ENERGY POLICY, ELECTRIC INDUSTRY RESTRUCTURING AND NUCLEAR WASTE MANAGEMENT IN MINNESOTA

A REPORT TO THE
MINNESOTA LEGISLATIVE
ELECTRIC ENERGY TASK FORCE

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EXECUTIVE SUMMARY

The 1994 legislation that resolved the divisive debate precipitated by Northern States Power Company's request for above-ground dry cask storage reflected the reasoned judgment that, while it would be unwise to abruptly disrupt a system that was providing reliable and relatively low cost electricity, an opportunity had arisen to take a closer look at other options for Minnesota's energy future, and explore whether it would be technically feasible and economically sound to shift to an alternative means of electricity production.

Among other things, the legislation created the Electric Energy Task Force, whose purpose was to study future electric energy policy and nuclear waste management issues. One among several studies that were commissioned by the Task Force was designed to determine whether Minnesota could become energy self-sufficient and, if so, when and at what cost. The result of that study was "The Appel Report" (so named for the consulting group that prepared it).

This report presents the review and critique of a designated panel of experts, as well as independent research, concerning the findings of the Appel Report. It also examines a series of nuclear waste management issues about which the Legislature has sought information.

Findings of the Appel Report

The Appel Report concluded that, within 20 years and at a 45% increase in cost, it is technically feasible, if economically inadvisable, to generate 100% of Minnesota's energy needs primarily through a combination of wind and biomass resources. The report also recommended that, as soon as possible, the State embrace full retail competition and require divestiture of generation assets by suppliers. It concluded that such an industry model would reduce electricity prices and, coupled with the inclusion of the proper incentives, could foster a market in renewable energy.

Expert Panel

The Legislature designated a panel of experts representing a comprehensive range of energy interests to review and critique the Appel Report. The comments of these experts focused predominantly on electric industry restructuring, generally addressing renewable energy in that context. In sum, the Expert Panel believes that the Appel Report provides an insufficient basis for formulating State energy policy.

Findings on Alternative Energy

The Expert Panel finds that the Appel Report's conclusion that Minnesota could become energy self-sufficient within 20 years using renewable resources, even if technically feasible, is unsupported and unrealistic. They question the validity of many of the facts, assumptions and conclusions provided in the Appel Report, point out serious technical and economic barriers, and generally believe implementation to be both unwise

and impractical. Significantly, however, most of the panelists support, and in fact encourage, a more modest, yet steady and progressive movement towards increased renewable energy production in the State.

Of the specific alternative resources investigated, windpower, despite its shortcomings, appears to hold the most promise of any other currently available technology. Among other things, steady technological advancements and declining costs make wind worthy of continued support.

The Appel Report's suggestion that about 1.8 million acres of land could be used to grow trees for energy to serve 75% of Minnesota's electricity needs was met with a sizable amount of skepticism by the panel. The panelists were virtually unanimous in their belief that either attempting or accomplishing such an undertaking is infeasible from a technical, economic and practical perspective.

Solar energy could play a limited role in selected applications. The photovoltaic solar potential in southern Minnesota is as high as anywhere in the country. However, despite imminent technological advancement, cost and intermittency continue to present barriers to solar energy becoming a widespread alternative source.

Hydrogen holds much promise for the future, but, due to substantial technical and cost barriers, it will not be even possible to unleash its potential until well into the 21st Century.

Several commenters take the Appel Report to task for its failure to place substantially more emphasis on energy efficiency. Several ideas worthy of further development surfaced during this investigation.

Findings on Electric Industry Restructuring

The expert panelists generally believe that restructuring is inevitable, but they are decidedly mixed in their reaction to the Appel Report's espousal of a rapid advancement to full retail competition coupled with divestiture of generation assets. A few urge an aggressive move to introduce retail competition in Minnesota. Proponents of this course believe lower prices are necessary to attract and retain industry and to compete with surrounding states.

Others prefer a more deliberate process to determine whether and how the electric industry should be restructured. This group questions the urgency for change and wonders whether the benefits touted by proponents will in fact materialize given that Minnesota is already a relatively low cost state in terms of electricity prices. Further, they speculate that perhaps only wholesale competition is necessary to obtain the benefits proponents predict can accrue only from retail competition. Municipal utilities and rural electric cooperatives are concerned about how they and their customers will fare under retail competition.

Congress and practically every state legislature and/or public utility commission in the country, including Minnesota, is either studying or acting upon the restructuring of the electric industry. Some of the key challenges the Minnesota Legislature will face if and when it decides to enact restructuring legislation include: determining the appropriate industry model; ensuring fair and competitive markets; maintaining and improving system reliability, and addressing stranded costs.

Another formidable task will be deciding whether and to what extent to preserve what have become known as "public benefits." These are products of the regulatory system, commonly understood to include environmental protection, low income assistance, research and development efforts, energy efficiency programs, and consumer protections (including the guarantee of universal service), and renewable energy acquisitions.

Minnesota is heavily dependent on coal and nuclear sources. About 80% of in-State generating capacity is derived from these two fuels. The Appel Report presented a variety of alternatives for ways the State could promote the use of renewable energy. Some panelists and other observers would prefer to allow market based approaches, such as green pricing arrangements, to determine the fate of renewable energy, while others are convinced only market intervention, through the establishment of a Renewables Portfolio Standard or Systems Benefits Charge, can ensure an appropriate level of renewable source production and use.

Some believe that the only sound approach is for Minnesota to create and guarantee a renewables energy market. One panelist suggested that the State create or facilitate and support the creation of a "green utility" to compete in the market alongside traditional sources. There was negligible support for the imposition of a carbon tax or a penalty on fossil and nuclear fuel production.

The Expert Panel is in agreement, however, that the introduction of retail competition (with its emphasis on price) and the acceleration of renewable energy production appear to be incompatible goals.

Nuclear Waste Management Issues

Questions concerning the future disposal of and costs to manage the spent nuclear fuel resulting from electricity production at Prairie Island are plentiful and perplexing, and their answers will have profound implications for the health, safety and welfare of all Minnesotans, and the energy policy and economics of electricity production and consumption in the State.

At present, Northern States Power Company has sufficient dry cask storage capacity to operate the Prairie Island units into the first few years of the next century. If no permanent or interim storage facility becomes available, then the Minnesota Legislature once again will be faced with the decision of whether to approve an inevitable request for additional dry cask storage or allow the units to close prematurely, about ten years before their license period expires.

Regarding removal of the waste, it is a virtual certainty that the federal repository being characterized at Yucca Mountain, Nevada will not be ready to accept waste for disposal by its statutorily imposed deadline of January 31, 1998. However, there is a reasonably strong possibility that an out-of-state interim facility, built by either the Federal Government or private and/or tribal interests, will be available prior to the need for the next series of dry casks by Northern States Power.

Present and future ratepayers of Northern States Power will continue to bear cost responsibility for nuclear waste management until such time as the U.S. Department of Energy takes title to the waste. That may happen either at the time the federal repository is prepared to accept the waste or when a federal interim storage

facility is available. Some prefer that title to the waste remain with the utilities because once it transfers, the cost burden shifts to the nation's taxpayers.

Northern States Power estimates that, assuming no more than 17 casks will be used, waste management costs will rise to $161,000,000 by 2015. The Department of Public Service is concerned that should Prairie Island prematurely close, costs could escalate to as much as three-quarters of a billion dollars.

The U.S. Nuclear Regulatory Commission's most recent rating of the Prairie Island units indicates "the probability of a major accident releasing radiation from the plant is exceedingly small." However, a local consumer coalition presents documentation indicating structural and operational flaws that it believes pose a danger of catastrophic proportions.

Transportation of waste is governed by laws administered by the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission. The State is primarily responsible for first emergency response in case of an accident. There have been seven transportation accidents nationwide in the 2,500 waste shipments that have taken place over the last 25 years. None, according to the Department of Energy, have caused fatality, injury or environmental damage. However, when a federal facility is available, there will be as many shipments per month as there have been in the entire 25 years combined. Utility liability for damages is limited under the federal Price-Anderson Act.

The Department of Energy has canceled development of a multi-purpose container, which was contemplated as a storage, transportation and disposal vessel. In

addition, there are currently no dual-purpose (storage and transport) containers licensed. However, licensing of at least one dual-purpose container appears imminent.

Multi-purpose containers will likely be available by the time additional storage containers are required in 2003 or thereabouts. However, the casks used by Northern States Power at Prairie Island now can be used for storage only. To move the fuel in those casks, transference into a separate transport container is necessary. While procedures to accomplish this task are approved by the Nuclear Regulatory Commission, the aforementioned consumer coalition has raised public safety concerns about the dangers inherent in the transference process.

With respect to reprocessing, though it is not prohibited, it is deemed uneconomical and nonviable by the nuclear industry. Similarly, although several developmental technologies hold promise, there are none that will be deployable and economical, as well as able to generate electricity without environmental damage while producing little or no radioactive waste, within the first quarter of the 21st Century.

Finally, the issue of an alternative storage site in Minnesota for nuclear waste has not yet been settled to the satisfaction of all affected parties. The Prairie Island Dakota Community, whose representatives point out that its land abuts the storage site yet its inhabitants enjoy neither the electricity nor any tax revenues generated from the plant, has taken the consistent position that either the waste be moved to another location or compensation be provided in the form of payments to relocate, en masse, those who desire to leave to a site of their choosing. This is an issue that demands resolution. The Prairie

Island Indian Community, as well as a number of others, have called for the revivification of the Nuclear Waste Council.

Issues for Legislative Consideration

Several issues have emerged from this investigation as warranting further legislative attention. They include: (1) the process for consideration of electric industry restructuring; (2) the process for integrated resource and energy planning; (3) a new approach to the delivery of energy efficiency services; (4) Minnesota's role in windpower development; and (5) planning for future nuclear waste storage contingencies. They are presented in greater detail below.

1. *Electric Industry Restructuring:* Whether and how to restructure the electric industry will undoubtedly be one of the most difficult and significant decisions ever to come before the Legislature, and it will subsume all other energy matters. A number options were identified during the course of researching this report with respect to the process that might be most productive to consider the many issues that such an endeavor raises. One or some combination of the following might serve to render an outcome that meets the needs of all the affected parties and is in the broad public interest.

The Legislature might choose to act on one or a combination of the following:

a. *Provide a vision for Minnesota's energy future and require that all interested and affected parties collaborate to develop a legislative proposal that addresses each's needs and concerns.*

b. *Promulgate guidelines that would provide a structured framework within which discussions and negotiations among all concerned could take place.*

c. *Develop a comprehensive citizen involvement strategy, with or without the aid of independent citizen organizations, to aid in sound policymaking.*

2. *Energy Planning:*. The future of centralized, integrated resource and energy planning is uncertain in a more competitive utility industry. Even if there is no immediate change in industry structure, most believe the process could and should be improved. Balancing the desire for economic benefits to customers and economic development for the State with the desire to maintain or improve the environment is and will continue to be the challenge.

The Legislature might wish to explore the development of a broader, more inclusive and collaborative energy and resource planning approach.

3. *Energy Efficiency Services:* Despite mandated spending, the future of energy efficiency services is also uncertain. Most believe that it is important to maintain a sensible energy efficiency policy in the State.

The Legislature might wish to explore the viability of a specific idea that was proposed: vesting authority in an existing or newly created independent entity to administer funds and coordinate government, private and nonprofit sector efforts at conducting energy efficiency projects that feature: state-of-the-research techniques; activities that would not otherwise naturally occur in the market; highly

targeted and cost-effective initiatives; aggressive consumer information and education campaigns; and market transformation programs.

4. *Windpower Industry Development*: Minnesota, as a result of a combination of its own abundant, indigenous wind resources, the expected technological advancements occurring in the field, anticipated cost reductions, the robust world windpower market and potential domestic market, is well positioned to take advantage of the economic development opportunities this resource appears to offer.

The Legislature may wish to consider strategies to enable the State to benefit economically from further windpower industry development and support. It could commission further study by the Department of Trade and Economic Development, in partnership with the Department of Public Service, to determine whether becoming more active in seeking to attract developers and designers, partnering with existing companies in various markets, or working to create a local market could bring jobs and net revenue to the State.

5. *Nuclear Waste Storage Contingency Planning*: There is a reasonable likelihood that an interim nuclear waste storage facility will be available before Northern States Power Company exhausts storage space in the 17 approved dry casks. However, there is also a possibility that no solution will be found before the need for more storage arises again. Contingency planning would appear to be a prudent path to follow.

The Legislature might wish to consider directing the development of options in the eventuality that no interim spent fuel facility is available before the need

for additional dry cask storage at Prairie Island arises. Reconstituting the Nuclear Waste Council and, among other things, directing it to develop such options, is one method the Legislature could adopt.

Chapter 1

INTRODUCTION

Realizing that the spent fuel storage pool at its two Prairie Island nuclear facilities would soon reach capacity, Northern States Power Company (NSP or Northern States Power) sought approval to house radioactive waste in above ground dry casks. NSP's request precipitated a debate in the Minnesota Legislature -- and, indeed, the entire State -- which revealed a significant gulf of opinion about Minnesota's energy policy. Some saw the utility's request as a chance to drastically alter the way electricity is produced in the State by substituting a reliance on non-fossil fuel sources for dependence on nuclear generation. Others saw it as a way to affirm the dominance of conventional fuels. The 1994 legislative resolution that evolved reflected the reasoned judgment that, while it would be unwise to so abruptly disrupt a system that was providing reliable and relatively low cost electricity, an opportunity had arisen to take a closer look at other options for Minnesota's energy future, and explore whether it would be technically feasible and economically sound to shift to an alternative means of energy production.

Hence, the 1994 session produced historic legislation, which, among other things, created a legislative Electric Energy Task Force (EETF or the Task Force) and charged it with initiating a number of studies concerning future electric energy policy and nuclear waste storage issues.[1] This report, the last in a series of three that were commissioned, fulfills the legislative requirements to:

1 Present a summary of the review and critique by a panel of experts (the Expert Panel), of a previous report by a team of consultants that considered future electric energy policy;[2] and

2. Examine specific nuclear waste management issues explicitly mentioned in the statute.

The debate over energy policy continues, made vastly more complicated at this juncture by the issues presented with respect to the restructuring of the electric industry.[3] When the 1994 statute was enacted, Minnesota was not yet engaged in the national debate concerning restructuring, it gained nary a mention in the legislation as a topic worthy of examination in the study of future energy policy. When the Request for

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[1] See the Laws of Minnesota 1994, Chapter No. 641. The Task Force is comprised of eight members of the Minnesota House of Representatives (including the chairs of the Environment and Natural Resources Committee and the Regulated Industries and Energy Committee) and eight members of the Minnesota Senate (including the chairs of the Environment and Natural Resources Committee and the Jobs, Energy and Community Development Committee). A list of the members of the legislative Electric Energy Task Force may be found in Appendix A.

[2] The individuals who served on the Expert Panel were designated by the Legislature. A list of the members, together with their affiliations, may be found in Appendix B. The report was prepared under the auspices of Appel Consultants, Inc. The consulting team consisted of: George Wiltsee (lead consultant); John Schaefer; Ahmad Faruqui; Brian Kick; Lynn Coles; Edward Beadsworth; and Ronald Sundberg.

[3] There are a number of terms that are used to indicate the process of change taking place in the electric industry. Restructuring, competition and deregulation are three which are often used interchangeably, although their meanings are not synonymous. For accuracy and consistency, restructuring and competition will be used throughout this report to describe this change process.

Proposal for the study was issued in 1995, the issues surrounding restructuring had gained sufficient attention to warrant inclusion as one additional matter to be explored. However, by the time the study was concluded, the subject had become so important that it garnered a position equal to that of the discussion of alternative sources in the final report. Though only now beginning to become a subject ripe for regulatory and legislative attention in Minnesota, restructuring decisions have already been made in some states and the decision making process has accelerated considerably in others.

Clear signals have been given that the Minnesota Legislature will not act on restructuring in 1997. Equally clear is the fact that it will soon be one of the central issues confronting Minnesota lawmakers. In many ways, the momentous decisions they will make about restructuring subsumes all other energy matters, for policies regarding energy and resource planning, renewables preferences, energy efficiency, low income programs, and many others will need to be resolved during the course of the Legislature's deliberations. Due to its prominence in the consultants' report and its impending influence on State energy policy, restructuring is addressed to a large extent here.

This report is organized into chapters. Chapter 2 provides background information. Chapter 3 presents the Expert Panel's commentary on and critique of the consultants' report and other research as it relates to alternative energy and electric industry restructuring. Chapter 4 addresses the nuclear waste management issues. The conclusion is found in Chapter 5. To provide a context for the discussion, Appendix C presents a snapshot of energy provision, production and consumption in the State of Minnesota.

Chapter 2

BACKGROUND

Electricity is provided to 2.1 million Minnesota customers by five investor-owned utilities, forty-six rural electric cooperatives and one hundred twenty-six municipal electric companies. Almost half of the customers in the State are served by Northern States Power Company.

In April 1991, NSP filed for a Certificate of Need (CON) to construct an Independent Spent Fuel Storage Installation (ISFSI) on the Prairie Island site to store spent nuclear fuel (SNF) in 48 above ground dry casks. The company, which was about to exhaust capacity in its spent fuel storage pool, claimed it needed the full complement of containers to allow it to continue generating electricity at Prairie Island through 2013 and 2014, the end of the licensing period for Units I and II, respectively.

In June 1992, the Minnesota Public Utilities Commission (PUC) granted only part of NSP's request, approving only 17 of the 48 casks. Opponents of the installation litigated and, one year later, the Minnesota Court of Appeals ruled that legislative authorization for the cask storage was required by law.[4]

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[4] Minn. Stat. §116C.72, reads, in part: "...no person shall construct or operate a radioactive waste management facility within Minnesota unless expressly authorized by the Minnesota legislature."

In 1994, the Minnesota State Legislature, fulfilling its statutory responsibility, approved the use of the 17 casks, which would not permit the utility to continue operation of the Prairie Island plants until the end of the license period.[5] Consent, however, was not granted unconditionally. Five casks were approved for use immediately. But in order to obtain authorization to fill four additional casks, NSP was required to, among other things: (1) file an application for an alternative storage site off Prairie Island in Goodhue County; and (2) make a good faith effort to implement the site.

The question of whether NSP has in fact complied with the statutory requirements for the four additional casks has not yet been fully resolved. On October 2, 1996, at the same time it denied NSP's application for an alternative site, the Minnesota Environmental Quality Board (EQB) determined that NSP had complied with its obligations under statute.[6] However, the Prairie Island Mdewakanton Dakota Community (Dakota Community) has challenged the EQB's decision in the Minnesota Court of Appeals, claiming that the administrative ruling contravened both the letter and the intent of the statute. The Dakota Community's appeal is pending.

