MINNESOTA
DEPARTMENT OF
COMMERCE

85 7th Place East, Suite 500
St. Paul, Minnesota 55101-2198
651.296.4026 FAX 651.297.1959 TTY 651.297.3067

03 - 0019

January 9, 2003

Dear Representatives, Senators and Interested Parties:

Minnesota Laws 2001, Chapter 212, Article 7, Section 35 mandates that the Department of Commerce provide to the Legislature an update to its Energy Planning Report by December 15, 2002. On January 7, 2003, a report entitled *Energy Planning Report, 2002 Update* was delivered to the Legislature. This report should be construed as complying with the above-cited Law.

The report was written by and reflects the views of the previous Administration under past Governor Jesse Ventura and may not reflect the policy and vision of the present Administration under present Governor Tim Pawlenty. Since the present Administration has been in place for only a few days it has, naturally, not had the opportunity to review the report. However, we would be pleased to review the report and re-present an updated Energy Planning Report at the request of the Senate or the House.

Sincerely,

Glenn Wilson
COMMISSIONER

GW/MMW/cw

Energy Planning Report

2002 Update

Energy Division
Minnesota Department of Commerce

In 2001, the Minnesota Department of Commerce, Energy Division, presented to the Minnesota Legislature the 2001 Energy Planning Report required under Minn. Laws 2001, Ch. 212. Art. 7, Sec. 35. That report provides a wealth of background information on all aspects of energy. It does not, however, articulate long term energy goals and strategies to meet the goals.

We are pleased to submit this update, also required under the legislation, which does articulate energy goals and strategies for the state. The only additional background information in this update is found in Appendix A relating to additional environmental information developed since last year's report. Otherwise, the informational material in the 2001 Energy Planning Report (Planning Report), the 2002 Universal Energy Service Report (Universal Service Report), and the 2000 Energy Conservation and Policy Report (Quad Report) serves as the basis for the goals and strategies articulated in this report. All of those reports may be found at www.commerce.state.mn.us or may be obtained by calling 651-296-7502 and requesting a hard copy.

In preparing this update report, the Energy Division hosted five energy forums seeking additional public input. Those forums discussed:

1) Renewable Portfolio Standard, the Renewable Energy Objective, and Green Pricing
2) Energy Infrastructure – Certificate of Need and Transmission Issues
3) Universal Energy Service
4) Energy and the Environment
5) Small Power Production and the Renewable Energy Production Incentive

Participation in the forums ranged from approximately 50 to 100 attendees and each generated helpful discussion and insights. In addition, utilities, organizations and individuals submitted written comments. Copies of the public comments are available by calling 651-296-7502.

This report is a summary list of energy goals and strategies to meet the goals. Under each strategy is included an indication of who might be responsible to engage in that strategy or initiate action to enable implementation of a strategy.

The following terms are used in abbreviated form:

Agriculture	Minnesota Department of Agriculture
CIP	Minnesota's energy Conservation Improvement Program
Commerce	Minnesota Department of Commerce, Energy Division

EERE	Energy Efficiency and Renewable Energy
EQB	Minnesota Environmental Quality Board
MAPP	Midcontinent Area Power Pool, now part of MISO
MISO	Midwest Independent System Operator (electric transmission)
NGO	Nongovernmental organization
PCA	Minnesota Pollution Control Agency
PUC	Minnesota Public Utilities Commission
RUD	Residential and Small Business Division in the Office of the Attorney General

Within the Energy Division in the Department of Commerce are three sections:

State Energy Office - energy efficiency and renewable energy promotion, technical assistance, information, and coordination.

Energy Planning & Advocacy – economic, financial, and public policy analysis and advocacy on issues before the PUC, the Federal Energy Regulatory Commission, and other regulatory entities.

Energy Assistance Program – administers the federal Low Income Home Energy Assistance Program (LIHEAP).

OVERALL ENERGY GOAL

RELIABLE, AFFORDABLE, SECURE, AND ENVIRONMENTALLY BENIGN ENERGY SOURCES TO FUEL OUR INDUSTRIES, BUSINESSES, HOMES, AND TRANSPORTATION NEEDS FOR THE LONG TERM AND PROVIDE LOCAL ECONOMIC DEVELOPMENT

Energy systems in Minnesota are, for the most part, **reliable**, although they are aging and need significant improvement and additions.

Energy is **affordable** for most industries, businesses, and about three-quarters of our households. Because of needed significant capital investment in the system, future affordability is somewhat at risk. As it is, one-quarter of our households struggle to pay or are unable to pay their energy bills.

Energy **security** has become a more immediate concern in the past year. Increasing energy security also can benefit the state's economic and natural environments.

Energy production and use in Minnesota are not **environmentally benign**. Electric generation mostly complies with old minimum air and water pollution standards. There are positive indications of some potential for reducing the environmental damage caused by existing electric generators in the state such as the emissions reduction project proposal by Xcel Energy for its metropolitan power plants. Long term, there are very positive indications for developing new electricity sources that are intrinsically environmentally benign that also bring economic benefits

to the state and local communities. The worst environmental damage caused by energy consumption is motor vehicles. The only portion of that issue that is within the purview of this report relates to development and promotion of alternative fuels for vehicles.

The potential for **local economic development** in relation to Minnesota's energy resources is tremendous and has only begun to be tapped. Developing Minnesota's energy resources could provide a huge economic benefit to Minnesota's agricultural economy.

Minnesota, like most of the rest of the nation, is at a crossroads in its energy future. Minnesota has a huge advantage because of its vast untapped energy sources that are or are becoming the most economic, secure, reliable, and least environmentally destructive choices regionally, nationwide, and worldwide. These include wind energy, solar energy, bioenergy (biomass, biogases and biofuels such as ethanol and biodiesel), and ultimately hydrogen made from renewable resources.

The choices we make today and in the next five years will shape our energy infrastructure for the next half-century. Those choices need to be made carefully and deliberately.

We need additional and new energy sources. To the extent we develop indigenous Minnesota energy resources; we can continue to enjoy reliable, secure, and affordable energy and can minimize the environmental effects of energy production and use. To the extent we continue to rely on the last century's energy technologies, we will continue to be only consumers in the energy marketplace, spending billions of dollars per year on energy resources that must be imported. Energy spending in Minnesota could be reconfigured to provide much more benefit to the state's economy, rather than exporting many of the economic benefits of that spending to other states and countries.

Energy Reliability

We have held many public meetings on energy issues throughout the state over the past four years. The second most often mentioned concern of Minnesota citizens - a fairly distant second after environmental damage - is reliability. This was particularly true in light of the electric reliability crisis in California and the potential electric capacity deficit faced by Minnesota in this decade.

All energy infrastructure in Minnesota is aging: power plants, transmission lines, pipelines, and refineries. Demand for all energy sources is increasing, particularly for motor vehicle gasoline and for electricity. Demand has increased dramatically for gasoline and steadily for electricity. At the same time only very limited improvements have been made to the infrastructure that supports these systems. One result is that each facility, a refinery, a power plant, a transmission line, etc., has become increasingly critical to reliable supply. The potential for one facility failure or one supplier in the market to disrupt service and/or drive up prices has also increased.

