to pay careful attention to the federal government's continuing efforts to restructure the gas industry. Federal initiatives, such as FERC Order 636 discussed earlier, will definitely have an impact on Minnesota consumers. Located at the end of the U.S. interstate pipeline and dependent on natural gas for our winter heating needs, Minnesota could face significant increases in the price paid to transport gas into the state. Federal efforts to streamline applications for new and expanded natural gas pipelines may also affect our access to additional gas supply and potentially raise local issues for lines sited within the state. But these same natural gas industry changes will also create new options for Minnesota consumers. Protecting Minnesota's citizen interest, mitigating the impact of federal initiatives, and determining the best solutions will be a major challenge for the state in the near future.

Environmental Issues

Although it burns cleaner than other fossil fuels, natural gas does have environmental drawbacks. Burning natural gas emits nitrogen oxides, which are toxic to humans and contribute to acid rain, and carbon dioxide, which is suspected to be causing global warming. In addition, methane, the major component of natural gas, is itself a greenhouse gas. While certain abatement measures can be taken on large-scale applications like electric generating plants, most of our gas use is for home heating, for which abatement measures are not available. Further, gas exploration and drilling raise environmental concerns, especially in environmentally sensitive areas. Regulators must look to both the economic and environmental costs of all fuels when charting energy policy.

FIGURE III-7

Households with Natural Gas as Primary Heat Source



New Markets

Given the current comparatively low price, plentiful supply, and perceived environmental benefits of natural gas compared to other traditional fuels, natural gas is again being considered as a fuel for electric generation, primarily peaking plants. Other markets are also open to natural gas, most notably cogeneration and AFVs. Natural gas is also the major feedstock for methanol production, which is being considered as an alternative vehicle fuel, and gasoline oxygenate additives such as MTBE. How we balance supply, price, and environmental concerns as new natural gas markets grow will be an important issue in the future.

Adequacy of Current Capacity

Determining the appropriate role for natural gas in the state's energy policy also requires consideration of capacity. Although natural gas use has been relatively stable over the last several years, in part due to mild winters, the percentage of households using natural gas as the primary heating source continues to grow, as illustrated in Figure III-7.

Increased consumer access to natural gas and development of new uses for natural gas may increase demand, requiring expansion of the pipeline transmission and storage system and

increasing rates, thus changing the attractiveness of gas as a fuel choice. The state's energy policy should account for these additional capacity requirements when determining the appropriate role for natural gas.

Increased Reliance Due to Unseasonably Warm Temperatures

The comparatively low price of natural gas has increased its use by large volume customers, most of whom have the ability to switch between natural gas and other fuels (most frequently fuel oil). The relatively mild winters in recent years have enabled the natural gas pipeline and distribution system to provide both firm (continuous access) heating supply and interruptible industrial supply. Also as a result of the mild winters, the production and distribution system for petroleum has adapted to reduced demand. Average or unseasonably cold temperatures in coming winters could cause industrial customers to have difficulty obtaining supply from either natural gas utilities or the petroleum industry. There also could be a capacity shortage on transportation pipelines.

FUTURE DIRECTIONS AND ACTION: A TRANSITIONAL FUEL

Minnesota must be creative in meeting the challenges described above. We present the following suggestions for shaping and defining the role of natural gas in our state energy future.

Integrated Resource Planning (IRP)

Like the electric utilities, natural gas LDCs should be subject to an IRP process. As with electricity, consumer demand for natural gas can be delivered in a number of ways and utilities should evaluate the least-cost way of supplying customers, including conservation and load management. Integrated Resource Planning for gas utilities would allow regulators and other interested parties to evaluate LDCs' supply portfolios and demand-side efforts together, thus improving the quality and scope of review. The regulatory agencies should work with the LDCs and other interested parties to study the appropriateness and feasibility of implementing a gas IRP process in Minnesota.

Further Exploration of Financial Incentives

Financial incentives encourage increased investment in demand-side management by Minnesota's LDCs. The PUC should continue to evaluate the effectiveness of incentives, including developments in other states, and implement change where appropriate.

Use as a Transitional Fuel

Natural gas should continue to be an important part of Minnesota's energy future, but the state should not lock itself into a plan based on extensive expansion of natural gas use over the long term. Instead, Minnesota should rely on natural gas to help bridge our present situation to the future, as we move to a more sustainable and environmentally sound energy policy.

Petroleum

4

PETROLEUM

"Energy is so cheap that no one attends (local) electric rate increase hearings outside of a commercial user or two, no one writes to the newspaper editor about the price of gasoline, and Detroit keeps on building petro-pig automobiles."

Norman Erickson
Rochester newspaper columnist
Rochester Public Meeting
March 18, 1992

"We use too many cars... Widening roads to solve congestion of traffic is like loosening your belt to solve an obesity problem."

Susan Hutchins
Grand Rapids
Written Comments

HISTORIC TRENDS: SUPPLY AND PRICE SHOCKS

Petroleum consumption rose at an average annual rate of 3.6 per cent between 1960 and 1973, reaching a peak of 543 trillion Btus in 1972. Following the first Arab oil embargo of 1973, consumption of petroleum started to decline but remained high until the second oil price shock came in 1979. This price shock nearly tripled the price of some petroleum products and caused petroleum consumption to decline dramatically in 1980 and 1981. Since 1981, consumption patterns have fluctuated, but have exhibited an average increase of 1.2 percent through 1990.

CURRENT ISSUES: OVER-DEPENDENCE ON A VOLATILE ENERGY SOURCE

Petroleum products — including gasoline, fuel oil, jet fuel, and propane — are the largest source of primary energy used within the state of Minnesota. More than 460 trillion Btus or 35.4 percent of all primary energy used in Minnesota in 1990 came from petroleum products. Nearly half, 46.8 percent, of Minnesota's energy dollar went for petroleum products. This represents more than 3.6 billion gallons of petroleum products, costing $3.16 billion, consumed by Minnesotans in 1990. The major petroleum product consumed within the state is gasoline at 2.1 billion gallons. Second is distillate fuel oil, including diesel fuel, at 827 million gallons. Smaller amounts of jet fuel, propane, and residual fuel oil round out the energy mix. (Figure IV-1)

Transportation

Petroleum's dominance of our energy mix is due largely to use of petroleum fuels for transportation; transportation, therefore, must be part of any discussion of petroleum use in Minnesota. Transportation's share of petroleum use has grown steadily from 57 percent in 1960 to 76 percent in 1990. (Figure IV-2) This growth is partially explained by Figure IV-3, which shows the increase in total vehicle miles greatly outstripping the limited gains in automobile efficiency.

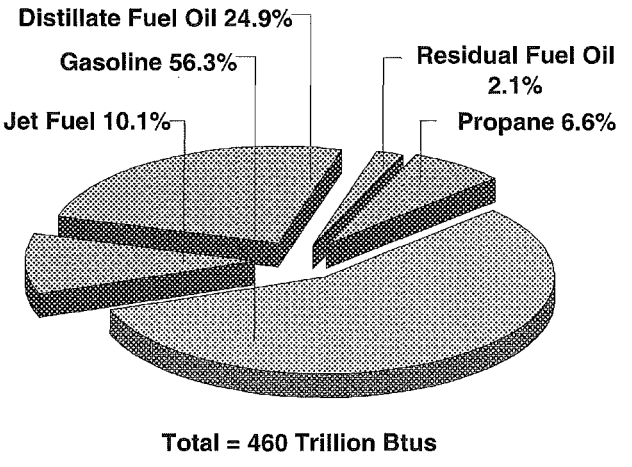
Gasoline and diesel fuel used in cars, trucks, and buses are a major cause of air quality problems in urban areas throughout the United States. Minnesota is no exception. A number of current environmental mandates aim at reducing air pollution within our cities. These mandates come from both the federal and state government and will directly and indirectly affect operations within the petroleum industry.

The federal Clean Air Act, the most far-reaching of these mandates, identifies Minnesota's seven-county metro area as an area where the level of carbon monoxide is above the allowable limit. Gasoline sold in this area, therefore, must be blended with "oxygenates" (fuels with high oxygen content, such as ethanol). Other federal government mandates require a reduction in the sulphur content in diesel fuel and more stringent emission requirements on petroleum refiners.

Minnesota has its own law that requires the addition of oxygenates to gasoline in several metropolitan areas after October 1992. This requirement will become statewide in 1997. Minnesota also requires annual emissions testing for all automobiles in the metropolitan area. Recent Minnesota Pollution Control Agency records indicate a compliance rate of approximately 90 percent. In addition, a number of regulations deal with petroleum tank and pipeline testing, including clean-up and disposal when tanks or pipelines are found to be leaking. Although all of these regulations are primarily designed to reduce harmful emissions, the net effect will be to make petroleum products more expensive. As the cost of the product increases, relative demand for the products will decrease.

FIGURE IV-1

1990 Petroleum Product Consumption



Total = 460 Trillion Btus

Space Heating

Petroleum fuels are also used for space heating. Fuel oil and propane are often the primary residential heating fuels in the rural areas of the state, which are not served by natural gas. Fuel oil and propane are also used as "backup" fuel for large commercial and industrial natural gas customers whose natural gas service can be interrupted during periods of supply shortages. Recently, electrical utilities began offering lower, "interruptible" electric heating rates to clients who have backup heating systems. In general, petroleum use as a heating fuel has diminished over the last several years.

Price Volatility

Price volatility is another characteristic associated with petroleum products. No energy source has a more volatile price track record. Minnesotans have seen the price of petroleum increase rapidly due to world political events, weather conditions, and real and imagined supply problems; we have also seen rapid and unexpected price decreases. (Figures IV-4 and IV-5)

Primary reasons for price volatility are two. First is U.S and world dependence on petroleum supplies located in politically unstable parts of the world. In the 1970s, the nations of OPEC (Organization of Petroleum Exporting Countries), which control most of the world's oil supply, used world dependence on petroleum to further their political and economic goals. Although OPEC is not the dominant force it was in the seventies, the U.S. is nearly as dependent on imported oil as it was at the height of OPEC's power. The Gulf War and its effect on oil prices clearly show that international events still affect local oil prices. The Strategic Petro-

leum Reserve has reduced our vulnerability to supply disruption somewhat, and acts as a limited price buffer, but the reliability of petroleum supply is a constant concern to our citizens.

The second reason for price volatility is the fact that the oil industry is made up of several different businesses all competing for profits in an unregulated industry. Oil producers, transporters, refiners, wholesalers, and retail distributors are all trying to make a profit. Some companies are large, fully integrated companies and some are small independents. Often the actions of one of the parties directly affect the other parties. The changing supply and pricing strategy of each of these players adds to the volatility of oil prices.

Price volatility, much of it outside the control of any one part of the oil industry, confuses and alienates consumers. And rapidly rising prices place severe economic consequences on petroleum users, especially the people in rural areas.

FUTURE CONCERNS: CONTINUING UNCERTAINTY OF SUPPLY AND PRICES

The Department of Public Service analysis predicts that the petroleum industry faces a growing but uncertain future. The products it creates and sells face upward price pressures from several types of environmental mandates. Rising prices will certainly cause some consumer resentment. The industry will continue to face possibilities of supply disruptions and substantial price volatility, as long as we depend on sources from outside the country for large shares of our crude oil and petroleum products. All present indications are this dependence will continue well into the next century. The fundamental instability of supply and volatility of price will continue to alienate consumers and create difficulty and tension among the various players within the industry as well as between industry and government.

Despite all these concerns, petroleum use will grow substantially because of current and anticipated growth in transportation. The Department's baseline forecast shows rapid growth in petroleum use, from 460 trillion Btus in 1990 to almost 700 trillion Btus in 2020, a 50 percent increase. We anticipate that initiatives such as the Clean Air Act, the Surface Transportation Act, and new auto efficiency standards may reduce this growth somewhat, but their implications are too new and/or too unpredictable to incorporate into our forecasting model at this time.

FIGURE IV-2

Petroleum Consumption by Sector

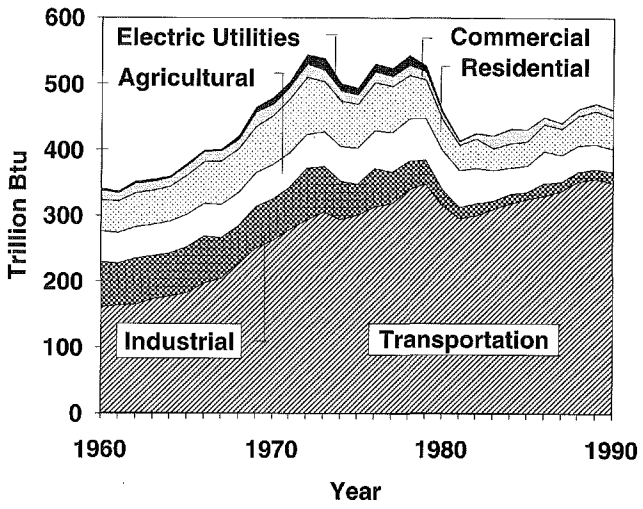
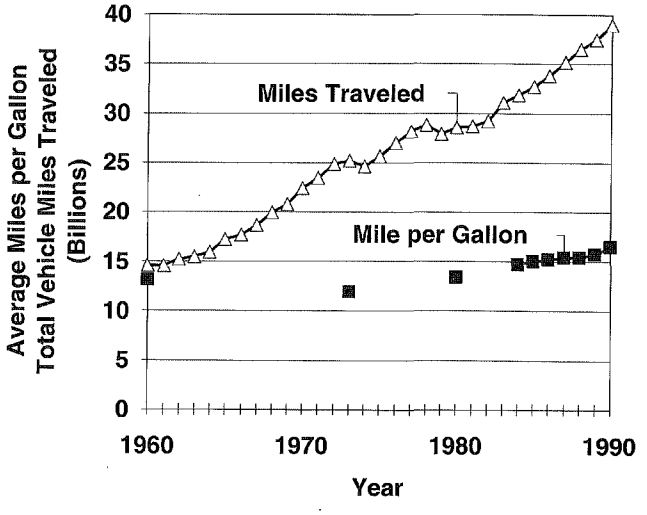


FIGURE IV-3

Transportation Trends: Average Vehicle Efficiency and Total Vehicle Miles



Transportation

Transportation fuels, primarily gasoline, will continue to dominate the petroleum market. All indicators point to a growing transportation sector as we continue the trend of more and more total passenger miles. Yet consumers and government policy makers are looking for ways to reduce transportation gasoline use, primarily for environmental reasons. We have already seen some improvement in the overall efficiency of the vehicles within the state; this trend should continue as old vehicles are replaced with newer more efficient models. In addition, pressure is growing in Congress for acceleration of the national energy efficiency — or Corporate Average Fuel Economy (CAFE) — standards for automobiles. New fuels are being developed and tested and new, non-gasoline engine technologies are being developed and tested. Government agencies are starting to investigate and implement strong public transit policies and programs to limit use of automobiles in urban areas. Even as these new fuels, new technologies, and new policies develop, the use of gasoline is still expected to increase.

FIGURE IV-4

Petroleum Product Expenditure by Sector

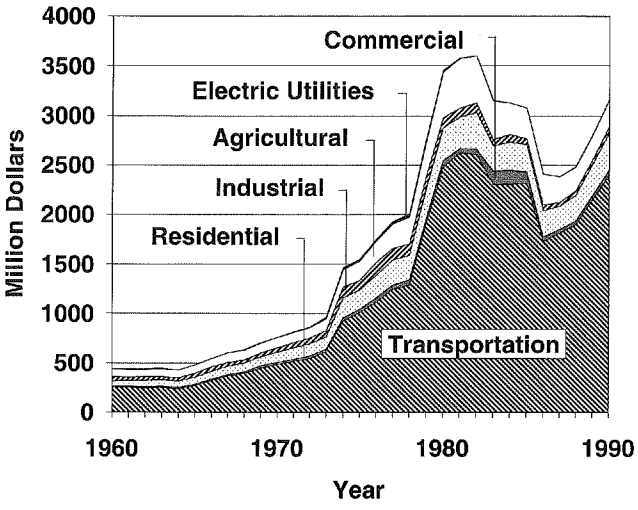
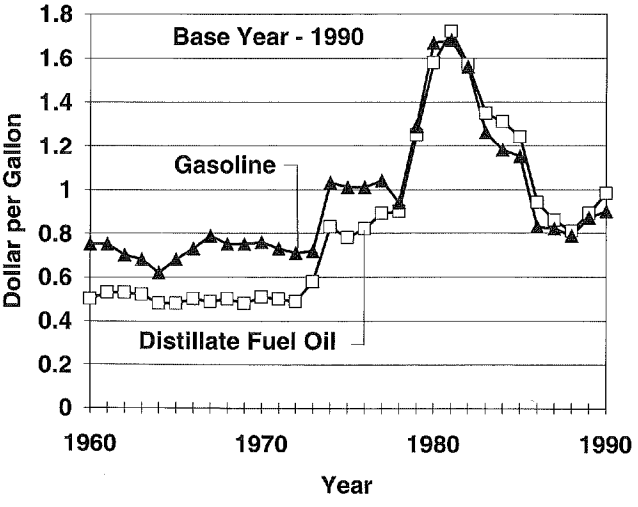


FIGURE IV-5

Average Real Petroleum Product Prices



Heating Fuels

Petroleum heating fuels also face uncertainty. As natural gas expands its heating markets to large interruptible commercial and industrial customers, fuel oil will likely be the backup fuel. Fuel oil will also likely be the backup fuel for electricity, as interruptible electric heating expands in rural areas. Developing solar and wind energy systems also will probably need to rely on diesel fuel as a backup. The petroleum fuels industry, therefore, is likely to be in the strange position of being less needed as a primary fuel but even more critically needed as a backup or "emergency" fuel. Conceivably, weather (or other conditions) could cause petroleum heating fuels to have very low sales one month and almost crisis levels of sales the next month.

This unpredictability makes it very difficult for the petroleum industry consistently and profitably to match production, delivery, and inventory levels with actual consumption. As long as the profitability of the industry is not consistent and predictable, and with future market trends pointing downward, it is unlikely that the industry will invest in additional refinery or delivery infrastructure. The result could mean more frequent short-term, regional supply problems.

Industry Competition

Competitive pressures within the petroleum industry, combined with a shrinking and unpredictable market, are beginning to limit the number of petroleum suppliers and brands from which consumers can choose. In some areas of the country, major integrated companies are trying to solidify their market share through aggressive competition with independents. Generally, independents do not have the financial means for long term competition with the major brands and may be forced out of business. In some areas of the country, major retailers are abandoning entire areas because they are judged unprofitable. Both of these trends ultimately lead to fewer suppliers to a state like Minnesota, less competition, and ultimately, less choice for consumers.

FUTURE DIRECTIONS: REDUCING INSTABILITY, PAYING SOCIETAL COSTS

Options for Reducing Instability

The petroleum industry must find ways to reduce price volatility and the potential of supply disruptions.

One option for reducing price volatility is to use the petroleum futures and options market to hedge against future price swings. This can be done directly on commodity exchanges like NYMEX by large purchasers of fuel oil and gasoline such as the state of Minnesota. This can also be done by the petroleum industry itself. Use of futures and options can allow petroleum product suppliers to provide fixed price or capped price fuel contracts to their customers. This procedure not only provides more stable prices for consumers, it also helps the industry maintain a more consistent profitability. This procedure has grown rapidly in New England and we expect to see further growth in the Midwest.

An option for minimizing potential supply disruptions is to build and use additional petroleum product storage models very much like the national Strategic Petroleum Reserve. This could be done at several levels within the industry, but the closer a reserve is to the consumer, the more responsive it will be to consumer needs and the more quickly it can respond to a supply emergency. Up to this point, the petroleum industry has relied on a very "close-to-the-wire" delivery infrastructure. Additional storage would give the industry and its consumers some breathing room.

Both of these options are potentially quite expensive and, as in all industries, the consumer ultimately pays the cost. But the Department of Public Service believes that this would be an example of the consumer paying the true "societal" cost of petroleum energy use.

Effects of Less Competition/ Environmental Concerns

The petroleum industry and its consumers apparently have no choice but to adjust to a market with fewer suppliers, fewer retail outlets, and larger service areas. The competitive pressures that are forcing the industry to "down-size" will continue well into the future.

The industry will also have to produce cleaner burning fuels. This is already happening with the development and marketing of "reformulated" gasoline and gasoline with oxygenate additives. The demands of consumers and policy makers for cleaner air will continue to drive the petroleum industry's decisions well into the future. Again, these fuels will probably be more expensive than traditional gasoline, but consumers must be expected to pay the additional costs.

Even though the transportation sector is expected to experience continued growth, there will be continued advances in the efficiency of automobiles, continued development of "transit" options, and continued development of non-gasoline vehicles. Even with all of these developments, we expect the future gasoline market to grow well into the future.

Renewable Energy Sources

5

Renewable Energy Sources

"We are dragging our feet in developing alternative sources of energy. Minnesota should take the lead in developing these alternative sources."

Helen Marti
New Ulm
Written Comments

"If we care about the future of our planet and the future of our children, we should take a very hard and serious look at renewable options before we act; for it is the decisions that we make today that dictate the future of generations to come."

Dan Juhl
Minnesota Windpower
Marshall Public Meeting
March 17, 1992

Historic Trends: Changing Sources, Growing Use

Before the 1980s, hydropower and wood were the primary renewable energy sources used in Minnesota. Utilities and private industrial companies used hydropower for electric generation and wood was used mainly for residential heating. In the late 1970s and early 80s, wood use expanded into the commercial and industrial sector. This same time period saw other renewable energy sources emerge, including ethanol for blending with gasoline, solid waste used as boiler fuel and to generate electricity, solar water and space heating, stand alone photovoltaic (solar electric) systems, and wind energy electrical generation.

Renewable energy use declined in the 1960s due mainly to decreased use of wood for residential heating. Renewable energy use reached its lowest level of 13.8 trillion Btus in 1972. Since then there has been steady growth. (Figures V-1 and V-2)

In 1990, renewable energy use, including hydro, reached an estimated peak of 61 trillion Btus, a total of 4.7 percent of the primary energy used within Minnesota. Renewable energy use increased by an average annual rate of 3.5 percent between 1960 and 1990. During this 30 year period, it grew from providing 3 percent of total energy use to providing almost 5 percent.The Department's baseline forecast shows limited growth in the use of renewable energy sources. It must be pointed out that baseline forecast considers regulatory and market structures to continue basically unchanged. The Department realistically expects movement in these structures to encourage renewables, but the effects of these are too new or too speculative to include in our model.

WOOD/BIOMASS

Current Situation: The Largest Source of Renewable Energy Use

Minnesota has more than 43 million acres either in forests or agriculture devoted to producing biomass. Biomass energy is generally used in solid form such as firewood, wood chips, wood pellets, sawdust, or agricultural residue. Ethanol, a liquid form of biomass, is discussed separately (see page 38).

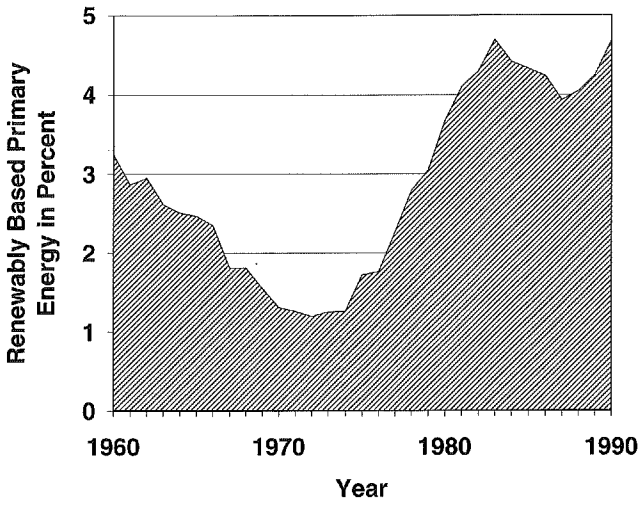
The Biomass Energy Facilities Directory, published by the Department of Public Service in

1992, lists 13 facilities burning crop residue within the state, 173 burning wood in some form, and 2 facilities using biomass-derived methane biogas. Crop residue used includes 1,130 tons of sunflower hulls, 610 tons of cull sugar beet seeds, 90 tons of corn cobs, and 10 tons of weather damaged hay. All of this consumption is associated with the commercial and industrial sector.