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[5] According to the Department of Public Service, recent improvements in fuel utilization at Prairie Island will permit extension of storage capacity to about 2003. (See Minnesota Department of Public Service, Report of Investigation and Recommendations Regarding Payments By Ratepayers of Northern States Power Company to the Nuclear Waste Fund, submitted to the Minnesota Public Utilities Commission, Docket No. E002/DI-95-1137, June 12, 1996, p. 6.)

[6] The EQB concluded that no site would be comparable to the already existing Prairie Island site because of the risks involved in the transportation and additional handling of the spent nuclear fuel that would be required to move it to an alternative location. NSP, as part of the procedure necessary to comply with the stipulations in the statute, had also filed an application for an alternative storage site with the U.S. Nuclear Regulatory Commission (NRC). On November 13, 1996, six weeks after the EQB decision, NSP announced that it had asked the NRC to suspend its application. On January 16, 1997, Sen. Steve Murphy introduced legislation to eliminate the requirement that NSP find an alternative site in Goodhue County for dry cask storage.

To obtain authorization to fill the remaining eight casks, NSP was required to meet goals to install 400 megawatts (MW) of windpower and 125 MW of biomass capacity by 2002.

The legislation also created the Electric Energy Task Force, whose purpose was to study future electric energy sources and costs, and to analyze nuclear waste issues and other economic factors surrounding the continued generation of electricity at Prairie Island. A process ensued, marked by the conduct and presentation of several studies and reports.

First, the legislation called for a preliminary report that assessed the current energy picture in the State. That report was prepared by former Minnesota State Representative Todd H. Otis and presented to the EETF on March 6, 1995.[7]

Second, a study was commissioned to evaluate future energy policy, specifically whether Minnesota could become energy self-sufficient and, if so, when and at what cost. This task was assigned to a group of researchers under the auspices of Appel Consultants, Inc. The result of the consultants' work was a report (the Appel Report) that was presented to the Task Force on June 28, 1996.[8]

The third phase of the process entailed the review and critique of the Appel Report by a legislatively designated panel of experts, the product of which is this report.

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[7] Todd H. Otis, Report to the Minnesota Legislative Electric Energy Task Force, Preliminary Document, March 6, 1995.

[8] The Appel Report consists of two studies: George Wiltsee and others, Appel Consultants, Inc., Evaluation of the Current Energy System in Minnesota (Study A -- Regulatory and Structural Issues), Final Report, June 28, 1996; and Evaluation of Emerging Generation Technologies in Minnesota (Study B), Final Report, June 28, 1996. The consultants gave an oral presentation of the reports to the Task Force on July 31, 1996.

Chapter 3

THE APPEL REPORT

Appel Consultants, Inc. were chosen by the Electric Energy Task Force to conduct the study of Minnesota's energy future as required by the 1994 legislation addressing NSP's dry cask storage request. The Appel Report poses a scenario for State energy self-sufficiency through the use of renewable resources. It concludes that, though economically inadvisable, it is technically feasible to generate 100% of Minnesota's electrical energy requirements primarily through a combination of wind and biomass resources. Further, it determines that the transition to such an energy delivery system could be accomplished within 20 years, and that, under such a system, energy prices would be about 45% higher than they are today.

The Appel Report also places a great deal of emphasis on electric industry restructuring, suggesting that, as soon as possible, Minnesota should embrace a system allowing all customers direct access to their choice of the retail supplier while simultaneously requiring complete divestiture by incumbents of all generation assets.[9]

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[9] There are many terms used interchangeably to describe the ability of end users to choose and enter into contracts with any one of a variety of energy suppliers. Those terms include: retail wheeling; retail competition; direct access; full access; and consumer/customer choice.

The consultants concluded that such an industry model would reduce overall electricity prices and, with the inclusion of proper incentives, could foster a market in renewable energy.

Comments on and critiques of the Appel Report, and the subjects with which it dealt, were gathered from a variety of sources between July and December, 1996. The views of the Expert Panel were, by agreement, supplied in writing.[10] Additional comments were provided by other interested observers.[11]

Although the original thrust of the study and the purpose of the Expert Panel was to evaluate alternative energy options, the comments of these experts focused much more on electric industry restructuring. To be clear, most rendered their opinions about the future of renewables within the context of their comments about restructuring, for they believed it to be a virtual certainty that the State would not unilaterally move forward on the Appel Report's "sustainable scenario" or even consider any of its relevant proposals outside of the broader task of reorganizing the electric industry.

The following is a review of the comments of the Expert Panel and others on the Appel Report and an explication of certain alternative sources of energy and the

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[10] In addition, personal or telephone interviews were conducted with each of the members of the Expert Panel. Three panelists -- Steve Hoffmann of the University of St. Thomas, representing Minnesotans for an Energy Efficient Economy; Thomas Koehler, representing the International Brotherhood of Electrical Workers; and John White, representing the Center for Energy Efficiency and Renewable Technology -- failed to submit written comments. In addition, Appel Consultants, Inc., after receiving copies of the panelists' comments, submitted response comments dated December 27, 1996. To the extent they shed additional light on the issues, they are incorporated in this report.

[11] Winthrop & Weinstine, on behalf of the Center for Energy and Economic Development (an industry trade organization), and Mike Holly of Sorgo Fuels (a biomass energy company) submitted unsolicited written comments on November 26 and December 7, 1996, respectively. In addition, the author met or otherwise communicated more than 60 individuals representing more than 40 organizations. A list of those individuals is supplied following the list of sources at the end of the body of the report.

issues surrounding electric industry restructuring that were the subject of spirited discussion among the panelists and other commenters. Controversy also surrounded consideration of environmental externalities. Discussion of this subject is also provided below.

3.1 Overview of Comments/Critiques

There is a clear consensus among the Expert Panel that, although supplying comprehensive background information, the Appel Report provides an insufficient basis for formulating State energy policy. The panelists raise deep concerns regarding a series of technical barriers to, and economic consequences of, implementing Appel's "sustainable scenario."[12] They question the validity of the information and analysis presented. For instance, the Minnesota Municipal Utilities Association (MMUA) finds the report "seriously flawed...inconsistent in logic, unrealistic in assumptions, inaccurate in facts, and unreliable in conclusions."[13] The Minnesota Department of Public Service (DPS) asserts that mandating implementation of such a scenario would be "imprudent."

In short, the panel believes that the report's conclusion that Minnesota could become energy self-sufficient within 20 years using indigenous biomass and wind

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[12] Panelist Steven B. Corneli raised a definitional issue concerning the phrase "sustainable." In response, Appel Consultants, Inc. indicated that it used the term as "a shorthand" for non-fossil and non-nuclear energy use. Specifically, the consultants state that the term "is appropriate...to describe an energy system consisting of energy efficiency, farm-grown biomass, wind, and hydroelectric power." (Appel Consultants, Inc., Response to Comments from Expert Working Group, December 27, 1996, p. 2.)

[13] Minnesota Municipal Utilities Association, Comments on the Legislative Energy Task Force Reports, by Jack Kegel, November 1, 1996, p. 1. (Unless they do not represent any specific organization or have asked not to be identified by their affiliations, throughout this report commenters will be referred to by the organization to which they belong.)

resources is unsupported and unrealistic. At the same time, most of the panelists support, and in fact encourage, a more gradual movement to non-fossil fuel production in the State.

There is less unanimity of opinion with respect to the report's recommendations on restructuring, with a few ardently advocating an aggressive transformation of the industry to one featuring full retail access for all consumers and most preferring a more deliberate consideration of industry restructuring. Moreover, several of the panelists observe that there seems to be a significant disjunction (and in fact substantial conflict) between the presentation of the "sustainable scenario" and the advocacy of retail wheeling. (Minnesota Power characterizes these two conclusions as "two trains going in the opposite direction.")[14]

For its part, Appel Consultants, Inc. defends its report, stating that it "stands firm" in believing that the goals of "favoring retail access and divestiture of utility power plants on the one hand, and on the other hand favoring a 'sustainable' scenario based on renewables and energy conservation programs..., are indeed the goals that Minnesota and all other states should try to attain."[15]

Assuming the Appel Report's conclusion that full replacement of the current system with renewables is in fact possible and desirable, a key issue for legislators would then be the decision as to whether to displace (which is what the Appel Report implies) or replace current fossil fuel sources with renewable sources. In other words,

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[14] Minnesota Power filed comments on behalf of itself and Otter Tail Power. They are included in: Joint Comments, EETF Report -- Studies A and B, Dated: June 28, 1996, Comments and Supplemental Information, November 1, 1996.

[15] Appel Consultants, Inc., Response Comments, p. 1.

should the State take actions to use more renewable resources to generate electricity before the useful lives of existing fossil fuel plants have expired, or should the State take actions to foster the use of renewable sources when capacity additions or replacements of worn out plants are required?[16] Obviously, the former course would speed the wide scale introduction of renewables, the latter would result in a more lengthy transition.

3.2 The Appel Report and Alternative Energy[17]

Coal, oil and nuclear sources together provide more than 90% of the total in-State electricity generating capacity.[18] The Appel Report provides a vision of a State energy future that relies exclusively on non-fossil fuel, renewable resources. The individuals and organizations commenting on the Appel Report rendered a multitude of opinions on this future vision. The following portion of the report examines in more detail the views expressed by the Expert Panel and other interested parties. It also provides the results of independent research intended to complement the panelists' comments.

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[16] The Department of Public Service estimates the addition of 3,400 MW of new or repowered capacity by 2013. (See Appendix C, Section C.3.2) Note that about three-quarters of in-State generating capacity is produced by units that have come on line since 1970, although 30% of that capacity is derived from the Monticello and Prairie Island nuclear plants. Minnesota's gas and oil generating facilities, which together account for about 15% of in-State generating capacity, are of relatively recent vintage, while at the other end of the spectrum, nearly 80% of Minnesota's hydroelectric plants, though accounting for only a small percentage of in-State capacity, are 50 or more years old. About 60% of Minnesota's coal units are 30 or more years old. (See Appendix C, Section C.2)

[17] Though they do not mean exactly the same thing, the terms alternative energy, non-fossil fuel energy and renewable energy are often -- and will be throughout this report -- used interchangeably. The author recognizes that there are differences among the terms. For instance, all renewable energy is alternative energy, but all alternative energy is not renewable.

[18] By comparison, the United States as a whole relies on these sources for less than 70% of its total generating capacity. (See Appendix C, Section C.2.3 and Tables C-7 and C-8.)

3.2.1 Technical Considerations

Several commenters listed a variety of technical barriers to implementing the Appel scenario, many or all of which, they believe, are insurmountable. Some of the key issues raised in this regard are discussed below.

According to the Minnesota Municipal Utilities Association, the consultants themselves admit that the Minnesota market is not large enough to accomplish the economies of scale necessary for a market transformation the magnitude of which would be required to move to a "sustainable" energy future. The Minnesota Rural Electric Association (MREA) and the Department of Public Service question whether wind, biomass and conservation are sufficiently available commercially at a level required to support the scenario. They further state that these sources do not provide reliable, fully dispatchable peaking capacity. Minnesota Power adds that utility scale renewable technologies are not yet thoroughly proven. Several note that system constraints (e.g., capacity limitations on existing transmission lines; need to construct new lines) present considerable obstacles.

The Izaak Walton League of America (IWL) concurs to an extent, asserting that "transforming the existing system from one dependent on central station fossil fuel and nuclear plant to smaller renewable facilities requires more than swapping capacity for capacity."[19] Explaining further, IWL states that the system was designed to

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[19] Izaak Walton League of America, Comments on the Appel Report, by William Grant, November 1, 1996, p. 6.

serve hourly, daily and seasonal customer usage requirements while the proposed system would need to be designed to "follow the intermittent [renewable] source."[20]

3.2.2 Economic Considerations

Several commenters warn that such a radical movement to a renewable generation system which is substantially more expensive than the current system would have dire consequences for Minnesota's economy. Businesses would be driven away from, or discouraged from coming to, the State. Loss of current jobs and missed future employment opportunities would result, with added financial burden being placed on all Minnesota residents, especially the elderly and low income, according to this view.

The effect of renewables development on the Minnesota economy and the number of jobs created or lost by its intensity is a subject of some dispute. The Appel Report suggests that shifting energy gears would result in "the creation of jobs and income" to farmers, laborers and truckers for growing, harvesting, hauling and land use. But the Department of Public Service cautions that "claims of job creation must be examined critically" because the investment of capital and labor in such effort might come at the expense of investment in other "economic opportunities" that might result in greater overall societal benefit.[21] (The Appel Report acknowledges that job creation could be offset by job losses caused by higher energy prices.) A recent study which examined the economic impacts of large scale windpower development concluded that further

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[20] Izaak Walton League, Comments, p. 7.

[21] Minnesota Department of Public Service, Draft 1996 Energy Policy and Conservation Report, July 1996, Chapt. 3, p. 5.

development of wind energy in Southwest Minnesota, compared to other key industries, may offer a "modest" contribution to the rural economy via salary and wages, revenues to land owners (likely the greatest beneficiaries), property taxes and job creation. However, the study also indicates that local ownership of windpower development would substantially increase the economic impacts to the region.[22]

Low energy prices are touted by some, especially those representing business and vested energy interests, as the most important economic development and job creation strategy. For instance, a study commissioned by Center for Energy and Economic Development (CEED) estimates that "the multiplier effect" of salaries, fees, taxes and business stimulation from coal production and use generates income gains totaling up to $1.2 billion and results in 9,000 to 56,000 jobs.[23] A contrary view is presented in a 1980 report by the Minnesota Energy Agency. It concluded that investment in energy efficiency measures provides a greater multiplier effect than investment in either fossil or renewable fuels.[24]

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[22] Randy L. Jorgenson, Executive Director, Southwest Regional Development Commission, Letter to author, dated November 1, 1996, summarizing findings of Economic Impact Analysis of Windpower Development in Southwest Minnesota, submitted by Agricultural Utilization Research Institute, prepared by DanMar and Associates, September, 1996. (DanMar's principal is Dan Juhl, one of the expert panelists.)

[23] Adam Rose, Philip Szczesniak, and Dongsoon Lim, "Multiplier Impacts of Coal Use in Minnesota," in Economic Impacts of Coal on the Minnesota Economy, Pennsylvania State University, Report to the Center for Energy and Economic Development, November 16, 1994, pps. 1-3. The Center for Energy and Economic Development is a non-profit association representing the coal and railroad industries. The "multiplier effect" refers to the flow of a dollar spent throughout the local, state or national economy.

[24] Minnesota Energy Agency, 1980 Energy Policy and Conservation Biennial Report. The Minnesota Energy Agency is no longer in existence; its functions are now performed by the Department of Public Service.

Panelist Steven B. Corneli instructs that, to develop an efficient exportable market in energy (or any commodity for that matter), local resources must cost less than those otherwise commercially available. If this is not the case, a few local producers reap benefits while all local consumers are harmed.

Clearly, all the information presented concerning the economic development and job creation resulting from large scale renewable energy development is either theoretical or speculative. No definitive analysis of the actual effects is available. Minnesota Energy Consumers (MEC), which represents large industrial customers, offered cautious advice in its call for further investigation of the economic impacts to the State prior to any consideration of implementing the Appel Report's proposal.

Costing Assumptions

The assumptions used in the Appel Report to calculate the cost of the "sustainable scenario" are, for many, questionable. Corneli observes that the figures were based on "a complicated set of information" and concludes they are "unlikely to be accurate."[25]

Commenters generally characterize the Appel Report understates cost estimates for renewable sources (e.g., Minnesota Power and NSP call them "optimistic"), while they contend the Appel Report overstates cost estimates for conventional fuels.

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[25] Steven B. Corneli, Economist, Minnesota Office of Attorney General, Comments on the Appel Report to the Minnesota Legislature's Electric Energy Task Force, November 1, 1996, p. 3.

With respect to the alleged understating of renewable costs, such items as transmission costs, the value of farm land and the price and efficiencies of biomass resources are cited and challenged by various panelists. For example, Corneli points out that the consultants used land values that are more than three to eight times lower than those that are currently obtainable. Minnesota Rural Electric Association cites a World Bank study of biomass resources which indicates costs to be three times higher than those used by the consultants. In MREA's view, the Appel Report vastly overstates the efficiency at which biomass plants would operate and thus, it submits, cost assumptions should be adjusted (i.e., increased) accordingly. The result of these allegedly inaccurate assumptions, these critics contend, is that the differential between today's cost and the cost under the "sustainable scenario" would be significantly greater than the Appel Report estimates. For instance, the Department of Public Service estimates that, in sum, moving to the system the Appel Report advances would raise costs to Minnesotans by 78%, not 45%.

A contrary view is presented by panelist Orrin "Skip" DeLong, who implies that the costs of renewables are *overstated* because outdated prices of wind energy are used and externalities are not properly considered in the cost calculations. By their own admission, the consultants' cost estimates for renewables were "conservative" (i.e., erring on the higher side), and they acknowledge that environmental externalities were not included. Had they used lower assumptions and including externalities, the Appel consultants concede, dramatically different cost projections would have resulted, with the

differential between today's costs and the "sustainables scenario" costs being not nearly as great as stated.

The issue of externalities is complex and controversial, and their treatment has a major impact on cost estimates and cost/benefit calculations. A discussion of externalities ensues.

Externalities

The direct and indirect impacts on society of the use of a particular energy source which are not captured in the price of the commodity are considered "externalities." The most commonly examined type are environmental in nature, and thus the term most often associated with this economic construct is "environmental externalities." Economists generally agree that when these costs are not reflected in retail commodity prices, consumers receive inaccurate price signals and markets experience economic inefficiencies.

If there is general agreement on this economic theory, there appears to be little agreement as to whether and how to apply externalities to the practice of establishing concrete energy policy. This is no small matter, for the manner in which externalities are considered has profound implications for such policy.

Fossil fuel utility power plants (which comprise more than 75% of Minnesota's capacity) account for only a small percentage of the total emissions in this country of volatile organic compounds (VOCs), nitrous oxide (N_20) and carbon monoxide (CO). However, they contribute almost three-quarters of total U.S. emissions of sulfur

dioxide (SO_2), and about one-third of the total of carbon dioxide (CO_2) and nitrogen oxides (NO_x) emissions.[26]

According to the Department of Public Service, while environmental impacts are lower in this State than elsewhere due to the progressive actions (e.g., high air quality standards; strict siting processes) of Minnesota lawmakers and policymakers, "energy production imposes a variety of environmental costs" on society, even after meeting State and federal standards.[27] Among those costs are the consequences of certain emissions.

In 1993, Minnesota became one of only a handful of states to incorporate environmental externalities into energy policy decision making when it directed the Public Utilities Commission to monetize the environmental consequences of electricity production.[28] In 1996, the PUC determined final dollar values for the most significant by-products of generation, establishing a range of environmental externality costs that will be used when evaluating and selecting resource options in the context of resource plan filings

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[26] John Carlin, "Environmental Externalities in Electric Power Markets: Acid Rain, Urban Ozone and Climate Change," in Renewable Energy Annual 1995, 1995, http://www.eia.doe.gov/; Internet; accessed October 28, 1996.