While all energy infrastructure in the state is in need of improvement, only electric infrastructure, and to a lesser extent, natural gas infrastructure, falls within the state's regulatory authority, so those aspects of the system will be mentioned almost exclusively throughout this report.

Infrastructure improvement for petroleum products is solely a function of the marketplace. Construction of a new oil refinery is unlikely given that petroleum reserves will be depleted before the investment in a new facility could be fully returned, usually 30 to 50 years, unless the price of gasoline were to increase more than the public likely would tolerate.

GOAL:

MAINTAIN AND IMPROVE THE RELIABILITY OF MINNESOTA'S ENERGY INFRASTRUCTURE

Affordability

Minnesota enjoys average to well below average energy prices. For the most part, energy is affordable in Minnesota for those whose household incomes are substantially above the poverty line.

There are two primary aspects of affordability. The first is rate design. That is accomplished by the PUC for public utilities (investor owned utilities) and by their boards or governing bodies for municipal utilities and cooperative electric associations. To date these price setting entities have kept rates low while allowing a comfortable rate of return for the public utilities and a comfortable operating budget for the others, thus ensuring stable rates and healthy energy service providers.

Minnesota's present relatively low electricity and natural gas rates, however, are partially the result of timing. At present we are at the end of a cycle of overbuilding infrastructure and then gradually using up that excess capacity. New additions must be made to energy infrastructure in Minnesota and to serve Minnesota to maintain sufficient supply and reliable delivery of supply to consumers. New investment is necessary. It will come with new costs.

The second aspect of affordability is the ability of Minnesotans to afford to pay their energy bills. See the Universal Energy Service Report. Even today, with relatively low rates, nearly a quarter of Minnesota households struggle to pay their energy bills. Those households are eligible for bill payment assistance and weatherization assistance, but only a quarter of those who qualify can be served under the federal Low Income Home Energy Assistance Program and the federal Weatherization Assistance Program. Presently and for several years, no state dollars have been used to supplement federal funds for these programs. There are a few very small private funds, but for the most part only LIHEAP, Weatherization, and emergency county assistance is available for those who are unable to pay their bills. As system improvements are made and rates increase, affordability for those unable to pay their present bills will be come increasingly elusive.

GOALS:

IMPROVE THE AFFORDABILITY OF ENERGY SERVICES IN MINNESOTA

PROVIDE FUNDS SUFFICIENT TO ENSURE THAT AT LEAST HALF OF THE HOUSEHOLDS WHO QUALIFY FOR WEATHERIZATION, ENERGY BILL PAYMENT, AND/OR EMERGENCY ENERGY ASSISTANCE CAN RECEIVE IT

Energy Security

Energy security is primarily the responsibility of the owner and operator of an energy facility. It is not part of energy regulation, except for nuclear power plant security, which is overseen by the federal Nuclear Regulatory Commission. There is no indication that Minnesota's energy facilities pose any greater security risks than any other energy facilities.

It is obvious, however, that concentrated energy facilities are intrinsically less secure than dispersed energy facilities. A large power plant or a large transmission line that fails to perform for any reason has a huge effect on the regional energy system. The most secure energy is energy that is not used through energy efficiency improvements and energy conservation methods, thereby reducing the need for additional large energy facilities. A network of smaller energy facilities is more secure than one or two large facilities. A field of wind energy turbines is less at risk than a concentrated coal or nuclear plant.

Additionally, the fuel for much of our electric generation, transportation, and space heating travels long distances to Minnesota. The longer the supply lines are the less secure the supplies are.

GOAL:

MAINTAIN AND IMPROVE MINNESOTA'S ENERGY SECURITY

Environmentally Benign Energy

As noted above, Minnesota's energy production and consumption is not environmentally benign. It will not be for a very long time, if ever. There is, however, no need for it to be as environmentally damaging as it is. Over time, environmental damage from energy production and use can be decreased and at the same time, our energy system can be made more reliable, affordable, and secure and can provide huge new benefits to the state's economy, local communities, and the agricultural sector.

There is a detailed explanation of the environmental effects of electric generation in Appendix A to the Planning Report. Appendix A to this report updates and expands that information.

GOAL:

REDUCE, AS FAR AS REASONABLY FEASIBLE, ENVIRONMENTALLY DAMAGING EMISSIONS FROM ENERGY PRODUCTION AND USE IN MINNESOTA

Local Economic Development

Minnesotans spend about $10 billion per year for energy. The majority of that amount makes it way directly out of the state. Energy development within the state has huge potential for contributing to Minnesota's economy. At present much of our energy spending is a drain on the state's economy.

The Southwest Minnesota Regional Development Commission's Energy Task Force has quantified the economic benefits of the early wind energy developments in that area. Those benefits are substantial, especially in that area with an economy that operates well below the state's average. The benefits of small wind energy projects (2 MW and less) for farmers and others can range from a few thousand dollars per year for lease payments to over $30,000 per year for projects owned and operated by the farmer or other entity in the first ten years and substantially more after that time when any debt has been paid.

Businesses that provide operation and maintenance services are being developed in localities where energy generation facilities are being constructed so there are ongoing economic development effects beyond the direct construction and income benefits. A major international wind turbine manufacturer is considering Minnesota as a site for a manufacturing facility. The economic benefits would be huge and the Legislature should consider enacting a firm commitment to develop the state's energy resources to encourage this and similar projects.

GOAL:

INCREASE THE PACE OF DEVELOPMENT OF MINNESOTA ENERGY RESOURCES AND SPREAD THAT DEVELOPMENT THROUGHOUT THE STATE TO MAXIMIZE LOCAL ECONOMIC BENEFITS

A word about Hydrogen

Fuel cells using hydrogen for fuel, which may be made using indigenous Minnesota renewable resources, will take the place of internal combustion engines and perhaps also provide home and business space heating and electricity, along with a multitude of other applications. This will be the largest energy shift since the exploration, mining, transportation, and delivery infrastructure for fossil fuels was developed over several centuries. We do not have several centuries before the earth's remaining petroleum reserves are depleted. We may have a few decades, perhaps as few as two or three. While improved technologies for burning or gasifying coal for energy are available, new facilities are expensive, require huge long term capital investment, require increased reliance on fuel that is not indigenous to Minnesota; and would result in increasing Minnesota's overall contributions to air and water pollution.

In just the past year the discussion of the future of hydrogen as our primary energy source has taken on a life of its own. Nearly everyone involved in any way in energy is working to assess how quickly and in what ways hydrogen technologies can be deployed. The State Energy Office is participating in a public/private hydrogen initiative consortium that includes major Minnesota research, development, and manufacturing companies, educational institutions, NGOs, and other state agencies. The Minnesota Office of Strategic and Long Range Planning is about to publish an excellent white paper on the future hydrogen economy.