The DPS has limited data on statewide wood use, since the bulk of this use is in residential heating and the wood is often collected by the homeowner or purchased from small firewood suppliers. Because no record is made of these transactions, we rely on U.S. census data and federal government surveys to estimate residential wood heating statistics. Data for commercial and industrial wood use are more available. The best estimates available to the Department show 1990 wood use to be approximately 39.4 trillion Btus, or about 3 percent of total Minnesota energy consumption. Wood and other biomass currently provide the largest portion — 64 percent — of renewable energy sources used in the state. Approximately 55 percent of the wood and biomass used is for residential heating, 43 percent is for industrial process heating, and the remainder for commercial space heating.

FIGURE V-1

Renewable Primary Energy Contribution (including Indigenous Hydro)



FUTURE CONCERNS: POSSIBLE ECONOMIC AND ENVIRONMENTAL ADVANTAGES

Historically, use of wood and other biomass (residue) fuels has been driven primarily by their cost competitiveness with traditional heating fuels such as fuel oil and natural gas. If the price of oil and gas is high, wood becomes an attractive alternative. If oil and gas prices are low, wood is not economically attractive. Special technology is also needed in many cases to handle and burn biomass fuels. Yet there are also cases where biomass residue that is a costly waste in one industry might be a cheap, usable fuel in another industry. In these instances, the determining factors are technology and supply reliability.

Biomass fuels offer some positive environmental advantages since they are generally low in sulphur content. They do emit carbon dioxide, carbon monoxide, and particulate emissions common with fossil fuels, especially when they are burned inefficiently or improperly. When the total fuel cycle is considered, however, wood and biomass emit less carbon dioxide than traditional fossil fuels. In addition, efficiency standards now in place for residential wood stoves should help minimize the particulate and carbon monoxide emissions of wood burning. Similar standards could be extended to commercial and industrial furnaces and boilers.

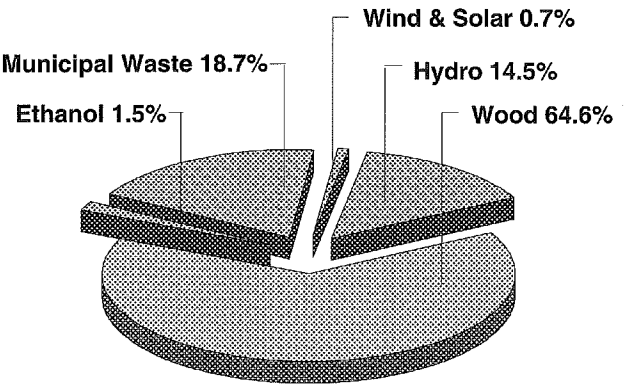
FUTURE DIRECTIONS:
LIMITED GROWTH POTENTIAL

The Department believes the growth of agricultural crop residue as a combustible energy source will be limited. Each application is site and crop specific, may require special technology, and is very susceptible to reliability of the residue supplier. Faced with these uncertainties, it is doubtful that private businesses will invest the capital necessary to develop these applications significantly.

Commercial and industrial wood use will continue to be limited by low prices of competing heating fuels in the near term. Long term price increases in the cost of fuel oil and natural gas would increase demand for wood fuel. At present, substantial subsidies would be necessary to encourage commercial and industrial investment in wood technologies.

FIGURE V-2

1990 Renewable Energy Mix by Source



Total = 61 Trillion Btus

Growing short rotation wood crops specifically for use in power plants appears to have a promising future. Currently, the Electric Power Research Institute (EPRI) is testing the whole tree burning concept. Successful tests have been conducted with fuel handling and combustion. Estimates of cost provided to the Department by the technology provider appear favorable - $700 per kW of capacity and 4 to 5 cents per kWh. Production tax credits contained in the recently passed National Energy Strategy legislation could improve the economics of this technology even more. The Department believes this technology has enough potential that it has recommended, through the Integrated Resource Planning process, that Minnesota Power implement a test project of this technology at one of its existing coal plants.

MUNICIPAL WASTE

CURRENT SITUATION:
A TECHNOLOGY FOR WASTE DISPOSAL

Municipal waste was Minnesota's second largest renewable source of energy use in 1990, contributing 11.4 trillion Btus of energy to Minnesota's energy mix. This represents 19 percent of the renewable energy use within the state, but less than 1 percent of total state energy use.

Fifteen waste-to-energy facilities currently operate in the state. Using municipal waste as an energy source is a relatively new technology in Minnesota. Department of Public Service records show that this source of energy first became significant in the early 1980s; it has grown very rapidly in the last five years.

The critical need to dispose of municipal wastes through means other than landfill is the primary driver of this technology, not the value of the energy involved. There are two major

types of waste-to-energy facilities. The first is mass burn, where unprocessed waste is burned prior to separation or processing. The facility in Minneapolis is a mass burn facility. The second type of facility is a refuse derived fuel or RDF facility such as those in Red Wing and Elk River .

FUTURE CONCERNS: STRONG ENVIRONMENTAL CONCERNS

Municipal waste has a large potential as an energy source within Minnesota, but the public has voiced strong concern and opposition to waste-to-energy facilities. Primary concern is possible toxic pollutants emitted when the waste is burned, including mercury, lead, other heavy metals, dioxin, and others. Even with the best pre-burn separation technologies and government regulation prohibiting the disposal of certain items, some unwanted portions of the garbage stream are burned. The waste-to-energy industry has been unable to convince the public that this is a safe and environmentally acceptable technology.

A good example of how difficult it is to build a waste-to-energy facility is the current mass burn facility being considered in Dakota County. This facility was first denied a permit by the Pollution Control Agency (PCA). This decision was taken to court by county officials and eventually overturned. The most recent development is a decision by PCA to permit a smaller facility than originally planned. Even after it has received its PCA permit, the facility has a number of other legal obstacles and challenges to overcome before it will become operational.

Another major concern is the effect of these facilities on local recycling efforts and the reliability of the waste stream. Reducing, reusing, and recycling materials save more energy than creating new products and then burning them to withdraw useful energy. A dedicated and guaranteed waste stream is necessary, however, to have large scale commercially profitable waste-to-energy facilities. Opponents of these facilities believe that local government cannot have successful and aggressive waste reduction and recycling programs if they are contractually obligated to deliver large waste streams to waste-to-energy facilities. We have already seen one Minnesota waste-to-energy facility discussing what financial adjustments will be necessary if the counties it serves are unable to deliver the contractually required amounts of garbage.

FUTURE DIRECTIONS: LITTLE EXPANSION SEEN

Any major expansion in use of municipal waste as an energy source appears unlikely until the safety of plant emissions and the waste stream issues are resolved. The Department of Public Service agrees that further expansion of this industry is not warranted at this time.

HYDROPOWER

CURRENT SITUATION:
A TRADITIONAL SOURCE OF ELECTRIC POWER

Hydroelectric power has been used in Minnesota for more than 100 years. Approximately 81 percent of the hydroelectric power generated within the state is generated by or for electric utilities. The remainder is generated and used by large industrial concerns.

The Department of Natural Resources Hydro Task Force reports that 34 hydroelectric plants now operate within the state and have a combined capacity of roughly 180 megawatts. Electric utilities also purchase and import a substantial amount of hydroelectric power from neighboring states and Canada.

Hydroelectric power facilities within the state supplied 8.85 trillion Btus of energy to Minnesota consumers in 1990. This number represents less than 1 percent of total state energy consumption, but 15 percent of the state's renewable energy use. Indigenous hydroelectric power generated about 1.5 percent of all electrical power used within the state.

In addition, Northern States Power purchased 1.44 million MWh of electricity from Manitoba Hydropower in 1990.

FUTURE CONCERNS:
RELICENSING, UPGRADING FACILITIES

Construction of new hydropower facilities is limited by high initial construction costs, environmental concerns, and relatively low purchase prices for electricity generated. New sites for hydroelectric facilities also are becoming increasingly limited. Any development of hydropower, therefore, is likely to continue to be made in conjunction with needed dam repairs and updating of existing facilities.

During the coming decade, many sites in the state will come up for relicensing. As part of the relicensing procedure, the Federal Energy Regulatory Commission will look at maximum use of site resources as well as dam safety and environmental impacts. It is also possible that some of the existing facilities may be removed from service to improve the recreational characteristics of the affected rivers. The Department of Natural Resources has already expressed an interest in removing three of the existing facilities in Minnesota.

Hydropower that is imported into our state is not without controversy. One concern is the adequacy of existing transmission lines to carry large additional purchases. To use larger amounts of imported hydroelectric power, old power lines may need to be upgraded and new power lines may need to be sited and built. Another concern is the impact of new dams on the people and land behind the dam site.

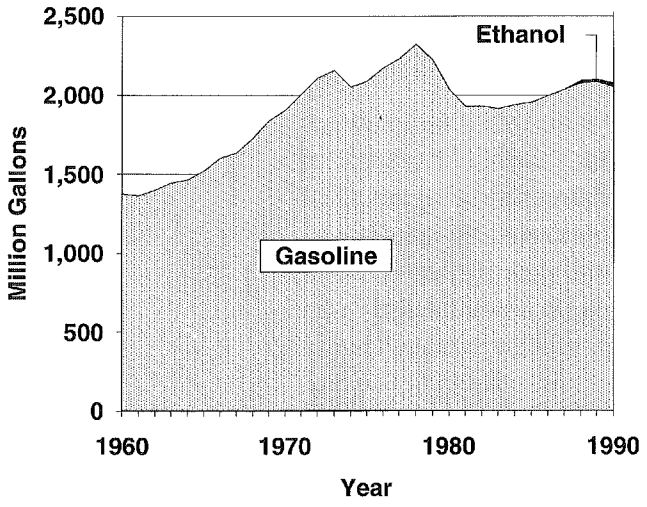
FUTURE DIRECTIONS:
IMPORTING HYDRO

The Department of Public Service believes that hydroelectric power, primarily imported, will play an increasing role in our energy future. Utilities are currently entering into long-term contracts to purchase electricity from Manitoba Hydro. For example, Northern States Power is entering into a contract for 500 MW of baseload power starting in 1993. Other agreement for peaking power and seasonal diversity power will increase this to approximately 800 MW for ten years starting in 1995. Otter Tail, Minnesota Power, and United Power Association are also contracting for smaller purchases in the near future.

In addition, the FERC licensing review process should stimulate several existing facility operators to consider facility expansion to coincide with license renewal. And as true environmental and societal costs begin to be integrated into electrical generation resource decision and eventually into the purchase price of electricity, economic viability of hydroelectric facilities should increase.

FIGURE V-3

Comparison of Gasoline and Ethanol Use



ETHANOL

CURRENT SITUATION:
TAX SUBSIDIES, EXPANDING MARKETS

Ethanol (commonly called grain alcohol) is a high grade liquid fuel produced from biomass, most often corn fermentation. Pure ethanol can fuel internal combustion engines, with slight modifications to the fuel system. Most ethanol fuel used today is blended with gasoline, forming the fuel commonly called "gasohol". This fuel, 90 percent gasoline and 10 percent ethanol, can be burned in existing automobiles with no modifications.

Almost 11 million gallons of ethanol were blended with gasoline in 1990, according to Minnesota petroleum tax records. This amounts to less than 1 percent of the more than 2 billion gallons of gasoline used in Minnesota in 1990. In 1991, ethanol use increased to 43 million gallons of ethanol, or 1.8 percent of the total product. In 1991, approximately 20 percent of the gasoline sold in Minnesota was ethanol blended "gasohol". (Figure V-3)

Tax Subsidy

Currently the cost of ethanol as a transportation fuel is substantially subsidized with both state and federal tax credits. Gasoline distributors in Minnesota are allowed a tax credit of $.02 for every gallon of 10 percent ethanol blended fuel sold. This equates to $.20 per gallon of pure ethanol. In addition, a producer payment of $.20 per gallon of ethanol is available for all ethanol produced in Minnesota within certain restrictions. That equates to a potential $.40 per

gallon state subsidy for ethanol produced in Minnesota. In addition, there is a federal gas tax credit of slightly over $.05 per gallon of 10 percent ethanol blended gasoline.

Clean Air Act

The federal Clean Air Act requires all gasoline sold after October, 1992, within specific Carbon Monoxide Control Areas to contain an oxygenate additive. This requirement applies only to the winter months. Under state law, this requirement will apply year-round and statewide after October, 1997. It is anticipated that at least in the early stage of the new law, ethanol blended gasoline will be used to meet this requirement in Minnesota. Ethanol blended gasoline, approved by all automobile manufactures, substantially reduces the amount of carbon monoxide released by automobiles.

Several large car manufactures, including General Motors and Ford, have started producing and selling "flexible fuel" vehicles on a limited basis. These vehicles, using sophisticated monitoring of the fuel systems, will be able to burn fuels ranging from 100 percent gasoline to 85 percent ethanol. These cars will not require drivers to use specific fueling stations; however, because these cars generally rely on central fueling stations that easily store and dispense the more concentrated blends of ethanol, metropolitan fleets probably offer the greatest potential for using these vehicles.

These state and federal laws expand the market for ethanol, especially that produced within the state. New ethanol production facilities are being planned, including a plant recently announced for the Winthrop area.

FUTURE CONCERNS: PRODUCTION COSTS

Early studies showed more energy is needed to produce ethanol from corn than can be obtained from the finished ethanol and by-products. More recent studies show that the energy content of the finished ethanol is greater than the energy used in production, using corn as a feedstock. The Department of Public Service relies on the more recent studies that show positive energy balance. We also believe that the energy balance will be improved in the future by use of alternative feedstocks and new production processes and technologies.

The main concern related to ethanol is financial rather than technical. Ethanol is financially viable because of existing subsidies. The Department believes such subsidies are reasonable for a new industry, especially if the industry furthers the goals of public policy, such as reduced auto emissions, decreased dependence on gasoline, and development of new agricultural markets. The real concern is the long term financial feasibility if the financial subsidies are removed. Many argue that ethanol subsidies should be permanent, to offset past subsidies of traditional fuels. The Department believes that eventually the financial subsidies for ethanol, as well as subsidies for other fuels, should be removed. This should happen as consumers begin to pay more of the true societal cost of competing traditional energy sources.

The cost of ethanol production is definitely higher than that of unblended gasoline. It is reasonable to expect that as ethanol production facilities gain more experience and better technology, the cost of production will go down. The real problem is that the cost of ethanol produc-

tion depends mainly on the cost of its primary feedstock, corn. As the demand for ethanol grows, the demand for corn grows, the cost of corn goes up, and the cost of ethanol production rises. These price swings are not unusual for an agricultural commodity, and they should be judged against the current volatility of worldwide petroleum prices.

The question of financial viability is most important to investors in future ethanol production facilities. Until long term financial viability of ethanol production and sales is assured, it will be difficult to attract significant amounts of capital into this industry without maintaining the current subsidies.

FUTURE DIRECTIONS: CONTINUING SUBSIDIES, FURTHER RESEARCH

The use of ethanol as a transportation fuel will continue to grow in Minnesota. The industry estimates that in the near future, ethanol use will climb to more than 100 million gallons because of the expansion of the oxygenate mandates. Based on current levels of gasoline consumption, that would mean 42 percent of all gasoline purchased in Minnesota would be the 10 percent ethanol blend.

The Department believes that present financial subsidies for ethanol should continue into the foreseeable future. Without these subsidies, ethanol production and use in Minnesota would be severely diminished. Ideally, these subsidies should be removed so that ethanol can compete fairly with other fuels. That cannot occur, however, until competing fuels are priced more closely to their true social cost. Until that time, further research must be conducted on both the production and use of ethanol.

Production Studies

A number of alternative feedstocks are being investigated in Minnesota. The two most promising appear to be sweet sorghum and short rotation wood crops. Research into both of these should continue aggressively.

Sweet sorghum is higher in sugar content than corn, making the fermentation process more efficient. Some estimates predict that sweet sorghum can yield 450 gallons of ethanol per acre compared to 250 gallons per acre for corn. Using sweet sorghum would also remove the feedstock from competition with food production. More research on the technical and financial feasibility of this process, including demonstration of its operation, is yet to be done. Large scale commercialization appears to be several years into the future, but additional research may shorten this time.

Short rotation woody crops, generally hybrid poplars, also could be grown and harvested specifically for ethanol production. Wood-based products, such as waste paper and cardboard, also could be used. The experimental process would use enzyme actions to produce alcohol from the cellulose in the wood or wood product. A consortium of state and federal agencies, headed by the Agricultural Utilization Research Institute, has submitted a letter of interest to the National Renewable Energy Laboratory for an experimental facility to produce ethanol from short rotation woody crops and switch grass. The experimental facility would use 40 tons of cellulose from biomass per day. This technology is also a long way from large scale commercialization, but it is a promising area for further research.

Research on Use

Automobile manufactures will continue to do research and development on vehicles and engines that can use ethanol in higher concentrations. Some of these vehicles can use ethanol blend containing up to 85 percent ethanol. There are specific opportunities for increased use of ethanol powered vehicles in fleet operations. For example, the MTC (Metropolitan Transit Commission) is in the process of purchasing 37 alternatively fueled buses. Ten of these buses will demonstrate two specific ethanol applications: the first is a fumigate system, using 5 percent ethanol blended diesel fuel, that injects ethanol upon acceleration to reduce the diesel buses' characteristic cloud of smoke. The second is specially designed engines that burn 90 percent to 100 percent ethanol. Other government and commercial fleets could also be used to demonstrate and test this new technology.

The critical decision for state policy makers will be to determine how long and to what extent they will continue to subsidize the production and use of ethanol. At the current time, removal of the subsidies would probably mean the demise of the ethanol industry in the state.

SOLAR

CURRENT SITUATION: IMPROVING TECHNOLOGY

Solar energy provides a very small part of Minnesota's energy use. The Department of Public Service estimates that Minnesotans used approximately 370 billion Btus of solar energy in 1990, representing less than .1 percent of total state energy consumption. This estimate might be low: since most solar systems are associated with individual residences or businesses, limited data are available.

Many solar technologies are well developed and integrated into niche markets, such as the use of photovoltaics in solar calculators and watches. Photovoltaics — a system for directly converting light into electric energy — is increasing dramatically in Minnesota and around the world. Cost of photovoltaics has dropped by more than 95 percent in the past decade, to $3.75 per Watt. Photovoltaics is currently cost effective in many applications where grid electricity is not readily available, such as remote security lighting and remote or portable monitoring equipment.

Utilities across the nation have installed several large systems to learn about grid- connected photovoltaic power. Niagara Mohawk in New York has installed a 13 kW system on a building to demonstrate the air-conditioning peak-shaving potential of a photovoltaic system. Authors for *Scientific American* have stated that because photovoltaic cells perform more efficiently when they are cooler, a photovoltaic system may produce as much electricity annually in Minnesota as anywhere in Florida.

Electric vehicles are also being introduced in major metropolitan areas, primarily to reduce harmful air emissions related to gasoline and diesel vehicles. Many of these cars have incorporated photovoltaic systems to augment their battery storage during the day.

Passive solar heating, a relatively exotic concept several years ago, has been effectively inte-

grated into modern energy efficient home design. Active solar heating is also experiencing a rebirth of sorts as people concerned about the environment find this a more acceptable technology than traditional heating sources. Certification programs have been developed to help ensure the reliability of the technology. The U.S. Department of Housing and Urban Development (HUD), in fact, accepts the solar certification program for its financing programs, meaning that solar heating systems can be included in home loans supported by HUD.

To stimulate the growth of renewable energy, Minnesota exempts photovoltaic systems from state property and sales tax.

FUTURE CONCERNS: ENSURING RELIABILITY

The primary concern related to solar energy use is reliability. American consumers have come to expect energy available on demand, any time of day or night, any season. Solar energy by its nature is available only at specific periods. This is often acceptable in private situations such as home use, especially if the home is connected to a backup energy supply; however, for solar energy to be commercially viable and compete with utility power, it needs to be available on demand.

Some type of large storage system designed in conjunction with the solar technology would increase the dispatchability (availability) of solar energy power. Another option is to design and incorporate standby energy from traditional sources, such as a diesel generator. Although both of these options increase the usability of solar energy, they also increase the cost of the system and make the project financially less feasible.

FUTURE DIRECTIONS: RESEARCH AND DEVELOPMENT

The cost-per-Watt of power continues to decrease for photovoltaics. Additional research and new technologies will continue this trend. In addition, the production tax credits contained in the recently passed National Energy Strategy legislation could improve the economics of this technology even more. Research into new battery and electrical storage technologies is taking place at the national level and may lead to a breakthrough.

Until photovoltaic cells and associated storage become cost competitive with utility power, photovoltaics will continue to develop in small, specialized applications, primarily applications off the electrical grid. The Department believes it is important to identify and use these opportunities whenever possible. One possible large market for photovoltaics may be electric cars, but it is unknown to what extent electric cars will rely on solar electric generation.

The movement toward incorporating appropriate environmental and social costs into future electrical resource decisions and into the price that utilities pay small generators will also help to stimulate growth in photovoltaic generation.

WIND

CURRENT SITUATION: ASSESSING POTENTIAL; ENCOURAGING DEVELOPMENT

Wind power provides a very small portion of Minnesota energy use — less than .01 percent in 1990. Potentially, however, it may be the largest renewable source of energy use in the state.

Several years of monitoring wind speeds throughout the state have identified tremendous potential for wind energy development. The Department of Public Service estimates that a small area in southwestern Minnesota known as Buffalo Ridge could produce an amount of electricity equivalent to total current state use. The U.S. Department of Energy estimates that Minnesota could produce 14 times the amount of electricity we now consume.

Minnesota has taken firm steps to increase the use of wind energy. Smaller machines, those typically used on individual farms, receive retail rates for electricity they produce and sell back to the utilities. Wind turbines are now exempt from property and sales tax, and investors are allowed to use financially attractive depreciation schedules. Finally, the law now requires utilities to include avoided environmental costs in the rates they pay for wind generated electricity.

Minnesota's first privately owned commercial wind power plant, a 600 kW array in Marshall, started producing power in the spring of 1992. Many wind power developers, including state utilities, are considering Minnesota as the site for wind energy projects. In addition, Northern States Power has just announced its intention to develop 100 megawatts of windpower by the year 2000. The Department has also recommended, through the IRP process, that Otter Tail Power consider installing up to 30 MW of wind generation capacity.

FUTURE CONCERNS: IMPROVING RELIABILITY

Availability of power is the main concern with wind energy as well as with solar energy. Commercial viability of wind energy systems generally depends on the electricity being sold to electric utilities. Electric utilities' prime concern is the availability of specific amounts of power at peak demand times. In general, wind energy systems cannot guarantee this level of reliability to the utilities they supply without expensive standby energy storage or generation capacity. Therefore, wind systems generally qualify for a much lower "buy-back rate" — the price the utility pays for the electricity. This makes investment in wind energy systems less attractive.

The first wind energy machines installed in the early 1980s had a significant failure rate. The current generation of wind machines has demonstrated much greater reliability and the technology continues to improve through development and demonstration programs. Actual installations such as those in Marshall will help document the potential of windpower in Minnesota.

FUTURE DIRECTIONS:
HIGH GROWTH POTENTIAL

Wind energy is becoming more cost competitive each day. A wind system currently costs an estimated $900 per kW capacity and produces electricity at 6 to 8 cents per kWh. Present tax incentives, technology advances, and state regulatory policies should help the wind energy industry grow. The movement toward incorporating appropriate environmental and social costs into future electrical resource decisions and into the price that utilities pay small generators will also help to stimulate growth in wind generation. In addition, the production tax credits contained in the recently passed National Energy Strategy legislation could improve the economics of this technology even more.

Multi-Industry Issues

6

Multi-Industry Issues

"Minnesota imports all of its conventional fuels and at the same time 'exports' our energy dollars."

Cherie Hales
Resident, Zumbro Falls
Rochester Public Meeting
March 18, 1992

A number of issues related to energy use, such as the issue of exporting energy dollars as noted in the quote at left, affect all or multiple energy sources. We discuss a number of these "multi-industry" issues in this chapter.

Energy Self Sufficiency

The goal of "energy independence or "energy-self sufficiency" for Minnesota was the focus of considerable discussion in the past. Attention was also given to the problem of "energy dollars" leaving the state. Energy independence and keeping all of our energy dollars within the state may sound ideal, but the Department does not consider these reasonable or even desirable goals.

Minnesota, along with every other state and every other nation, is involved in an economy that depends on both imports and exports. Our businesses look for, and develop, export markets for many different types of Minnesota goods and services. If Minnesota products and services are of lower cost and/or higher quality, then people outside of Minnesota will purchase these goods and services. They will do so because it makes good economic sense. Minnesota's export market is based on other consumers making good economic decisions, rather than parochial choices.