[27] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 3, p. 2.

[28] See the Laws of Minnesota 1993, Chapter 356.

and certificate of need proceedings.[29]

Incorporating externalities in administrative resource planning proceedings is one thing; considering them in legislative decisions on energy is another. Where regional, national or even international issues are involved, the extent to which environmental policy is within the purview of the State is, and will continue to be, a contentious issue, especially in light of restructuring. Witness, for instance, the clamor sparked by the recent findings concerning global warming by the Intergovernmental Panel on Climate Change (IPCC), which even found its way into the PUC's externality proceeding. The IPCC was set up jointly by the World Meteorological Organization and the United Nations Environment Programme to assess available scientific information on global climate change. This "panel of 2,500 world scientists agreed that human activity is affecting the global climate."[30] The effects will, the scientists predict, most likely result in an increase in the Earth's surface temperature and a variety of consequences, some beneficial, some harmful. Yet, a handful of highly credentialed scientists dispute the

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[29] The externality values the Commission assigned each pollutant can be found in Appendix D. There are a variety of methods to determine externality values, each with its shortcomings. In its order, the Commission found the so-called damage-cost approach (which considers the net damage to the environment caused by a resource) "superior" to the so-called cost-of-control approach (which considers the cost of avoiding or reducing the effects at the source), although it stated that the latter method may be reasonable in some circumstances and may be easier to calculate. The Commission rejected other methods, including the so-called mitigation approach (which considers the costs to eliminate or reduce harm from occurring to the environment from a resource) and the so-called risk of regulation approach (which considers the costs estimated to arise from future taxes or requirements of additional environmental regulation). Questions about the practical application of these values have arisen in the context of discussions of the larger question of what, if any, role integrated resource planning will play if and when the electricity industry is restructured.

[30] "Climate Change, Questions Minnesotans Must Answer," Editorial, Star Tribune December 11, 1996: p. A20.

IPPC's findings.[31] Some believe these findings are a cause for aggressive Statewide action; some may accept them, but are dubious of the State's obligation and ability to respond; others distrust them. What Minnesota's role in environmental protection should be when certain sources of pollution come from without, and when the effects and timing of suspected global climate changes are uncertain, is far from clear.

Where effects of human activity on the environment are locally manifest, however, the discussion can be more focused. When ecologists from the University of Minnesota and the University of Toronto report rising levels of nitrogen from automobiles and fossil fuel burning power plants "may eventually kill native grasses in Minnesota," and when Minneapolis' Center for Energy and Environment (CEE) finds that in-State emissions of greenhouse gas, 39% of which come from electricity production using fossil fuels, is expected to increase to 126.54 million metric tons (or by 32%) by 2010, these matters may seem more relevant and immediate to Minnesotans.[32]

Zeroing in on the fundamental policy questions these issues raise, a recent editorial in the Star Tribune lists the range of possible responses. Some believe, the editorial asserts, that there is nothing Minnesota, or even the United States, can do to improve the situation; others resignedly suggest that regional action would only be

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[31] Allegations have been made in recent articles in Harper's and The Washington Post that these doubters are financially supported by the fossil fuel industry.

[32] See Jim Dawson, "Air Pollution Threatens Prairies, 'U' Study Finds," Star Tribune December 6, 1996: p. B1; and Center for Energy and Environment, Inventory and Projections of Minnesota Greenhouse Gas Emissions 1990 - 2010 (Minneapolis: Center for Energy and Environment, June, 1995), pps. 1, 2.

overwhelmed by irresponsible activity either domestically or abroad; still others insist that aggressive local action is imperative.

One thing is certain: the degree to which the State determines it is appropriate to take account of proven or perceived environmental impacts of various energy sources will have a pronounced effect on Minnesota's future energy policy.

3.2.3 The Potential of Alternative Sources

Each of the currently available alternative sources of is in a different stage of technological development, has different economic attractiveness, and its own set of advantages and disadvantages. In addition to wind and biomass, the Appel Report covered co-generation, fuel cells, municipal solid waste, landfill gas and solar technologies.

The following discussion looks in greater detail at wind and biomass, providing the views of the expert panel, as well as additional information gathered through independent research. It also focuses on solar energy in more depth and discusses the future potential of hydrogen.

Wind

Despite the fact that Minnesota is among the leaders in the nation in evaluating and tapping the potential of wind energy, controversy about its use prevails, as is evident from the comments submitted by the Expert Panel. The Department of Public Service, in particular, suggests that better data and analysis concerning wind's actual

potential will be available at the conclusion of the NSP mandatory wind project, implying that any decision to move forward with full-scale wind resource requirements now is premature.

Advantages

All things considered, wind is perhaps the most promising of any alternative resource currently available. It carries significant environmental advantages as a completely benign energy source, the land required for wind farms has multiple use potential and can provide a steady source of alternative income for property owners (many of whom would likely be farmers), operation and maintenance costs are low, and, according to a 1992 New York State Energy Office study, it creates an estimated 14 jobs per $1 million in investment, more than coal and natural gas.[33]

Further, the addition of wind (or any alternative for that matter) diversifies the energy portfolio of a utility or state. Several observers maintain that fuel diversity is a critical component of any energy strategy, acting in a similar manner to the way risk-averse financial investment portfolios are structured -- spreading investment to hedge against known or as yet unknown eventualities. In fact, the Minnesota Wind Energy Association's representative on the Expert Panel criticizes the Appel Report for omitting any proposals to guard against such risks, which he believes are possible, probable or imminent. This commenter cites several examples: an unforeseen rise in fossil fuel prices; a potential increase in energy costs resulting from the sale by the Federal Government of

[33] New York State Energy Office, Economic Development: Number of Jobs Created per $1 Million Investment, 1992.

the Western Area Power Administration (WAPA), which, up to now, has provided low cost hydroelectric power; and the costs of compliance with Phase II of the Clean Air Act Amendments, which take effect on January 1, 2000 and will affect North Dakota coal plants supplying Minnesota, as well as Minnesota plants exempted from Phase I.

Drawbacks

The Appel Report noted one of wind's principal drawbacks: utilities do not consider wind a firm power source, especially during peak demand periods, because of its intermittence. Many commenters support that assessment, emphasizing that wind is not an appropriate baseload source. NSP asserts that, given the intermittent nature of wind, a system with wind generation will require more total megawatts of capacity than one without it; more investment per delivered energy is required for wind than for fossil fuel sources.

The Appel Report also identified as a roadblock to wind development the need to construct transmission lines, which can run as high as $1 million per mile, to integrate the source to the grid and ultimate end users.

Land use is also an issue. Wind plants "typically require at least 15 acres of land for each megawatt of capacity...."[34] Yet another barrier is the capacity factor, which for wind systems typically ranges between about 20% to 25%.[35] Detractors also cite

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[34] Dawn Stover, "The Forecast is for Windpower," Popular Science, July 1995, p. 85.

[35] Capacity factor is the degree to which a generating source or facility actually produces electricity compared to what it is capable of producing. Burn rates, heat losses and unplanned maintenance are some of the influences that could reduce actual productivity from optimal potential. Note: The Mid-Continent Area Power Pool accredits summer peak for windpower at only 15% of nameplate capacity, which means that the full potential of the source can be counted on only 15% of the time.

obtrusive towers and avian mortality as other problems associated with utilization of the wind resource. Further, up front capital costs can be a hurdle; initial investment in equipment can be quite substantial.

One study summarized wind's disadvantages as cost (due, in part, to the current overcapacity), risk (a federal incentive for wind development must be constantly reauthorized) and operations (wind offers few system operational benefits).[36]

Technology and the Cost of Energy

As wind technology advances, cost declines. And the U.S. Department of Energy (DOE) is convinced that "there are no insolvable technical restraints."[37] As a result of previous technological improvements, the cost of wind has dropped precipitously, from just about 30 cents per kilowatt-hour (kwh) for the first projects in 1981 to about what the Appel Report states to be about five cents per kwh today. And with State and federal subsidies, the price of wind is even more cost-competitive (the winning NSP bid was 3.5 cents per kwh).[38] Some commenters state that wind appears extremely economical in comparison to new coal-fired plants, less so if compared to most existing

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[36] Thomas A. Wind, P.E., Wind Farm Feasibility Study for the Iowa Association of Municipal Utilities, April 1996, p. 75.

[37] U.S. Department of Energy, National Renewable Energy Laboratory, Wind Energy as a Significant Source of Electricity, by R. Gerald Nix, Paper presented at 18th World Energy Engineering Conference, Atlanta, November 8 - 10, 1995, p. 1. NREL/TP-441-8162.

[38] The federal government provides a 1.5 cents per kwh production tax credit, available for ten years, for wind projects installed by June 30, 1999. For municipal systems, a direct payment substitutes for the credit. Minnesota also provides favorable tax advantages to wind developers.

plants. Significant and imminent engineering breakthroughs predicted by the Department of Energy and private industry promise to bring costs down even further.

For instance, scientists at the Department of Energy's National Renewable Energy Laboratory (NREL) are working with wind turbine developers to advance wind technology science. By the year 2000, NREL's "Next Generation Program" envisions the availability of improved blades with variable speed capability to allow greater power capture, and taller towers to improve productivity (doubling the height, for example, can provide 6% faster wind speed, which in turn increases power production by 19%).[39] By 2005, NREL's goal is to develop lower cost direct drive systems and to increase aerodynamic sophistication. Next year's budget request by the DOE for its wind programs is up 57% (to $81 million), an indication of its optimism concerning wind's development.[40]

The Market for Windpower

"The international wind market is exploding at a record pace," NREL declares.[41] The American Wind Energy Association reports that 1995 worldwide wind sales reached $1.5 billion.[42] R. Gerald Nix of the Department of Energy identifies both foreign utility grids and village systems in developing countries as potential markets, with

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[39] Wind, Wind Farm Feasibility Study, p 20.

[40] U.S. Department of Energy, FY 1997 Congressional Budget Request, Budget Highlights, (March 1996), p. 44.

[41] Mike Coe, "Gusty Times for Wind Energy," NREL in Review (Summer 1996), p. 10.

[42] American Wind Association, Windpower, Clean Energy for the 21st Century (Washington, D.C.: American Wind Energy Association, 1996), p. 1.

the former being ripe because of a greater need to improve air quality and the latter being particularly attractive because more than one billion people live in remote areas without electricity where connecting to the grid is prohibitively expensive.[43] This is not to say there are no barriers to entrance into international markets. Certification requirements and competition from other countries (particularly Germany and Denmark) are but two. However, there seems to be little doubt that this is a growth area.

Domestically, the wind market, which once boasted 90% of the world's wind capacity but now possesses only 30%, has stagnated, in large measure in anticipation of the outcome of electric industry restructuring. Whether the domestic market will rebound is uncertain, although the DOE predicts "a six-fold increase in the nation's wind-energy use in the next 15 years."[44] The Appel Report theorizes that the market may not bounce back, but panelist DeLong asserts that "evidence suggests otherwise," citing the current aggressive development of wind resources in the State of Texas.[45] The most recent mandated NSP wind project alone attracted 17 bidders. (Significantly, the winning bidder was not a local company.)

A trend might be discerned by the increase in the number of municipal utilities around the country (e.g., Waverly Power and Light in Iowa; Traverse City Light and Power in Michigan; and Sacramento Municipal Utility District in California) which

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[43] U.S. Department of Energy, Nix, Wind Energy as a Significant Source of Electricity, p. 4.

[44] Stover, Popular Science, p. 68.

[45] Orrin "Skip" DeLong, Evaluation of Emerging Generation Technologies in Minnesota (Study B) by George Wiltsee of Appel Consultants, Inc., Questions and Comments, November 1, 1996, p. 2.

have recently either purchased or contracted for wind systems.[46] (Public applications of wind can be especially cost-effective due to favorable financing arrangements possible from the issuance of municipal bonds with low interest rates and long payback periods.)

Finally, the domestic wind market may in fact become more robust if the federal and state activity on restructuring that took place in 1996 is any indication. Renewable mandates of some sort were featured in most restructuring proposals.

Mr. Nix sees opportunities for dispersed, as well as distributed, generation in the U.S.[47] While general transmission constraints in connection with distributed generation have already been identified, NSP corrects a "mischaracterization" in the Appel Report concerning the need for new transmission associated with the company's wind project on Buffalo Ridge. Contrary to the consultants' finding, NSP indicates that the already existing substation can accommodate between approximately 225 MW and 250 MW.[48] And, according to the DPS, there is a huge potential (as much as perhaps 10,000 MW; twice that according to the Appel Report) on Buffalo Ridge alone -- and the potential is not isolated to that area.

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[46] In its progress report, Waverly Light and Power found wind availability to be 97% and 99%, and actual to calculated wind productivity to be 101% and 107%, for the first and second year of its program, respectively.

[47] Dispersed generation refers to energy produced and used within a limited region and not connected to the utility grid; distributed energy refers to utility scale, grid connected capacity.

[48] Northern States Power Company, Northern States Power Company's Comments on Appel Consultants Reports in the Electric Energy Task Force, by Carl Lehmann, November 7, 1996, p. 2.

Minnesota's Role in Wind Development

Given the expected technological advancements, the anticipated cost reductions, the potential markets, the existing federal incentives and its own abundance of indigenous wind resources, Minnesota may wish to investigate in more depth how it can benefit economically from further wind development. Up to now, the State has been extremely supportive of this resource. It provides full or partial property tax exemption, depending on the size of the project, and will provide a 1.5 cent per kwh production incentive to owners or agricultural cooperatives.[49] The Department of Public Service has operated a Wind Resource Assessment Program (WRAP) since 1981. Currently, the DPS is monitoring 70 sites around the State and conducting two studies: one to determine the effect of elevation on windpower potential, the other designed to evaluate the relative benefits of concentrated and dispersed wind farm placement.

Minnesota, as a result of a combination of its own geophysics and it favorable tax and incentive policies, is extremely well-positioned to take advantage of the economic potential this resource appears to offer. If it so chooses, this State could investigate whether it would be to its advantage to: (1) become more active in seeking to attract developers, manufacturers and designers; (2) partner with existing companies to enter the burgeoning world market and the potential expanding domestic market; and/or (3) work to create a local wind market.

[49] Full property tax exempt status is provided to systems under 2 MW. For systems over 2 MW, for the first five years, only the foundation and support pads are taxable; after five years, the foundation and support pads and 30% of the tower structures are subject to property tax.

Biomass

The Appel Report's suggestion concerning biomass production -- that about 1.8 million acres (between 25% and 30% of available land in Minnesota), set aside under the Conservation Reserve Program, could be used to grow trees for energy to serve 75% of Minnesota's electricity needs -- met with a sizable amount of skepticism from the Expert Panel.

The report envisions about 50 billion kwh of biomass use by 2016 to sustain its scenario. By contrast, a Center for Energy and Environment study estimated the potential for biomass at only about six billion kwh by 2010.[50] This great discrepancy aside, the panelists did not so much challenge the proposition of whether the amount of biomass-produced energy contemplated was technically achievable as they did present their virtually unanimous belief that this scenario is simply unrealistic as a practical matter.

Minnesota, of course, has native biomass resources and has mandated NSP to utilize that resource potential to some degree. But, for the panelists, expanding biomass production to the level proposed by Appel raises many questions. A number wonder about the effects biomass cultivation and burning would have on the State's land use policy, its agricultural economy and its environment. They note the omission in the Appel Report of any reference to adverse impacts such as surface water and groundwater pollution, damage to forest eco-systems, and production of unwanted pollutants. The Department of Public Service claims that burning wood and other biomass fuels, while

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[50] Center for Energy and Environment, Energy Efficiency, Economic Development and Reduced Emissions, An Action Plan for Minnesota (Minneapolis: Center for Energy and Environment, June, 1995), p. D-7. (MW converted to kwh.)

reducing emissions of greenhouse gases, would "significantly increase" emissions of other noxious gases.

Yet, there are benefits to using biomass as a source of energy. A biomass industry can create jobs in rural areas and provide an additional income stream to farmers. Substitution of biomass for fossil fuel reduces greenhouse gases if done in a manner that utilizes the same amount of carbon dioxide as the fuel cycle produces. Further, there could be side benefits to growing biomass crops, including the improvement of soil quality.

From an economic perspective, biomass is generally cost-effective only in circumstances where residues are available at no or low cost. As the Appel Report pointed out, transportation of raw biomass is uneconomic. Further , according to the Department of Public Service, the "high demand for wood in wood products will continue to keep the costs of wood high, thus limiting [biomass'] use for energy production."[51]

Finally, from a technological point of view, there is one considerable obstacle to achieving lower biomass costs. Unlike fossil fuels, advises Kenneth Campbell of Minnesota Valley Alfalfa Producers, biomass fuels are not homogeneous. They include grasses, trees, and agricultural and urban waste. Because feeding systems used for electricity production from biomass are usually able to accept only one type of biomass, production (and thus cost) efficiency is limited.[52]

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[51] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 7, p. 7.

[52] Kenneth Campbell, Telephone interview by author, December 18, 1996.

Solar

Solar energy received scant mention in the Appel Report and no mention from the Expert Panel.. It has been largely ignored because, despite substantial progress in reducing its costs over the years, it is still significantly higher than other renewable and conventional resources. However, it is a somewhat overlooked indigenous resource which may have some, if limited, application in Minnesota.

Solar Potential in Minnesota

There are two kinds of solar energy: photovoltaics (PVs) and solar thermal systems. PVs convert sunlight directly into electricity. Solar thermal systems heat water to drive turbines to produce electricity. An earlier study by the Izaak Walton League found that, based on average daily solar energy values, the PV potential in Minnesota is equivalent to parts of Texas and all of Florida.[53] According to the Department of Public Service, Minnesota ranks 11th in the country in terms of estimated solar potential. The full expanse of the southern portion of Minnesota has solar values equal to those existing anywhere in the country. Essentially dismissed by the Appel Report, solar energy could play some role in selected applications.

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[53] Otis, Preliminary Report, pps. 23-24.

Cost

Cost is the most inhibiting factor with respect to solar applications. The purchase price of customer owned PV arrays (as high as $36,000) and the cost of grid connected PV power (about 22 cents per kwh) makes this source uncompetitive on a large scale at this time. PV power is far more cost-effective as a dispersed source, utilized in remote areas where a service line extension would be prohibitively costly, or as part of new construction, where the cost of the unit can be incorporated into mortgage financing.

However, imminent technological advancement promises to enhance the cost-effectiveness of this source. Currently, about 95% of commercially available photovoltaic modules are constructed from expensive crystalline silicon cells. The other 5% are made from newer, thin-film technologies, which, according to NREL, "promise to reduce material costs and simplify manufacturing to reach competitive energy costs...."[54] The fact that the Department of Energy has asked for an increase of 41% (to $87 million) in FY 97 for its research and development budget for PVs is indicative that the Federal Government believes that this technology holds promise.[55]

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[54] U.S. Department of Energy, National Renewable Energy Laboratory, NREL's Photovoltaic Research (1996), 1996, p. 1. See also Linda Brown, "The Thin Film Alternative," NREL in Review, Summer 1996, p. 3.