Hydrogen is the future of energy for this planet. The economic development opportunities for Minnesota in producing hydrogen from renewable resources are nearly limitless. The environmental effects of hydrogen are minimal when the hydrogen is made from renewable resources. The byproduct of hydrogen fuel cells is water. Fuel cells provide high reliability and very high quality electricity, which is increasingly required for our computer-based society. Today, fuel cells are not affordable for most energy consumers, but predictions are that within ten years, they will be affordable for the majority of industries, businesses, and even households. This will profoundly affect our entire energy production and delivery system. The shift to this technology needs to be made thoughtfully and carefully. Sometime within the next few decades, transmission lines, coal trains, energy-related smoke stacks, and nuclear power plants may disappear from the landscape. Wind facilities likely will be converted to electrolyze hydrogen rather than make electricity. Biofuels will be very important in the transition to hydrogen. Minnesota can position itself to take advantage of this shift.

GOAL:

DEVELOP HYDROGEN PRODUCTION AND DELIVERY INFRASTRUCTURE IN MINNESOTA UTILIZING INDIGENOUS RENEWABLE ENERGY RESOURCES TO PRODUCE THE HYDROGEN

Strategies

The following strategies apply to multiple goals. Each strategy will list which goals it may help advance and which entities are in the best position to advance the goals through using the strategy.

Energy Efficiency

Maximize energy efficiency improvements.

Advances **reliability, affordability, security, environmental, and economic development** goals

- least costly, most reliable, most secure, and least environmentally damaging of all energy resources;
- minimize the need for expensive capital improvements in the system;

- increase individual industry, business, and household control over energy use and the affordability of their energy bills;
- increase energy security by reducing the need for additional large energy facilities;
- reduce existing and negate potential environmental damage from additional energy and fuel production, electric generation, electric transmission, fuel transportation, and energy use;
- Create and enhance energy efficiency businesses resulting in local economic development.

See Chapter 4 and Appendix D of the Planning Report for estimates of how the Conservation Improvement Program alone can substantially increase reliable energy efficiency with minimal additional investment.

An excellent project for the Reliability Administrator position created by the 2001 energy legislation would be to strategically identify opportunities for energy efficiency improvements statewide, develop a comprehensive energy efficiency plan for the state in coordination with the State Energy Office (Industries of the Future, Rebuild Minnesota, and technical assistance programs), Agriculture (substantial energy provisions in the most recent federal agriculture legislation), other state agencies, utilities and utilities' Conservation Improvement Programs, local communities, energy efficiency businesses (through Energy Alley and with the businesses themselves), educational institutions, NGOs and energy consumers. The plan should incorporate and coordinate present Conservation Improvement Program activities and go well beyond the limitations of that program to achieve maximum comprehensive statewide energy efficiency improvements.

Primary actors:	**Industry, business, institutions, households, utilities, energy efficiency businesses**
Planners/promoters:	**Commerce – Reliability Administrator, State Energy Office (through Industries of the Future, Rebuild Minnesota, and other technical assistance), Agriculture (farm energy audits and energy efficiency improvements), business and trade associations and advocates, local governments, educational institutions through research, teaching, development, and deployment projects, nongovernmental organizations.**
Regulators:	**PUC** (rate recovery of utility expenditures for CIP); **Commerce – Commissioner** (utility CIP plan approvals), **Energy Planning & Advocacy** (economic and policy CIP plan analysis and advocacy before the Commissioner and utility rate recovery advocacy before the PUC), **State Energy Office** (technical and policy CIP plan analysis and advocacy in conjunction with Energy Planning and Advocacy), **RUD** (advocate for access to CIP funds for households and small businesses and for efficiency generally to ensure long term affordability of the system).

Diversification

Diversify our sources of energy, particularly for electricity and transportation, by.

- supporting research and development of modern energy technologies such as renewable energy sources, high efficiency motors and electric generation technologies (such as combined heat and power applications);

- promoting and enforcing existing federal and state law (federal Public Utility Regulatory Policy Act and Minn. Stat. §216B.164) encouraging development of indigenous renewable resources and mandating incorporation of electricity from renewable generation facilities into the system;

- continuing and increasing recently initiated activities creating public/private partnerships to develop and promote use of alternative motor vehicle fuels and to create distribution networks (example – the award-winning E85 fueling site effort of the Twin Cities Clean Cities Coalition coordinated by the State Energy Office and managed by the American Lung Association of Minnesota, in association with many businesses and other organizations;

- enacting and enforcing a renewable energy portfolio standard to ensure that all new electric generation sources for the foreseeable future do not rely solely on fossil fuel for operation and to ensure that Minnesota reaps the economic benefits of developing its indigenous energy resources. See Appendix B for a discussion of a potential renewable portfolio standard.

Advances **reliability, long term affordability, security, environmental, and economic development** goals

- reduces our heavy reliance on fossil fuels (Minnesota statutory policy for over 25 years; no usable fossil fuels are indigenous to Minnesota);

- increases the numbers and types of smaller modern electric generation facilities making each facility less critical to operation of the system thereby increasing reliability and security;

- decreases our heavy reliance on long distance transportation of fuels and electricity;

- decreases the potential for rate or price shock by decreasing the effect of any one energy source on the affordability of the system as a whole and increasing economic competition between energy sources to keep prices reasonable for the long term;

- Increases long term affordability by developing renewable and high efficiency technologies whose costs are continuing to decrease as opposed to traditional concentrated technologies whose costs are either remaining about the same or increasing;

- decreases environmental damage particularly for electric generation and motor vehicle use; and

- creates and grows modern energy technology development and maintenance businesses thereby enhancing local economic development.

Primary actors:	**Private businesses (energy developers, component manufacturers, energy consumers), utilities, educational institutions** (research, development, deployment)
	Commerce – State Energy Office, nongovernmental organizations, private businesses (cooperative ventures to develop and deploy diverse energy and fuel sources)
Planning/Promotion	**Commerce – State Energy Office, Reliability Administrator, utilities, business and trade associations and advocates, nongovernmental organizations, educational institutions**
Regulation	**PUC, Commerce – Energy Planning & Advocacy** (enforcement of PURPA and state small power production law), **RUD** (advocate for long term affordability issues)

Indigenous Energy Sources

Develop, to the maximum extent feasible, energy sources indigenous to Minnesota.

Advances **reliability, affordability, security, environmental, and economic development** goals

- reduce reliance on fuels that must be imported, whose prices, supplies and distribution systems are wholly outside of the control of Minnesota utilities, businesses and individuals;

- increase long term affordability by developing technologies whose costs are decreasing (indigenous, renewable technologies) rather than staying the same or increasing (traditional fossil fuel and nuclear technologies);

- increase energy security by reducing the need for energy sources that must travel long distances and must be concentrated for economic efficiency and by increasing diversification of Minnesota's energy sources (see above);

- reduce environmental damage (Minnesota's energy resources are nonpolluting and renewable like wind, solar and small hydro or substantially less polluting and renewable like bioenergy); and

- create and grow local businesses that develop indigenous energy technology and develop and maintain indigenous energy facilities.