The same is true with goods and services we import. We purchase products and services from other states and nations when those products and services are unavailable in Minnesota or when cheaper or higher quality products and services are available from outside the state. We base our purchasing decisions on clear economic considerations. It would be unwise for the economy of our state consistently to select products and/or services produced in Minnesota that were of a significantly higher net cost.

These same economic fundamentals must apply to our decisions about energy. If a clean and reliable (therefore high quality) source of energy is available from outside of the state at a lower cost than a competing source within the state, economics dictate that we "import" this energy source. To do otherwise over the long term would adversely affect the long-term economic health of the state.

It is important to emphasize, however, that the Department believes that future choices between all energy resources, whether imported or indigenous, should consider environmental and social costs to the maximum extent possible.

Impact of True Energy Pricing on Low-Income Minnesotans

Previous chapters of this Report include considerable discussion of incorporating environmental and social costs into future resource decisions when ever possible. Systematic consideration of these costs will result in these "external costs" being incorporated into the prices consumers pay for energy over a gradual period of time. The Department believes that the ultimate, long term policy goal should be to have energy prices include all appropriate environmental and social costs of that energy source. This means that consumers will then have all of the appropriate economic price signals for making the best energy choices.

The Department of Public Service believes that we must progress toward incorporating appropriate environmental and social costs in all future resource decisions. Our commitment to this goal is reflected in our position on several energy issues: advocating before the PUC to include appropriate environmental costs in the rates utilities pay small generators, advocating full rate recovery for nuclear waste disposal costs, and advocating full rate recovery of the costs of conservation programs offered by the utilities. Our support for strong environmental standards in the production and use of all energy sources also reflects this commitment.

The Department realizes that our advocacy of incorporating appropriate societal cost of energy into future resource decisions is generally an advocacy of consumers paying higher, yet responsible, energy prices. We believe paying energy prices that do not include environmental and societal cost leaves these costs to future generations.

We also realize, however, that the "price" of energy is an issue especially critical to low and fixed income citizens. It is clear that low-income Minnesotans pay a disproportionate share of their income for energy use. In 1990, the average Minnesota household paid less then 4 percent of household income on energy: roughly 2.1 percent for home uses and 1.8 percent for transportation. Data from the Low-Income Heating Energy Assistance Program show that many of the poor served by that program pay well over 20 percent of household income for energy use, exclusive of transportation.

As energy pricing policy changes to reflect more closely the true costs of energy, the higher prices will likely make the energy payment situation worse for many low-income citizens. In Minnesota, with its severe climate, an inability to pay a home heating or electrical bill and the resulting possibility of disconnection can be a survival issue. Therefore it is important for the state to implement these new pricing decisions gradually and wisely. It is also important to continue low-income energy efficiency programs since these can reduce total energy costs despite rising prices.

The Department of Public Service strongly supports programs of protection and support for low-income citizens as long as the primary consumer remains responsible for payment. In energy, these programs include shut-off protection during the cold weather season, use of flexible repayment plans or budget plans to make it easier for low-income consumers to meet their own payment responsibilities, and a strong and adequately funded program for weatherization of low-income households. These programs will provide needed protection and, in the case of weatherization, lower energy bills for low-income consumers without distorting the consumers' responsibility to pay the full cost of energy they use.

There are, however, a number of proposed support mechanisms for low-income consumers that the Department does not support because they limit or remove the responsibility of energy payment from the ultimate consumer who uses that energy. These mechanisms include arrearage forgiveness programs and percent of income or "PIP" payment limitations. The Department believes that these types of mechanisms remove the incentive to use energy wisely.

The Department also supports programs that help low-income citizens pay their energy bills, including the federal Low-Income Heating Energy Assistance Program (LIHEAP). We have lobbied for continued funding of this valuable program and will continue to do so. The Department believes, however, that this type of program should be viewed as social policy rather then energy policy. Financial assistance for paying energy bills is one of the many needs of low-income citizens. It is no different than the need for affordable housing, affordable health care, day care assistance, job training, and education assistance. Discussion and decisions about energy assistance funding and programs should take place at the same time and place as discussion and decisions on these other important low-income issues. The Department believes that it would be more appropriate to address the many needs of the low-income citizens of Minnesota in a comprehensive manner rather than through individual programs that address only single aspects of low-income needs.

Interdependence of Energy Industries

All of the various energy sources are intricately connected. For example, a major price increase in one energy source affects industry and consumer behavior, causing in time a switch away from the more expensive fuel toward other sources. Price changes and the resulting fuel switching affect the consumption patterns of all of the other energy sources.

The intricate interconnectedness of the energy industries can be seen clearly using two examples: one in transportation and one in space heating.

Transportation

Clearly, gasoline is the dominant energy source for transportation. Environmental, economic, and national security reasons provide tremendous pressure to both increase automobile efficiency and find "non-gasoline" transportation fuels. Several different types of fuel are being considered and tested: electricity, natural gas, propane, ethanol, and methanol. Changing to any of these fuels appears to be a good idea, but the results must be carefully considered. Major shifts into electric vehicles within the city will increase an already large electrical production growth rate, and unless the vehicles are all charged during off-peak hours, new power plants may be necessary. What sources would be used to generate that power: coal, nuclear, or renewable? A major shift to natural gas vehicles also raises questions: Is there adequate existing pipeline and storage capacity to heat our buildings, run our factories, and power our vehicles in the middle of winter? How will transportation demand for natural gas affect the cost and availability of natural gas for home heating? Or, if we make major strides into using higher blends of ethanol motor fuel, what will be the impact on the current gasoline production and delivery system and what will be the impact on corn prices and therefore food prices?

Space Heating

When it is available, natural gas is the fuel of choice for space heating because of its cost, availability, and less harmful environmental effects. Large commercial and industrial natural gas customers often have interruptible service, which means when the demand for gas is high, utilities may require that they switch over to a backup fuel, generally fuel oil. For this flexibility, they are rewarded with a lower rate for the natural gas they use. Electrical utilities are beginning to offer more interruptible rates to customers who heat with electricity but can switch to a backup fuel when necessary. During most of the winter, when natural gas is plentiful, fuel oil is not required. During an extended cold snap in February, however, natural gas or electric heating may be curtailed, forcing the fuel oil delivery system to gear up from limited sales to very high demand in a matter of days or hours. This strains the fuel oil delivery system and usually creates a significant price spike in fuel oil. Will natural gas curtailment occur more often as natural gas is used for vehicles and electric generation? Can the fuel oil industry, or any industry, be expected to survive this type of "feast-or-famine" market structure?

Unfortunately, we do not yet have the answers to all of these questions. These examples are presented simply to illustrate the complex, interconnected nature of the energy systems on which we all rely. They also illustrate the need to study issues completely and move carefully when making energy policy choices.

Global Climate Change

Global climate change has been the subject of a great deal of discussion in recent years in both the scientific and political communities. At the center of this discussion is the theory that various by-products of energy production and consumption cause change in the earth's atmosphere which alter its ability to retain heat.

This theory is controversial within the scientific community itself, and political discussions have tended to be quite polarized. Observations of recent climatic events and historical studies of climate change have yet to clarify the matter. What is clear, however, is that cost-effective and economically sound use of renewable resources and energy efficient technologies reduce the output of energy use by-products that enter the atmosphere.

The Department believes that government should adopt policies that promote the expansion of the use of renewable resources and the use of the most efficient technologies, that are cost-effective for personal, commercial, and industrial energy use, including transportation. Further, the Department believes that this expansion be promoted through the use of financial incentives for:

- Research and development of renewable energy resources and energy efficient technologies;
- Manufacture of renewable energy resources and the distribution and manufacture of both renewable resource and energy efficient technologies;
- Consumer and utility investment in renewable resources and energy efficient technology.

These issues are discussed further in Chapter 7, Recommendations of the Department of Public Service.

Issues Associated with the Carbon Tax

One method that has been suggested to reduce energy related carbon dioxide production is a carbon tax. By its nature, this type of tax would reduce energy use, specifically in the carbon-based fuels. This tax would be placed on either actual, monitored carbon dioxide emissions, or on carbon-based fuels prior to use.

The Department of Public Service opposes the implementation of a carbon tax, especially a unilateral carbon-based tax imposed within the state of Minnesota. Our opposition stems from the economic consequences of such a tax and the fact that economic incentives are a far more productive and effective means of increasing energy efficiency and renewable resource use.

The implementation of a carbon tax accomplishes energy use reduction by increasing the price of energy. Any state or economic entity, taking this action unilaterally, will raise its energy prices relative to its neighbors and competitors. This will put it at a competitive disadvantage in that all of the goods and services produced within that economy will have a higher cost of production than similar goods and services produced by a competitor. We have already experienced a small aspect of this competitive disadvantage, as evidenced by the problems created in border communities when the gasoline tax is raised in Minnesota.

Another adverse effect of a carbon tax is its impact on the low-income citizens of Minnesota. All energy price increases impact the low-income consumer to a greater extent then the average consumer, and the carbon-tax would be no exception. It would be a very regressive tax.

The same concern about putting Minnesota at a competitive disadvantage relative to other states also is a concern on a national level. If the United States were to implement a national energy carbon tax, it would have additional competitive problems with its foreign trade partners. In addition, OPEC, through Saudi Arabia, has already indicated that there would be in-kind price retaliation if the U.S. were to implement either a carbon tax or an imported oil tax.

On the other hand, a well designed system of economic incentives – such as sales and property tax forgiveness, low-interest loans, accelerated depreciation – attached to research, development, manufacture and use of renewable resources and high efficiency energy use will not only stimulate the future use of renewables and energy conservation, but will also tend to stimulate the overall economy as well.

In addition to economic incentives, the Department believes there are significant regulatory incentives that can be applied to stimulate the development of renewables and to promote energy conservation through the regulated utilities. These include:

- Reduction or removal of regulatory processes, such as Certificate of Need proceedings for utilities seeking to develop renewable energy capacity.
- Additional earning incentives for utilities investing in renewable capacity or in energy conservation or renewable programs for their customers.

Additional discussion of these issues appears in Chapter 7, Recommendations of the Department of Public Service.

Sustainable Energy Policies

7

SUSTAINABLE ENERGY POLICIES

Recommendations of the Department of Public Service

"Aggressive investments in energy conservation and the development and use of natural resources will provide Minnesota with a hedge against an uncertain energy future .... We can retain energy dollars within Minnesota while creating thousands of permanent jobs .... Our long term energy and economic future is enhanced and our natural environment is improved."

Michael Hohmann, Minneapolis

SETTING QUANTIFIABLE GOALS

The energy issues facing Minnesota decision makers are many and complex. Actions are needed to shape our energy future, and a set of quantifiable goals, aggressive yet realistic, are needed to guide these actions. Based on our review and analysis, the Department of Public Service recommends that the state adopt five major energy goals. These goals are:

- Ensure that the U. S. Department of Energy (DOE) begins to remove Minnesota's nuclear waste by 2000, and hold DOE to its schedule for operation of a permanent nuclear waste repository by 2010.
- Protect a strong state role in future nuclear plant licensing and pipeline siting decisions.
- At a minimum, double the total amount of renewably based energy used within the state by 2020.
- Improve the efficiency of our energy use per real dollar of gross state product by 30 percent, by the year 2020, while maintaining or improving comfort and productivity.
- Create a self-supporting, innovative, sustainable energy industry in Minnesota.

Achievement of these goals will require aggressive actions on several fronts including political, technological, and consumer behavior.

To establish measurable goals, specifically goal three and goal four, the Department simultaneously modeled three aggressive energy efficiency scenarios and one aggressive renewable energy scenario using the forecasting model, ENERGY 2020. A more complete description of this model can be found in Appendix B of this Report. The results of this analysis were then compared to a baseline forecast. As with all analyses, it is important to understand the basic assumptions. The basic assumptions of our baseline analysis included:

A. Continued population and economic growth for the state through 2020.

B. Continued energy efficiency gains in technology.

C. Continuation of existing energy conservation programs and consumer purchasing behavior.

D. Continuation of all existing energy production and generation facilities.

E. New electrical generation capacity being supplied by coal plants.

F. Statewide use of 10 percent ethanol blended gasoline by 1996.

The basic assumptions of our goal scenario included all of the above assumptions except (E) and added four additional, aggressive energy efficiency and renewable energy actions including:

G. Increasing the Corporate Average Fuel Economy Standards (CAFE), starting in 1993, until a level of 45 miles per gallon is achieved by 2008.

H. At the end of the normal useful life, replacing all energy using appliances and equipment with new devices achieving at least 90 percent of theoretical maximum efficiency.

I. Fifty percent of all residential consumers investing $200 in household energy conservation and then maintaining a $50 per year maintenance level.

J. Instead of all new electrical capacity supplied by coal, supplying 50 percent of all new electrical generation capacity by wind, 25 percent by biomass, and 25 percent by coal.

The Department believes these final four assumptions to be very aggressive. These four changes or policy scenarios were analyzed using the Department's ENERGY 2020 computer model. The simultaneous modeling of these four energy scenarios established quantifiable benchmarks for energy efficiency and renewable resource targets described in the third and fourth energy goals listed above. Many would say it is impossible for us to achieve these individual actions. However, modeling these actions simultaneously can establish an aggressive benchmark by which to measure progress toward these goals.

GOAL 1: Ensure that the U. S. Department of Energy (DOE) begins to remove Minnesota's nuclear waste by 2000, and hold DOE to its schedule for operation of a permanent nuclear waste repository by 2010.

Minnesota relies on nuclear energy for a significant portion of its current electricity supply. Without a permanent disposal site for nuclear waste, the future viability of this energy supply is in serious doubt. Yet the costs of replacing Minnesota's three nuclear reactors would be large, and each of the choices for replacing this capacity has drawbacks. Therefore, Minnesota's leaders must make every effort to hold the federal government to its legal obligation to accept and dispose of nuclear waste in a timely and cost-effective manner.

Our analysis shows that premature retirement of these plants would have a dramatic negative effect on the state economy. Electric costs would rise, which would reduce electrical use. However, total primary energy use would increase because coal would most likely replace the lost generating capacity. This increased electrical cost would put Minnesota at a competitive disadvantage while the increase coal use would have a negative environmental impact.

STRATEGIES:

To accomplish this goal, the Department of Public Service recommends that Minnesota:

1. Take all viable actions — including legislative, legal, and administrative initiatives — to hold the federal government to its obligation for nuclear waste disposal. Nuclear waste disposal should be a top priority among Minnesota's federal initiatives. Minnesota should seize all opportunities, existing and new, to stress the importance of this issue to the state and nation's energy future.

2. Develop and implement actions that protect Minnesota consumers from the costs and consequences of delays in the federal nuclear waste disposal program. As required by law, Minnesota has made timely and full contributions to the national Nuclear Waste Fund, which supports the nuclear waste disposal program. Since we have met our obligations under the Nuclear Waste Policy Act, Minnesotans should not be required to fund any additional costs due to DOE's delays in meeting its legal obligations. Minnesota should take action to ensure that consumers are protected from the costs and consequences of any DOE delays.

3. Work collaboratively with other affected states, utilities, and interest groups to increase the effectiveness of Minnesota's initiatives. Because of our pressing need for nuclear storage, Minnesota has led the nation on the nuclear waste disposal issue. Other states will soon be compelled to take action as they face similar waste storage problems. Utilities, environmental groups, and other organizations also may recognize and share our concerns about the need for an effective federal nuclear waste disposal program. Working collaboratively with these organizations can increase the strength of our initiatives, and improve our effectiveness. Minnesota should lead in developing collaborative efforts on the nuclear waste disposal issue.

GOAL 2: Protect a strong state role in future nuclear licensing and pipeline siting decisions.

Many federal initiatives, including the new National Energy Strategy currently in Congress, streamline and hasten the processes for licensing/relicensing nuclear power plants and siting natural gas pipelines. Unfortunately, these efforts often come at the expense of state oversight and public review and comment. Minnesota must act to protect its vital interests in oversight of these major energy projects.

STRATEGIES:

To implement this goal, the Department of Public Service recommends that Minnesota:

1. Actively participate in federal initiatives and proceedings on nuclear licensing/relicensing and pipeline siting issues. These two issues are extremely important to Minnesota's energy future. Minnesota, through its Energy Issues Intervention Office in the Department of Public Service, should actively participate in federal proceedings on nuclear licensing and pipeline siting issues that affect our state.

2. Oppose all actions that weaken Minnesota's right to review and approve major energy facilities located within our borders and serving our residents. Minnesota has a legitimate interest in overseeing these major energy projects. To retain our ability to chart our energy future, Minnesota must strongly oppose all efforts to limit or minimize state oversight of these projects.

3. Maintain close contact with Minnesota's congressional delegation and seek support of our initiatives and positions. Our delegation must protect our state's interests in energy policy and projects. The Energy Issues Intervention Office and the Governor's Washington Office must keep the delegation informed of our positions on major energy initiatives and plan cooperative efforts to ensure that Minnesota's interests are protected.

4. Work cooperatively with national organizations and other states that support our views. As with the nuclear waste disposal issue, Minnesota will be more effective in implementing its

agenda if it gains widespread support of its initiatives and positions. Minnesota should seek and join the efforts of other groups, such as the National Association of Regulatory Utility Commissioners and the National Association of State Energy Officials, that share our interests in this area.

GOAL 3: At a minimum, double the total amount of renewable based energy used within the state by 2020.

In making future energy resource decisions, Minnesota should use a social-cost perspective whenever possible. Under this perspective, renewable energy sources compare more favorably to traditional energy sources, primarily because renewable energy resources generally impose lower environmental costs. Although specific resource decisions must weigh all important factors, including reliability, dispatchability, and cost, the Department believes that Minnesota can and should make better use of renewable energy.

Our analysis shows that the primary applications for substantial renewable energy use growth will likely be in electricity generation (hydro, wind, and possibly biomass) and transportation (ethanol). The Department believes, however, that Minnesota should take advantage of all cost-effective uses of renewable energy. We believe this doubling is an aggressive, yet realistic, goal under the assumption of the analysis. For example, to reach this goal, even after future contracts with Manitoba Hydro and NSP wind development are considered, Minnesota would have to add either renewable base load electric generation roughly equivalent to a 600 MW base load power plant or make a ten-fold increase in current ethanol use, from 43 million gallons in 1991 to more than 400 million gallons in 2020.

STRATEGIES:

To implement this goal, the Department of Public Service recommends that Minnesota:

1. Maintain both current sales and property tax exclusions for wind and photovoltaic systems and producer/retailer tax credits for ethanol. Renewable energy is still in the early stages of development and is competing with traditional energy sources, which have established and well financed infrastructures. In addition, most of these traditional energy sources are not priced at their true societal cost. Elimination of these subsidies for renewable energy, at this time, would greatly hinder their development and use.

2. Allow additional incentives, such as accelerated depreciation or other tax benefits, for any business or utility investing in cost-effective renewable energy resources and energy-efficient products. A majority of those speaking at our public meetings on state energy policy supported renewable resource development and energy conservation, with many advocating additional tax benefits and other financial incentives to encourage investment in renewable resources and energy-efficient products. Minnesota should explore and implement these incentives, as appropriate, and these incentives should apply to all Minnesota residents and businesses investing in renewable energy resources and energy efficiency.

3. Implement regulatory reforms — including reduced regulation and/or additional incentives — to encourage cost-effective investment in renewable energy by Minnesota's electric utilities. Legislative mandates already require that electric utilities first consider renewable energy sources when deciding how to meet future needs. Also, the PUC's Integrated Resource

Planning (IRP) process establishes a framework to compare and select potential resources for meeting electric needs based on their social cost. These initiatives are likely to bring about increased investment in renewable energy by Minnesota's electric utilities, but the Department believes that additional regulatory reform is needed to supplement these efforts and ensure that utilities can invest in cost-effective renewable energy as quickly and efficiently as possible.

The Department sees two specific initiatives that can further this effort. First, Minnesota should eliminate Certificate of Need requirements for renewable energy investments that have been reviewed and approved by the PUC in an electric utility's integrated resource plan. This action will speed implementation of renewable generating capacity. Since the PUC retains oversight through the IRP and rate-case processes, consumer protection and the public interest will not be compromised. Second, Minnesota should provide financial incentives for utility investment in renewable energy similar to incentives for investment in demand-side programs. Investing in the most socially beneficial resource should also be the utility's most profitable course.

4. Eliminate subsidies of renewable energy by 2020. While we support continuation and potential expansion of current subsidies to renewable energy, the Department believes that Minnesota must set a long-term goal that all energy resources be priced at their true societal cost. An implicit part of this goal is the elimination of all subsidies for all energy resources, traditional and renewable. By 2020, renewable energy should be developed sufficiently to compete with traditional energy supplies, if they are priced at their true societal costs.

GOAL 4: Improve the efficiency of our energy use per real dollar of gross state product by 30 percent, by the year 2020, while maintaining or improving our comfort and productivity.

Measures of Minnesota's energy efficiency, such as our energy use per dollar of gross state product, have improved substantially over the last 30 years, but additional improvement is attainable. The Department believes that Minnesota should set specific, quantifiable, efficiency goals based on this measurement. Improving this energy efficiency measure by 30 percent is an aggressive, yet achievable goal. However, this goal must not be achieved at the expense of our state economy or our quality of life. Given the advancements in technology and more energy conscious consumers, we can and must achieve this goal while maintaining or improving the comfort and productivity of all Minnesotans.

STRATEGIES:

To achieve this goal, the Department of Public Service recommends that Minnesota:

1. Stress each Minnesotan's responsibility to invest in energy efficiency, highlighting the economic and environmental benefits of these actions. These aggressive efficiency goals will not be achieved by government and utility action alone. Individuals must also take responsibility for their own energy choices. Fortunately, in addition to being good energy policy, investments in energy efficiency make good economic and environmental sense. Therefore, by stressing the benefits of these investments, Minnesota should be able to tap the resources and ingenuity of its individual citizens to improve our overall energy efficiency.

FIGURE VII-1

Energy Use per Real Dollar of Gross State Product (End-Use)

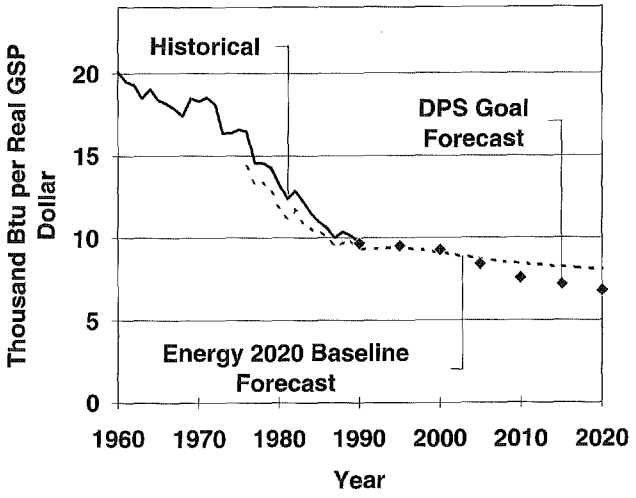
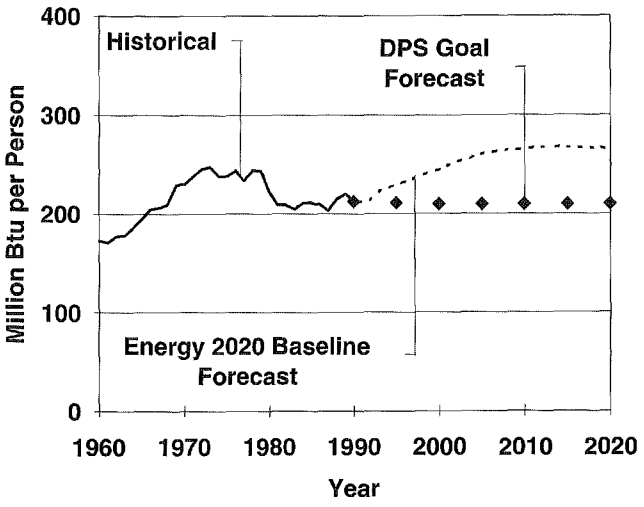


FIGURE VII-2

Per Capita Energy Consumption (End-Use)



2. Embark on a major educational campaign to promote the many cost-effective ways that Minnesota residents, businesses, and industries can improve their energy efficiency. This strategy complements the initiative above. By educating the public on the economic and environmental benefits of energy-efficiency improvements, Minnesota will be better poised to meet its energy goals.