[55] U.S. Department of Energy, FY 1997 Budget Request, p. 44.

Advantages

Solar energy of both types provides a number of benefits. It requires no moving parts and little maintenance. Units are modular and can be constructed or enlarged to meet varying needs. It features low operating costs, produces power coincident with peak periods and can be stored. And, of course, it produces no emissions.

Drawbacks

Other than cost, the two major obstacles to the large scale deployment of solar power in this country are land requirements and resource availability. The large amount of land required for utility scale solar applications (approximately one square mile for every 20 - 60 MW generated) makes reliance on this source problematic.[56] And, as with wind, intermittency is a barrier.

Hydrogen

Hydrogen, the most abundant element on earth, is "the cleanest and potentially the most efficient energy resource," according to the Department of Energy.[57] It is expected to form the basis for our energy future. The DOE's vision is to transition, over time, to an energy economy based on hydrogen. However, it will be decades before this vision becomes a reality. By 2030, the DOE hopes to replace about one-tenth of U.S. fossil fuel energy with energy produced by hydrogen.

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[56] Union of Concerned Scientists, Environmental Impacts of Renewable Energy Technologies (Cambridge: Union of Concerned Scientists, January, 1993), p. 2.

[57] U.S. Department of Energy, FY 1997 Budget Request, p. 47.

Hydrogen is an energy carrier, not a primary energy source, that must be produced by fossil, nuclear or renewable energy resources. Its most prominent energy utilization today is to provide fuel for NASA's space shuttle and in fuel cells, which combine hydrogen and oxygen to produce heat and generate electricity for astronauts.

"Cost remains the single largest obstacle [to widespread hydrogen application], although there are many formidable engineering challenges as well," explains NREL.[58] According to Department of Energy scientists working in the Hydrogen Program, "[s]ubstantial advancements are required in technologies for hydrogen production, storage, transportation and utilization before [it] can become the basis for a renewable, sustainable energy future."[59] Among the prime necessities is the development of an infrastructure to transport and distribute hydrogen. The natural gas delivery and storage system may ultimately provide the answer, according to the DOE.

Offering another view is John Kennedy of the National Hydrogen Association, who claims that the public associates hydrogen with the bomb and volatility. "The real barriers to widespread use of hydrogen are not technical," he maintains, but "have to do with our perceptions and commitment to solving our energy and environmental problems."[60]

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[58] U.S. Department of Energy, National Renewable Energy Laboratory, Hydrogen, The Fuel for the Future (March 1995), p. 1.

[59] U.S. Department of Energy, National Renewable Energy Laboratory, Hydrogen Program Overview (February 1995), p. 27.

[60] Robert S. Boyd, "Beyond the Stigma of Dreaded 'H-Word' Lurks an Efficient Auto Fuel," Duluth News-Tribune February 12, 1995: p. A10.

3.3 The Appel Report and Restructuring

American citizens and businesses spend $300 billion a year on electricity and Minnesotans contribute about $2.8 billion of that total to meet their electricity needs.[61] While there are about 3,200 utility companies in the United States, three-quarters of all electricity sales are made by the approximately 250 investor-owned utilities, whose prices are established under a regulatory scheme that has been operative in this country for almost 100 years.[62]

A number of factors -- including, but not limited to, technological advancements and structural changes in the generation market, a current overcapacity condition, the ability of large usage customers to bypass the utility system, a general dissatisfaction with regulation, and perhaps most importantly, high electricity prices in some parts of the country -- has led to a growing view among certain legislators, regulators, providers, customers and economists that electricity prices could be lower for customers than they are under the present system. That view is manifesting itself in federal and state actions that have already changed -- or will likely result in changing before the end of the century -- the way in which electricity is purchased by customers.

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[61] Marc Levinson, "Monopoly Unplugged," Newsweek, September 9, 1996, p. 54; and Minnesota Department of Public Service, Restructuring the Electric Industry, Policy Implications for Minnesota, Discussion Workbook, September 1995, p. 7.

[62] Appendix E contains a brief description of the landmarks of utility regulation. Information on utility companies derived from U.S. Department of Energy, Energy Information Administration, Electric Power Annual 1995, Volume II, December 1996, p. 10. DOE/EIA-0348(95)/2.

Electric industry restructuring is under consideration or study by Congress, state legislatures and/or public utility commissions in virtually every state. In fact, four states have enacted legislation mandating retail competition.[63]

The Appel Report describes the advantages and disadvantages of four possible options for restructuring.[64] It favors an industry model featuring full retail access by all consumers and requiring divestiture of generation assets by suppliers, accompanied by strong environmental regulations and other incentives to support renewable energy sources. At the same time, the report acknowledges that accomplishing restructuring is complex, and involves multiple and diverse stakeholders. Those sentiments are echoed by the Vermont Public Service Board in its order presenting its restructuring plan. The Board stated that "restructuring an entire sector of the economy, particularly one 'affected with the public interest,' is a monumental and extremely complicated endeavor. Its ultimate resolution should be seen as a comprehensive package of agreements and policy initiatives, a balancing of sometimes competing interests and public policy considerations."[65]

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[63] See Appendix F for a summary of federal restructuring legislation proposed in 1996. See Appendix G for a chart comparing how states that have passed laws or issued orders requiring restructuring have dealt with various key issues. (It should be noted that these states, unlike Minnesota, have high utility rates.) Appendix H shows the progress of all the states with respect to restructuring.

[64] They are: Wholesale Wheeling; Limited Retail Competition; Full Retail Access; and Full Retail Access Plus Divestiture of Generation Assets.

[65] State of Vermont Public Service Board, Docket No. 5854, Investigation into the Restructuring of the Electric Industry in Vermont, Report and Order, issued December 30, 1996, p. 5.

Every state, regardless of the stage of the decision making process it is currently in, is grappling with similar issues. Broadly, they can grouped as follows:

- **Determining the Industry Model**
- **Preserving Public Benefits**[66]
- **Ensuring Competitive Markets**
- **Maintaining and Improving System Reliability**
- **Addressing Stranded Costs**[67]

Two additional issues face Minnesota policymakers: determining what, if any, role energy planning should play in a wholesale or retail competition environment, and determining the most productive process that should be established to guarantee the fairest and most advantageous outcome for providers, customers, and all citizens of Minnesota.

The following portion of the report presents some general observations of the Expert Panel about the report's discussion of the restructuring issues. It then explores some of the possible outcomes of restructuring and, finally, tackles the individual issues listed above.

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[66] Public benefits are products of the regulatory system that deliver what economists call "public goods." These are initiatives, programs or results that benefit all or some segment of ratepayers that would likely not be provided by market participants in a competitive environment. The National Association of Regulatory Utility Commissioners refers to these salutary outgrowths of regulation as "strandable benefits," meaning that they could be lost or "stranded" in the transformation to a competitive, market based system. A symmetrical appellation, "stranded benefits" are the flip side of the notion of "stranded costs."

[67] Stranded costs are defined as those investments made by utilities that are presently recoverable in rates but, in a competitive regime, may be above market, uneconomic, and therefore unrecoverable or "stranded."

3.3.1 General Observations

As a general matter, most commenters agree with DeLong's conclusion that "restructuring is inevitable" and NSP's contention that the decision involves not whether but how to restructure the industry. Betsy Engelking of the PUC reminds that if restructuring occurs, it will require substantial changes in law and policy.

While there is general agreement that the outcome is seemingly inexorable, there is little consensus on the consultants' espousal of the full retail competition plus divestiture approach. For instance, Minnesota Energy Consumers concurs with the Appel Report's preference, advocating direct access for all consumers, while the Minnesota Rural Electric Association characterizes the report's conclusion as "premature." The Department of Public Service supports increased competition, but not full divestiture of generation assets, while Engelking charges that the report's recommendation was made "without any credible analysis of a number of very difficult issues which must be addressed before such a move could be seriously contemplated."[68]

3.3.2 Potential Outcomes of Restructuring

Perhaps the Maine Public Utilities Commission, in its draft restructuring proposal, said it best when it concluded that "neither qualitative nor quantitative analysis will prove with certainty that retail access will in fact (emphasis in original) reduce the total costs of producing and providing electricity or whether all customer groups will

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[68] Betsy Engelking, Minnesota Public Utilities Commission, Comments on Appel Reports, November 1, 1996, p. 3.

benefit from those cost reductions."[69] Nonetheless, many hold strong opinions on the matter.

Equal Benefits for All?

Many argue that retail competition will indeed lower rates for all consumers -- residential and business as well as industrial.[70] The Department of Public Service, for instance, asserts that "competition and free markets can benefit all energy consumers."[71] But others are unconvinced. Engelking, for example, though granting that prices may drop in the short run, hypothesizes that they could ultimately rise as marginal costs exceed embedded costs -- a circumstance that will occur when excess capacity evaporates and new capacity is needed. In response comments, the Appel consultants. agree that prices will increase when new capacity additions are required; they argue, however, that the issue is not *whether* prices will rise, but rather which structure (monopoly or choice) will produce the least incremental cost.[72] The Energy CENTS Coalition (ECC) warns that prices may drop, but consumers' net bills could increase.

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[69] Edison Electric Institute, Retail Wheeling & Restructuring Report 3 (September 1996), p. 89. On December 31, 1996, the Maine Commission presented its restructuring proposal to the Maine Legislature.

[70] A Clemson University study predicted that, after the introduction of retail competition, the average residential Minnesotan's electric bill would drop by as much as 25.5%. (See Michael T. Maloney and Robert E. McCormick, Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry (Washington, D.C.: Citizens for a Sound Economy, 1996), p. xi.)

[71] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 1, p. 5.

[72] Appel Consultants, Inc., Response Comments, p. 4.

Such an outcome could result (especially in low income communities, ECC fears) if unbundling of rates is accomplished in such a way as to require separate charges for such things as meters, billing, connection, and other individual service elements.

Business organizations such as the Minnesota Chamber of Commerce and the Minnesota Retail Merchants Association, together representing thousands of Minnesota businesses, are strongly in favor of retail competition. Though as a group, small businesses consume a substantial portion of total energy, individual small business customers expend a small portion of their operating budgets on energy. Nonetheless, a study conducted for the U.S. Small Business Administration: (1) concludes that competitive restructuring could reduce costs for these firms; (2) disputes the view that because of their load pattern they will be undesirable customers for suppliers; and (3) asserts with confidence that aggregation will be the vehicle that permits easy access to the electricity market for small businesses.[73]

The Appel Report posits that distribution companies will prefer to retain the obligation to serve, but Energy CENTS Coalition is skeptical about that supposition. ECC maintains that universal service (i.e., both access to and affordability of electricity) must be ensured through a combination of mechanisms that could include a standard service offer, energy assistance and conservation services provided through the utility or government.

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[73] J.W. Wilson and Associates, Electric Utility Restructuring: Issues for Small Business (Washington, D.C.: U.S. Small Business Administration, March 1996), pps. 1, 12.

Small Users vs. Large Users

The specters of cost shifting, cross-subsidization and Ramsey Pricing have been raised by analysts as contributing factors to potential inequities that could follow from retail competition. According to these theorists, large industrial customers may obtain lower costs at the expense of lower use residential and commercial customers because the latter group is far more inelastic, face greater hurdles to participation (e.g., lack of information, imperfect market conditions, lack of choice) and will bear the brunt of the cost recovery for past utility investments.[74] The Appel Report recognizes that restructuring provides additional opportunities for cost shifting and cross-subsidization, but suggests that simultaneous deregulation of prices for all classes will negate any deleterious effects on residential and small business customers. Corneli disputes that assertion, arguing that only in states unlike Minnesota (i.e., high cost states) is it possible that opening up the system to all at once might blunt the adverse effects on residential and small business customers that may be caused these practices. A number of states have addressed this potential problem by installing rate caps during the transition to competition. California, in particular, has installed what it terms "a fire wall" so that residential and small business customers will be protected against inappropriate cost allocations among customer classes.

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[74] Cost shifting refers to the practice of reallocating costs from one group to another. Cross-subsidization refers to the practice of charging one customer class a higher rate to lower (or subsidize) the rate of another class. This term is also used to describe the inappropriate use of revenues from a regulated business to finance all or part of the operations of an unregulated affiliate. Ramsey Pricing refers to the practice of charging higher prices to those customers who have no choice of supplier so as to maximize a monopolist's profits. Elasticity refers to the ability of a consumer to alter individual demand for electricity in response to changing price signals.

Further bolstering the view that smaller use customers may not see gains from retail competition is the recent experience in Great Britain, where the electric industry was restructured in 1990 and market participation by low load customers has proven to be difficult to achieve.[75] In addition, Corneli posits that transaction costs for small customers may be high and could translate into higher costs and less savings than anticipated for such customers.

Rural electric cooperatives worry that large load customers will see the benefits of restructuring first or exclusively. Since the cooperative customer base is 95% residential, they contend their customers will not have an opportunity to participate in the new market. Further, they caution, if their few large load customers are "cherry picked" by rivals, the higher remaining cost burden falls on the remaining residential customers.[76]

Similarly, municipal utilities are concerned about their fate under restructuring. "If smaller players are squeezed out, consumers will lose," the Minnesota Municipal Utilities Association predicts.[77] In its response comments, although suggesting

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[75] See Frank Clemente; "The Dark Side of Deregulation," Public Utilities Fortnightly 134 (May 15, 1996): p. 13. See also Michael C. Brower, Stephen D. Thomas and Catherine Mitchell, The British Electric Utility Restructuring Experience, History and Lessons for the United States (National Council on Competition and the Electric Industry, October 1996), p. 20. Brower, Thomas and Mitchell indicate that penetration among small use customers has been slow because there is little profit, and therefore little incentive, for utilities to serve them.

[76] Given the number of rural electric cooperatives in Minnesota, this will be a critical issue as the matter of restructuring is considered in the Legislature and at the PUC. Reflecting the importance of this issue, Sen. Paul Wellstone, in his comments during the 1996 hearings on restructuring conducted by the Senate Committee on Energy and Natural Resources Committee, asked whether it is feasible to treat cooperatives like other utilities and if not, how should they be treated. His concern is "to ensure that retail competition does not leave rural America and rural people out in the cold." (See U.S. Congress, Senate, Committee on Energy and Natural Resources, Competitive Change in the Electric Power Industry: Hearings Before the United States Senate Committee on Energy and Natural Resources, 104th Cong., 2nd sess., March 6, 1996, p. 12.)

[77] Minnesota Municipal Utilities Association, Comments, p. 6.

that aggregation opportunities will emerge for municipal utilities, Appel Consultants, Inc. confirms MMUA's fears, stating that "the impacts of restructuring are likely to be severe and traumatic for some municipal utilities, especially those with uneconomic power plants or long term contracts to buy expensive power."[78] Indeed, MMUA reacts with alarm at the prospect of possible municipal bond default should those long term contracts become jeopardized or nullified.[79] The survival of some municipal utilities in Minnesota could well be in jeopardy in an open competitive environment, since, in the aggregate, two-thirds of municipal utility revenues come from only 13% of their customers (i.e., the commercial and industrial pool).[80]

Municipal utilities and rural electric cooperatives have received varied treatment in states that have already dealt with restructuring in a meaningful way. In some of those states, even though the restructuring plan applies to them, municipals and cooperatives, unlike the investor-owned utilities, are not obligated to functionally separate or divest their generation assets. Other states have given municipals and cooperatives the choice of whether or not to participate in the revised market, provided that if they choose to enter they would be bound by reciprocity rules that would permit others to compete for their customers.

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[78] Appel Consultants, Inc., Response Comments, p. 8.

[79] Minnesota Municipal Utilities Association, Comments, p. 5. Dave Schoengold, in a report commissioned by an organization formed by state regulators and state legislatures, echoes the Appel Report's ominous prediction and confirms MMUA's apprehension. "Publicly owned utilities could face severe consequences from retail competition...Municipal bond defaults, in the extreme, or higher rates for remaining customers, under a more moderate scenario, could occur," the report theorizes. See Dave Schoengold, The Unintended Impacts of Restructuring, National Council on Competition and the Electric Industry, October 1996, p. 17.

[80] See Appendix C, Section C.1.

Consumers vs. Investors

If there are gains for all, a disparity between those experienced by customers and stockholders may become an issue of concern. Again, the British experience may be a harbinger of things to come in the United States. There, though prices have fallen somewhat (from a relatively high level), "corporate profits have increased a great deal more, leading to concerns about the program's inequitable distribution of benefits between shareholders and consumers."[81]

Will Different Regions Within Minnesota Fare Differently?

Different Minnesota regions could experience different effects from restructuring. In his report -- one in a recent series commissioned by the National Council on Competition and the Electric Industry, a joint project of the National Association of Regulatory Utility Commissioners (NARUC) and the National Conference of State Legislatures (NCSL), whose members include the U.S. Environmental Protection Agency (EPA) and the Department of Energy -- Roger Colton surfaces the concern about what he terms "geographic diverging," meaning cost differentials based on customer location. The consequences of this phenomenon would be higher costs for low density (primarily rural) areas and lower costs for high density (primarily urban) areas.[82]

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[81] Brower and others, The British Electric Utility Restructuring Experience, p. 11.

[82] Roger Colton , Assessing Impacts on Small-Business, Residential and Low-Income Consumers (National Council on Competition and the Electric Industry, October 1996), p. 24.

Minnesota vs. Neighboring States

Whether Minnesota as a whole will be better off under a retail competition regime was debated by the panelists. The Appel Report asserts that lower cost states will reap the benefits of retail competition, but that conclusion is taken to task by Corneli, who charges it is unsupported and contradicts other information presented in the report. He reasons that in high cost states, where larger disparities between fixed and variable costs exist, substantial benefits can be had by refinancing (witness the "securitization" schemes passed by both the California and Pennsylvania Legislatures), but in states such as Minnesota, where operating and fixed costs are low and fewer alternatives to reduce cost exist, the degree to which gains are available is questionable.[83] Other experts speculate that lower cost Minnesota power will be swallowed up by higher cost states (like Illinois) and, in general, the country will experience flattening of rates. Rate equalization would serve states with high costs well but produce little benefit (or even raise prices) for states with low costs.

Another view is that Minnesota cannot afford to wait until others restructure and reduce their prices. Such procrastination, this view holds, would place Minnesota at a competitive disadvantage.

Fears also exist that Minnesota could lose a competitive edge should it approve a restructuring plan that imposes non-market based costs or regulatory mandates,

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[83] Securitization is not a free market mechanism, but a mechanism to refinance (and thus lower) utility debt and ratepayer burden through government issued securities. In California, it was the only way that residential customers would receive lower prices now, instead of several years hence, when utility stranded cost compensation was completed.

such as a Systems Benefit Charge or a renewables portfolio standard, that are not required in neighboring states.