Minnesota is still one of the national leaders in development of wind energy resources, but it is slipping fast due to lack of aggressive infrastructure (primarily electric transmission) planning and construction to allow appropriate development of Minnesota's tremendous wind energy resource and, according to representatives of wind energy development businesses, to lack of a firm legislative commitment to develop wind resources beyond the token wind energy mandate for Xcel Energy (NSP) enacted in 1994 and the lukewarm renewable energy objective. Bioenergy sources also tend to be most economically based in areas of the state that historically have not needed substantial energy infrastructure and also suffer from the lack of a firm commitment to develop the resources.

Primary actors	**Private indigenous energy resource development businesses; utilities, Legislature** (to set firmer commitments for developing indigenous resources – see Renewable Portfolio Standard section below), **local communities, large energy consumers**
Planners/Promoters	**Utilities, private businesses, business and trade associations and advocates, Commerce – State Energy Office**
Regulators	**PUC, Commerce – Energy Planning & Advocacy** (enforcing PURPA & state small power production law), **RUD** (advocate for long term reliability, affordability, and improved health effects for small business and residential consumers)

Distributed Generation

Maximize utilization of renewable and high efficiency/low emission distributed electric generation facilities where they enhance energy infrastructure, help avoid costly infrastructure additions, and improve the overall performance of intermittent energy resources like wind energy.

Advances **reliability, affordability, security, environmental and economic development** goals.

- Increases specific reliability of electric supply (for the owner/operator of a distributed generation facility) and overall reliability of the system by strengthening weak points generally;

- Improves the contribution of intermittent resources like wind energy by dispersing generators across the state thereby minimizing the effect of a drop in wind at any given location and by the ability to pair wind turbines with other renewable generation like biodiesel and ultimately fuel cells for providing firm capacity to the system;

- Improves the long term affordability of the system through (usually) long term contract prices for the electricity set in relation to the price for other sources;

- Increases system security by increasing the number and reducing the concentration of electric generation sources thereby decreasing the vulnerability of system as a whole to natural and other disasters;

- Decreases environmental damage as long as distributed generation facilities utilize modern renewable and/or high efficiency/low emission energy technologies;

- Creates and grows businesses to develop, sell, and maintain distributed generation facilities thereby enhancing local economic development.

Distributed electric generation may not be appropriate in some locations and on some parts of the electric system, although evidence is increasing that it is appropriate in most situations. It is important to identify the best locations and begin developing facilities where they will have the most positive technical and economic impacts first.

An excellent project for the Reliability Administrator would be to work with utilities, distributed generation facility developers, the State Energy Office (resource mapping expertise as well as technical expertise), MAPP/MISO and their regional planning groups, EQB power plant siting and routing staff, EERE businesses, commercial and industrial energy consumers, and others to develop a map of the state identifying where distributed generation facilities would enhance the technical and economic operation of the system.

Primary actors	**Utilities, businesses and industries, institutions, EERE and distributed generation development businesses, local communities**
Planners/Promoters	**Commerce – Reliability Administrator, and State Energy Office, business and industry trade associations and advocates, utilities, NGOs, local communities**
Regulators	**PUC** (generic and utility specific distributed generation tariffs – in process); **Commerce – Reliability Administrator** (determination of and advocacy for uniform interconnection standards) and **Energy Planning & Advocacy** (analysis of and advocacy for rates for utility purchase of electricity from distributed generators), **RUD** (advocate on rates and general issues related to distributed generation and small business and residential consumers)

Electric Transmission

Identify electric transmission needs and address them.

Incorporate analysis of transmission needs in utility resource planning in the context of alternatives for meeting demand.

Advances **reliability and security** goals; indirectly advances **affordability, environmental, and economic development** goals

- Improves operation of the system to ensure reliable delivery of high quality electric power;

- Increases system backup capability thereby decreasing vulnerability of the system to natural or other disasters; and

- Increases the ability of the system to accommodate indigenous, renewable, and diverse energy sources whose costs are decreasing and are projected to continue to decrease over time thereby improving long term affordability, decreasing environmental damage from traditional concentrated generation sources, and providing local economic development related to these energy sources

Transmission is an example of how integrated and complex the electric system actually is. Transmission, generation, and energy efficiency can all be substituted for each other up to a point and that point is different in different locations and situations.

Very few proposals generate as much landowner and community opposition as do proposals for new electric transmission lines. Very few other infrastructure improvements bring so few identifiable local benefits along with substantial local burdens. One of the great challenges in the future of electric transmission is designing new and upgraded systems to provide some local benefits along with the burdens. One example might be to design and construct new and upgraded transmission lines to allow relatively easy interconnection capability for local electric generation projects.

One of the greatest challenges facing Minnesota and the nation is improvement of electric transmission capability. This can be accomplished in many ways, from increasing energy efficiency and installing distributed generation to upgrading existing lines to building new ones. Unfortunately, Federal Energy Regulatory Commission rules governing operation of the system that result in many more long distance bulk transactions across the grids were imposed beginning about ten years ago on a system built basically to move electricity from its point of generation to its point of consumption, usually within the same state or between two or three states. Very little has occurred to upgrade the transmission system nationally or regionally since these rules took effect. The additional stress on a system that already had not seen significant improvement in 20 years has been tremendous. Minnesota's transmission system planner/operator (MAPP and now MISO) has done an impressive job of keeping the system operating reliably in the face of

increasing numbers of constraints on the grid. In addition MAPP has recently taken steps to ensure earlier and better public participation in transmission planning.

Improvement of the transmission system will be expensive and take time. Cost effective alternatives to building additional transmission, such as energy efficiency improvements, distributed generation facilities, and greater coordination of the operation of the transmission system itself, should be maximized. Even after maximization of these alternatives, new and upgraded transmission lines are needed, especially if Minnesota and the Upper Midwest are to realize their potential to produce clean, sustainable, renewable energy.

Smaller improvements to the transmission system are being made fairly regularly. A certificate of need application for one large project, the southwest Minnesota high voltage transmission line, is about to be heard by the PUC. Affected local communities, NGOs, generation facility developers, state agencies, and others have been working on some creative solutions to some of the challenges facing this proposal. Hopefully creative solutions will continue to be developed and negotiated over time to ensure adequate and reliable, but not excessive, transmission development in Minnesota while minimizing the delay and controversies of the past.

A potentially positive development in electric transmission is the creation of transmission companies to own, develop and operate transmission systems. The greater focus on transmission itself should result in a more cohesive system and greater system efficiencies. The potential negative is that by segregating transmission from other utility planning and operation, the offsets between transmission, generation, and energy efficiency may be less apparent and the transmission system could end up discouraging those other system choices outside of the application of public policy and regulatory balancing. Transmission companies should work closely with utility planning functions and with state regulators to ensure that public policy and energy consumers' interests are fully addressed.