3. Convince 50 percent of Minnesota households, by the year 2000, to invest at least $200 in energy efficiency, and $50 each year thereafter in routine energy related maintenance. The Department's analysis shows that at this level of investment, the average residential consumer could expect to save $100 per year, providing an investment payback of three years. If 50 percent of the households in Minnesota took this action, approximately $45,000,000 in annual disposable income would be created throughout the state. There are many low cost/no cost ways for residential energy consumers to save energy. Most of these measures have very quick paybacks (three years or less), and will reap savings for the consumer over future years. If 50 percent of the households in the state invested at the level described above, Minnesota could reduce its future energy needs by almost 3 percent. Equally important, the consumers who invest would reap over $100 in savings each year.

4. Increase consumer participation in utility conservation programs by an average of 15 percent per year, over the next five years. The Minnesota Legislature and the Commissioner of the Department of Public Service have aggressively increased utility investment in energy conservation programs. Further cost-effective expansion of these programs is achievable. To achieve our energy efficiency goals, Minnesota must continue to increase participation in utility programs. Increased participation can be achieved by a combination of active utility promotion and consumer demand for these types of services.

5. Implement an Integrated Resource Planning process for natural gas utilities. The Public Utilities Commission is implementing IRP for electric utilities. Gas utilities and their customers may likewise benefit from an IRP process designed to address natural gas procurement and use. Other states have initiated gas IRP. Minnesota should explore these initiatives and implement an IRP process for Minnesota gas utilities.

6. Expand incentives for utility investment in demand-side management. The PUC has implemented financial incentives for both electric and gas utilities to encourage investment and performance in demand-side management. Given the newness of this initiative, the PUC intends

to study the effect and design of various incentives. The PUC should continue this effort and modify or expand utility incentives as appropriate. The PUC should also examine the benefits of decoupling utility profits from sales, and implement on a test basis if analysis supports such a decision.

GOAL 5: Create a self-supporting, innovative, sustainable energy industry in Minnesota.

Energy industries are changing at a rapid rate. New technology for energy efficiency and renewable energy is improving dramatically. Minnesota should lead these changes and seek to create a strong energy industry in Minnesota.

STRATEGIES:

1. Work with the Minnesota Technology Initiative to provide seed money and low-interest loans to fund research and development and manufacture of energy efficient technology and renewable energy resources in Minnesota. Provide start-up state funding of this initiative through the Environmental Trust Fund. Working through the Minnesota Technology Initiative, Minnesota should support establishment and growth of innovative energy-technology businesses. This support could take the form of research and development activities, start-up funding for new businesses, or funds to expand existing energy related businesses. Given the significant environmental benefits of energy efficiency technologies and renewable energy resources, seed funding for this initiative should be provided through the Environmental Trust Fund. The state could condition its financial support to energy businesses on their commitment to operate within Minnesota for a specified period of time. This initiative will help create and sustain an innovative energy industry in Minnesota.

FIGURE VII-3

Energy Expenditure as Percent of Gross State Product

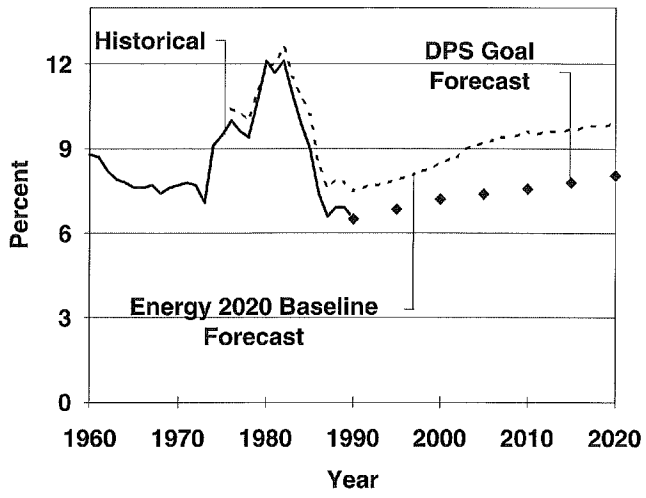
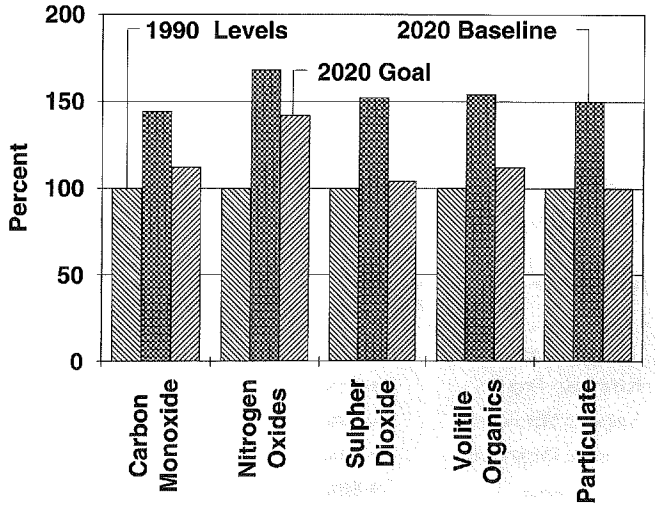


FIGURE VII-4

Comparison of Selected Pollutants Under Baseline and Goal Scenarios



In a separate but related initiative, the Department recommends a general fund appropriation for ethanol research and development that would be matched by private funds. This initiative would aim at both improving ethanol production processes and at examining new engine technologies to better use ethanol. Research into ethanol production could eventually lower the cost of production, either by improving the existing process or by using new feedstocks or enzymatic processes. Research into new engine technologies would expand the potential market for ethanol. As research develops, both the production of ethanol and new engine technology could become important segments of our Minnesota economy.

RESULTS OF GOAL ACHIEVEMENT:

As stated earlier, the Department modeled a set of aggressive conservation and renewable actions to determine future impacts on the state and its consumers. The results of this modeling set the quantifiable benchmarks used in Goals 3 and 4. To examine other efficiency, economic, and environmental benefits resulting from attaining these goals, the increased renewable and efficiency results are compared to a baseline forecast that assumes a "business-as-usual" approach. These two scenarios are compared using simple, quantifiable indicators that describe energy efficiency, economic prosperity, and environmental health. The historical values, baseline forecast, and goal forecasts are presented in detail in Figures VII-1 through VII-5.

FIGURE VII-5

Annual Energy Related Production of Carbon Dioxide

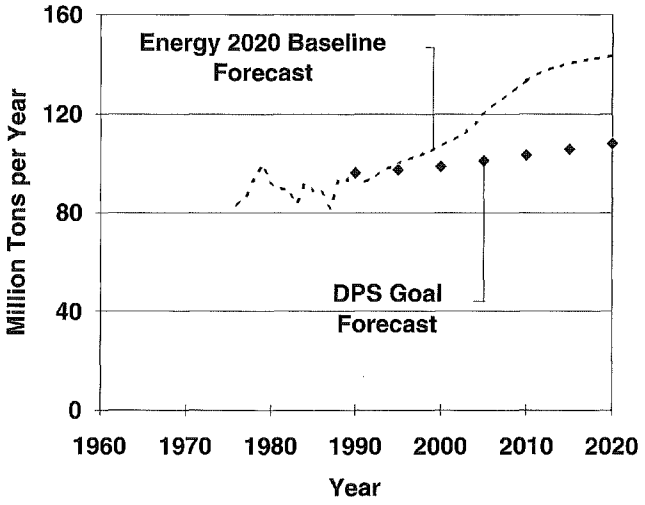


TABLE 1

Comparison of Emissions

Emission	Baseline Forecast 2020	Goal Forecast 2020
Carbon Monoxide	+ 42%	+ 10%
Nitrogen Oxides	+ 65%	+ 40%
Sulphur Dioxide	+ 50%	+ 5%
Volatile Organics	+ 50%	+ 10%
Particulates	+ 50%	+ 0%
Carbon Dioxide	+ 50%	+ 15%

Energy Efficiency Indicators

Energy use per dollar of real gross state product in 2020, with increased use of renewable resources and greater energy efficiency, is 30 percent lower than 1990 levels. This compares to a smaller 10 percent decrease under the baseline forecast.

Per capita energy consumption in 2020, with achievement of our goals, would stay approximately equal to 1990 levels. This compares to a 25 percent increase in per capita energy consumption under the baseline forecast.

Renewable Energy Use Indicators

Total renewable energy use will double by the year 2020, increasing to approximately 8 percent of Minnesota's total primary energy use.

Economic Indicators

Energy expenditures as a percent of gross state product in the year 2020 will be only 15 percent higher than levels in 1990 compared to a 30 percent increase under baseline forecast.

Growth in per capita gross state product will remain constant under both scenarios.

Environmental Indicators

The production of several energy related air emissions will be greatly reduced with achievement of the Department's goals. The percentages presented in Table 1 are relative to 1990 production levels.

Conclusion

Minnesota's energy future presents multiple challenges and opportunities. This Report outlines both, and recommends actions to ensure that our energy future is bright. Minnesota should take the lead in charting its energy future, achieving these measurable goals by implementing the strategies outlined in this chapter. The Minnesota Department of Public Service, drawing on the resources, expertise, and ingenuity of the Legislature, other state agencies, energy industries, and all Minnesotans, commits to leading this effort throughout the coming years.

Initiatives and Programs

8

INITIATIVES AND PROGRAMS

Minnesota Department of Public Service

"Minnesota has the resources and Minnesotans have the skills, to improve energy efficiency and to use significant amounts of renewable energy."

Robert Hogg
Director,
Student Coalition for Clean Energy
St. Paul Public Meeting
March 19, 1992

The Department of Public Service has broad responsibilities and powers related to energy policy, energy conservation, and renewable energy sources under Minnesota Statutes 216C and 216B. These responsibilities are discussed in four general categories: Working with Utilities to Deliver Energy Programs, Department Regulatory Responsibilities; Direct Outreach and Assistance to Consumers, and Statewide Data Collection and Analysis.

WORKING WITH UTILITIES TO DELIVER ENERGY PROGRAMS

Conservation Improvement Programs (CIP), mandated by the Minnesota Legislature, are required of all investor-owned, regulated electric and gas utilities in Minnesota. See separate chapter, beginning on page 73.

MUNICIPAL AND COOPERATIVE UTILITY PROGRAMS

The opportunity to advance energy conservation through utility-delivered programs was significantly expanded by the 1991 Minnesota Legislature. The 1991 Omnibus Energy Act requires municipalities that operate natural gas or electric utilities and generating and transmission cooperatives to spend a minimum percentage of gross operating revenues on energy conservation and load management activities. The law further specifies that those utilities not meeting these spending requirements should contribute to a statewide Energy and Conservation Investment Account, managed by the Department of Public Service. The Department is further charged with collecting data on utility revenues, expenditures, and programs.

One hundred-twenty-six Minnesota municipalities operate electric utilities and 19 operate natural gas utilities. There are 48 electric distribution cooperatives; they serve primarily rural areas of the state. These distribution cooperatives are served by seven electrical generating and transmission cooperatives. The most distinguishing difference between regulated utilities and municipal and cooperative utilities is that for the latter groups, the ratepayers are shareholders.

The 1991 Omnibus Energy Act set forth differing investment requirements for each type of utility. It also specified a transition formula that allows utilities a period of four years to achieve the required expenditure levels.

CURRENT ACTIVITIES:

Reporting on municipal and cooperative load management and energy conservation programs began in 1992. It is premature to attempt to identify specific trends; however, several facts are worthy of note.

Based on reported revenues, 1992 expenditure requirements on conservation and load management for each of the utility types are: Municipal Electric, $ 1.7 million; Municipal Natural Gas, $ 0.12 million; and Cooperative Generating and Transmission, $ 5.4 million. The utilities planned expenditures for 1992 were listed as follows: Municipal Electric, $ 3.4 million; Municipal Natural Gas, $ 0.8 million; and Cooperative Generating and Transmission, $17.6 million. In aggregate, planned expenditure exceeded 1992 spending requirements for all utilities.

The programs offered by these utilities varied greatly based on a number of factors such as population, number of meters, customer profiles, geographical location, and capacity concerns of primary power supplier. Such characteristics affect both the type of programs and the degree to which a utility promotes its programs.

The programs reported for 1992 were primarily load management (i.e. interruptible rates or time-of-day rates) and utility system improvements (i.e. new lines and transformers) rather than conservation programs aimed at the consumers. In total, more than 80 percent of the 1992 expenditures were for primarily load management programs. Less than 20 percent of expenditures were targeted to consumer energy conservation.

FUTURE DIRECTIONS:

The Department has begun a data base of programs, and associated costs and savings, offered by municipal and cooperative utilities. As more information about these utility energy programs becomes available, specifically program evaluation data, this data base will help utility officials and state policy makers shape the future directions of utility energy conservation programs in Minnesota. The Department also intends to work with these utilities, within the parameters of the existing law, to encourage additional programs and expenditure directly targeted to consumer energy conservation.

REGULATORY RESPONSIBILITIES

UTILITY INTERVENTION

The Department of Public Service serves as the main advocate for the public interest in all natural gas and electric proceeding before the Minnesota Public Utilities Commission (PUC), represents Minnesota's energy interests before the federal government, and develops recommendations for the Commissioner of Public Service on utility Conservation Improvement Programs (CIP). In all of these activities, the DPS is guided by its mission of developing and implementing energy policies that provide reliable, efficient, safe, and environmentally sound energy services at reasonable rates.

RECENT ACTIVITIES:

General Rate Cases. Department staff review each rate case application filed by an electric or natural gas utility and submit recommendations to the PUC. Major financial items subject to investigation in a rate case include the utilities' allowed profit levels, operating expenses, and investments in new equipment or plant. Other issues warranting special review include the

allocation of the requested rate increases across the various customer classes (residential, commercial, and industrial), the pricing strategy used by the utility, and other proposed conditions of service. Department staff typically spend three to four months investigating the utility's rate case filing, with another two to three months devoted to argument and hearing. By Minnesota law, the PUC decides the merits of the rate case within 10 months of the date of filing.

Integrated Resource Plans. In 1990, the PUC adopted rules requiring Minnesota's major electric utilities to file individual Integrated Resource Plans (IRPs) mapping out both the utility's expected customer demand and the resources the utility intends to use to meet that demand. Department staff review each plan and recommend modification or alternative plans to the PUC. Integrated Resource Planning is an important regulatory tool, as it involves regulators up-front in the planning process and allows the state more control of its energy future. The Department devotes considerable resources to investigating the IRPs, focusing on such topics as the achievable impacts of conservation and load management, the availability of renewable resources, the accuracy of forecasted customer demand, and the reliability and cost effectiveness of the proposed supply side resources such as new power plants and life extensions of existing plants.

Certificates of Need. Before utilities can construct major energy facilities in Minnesota, they must obtain permission from the PUC. These Certificate of Need proceedings are required for new electric generating plants, high-voltage transmission lines, gas pipelines, gas storage facilities, and nuclear waste storage facilities. During the past year, Northern States Power Company requested Certificate of Need for additional storage of spent nuclear fuel at its Prairie Island generating plant. Department of Public Service staff investigated the major issues, including the health and safety risks of the proposed storage facility, the availability of conservation and demand side management to replace all or a portion of the proposed project, and the efforts of the federal government to develop permanent nuclear waste storage and disposal facilities. The Department recommended limiting the nuclear storage capacity NSP be allowed to construct and took action to hold the federal government accountable for meeting its obligations to remove nuclear waste from Minnesota. The Department submitted its recommendations to the PUC and defended its recommendations through written and oral testimony. The Department has assumed an aggressive role in holding the federal government accountable to its obligations to remove nuclear waste from Minnesota. Other actions taken in this area are described below in Federal Intervention.

Investigations. Either on its own initiative or at the request of the PUC, the Department investigates issues affecting Minnesota's regulated industries. These investigations arise from such occurrences as changing federal regulatory practices, internal revenues service rulings, or complaints from outside parties. Department staff also annually investigate utility earnings to protect consumers from excessive rates.

Alternative Energy Production. Department staff assist the development of alternative power in Minnesota by reviewing the rates and other contract provisions offered by electric utilities to Qualifying Facilities (QFs) under the Public Utility Regulatory Policies Act (PURPA). The staff review the standard rates for small facilities (under 100 kW), as well as standard contract

terms and rates offered to large QFs willing to sign long-term contracts. Department staff then make recommendations to the PUC. Participating QFs include small wind generators, hydroelectric plants, waste-to-energy facilities, and cogenerators. Department staff also participate in the PUC's rulemaking in reflecting environmental externalities — hidden costs such as impact of sulphur dioxide emissions — in the buyback rates offered to QFs, further encouraging development of alternative energy in Minnesota.

Federal Intervention. The Department represents Minnesota's interest in energy proceedings before the federal government or other jurisdictions. The Department seeks recommendations for intervention issues and policies from public and private interests to determine both the state's intervention needs and priorities. Recent, top-priority issues have included the federal government's efforts to site and develop nuclear waste storage and disposal facilities, the Nuclear Regulatory Commission's proceeding to streamline the process of relicensing nuclear power plants for extended operation, and the Southern Minnesota Municipal Power Agency's efforts to study and site a pumped-hydroelectric plant on the Mississippi River at Lake Pepin. The Department participates in federal proceedings through written recommendations, initiatives, or complaints to federal agencies; testimony before Congress; and settlement conferences.

FUTURE DIRECTIONS:

The Department will continue its aggressive intervention on behalf of Minnesota consumers at both the state and federal level. First and foremost, it will press the U.S. Department of Energy to meet its responsibilities and timelines associated with development of the permanent nuclear waste storage facility at Yucca Mountain, Nevada. It will also intervene with the federal government to protect the interest of Minnesota consumers in areas of federal jurisdiction such as pipeline siting and nuclear plant relicensing.

The Department will also use its unique role in the regulatory process to push regulators and utilities toward policies and actions that benefit the consumers in the long run. These include stronger and expanded role for Integrated Resource Planning, stronger and better utility conservation programs, more reliance on renewable resources, and movement toward incorporating all appropriate environmental and societal costs into the price of energy.

BUILDING ENERGY PERFORMANCE STANDARDS

The Department conducts several projects to assure energy efficiency in all new and remodeled buildings in the state. The Commissioner of Public Service is authorized to set State Energy Code rules and to regulate the residential thermal insulation industry. Information on building efficiency, standards, and problems is targeted to building officials, home builders, and commercial building designers. Research projects are undertaken to provide a sound basis for regulatory and informational programs.

CURRENT ACTIVITIES:

The Department has been a pioneer among states in its work on the State Energy Code. Currently it is working on a three-phase program to incorporate changes into the State Energy

Code that will make Minnesota's building energy efficiency standards equal to or exceeding those adopted by any other state in the nation. These changes include lighting efficiency standards for commercial buildings and requiring all thermal insulation to achieve its stated performance at winter temperatures.

FUTURE DIRECTIONS:

The full energy saving benefits of energy code changes are not being realized because in many cases they are not being implemented. A statutory mandate directs the Department to adopt an energy code which equals or exceeds the most energy-conserving codes adopted by any other state. To ensure that this mandate has a meaningful impact, effective implementation and acceptance by all concerned are necessary.

Substantial improvements in building energy efficiency could be realized by improving building design. The Department encourages greater efforts be made to educate home builders, architects, and engineers on the principles of energy efficient design.

The process of "commissioning" buildings would ensure proper operation of a building to achieve maximum energy savings. Commissioning is a process for checking and testing a completed and occupied building on a wide range of operating characteristics, during all seasons of the year, to determine if all systems and components are operating properly. The Department recommends that commissioning be established as a necessary step toward completion for all new and remodeled buildings.

APPLIANCE STANDARDS

Legislation has been enacted to help bring energy efficient technologies into the marketplace and reduce the growth in demand for energy. Recent Minnesota and federal regulations are described below.

CURRENT ACTIVITIES:

State Legislation. The 1992 state legislation concerning electric motor efficiency and water consumption of shower heads and faucets was enacted. The electric motor component of this law has already been incorporated into the State Energy Code; the shower head and faucet standards have been proposed for adoption in the State Energy Code and should be adopted shortly. Because the new efficiency standards apply to all motors, shower heads, and faucets sold within the state, effective enforcement should be possible and significantly improve energy efficiency.

National Legislation. The National Appliance Energy Conservation Act of 1987 preempts Minnesota from regulation in most segments of the appliance industry. This preemption was phased in as individual standards within the act came into effect. This legislation set minimal efficiency standards for large groups of appliances. It also requires the U.S. Department of Energy to review these standards every five years and to improve the efficiency standards if a test of cost effectiveness is met.

FUTURE LEGISLATIVE ACTIVITY:

State Activity. State preemptions contained in federal law will limit Minnesota's future ability to significantly affect appliance efficiency.

National Legislation. The final component of the National Appliance Energy Conservation Act comes into effect in 1993. The U.S. Department of Energy is in the stage of proposing rules for additional efficiency improvements for eight appliance groups; proposals will come later for efficiency improvements in three additional appliance groups.

The phaseout of chlorofluorocarbons (CFCs) as an appliance refrigerant will also affect appliance efficiency in the future. CFCs are being phased out internationally because of their negative impact on the ozone layer of the earth's atmosphere. Although some manufacturers claim that replacement refrigerants will increase energy consumption, sufficient technology advances have been made to allow for efficiency improvements without adverse effect on the industry. Consumers shall see these new appliances available in 1993.

LIGHTING STANDARDS

Advances in lighting technology, combined with the environmental imperatives to reduce the use of electricity, have provided the rationale for an increasing number of regulations and standards aimed at improving the energy efficiency of lighting systems.

CURRENT ACTIVITIES:

State Legislation. In 1991, the Minnesota Legislature passed a law requiring the Minnesota Energy Code to adopt lighting standards at least as stringent as those specified for federal buildings. These requirements reduce electrical demand for lighting from 30-40 percent compared to the previous lighting code.

New requirements for exit sign illumination specifying higher efficiency lamps also were enacted in 1991. The law, revised in 1992 and taking effect in 1994, requires that signs in new and existing buildings be modified so that electrical consumption not exceed 20 watts, half the wattage of a typical, older exit sign.

A law requiring the Department of Public Service to establish minimum efficiency standards for incandescent lamps, including the most common consumer bulbs, was passed in 1992. Rules are to be in effect in July of 1993.

Federal Legislation. An amendment to the National Appliance Efficiency Standards, establishing minimum efficiency standards for fluorescent ballasts, went into effect in 1990 and was well received by the industry. It is again being revised.

FUTURE ACTIVITY:

Federal Legislation. At the time this is being written, both the House and Senate versions of the national energy legislation include new regulations for incandescent reflector lamps and fluorescent lamps. Designed to establish minimum efficiency performance standards, they prohibit the sale of standard lamps when an "energy-saving" version is available.

A more stringent standard for fluorescent ballasts is expected to be adopted. It would go into effect three years after federal rulemaking is complete.

State Activities. New legislation requiring all major electric utilities in Minnesota to invest in conservation should help increase the use of energy efficient lighting within the state. In the past, utilities have typically directly marketed efficient lamps to consumers and rebates to commercial and industrial customers. These types of programs will continue. In addition, the Department will work with utilities to expand the availability of efficient lighting technologies in traditional markets.

EDUCATION AND ASSISTANCE

Municipal Energy Conservation Financing Programs

The Department operates several programs that provide funds for improving the energy efficiency of institutional buildings in Minnesota. These include the federally funded schools and hospitals grant program, the state's cost-share maxi-audit grant program, and the state's low interest loan program for public buildings. This last program uses a combination of state general obligation bond funds and Exxon oil overcharge funds as its capital base.

CURRENT ACTIVITIES:

Energy conservation loans have been provided to more than 150 public school districts, cities, and counties. Nearly $ 27 million in loans has been distributed, resulting in retrofit of more than 500 buildings. Most of the loans have gone to communities in greater Minnesota. Estimated energy cost savings from program activities to date are $ 5 million annually.

Federal matching grants have been awarded to more than 1,000 public and private non-profit schools and hospitals. More than $22.5 million has been distributed since 1980. When local match is included, this has implemented more than $38 million in energy efficiency and renewable energy projects in Minnesota with an estimated energy cost savings of $ 9.5 million annually.

FUTURE DIRECTIONS:

The Department plans to continue these programs. As existing funds become limited, the Department will attempt to identify new sources of funding. The Department will also continue to examine program modification to further the goal of energy efficiency, especially renewable energy use.

Community Energy Grant Program

Purpose of this program is to protect Minnesota's environment and strengthen its economy by helping communities gain control over their local energy costs. The program provides techni-

cal assistance to communities to develop and implement local energy programs, and provides competitive matching grants to support local efforts.