Productivity Gains or Environmental Losses?

Proponents of restructuring foretell of great efficiency gains in production that, they claim, will lead to economic benefits for all. A Clemson University study estimates that the introduction of competition will spur sales of currently unused capacity, producing a positive benefit by filling the daily, monthly and seasonal valleys of usage patterns. According to these analysts, because of efficiencies and better load shapes, electricity production will increase by about 25% and consumption will rise about 42% without the need to add one new generator or transmission line.[84] They also speculate that more electricity use means more jobs -- between 1.0 million and 3.5 million new jobs is their estimate of one of the impacts of restructuring.[85]

Critics mention that, in considering the effect of restructuring on jobs, the negative impacts of utility mergers and downsizing (i.e., job losses) need to be considered in evaluating overall economic consequences. Further, notes the Center for Energy and Environment, one of the potential fallouts from restructuring is the diminution of demand-side management (DSM) and energy efficiency programs, which would be accompanied by additional and significant job loss.

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[84] According to the Center for Energy and Environment, Minnesota has already made a strong effort to improve load shapes and restrain the growth of peak load. CEE questions whether the State will reap the benefits that such analysts suggest are available.

[85] Maloney and McCormick, Customer Choice, Consumer Value, pps. ix-x, 38.

Others are concerned that productivity gains will come at the expense of the environment. Many envision the increased operation of older power plants. That result coupled with "[l]ower electricity prices will lead to higher electricity consumption and perhaps higher levels of emissions; this suggests the possibility of further environmental degradation."[86]

Adding to this concern is the possibility raised by some that, due to the dissolution of traditional regulatory provisions for cost recovery and the imminent repeal of the Public Utilities Regulatory Policies Act (PURPA), there will be a reticence to invest in new (i.e., cleaner) generation facilities when, in the not too far distant future, additional and replacement capacity will be required.

State and Local Tax Implications

According to one recent analysis, "competition is likely to cause [tax] revenues to decline in many jurisdictions. This could result from lower electricity prices, a shift in market share from more to less heavily taxed providers, and declining values of property owned by utilities." Over the long term, however, losses may be offset or even outpaced by gains stemming from the competition's anticipated economic dividends because "lower energy prices encourage businesses to invest in plant and equipment and thereby increase the rate of economic growth."[87]

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[86] Timothy Brennan and others, A Shock to the System (Washington, D.C.: Resources for the Future, 1996), pps. 13-14.

[87] Deloitte & Touche, LLP., Federal, State and Local Tax Implications of Electric Industry Restructuring, National Council on Competition and the Electric Industry, October 1996, pps. x, 22.

For some time, electric utilities have been a major source of tax revenues, and have served as both taxpayers and tax collectors for state and local jurisdictions. In 1995, for example, utilities paid more than 48% of all property taxes received in Goodhue County.[88] As states move to reconfigure the industry, they will need to: (1) consider the implications on service and program delivery should tax revenues decrease; and (2) prevent the unintended creation of an unlevel playing as a result of the tax structure.

Preservation of tax based service delivery is being recognized and addressed in some states. Massachusetts, for one, has taken steps to protect municipalities against expected loss of electricity company property taxes associated with diminished plant values. Under its proposed restructuring plan, Massachusetts would require utilities to pay municipalities a portion of the stranded costs they are permitted to recover commensurate with the market value for the assets for which such recovery is authorized.

What about Nuclear Decommissioning Costs?

Dr. Shirley Ann Jackson, Chair of the U.S. Nuclear Regulatory Commission (NRC), recently expressed concern that restructuring may have "profound impacts on the long-term ability of...power reactor licensees to obtain adequate funds to operate and to decommission their nuclear plants safely."[89] Under NRC regulations, power reactor license applicants must demonstrate financial fitness. Evidence of adequate

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[88] Joel Hoekstra, "A Jolt to the System," Twin Cities Business Monthly, 4 (January 1997), p. 55.

[89] Shirley Ann Jackson, Current Regulatory Challenges, Address to Nuclear Power Reactor Safety Course, Massachusetts Institute of Technology, Boston, July 22, 1996, p. 1. http://www.nrc/gov/; Internet, accessed October 31, 1996.

capital on hand, possession of a surety instrument or, most typically, the accumulation of sufficient funds through rates over the life of a plant are three methods by which an applicant can meet the NRC's criteria. In a recent Policy Statement, the NRC expressed its fears that if licensees are no longer subject to regulatory ratemaking, sufficient funding for operating and decommissioning nuclear plants may not be available, and thus, public health and safety could be jeopardized. To guard against such an occurrence, the NRC is proposing new rules imposing additional financial qualifications for current licensees to insure against those fears being realized.

3.3.3 Determining the Industry Model

Increased wholesale competition in the electric utility industry has been facilitated by both PURPA in 1978 and the Energy Policy Act of 1992 (EPACT). The recent issuance by the U.S. Federal Energy Regulatory Commission (FERC) of orders pursuant to EPACT requiring open access to the nation's transmission system paves the way for the introduction of retail competition.[90] The timing and nature of competition in the electric industry is still a matter of some debate. This was addressed by many of the panelists.

Corneli agrees with the Appel Report's assessment of the current utility industry in Minnesota, which it characterizes as exhibiting, among other things, low regional production costs, low power plant fixed costs, and excess capacity (which is,

[90] U.S. Federal Energy Regulatory Commission, Docket Nos. RM94-7-001 and RM95-8-000, Order No. 888 and Docket Nos. RM95-9-000 and RM96-11-000, Order 889, Issued: April 24, 1996. A further description of these orders may be found in Appendix E.

however, projected to diminish within the next decade).[91] Where Corneli parts company with the report is in the analysis of the implications of these conditions. In a retail wheeling context, he infers, these circumstances bode well for only a few buyers and only for a short time. By contrast, under a wholesale wheeling regime, he concludes that all consumers might benefit from these short term benefits.[92] Others support the Appel Report's preference for retail access.

All three of the bills introduced in Congress last session would require retail competition either sooner or later. And, the introduction of retail competition for all customers (some through various phase-in approaches) is mandated in the four states in which legislatures have spoken on restructuring. Further, in all other states where public utility commissions have indicated their intentions, utilities would be required to open their systems to retail competition. (New York will introduce wholesale competition first, then, one year later, retail competition.)

The Minnesota Public Utilities Commission's Competition Work Group, in its recently completed Wholesale Competition Report, "exhibited near universal support for increased competition at wholesale," while some believed only direct retail access would bring the full benefits of competition to Minnesota electricity consumers.[93] The

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[91] Some argue that wholesale and/or retail competition will bring with it the incentive for entrepreneurs to build new generators and sell power into the market. This, they proffer, will cause more, not less, capacity to become available.

[92] To support his hypothesis, Corneli points to the recent long term agreement between Minnesota Power and Minntac as evidence that customers with the most to gain under a retail competitive system are wagering that they will be better off locking in rates from their current monopoly supplier than they would be shopping for a better deal on the open market.

[93] Minnesota Public Utilities Commission, Electric Competition Work Group, Wholesale Competition Report, October 18, 1996, p. iii. (The Electric Competition Work Group expects to complete and present its Retail Competition Report shortly.)

group was divided as to whether Minnesota's policymakers should adopt wholesale competition instead of retail competition, wholesale first, then retail competition, or wholesale and retail competition simultaneously.[94]

There are varying opinions as to whether or not Minnesota should engage in a retail wheeling pilot. Some believe it will allow a test of one or more approaches and provide guidance for a final determination on restructuring. Others contend that pilots are artificial, only benefit the selected few participants, do not accurately reflect true market conditions, and are useless for providing wisdom regarding energy policy. Pilot retail wheeling projects are underway or being considered at least nine states.

3.3.4 Preserving Public Benefits

The current regulatory system has come under attack for its failures to provide proper incentives for utilities to operate with economic efficiency. An increasingly

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[94] Once this debate is settled, Minnesota will need to decide on the specific industry model. Three are generally being discussed throughout the nation: a "Poolco"; "Bilateral Contracts"; or some hybrid. In a "Poolco" model, the short term price is set in a centralized spot market; electricity is bought and sold as available. In most scenarios, an Independent System Operator (ISO) would be established as a neutral and independent organization with no financial interest in any transmission or generation facilities. Its function is to operate the system and coordinate and balance supply and demand, usually dispatching the most economical power. A variation on this model utilizes an ISO for system operation and establishes a separate Power Exchange (PE) to manage the financial transactions. In a "Bilateral Contracts" model, electricity transactions take place under individual contracts between buyers (e.g., distribution utilities, aggregators, marketers, brokers, or direct end use customers) and sellers, generally involving agreements for future purchase prices and delivery dates. (One observer likened the spot market approach to purchasing a magazine at the newsstand and the bilateral contract approach to taking a subscription.) In a hybrid model, a spot market and bilateral contracts operate simultaneously. In all models, the ISO oversees the transmission system to ensure reliability. However, the degree to which the ISO is involved in financial transactions and effectuates economical dispatch of generation resources depends on the choices of the participants. Note: MAPP has recently determined that if it is chosen as the region's ISO, it will functionally separate operational and transactional responsibilities.

popular view holds that the marketplace can do a better job than regulators have in producing lower electricity prices.

If regulation has fallen short in producing the lowest prices, it has, most agree, done a better job than the marketplace probably would otherwise have in obtaining for consumers what are known as "public benefits." Public benefits are commonly understood to include the following:

- Renewable Energy
- Environmental Protection
- Energy Efficiency
- Low Income Programs
- Consumer Protections

How these areas will -- and should -- fare under a retail competition regime is the subject of vigorous debate. A number of interested parties contend that the fate of public benefits is best left to the marketplace. Others argue that it is essential that mechanisms be installed to preserve these value-added system attributes. Still others believe that they should be maintained, but funded through general taxes rather than a surcharge on electricity providers or customers. One reasonable opinion is rendered by Richard H. Cowart, Chair of the Vermont Public Service Board, who, in testimony before the Senate Committee on Energy and Natural Resources, exhorts policymakers to "find ways to harmonize the objective of decreasing electricity prices with these other important public goods."[95] The way in which restructuring in Great Britain has transpired may be

[95] Richard H. Cowart, U.S. Congress, Senate, Committee on Energy and Natural Resources, Competitive Changes in the Electric Power Industry: Hearing Before the United States Senate Committee on Energy and Natural Resources, 104th Cong., 2nd sess., March 6, 1996, p. 24.

instructive in this area. According to one detailed report, the British restructuring experience "clearly indicates that special mechanisms are needed to ensure support of renewable energy and energy efficiency programs in a competitive industry."[96]

Renewable Energy

As the Department of Public Service points out, "Minnesota law strongly encourages the development of renewable resources."[97] Indeed, Minnesota statutes prohibit the PUC from approving a new or retooled energy facility in a resource plan unless the utility has demonstrated that a renewable facility is not in the public interest.[98] And, of course, the 1994 Prairie Island legislation established a requirement for NSP to install a minimum amount of renewable capacity. Whether and how these laws might be modified in light of restructuring remains to be seen.

The Appel Report claims the introduction of retail competition, coupled with appropriate government stimuli, will provide the greatest assurance that renewable energy will be competitive and utilized in a restructured energy market. Many of the panelists strenuously disagree.

The Minnesota Municipal Utilities Association, the Izaak Walton League and Minnesota Energy Consumers all oppose the report's conclusion in this regard. Many find the link between satisfying 100% of Minnesota's energy needs through renewable

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[96] Brower and others, The British Electric Industry Restructuring Experience, p. 33.

[97] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 1, p. 6.

[98] See Minn. Stat. § 216B.2422, Subd. 4.

sources and recommending a rapid transition to retail competition tenuous at best, non-existent in the extreme. Minnesota Power, for instance, remarks that full competition "will likely slow down the move to add renewable generation resources and encourage the sunsetting of renewable...initiatives."[99] MMUA reasons that a "least-cost-at-all-cost industry model hardly seems...to be the best strategy for fostering a major shift to reliance on comparatively high-cost renewable resources."[100]

MMUA and IWL comment further that, contrary to the Appel Report's assertion, promotion of renewables will fare just as well under a wholesale competition industry model as under a retail competition one, with or without divestiture of generation assets.

There are some who believe that renewable energy should have absolutely no influence on restructuring decisions. The Center for Energy and Economic Development, for instance, emphatically articulates the following position: "The prospects for renewable resources cannot be a determinative factor for the State of Minnesota as it decides energy policy in a restructured industry. At least for the foreseeable future, renewable resources will not represent a substantial part of the baseload electricity generation mix in Minnesota."[101]

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[99] Minnesota Power and Otter Tail Power, Comments, p. 8.

[100] Minnesota Municipal Utilities Association, Comments, p. 7.

[101] Winthrop & Weinstine, Comments of Center for Energy and Economic Development on EETF Reports, November 26, 1996, p. 6.

Strategies to Promote Renewable Resources

The Appel Report proposed a number of strategies the State might employ to ensure early implementation of the "sustainable scenario" and assist and accelerate the transition to renewable energy sources. This report lists, among others, restructuring the industry to allow customers to choose their sources of power; assessing emissions fees (such as a carbon tax on fossil fuel plants or a fee for the production of nuclear waste) to be used to provide incentive payments to producers and consumers for renewable energy production and purchase; facilitating assured markets; providing incentives for phasing out conventional fossil and nuclear plants; establishing a renewables portfolio requirement; and instituting a nonbypassable charge on all electricity consumers.[102]

DeLong supports a carbon tax, explaining that Minnesota cannot afford not to impose a fee on polluting sources for fear of encouraging their construction and use in the State.[103] Minnesota Municipal Utilities Association finds the imposition of such as tax to be inimical to competition since it would raise Minnesota's electricity prices relative to competing neighbor states. Corneli observes that such unilateral action of the part of Minnesota would likely shift in-State production to other regions, thus resulting in the loss

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[102] A nonbypassable charge is an inescapable fee. If imposed on producers for connection to the electricity grid, it is generally known as an "access fee" or "entry fee"; if imposed on ultimate end users at the point of distribution, it is generally known as a "wires charge." It could take the form of a flat fee (e.g., as a surcharge applied uniformly to all customers), or be usage based (e.g., imposed on a per kilowatt-hour basis). The DPS has suggested other mechanisms that could be used for this purpose, including private donations, general taxes or a tax on all energy sources (e.g., oil, propane).

[103] DeLong urges that a fee be imposed on all electricity users based on the amount of service they take from carbon-based sources. He further proposes that the proceeds be used to fund new and upgraded renewables infrastructure, and that once completed, the facilities be sold to utilities to generate more funds to finance still more renewable infrastructure additions.

of economic benefit for the State. The Minnesota Chamber of Commerce vehemently opposes a carbon fee.

If given a choice of a mechanism to promote renewable resource use, Minnesota Power prefers incentives to a carbon tax or similar penalties, but is firm that renewable energy should be cost-effective, commercially proven and available on a utility scale. Further, Minnesota Power maintain, it should have demonstrated customer support. Corneli favors the promotion of renewable energy when new capacity is needed.

Others believe that the single most important policy initiative necessary to support the increased use of renewables is the making and assuring of a market. If the experience of PURPA serves as any guide, then indeed actions to ensure that renewable energy producers have buyers will ensure that renewable energy developers are plentiful and renewable sources are available.

Notably, no proposed federal or state restructuring plan includes a carbon or emissions fee of any sort. In fact, if explicit support of renewable energy is included, there are only three approaches nationwide that are being considered: a Renewables Portfolio Standard (RPS); a Systems Benefits Charge (SBC);[104] and so-called "green pricing" or other market based approaches.

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[104] Research and development (R&D) is another public benefit that, following restructuring, many believe will be in need of support through a Systems Benefits Charge. Traditionally, much of the utility R&D work has been conducted by a utility-funded organization -- the Electric Power Research Institute (EPRI). However, there is fear that R&D will be de-emphasized, at least in the short term, during the transition to and the beginning implementation stages of competition. While it will likely be in individual electricity providers' long term interests to develop new products, services and technologies, many policymakers believe a certain portion of funds raised through an SBC should be dedicated to maintaining an adequate level of research until such time as subsidization is no longer necessary.

Renewables Portfolio Standard

A renewables portfolio requirement is included in two of the three restructuring bills introduced last year during the 104th Congress -- Rep. Dan Schaefer's "Electric Consumers' Power to Choose Act of 1996" and Rep. Edward J. Markey's "Electric Power Competition and Customer Choice Act of 1996" -- as well as in the restructuring law of New Hampshire and the restructuring proposals of Arizona, Maine and Vermont.[105] Former U. S. Senator J. Bennett Johnston's "Electricity Competition Act of 1996" explicitly indicated states were not enjoined from promoting renewable generation, but did not require any minimum standard. Pennsylvania is the only state legislature or commission so far to reject regulatory intervention to promote renewable energy.

Michael Noble, Executive Director of Minnesotans for an Energy-Efficient Economy (ME3), maintains that establishing a portfolio standard is the only way that non-fossil fuels can compete in a competitive environment. ME3 and IWL contend that an RPS can and must establish a renewables market, because without such market there would be little incentive for investment and consequently little opportunity for the price of renewable energy to continue to decrease.

The Union of Concerned Scientists likens a renewables portfolio to a financial investment portfolio, suggesting that fuel diversification is necessary to protect utility investors (as well as consumers) against both prices increases of fossil and nuclear

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[105] New Hampshire requires that renewables account for 3% of each utility's load; Arizona proposes a set-aside of .5% of utility revenues for the acquisition of solar energy; Maine would require a minimum amount of renewable energy to be determined; and Vermont would continue funding for renewable energy at existing levels.

energy and unanticipated fluctuations in energy markets. The Department of Public Service also supports fuel diversity in the restructured industry, stating that "a renewable energy standard could ensure that renewables play an important role in our mix of electric generation sources."[106]

Minnesota Power contends that instituting a renewables portfolio standard is antithetical to a competitive system, and Minnesota Rural Electric Association finds an RPS to be too restrictive. The Center for Energy and Economic Development, while indicating support for resource diversity, expresses opposition to any fuel preference or required portfolio standard because such a mandate, it claims, would "distort the marketplace." In the opinion of the Minnesota Chamber of Commerce, the State should first evaluate how the market works in this regard, retaining the option of establishing a portfolio standard at a later date should the market fail to provide a level of renewable power deemed sufficient by the Legislature.