Additionally, Commerce proposed, and in 2001 the legislature enacted, a transmission planning oversight procedure at the PUC. This is a biennial filing by all utilities in the state outlining their transmission plans. The goal is to develop a broad context in which to analyze individual proposals for transmission projects. Procedural administrative rules governing these filings have been proposed by the PUC and are open for comment at this time.

An excellent project for the Reliability Administrator would be to work closely with utilities, MAPP/MISO and their regional planning groups, electric transmission companies, indigenous and distributed energy development businesses, NGOs, the State Energy Office (particularly the wind and solar resource mapping expertise), EQB transmission routing staff and others to identify potential upgrades to the transmission system that would enhance the ability of the state to take advantage of its own energy resources and to work closely with utilities or transmission companies to implement those

upgrades, while avoiding unnecessary or duplicative development of additional infrastructure.

Primary actors	**Utilities, MAPP/MISO, transmission companies, local communities, energy facility developers**
Planning	**MAPP/MISO, utilities, transmission companies, Commerce – Reliability Administrator and State Energy Office** (planning and promoting alternatives to transmission or projects that need additional transmission), **local communities, NGOs, property owners**
Regulators	**Legislature** (add transmission issues to utility resource planning), **PUC** (certificates of need), **Commerce – Energy Planning & Advocacy** (public policy and economic analysis of need), **EQB** (environmental review and routing of proposed transmission lines), **local governments** (land use permits)

Service Standards

Develop and enforce uniform energy service standards for outages, service responses, and record keeping. Energy service standards are being developed by administrative rule by the PUC for regulated utilities and are required to be developed by their governing bodies for municipal utilities and cooperative electric associations.

Advances the **reliability** goal.

Service standards, as has been experienced in the telecommunications industry, are one of the first things to slip as competition starts replacing regulation of an industry. They also tend to slip as utilities avoid proposing rate changes to cover increasing costs of doing business. While competition has not yet become a direct factor in Minnesota, it has an indirect effect. Utilities, as they position themselves for potential deregulation of the industry appear to be working hard to cut operations costs. Additionally, most of Minnesota's regulated utilities have not sought rate increases in the past decade. Clearly operation and maintenance costs have increased over that period of time.

In an extreme cold weather state like Minnesota, utilizing routine maintenance to avoid outages and quick responses to service calls are critical. Increasingly, business and industry suffers huge losses due to electric outages. Today we are all more dependent on electricity for basic system operations than ever before.

Service standards may be more critical for business, institutions like hospitals, and industry than for residential customers, but increasingly energy service is a life and death issue for households with a member who needs medical equipment to sustain life. Additionally, where the energy source provides primary heat, it is always critical in Minnesota in the winter months.

Environment

Abandon the existing rigid and quickly outdated approach to adopting generic environmental and societal costs in a vacuum and replace it with specific analysis of societal and environmental costs associated with any given set of options at the time they are considered to ensure better long term analysis of the true costs of infrastructure additions and other infrastructure improvements.

Advances the **environmental** goal.

Primary actors **Legislature** (repeal present rigid requirement and replace with more flexible approach), **PUC, PCA, EQB, Commerce**

Encourage utilities to use the 2001 statute allowing them to pass through to their customers, without a rate case, the costs of emission reductions at existing power plants.

Primary actors **PCA, PUC, Commerce**

Universal Service

All of these strategies advance the **affordability** goals.

Promote continued federal funding of programs to assist low income households maintain energy service – LIHEAP and Weatherization Assistance.

Primary actors **State Congressional delegation; Commerce – Energy Assistance Program & State Energy Office, RUD, NGOs who advocate for the interests of low income households**

Administer federal funds to maximize direct benefit to low income households, particularly to assist them to use energy more efficiently through weatherization assistance.

Primary actors **Commerce – State Energy Office** (weatherization) **and Energy Assistance Program**

Coordinate efforts with governmental and private housing development entities to ensure that all housing, including "affordable" housing, is developed or rehabilitated using energy efficient construction techniques, lighting, and appliances.

Primary actors **Commerce – State Energy Office & Energy Assistance Program, other state agencies, housing developers, local governments**

Provide state funds to smooth out the chaos in the federal funding for low income home energy assistance and to supplement federal funding to be able to assist at least half of the households who qualify.

Primary actors **Legislature** (Universal Service Report lists options)

Appendix A

Environmental Materials

to supplement
Appendix A of the 2001 Energy Planning Report
Prepared by Minnesota Pollution Control Agency Staff

Recent Concerns about Air Pollution from Power Plants

A comprehensive discussion of the impacts of power plants on public health and the environment can be found in the 2001 Energy Planning Report. Since publication of that report, there has been increasing concern about two pollutants that are linked, in part, to power plant emissions – fine particulates and ozone.

Fine particulate matter is a complex mixture of very small liquid droplets or solid particles in the air. Major sources are cars, trucks, construction equipment, coal-fired power plants, wood burning, vegetation and livestock. These particles can be directly released when coal, gasoline, diesel fuels and wood are burned. Many fine particles are also formed in the atmosphere from chemical reactions of nitrogen oxides, sulfur oxides, organic compounds and ammonia. Fine particulates are associated with increased hospitalizations and deaths due to respiratory and heart disease and can worsen the symptoms of asthma. People with respiratory or heart disease, the elderly and children are the groups most at risk. Fine particles are also major contributors to reduced visibility (haze). Power plants are significant sources of fine particulates because of their emissions of SO_2 and NOx.

PM-2.5

In the past year since publication of the 2001 Energy Planning Report, the evidence that fine particles in the atmosphere are linked to health effects has strengthened. Scientists are finding serious health impacts at levels below the federal air quality standard. This evidence indicates that Minnesotans are likely impacted by breathing fine particulates. While this region meets the annual PM-2.5 ambient standard of 15 μg/m3 and the 24 hour standard of 65 μg/m3, the Minnesota Pollution Control Agency (MPCA) has had to issue air alerts when PM-2.5 levels reach 40.5 μ/m3. EPA has specified 40.5 μ/m3 for these warnings because research has shown that serious health effects can occur at levels below the standard. Air reached alert levels for fine particles twice in 2002. One event occurred when smoke from Canadian forest fires reached Minnesota. In addition, a review of available PM-2.5 data indicates that concentrations in the Twin Cities reached levels considered "Unhealthy for Sensitive Groups" on seven days during calendar year 2000 and on four days during calendar year 2001. One PM-2.5 event considered "Unhealthy" was monitored in October 2000 in Minneapolis. PM-2.5 events can happen throughout the year, although the causes of high PM levels may differ seasonally.

Ozone

Another pollutant that is receiving increased attention is ozone. Ground level ozone, also called "smog," is formed in the atmosphere by chemical reactions involving NOx, volatile organic chemicals, and sunlight. Ozone pollution is primarily a summer problem because of the need for sunlight in the formation process.