CURRENT ACTIVITIES:

Community Energy Councils have been formed in more than 100 communities and are composed of local volunteers appointed by the city council or county board. Program guidelines encourage partnerships between local governments, utilities, poverty programs, business and labor organizations, and senior citizen groups.

Community Energy Grants create partnerships by combining resources from state grants, local governments, utilities, and other sources. Results through fiscal year 1991 include approximately 40,000 residents and businesses served. On average, every dollar of state grants has been matched by two dollars of project funding from local sources.

Local community programs have included Arbor Day tree plantings, city reforestation plans, car care clinics, bike path development, urban and rural car-pool programs, "Seniors Helping Seniors" weatherize their homes, Home Energy Check-ups, Small Business Energy Tune-ups, low interest business energy loans, energy analyses for resort owners, and student energy projects.

FUTURE DIRECTION:

The Department is pursuing additional sources of funding to continue the community energy program. It is also working at establishing much closer links with local utilities.

ENERGY INFORMATION CENTER

The Energy Information Center serves energy consumers and features a toll-free "hot-line" staffed by full-time energy specialists. These energy specialists answer general energy-related questions and provide client specific advice on improving the energy efficiency of homes and businesses.

The Center also offers publications on understanding and improving energy use, many including specific "how-to" instructions for implementing conservation measures. The publications also address the development of alternative energy resources in Minnesota. The publications are tailored for Minnesota's unique climatic conditions.

The Information Center also provides information related to safety and hazard prevention as related to energy conservation and energy use. The energy specialists also provide technical support to community and utility based energy conservation programs.

CURRENT ACTIVITIES:

The Energy Information Center has averaged more than 23,000 client contacts per year. It annually distributes more than 190,000 energy related publications. Approximately 100 titles are available through the Center covering a wide range of energy-related topics. Major series are the Minnesota Housewarming Guides for residential consumers, the Small Business Ener-

gy Investment Portfolio, the Alternative Energy series providing practical information on renewable use and development, and the Home Builders' Energy update offering practical energy-saving information for Minnesota's home builders. In fiscal year 1992, the Information Center had more than 42,000 contacts and distributed more than 178,000 publications.

The Energy Information staff, in addition to handling the "hot-line" phone service, also participate in trade and home shows across the state, delivering information on energy conservation and the development of alternative energy sources directly to the public.

FUTURE ACTIVITY:

The Department plans to continue and improve this service, extending it to serve more Minnesotans.

RENEWABLE ENERGY OUTREACH

The Department of Public Service is charged with promoting the growth of renewable energy sources within the state of Minnesota. Department engineers work with several national and state organizations, local utilities, and local developers to follow and promote the latest developments in the renewable energy field including both technology and regulatory issues.

CURRENT ACTIVITIES

The Department actively promotes renewable energy development. The Department continues its Wind Resource Assessment Project, a project begun in 1981 that involves working with a number of utilities to collect wind speed data throughout the state. Based partly on this data that established the high wind energy potential of the Buffalo Ridge area near Marshall, Minnesota Windpower, Inc. opened the first commercial wind farm east of California in the spring of 1992. The facility is small, at 600 kW, but additional development is expected in that area.

The Department recently completed a study on cost-effective applications of photovoltaic energy systems and found that in many cases, especially remote off-grid, small photovoltaic systems are already cost effective. The Department has worked closely with other states and solar industry officials to develop an effective solar equipment certification program. The Department also works closely with the Council of Great Lakes Governors in promoting biomass use. In February of 1992, the Department published the Biomass Energy Facilities Directory.

FUTURE DIRECTIONS:

The Department expects to increase its work with renewable energy sources. A statewide mandate for oxygenate additive in gasoline by 1997 is expected to increase the need for ethanol within the state and advances in ethanol production technology will have to be monitored closely. As noted above, we believe there will be additional growth in the use of wind energy in the southwest portion of the state and we need to continue monitoring the technology and regulatory environment to help this development. The Department also plans to work

for development of photovoltaic applications. The Department will cosponsor SunRayce 93, a solar automobile contest, scheduled to begin in Texas and end in the Twin Cities next summer.

The Department will also seek funding from both private and public sources to stimulate the growth of ethanol use. The Department intends to issue loans and grants for research projects aimed at lowering the cost and energy intensity of ethanol production. In addition, these loans and grants will also support research into developing more efficient and cost-effective engines that use ethanol.

The Department will make a portion of its vehicle fleet in the Weights and Measures Division available as a test platform for alternative vehicles fuels, including Compressed Natural Gas (CNG), Liquified Natural Gas (LNG), and higher ethanol blends.

Further, since transportation constitutes the largest single category of energy use in Minnesota, the Department will become an active participant in increasing overall transportation energy efficiency, developing cost-effective alternative fuels, and in educating the public on transportation energy developments.

Energy Education

A broad range of educational services are provided to increase public awareness of energy use/impact and implement changes that will improve Minnesota's economy and environment.

CURRENT ACTIVITIES:

Energy Conservation Workshops for building operators of commercial, industrial, and institutional properties have been held since 1981. One- and two-day workshops are coordinated with the Minnesota Technical Colleges and utilities in the topic areas of air conditioning, troubleshooting boilers, pneumatic temperature controls, lighting systems, preventative maintenance, etc. The workshops are designed to identify procedures that will improve the efficiency of energy using systems primarily through maintenance and operation changes. To date, more than 500 workshops have been conducted on 14 topics, with attendance totaling more than 9,800.

Energy Education Activities for K-12 include publication and distribution of an Energy and Environmental Education Curriculum Catalog, participation on advisory boards to develop a State Plan for Environmental Education, development and distribution of a videotape for elementary and middle schools, the development of a pilot classroom project "Student Weatherization Action Team," and workshops for educators on technical and curriculum issues.

Energy Auditor Training and Certification coordinates training for Minnesota citizens to complete the requirements of residential, multifamily, commercial, and institutional energy auditors. Jobs are available from utilities, architectural and engineering firms, community energy councils, citizens action programs, nonprofit organizations, and energy service companies. Presently, 290 residential, 160 commercial, 83 multifamily, and 105 maxi-auditors serve Minnesota.

Builder Education and Training activities inform and train builders, contractors, and lumber dealers on energy efficient construction practices. Eighteen editions of a newsletter for builders have been published and distributed to 10,000 builders and other industry personnel. Workshops on preventing moisture and/or indoor air quality problems were presented to builders and remodelers.

FUTURE DIRECTIONS:

The Department will continue to translate technical research and engineering practices into informational and educational materials. All K-12 energy education materials will meet the Department of Education's requirements for Outcome Based Education. Adult education and training materials shall continue to be developed, updated, and presented to improve Minnesota's workforce.

STATEWIDE ENERGY ANALYSIS

The Department is charged with collecting data on all energy use within the state, monitoring energy trends, and forecasting energy use and cost under various scenarios. It is also charged with monitoring petroleum supply conditions so that the state can effectively respond to potential petroleum supply emergencies.

CURRENT ACTIVITIES:

The Department annually collects energy sales, revenue, and customer data from all utilities, pipelines, petroleum suppliers, and coal users serving Minnesota. The data are used to maintain the Regional Energy Information Service (REIS), a computerized database that includes historic energy consumption and cost statistics for all energy source and all use sectors in Minnesota. It also contains forecast information submitted by electric and natural gas utilities.

The Department also receives and reviews sales and demand forecasts submitted annually by all of the state's major electrical utilities. Forecasts are checked for appropriate forecasting methodology and to monitor which utilities are facing capacity concerns and at what future time. Recommendations are made to the utilities on how to improve forecasting methodology and they are encouraged to incorporate demand-side options into capacity planning. The results of this forecast review are presented to the Environmental Quality Board, legislators, and the Governor's office so proper policy discussion and decisions can occur.

The Department also collects petroleum inventory and cost information on a weekly basis. It also collects information on refinery operations, pipeline operations, and world crude prices, enabling the Department to react to potential petroleum supply issues rapidly. During the last two years, the Department has also collected retail price information on fuel oil and propane during the winter heating season.

FUTURE DIRECTIONS:

The Department is making a strong effort to upgrade its policy analysis and forecasting capabilities. It currently uses a sophisticated computer model called Energy 2020. We will continue

to press for development in this area, increasing the sophistication of the analysis tools we have and investigating new and improved forecast/analysis tools.

The Department also intends to pursue direct electronic data submission for the large volumes of data it collects, specifically from the utilities, to help us obtain better information faster and reduce reliance on traditional, paper-based data reporting.

Conservation Improvement Programs

9

Conservation Improvement Programs

The Conservation Improvement Program (CIP) enables Minnesota to be in the vanguard of states advancing conservation as a major resource in meeting the energy needs of its citizens. This section describes Minnesota's CIP — who participates, why, what the results have been, and what directions are ahead.

Since 1983, the Minnesota Legislature has mandated that investor-owned utilities participate in Conservation improvement Programs (CIP). The title "CIP" is specific to Minnesota, but the concept is part of a national trend emphasizing Demand-Side Management projects (DSM). Demand-side management activities are designed to reduce the need for future generating capacity by reducing or modifying energy demand. CIP projects are an integral part of a utilities' DSM activities, and DSM activities are an integral part of the utilities' resource planning.

The commitment to CIP by the legislature has steadily increased, and the 1991 Omnibus Energy Bill further strengthens that commitment by requiring investor-owned utilities to expend a specific dollar amount each year in conservation efforts. This latest legislation requires that by 1995, all electric utility companies invest 1.5 percent of gross operating revenues per year and gas utilities participate at .5 percent of gross operating revenues.

Between 1983 and 1990, CIP was under the jurisdiction of the Public Utilities Commission. In 1990, the responsibility of the CIP program was transferred to the Department of Public Service. The Commissioner of Public Service is empowered to set the specific levels of investment by the utility, mandate specific activities, and even set specific interest rates, prices, and terms under which conservation improvements may be offered.

In evaluating and making decisions on CIP projects proposed by the utilities, the Commissioner considers a number of factors: the projects' cost effectiveness, whether they accurately address the end-uses and customer classes of the utility, and whether the programs are progressing sufficiently along a continuum toward providing more direct conservation products and services. Special consideration is given to programs that bring about net savings in energy efficient lighting and there is some emphasis on reaching low-income residential customers.

Program Participants

The CIP process has been specifically formulated to allow participation by all sectors — the utilities, their stockholders, the ratepayers, the regulators, and the citizens of Minnesota. The following is a brief description of each of the participants.

Investor-owned utilities. Five electric utilities and eight natural gas utilities currently participate in CIP. The smallest participant is Northwestern Wisconsin Electric Company, a utility that services fewer than 100 customers in Minnesota and has a budget of less than $1,000 for its

biennial CIP. On the other end of the scale, Northern States Power Company (electric) is projected to spend more than $52 million over the 1992-93 biennium. ALthough NSP is far and away the largest CIP participant, the other utilities will spend proportionately. Total CIP expenditures, once all of the utilities reach their percentage requirement in 1995, will equal or surpass $35 million per year.

Ratepayer/Consumers. Primary beneficiaries of the CIP program are certainly the customers — residential, commercial, industrial, and agricultural — who are able to participate in conservation programs sponsored by their utility provider. The list of conservation programs for each customer class is lengthy, running from energy audits, appliance rebates, lighting rebates, financial services, and weatherization in the residential sector to HVAC system rebates, lighting replacement and rebates, workshops and seminars, commercial audits, grant programs, low-interest loans, and customer designed projects for the commercial, industrial, and agricultural sectors.

Service Providers. This category encompasses two groups: the non-profit organizations that have traditionally provided services primarily to the low-income and residential sector, and the expanding field of for-profit groups that implement and design energy assistance programs for all sectors of the market. Service providers, or any interested party, are encouraged to submit CIP projects to the Department for approval, and many currently deliver services through approved projects.

Department of Public Service. The Department of Public Service administers all Conservation Improvement Programs, extensively reviewing all projects submitted for approval. Included in the review is a due process component that allows any interested party, be it individual, company, or organization, to comment on the proposed project. Those comments become part of the record and assist the Commissioner in approving or disapproving CIP projects.

Public Utilities Commission. Although the Commissioner of the Department of Public Service has full and complete authority in administering and ordering CIP projects, any participant who has sufficient reason can appeal the final decision to the Public Utilities Commission (PUC). Additionally, the PUC approves the financial incentive mechanism for all of the investor-owned utilities in their recovery of dollars expended on CIP.

Stockholders. Because the utility is required to spend dollars on programs that encourage and accomplish energy savings, and therefore decrease sales of electricity or gas, a financial incentive mechanism is/will be instituted to mitigate any lost return that could reduce the stockholders return. The incentive mechanism is new, and is being applied differently to each utility at the present time, but in all cases will allow a higher return on CIP expenditures than on regular earnings.

Municipal Utilities/Coops. Although not legislatively mandated to submit CIP projects for approval, both of these energy providers are required to report to the state the extent of their conservation improvement programs and projections for future budgets.

WHY CIP?

It has been increasingly evident in the last decade that energy use and generation is directly linked to the environmental issues that will be facing us into the twenty-first century

Heightened awareness of the environmental consequences of electricity production has focused debate on electricity use. Coal-fired power plants emit significant pollutants and nuclear generation creates highly radioactive material that remains dangerous for thousands of years.

Despite that fact that it burns cleaner than fossil fuels, natural gas also poses some environmental drawbacks. Burning natural gas causes significant emissions of nitrogen oxides, which contribute to acid rain, and carbon dioxide, which is linked to global warming. Gas exploration also has environmental implications.

In addition to the environmental concerns of present energy generation and consumption, there is also the supply issue. The benefits of using renewable energy such as wind power are significant not only for the environment, but also for providing new and continual sources of power.

PAST AND PRESENT PERFORMANCE

Electric Utilities. As shown in Figure IX-1, electric utilities are well on their way to achieving the stated budget goal of 1.5 percent of gross revenues for each individual utility. NSP will surpass that goal in 1992 if all of its programs are fully expended. Both Minnesota Power and Interstate Power substantially increased their conservation programs, with Interstate almost tripling its projected budget. Although Otter Tail expenditures remain virtually stagnant in 1992, they do increase by more than 30 percent in 1993 as the programs become more mature and well developed, enabling them to meet their goals by 1995. (Since Northwestern Wisconsin's investment is less than $1,000, it was not include in this comparison.)

Gas Utilities. Whereas the electric utilities programs run on a calendar year, gas programs run from September to September. Final decisions on the 1992-1993 and 1993-1994 programs presently before the Commissioner will be issued sometime in the third and fourth quarter of 1992. Figure IX-2 shows the past history for the gas utilities and projections of those proposed for the following two years.

FIGURE IX-1

Investor Owned Electric Utilities Conservation Improvements Expenditures

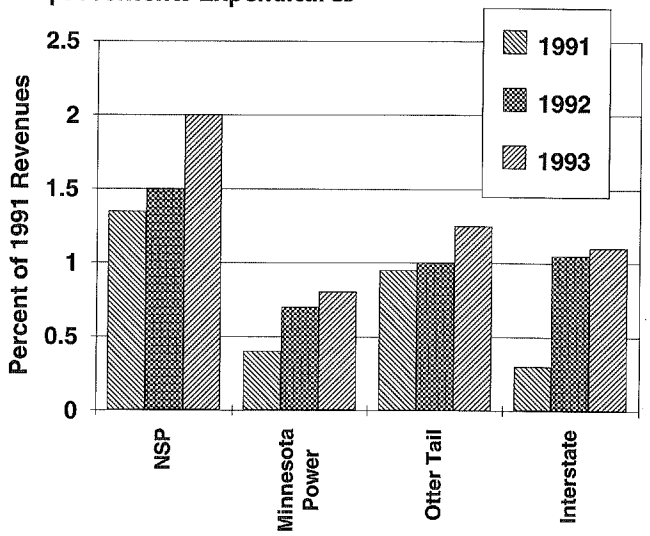
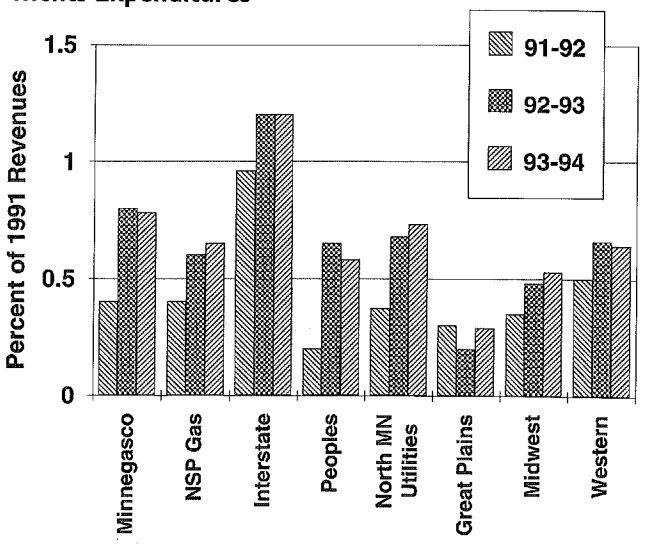


FIGURE IX-2

Investor Owned Gas Utilities Conservation Improvements Expenditures



Program Types

Since the last edition of this Quadrennial Report, significant strides have been made to diversify the type and amount of conservation programs that are offered to residential, commercial, and agricultural customers.

In the past, conservation programs for the gas utilities were primarily limited to the residential sector and concentrated almost solely on residential audits, various forms of weatherization, and equipment rebates for furnaces and water heaters.

The electric utilities had more variety in their programs, and t he 1992 biennial filings further expanded the scope of those projects. Major programs include low interest financial services and grants, rebates for equipment and lighting materials, process motors rebates, workshops and seminars for new construction and plant management, direct retrofits, and research and development for projects planned in the future.

Load management programs, although necessary and well developed, have taken a backside to the more innovative energy saving measures now being proposed by utilities operating in Minnesota.

Following are some examples of innovative projects currently or soon to be implemented:

Power Grant. In 1991, Minnesota Power designed the Power Grant project to allow its commercial and industrial customers to implement energy saving measures that would best benefit their specific enterprise. The hope was that consumers, especially large customers and manufacturers, would design projects that were process oriented, in addition to the traditional lighting retrofits.

Although the customer must participate financially in the project, Minnesota Power awards substantial matching grants. The 1991 project was a resounding success with more than 250 proposals submitted by more than 100 customers, and 30 percent of the projects were awarded funding. Minnesota Power will offer the project in 1992 and 1993, and the outlook for success is excellent.

In addition to the obvious benefits of energy savings, this type of program also makes the business owner and employees aware of saving energy. Active participation in designing a conservation project not only contributes to the company's operating income, but also educates individuals who will then incorporate energy savings into other areas of their life.

Integration of energy efficiency and conservation through all consumer uses is ultimately the key to successful conservation throughout the community and state.

Lights 2000. Each utility in Minnesota has unique features and characteristics that distinguish it from the other utility providers in the state. The Lights 2000 program, offered by Otter Tail Power, is a perfect example of a utility recognizing its customer base and tailoring its individual projects accordingly.

Lights 2000 is a pilot project for Otter Tail and will involve selecting towns of approximately 1,000 residents who will individually be given one or more energy efficient light bulbs. A

community group, such as the Kiwanis and Rotary, will coordinate delivery of the bulbs and will require that each participant receive personalized information and agree to use the product.

With thorough information and direct assistance, the probability of consumers actually using the energy efficient light bulbs throughout their house or business is much higher than through the traditional avenues of selling a product. Because Otter Tail services many small towns, this is an extremely good example of a utility's attention to its customer base as well as actively trying to change consumer behavior.

Lighting Merchandising. NSP has taken a different approach to penetrating the residential lighting market, appropriate for its unique role in Minnesota of serving nearly 900,000 residential customers. NSP began this program in 1991 with the kick-off of a pilot program at the State Fair, selling light bulbs to fairgoers at discounted prices. NSP then continued to merchandise energy efficient light bulbs through bill inserts, allowing residential customers to have light bulbs shipped directly to their home and then pay for the project on the monthly electric bill.

NSP will redesign the program as it moves forward to include not only the present direct sales component, but also to provide rebates on products that the consumer buys at the local discount or hardware store. Because customer satisfaction with energy efficient light bulbs will motivate that customer to purchase them in the future, NSP also is working toward developing a customer service information component. NSP anticipates spending more than $3.5 million on this project in 1992 and 1993.

Chiller System Replacement. Both Minnegasco and NSP (electric) are moving forward with comprehensive programs to help commercial customers who own office or industrial buildings and are considering changes in heating and cooling systems. The cornerstone of each utility's program is a partially funded engineering study that will identify the most energy efficient and cost-effective heating and air conditioning system to replace existing systems. Many office and industrial buildings in these utilities' service territory have original equipment or, at the very least, outdated and non-energy efficient heating and cooling equipment.

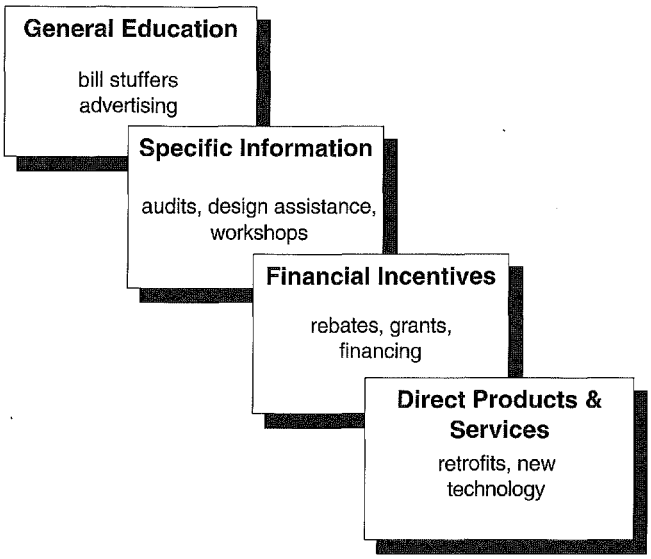
There may be instances where current electric customers will opt to install a natural gas system and vice versa. This type of project allows customers to make choices based not only on their specific building design and needs, but also on the financial impact and environmental consequence.

Appliance Recycling. Started as a pilot project in 1991 and becoming a full fledged program in mid 1992, the appliance recycling program by NSP electric looks like it is going to be successful well into the 90s. The concept is simple, but the benefits are multi-dimensional. NSP offers a $25 rebate to residential customers for allowing NSP to pick up their non-energy efficient refrigerators and sleeve air conditioners. Survey results from the pilot project suggest that well over 75 percent of the appliances picked up so far have been second appliances, and that fully three quarters of the participant s do not intend to replace this inefficient appliance with another.

In addition to removing the inefficient appliance from the residential customers and therefore from NSP's load, NSP then turns around and recycles the appliance, reclaiming CFC refrigerants (a contributor to the depletion of the ozone) and capacitors that may contain PCBs, which are disposed of as potentially hazardous waste.

FIGURE IX-3

The Conservation Continuum



FUTURE DIRECTIONS FOR CIP

As we move into the 90s, CIP is going to continue along an aggressive path of providing conservation to fill the gap between supply and demand created by continued increases in demand for energy services. Public policy will most certainly drive the continued expansion of CIP. Emphasis in the next four years will continue to be focused on developing programs that actually save energy.

Evaluation. Since financial incentives have now been instituted for several of the participating utilities, evaluation techniques to measure the performance of conservation programs are becoming the latest "hot topic" in DSM. The utilities have become increasingly aware of the need to be able to verify the real outcome of conservation measures so that they can adequately use that information in integrated resource planning.

The Department of Public Service and the PUC will be developing a workable and progressive evaluation program in the near term.

Conservation Continuum has become a familiar term in the past several years and is basically the benchmark of programs that will induce action. Moving along the continuum will certainly continue to be a part of the future direction of CIP, but the components of the continuum are likely to change or be redefined as new technology and marketing expertise evolve. (Figure IX-3)

The traditional conservation continuum has started with providing general information to promote awareness and interest. The second step is to provide more specific information such as audits, design assistance, and workshops. The next step could be broadly categorized as a financial incentive, such as a rebate for an energy efficient light bulb or financing capability for the commercial owner to install new lighting. The last step is generally direct products and services, retrofits, assistance in developing process innovation, and new technology.

Many of the utilities that participate in Minnesota's CIP provide projects that generally fit into the first two categories of information. Some utilities have moved substantially along the continuum and provide services throughout. We hope that by the time the next Quadrennial Report is prepared, we will have moved far enough along the learning curve to redefine the present continuum.