Systems Benefits Charge

A second option for promoting the inclusion of renewables in the energy mix of a restructured electric industry is the imposition of a Systems Benefits Charge, which consists of a nonbypassable fee, the proceeds of which are placed in a fund to support renewable energy projects and/or to subsidize producers or consumers of renewable energy. California and New York prefer this approach. The California Legislature, in what is perhaps the most widely discussed restructuring decision in the

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[106] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 7, p. 20.

nation, required that funding at current levels for renewable energy. In doing so, lawmakers allocated 40% to existing renewable projects, 40% to new projects, and directed the California Energy Commission to provide recommendations as to how the remaining 20% should be used. The legislature indicated its preference was a market based approach that: (1) rewards the most cost-effective renewable generation while fostering a market for renewable energy; (2) certifies eligible renewable energy providers; or (3) provides rebates for customers who purchase from renewable sources. New York seeks to use the proceeds from the SBC to fund renewable energy activity that would not otherwise take place in the competitive market.

Green Pricing

Most free marketers who address the issue at all prefer to allow "the discipline of the market" to work, and would leave the resolution of the renewables issue in the hands of the consumers themselves. They thus prefer a green pricing approach, where consumers are offered the opportunity to purchase renewable electricity to meet all or part of their demand, and asked to pay a higher rate, or premium, generally the incremental cost difference for its acquisition by the supplier.

Touted by proponents as the appropriate market based response to determine the proper role renewables should play in a restructured electric industry, over 20 regulated utilities around the country and a number of municipal utilities have in place or are developing green pricing programs.[107] Advocates of this strategy believe it is

[107] Cooperative Power in Minnesota has recently approved a pilot optional renewable energy program and will be offering it to its member systems.

a good way for electric companies to market their product, to woo and retain loyal customers, and to provide a "value-added service."

Green pricing programs take many forms, ranging from a small premium (generally a few mills[108] per kilowatt-hour) to a substantial one ($18 per month for commercial customers at one utility). Other companies have used the approach of enabling customers to purchase "shares," or "round up" payment on the bill to the next dollar. Others have asked for voluntary ratepayer contributions. The Department of Public Service predicts that green pricing programs will increase renewable energy market share in the future.

Engelking accurately points out that the results of these programs has been somewhat mixed; some programs are oversubscribed while others do not reach expected participation levels. At the same time, there seems to be a common misperception that these programs are unattractive to nonresidential customers. One recent survey refuted this notion. "Research results from a number of studies suggest that an equal proportion of commercial and industrial...customers will also participate in green pricing programs...[and] they appear willing to pay dramatically more to support environmentally friendly electricity," according to a recent article in Public Utilities Fortnightly.[109]

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[108] One mill is one-tenth of one cent.

[109] Brian Byrnes and others, "Green Pricing: The Bigger Picture," Public Utilities Fortnightly, 134 (August 1996) p. 18. Byrnes also reports that the most popular residential green pricing programs are those with the lowest premiums.

There are those, however, who believe green pricing is not the answer to assuring the inclusion of renewable energy as part of the energy mix in a competitive environment. Some believe it simply will not produce any significant amount of use of renewable sources. (Expert panelist Steve Hoffman calls it "boutique electricity," which will only be purchased by upper income customers.) Others among the panel question whether retail competition is necessary for green pricing programs to flourish, noting (as has been indicated above) that many programs are already in place. Still others contend that green pricing is flawed because it produces a "free ridership" condition where only some pay for the environmental benefits enjoyed by all.

Several alternative ideas were offered. One commenter suggested giving preference to local investors in renewable projects. Another proposed the State create a "green utility" that would be established to compete in the market by providing only renewable energy.

Which Mechanism is Best?

One view holds that, regardless of how restructuring is accomplished, the result will be, like all markets, somewhat imperfect. Since the textbook economic model virtually never exists in the real world, advocates maintain that some government intervention is both necessary and proper to further public policy goals. Rader and Norgaard, in their recent article in The Electricity Journal, argue that "[e]quity and [economic] efficiency are improperly pitted against one another." They suggest, for instance, that it "is not 'inefficient' to ensure that all homes are heated on the coldest

winter day." They observe that "the problem of market imperfections is seldom acknowledged in discussion about restructuring electricity markets" and conclude that "[i]mperfections in competitive markets ought to be corrected through policies that affect how the market works."[110]

If *some* mechanism is required to correct for inevitable market imperfections, there is no consensus regarding which one is superior. Some states, while indicating in restructuring orders that renewable energy must have a place in the ultimate energy mix, are leaving their options open as to the appropriate mechanism to ensure it does. The Massachusetts Department of Public Utilities, for example, has asked the legislature to determine whether simply encouraging direct purchase of renewables, instituting a renewables portfolio standard or establishing a nonbypassable Systems Benefits Charge is best.

Environmental Protection

Some fear that environmental degradation will accompany electric industry restructuring -- either wholesale or retail. As the New Hampshire Public Utilities Commission states in its proposed restructuring rules, there is "general concern that the introduction of competition...will encourage greater use of facilities that are subject to less stringent environmental standards."[111] Because older plants may not be subject to the

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[110] Nancy A. Rader and Richard B. Norgaard, "Efficiency and Sustainability in Restructured Electricity Markets: The Renewables Portfolio Standard," The Electricity Journal, 9 (July 9, 1996), pps. 38-39.

[111] State of New Hampshire Public Utilities Commission, DR 96-150, Restructuring New Hampshire's Electric Industry: A Preliminary Plan, September 10, 1996, p. 54.

same standards as newer plants, observers are fearful that such plants will enjoy an undue competitive advantage, operate more often and generate higher harmful emissions.[112]

New Hampshire and some other states which have enacted or proposed restructuring rules have addressed this concern by requiring old source generators to meet new source standards by some date certain, or by installing an emissions cap.

Another view holds that increased use of electricity will lead to lower emissions, as electrotechnologies replace other commercial and industrial processes that produce greater pollution. In addition, some see restructuring as encouraging the entrance into the market of new players, whose "entry might alter the age profile of generating plants, perhaps favoring newer, less-polluting facilities."[113] In Minnesota, 75% of in-State natural gas facilities and 65% of in-State oil plants are 20 years old or less. (But these sources, combined, account for about 15% of the total in-State generating capacity.) In contrast, six in ten of the State's coal plants are 30 years old or *older*, and this source accounts for over 60% of in-State generating capacity.[114] Lee and Darani, in a recent Electricity Journal article, support this view, speculating that wholesale competitive generation will spur new construction, "competition, coupled with strategically wise environmental regulation [e.g., applying new source environmental standards to old source

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[112] Any new electricity facility which has significant environmental impacts is subject to the environmental impact statement requirements of the Minnesota Environmental Rights Act (Minn. Stat. § 116B.09) and the Minnesota Environmental Policy Act (Minn. Stat. § 116D.04).

[113] Brennan and others, A Shock to the System, pps. 13-14.

[114] Coal facilities can operate efficiently for 40 years or longer. Of course, a significant amount of the electricity consumed in Minnesota is produced elsewhere. See Appendix C-3 for a table showing the age of generating units in the State.

power plants], has the potential to offer a more environmentally friendly alternative to cost-of-service regulation...."[115]

Energy Efficiency

The Izaak Walton League takes the Appel Report to task for its failure to place substantially more emphasis on energy efficiency. IWL claims that relatively small investments in energy efficiency could offset potentially large investments in renewable sources.[116] The Department of Energy, for example, reports that investment in energy efficiency programs can stimulate the local economy, produce a more favorable economic multiplier, stimulate more economic activity and create more jobs than payment of energy bills.[117]

The Center for Energy and Environment has proposed a number of alternatives to enhance and improve the delivery of energy efficiency in the State, including the development of a revolving loan fund, seeded through the issuance of low interest State bonds, that would finance cost-effective projects initiated by the State and/or proposed by private and nonprofit groups.

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[115] Henry Lee and Negeen Darani, "Electricity Restructuring and the Environment," The Electricity Journal, 10 (December 1996), p. 12. They also point out (on page 13) that early retirement of nuclear facilities leads to higher pollutant emissions, since coal, oil and natural gas are the likely replacements.

[116] Izaak Walton League of America, Comments, p. 7.

[117] U.S. Department of Energy, National Renewable Energy Laboratory, Energy Efficiency Strengthens Local Economies, http://www.eia.doe.gov/; Internet, accessed October 31, 1996.

The Appel Report, though presenting a range of both technical and practically achievable energy efficiency gains, does not propose to utilize this option in its sustainable scenario.[118] Expert panelist Phil Smith suggests that the State, perhaps in partnership with the electric industry, should take a new approach to conservation and efficiency, supported perhaps by a Systems Benefits Charge, which features a combination of targeted, highly cost-effective retrofits, an aggressive consumer information/education campaign, and market transformation initiatives.

By law, Minnesota utilities are required to spend a certain percentage of their gross operating revenues on demand-side management activities.[119] The continuation of this mandate may be jeopardized by the introduction of competition. Lee and Darani reach the "inescapable conclusion" that there will be less investment in and poorer cost-effectiveness results connected with DSM and energy efficiency as we move from higher cost to lower cost electricity."[120] Some promote "market based DSM," where there are no minimum expenditure requirements or any form of government

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[118] The consultants indicated that energy efficiency gains are projected to be no more than 1.8% per year from utility DSM programs through 2016 (under current industry structure), that maximum future technical potential for savings is 27%, and that realistic potential is in the 15% to 19% range. Studies indicate that the technical potential is as high as 45% and, for certain select industrial uses (motors, for instance), 70% savings are possible. (See R. Neal Elliott, Electricity Consumption and Potential for Electric Energy Savings in the Manufacturing Sector (Washington, D.C.: American Council for an Energy-Efficient Economy, April 1994) and Barakat and Chamberlin, Inc., Efficient Electricity Use: Estimates of Maximum Energy Savings (Washington, D.C.: Electric Power Research Institute, March 1990)). These estimates are for technically achievable savings and do not utilize any of the many cost/benefit measurements commonly applied.

[119] Under current statute, municipal utilities and natural gas utilities must spend 0.5% of their annual gross operating revenues on DSM; cooperative utilities and investor-owned utilities that do not operate nuclear facilities 1.5%; and utilities that operate nuclear facilities (only NSP) must spend 2.0%. (See Minn. Stat.§ 216B.241.)

[120] Lee and Darani, "Electricity Restructuring and the Environment," p. 12.

intervention, but rather a system wherein energy services companies market and provide energy efficiency just as generating companies market and sell electricity.

The Department of Public Service suggests that "there may still be many barriers to energy efficiency that the State has an interest in overcoming. [Therefore], the State could require all future power marketers (i.e., entities that sell energy to end-use customers) to deliver a certain level of energy-efficiency services."[121] Minnesota Power and Minnesota Rural Electric Association oppose mandates, the former proposing that future energy efficiency investments be driven by customer choice, the latter preferring investment driven by provider choice.

Two of the three pieces of legislation introduced last year in Congress either required a minimum level of spending on energy efficiency or required states to consider how to promote energy efficiency in their restructuring plans, and all except one state in which restructuring legislation has been passed or a PUC order issued mandate the continued provision of energy efficiency services.

Some, including the Center for Energy and Environment and the New York State Public Service Commission, believe that mandated efforts should apply only to those areas that would not naturally occur in the market. Others question leaving responsibility for the provision of energy efficiency services to the utilities for fear they would use this activity to exercise horizontal market power.[122]

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[121] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 4, p. 19. Some of the barriers the DPS mentions are serving renters and the lack of financing available for small businesses to accomplish energy efficient improvements.

[122] Horizontal market power exists when there are an insufficient number of competitors of sufficient size to establish a truly competitive market.

Lee and Darani suggest a better alternative would be to vest authority for this function with an existing or newly created independent entity. A successful model they and others cite as having national applicability is the North Carolina Alternative Energy Corporation (NCAEC), an independent, nonprofit group that, like the Legislative Commission on Minnesota Resources (LCMR), administers dedicated funds and chooses and oversees the implementation of worthy projects. NCAEC works with utilities and other private energy companies, state and local government agencies and other nonprofit organizations to deliver only the most cost-effective energy efficiency programs.

Low Income Programs

Historically, according to the Energy CENTS Coalition, about 105,000 Minnesotans receive low income energy assistance each year. If "low income" is defined as categorically eligible for Conservation Improvement Program (CIP) services or cold weather disconnection moratorium protection, ECC advises, then over one million (or 25% of all Minnesotans) would be considered in this category. ECC and others are concerned that restructuring will bring with it dire consequences for this segment of customers. In his analysis of a restructured market's potential impacts on certain customer segments, Roger Colton has determined that "low-income customers in particular are not well-positioned to take advantage of competition...."[123]

So far, every state that has passed legislation or promulgated rules or proposals about restructuring has either maintained or expanded current low income

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[123] Colton, Assessing Impacts, p. 1.

program protections. The question appears to be not so much whether the continuation of low income customer programs is at risk, but how they will be funded in an altered industry.

The Department of Public Service maintains that the needs of low income customers require attention, but, reasoning that unaffordability is a "societal problem," believes that any low income programs be financed through general funds. Minnesota Rural Electric Association, Minnesota Power and the Minnesota Chamber of Commerce concur that low income programs should continue, but that they be taxpayer, not ratepayer, supported. The Attorney General's Office, on the other hand, believes that a Systems Benefits Charge is the appropriate funding mechanism.

ECC, noting that low income Minnesotans pay four times as much for energy as a percentage of their income as do median income families, asserts that affordability is indeed the problem, maintains that continued funding for low income programs is vital, and suggests a combination of funding mechanisms, including a Systems Benefits Charge supplemented by general funds to the extent they are necessary to address the problem.

Consumer Protections

Consumer advocates worry that one outcome of restructuring will be the dilution of protections for all consumers, but particularly for the low income, non-English speaking and elderly, in such areas as disconnection (especially during the winter months), deposit and collection policies, and dispute resolution. Some fear that, as it is in the

restructured telecommunications industry, "slamming" will be rampant.[124] The Minnesota Municipal Utilities Association admonishes the Appel Report for its "cavalier approach" to consumer protection issues.

According to analysts and observers, lower quality service for some is a potential outcome of restructuring. They warn of a possible condition where certain customers might have difficulty in obtaining service depending on ability to pay or geographical location ("redlining"). Some see "reverse redlining" as a more serious problem, where unscrupulous merchants prey on vulnerable communities by charging unreasonable prices, imposing harsh conditions of service or perpetrating illegal schemes. Many states are requiring sellers to obtain licenses before being permitted to compete.

Under rate of return regulation, the quid pro quo for monopoly franchise rights has been the "obligation to serve." Essentially, all companies granted an exclusive service territory are required to provide nondiscriminatory electricity service to all who request it. In a new system, where the notion of franchises would be obsolete, whether all customers will be served becomes an issue of great concern to consumer advocates. In a retail wheeling world, low use, poor credit history and geographical location are some of the reasons advocates say certain customers or groups of customers may be left without a supplier willing to serve them. The rules for any new industry model, they insist, must ensure "universal service" -- access to and affordability of electricity through provisions that require a "provider of last resort," a standard service offering, and rules that facilitate

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[124] "Slamming" is the unauthorized switch from one's chosen provider to a different service provider. Many states are including anti-slamming provisions in their restructuring laws and rules.

aggregation for all customer segments. The establishment of provider of last resort requirements is occurring with regularity around the country.[125]

Finally, the issue of customer confusion has been raised as one that requires attention in the restructuring process. The introduction of more choices and more competitors, it has been suggested, brings with it responsibilities that some consumers will welcome and a fair percentage will perceive as a burden. If the experience with telephone industry deregulation is any indication, then many consumers will be resistant to change, will experience confusion at the many options available, will feel (and in many cases be) ill-prepared to make informed choices, and will be confronted with a barrage of solicitations (including the dreaded dinner time telemarketing calls) they would prefer to avoid.

3.3.5 Ensuring Competitive Markets

The Appel Report urges that, along with moving toward retail competition at the earliest possible time, the State require competitors to fully divest themselves of their generating assets so as to prevent the one obstacle to competition that most observers agree has the greatest likelihood of negating any of its potential benefits: market power.

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[125] Mechanisms vary. They include: designating the distribution company as the provider of last resort; establishing an auction for customers who otherwise would not be served; making random assignment; obligating companies to serve a percentage equal to their proportion of market share; or creating a "pay or play" system, where the supplier either serves unwanted consumers in the markets they enter or pays a rival or the distribution company to provide service; or a "tradable obligations" system, which would work much the same way that tradable emissions allowances do.

Of the two types Corneli identifies, he suggests that horizontal market power is the one most likely to occur in Minnesota.[126] Interestingly, Corneli and NSP both dispute the Appel Report's conclusion that divestiture will prevent the exercise of undue market power, but they reach the identical conclusion from opposite points of view. Corneli, calling the Appel Report's conclusion on this score "overly simplistic," warns that divestiture may not be sufficient to check anti-competitive behavior, and it may have adverse ancillary effects as well (e.g., raising costs, jeopardizing system reliability).

Northern States Power, which would likely be most affected by the Appel Report's recommendation in this area, alleges that the consultants present insufficient evidence to conclude that the incumbents will exercise undue market power. The company claims that regulators will provide the necessary scrutiny to ensure that an anti-competitive outcome does not occur, and it agrees with Corneli to the extent that costs might actually increase as a result of any divestiture of assets due to a loss of economies of scale. DeLong opposes divestiture for municipal and cooperative utilities because, by his logic, they are beholden to citizens, citizen-owners and boards, and are in the best position to support and coordinate local investment in renewable energy projects.

By contrast, the Izaak Walton League and Energy CENTS Coalition underscore the need to be watchful of the dangers posed by, and institute adequate

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[126] The other type he identifies is vertical market power, which, he explains, occurs when one firm controls generation, transmission and distribution, and engages in self-dealing between the regulated monopoly transmission and distribution companies and the unregulated generation company. Exercising vertical market power, a firm can control market price. As noted previously, horizontal market power exists when one firm, by virtue of its size, is so dominant over its competitors so as to effectively thwart competition. Under these conditions, a firm with horizontal market power can charge prices above what a robust competitive field would otherwise generate.

protections against, market power.[127] The Minnesota Municipals Utilities Association appeals to policymakers to "maintain the health and viability of our municipal and cooperative utilities...."[128] ECC and MMUA remind that it was the very practice of unbridled market power and the abuses of utility monopolists in the 1920s that led to the enactment of the Public Utilities Holding Company Act (PUHCA) in 1935, and subsequently to the regulatory system that is under attack today. MMUA, in particular, finds the report's conclusion regarding divestiture incredible, scoffing that the consultants make an "heroic" assumption that market power will be restrained.

The Effect of Mergers

According to the Chair of the Vermont Public Service Board, the market power problem "is likely to worsen with the disaggregation of vertically integrated monopolies...and mergers and acquisitions...."[129] A trend toward mergers, consolidations and acquisitions has already manifested itself with a vengeance, even before the final configuration of the electric industry has been settled. (In 1996 alone, there were 52

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[127] Another area in which watchdogs are fearful regards the industry structure and the ramifications of which model is chosen. The Center for Energy and Environment favors the "Poolco" model because it not only ensures economic dispatch of power, but it also guarantees access to the power market by smaller users. Others see the Poolco as another bottleneck and prefer the bilateral contract approach. See footnote 93 for a description of the Poolco and bilateral contract models.