Ozone affects healthy adults, but children and people with existing respiratory problems are most susceptible to its presence. Ozone causes eyes to itch, burn and water, triggers asthma attacks, and can cause coughing, chest pain and difficult breathing. Power plants are a significant contributor to ozone because of their emissions of NOx.

EPA promulgated a new, more restrictive ozone standard in 1997. Currently, Minnesota is considered to be in compliance with that standard. However in the last 2 years, the MPCA has had to issue air alerts for ozone—4 times in 2001 and twice in 2002. These represent the first air pollution alerts issued for ozone since the 1970's. A recent study commissioned by the MPCA has determined that ozone levels appear to be increasing the Twin Cities[1]. If this trend continues and the Twin Cities drops out of compliance for ozone, new federal regulations costing up to $250 plus million per years would be required[2].

Regulatory Activities on the Horizon

Several major regulatory initiatives will affect power plant emissions. These regulations would have significant impacts on the operations and emissions of power plants in Minnesota. They could also play a role in decisions about new generating capacity.

First, EPA recently finalized a rule to improve visibility in National Parks and Wilderness Areas (called the Regional Haze Rule.) This rule requires the development of plans to improve visibility by 2007-2008. Power plants play an important role in the formation of haze, but it is not yet known to what extent emissions will be reduced through this regulation. There is a multi-state regional planning effort underway to identify what emission reductions will be needed to reduce regional haze.

Second, EPA's new ambient air standards for PM2.5 and ozone are in effect. Plans to address these standards will likely also be due in the 2007-2008 timeframe. Even if these standards are being met in Minnesota, it is possible that emission reductions will be required from power plants in Minnesota to help meet the standards in other states, such as Wisconsin, Illinois and Michigan.

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[1] L.R. Chikin et. al. Preliminary Assessment of Ozone Air Quality in the Minneapolis/St. Paul Region. Sonoma Technology, Inc. October 2002.

[2] T. R. Aulich and K. N. Neusen. Estimated Economic Impact of Twin Cities Ozone Nonattainment. Minnesota Chamber of Commerce, February 1999.

Third, EPA is currently developing a rule to limit mercury emissions from fossil-fuel-fired power plants. This rule is required by the 1990 Amendments to the Clean Air Act. The rule is expected to be proposed by 2003, finalized by 2004 and implemented by 2008. At this time it is not known to what degree emissions of mercury in Minnesota would be impacted.

Fourth, because these different regulations are proceeding on separate tracks and timeframes, there are congressional proposals to address all of these issues, including greenhouse gas emissions in some proposals, through multi-pollutant legislation. The two main proposals include a Senate bill and the White House proposal (Clear Skies.) Both require different but substantial reductions in emissions over widely different timeframes. Both would likely require substantial emission reductions, at older power plants.

Next Steps Towards Reductions: Xcel Metropolitan Emissions Reduction Proposal

In 2001, the legislature responded to growing public concern over air pollution from existing electric generating plants by enacting Minn. Stat. §2168.1692, an emissions reduction rider that allows utilities to propose cost-effective pollution controls on existing plants, and receive recovery of the costs in their rates. On July 26, 2002, Xcel Energy submitted a proposal that would substantially reduce emissions from the King, Riverside and High Bridge plants, and recover costs in a proposed rate rider.

The MPCA has reviewed the Xcel proposal and is required by the statute to provide its analysis to the Public Utilities Commission (PUC) on:

1. Whether the project qualifies for the rider;
2. The projected environmental benefits from the project; and
3. Its assessment of the appropriateness of the project.

The MPCA's filing will initiate the decision-making process before the PUC. The PUC will ultimately decide on the reasonableness of the proposed emissions reduction rider. After the PUC makes its decision, Xcel Energy will decide whether to proceed with the projects, which are voluntary.

Benefits of Reducing Power Plant Emissions

Several studies have been conducted to estimate the economic and health benefits of reducing the emissions from power plants. Four of those studies are summarized below and in Table X.

EPA's Clear Skies Initiative

The Bush Administration proposed the "Clear Skies Initiative" to reduce emissions from electric power generating utilities. Nationwide, the Clear Skies Initiative is estimated to reduce emissions of sulfur dioxide, nitrogen dioxides and mercury by 73%, 67%, and 69%, respectively from 2000 baseline levels.

The largest estimated benefits were related to the reduction of fine particle pollution primarily through the reduction in emissions of SO2 and NOx. As of 2020, the estimated national annual monetary benefit was $93 billion for 12,000 avoided premature deaths, followed next by $3.2 billion for 7,400 fewer cases of chronic bronchitis. This estimate includes the assessment of the potential cumulative effect of long-term exposure to particles. EPA separately estimated the impacts of these pollutant reductions presuming that PM effects are limited to those that accumulate over much shorter time periods. This separate estimate concludes that nationally 7,400 early deaths would be avoided by reducing power plant emissions.

In Minnesota, EPA projected that a Clear Skies program would reduce particulate matter levels across the state, and result in 100 fewer early deaths due to particulate matter effects. EPA further estimated that all health improvements combined result in $1 billion in benefits in Minnesota from Clear Skies. Because PM2.5 is a regional pollutant, benefits estimated in MN would be a result of emission reductions in MN and other states.[3]

Eight Utilities Study

Eight utility systems in the eastern half of the United States were the subject of a study to estimate the health impacts of the projected 2007 emissions from their coal-fired power plants[4] [5]. This assessment estimated that roughly 5,900 premature deaths might be avoided if emissions ceased from these plants. The study did not attempt to translate these deaths and other respiratory effects into economic terms. The study shows emissions from power plants in Illinois and Indiana contributing significantly to deaths in Missouri, Illinois, Indiana, Wisconsin and Minnesota.

Two Massachusetts Power Plants

Harvard researchers Levy and Spengler estimated a portion of the health benefits of reducing SO2 and NOx emissions from the Brayton Point and Salem Harbor coal-fired power plants in Massachusetts[6]. Their analysis compared current emissions with emission rates estimated under best available control technology (BACT), which results in decreases of 57,348 tons of SO2 and 11,074 tons of NOx per year from the two plants. This study estimates that this reduction in SO2 and NOx would reduce 70 premature deaths each year over a total population of 33 million. Levy cautioned that while it should be considered illustrative, using standard EPA valuation for premature death, these avoided deaths represents a $400 million benefit per year. This study only looked at death and did not address other health problems that these emissions cause or contribute to.

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[3] Details of this cost study for the Clear Skies initiative are on EPA's web page at www.epa.gov/clearskies

[4] Rockefeller Family Fund. Particulate-related Health Impacts of Eight Electric Utility Systems. April 2002. http://www.rffund.org/abt%20report%20FINAL.pdf

[5] The year 2007 was chosen to allow for full implementation of two federal air pollution control requirements expected to affect power producers: the Acid Rain program and the EPA 1999 NOx SIP for the eastern half of the United States.

[6] Levy and Spengler. Modeling the Benefits of Power Plant Emission Controls in Massachusetts". Journal of Air and Waste Management Association 52:5-18.