Fuel Switching. The future also will most likely see the Commissioner recommending fuel switching and, in some instances, even requiring utilities to participate financially in implementing fuel switching. For example, NSP is a summer peaking utility and will soon need to build new power plants to maintain capacity. By removing some of NSP's load (for example: replacing electric heating and air conditioning systems in the commercial sector with natural gas HVAC systems), NSP could effectively meet the challenge.

The Department of Public service will thoroughly examine this issue in the next several years to determine whether it is appropriate to require that a utility encourage its customers to convert to a different fuel source. There is some precedence for requiring fuel switching when efficiency as measured in Btus can be proved to be higher in a gas system than an electric system. The Department may go even further, however, in examining cases where the ultimate goal is to remove the customer altogether from the peak load whether superior efficiencies can be documented or not.

Energy and Conservation Account. Lastly, it is very likely that the Commissioner will exercise her right to require that utilities deposit funds to the existing escrow account for conservation measures. If utility management, and therefore line personnel, cannot effectively implement conservation programs in their service territory, the Commissioner now has the ability to require those companies to deposit funds to be distributed as she feels would be more appropriate. Although the Commissioner would much prefer that utilities fully develop their own programs, she is unwilling to allow them to perform below the standards as set by the legislature. The Energy Conservation Account enables her to meet those standards in an alternate manner.

Initiatives and Rate Design Policies

Initiatives and Rate Design Policies

Minnesota Public Utilities Commission

The Minnesota Public Utilities Commission ensures that consumers of natural gas and electricity have access to reliable and efficient service at just and reasonable rates. The Commission is also charged with furthering state energy policy goals, including: encouraging conservation, increasing the efficiency of energy consumption, promoting cogeneration and small power production, and encouraging the development and use of renewable resources. The Commission must grant a Certificate of Need before large energy facilities can be built in the state. In carrying out these responsibilities, the Commission faces the difficult task of setting fair and reasonable rates while promoting future least cost energy options. The Commission must carefully examine the social costs and rate impact of energy policies that affect utilities and their customers.

The Commission has undertaken major initiatives to further the state's energy policy. One of the most significant is the establishment of an integrated resource planning process for electric utilities. The initiatives described below, implemented through Commission rate and regulatory processes, are consistent with the state's goals of encouraging energy efficiency, conservation, and renewable resources. They will play a major role in shaping Minnesota's energy future.

Initiatives on Conservation and Planning

Integrated Resource Planning. The Commission adopted rules in 1990 requiring investor-owned, electric utilities to file resource plans every two years. The planning process provides up-front involvement of regulators and other interested groups in electric utilities' plans for supplying customers' needs. The plans must identify and justify the mix of supply and demand-side resource options that a utility expects to use to meet its projected energy demand over the next 15 years. The rules strengthen utilities' long term planning processes and improve the efficiency by which resources are deployed by providing input from the public, other regulatory agencies, and the Commission. The rules also help ensure that utilities making resource decisions adequately consider the environmental and socioeconomic impact of different resource mixes.

In addition, the resource planning process enables issues and alternatives to be addressed prior to the time decisions are needed and firm commitments to specific resources must be made. Early consideration preserves options, and provides the utility and the public with a clear statement of the direction that the utility is expected to go before large expenditures are made for facilities that might later be judged not to be prudent or used and useful.

NSP and Interstate filed their first plans in 1991. Otter Tail and Minnesota Power filed their first plans in 1992.

Financial Incentives for Demand-Side Management. Traditional regulatory and rate policies may discourage utilities from making optimum use of demand-side resources, especially energy conservation. When utility profits are tied directly to energy sales, measures like conservation, which reduce energy consumption, generally reduce the utilities profits in the short run. To address this concern, in 1991 the Commission ordered all regulated utilities to propose financial incentive plans to the Commission. To date, the Commission has approved financial incentive plans for all four major regulated electric utilities and one natural gas utility; plans for the other major gas utilities are under review. Each approved plan is different, which will allow the Commission to compare effectiveness of different mechanisms.

The Commission believes that financial incentives may be an effective tool for encouraging utilities to go beyond minimum compliance with existing statutory conservation investment requirements. The Commission also believes that an optimal incentive plan ties the incentive to actual performance in achieving demand-side management goals. Therefore the Commission has linked incentives to performance and will require utilities to document their performance. The public interest requires serious consideration of financial incentive programs whether they are used to ease the transition from supply-side management to integrated resource planning or they become a permanent part of utility ratemaking.

CIP Cost Recovery/Tracker Account. State statute requires inclusion of utility energy conservation expenditures in the determination of just and reasonable rates. The Commission also recognizes the importance of allowing utilities to recover conservation expenditures to encourage them to actively pursue conservation programs. Therefore, the Commission moved beyond traditional test year ratemaking concepts and designed a conservation program tracker account to insure utilities a dollar-for-dollar recovery of prudent conservation investments and expenses. Expected conservation-related expenses for the test year are included in setting the revenue requirement in a rate case. Actual approved expenditures, including financial incentives, are included in the tracker account, and offset by the revenues per kilowatt-hour or hundred-cubic-feet sold. Tracker account revenues in excess of expenses are due the ratepayers; expenses greater than revenues are due the utility. Balances are frequently allowed a carrying charge. This helps to assure that the ratepayer and the utility remain whole and disincentives to conservation expenditures are removed.

Initiatives on Cogeneration and Renewable Resources

Environmental Costs and Buyback Rates. The 1991 Legislature required the Commission to include avoided environmental costs in the rates paid by utilities to small power producers and cogenerators. It also required the Commission to quantify environmental costs associated with each method of electrical generation. The goal of this legislation is to stimulate investment in renewable energy and thereby reduce environmental damage from electricity generation. The Commission is developing rules on environmental costs. To date, the Commission has solicited opinions from interested parties and has formed a technical resource advisory panel. The Commission is faced with the difficult task of balancing the directives of the statute with its other goals and duties, including maintaining fair and reasonable rates and reliable electric service. The Commission is continuing to evaluate the economic impact of various

alternatives and to develop the best possible policy that balances competing goals and interests.

Landfill Gas Study. In 1991, the Commission was charged with the responsibility of examining the technical and economic aspects of the process by which a qualifying facility could use methane gas from solid waste facilities to produce electricity for sale under Minn. Stat. 216B.164. In January 1992, the Commission issued a report to the legislature on the "Economic and Technical Review of Generating Electricity From Landfill Gas." The Commission concluded that it is technically feasible to produce electricity from landfill gas; the economic feasibility varies according to individual site characteristics; the potential electrical generation from landfill gas for the state could reach 200 MW; the legislature may want to encourage landfills to conduct site specific analysis of economic feasibility; and, no change in relevant statutes is necessary at the current time.

Copies of this report are available from the Commission.

Initiatives on Electric and Gas Rate Design Policy

Additional rate-design policies of the Commission also play an important role. Consumers generally make energy decisions based on the relative prices of energy sources. Therefore utility rates, both their level and design, influence customer demand, which in turn significantly affects our energy picture.

Electric Rate Design

Rate Structure. In the past, regulators used declining-block rates — which lower the per unit price as consumption increases — to reflect the economies of scale which made it cheaper to produce additional energy. Now, with the increased costs of providing additional energy services, this situation is reversed. Maintaining declining block rates in such circumstances is contrary to the Commission's policy of promoting conservation and demand-side management to achieve least cost service. Therefore, to better reflect cost, the Commission has generally moved toward replacing declining-block rates with flat rates.

Time-of-Day Rates and Off-Peak Rates. The Commission has required and approved time-of-day rates which set the price of energy consumed during peak hours higher than during off-peak hours. The Commission has also approved rates specially designed for off-peak consumption. These rates, priced lower than general rates, serve off-peak loads such as stored heating systems. These pricing strategies more accurately reflect the costs of producing and delivering electricity and encourage customers to use energy during the lower-cost, off-peak periods. These rates are primarily intended to use utility capacity more effectively and to avoid or delay new power plants.

Interruptible and Controllable Rates. Interruptible rates are designed for customers who are willing to turn off all or a portion of their load when the utility is nearing its peak conditions. Controllable rates are like interruptible rates, except that the utility is able to disconnect the customers' load directly through radio signals. In exchange for the commitments to shed load, the utility charges interruptible and controllable customers rates lower than those charged for

firm, or continuous, service. Most electric utilities offer interruptible rates to their large customers and many offer controllable rates to residential and other small customers. These rates are primarily intended to avoid or delay new peaking plants.

Seasonal Rates. Under seasonal rates, prices are higher during the utility's peak season. For example, Northern States Power Company's electric rates are higher in the summer. These higher rates encourage conservation. Currently, NSP is one of the few utilities to offer seasonal rates.

Competitive Rates. Minn. Stat. 216B.162 directs the Commission to allow competitive electric rates for large customers when effective competition exists. The rate is subject to a number of terms and conditions. The Commission has authorized such rates for several customers to date. The Department of Public Service must report to the legislature on the operation of these rates, including the effects on cogenerators and small power producers, by January 1, 1995.

Area Development Rates. Minn. Stat. 216B.161 requires the Commission to establish at least one area development rate pilot program to assist industrial revitalization projects. The Commission has established an area development rate for Northern States Power Company. The rate allows for a 50 percent discount in a customer's demand charge for a limited period of time. It must be offered as a supplement to other development incentives offered by the municipality. The Commission must evaluate the impact and effectiveness of the rate and submit a report to the legislature by January 1, 1995.

Gas Rate Design

Rate Structure. As with electric rates, the Commission has generally favored flat energy rates for natural gas service to better reflect cost and promote efficient energy use.

Flexible Gas Rates. The Commission has allowed flexible rates pursuant to Minn. Stat. 216B.163. Under flexible rates, gas utilities can lower their prices, within a prescribed range, to keep customers who would otherwise switch to an alternative fuel. As amended in 1990, the statute requires the Commission to establish a maximum on the flexible price range. The Commission established rate ceilings for each gas utility at levels that exceed the standard, nonflexible rate by the same amount that the minimum rate falls below the standard, nonflexible rate.

New Town Rates. To expand the availability of natural gas service in Minnesota, the Commission has approved New Town Rates for one gas utility and several other proposals are pending. This special rate allows the utility to collect a surcharge from customers to recover the extra cost of extending lines to towns where it would not be cost effective to do so under standard rates. In approving the rate, the Commission found that expanded availability of natural gas service could bring benefits to individual customers and enhance the economic viability of smaller communities. In addition, the Commission found that the rate protected existing customers and utility stockholders from subsidizing uneconomic service to new areas.

Recommended Future Directions and Actions

The Commission will pursue administrative activities and policies appropriate for carrying out its statutory mandates on energy policy. These plans include: continuing with environmental cost rulemaking, continuing to investigate the effect of the Clean Air Act on utilities

and the issues surrounding allowance trading, examining standby rates for cogenerators, exploring interruptible and time-of-use rate options, and considering renewables and energy efficiency within the framework of electric utility integrated resource plans.

The Commission will also explore whether any statutory changes are appropriate, including: whether to change the requirement that general rate case filings contain a conservation improvement plan to a requirement that the filing utility has an approved or pending Conservation Improvement Program; whether to modify Certificate of Need jurisdictional thresholds for certain power plants, such as natural gas-fired and standby generators; and whether to clarify Commission jurisdiction over changes to existing plants.

A more thorough discussion of these rate policies and recommended actions can be obtained by contacting the Public Utilities Commission directly.

Appendixes and Index

APPENDIX A

Most Current Minnesota Energy Price Forecasts

Forecasts of Minnesota energy prices are crucial for statewide energy policy modeling. The most current energy price forecasts are presented here with a description of the forecast methodology presented in Appendix B. Table 1 shows the nominal energy price forecasts and Table 2 shows the energy price forecasts in real or constant 1988 dollars. Nominal prices include the expected impact of future inflation. Real or constant dollars prices exclude the impact of forecasted inflation. Also shown in Table 2 is the GNP deflator used to convert the nominal energy prices into constant 1988 dollars.

The nominal energy price forecasts are obtained by taking the most recent Minnesota nominal energy price data[1] and multiplying them by the appropriate average annual energy inflation forecasts[2] of Data Resource Incorporated (DRI). The results are divided by DRI's forecasts of GNP deflator[3] for that year to obtain the real energy prices forecasts. These forecasts were chosen because of DRI's reputation as one of the country's leading economic forecasting firms. Moreover, econometric estimations used by DRI account for the simultaneous feedback effects between macroeconomic factors and policies at the regional, national, and international level.

The energy price forecasts presented here do not account for seasonal fluctuations and interstate and intrastate variations in prices. This does not seriously limit their use in policy simulations since the substantial focus of our analysis is on the long-run and the Minnesota energy market is small relative to the national market. Therefore, it is reasonable to approximate the movement of Minnesota energy prices by the national annual average change in prices.

1. The most current energy prices available for the state of Minnesota are 1990 prices and these are obtained from the Minnesota Department of Public Service Energy Data Book: Energy Trends from 1960 through 1990.

2. Forecasts of energy price inflation are obtained from Table 17 of the DRI review of the U. S. Economy: Long Range focus (Winter 1991-1992).

3. Forecast of the GNP deflator is obtained from Table 15 of the DRI Review of the U. S. Economy: Long Range Focus (Winter 1991-1992).

TABLE 1

Nominal Prices

					COMMERCIAL			INDUSTRIAL			RESIDENTIAL		
	Coal	Resid Fuel Oil	Gasoline	Crude Oil	Natural Gas	Dist Fuel Oil	Electric	Natural Gas	Dist Fuel Oil	Electric	Dist Fuel Oil	Electric	Natural Gas
	$/Ton	$/Gal	$/Gal	$/barrel	$/Mcf	$/Gal	c/kwh	$/Mcf	$/Gal	c/kwh	$/Gal	c/kwh	$/Mcf
1988	37.34	0.34	1.00	14.6	4.05	0.52	6.30	2.78	0.52	4.57	0.74	7.07	4.67
1989	37.38	0.39	1.09	17.8	4.28	0.55	6.53	2.94	0.55	4.73	0.77	7.26	4.80
1990	38.12	0.42	1.13	18.0	4.24	0.55	6.65	2.91	0.54	4.82	0.84	7.54	4.79
1991	39.12	0.44	1.15	19.5	4.73	0.61	6.90	3.25	0.61	5.01	0.84	7.76	5.00
1992	40.80	0.47	1.22	20.6	5.20	0.67	7.17	3.57	0.67	5.20	0.89	8.03	5.38
1993	42.59	0.50	1.29	22.1	5.70	0.73	7.38	3.91	0.73	5.35	0.94	8.23	5.70
1994	44.51	0.54	1.36	23.7	6.23	0.80	7.59	4.28	0.80	5.51	1.00	8.40	6.09
1995	46.82	0.58	1.49	25.5	6.86	0.88	7.88	4.71	0.88	5.72	1.06	8.68	6.54
1996	49.40	0.62	1.58	27.5	7.53	0.97	8.22	5.17	0.96	5.96	1.13	9.02	7.03
1997	52.22	0.68	1.69	30.2	8.38	1.08	8.58	5.75	1.07	6.22	1.21	9.36	7.61
1998	55.19	0.74	1.81	33.2	9.34	1.20	8.95	6.41	1.19	6.49	1.30	9.72	8.27
1999	58.45	0.82	1.96	37.0	10.51	1.35	9.38	7.21	1.34	6.81	1.41	10.15	9.05
2000	62.07	0.90	2.16	41.1	11.82	1.52	10.16	8.12	1.51	7.37	1.53	10.91	9.90
2001	65.92	1.00	2.33	45.7	13.10	1.69	10.80	8.99	1.68	7.84	1.66	11.64	10.73
2002	70.01	1.10	2.52	50.6	14.44	1.86	11.45	9.91	1.85	8.31	1.80	12.34	11.57
2003	74.35	1.21	2.72	55.7	15.84	2.04	12.15	10.87	2.03	8.81	1.95	13.05	12.45
2004	79.25	1.32	2.92	60.8	17.23	2.22	12.90	11.83	2.20	9.36	2.10	13.83	13.35
2005	84.25	1.43	3.19	65.9	18.63	2.40	13.74	12.79	2.38	9.97	2.25	14.74	14.25
2006	89.81	1.55	3.41	71.3	20.08	2.59	14.63	13.78	2.57	10.62	2.41	15.71	15.21
2007	95.74	1.67	3.63	77.0	21.63	2.79	15.58	14.84	2.77	11.31	2.58	16.75	16.23
2008	101.96	1.79	3.87	83.0	23.23	2.99	16.58	15.94	2.97	12.03	2.76	17.86	17.28
2009	108.08	1.92	4.11	88.9	24.85	3.20	17.64	17.06	3.18	12.80	2.94	19.05	18.36
2010	114.67	2.05	4.37	95.0	26.52	3.42	18.76	18.20	3.39	13.60	3.13	20.37	19.44
2011	123.38	2.18	4.63	101.4	28.24	3.64	20.03	19.38	3.61	14.53	3.33	21.85	20.70
2012	132.27	2.33	4.91	108.2	30.08	3.88	21.39	20.64	3.85	15.52	3.54	23.52	22.11
2013	141.39	2.48	5.20	115.4	32.03	4.13	22.80	21.99	4.10	16.54	3.76	25.30	23.57
2014	151.15	2.64	5.51	123.1	34.11	4.40	24.31	23.42	4.36	17.63	3.98	27.23	25.10
2015	160.82	2.81	5.83	131.4	36.33	4.68	25.89	24.94	4.65	18.78	4.22	29.30	26.73

TABLE 2

Real Prices (1988 dollars)

					COMMERCIAL			INDUSTRIAL			RESIDENTIAL			
	Coal	Resid Fuel Oil	Gasoline	Crude Oil	Natural Gas	Dist Fuel Oil	Electric	Natural Gas	Dist Fuel Oil	Electric	Dist Fuel Oil	Electric	Natural Gas	GNP Implicit Deflator
	$/Ton	$/Gal	$/Gal	$/barrel	$/Mcf	$/Gal	c/kwh	$/Mcf	$/Gal	c/kwh	$/Gal	c/kwh	$/Mcf	88$'s
1988	37.34	0.34	1.00	14.64	4.05	0.52	6.30	2.78	0.52	4.57	0.74	7.07	4.67	1.000
1989	35.87	0.38	1.05	17.10	4.10	0.53	6.26	2.82	0.52	4.54	0.74	6.97	4.60	1.042
1990	35.19	0.39	1.04	16.62	3.91	0.50	6.14	2.69	0.50	4.45	0.77	6.96	4.42	1.083
1991	34.81	0.40	1.03	17.36	4.21	0.54	6.14	2.89	0.54	4.46	0.75	6.91	4.45	1.124
1992	34.87	0.40	1.04	17.64	4.45	0.57	6.13	3.05	0.57	4.45	0.76	6.87	4.60	1.170
1993	35.00	0.41	1.06	18.17	4.68	0.60	6.06	3.21	0.60	4.40	0.78	6.76	4.68	1.217
1994	35.10	0.42	1.07	18.65	4.91	0.63	5.99	3.37	0.63	4.34	0.79	6.62	4.80	1.268
1995	35.34	0.43	1.12	19.21	5.17	0.67	5.95	3.55	0.66	4.32	0.80	6.55	4.93	1.325
1996	35.39	0.44	1.13	19.69	5.40	0.70	5.89	3.70	0.69	4.27	0.81	6.46	5.03	1.396
1997	35.67	0.46	1.16	20.62	5.72	0.74	5.86	3.93	0.73	4.25	0.83	6.39	5.20	1.464
1998	35.94	0.48	1.18	21.62	6.08	0.78	5.83	4.18	0.78	4.23	0.85	6.33	5.39	1.535
1999	36.27	0.51	1.21	22.96	6.52	0.84	5.82	4.48	0.83	4.22	0.87	6.30	5.62	1.611
2000	36.64	0.53	1.28	24.24	6.98	0.90	6.00	4.79	0.89	4.35	0.90	6.44	5.85	1.694
2001	36.99	0.56	1.31	25.64	7.35	0.95	6.06	5.05	0.94	4.40	0.93	6.53	6.02	1.782
2002	37.36	0.59	1.35	27.00	7.70	0.99	6.11	5.29	0.99	4.43	0.96	6.59	6.18	1.874
2003	38.87	0.64	1.42	29.15	8.28	1.07	6.35	5.68	1.06	4.61	1.02	6.82	6.51	1.913
2004	39.51	0.66	1.46	30.32	8.59	1.11	6.43	5.90	1.10	4.67	1.05	6.89	6.65	2.006
2005	40.03	0.68	1.52	31.29	8.85	1.14	6.53	6.07	1.13	4.74	1.07	7.00	6.77	2.105
2006	40.68	0.70	1.54	32.28	9.09	1.17	6.63	6.24	1.16	4.81	1.09	7.12	6.89	2.208
2007	41.29	0.72	1.57	33.23	9.33	1.20	6.72	6.40	1.19	4.88	1.11	7.23	7.00	2.318
2008	41.85	0.74	1.59	34.06	9.53	1.23	6.81	6.54	1.22	4.94	1.13	7.33	7.09	2.436
2009	42.19	0.75	1.61	34.72	9.70	1.25	6.89	6.66	1.24	5.00	1.15	7.44	7.16	2.562
2010	42.59	0.76	1.62	35.29	9.85	1.27	6.97	6.76	1.26	5.05	1.16	7.57	7.22	2.692
2011	43.61	0.77	1.64	35.83	9.98	1.29	7.08	6.85	1.28	5.14	1.18	7.72	7.32	2.829
2012	44.47	0.78	1.65	36.36	10.11	1.30	7.19	6.94	1.29	5.22	1.19	7.91	7.43	2.974
2013	45.22	0.79	1.66	36.90	10.24	1.32	7.29	7.03	1.31	5.29	1.20	8.09	7.54	3.127
2014	45.96	0.80	1.67	37.44	10.37	1.34	7.39	7.12	1.33	5.36	1.21	8.28	7.63	3.289
2015	46.50	0.81	1.69	37.99	10.50	1.35	7.49	7.21	1.34	5.43	1.22	8.47	7.73	3.459

APPENDIX B

Minnesota's Energy Model: What It Is and How It Works

DESCRIPTION OF THE MODEL

The forecasting and analysis in the Quadrennial Report was done using the ENERGY 2020[1] model of Minnesota's energy use and the REMI[2] model of Minnesota's economy. These two models interact dynamically to produce a unified picture of the interactions of state-wide energy use on the state economy and also the state economy's impact on state-wide energy use. Both models can be calibrated to any service territory or region. The versions which have been used for this Report have been calibrated to the state of Minnesota.

REMI is commonly used for state and regional forecasting. Other Minnesota state agencies using REMI include the Departments of Finance, Natural Resources, Trade and Economic Development, the Minnesota Racing Commission, and the Pollution Control Agency. The REMI model[3] uses a traditional Keynesian Income/Expenditure model to forecast national GNP, economic activity by Standard Industrial Classification (SIC), and the various National Income accounts (Personal Consumption Expenditures, Investment, etc.). It then forecasts Minnesota's share of each of these, based on the factors that historically have been shown to affect Minnesota's share of these economic activities. These include Minnesota's historic share of these accounts, Minnesota's percent of national population, Minnesota vs. national prices (due to location, state policies), etc. REMI also accounts for the effects of various special projects or circumstances (such as the Northwestern Airlines deal) on Minnesota's share of the industry.

ENERGY 2020 is a model of energy use by type of fuel and by end-use; it also models the repercussions (most notably pollution) of energy use. It is used by several states in addition to Minnesota; the most intense users at a state wide level are California, Illinois, Massachusetts, and Vermont. Other users include the Canadian Department of Energy, Mines, and Resources; the National Renewable Energy Laboratory; and several utilities (including one Minnesota utility: Minnesota Power). It was developed from the same source as the U.S. Department of Energy's Fossil II model.

ENERGY 2020 uses a systems dynamics approach to modeling. In other words, it looks at the factors directly affecting demand for energy, including physical factors such as electric motors, and natural gas space heating for the homes; behavioral factors such as gasoline prices, which affect how much people drive or which type of cars (gas mileage) they buy; and factors directly affecting production, such as type of power plants, both historically and how they might be built in the future given costs and demand.

ENERGY 2020 starts from an estimate of the amount of energy use associated with an activity, or with income, (the "energy intensity" of production). For example, paper mills use a given average amount of energy per unit of output. ENERGY 2020 would take the REMI estimate of activity in the paper milling industries and multiply it by the average energy use per dollar of output in that industry. ENERGY 2020 modifies its estimates of energy intensity based on prices of the various fuels, adjustments in the capital stock, and various other behavioral variables. ENERGY 2020 will pass the appropriate data to REMI to permit REMI to modify the

economic forecast as necessary. The price forecasts in the model are provided exogenously, using energy price inflation rates developed by DRI (see Appendix A).