[128] Minnesota Municipal Utilities Association, Comments, p. 6.

[129] Cowart, Senate Hearings, p. 23.

mergers or acquisitions in the gas and electric industry.)[130] Some predict that what is now an industry of about 250 investor-owned utilities will someday have as few as 50, or perhaps even less.[131]

According to industry analyst Carmen D. Legato in a recent article in Public Utilities Fortnightly:

> ...one can predict that most mergers of utilities that operate within the same power pool...will be anti-competitive. Mergers of interconnected utilities can, and generally will, create or exacerbate undue concentration of ownership in the market for generation and the sale of power, which will dampen competition upon deregulation.[132]

Being closely watched in both Minnesota and Wisconsin is the proposed merger of Northern States Power and Wisconsin Electric Company (WEC), parent of Wisconsin Electric Power Company, into the mega-utility, Primergy. Critics of the union in both states are concerned that the very consequences about which Legato forewarns will be realized. Confirming those fears to some extent is an analysis of the proposed merger by FERC staff, which found that Primergy "will possess considerable market

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130 Charles Bagli, "Merging Utilities," Star Tribune December 16, 1996: p. D4. One of those 52 mergers was the first major joining of a natural gas company (Enron) and an electric utility (Portland General Corporation). This event perhaps signals the shape of things to come, as former gas and electric rivals unify into full service energy companies. See Charles M. Studness, "Converging Markets: The First Real Electric/Gas Merger," Public Utilities Fortnightly, 134 (October 1, 1996), pps. 21-25.

131 Evidence that this may well be the future configuration of the electric industry may be found in the restructured telecommunications industry, where a number of Regional Bell Operating Companies are merging (e.g., NYNEX and Bell Atlantic).

132 Carmen D. Legato, "Electric Mergers: Transmission Pricing, Market Size, and Effects on Competition," Public Utilities Fortnightly, 134 (June 1, 1996), p. 23.

power over certain constrained interfaces and that an incentive exists to exercise that market power." [133]

Of the states having already ruled on restructuring, only Maine has required divestiture, to be accomplished in stages: separation into generation affiliates will be required by the year 2000, complete divestiture by 2006. The remaining states either require only functional separation of generation or "encourage" or indicate "preference" for divestiture.

3.3.6 Maintaining and Improving System Reliability

Following the Great Northeast Blackout of 1965, utilities voluntarily organized into nine principal "regional reliability councils," coordinated by the North American Electric Reliability Council (NERC). The Mid-Continent Area Power Pool (MAPP), one of the nine regional councils, serves the Midwest, including all of Minnesota.[134] The prime goal of the councils is to ensure transmission system dependability.

Virtually all interested parties to the restructuring debate would agree that reliability cannot be compromised in a competitive climate. However, there are those who fear that changing the structure of the industry could place the safety and reliability of the

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[133] Edison Electric Institute, Retail Wheeling & Restructuring Report, 3 (September 1996), p. 31. It should be noted that a FERC administrative law judge recommended approval of the merger.

[134] In anticipation of the oncoming restructuring, MAPP has reorganized. As of November 1, 1996, upon receiving approval from the FERC, MAPP is organized into three distinct units: a Regional Transmission Group (RTG), which will be responsible for planning and operating the regional transmission system and setting a regional transmission rate; an Energy and Power Market, responsible for coordinating purchase and sales transactions; and a Regional Reliability Council, to ensure safety and reliability of the transmission system.

network in jeopardy. The Minnesota Municipal Utilities Association is critical of the Appel Report for "paying scant attention" to the transmission issue. MAPP also registers concern in this area, remarking that assuring reliability becomes more complicated as the number of transactions and the types of generators increase. As Minnesota Power points out, the system was built to serve native loads, not accommodate multiple transactions in a competitive market.

The International Brotherhood of Electrical Workers (IBEW) warns that utility downsizing has already compromised system integrity, and restructuring will only exacerbate system maintenance problems. IBEW contends that reduction in the labor force has led to less frequent maintenance and will result in slower response time if outages occur.

However, as the DPS points out, the MAPP system, to date, has been remarkably reliable, and has avoided the blackouts and brownouts of the East and, recently, the West. The MAPP grid interconnects south and east (and thus can accommodate the wheeling of power in those directions), but there is a bottleneck at the Western Intertie, inhibiting power transfers westward.[135]

The resolution of the reliability issue will be one of the most -- if not the most -- important aspects of any restructuring plan for Minnesota. While most observers agree that the creation of an Independent System Operator (ISO) is necessary to ensure the efficient and effective operation of the grid, the issue of ensuring system reliability poses perhaps the most technically complex, though likely not insurmountable, challenge

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[135] This system constraint has implications in a retail wheeling environment.

of all. In its Wholesale Competition Report, the PUC's Electric Competition Work Group has recommended "that the Commission support legislative change that would recognize the need for safe, reliable service in the building and siting of new transmission...."[136]

3.3.7 Addressing Stranded Costs

Stranded costs may be defined as any asset owned by a utility whose costs were being recovered in rates but are below market value and would be rendered uneconomical in a competitive environment. There is, to say the least, spirited debate around the country on this issue, and its resolution, says Kenneth Rose in An Economic and Legal Perspective on Electric Utility Transition Costs, "will have a major impact on the savings actually realized by consumers from industry restructuring."[137] As Rose notes, the notion of stranded costs is a "regulatory phenomenon," with "little basis in economic theory, [arguably] legal precedence or other deregulated industries."[138] Utilities are convinced of their right to full recovery, while others are sharply critical of any guarantee of stranded cost compensation. Still others suggest that if utilities are entitled to stranded costs (i.e., recovery of below market assets), then consumers are entitled to recompense to the extent profits or value exist with respect to above market assets.

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[136] Minnesota Public Utilities Commission, Wholesale Competition Report, p. viii.

[137] Kenneth Rose, An Economic and Legal Perspective on Electric Utility Transition Costs (Columbus: National Regulatory Research Institute, 1996), p. 1.

[138] Rose, pps. 7, iii.

How Much Are We Talking About?

Nationally, estimates of the magnitude of stranded costs vary wildly, from $135 billion (Sen. Frank Murkowski of Alaska); to $73 billion (Resource Data International, Inc.); to between $50 billion and $300 billion (Moody's); to $65 billion today, $46.3 billion if full restructuring is implemented in the year 2000 or $23.2 billion if full restructuring is implemented in 2010 (R.J. Rudden Associates, Inc.); and as much as $22 billion for the State of Texas alone.[139]

In Minnesota, estimates equally unclear, although there seems to be general agreement that they are relatively low in comparison to other states and regions. (This is due mostly to the fact that there are few, if any, long term independent power contracts at above market rates and Minnesota's nuclear plants did not experience excessive cost overruns, were not canceled prior to becoming operational and do not operate inefficiently. Where high stranded costs exist, these are the primary contributing factors.)

In fact, several estimates demonstrate there are *no* net stranded costs in the State. One estimate in particular, indicates that in Minnesota, there is, in total, a net asset amounting to $407 million.[140]

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[139] See Sen. Frank H. Murkowski, Senate Hearings, p. 2; Resource Data International, Inc., Energy Choices for a Competitive Era, The Role of Renewable and Traditional Energy Resources in America's Electric Generation Mix (Alexandria: Center for Energy and Economic Development, April 1995), p 1; Deloitte & Touche, LLP., Tax Implications of Electric Industry Restructuring, p. 17; Lori Burkhart, "New Estimates of Nuclear Stranding," Public Utilities Fortnightly, 134 (October 1, 1996), p. 14; and Texas Public Utility Commission, Staff Releases Stranded Cost Electric Investment Draft, Press Release: October 29, 1996, p. 1.

[140] This total is the sum of both projected above and below market assets among all the utilities in the State, including municipal and cooperative utilities, some of which would have stranded liability. Chris Seiple, Resource Data International, Inc., Electronic communication with author, February 4, 1997. cseiple@resdata.com. See also Maloney and McCormick, Customer Choice, Consumer Value, pps. 49-52.

Table 1 following indicates one recent stranded cost estimate for some of Minnesota's utilities:

Table 1. Estimated Stranded Cost

Utility	Forecasted Net Stranded Costs[141] (in millions)
Northern States Power	($ 624,658)
United Power Association	($373,788)
Cooperative Power Association	($ 334,775)
Minnesota Power	($ 212,866)
Southern Minnesota Municipal Power Agency	($ 102,784)
Otter Tail Power	($ 96,328)
Rochester Public Utilities	$ 120,799

Source: Seiple and Pearson, Resource Data International, 1997[142]

The Appel Report also indicates that stranded cost in Minnesota is expected to be low. (From that, Engelking reasons that current costs are close to market costs and thus, contrary to the consultants' claim, there is little to be gained by Minnesota consumers from retail wheeling.)

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[141] Net stranded cost, as defined by this study, includes wholesale sale offsets of assets and long term contract liabilities.

[142] Christopher Seiple and Al Pearson, Power Markets in the U.S. (Boulder: Resource Data International, 1997). Electronic communication to author, February 4, 1997. cseiple@resdata.com.

Should Stranded Cost Recovery Be Allowed?

Despite claims that stranded costs in Minnesota will be low or nonexistent, the issue stirs passions. For some, the recovery of stranded costs is a matter, not of law or economics, but of fairness. Others believe it is a matter of entitlement. Northern States Power criticizes the report for its cursory discussion of stranded cost. Invoking constitutional protections against confiscation, raising the specter of prolonged legal battles and insisting that the so-called "regulatory compact" be honored, the utility appeals ardently for full stranded cost recovery.

Whether or not such a regulatory compact exists is the subject of much disagreement. The utilities insist that it does, that they were promised rate recovery for their investments made to provide all the electricity demanded by all customers in their franchise areas, and that in spite (indeed because) of the fact that the rules of the game are changing, they are entitled to recover their investments.

Peter A. Bradford, former Chair of the Maine and New York Commissions, makes the case that there never was such a compact, that investors have long known that "serious losses, even bankruptcy were possible," that utilities are not insulated from technological change, that investors (through rates of return that reflected additional risk) have already been compensated, and that the United States Supreme Court, in several cases, has ruled that the Constitution does not protect utilities against loss in the value of assets due to operation of market forces.[143] He and others assert that,

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[143] Peter A. Bradford, "Till Death Do Us Part or the Emperor's New Suit: Does a Regulatory Compact Compel Strandable Investment Recovery?, PUR Utility Quarterly, Third Quarter Supplement (July 16, 1996), pps. 1-3. The two cases cited are: Public Service Commission of Montana et al. v. Great Northern Utilities Co. 289 U.S. 130,135 (1932) and Market Street Railway Co. v. Railroad Commission of California et al. 324 U.S. 548,567 (1944).

under traditional regulation, utilities are given only an *opportunity*, not a guarantee, to earn a return on their prudent investments.

Other observers cite additional reasons for disallowing or limiting stranded cost recovery. They contend that stranded cost has resulted from poor management, complain that utilities should not be "rewarded" for bad decision making, and suggest that well-managed, low cost utilities (not to mention ratepayers) should not be punished. Some say market entry will be blocked or impeded because of artificially high, distorted prices resulting from stranded cost recovery.

Some take a more pragmatic approach. Citing the Savings and Loan bailout, DeLong believes that it is better to develop a mechanism for stranded cost recovery in the context of restructuring the electric industry than to have the State and taxpayers ultimately pay the tab.

With certain conditions -- principally that stranded costs must be legitimate, verifiable and mitigated to the extent possible, and that they be calculated net of the value or sale of above market assets -- state legislatures and utility commissions that have already made restructuring decisions have generally allowed recovery. A few (viz., Maine, New York and Pennsylvania) explicitly indicate that there is no *guarantee* of recovery, but all would allow utilities to collect those costs they can verify as legitimate as defined by each state.[144]

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[144] The utilities in New York sued the New York Public Service Commission following its restructuring decision for, among other things, its failure to guarantee full stranded cost recovery One of the bases for the lawsuit was the allegation that the Commission violated the regulatory compact. On November 25, 1996, a New York Supreme Court judge denied the utilities' claim, and, based on prior United States Supreme Court decisions, stated that the utilities are neither guaranteed net revenues nor are they immunized against the effects of competition.

Possible Resolutions

The matter of stranded cost recovery raises many issues. Its resolution can have a significant effect on the degree and timing of consumer benefits arising from retail competition. Some analysts submit that, to the extent that consumers are saddled with these costs, the true gains of the marketplace will be delayed. Further, the method of calculation of stranded cost is critically important in determining the exact amount involved. One way or another, the issue of stranded costs will need to be addressed.

To the extent the exist, some options for resolution that have been mentioned include mitigation, write-offs, requiring only customers who leave the system to pay, and using government bonds to refinance and thus lower the debt (the solution adopted by California and Pennsylvania).

Another approach is proposed by Hartman and Tabors in The Electricity Journal. They developed the notion that different treatment for different assets be applied. Full recovery should be permitted, they offer, for those costs incurred as a result of regulatory or other government compliance requirements, while a sharing between shareholders and ratepayers should obtain to those costs that are rendered uneconomic by technological and systemic change.[145]

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[145] Raymond S. Hartman and Richard D. Tabors, "The Regulatory Contract and Restructuring: A Modest Proposal," The Electricity Journal, 10 (December 1996), p. 79.

3.3.8 The Future of Energy Planning

At present, Minnesota law calls for investor-owned utilities, generation and transmission cooperatives and municipal power agencies that own generation to file Integrated Resource Plans (IRPs) on a biennial basis. In addition, utilities may be required to file plans when proposing to construct generation facilities and to undergo a Certificate of Need assessment.[146] With the advent of competition, the necessity of these processes are being called into question.

The issues in question are whether the IRP and CON processes should continue at all in a restructured electricity world and, if so, in what form. Minnesota Power suggests that, at least during the transition to competition, the IRP process is valuable and should continue, but in a different form and with different goals -- to keep Minnesota's energy prices low and permit the acquisition of the least cost, most reliable resources. Others would like to see the process changed to remove any responsibility for environmental decision making from utility regulators (and leave it in the hands of the Minnesota Pollution Control Agency, the Minnesota Environmental Quality Board and the U.S. Environmental Protection Agency).

The determination of the appropriate role for an integrated resource planning process in a restructured electric industry will be a critical one for policymakers. Balancing the desire for economic benefits for customers and economic development for the State with the desire to maintain or improve environmental protections will be

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[146] See Minn. Stat. § 216B.2422 and Minn. Stat. § 216B.24.

extraordinarily difficult, for as one commentator observes: "The economy and the environment increasingly appear to be in competition."[147]

One thing appears to be certain: the current system of planning is ill-suited to any new industry arrangement. A few states that have passed restructuring rules have either eliminated or cast doubt on the value of their IRP processes.

Many believe that a more comprehensive and collaborative Statewide planning process is necessary. Others see an unnecessary overlap of the IRP and CON processes. Others, including the Appel Report, are calling for a regional planning process. Minnesota Rural Electric Association and others support the regional planning concept, but believe it should include not just electricity providers, but all energy suppliers and participants (e.g., marketers, aggregators, brokers). As the Izaak Walton League observes, there is no corollary energy and resource planning organization conforming to MAPP's area of jurisdiction.

One proposal takes a diametrically opposite tack. Rather than expand the planning function to encompass a wider geographical area, this approach, called Local Integrated Resource Planning, focuses planning efforts on discrete, confined and localized communities or regions.[148]

The PUC's Electric Competition Work Group found that the current planning process may be incompatible with competition, explaining that "[i]ndividual

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147 Mills • McCarthy & Associates, Inc., Sustainable Development and Cheap Electricity. An Evaluation of the Impact of Lower Electricity Prices on the U.S. Economy and U.S. Carbon Dioxide Emissions (Washington, D.C.: Western Fuels Association, Inc. October 1992), p. 1.

148 See Nicholas Lenssen, "Local Integrated Resource Planning: A New Tool for a Competitive Era," The Electricity Journal 9 (July 1996), pps. 26-36.

resource plans may not identify the most efficient market solution for electricity supply" and that "[c]ertificate of need proceedings...may be inappropriate when a facility is being constructed, at the owner's risk, as a merchant facility."[149]

At the same time, the work group correctly points out that "even in a competitive market, the state continues to have an interest in promoting reasonable planning...to ensure an adequate supply of low cost electricity within the state, and the appropriate and efficient use of the state's natural resources." It goes on to conclude that: "A planning process that focuses on Statewide energy, natural resources and environmental protection policies, to be uniformly applied to all participants in the electricity market, could be more efficient and more effective...."[150]

The PUC report's proposal appears to meet many of the needs of those who enumerate the deficiencies in the present planning process, although additional efforts would be required to accomplish the objectives of those who prefer expanding beyond the State's borders to work regionally in the planning context.

3.3.9 Process Options for Deliberations

The issue of electric industry restructuring will undoubtedly be one of the most difficult and significant decisions ever to come before the Minnesota Legislature. There are a number of decision making process options available. Several were suggested during the course of researching this report.

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[149] Minnesota Public Utilities Commission, Wholesale Competition Report, p. v.

[150] Minnesota Public Utilities Commission, Wholesale Competition Report, p. v.

Believing that the urgency to restructure in Minnesota is not as pressing as it is in higher cost states, some suggest a "wait and see" approach. These parties would put off addressing the issues until results of experiences and experiments occurring or about to occur in other states have been completed and provide insight or until Congress enacts restructuring legislation and provides direction to states. Another camp is persuaded that procrastination is inadvisable because waiting will needlessly deny Minnesotans the benefits that competition will inevitably bring. They argue that by failing to act Minnesota will fall behind its neighbors, put itself at a competitive disadvantage and miss the opportunity to determine its own fate.

Some have the sense that the issue will remain forever contentious unless the Legislature speaks forcefully, providing a vision of what it would like Minnesota's energy future to look like and requiring that all interested and affected parties collaborate to develop a legislative proposal that addresses each's needs and concerns. Some would leave the process more open, but believe the Legislature should set forth guidelines that would provide a structured framework within which discussions and negotiations among all concerned could take place.

The Citizens League suggests that public involvement is the key to success, and proposes that the Legislature, with or without the help of outside organizations, develop a comprehensive citizen involvement strategy to aid in sound policymaking.[151]

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[151] The Minnesota Public Utilities Commission has completed a round of public forums to both provide information to and gather opinion from consumers about the impending changes in the electric industry. The Minnesota Department of Public Service also held a series of public forums on the issues.

Chapter 4

NUCLEAR WASTE MANAGEMENT

Questions concerning the future disposal of and costs to manage the radioactive spent nuclear fuel[152] resulting from electricity production at Prairie Island are plentiful and perplexing, and their answers will have profound implications for the health, safety and welfare of all Minnesotans, the energy policy of the State, the economics of electricity production and consumption, and, in particular, the business fortunes of Northern States Power Company.