Minnesota Power Plants

Nelson estimated the public health impacts of particulate emissions from current coal-fired power plants in Minnesota, and the impacts if these plants switched from burning coal to burning natural gas.[7] The study concluded that by switching from coal to natural gas at Minnesota's electric utility boilers, 25 early deaths would be avoided. Other health improvements were also estimated, and include fewer new cases of bronchitis, emergency room visits, days of respiratory symptoms, and days of restricted activity. This study calculated that the economic benefit from switching to natural gas to reduce emissions from these power plants is $187 million per year (1996 dollars).

This study recognizes that using high stacks at power plants to disperse pollutants means that much of the damages from the emissions occur outside Minnesota. However, Xcel's Riverside plant was estimated to have the highest incident of early deaths (7) due to it being located within a heavily populated area.

Table X. Comparison of Benefits when power plant emissions are reduced

Benefit Assessment	Annual Benefits	Avoided Deaths	NOx reductions	SO2 Reductions
	$/yr		Tons/yr	Tons/yr
Clear Skies (nationally)	$93 billion	12,000	5,000,000	2,500,000
Clear Skies in Minnesota	$1 billion	100	91,000	17,000
Eight Utilities	Not calculated	5,900	Not provided	Not provided
Minnesota Utilities	$187 million	25	53,700	57,000
Two MA Power Plants	$400 million	70	11,000	57,000

Reducing Emissions from Small Electrical Generators

Background

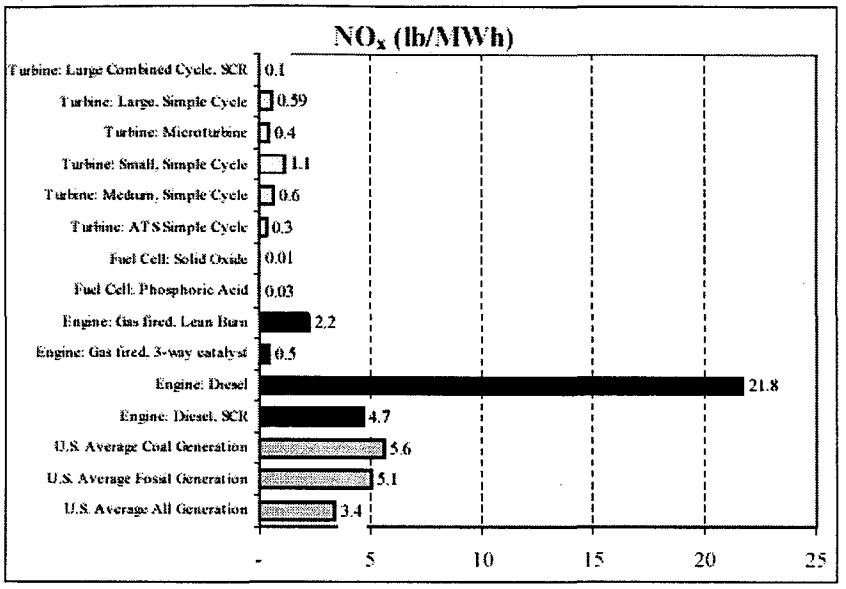
Small stationary generators are used for emergency power and to an increasing extent, in distributed generation applications. Emergency generators are used to replace grid power when weather or some other action interrupts the distribution of power, and are typically used on situations where human life and public safety are a concern. Distributed generation is generally grid connected and displaces energy that would otherwise be generated by large centralized power plants. Distributed generation can benefit a generation system through increased reliability, lower transmission line losses and lower peak demand from centralized generators.

[7] Nelson, C.D. 2000. The Public Health Impacts of Particulate Emissions from Coal-fired Power Plants in Minnesota. Thesis. Master of Science. University of Minnesota.

The increased use of emergency and distributed generators (EDG) raises concerns for local health effects and exacerbation of the metropolitan ozone problem, particularly since EDGs are most likely to be used in the summer on days when ozone levels may be high. In Minnesota there are easily more than a thousand small electric generators in place, ranging from emergency generators at hospitals, manufacturing facilities and commercial real estate, to peak shaving generators in a variety of locations with interruptible service contracts.

Small fossil-fueled generators typically have low exhaust stacks and can be located near sensitive populations. As can be seen from the following figures, diesel engines have much higher emission rates for nitrogen oxides (NOx) and particulate matter than other forms of electrical generation. Most concerns for the direct health impacts of EDG therefore center on diesel powered equipment. California has identified diesel particulate as a carcinogen, and has begun a program to clean up mobile and stationary diesel engines. EPA has established a health based standard for fine particles, and is in the process of reviewing the fine particle standard in light of new evidence of mortality effects at lower ambient levels than previously thought to have effects. NOx can cause respiratory effects in high concentrations.

High levels of ozone occur in the Twin Cities area on hot sunny summer days. The demand for peak shaving generation also tends to be highest on hot summer days. The pollutants generated by diesel and other generators will contribute to ozone formation at downwind locations.



SCR stands for selective catalytic reduction, a technology for reducing NOx emissions.

The last three bars in each chart refer to the emissions from the generation of electricity in the U.S. from burning coal, all fossil fuel combustion and from all forms of generation.

EPA has not established emission standards for NOx and particulate emissions from small stationary EDG. EPA is in the process of developing standards for air toxics emissions from reciprocating internal combustion engines. However, it is not anticipated that particulate and

NOx emissions will be substantially reduced through the air toxics standard because particulate and NOx are regulated by a different section of the Clean Air Act.

Principles for Regulation

In anticipation of the growth of EDG, measures should be taken to insure that public health is protected. Emission standards should be developed to insure that new or even existing generators are cleaner. Several principles could guide development of these measures:

- New generation should be at least as clean as current centralized power stations.
- Standards for similar engines in other uses (on and off- road mobile sources) should be a starting point.
- Minnesota should remove incentives for grid connection of high pollution technology

Regulatory Developments in Other States

At least three models are available for regulation of EDG emissions. The Regulatory Assistance Project (RAP), a Vermont/Maine non-profit, coordinated the development of model rules for small generators. The workgroup that developed the rules consisted of utility and environmental regulators and industry representatives.

The Vermont/Maine model RAP rules:

- Affect all types of small generators
- Are more stringent for higher use generators
- Tighten emission limits over time
- Are based on EPA non-road emission standards

The model rules were released in August of 2002. RAP staff anticipate that Connecticut and Massachusetts will be the first states to adopt the model rules.

California is developing toxic control measure rules for new stationary diesel engines and existing diesel engines over 50 horsepower. These rules include limits for NOx emissions.

California's proposed rules:

- Are more stringent for higher use engines
- Are based on best available technology
- Assume availability of very low sulfur fuel as will be required by EPA regulations
- Apply to owners or operators
- Exempt agricultural uses
- Establish compliance dates for existing engines in 2005-2007

California Air Resources Board (CARB) staff anticipate that the rulemaking will be completed in the first half of 2003. Once completed, the rules could form the basis for nationwide regulation of emissions from stationary diesel engines. Manufacturers will build equipment and retrofits for the large California market. Due to economies of scale, other states could adopt similar restrictions at relatively low cost.