Performing Simulations and Analysis

To use ENERGY 2020 to model the effect of a given change in policy or behavior, a change is made to the appropriate variable. For instance, to examine the effect of a carbon tax, the price of a fuel is increased by the level of the tax per ton of pollutant times the amount of pollutant released by the use of the fuel. To examine the effect of a 45 mpg fuel efficiency standard, the part of the model that estimates what type of cars people will choose is turned off, and exogenous estimates of new car efficiencies are used instead. Then a new forecast is generated which takes into account the relevant changes in the capital stock or behavior, etc. Because the model has both energy and economic sectors, the effect of an energy policy on the Minnesota economy will also be available. Although the Department did not do so in the Report, the effect of a specific policy on the state's energy use could also be estimated using the ENERGY 2020 model.

1. ENERGY 2020 is produced by the Policy Assessment Corporation in Lindstrom, MN, in association with Systematic Solutions, Inc. in Vandalia, Oh.

2. REMI is produced by Regional Economic Models, Inc. in Cambridge, MA.

3. From this point on we will use the phrases "REMI" or "the REMI" model to indicate the specific version of the REMI model which has been calibrated to the state of Minnesota.

APPENDIX C

Questions and Comments from the Environmental Quality Board

Prior to its release to the public, the 1992 Energy Policy and Conservation Report was presented to the members of the Environmental Quality Board for comments and questions. In general, their response was quite positive but they did have a number of comments and questions. This appendix presents those comments and questions and also a response by the Department of Public Service.

COMMENT 1: One member didn't see a strong enough commitment to modern nuclear power as a means to ease air emissions.

Response: The purpose of this Report is not to advocate one specific energy source over another. It is to discuss trends and issues involved with each of the energy sources. What the Department does advocate is a move toward paying the true social cost, including environmental costs, of all energy sources. When we have reached the point where all costs are reflected in the price, we will be able to select the energy sources that are environmentally and economically best for our state. This is just as true for nuclear power, as it is for natural gas and renewable energy sources.

While the Report does not advocate increasing nuclear energy production, it recognizes the importance of continuing existing nuclear capacity. The electrical chapter of the Report discusses the importance of resolving nuclear waste issues and also future relicensing concerns. The numerical forecasts are based on continued operation of our nuclear power plants. The first Department recommendation, found in chapter seven of the Report, is to ensure that DOE constructs a permanent nuclear waste disposal site and begins accepting nuclear waste. The Department believes this is the single biggest step required to maintain nuclear energy as a viable energy source in Minnesota. If this is not accomplished, the choice will not be whether to expand nuclear use, it will be how to phase out nuclear energy facilities.

COMMENT 2: Renewable energy use is sometimes characterized as small and sometimes stated as percentages. Can this be made more consistent?

Response: The primary problem in dealing with renewable energy use data is the reliability of the data. Many of the renewable energy use numbers are rough estimates because firm data sources do not exist. For example, residential wood use data are highly speculative since much of that wood is harvested privately at no cost or sold by small vendors. Therefore, there is no reliable and accurate data source, and we must rely on the best estimates available. The same is true for a source such as residential solar heating.

The approximate 5 percent value presented in the report for renewable energy use is our best estimate of the percent of primary energy use. Any attempt to quantify further (i.e. 4.672 percent) implies a level of accuracy that does not exist. Therefore we chose to say "small" in some cases rather than provide a specific number.

COMMENT 3: One member noted that some existing hydro-electric facilities in Minnesota may be eliminated to expand the recreational use of the affected river, specifically white water activities.

Response: Retirement of existing hydroelectric facilities is a future issue for our state. It was not

addressed in the initial text, but based on this comment we have added some discussion to the hydro section. Our forecasts are based on continuation of existing facilities. Since the specific facilities have not been identified and there is no specific action on their closure, it would be premature to attempt quantitative analysis. Most hydroelectric facilities in Minnesota are quite small when compared to the statewide energy picture. The energy impact of closing would most likely be small depending on which facilities were affected.

COMMENT 4: Advised Commissioner of DPS to talk more about ethanol.

Response: As stated before, the purpose of the report is not to advocate one energy source over another. However, there is an extensive discussion about ethanol in the body of the Report and we state that ethanol will play a much larger role in Minnesota's energy future. In addition, one of the Department's specific recommendations is a research and demonstration initiative aimed at improving ethanol production and expanding use.

COMMENT 5: Noted recent increases in natural gas prices and said potential increases need to be factored into the Report.

Response: The most recent price increases, many associated with damage from hurricane Andrew, are not specifically addressed in the Report. These storm related effects are sure to be temporary. However, the Report bases its forecasts on an upward trend in the real price of natural gas, and much of the text related to natural gas is discussion of potential price increases to current consumers that may occur as natural gas begins branching into new markets.

QUESTION 1: Why are the environmental costs of energy considered in some instances and other times not? The Report needs consistency.

Response: It is apparent from reading the Report that currently the environmental costs associated with most energy sources are not fully accounted for nor are they internalized into the price of that energy source. Unfortunately, the treatment of the environmental costs is inconsistent, both in the Report and the real world. That makes true cost comparison between different energy sources difficult, if not impossible.

This concept of determining the true social cost, including environmental externalities, and making consumers of energy responsible for paying these true social costs is one of the major themes of the 1992 Report. The Department believes that we must find mechanisms to quantify this true societal cost of energy and mechanisms to internalize these costs into the price of energy so that these costs are responsibly passed on to the consumers of energy from all sources.

QUESTION 2: What role will the EQB have on the issue of nuclear relicensing?

Response: The decision on whether to extend the license of the Monticello plant will be debated and decided on the national level under Nuclear Regulatory Commission (NRC) procedures. In that forum, EQB can participate as part of a state team which will present the state's concerns. By statute, the Commissioner of DPS will coordinate this statewide response. Since the Commissioner is also a member of the EQB, the board's concerns will be included in the states intervention. This process will occur in much the same way as the state's response to NRC's proposed rule on Environmental Review for Renewal of Operating Licenses and the Draft Generic Environmental Impact Statement.

It is unclear at this point whether or not the Public Utilities Commission will have authority to use its Certificate of Need authority to review the relicensing decision made by NRC. We do not believe that the EQB will have any direct jurisdiction in the matter because it will not be a siting related decision.

QUESTION 3: The future goal for renewable resources was somewhat unclear. Is the future target to increase renewable resource

use "by" 30 percent or "to" 30 percent?

Response: A number of people commented that the wording of this goal was very confusing. Therefore the Department has chosen to restate the goal as follows. At a minimum, double the use of renewable based energy sources within the state by 2020. This is the same amount as the original goal, yet it is stated more clearly.

QUESTION 4: Has the impact of the Clean Air Act been factored into the Report?

Response: Some of the potential impacts of the Clean Air Act (CAA) are discussed in the body of the Report including emission trading for electric utilities, environmental regulations for electric power plants and oil refineries, and new oxygenate requirements for gasoline. However, the act is too new and complicated to understand completely or quantify accurately. The Department does not know at this time what the total impact of the CAA will be or how regulations affecting one energy source will relate to other sources. Therefore we are unable at present to accurately quantify the impacts of CAA and incorporate them within our model. As the impacts of the CAA become more apparent, we will integrate them into our model. In doing so, we will request the assistance of other agencies or private entities that can assist us in quantifying the impacts of the CAA.

The same problem exists with other major, new federal legislative initiatives that will greatly impact future energy use. The two most prominent are the National Energy Strategy legislation pending in Congress now, and the Intermodal Surface Transportation and Efficiency Act (ISTEA).

QUESTION 5: Will the approval of the Dakota County Refuse Derived Fuel facility be factored into the Report?

Response: At the time the draft report was presented to the EQB, this facility was still tied up in the courts and that was addressed in the text of the Report. Since that time a decision was made to permit a smaller facility in Dakota County. We have modified the text of the Report to reflect the new decision. However, we will not be able to add its energy or environmental implications into our forecasting model because of time constraints.

QUESTION 6: Was input received from the Department of Trade and Economic Development (DTED), Department of Health (Health) and/or the State Demographer Office, as DPS developed our future indicators?

Response: Initially, we did not seek specific input on our forecasts from any of these entities. However, our economic model uses data based on Data Resource Inc (DRI) statistics and forecasts. DRI data form the basis of the forecasts of state economy and revenue used by the Departments of Finance and Revenue. As we began examining the results of our forecasts and the economic assumptions which formed their basis, we were in contact with forecasting staff at each of these departments.

QUESTION 7: Does the Department's analysis quantify heavy metal emissions associated with electrical generation?

Response: At the present time, our model does not have the capability to quantify heavy metal air emissions associated with electrical generation. This is possible in the future and Department staff have already begun examining how we can incorporate this feature into our computer model. We would be very interested in working with any agencies that wish to assist us in that task, especially those with data on heavy metals emission levels of different energy production facilities.

APPENDIX D

Public Comments on the Draft 1992 Energy Policy and Conservation Report

The Minnesota Department of Public Service actively sought public participation in the preparation of the 1992 Energy Policy and Conservation Report. To this end, the DPS held public meetings around the state both before and after publication of the draft Report; sent copies of the draft to interested groups and individuals, including editors of Minnesota's daily newspapers; and announced to news media how persons could receive copies of the draft Report and where and how they could submit comments.

Comments came in written statements, letters, and editorials, as well as by phone and in oral statements at public meetings. The comments were too numerous and lengthy to be included in their entirety here. Their major points are summarized below. Photocopies of the complete written statements are available. Anyone who would like to receive a copy should call or write the DPS, 121 7th Place East, St. Paul, MN 55101-2145. Phone 612-296-5175, statewide toll free 1-800-657-3710.

COMMENTS BY PRIVATE CITIZENS

A number of private citizens commented at public meetings and through phone calls and letters. They often expressed appreciation for the work of the Department of Public Service in putting together an energy strategy for the state. Their comments often included a "call for action" and expressed willingness to participate in making sure the plan would not become dormant.

From Henry W. Kliewer of Rochester: "I am proud to live in a state that takes energy policy seriously. I want to respond with some of my concerns and impressions, because I am concerned about the direction our state, nation, and world are headed with respect (to) energy and conservation. I see many of these concerns accurately reflected in the Report."

At the same time, nearly all the private citizens expressed disappointment with the "lack of aggressiveness" of at least parts of the plan, calling the goals included in the Report "too timid" or "inadequate."

From Norm Erickson of Rochester: "I find this document a cause for some optimism regarding Minnesota's ability to deal with the problems that lie ahead of us. Please, formulate a more aggressive energy strategy and let us support you in making it happen."

Strong support was repeatedly expressed for Goal number 5: to create a self-supporting, innovative, sustainable energy industry in Minnesota. A general consensus was that, to achieve this and other goals, the people of Minnesota and the nation need education to realize the importance of prudent management of energy use and production (many comments called specifically for initiation of public education programs).

Several people also expressed the view that although some sacrifices and changes in life style may be necessary, Minnesotans would be willing to work together and pay the price for a secure and safe energy future.

Suggested Barbara B. Lucas of Rochester: "Elevate energy conservation/environmental preservation to the level of patriotism! For those who are uncomfortable with making changes in the name of intangibles such as the environment and progeny not yet

born, then perhaps a more immediate beneficiary should be targeted: ourselves!"

The majority of private citizen comments mentioned nuclear power. Although a few supported its responsible use, a clear majority were adamant in their call for eliminating the use of nuclear power in Minnesota. The primary concern was the possible environmental threat posed by nuclear waste. Many favored replacing nuclear power with renewable technologies.

From Joann Lower of Rochester: "We should not continue to support the use of non-renewable and environmentally dangerous nuclear fuels. With increased emphasis on the efficient use of energy we should have a goal of being able to declare Minnesota a nuclear free state by 2020."

Strong support was expressed throughout the comments for aggressive development of renewable resources, especially wind and solar power. Comments urged use of available Minnesota resources and most were critical of the Report for not setting higher goals for use of renewables.

Said Sheri Wheeler of Rochester: "Your goal of increasing the amount of energy from renewable sources is too low. A more meaningful goal would be to increase the contribution of renewable energy by 30 percent per decade, compounded, for each of the next three decades."

Comments included support for the Report's goal of improved end-use efficiency.

From Paul Garvie of Minneapolis.: ""I'm impressed with the goals, particularly with encouraging the improved efficiency of existing technology. This is more cost effective than renewables at this juncture."

Also frequently mentioned was a need to include more aggressive conservation goals. A few comments took issue with the Report's assumptions concerning the overall increase in demand and use of energy over the next several decades. Comments called for more ambitious energy efficiency goals and for more public and private investment in, and incentives for, conservation.

Suggesting that Minnesota should be more energy self-sufficient, Randy L. McLaughlin of Red Wing said: "If we do not seriously face our problems of over-consumption now, we will find facing the problems even more difficult as we become more dependent in the future."

Environmental concerns were also frequently expressed, with some suggestions that the goal should be to realize a net reduction in pollutant emissions rather than setting goals to reduce the rate of growth.

Said Bruce Anderson of St. Paul: "Energy use plays a central role in determining environmental quality. My children are fifth-generation Minnesotans. I want them, and my tenth-generation Minnesota descendants, to be able to experience and love the state's natural environment that I have seen degraded significantly in my own short lifetime. With a much more aggressive state energy policy than that articulated in the current draft Report, they might be able to."

Many people suggested ways to address transportation energy use. Ideas included development of cars powered by electricity and natural gas, more mass transit, and a carbon tax in various forms.

From Charlie Fried of Oronoco: "....nearly 41 percent of our energy use is for transportation. Certainly there ought to be some sort of cooperative effort with MnDOT to evaluate light rail transport, car pooling, rail shipping, freeway expansion, etc. There is much energy to be saved and it ought to be part of the plan."

Other comments and suggestions mentioned more than once included: The need for utilities to take a more active role in conservation, strict housing and building energy efficiency standards, tax breaks and incentives for various energy efficient products, and higher energy prices to encourage conservation.

Comments by Environmental Groups

Twelve environmental organizations submitted written comments, some of them quite extensive. There were expressions of agreement with the Department's overall energy goal and guiding principles: "We are pleased to see that you are leading Minnesotans toward a more efficient and responsible use of energy in the future," wrote the Sisters of Saint Francis, Rochester. And the Natural Resources/Self-Reliance Center praised the "excellent list of 12 guiding principles." Most of the comments, however, were critical.

The DPS goal for increasing use of **renewable energy resources** over the next 30 years was criticized by nearly every group as too meager.

"The achievable potential of renewables, particularly biomass and wind technologies, is being vastly overlooked," wrote Blue Oak Environmental Planning Services.

Several felt that wind could provide a much bigger portion of Minnesota's energy than the DPS had projected. The DPS criticism of wind and solar as intermittent is not valid for a large, integrated utility system, according to the Izaak Walton League.

Objections also were made to some of the renewable resources included in the DPS target goal, specifically hydropower from Manitoba and energy from waste-to-energy plants. One group, skeptical of ethanol's energy balance, questioned whether ethanol should be given as large a role as DPS assigns to it.

Whole-tree burning to generate electricity and use of sorghum as a feedstock for liquid fuel should be given more attention, according to some. One organization called for developing hemp as an energy crop and adding a solar-hydrogen energy system over the long term.

The DPS goal of increasing the state's **energy efficiency** by 30 percent by 2020 also was seen as not sufficiently aggressive. "What looks like an ambitious goal is really paltry," said the Natural Resources/Self Reliance Center.

An indictment of the DPS renewable and conservation goals came from the North American Water Office: "This Report condemns Minnesota to increasing acid rain and increasing mercury contamination . . . . In so far as indigenous people rely heavily on fish as a dietary staple, this also amounts to genocidal environmental racism."

Regarding both the efficiency and renewable goals, the environmental groups criticized the DPS strategies for reaching these goals. Some felt that the DPS relied too strongly on the Conservation Improvement Program (CIP) for achieving energy reductions. The DPS should not use the amount of money spent by utilities on conservation as a measure of progress, stated the Institute for Local Self-Reliance.

CIP is an "elaborate 'jobs for bureaucrats' program [that] fills a political function and . . . allows utility managers and regulators to say 'we're doing something for conservation'," wrote the North American Water Office.

The DPS commitment to strengthening and using the Integrated Resource Planning process, particularly its call for implementing IRP for natural gas utilities, was commended by the Izaak Walton League. The League would have the DPS push more forcefully for a stronger IRP process, while the North American Water Office said that IRP is an even more elaborate "jobs for bureaucrats" program than CIP.

The DPS analysis of future renewable and conservation potential was criticized as not taking into account future changes such as lower renewable production costs, rising prices of conventional fuels, and the expense of relicensing and continuing nuclear and coal generation.

Minnesota's use of **nuclear power** concerned almost all of the environmental organizations. Many objected to the DPS analysis showing that premature retirement of Minnesota's nuclear reactors would have strong, negative impacts on the economy.

"The hallmark of this Report is the priority it places

on preserving the moribund nuclear industry in Minnesota," wrote the Izaak Walton League.

"The Report places an inexplicable reliance on nuclear energy for future electric generation," stated the Sierra Club. Both the Sierra Club and the Izaak Walton League singled out the Monticello Mark I reactor as being particularly "dangerous."

The Institute for Local Self-Reliance said it wants the Minnesota Legislature "to make a decision right now about the continued use of nuclear reactors in Minnesota. The Legislature in the next session should put on the ballot in the fall of 1994 the question of whether Minnesotans want to shut down Prairie Island's nuclear reactor by the year 2020." The Institute noted that such a decision cannot be made unless "aggressive" action is taken to advance renewable resources.

Regarding the specific DPS goal to ensure that the federal government handles Minnesota's nuclear waste, the North American Water Office stated: "According to this Report, Minnesota's number one energy policy goal is essentially to force the people of Nevada to accept our nuclear wastes."

The Sierra Club noted serious problems at the federal government's Yucca Mountain, Nevada, site. "Such problems raise serious doubts as to whether the facility will or should ever be put into operation and should be clearly detailed to policy makers before encouraging them to pressure the federal government into completing this facility."

The Izaak Walton League also expressed concern over this goal: "The Department's continued pressure on the federal government to site a nuclear waste repository . . . may backfire . . . . DOE's eyes may turn quickly to a Minnesota alternative if the Yucca Mountain site is rejected."

Many criticisms focused on **omissions** from the Report.

The DPS was taken to task for failing to sufficiently acknowledge the economic benefits of increased efficiency and greater use of renewables. In this regard, at least three groups took exception to the DPS claim that energy independence is not a desirable goal.

Several complained that although the DPS calls for prices to reflect the **true cost of energy** it offers no recommendation on how to incorporate such costs. Two groups expressed concern that attempts will be made to repeal recent Minnesota legislation requiring such costs to be reflected in the price paid to renewable energy providers. The DPS Report, said the Izaak Walton League, "should discuss and clarify the Department's position on this critical policy issue, as well as the specific objectives and schedule for implementing full social cost analysis."

In connection with the DPS call for energy to reflect its true social cost, several groups were disappointed that the DPS did not support a **carbon tax.**

The Natural Resources/Self-Reliance Center said that a carbon tax of $6 per ton would "have almost no impact on energy costs and will have no effect on energy use." Rather, the Center said, its intent is to create an energy bank to finance economic incentives to increase efficiency and renewable energy use.

The Minnesota Renewable Energy Society, Inc. said that DPS opposition to a carbon tax or any other pollution tax "guarantees that consumers will not 'pay the true cost of all energy sources'."

The absence of other specific proposals for economic incentives was a complaint of several organizations. Some specifically mentioned **decoupling** of utility profits from sales as an important incentive that the DPS failed to address.

"Decoupling can happen relatively easily," wrote the North American Water Office. "Utility revenue requirements, including earnings, could be determined by simply allowing conservation investments into the rate base, and then allowing the rate of return on the entire rate base to increase as energy savings reached a savings goal."

The Izaak Walton League said that the Minnesota PUC or Legislature should direct a complete examination of the decoupling issue.

Cogeneration is another energy topic that the DPS overlooked, and shouldn't have, said several groups. The Izaak Walton League called for the DPS final Report to "highlight the potential for cogeneration in Minnesota and describe some specific policies to bring this on-line."

Transportation is still another energy issue not adequately addressed, according to several groups.

Wrote the Sierra Club: The Report "identifies that the transportation sector is responsible for the majority of our petroleum usage and that it is also the major source of air quality problems in our urban areas. Yet nowhere in this Report are any goals, strategies, or actions outlined to address transportation."

And from the St. Paul Neighborhood Energy Consortium: "The Report presents no proposals for reducing the state's dependence on petroleum .... The DPS should take a strong leadership role in promoting mass transportation to reduce the state's dependence on this volatile energy source."

The DPS statement on **global warming** – that the theory is controversial within the scientific community – was specifically objected to by two groups. The Sierra Club called the statement "extremely misleading" and the Izaak Walton League characterized it as "unfounded skepticism."

Finally, several groups criticized the DPS for failing to allow sufficient time to comment on the draft Report.

Comments by Private and State Organizations

Climate Makers Inc. (CMI)(private business). CMI commented that the Report failed to emphasize the value of conservation. "Under no circumstances should any public funds be used to encourage conversion to any type of alternative fuel before efforts of energy conservation are implemented. Wasted fuel of any source contributes to the greenhouse effect and should not be encouraged."

CMI suggested that a minimum 10 percent reduction in summertime air conditioning demand could be achieved by properly maintaining the filters and heat transfer systems in commercial and residential air conditioners.

Nearly 20 years experience in the heating, ventilating, and air conditioning industry has convinced the company that cleaning heat transfer surfaces on air conditioners "will have a greater impact than any other energy conservation program suggested."

CMI also said that Wisconsin public utilities are way ahead of Minnesota's in terms of "Back to Basics" energy conservation programs that include education and rebate components.

Energy CENTS Coalition (low income interest group) stated that the DPS needs to recognize the following items:

1. Low income people represent an increasing number of rate payers in this state. The Report does not give this group proper acknowledgment as energy consumers.

2. Energy efficiency initiatives should include opportunities for low income people. DPS should develop alternatives for low income people to invest in energy efficiency, help promote those opportunities, and begin revising payback periods that show longer-term savings to break the stereotype that low income people do not care about conservation.

3. Energy is a survival issue. The Report should reflect the disproportionate burden high utility costs represent for low income households. Any references to consumers absorbing further costs of environmentally sound energy policies must also refer to the inability of many consumers to meet those costs now.

4. A "true cost" focus assumes that the state is still focusing on production rather than reducing demand. It is also assumed that demand is reduced by raising utility rates.

'"Increasing rates for those already unable to meet their energy needs does not mean people need less heat in their homes. Unless the focus changes, low

income people will continue to pay disproportionate amounts of their income for utilities."

SORGO Fuels & Chemicals (private business) argued that the 1992 Report repeats the mistakes of the 1988 Report by implying that renewables are not cost competitive with traditional fuels and in failing to explain the real reasons that large scale replacement of fossil and nuclear fuels remains a long-term possibility.

Renewable energy sources cannot compete under a pricing scheme where public electric utility monopolies are required to pay only 2 cents per kWh for electricity purchased from small renewable energy companies while they receive over 5 cents per kWh from rate payers to produce energy from imported coal and nuclear fuels.

SORGO asked: "Where is the proof that renewables are not cost competitive? Why is DPS, the PUC, and the Legislature afraid to give renewable energy companies the same fair price the public electric utilities receive? Obviously they do not support the principles of competition and free market economics that made this country great.

"We asked for the truth but only got political rhetoric designed to convince the public that DPS is pro-competition and pro-renewables while it favors utility interests by formulating policies so weak that renewable energy will never get off the ground."

Office of the Attorney General, Hubert H. Humphrey III. "The Report indicates a sound goal statement for Minnesota's Energy Policy and appropriate guiding principles by which to evaluate policy decisions, but fails to follow through on these statements."

The Attorney General stated that to achieve a sustainable environmental future for Minnesota, we must:

• Minimize the environmental impacts of our energy choices. Make this a primary goal rather than an after-the-fact consideration.

• Incorporate the environmental cost of our energy choices into all energy resource decisions. Determining how to incorporate environmental externalities into the Department's decision-making process should be a major energy goal.

• Place higher emphasis on meeting our energy needs through renewable resources.

• Place higher emphasis on decreasing petroleum consumption in the transportation sector. The Report does not address the potential gains that could be reached through conservation (light rail, better bus service, restrictions on automobile use).

• Demonstrate a lesser emphasis on nuclear power (the focus of our top two energy goals). Considering the Prairie Island decision, the state should be planning now to meet future energy needs without the availability of the state's two nuclear plants, rather than assuming their continued operation. The Department seems to be taking a short-term rather than a long-term view of our energy future.

University of Minnesota, President Nils Hasselmo. The University commended the Report 's statement of goals and guiding principles, noting that they provide "a much-needed basis for public discussion of energy issues and for the formulation of a long-term energy policy. . . . They will be of great value to the public policy makers throughout this state in addressing the difficult decisions that will take us into the 21st century."

Faced with planing how to meet its own future energy needs, the University said it adopted a long-term policy that embodies many of the same guiding principles set out in the Report. The University has set its own goals for reducing building energy use and is already realizing an annual energy savings of $1.3 million on an initial capital investment of $4.2 million. Using the latest, most advanced energy efficiency technology that reduces air pollutants and offers other environmental advantages is an important part of the University plan. So also is emphasis on fuel flexibility: "The University believes that fuel flexibility is critical to prudent energy planning, given the uncertain future. The University agrees with the Report that 'decision makers need to take care not to repeat mistakes of

the past by placing too heavy reliance on any one fuel.'"

The University expressed appreciation for the support and assistance received in the past from the DPS and said it looks forward to working with the Department in "developing and implementing energy policies that will best serve the people of Minnesota."

Comments by Utilities and Power Producers

Written comments representing the interests of utilities and other power producers were received from two independent utility cooperatives: Cooperative Power Association and United Power Association; two of Minnesota's larger investor-owned utility companies: Minnesota Power and Northern States Power Company; two alternative power producers: Minnesota Windpower, Inc. and WindRiver Power Company; and one organization representing shareholders' interest: Minnesota Utility Investors, Inc.

Generally, this group expressed overall support of the draft Report and praised the efforts of the Department to seek public input and to face the challenge of developing a balanced energy plan. As Phillip Martin from United Power Association said: "The goal statement and guiding principles are well articulated and provide a sound basis for all interested parties to work together. While there are some areas of disagreement, on the whole we feel the Department has provided an excellent analysis of where we are today and how we can move toward an even better tomorrow."

The group was most sharply divided on the issue of **nuclear waste** and the future of nuclear power in Minnesota, with the alternative power producers showing the least confidence in the Department's goal to hold DOE to its obligation to establish a permanent repository for our spent nuclear fuel. As Dan Juhl of Minnesota Windpower, Inc. stated: "Let's eliminate nuclear energy in Minnesota and across the country and let's get it done soon. Let's put the pressure on the U.S. Department of Energy to make alternative energy choices a priority."

In contrast, the larger, investor-owned utilities and the cooperatives were more supportive of the position stated in the draft Report and expressed their commitment to helping the state achieve its goal. NSP promised to increase its efforts to ensure that the federal government fulfills its obligation to permanently dispose of the state's spent nuclear fuel.

Vastly differing viewpoints on the role of **renewables** (especially wind power) in Minnesota's energy mix were also apparent. Comments ranged from complete lack of confidence in renewable energy sources (voiced by United Power Association and NSP) to the idea that wind power is more reliable than it is credited with being and should be considered an attractive, viable addition to traditional energy sources (WindRiver Power Company).

Phillip Martin from United Power Association said: " Many renewable and demand-side resources are at an immature state of commercial demonstration relative to supply-side resources. This makes it difficult to have the same level of confidence in the long-term effectiveness and reliability of these resources. Specifically, claims about Minnesota's wind potential are grossly misleading. Statements that leave the impression that wind alone can meet all of our electricity needs do a great disservice to the lay reader and undermine the credibility of the emerging wind power industry."

An opposing viewpoint was expressed by Marci Ytterberg, manager of project development at WindRiver Power Company: "Wind represents an attractive additional, not alternative, resource planning option for Minnesota utilities. It is an intermediate form of power generation that should not be viewed as a competing generating option with baseload and peaking options. It clearly has value, but the extent of that value will be known only when there are some 50 to 100 MW wind power plants operating in the state. Our guess is that wind energy will help Minnesota utilities meet on-peak and near-peak load growth in the years to come, and do so at an extremely attractive price."

Ms. Ytterberg commended the DPS for its "leadership position on renewable energy resources and its significant effort to incorporate wind energy into the generation mix of Minnesota utilities. Clearly, it is as a direct result of your efforts that Northern States Power Company is developing the 25 MW wind power project on Buffalo Ridge and we expect other utilities to follow suit."

NSP supported the Department's goal of doubling the use of renewable energy in the state by the year 2020, while Minnesota Windpower thought renewable use should be doubled by the year 2005.

Although there was no consensus on the "ideal" energy resource, a number of alternative technologies were suggested for the state to consider, including: geothermal energy tapped by ground source heat pumps, hydroelectric power, and energy from waste-to-energy facilities.

Frank Pazlar of Minnesota Utility Investors, Inc. suggested that certain criteria be followed as Minnesota progresses along the alternative energy continuum: Assess the reliability, the capital and operating costs, the environmental impact, and any capacity limitations and potential before committing to any energy source.

Both of the investor-owned utilities agreed that before relying too heavily on any renewable resource, time should be taken to assess its performance. It was also suggested that it's too soon to close the door on any option – including the possibility of building new power plants if necessary.

Ideas for improving **energy efficiency** included expanding the use of energy storage systems, installing "dispersed generation" facilities, increasing efficiency in the transportation sector, and increasing public energy education and services.

Several comments addressed the Report's support for integrating the **"true costs" of energy use.** William Kaul, manager of Cooperative Power Association, said that existing laws and regulations already address most of the environmental and social costs of producing electricity. "As a nation, $115 billion per year is spent on internalizing environmental costs. The Clean Air Act Amendments of 1990 will add between $30 and $60 billion to that annual figure. By the year 2000, a family of four will be paying $1200 per year for clean air alone."

Presenting another argument, Phillip Martin of United Power suggested that we use caution in proceeding with a social cost strategy. "Do not use social costing until significant damages or other external costs are real and reasonably quantifiable, unless the costs will continue without market intervention, unless intervention is the most effective mitigative mechanism, and until the possible results of intervention are well understood."

NSP also stated that quantifying the environmental costs of the various generation options would not improve Minnesota's ability to fairly evaluate and compare sources. "Attempting to quantify social costs, including environmental externalities, is an exhausting, expensive task which produces, at best, uncertain and untimely results." NSP suggested following the example of other states by adopting a more qualitative approach where the goals of achieving environmentally sound, least-cost and reliable energy are met through the selection of resources, during the resource planning phase.

Comments from this group also generally opposed establishing a new **regional resource planning** process, arguing that such a vehicle already exists within the Mid-America Power Pool. Minnesota Power had concerns over the cost effectiveness of the process and the loss of state jurisdictional authority and oversight. NSP said we should not enter into regional resource planning until we understand what the impact of the PUHCA (Public Utilities Holding Company Act) act will be.

Finally, in two points of agreement, this group of commentators called for the state to delete the **Certificate of Need requirement** for renewable energy investments and resource additions that have received prior PUC approval, and supported the state's position on leaving **carbon tax** issues to the federal government.

APPENDIX E

Department Response to Public Comments

This section presents the response of the Department of Public Service to both written and oral comments received after release of the draft 1992 Energy Policy and Conservation Report. The latter part of this section responds to some of the more prevalent comments. Before responding to specific issues, it is important to understand the underlying assumptions that form the foundations of the analysis and recommendations.

BASIC ASSUMPTIONS OF THE REPORT AND MODEL

1. Continued economic growth for the state and continued population growth. This is a realistic assumption according to Data Resources Incorporated (DRI), one of the country's leading economic forecasting firms. DPS did not want to create the illusion of efficiency and renewable gains by assuming an unrealistically low population or economic growth rate.

2. Gains in energy efficiency due to advances in technology, existing conservation programs, and existing consumer purchasing behavior. This assumption is used for all forms of technology including transportation, home heating, and electrical appliances. This assumption accounts for the fact that energy use per real dollar of gross state product decreases even under baseline conditions, continuing a steady trend which has been documented for the past 30 years.

3. All cost effective existing plant, both energy production plant and energy consuming plant, remain in use throughout the useful life of the equipment. This position was selected as the most realistic for the following reasons: First, no utility serving Minnesota has committed to any existing capacity retirement through either its Advance Forecast or Integrated Resource Planning. Secondly, since most utilities expect continued growth, it is anticipated that their first choice will be to upgrade existing plants, which is generally more cost effective than building new capacity. In most cases, it is not cost effective to change out energy using equipment prior to the end of the useful life of the equipment.

4. The "business as usual" scenario assumes all new baseload electrical generating capacity would most likely be met through coal generation. This is a reasonable expectation under the "business as usual" assumption since utilities in this region have historically met increased base load capacity requirements through coal or nuclear plants. At this point future expansion of nuclear plant is not expected. After running the first baseline, a baseline was run which included future committed purchases of Manitoba Hydro Power and NSP's commitment to construct and operate 100 MW of wind generating capacity. These changes made very little difference in the baseline.

ASSUMPTIONS FOR THE RENEWABLE RESOURCE GOAL

5. All new electrical generation capacity would be added at 50 percent wind, 25 percent biomass and 25 percent coal. These percentages were selected to represent what might be accomplished when environmental costs are considered for new capacity as is now required under the Integrated Resource Planning procedures and the State's Certificate of Need statute.

6. An increasing cost of traditional energy sources and a decreasing cost of renewable technology. See price forecasts in Appendix A.

Assumptions for the Energy Efficiency Goal

7. An increase in automobile Corporate Average Fuel Economy standards (CAFE), beginning in 1993, until a level of 45 miles per gallon is achieved in 2008, with a total fleet replacement by 2018. At that time, the average miles per gallon for all passenger vehicles on the road is assumed to be 45 mpg. This represents a very aggressive improvement in auto fuel efficiency and assumes a willingness to successfully address the issue at the federal level.

8. Replacement of all energy-using appliances and equipment in the industrial, commercial, and residential sectors with new devices achieving at least 90 percent of the theoretical maximum efficiency level. This assumes the rapid implementation of new, efficient energy technologies based upon replacement of existing equipment at the end of its useful life and cost effective replacement based upon attractive "pay-back" periods without additional major financial incentives (rebates, "buy-back" programs, etc.). Additional major monetary incentives would likely be required to induce a more accelerated rate of replacing this technology prior to consumer need.

9. Fifty percent of residential consumers making a $200 initial investment in conservation and efficiency improvements and then maintaining a $50 per year maintenance level. This action represents consumer confidence in energy conservation and efficiency, producing an energy savings of 9 percent. This savings would generate an estimated $45,000,000 in disposable income annually.

Impact of Altering Base Assumption

The Department has gathered information on electrical generation plant retirement projects for the utilities serving Minnesota.

No utility has committed to retiring any existing plant prior to 2020; however, the following table shows the generation capacity that has license expiration dates between now and 2020. It is likely that most of this plant will not be retired and that the utilities will choose to refurbish the installation for extended plant life, since this is almost always less expensive than investment in new plant. However, should any of this plant be retired, the Department assumes that replacement plant would be constructed according to the formula of 50 percent wind, 25 percent biomass, and 25 percent coal. Any retire-

TABLE 1

Generation Capacity Expiration Dates

Year	Coal	Natural Gas	Nuclear
2000	74.9		
2001	24.0		
2002	67.4		
2003	26.2		
2004	79.0		
2005	120.5		
2006			
2007			
2008			
2009	190.7		
2010			
2011	233.0		451.2
2012	260.0		
2013			438.8
2014	131.0	40.0	438.7
2015			
2016	70.0		
2017	326.1		
2018	26.0		
2019			
2020			
Total	1628.8	40.0	1328.7

ment would thus increase the Department's Goal number 3, and lower projected emissions.

With these data, the Department ran three additional modeling scenarios, as shown in table 2. The first column of the table shows the baseline projection number 4, or "business as usual." The second shows the original Goal number 3 projection. Columns three, four, and five show three new scenarios based on the assumptions described below:

Retirement Scenario Number 1

In this modification, the remodeling assumes that as licenses of all fossil fuel generation capacity expire according to the schedule above, the plants will be forced into retirement rather than relicensed. It further assumes that the new generating capacity needed to replace it will be based on 50 percent wind, 25 percent biomass and 25 percent coal.

Retirement Scenario Number 2

In this scenario, the original goal scenario has been remodeled to assume required retirement of all fossil fuel and nuclear generation capacity according to the license expiration schedule above. It also assumes replacement with new generation capacity based on 50 percent wind, 25 percent biomass and 25 percent coal.

Retirement Scenario Number 3

This third modification assumes required retirement of fossil fuel generation capacity according to the license expiration schedule above, and replacement with new generation capacity based on 50 percent wind and 50 percent biomass.

As one would expect, all retirement scenarios show a more rapid growth in renewable generation than contained in the original Goal number 3. This

TABLE 2

Results of Various Scenarios

	Baseline Projection	Original Goal Scenario	Retirement Scenario #1	Retirement Scenario #2	Retirement Scenario #3
Total Capacity in 2020 (MW)	14,908	11,613	11,285	11,046	11,435
Capacity Added (MW)	3,940	645	317	78	467
Retired (MW)	0	0	1,668	2,997	1,668
Added (MW)	3,940	645	1,985	3,075	2,130
Cost of New Capacity (Million $)	4,700	288	1,587	2,377	1,978
Percent of Renewable ElectricalGeneration	4%	7%	17%	25%	20%
CO_2 Emissions (mill tons)	144	111	100	103	99
SO_2 Emission (1000 tons)	532	364	294	312	282
NO_x Emission (1000 tons)	416	356	344	347	341
CO Emissions (1000 tons)	1205	940	1167	1165	1152
Per Capita Energy Use (1000 Btu)	327	260	251	255	247
Energy Use per $ GSP (1000 Btu/$)	9.9	8.0	7.6	7.8	7.5
Energy Dollar per $ GSP (Percent)	9.9	8.6	8.7	8.8	8.7
Average Real Cost of Electric	6.01	5.58	6.26	6.77	6.08

growth is accompanied by the expected improvements in the environmental indicators. Under the forced retirement scenarios, carbon dioxide emissions stabilize at approximately 1990 levels and there is a reduction in sulfur dioxide emissions and a slower growth in the other emissions.

Cost differences between retirement scenario 1, 2, and 3 and the original Goal number 3 are quite significant. The Department's original Goal number 3 projection is lowest in cost of new capacity, energy costs per dollar of Gross State Product, and average real cost of electricity in cents per kWh. All forced retirement scenarios are more expensive in terms of the cost of new capacity, the average real price of electricity, and energy costs as a percent of gross state product. The modeling system used by the Department lacks the capability to gauge the comparative economic impact of new construction for renewable energy generation capacity versus the economic impact of higher electric rates.

Results of the modeling analysis vary significantly, based on data contained in the initial assumptions. The Department chose to start with basic assumptions that were aggressive, yet attainable. Additional scenarios indicate improvements in emission reduction and associated costs. When all factors are considered, the Department still considers the renewable generation assumption of the original Goal number 3 as the most reasonable under current conditions.

Response to Public Comments

Introduction

The release of the Draft 1992 Energy Policy and Conservation Report created a great deal of discussion and comment within the state. This is as it should be. Indeed, by becoming the focal point of comments, criticism, and observations, this Report has achieved the result desired by the Department. A primary purpose of this document is to generate discussion and debate within the energy community and the decision makers of the state. It would be a tremendous achievement to produce a report that generated unanimous agreement on all aspects of future energy policy, announce that consensus had been reached on all pressing issues, and declare the necessary political, regulatory, and consumer actions had been identified and implemented, making it time to move on to other important concerns. Obviously, this is not likely to occur when dealing with an immensely complicated issue such as energy, which profoundly and fundamentally affects our lifestyle, environment, and economy.

The Department recognizes differences of opinion and philosophy regarding appropriate energy policy within the state. Many of our commenters wanted, in fact demanded, rapid, radical change in the energy markets primarily in an effort to improve the environment. Many wanted to maintain the status quo and feared we were moving much too quickly and were risking damage to our economy. Both sides of the debate believed the other was costing the state future jobs.

The Department believes its obligation is to seek a balanced energy policy. This is most clearly articulated in our Energy Policy Goal statement in the introduction section: Ensure continued access to reliable, reasonably priced, efficient and economically sound energy services to Minnesotans now and into the future through responsible resource use.

One commenter suggested that the Department should not worry about balance, that we should be the "zealous advocate" for change, and balancing should be left to other bodies. While it might be easier to select a single dogmatic position and zealously advocate that position, the statutory obligation of the Department to seek a balance is clear.

Written and oral comments received by the Department fell into the following general categories:

I. Lower than anticipated renewable energy use goals.

II. Lower than anticipated energy efficiency improvement goals.

III. Demand for immediate shut-down of nuclear generating plants.

IV. Insufficient details on implementation tactics.

V. Limitations of the Energy 2020 model.

VI. Opposition to inclusion of external costs in energy pricing.

The following is a discussion of each of these points.

I. Renewable Goal

A number of commenters stated that the Department's renewable goal was not aggressive enough. The Department disagrees. Introduction of renewable resources in new plant capacity, required by growth in demand, holds the greatest promise to incorporate cost-effective renewable electric generation sources into the energy plant mix. Slowing electrical demand growth through energy efficiency gains (see Goal number 4) shrink the need for additional generating capacity, thus decreasing the opportunity to introduce new renewably based plant. Major financial subsidies, penalties, or regulatory intervention would be required to spur more rapid introduction of renewables, all of which would drive up costs, as is shown above in the forced retirement scenarios. Indeed, table 2 shows that the Department's original Goal number 3 increased the use of renewables above the baseline at a cost lower than the forced retirement scenarios, and at a lower real cost of electricity, a lower amount of added capacity, a lower cost of new capacity, and a lower cost per dollar of Gross State Product than any scenario, including baseline. As stated above, the Department's statutory obligation to seek a balance in the development of energy policy is clear. The original Goal number 3 achieves this balance.

II. Energy Efficiency Goal

Likewise, a number of commenters stated that the energy efficiency goal was not aggressive enough. The Department disagrees with this assessment. As stated earlier, it was set using three very aggressive parameters. The result was a 30 percent decrease in energy use per dollar of gross state product. This 30 percent decrease comes on the heels of a 50 percent decrease since 1960.

1960	**20,000 Btu per $ GSP**
1990	**9,000 Btu per $ GSP**
2020	**6,500 Btu per $ GSP**

While it can be argued that efficiency will be gained at a more rapid pace than the 30 percent projection, tremendous and wide ranging technological advances would be required to sustain the level of efficiency improvements registered over the past 30 years. With existing technology, it is not reasonable to expect a continuing and steady reduction in the amount of energy consumed by energy using products to the point at which they use virtually no energy. Energy will still be needed to produce the goods and services created by Minnesotans. Energy will still be needed to heat our homes and businesses. The profound growth in the use of air conditioning systems shows no signs of abating . New energy consuming products will reach the market much as personal computers, video tape recorders, home security systems, fax machines, et cetera, arrived in the last decade. While significant opportunities exist to greatly improve the efficiency with which we use energy, the trend for energy use reduction will begin to flatten out as society continues to squeeze more productivity from each Btu consumed.

III. Nuclear Power and Nuclear Waste

The most controversial aspects of the Report were probably the recommendations and goals associated with nuclear power and nuclear waste disposal. While a number of comments said the Report was not aggressive enough in its support of nuclear power, the majority of commenters on this subject adamantly opposed any continuation of nuclear power. In most cases, these commenters demanded the immediate shut-down of both the Prairie Island and Monticello nuclear power plants. Some

advanced efficiency arguments, some relied on renewable generation arguments, some argued from a job growth standpoint, while some used cultural/racial arguments.

Nuclear power now contributes about 28 percent of all the electricity used in Minnesota. Closing these plants on short notice would have a terrific impact on the state's power supply and economy. Minnesota consumers, businesses, industries, and utilities would face huge problems in trying to meet current demand as well as future growth in demand. As projected in the Report, efforts to replace most of this lost capacity in a short time would likely focus on fossil based generation, either new plants or changing peaking plants to base load plants. While renewable generation technology is improving and becoming more available, the industry needs to make further advances to meet this high level of base load demand. Replacing current nuclear generation with renewable generation would obviously increase the use of renewables at a cost of much higher electrical rates and possible supply deficits and disruptions.

In addition, even if we shut down the plants immediately, the issue of nuclear waste disposal remains as an immediate, critical problem. Many commenters stated that relying on the U. S. Department of Energy to provide interim or long term storage at Yucca Mountain, Nevada, for spent nuclear fuel was either a pipe-dream or an abdication of state responsibility.

Beginning in the late 1950s and early 1960s, utilities sought permits to build nuclear power plants, and states granted permission, based on encouragement from the federal government and legal commitments obligating federal agencies to accept and provide storage for the resulting spent fuel. To date, federal progress toward fulfilling its contractual duty has been dismal, at best. Taking steps to ensure that the federal government meets its legal oblations is, by necessity, a responsibility that must be met by this state and others. Until recently, this situation has virtually been ignored at the state and federal level dating back nearly 20 years. Minnesota does not have the luxury of ignoring it any longer.

At this point, what are the realistic alternatives to a Yucca Mountain-type permanent storage site? The answer, to date, is none. Currently, spent fuel is being stored across the country in pools at more than 70 nuclear power plants operating over 100 nuclear reactors (many plants, like Prairie Island, operate two reactors at one site). As a nation, we have the choice of establishing one national repository in the national interest, or we end up with over 70 defacto permanent nuclear waste repositories. Further, failure to solve the waste issue will force the premature shut-down of all these plants, not just the Minnesota plants, potentially causing major market disruptions in energy supply and in the availability of replacement energy.

Many of the commenters opposed to nuclear power were also opposed to all fossil-fuel based energy, energy generated from waste, and hydro-electric power purchased from Manitoba.

IV. Implementation Tactics

A number of comments indicated that the implementation tactics presented were not specific enough. The commenters seemed to imply that a legislative agenda for 1993 should have been a part of the Energy Policy Report. The Department does have a number of specific legislative proposals currently under consideration within the Governor's office. However, it must be pointed out that this is a broader policy level document to be used for guiding energy policy decisions for the next four years, not just in 1993. Specific legislation must be judged within the political and financial constraints of a specific point in time.

Many commenters cited a lack of a specific funding source for stimulating research, development, and implementation of renewable and energy efficiency technology and policies. The Department favors the approach of using funds generated through the

Minnesota lottery to achieve this goal. This is only one possible source for the necessary funding and others will also be examined. The Carlson administration and the Department have opposed new fees and taxes, such as the carbon tax, within the Report. The state will be able to use existing incentives and regulatory structures, such as the Integrated Resource Planning and the Conservation Improvement Program, to implement and develop renewable energy sources and improve energy efficiency rather than to use taxes or fees to intervene in the prices of the existing energy markets.

The Department's opposition to a unilateral, statewide carbon tax is consistent with this position. A carbon tax adopted by this state only would be likely to damage the national and international competitiveness of goods and services produced within Minnesota. It would also hurt low-income Minnesotans more than moderate and upper income citizens.

V. Limitations of the Existing Model

A number of commenters said that our analysis was too narrow and did not include important aspects. Comments focused on three primary areas:

- an inability of the 2020 modeling package to incorporate a job impact analysis of various energy supply options.
- the modeling system's failure to account for heavy metal emissions such as mercury.
- an inability to model potential expansion of co-generation.

These are not currently within the abilities of our model. We hope to add these features in the near future and welcome assistance and data that can be provided by outside sources.

VI. Opposition to Inclusion of Externalities

A number of commenters were critical of the Report's position regarding the need to include environmental externalities in energy prices. Some argued that the Report overlooked or ignored environmental costs which are built into today's prices.

Examples cited included:

- the high cost of conducting Environmental Impact Statements for power plants, pipelines, and power lines.
- required pollution control systems for power plants, refineries, and automobiles.
- land restoration following coal strip mining operations.
- the estimated $30 - $60 billion in energy- related clean air costs contained in the recent National Energy Bill.

Others argued that inclusion of current or future external costs on only a statewide basis has the same competitive effects as the carbon tax. The Department recommendation is the gradual movement toward true total costs through mechanisms such as Integrated Resource Planning, which include environmental costs when making new resource and/or demand-side decisions. The Department recommends looking for other mechanisms that could incorporate these costs into what consumers pay.

INDEX