Finally, in 2001, Texas adopted permitting requirements regulating NOx from new small generating units. The standards vary by location and are phased in over four years.

Voluntary Approaches

The amount of particulate matter emitted by a diesel engine without a particulate trap is directly proportionate to the sulfur content of the fuel. According to EPA regulations, low sulfur (<15ppm) diesel fuel must be used in on-road diesel engines by 2006. It is also likely that low sulfur diesel fuel will be required for non-road mobile sources once concerns about adequate fuel supply have been resolved. A limited amount of low sulfur diesel fuel is available now in the Twin Cities. A voluntary effort could be mounted to expand this supply and channel some to stationary engines.

Retrofit devices are available for some diesel engines to remove particulate emissions. They work best when paired with low sulfur fuel. Retrofit campaigns for school buses and other mobile sources have been successfully completed in various locations across the country. The feasibility of a program to retrofit the larger diesel generators could be investigated. Retrofit costs should fall within the $2,000 to $8,000 range.

Finally, the use of biodiesel fuel can reduce emissions of particulates and organic compounds from generators. The higher the percentage of bio-to-diesel concentration, the greater the emissions benefit. Biodiesel fuel is becoming more available in Minnesota and could be a part of a voluntary effort to reduce emissions. A new state law requires 2 percent biodiesel in diesel fuel beginning in June 30, 2005.

Appendix B

Renewable Energy Portfolio Standard

Minnesota should adopt a renewable energy portfolio standard for electric utilities like a number of other states for the following reasons:

1. It is in Minnesota's best economic interest to develop its indigenous energy resources and they are all renewable – wind, solar, small hydro, bioenergy – an RPS jump starts that development.

2. Energy markets historically are especially slow to recognize and internalize new or improved technologies, although they are fairly efficient at understanding clear public policy and delivering energy according to that public policy – The RPS in Texas resulted development of almost all of the renewable energy required over a number of years in the first year after it was effective – an RPS fulfills that clear message to energy markets.

3. Renewable energy developers and renewable energy equipment manufacturers have articulated reluctance to locate in Minnesota with its unusual and far from clear renewable energy objective (good faith effort) when other states are making clear policy statements about incorporating renewable energy into their utilities' portfolios – the risks are less where the policy is clear – Minnesota likely will lose many economic development opportunities without an RPS.

4. An RPS results in healthy competition among renewable energy developers and technologies, creates economies of scale that are otherwise difficult on a pilot project by pilot project basis, technological improvements because of the scale on which development can occur, and generally improves the technologies and the economics of energy resources Minnesota has in abundance.

5. An RPS would result in keeping more of Minnesota's energy consumers' dollars in the Minnesota economy.

Structure

Minnesota should adopt an RPS of 20% renewables by 2020, 5% of which should be bioenergy based. Utilities that are experiencing demand growth should be expected to do more. Utilities that have stable demand should do the 20%. Utilities who have shrinking demand should be allowed to do less.

Before Minnesota adopts an RPS, all the stakeholders should be brought together to work out the details and structure.

Note: All of Minnesota's electric utilities oppose and RPS, as does the Minnesota Chamber. All of Minnesota's NGOs who advocate for energy or for the environment, as well as renewable energy businesses and developers support an RPS. Finding agreement may not be easy, but is in the best interest of the state.

Appendix C

Why Not Coal?

In the past year, three major Minnesota electric utilities dropped proposals for new coal fired power plants – Minnesota Power at Grand Rapids, Ottertail Power at its Big Stone plant in South Dakota, and Great River Energy in North Dakota. While there are likely several reasons for these actions, the common theme that appears to be emerging is that in today's energy markets, new coal power is not economic.

Coal technology can be advantageous with a large enough scale and a long enough time period over which to recoup the huge initial capital investment. In the era of dramatic growth in electric demand (the first seven decades of the 20th Century), coal plants made sense economically. A utility could overbuild capacity and grow into it over a period of decades, meanwhile demand would keep growing and electric could actually decline over time as the per unit of production cost declined as more units could be produced for the same or only slightly higher cost.

From the mid-1970s, electric demand growth slowed dramatically and it took a much longer time to grow into the excess capacity built in the late 1970s and early 1980s. One economist has voiced the opinion that the last round of large coal plants built during this time period was probably not the best economic choice.

The environmental damage caused by coal-fired power plants has become increasingly impossible to ignore. While other industries and technologies are governed by much stricter air emission standards than power plants, even the power production sector has seen an increase in the standards it must meet, at least for new plants. In addition, much stricter standards are a very real possibility in the relatively near future (see Appendix A). The uncertainty over what standards will apply to a new plant over what time period adds to the reluctance of investors to commit to coal plants that naturally exists because of the long time period required for a return on the investment.

Additionally, coal plants need to be large to work technologically and economically. The economics often work best when a plant can be located either near the consumption point to minimize the need for transmission lines or near the fuel source to minimize transportation costs for the fuel. Large plants need large populations to serve. Large population centers do not welcome coal plants because of the traffic in and out, coal dust, air pollution, and the like. Placing a plant near the fuel source requires construction of long distance high voltage power lines, which are not often welcomed by the landowners and communities they cross but do not obviously serve (note that transmission improvements often have indirect, but invisible benefits for a community or individual landowner even when there is no direct service to the community or individual).

Somewhat ironically coal fired power plants may be a victim of electric deregulation across the country as well. New coal plants work best in a fully regulated system where those that invest in excess infrastructure can be assured of a return on that investment over a period of 30 to 40 years. With deregulation occurring throughout the nation, which creates uncertainty over the

future of regulation in Minnesota, there no longer can be a guarantee that a return on investment can continue over such a long period of time. A proposed new very large, primarily coal fired, electric generation plant, for example, now must compete with smaller, much more economically agile and environmentally less damaging power plants that can provide a return on investment within 10 or even fewer years. This explains why the proposers of a new large coal plant in Minnesota sought a legislative requirement in 2002 for utilities to purchase power over a 25 to 30 year time period and exemption from the processes that would require economic and environmental comparison of various technologies to meet identified power needs. Without a purchase requirement and exemption from comparisons with other technologies, investment in such a project is simply too risky and investors will take advantage of other opportunities. Deregulation, more than environmental, local economic development, or fuel supply and price concerns, makes it very difficult to build new large power plants that require long term return on investment. If the return on investment period is shortened to match that for a natural gas or wind project, adding a large plant would result in rate shock, which means an immediate very large increase in the prices consumers pay for power and the resulting damage to the industrial and business economies of the state.

Perhaps in the future coal plants will again become a reasonable economic choice, but it appears that for meeting Minnesota's projected electric capacity deficit in this decade, coal is unlikely to play much of a role unless it is forced on the system and consumers pay a premium price for it.