At present, NSP has enough approved dry cask storage capacity to operate the Prairie Island plants into the first few years of the next century. If no permanent federal storage facility will be available and if no interim storage facility is found, then the Minnesota Legislature once again will be faced with the dilemma of whether to: (1) approve what will undoubtedly be another NSP request for additional casks so Prairie Island can continue to operate; or (2) allow the plant to be prematurely shut down.[153] If forced to prematurely close, there is evidence from the earlier Certificate of Need proceeding that a combination of resource alternatives -- including wind and

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[152] Spent nuclear fuel is the radioactive by-product of generating electricity at commercial nuclear power plants. High-level radioactive waste (HLW) is the by-product of production at defense facilities.

[153] A shutdown in 2003 or thereabouts would be about 10 years before the units' licenses expire. However, these observations assume no change in electric industry structure. If and when restructuring occurs, unpredictable consequences relative to this issue may result. One possible outcome, for instance, is that NSP, either by choice or requirement, might no longer own the Prairie Island plants.

conservation -- could replace the plants' energy and capacity output (but at an indeterminate, though likely higher, cost).[154]

In the 1994 legislation, the Electric Energy Task Force was charged with investigating and analyzing a series of issues concerning the future and economics of nuclear waste management.[155]. The following section addresses each of following subjects, as set forth in the statute:

1. **The Removal of Nuclear Waste from Prairie Island**
2. **Cost Responsibility for Managing Waste**
3. **Cost Estimates for Managing Waste**
4. **Accident Probability and Liability**
5. **The Economic and Technical Feasibility of Reprocessing**
6. **Emerging Nuclear Technologies**
7. **Available Waste Handling Technologies**
8. **Alternative Storage Sites in Minnesota**
9. **Transportation of Nuclear Waste**

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154 See Allan W. Klein, PUC Docket No. E-002/CN-91-19 and OAH Docket No. 6-2500-5462-2, Northern States Power Company Application for a Certificate of Need, Findings of Fact, Conclusions and Recommendations, Issued: April 10, 1992.

155 The issues for investigation are set forth in the statute as a series of questions. The verbatim language with respect the information sought by the Legislature on nuclear waste management issues can be found in Appendix I.

4.1 Removal of Nuclear Waste from Prairie Island

At one time or another, burying it below the ocean floor or in polar ice sheets, or rocketing it into outer space, has been contemplated for the permanent disposal of nuclear waste.[156] Spent nuclear fuel will be removed from Prairie Island and the State of Minnesota for permanent storage when the repository that the Department of Energy is required to construct (currently contemplated at Yucca Mountain, Nevada) is completed.[157] The Department of Energy is required under the Nuclear Waste Policy Act of 1982 (NWPA) and contracts signed with utilities pursuant to it to begin accepting the nation's spent fuel by January 31, 1998.[158] Despite this mandate, there is *virtual certainty* that the deadline will be missed; the earliest date by which the removal of Minnesota's waste for disposal at a permanent national repository can reasonably be expected is no earlier than 2010.

There is, however, a far greater possibility that an out-of-state interim storage facility will be built by either the Federal Government (as directed by Congress) or by private and/or tribal interests, perhaps located on or near Native American land, and that such a facility will be most likely be available prior to both the need for the next series of casks by Northern States Power Company in about 2003.

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156 Concerns about threats to ocean eco-systems and prohibitions against ocean dumping, international treaties protecting Antarctica, and concerns arising after the explosion in 1986 of the Space Shuttle Challenger all combined to eliminate ocean, ice cap or space disposal as an option. The only two options remaining are above or below ground emplacement.

157 Yucca Mountain is about 100 miles northwest of Las Vegas, Nevada. It is on the southwestern edge of the Nevada Test Site in an uninhabited desert.

158 42 U.S.C. § 10222(a)(5). The permanent repository will be used for both commercial waste and defense waste.

4.1.1 Actions to Force Adherence to the DOE's Waste Acceptance Deadline

After a series of delays that has made it evident that the Yucca Mountain site will not be prepared to accept waste by the January 31, 1998 deadline set by the Nuclear Waste Policy Act, the Department of Energy, in April 1995, determined that it is not legally obligated under the NWPA to accept spent nuclear fuel if a repository is not operational.

In response, a coalition of state attorneys general and state utility commissions filed suit in federal court to force the DOE to adhere to the date stipulated in the NWPA.[159] Ultimately 39 state agencies and 33 utilities in 28 states joined the consolidated case. On July 23, 1996, the United States Court of Appeals for the District of Columbia Circuit ruled in favor of the coalition and required the Department of Energy to meet the mandate of the Nuclear Waste Policy Act.[160] The decision, however, neither provided details on how the DOE could comply nor gave utilities the right to damages in the event of the DOE's noncompliance.

On December 22, 1996, the Clinton Administration indicated it would not appeal the decision; ironically, only days earlier the Department of Energy declared that it could not meet the date imposed by both statute and federal court to take possession of an

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[159] This body, the Nuclear Waste Strategy Coalition (NWSC), an ad hoc group of state regulators and utility companies, was formed in 1993 with the purpose of ensuring that the DOE meets the provisions of the NWPA regarding acceptance of spent fuel. One of its leaders is Commissioner of the Minnesota Department of Public Service Kris Sanda.

[160] Indiana-Michigan Power Co. v. DOE, Nos. 95-1279, et al., D.C. Cir., 88 F.3d 1272, issued July 23, 1996.

estimated 30,000 - 40,000 metric tons of waste, and asked the utilities for guidance on how best to accommodate the delay.[161]

4.1.2 The Status of Yucca Mountain

The challenge, as articulated by Stanford University's Konrad B. Krauskopf, is clear: to find a place to put nuclear waste where it can "be buried deep enough so that it cannot affect the present living world and in a geologic situation stable enough to prevent any appreciable amount from reaching the surface for at least a hundred centuries...without the need of caretakers."[162] The process, however, has been long and arduous, marked by scientific and political controversy and littered with lawsuits, local opposition and consequent and constant delays.[163]

In the face of hostility from all candidate states, the Nuclear Policy Act Amendments of 1987 narrowed the federal effort at building a permanent repository to one site: Yucca Mountain.[164]

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[161] The Department of Energy's Office of Civilian Radioactive Waste Management estimates that 84,000 metric tons of waste will have accumulated by 2035.

[162] Konrad B. Krauskopf, "Disposal of High-Level Nuclear Waste: Is It Possible?" Policy Forum 249 (September 14, 1990), p. 1231.

[163] Other nuclear countries also face public opposition to the siting of permanent waste facilities. However, Sweden has reduced some of that opposition by locating its interim waste facilities next to nuclear plants. Canada also stores its spent nuclear fuel on site. While both are exploring permanent underground storage, Sweden expects to license its permanent site in 2003 and begin fuel acceptance in 2008. (See National Association of Regulatory Utility Commissioners, The Nuclear Waste Program Office, Sweden's High-Level Nuclear Waste Management and Disposal Program, Issues Report, Volume 2, Report 2, April 1994; and Canada's Used Nuclear Fuel Storage and Disposal Program, Issues Report, Volume 2, Report 3, November 1994.)

[164] The Nuclear Waste Policy Act of 1982 directed identification of several sites around the country. Nine candidate sites were narrowed to three: Deaf Smith County, Texas; Hanford, Washington; and Yucca Mountain. Site characterization work was begun but delayed by litigation and eventually abandoned in favor of concentration solely on the Nevada location.

Before actual construction of the repository at Yucca Mountain can begin, the following steps must be taken: the site must be found suitable (or, in the DOE's parlance, "characterized"); an environmental impact statement must be prepared; public hearings must take place; the U.S. Environmental Protection Agency must establish acceptable standards for environmental protection; if found suitable, a recommendation must be made to the President that the facility be built; and the Department of Energy must seek and receive a license from the Nuclear Regulatory Commission. Accordingly, the Department of Energy has established new goals to: (1) complete the viability assessment of the site in 1998; (2) recommend a site to the President in 2001; and (3) submit a repository license application to the NRC in 2002.

Currently, the repository process is in the characterization phase. Scientific and engineering data are being gathered in order to make a determination as to whether Yucca Mountain is a suitable site. Complicating features of the Yucca site include the difficulty in characterizing the groundwater flow, and the potential for earthquake and volcanic activity.[165] The DOE recently announced a revised policy to concentrate on a total repository performance evaluation of the Yucca Mountain site rather than on individual technical aspects.

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[165] Yucca Mountain lies on a faultline. In June 1991, an earthquake registering 5.6 on the Richter scale damaged a DOE field operations building near the Yucca site. Further, the mountain was formed by a volcano. On September 24, 1996, the DOE announced the completion of the volcanic hazard analysis, finding that there is a one in 70 million chance per year of a volcano erupting in the next 10,000 years. Finally, the hydrological studies are considered critical because most scientists believe that groundwater is the most likely way radioactive materials could be released from the repository. The water table lies about 800 - 1,200 feet below the proposed site of the repository.

4.1.3 Interim Storage

Since the passage of the NWPA in 1982, there have been both federal and non-federal efforts to develop an interim storage site -- formally known as a Monitored Retrievable Storage (MRS) facility. These efforts have followed a rocky road.

Federal Efforts at Interim Storage

The Department of Energy attempted to comply with the Nuclear Waste Policy Act of 1982, which required it to study the need for and, if necessary, propose an MRS facility. In 1987, the DOE submitted a proposal to Congress to build an MRS at the site of the defunct Clinch River Breeder Reactor Project in Oak Ridge, Tennessee. Opposition to the proposal by the Governor of Tennessee was fierce.

Later that year, the Nuclear Waste Policy Act Amendments (NWPAA) not only canceled any siting activity in the State of Tennessee, but placed additional barriers in the path of the DOE in its effort to develop an MRS facility by: (1) linking the development of an interim site to development of a permanent repository (i.e., an MRS facility cannot be constructed until the Secretary of Energy has recommended a permanent site to the President and until construction on that site begins); and (2) prohibiting the siting of an interim facility in the same state where permanent site characterization is occurring.[166]

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[166] That provision was enacted to prevent the interim site from becoming a de facto permanent site.

In 1994, after a series of setbacks, the Department of Energy abandoned its efforts to build an interim storage site. The DOE's current position is that shifting focus at this time from the Yucca Mountain project to an interim facility is unnecessary, would cause further delay in permanent site characterization, and would be economically wasteful.

State, Regulatory and Industry Positions

The states, the regulators and the nuclear utility industry are aligned in their view that the Department of Energy should develop an interim site. The National Association of Regulatory Utility Commissioners takes the position that "centralized, interim storage of spent nuclear fuel is safer and more economical than having waste stored at reactor sites in 34 states."[167] NARUC calls for Congress to establish a schedule for the construction of an MRS facility. The industry's position holds that removing waste to a centralized site would be more cost-effective than continuing to maintain at-reactor storage, and that removal of waste to centralized storage will aid in the development of a necessary national transportation system.

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[167] National Association of Regulatory Utility Commissioners, Nuclear Waste Program Office, Discussion of Legislation to Amend the Nuclear Waste Policy Act of 1982 During the 104th Session of Congress, Issues Report, Volume 3, Report 2, April 1995, p. 5.

Congressional Activity

Nuclear waste legislation was introduced in both chambers in both sessions of the last year's Congress, including bills by both Minnesota senators and one Minnesota representative. One bill, which would have required the Department of Energy to construct an interim storage facility 50 miles from the Yucca Mountain site in the Nevada desert, was adopted by the Senate but, due in part to a threatened White House veto, failed in the House of Representatives.[168] This legislation would have overturned the co-siting prohibition and linkage provisions contained in the NWPA, whereby an interim and permanent site cannot be in the same State and an interim site cannot be constructed until the permanent one is built.[169]

Others have suggested using federal nuclear weapons facilities in South Carolina and Washington for the temporary repositories or providing payments to utilities to store waste on site until a permanent disposal is available.

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[168] Other bills introduced included two by Nevada legislators, which, not surprisingly, were designed to postpone any action in the State. One, proposed by Sen. Richard Bryan, would have authorized payment to utilities to maintain at-reactor storage until a permanent repository were available. The other, proposed by Rep. Barbara Vucanovich, would have extended the DOE's deadline until 2003 and authorized rebates for utilities needing to build additional at-reactor storage capacity.

[169] The bill introduced by Minnesota Senator Rod Grams would have accomplished the de-linking of the temporary and permanent sites. A bill introduced by Minnesota Senator Paul Wellstone would have prohibited the licensing of any new nuclear plant until there is a licensed facility available to accept spent nuclear fuel. Sen. Wellstone also attempted, unsuccessfully, to attach an amendment to the Senate bill that was eventually voted upon that would have prevented override of any federal, state or local environmental protections in connection with the siting of the interim facility.

Other Efforts

The Nuclear Waste Policy Act of 1982 also established an Office of the Nuclear Waste Negotiator, who was empowered to seek State or Tribal Government interest in siting either a permanent or temporary facility. Though some potential hosts were identified and preliminary exploration was done, the Negotiator was ultimately unable to secure a volunteer host and this post was eliminated when its statutory authority expired in January 1995. Recently, the Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM) announced changes to its waste management policy, shifting emphasis to the private sector for waste acceptance at, and transportation to, a temporary site.

However, utility efforts to arrange interim storage on or near tribal lands, though to date still unconsummated, is still an option that holds promise. Although a tentative agreement between NSP (leading a coalition of 33 utilities) and the Mescalero-Apache Tribe in Mescalero, New Mexico to co-own and operate an interim storage facility near the reservation did not materialize, waste storage on that site is still possible. Following the disintegration of the NSP agreement, the tribe has continued to pursue alternative financing arrangements and, in partnership with British Nuclear Fuels, Ltd., is seeking to construct a site, this time with utilities being customers rather than co-owners/customers. NSP has indicated its willingness to purchase space at such a site. The Mescalero-Apache Tribe has indicated that, in the near future, it anticipates announcing a firm commitment and a timetable to build an interim storage facility.[170]

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[170] Tom Gallagher, telephone interview by author, October 30, 1996. Mr. Gallagher is the Chief Financial Officer for the Mescalero-Apache tribe.

Northern States Power has also sought storage space in Utah, on a portion of the land of the Skull Valley Band of Goshute. It was reported on January 9, 1997 that negotiations are afoot with the Goshute for interim storage.

4.2 Cost Responsibility for Managing Waste

Ratepayers of nuclear utilities have borne and presently bear the cost responsibility for managing the nation's nuclear waste. There are two categories of costs to manage waste that a utility such as NSP (and their ratepayers) incur: ongoing operation and management costs for at-reactor storage; and future costs for removal, transportation and disposal. The ongoing at-reactor costs are obtained through the normal ratemaking process; in NSP's case, the Minnesota Public Utilities Commission determines on a rate case by rate case basis the appropriate level of funding based on the utility's request and staff and intervenor analysis and testimony. The future waste removal costs are also paid for by ratepayers, but through a different mechanism: the Nuclear Waste Fund (NWF).

The NWF, established by the Nuclear Waste Policy Act of 1982 and administered by the Department of Energy, is financed through a one mill per kilowatt-hour fee imposed on customers who use nuclear generated fuel.[171] It is to be used for site

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[171] 42 U.S.C. § 10222. For nuclear fuel generated and sold prior to 90 days following the enactment of the Nuclear Waste Policy Act of 1982 (which was passed on January 7, 1983), a one-time fee was charged utilities and their ratepayers equivalent to the one mill per kwh fee imposed on an ongoing basis on nuclear fuel generated after the effective date. It is in return for these payments that the Department of Energy is supposed to begin accepting spent nuclear fuel on January 31, 1998. The Secretary of Energy has the prerogative of adjusting the ongoing fee, but in the years since its inception, it has remained at one mill per kwh.

characterization and construction, and to provide for the permanent disposal of utility spent fuel. To date, $12 billion has been collected. Of that total, $249 million has been paid by Minnesota's NSP customers.[172]

4.2.1 Title vs. Possession; Taxpayers vs. Ratepayers

With respect to future costs, a critical and fundamental -- and frequently overlooked -- decision is whether utilities moving spent nuclear fuel to either interim or permanent storage should and will cede title to the waste.[173] The answer to that question has enormous consequences with respect to who will bear responsibility for future nuclear waste management costs.

Simply put, to the extent utilities retain title, utility ratepayers remain responsible for bearing the cost; when title transfers to the Department of Energy, cost responsibility switches to the nation's taxpayers. Depending on whether or not the Nuclear Waste Fund is adequate to meet all future waste disposal costs, who owns title could be extraordinarily significant.

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[172] Jahan Selim and Ron Callen, Iowa Utilities Board and Michigan Public Service Commission, Nuclear Waste: Inventory and Ratepayer Payments By State, October 21, 1996. To date, about half the amount collected (i.e., $6 billion) has been spent on efforts to find a suitable site for permanent disposal of spent fuel. In an effort to force the Department of Energy's hand with respect to meeting the January 31, 1998 deadline to accept spent fuel, the Minnesota Department of Public Service has petitioned the Minnesota Public Utilities Commission to withhold and place in an escrow account NSP customer payments to the fund.

[173] The NWPA requires the DOE to take title upon accepting the waste for permanent storage. The Senate bill introduced last session calling for the DOE to build an interim storage site would have transferred title to the DOE upon acceptance of utility waste for interim handling.

The nuclear industry claims the NWF is adequate to cover the cost of national nuclear waste management efforts.[174] Sen. Wellstone of Minnesota believes it may not be, and that utilities should keep title to the waste while the DOE should merely take possession of it. In that way, taxpayers will be insulated from potentially huge costs. He points to the fact that once utilities cease operations of their nuclear plant(s), their contributions to the NWF cease. He further notes that no plant has operated for more than 30 years, although they are licensed for 40. As utility contributions to the NWF dwindle, the fund declines, but the costs to manage the waste continue. Further, though he admits there is a wide disparity of opinion on the subject and grants the amount in the fund may in fact be sufficient, he notes several studies showing an ultimate shortfall of billions of dollars. If title transfers, he argues, the burden for any deficit would rest inappropriately with United States taxpayers, not as it should with the customers of the utilities which caused the waste problem in the first place.[175]

If no interim or permanent storage site is available by 1998, another possibility that has been mentioned is that the Federal Government will pay utilities to continue to store their spent fuel in place. That potentiality is feared by those who believe that, regardless of whether or not the DOE takes title, at-reactor sites will become de facto permanent sites.

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[174] Nuclear Energy Institute, The Nuclear Waste Fund Is Adequate to Cover Cost of America' Used Nuclear Fuel Management Program, Washington, D.C.: Nuclear Energy Institute, April 23, 1996.

[175] See Paul Wellstone, Statement of Senator Paul Wellstone on the "Title Transfer" Amendment to S. 1936, the "Nuclear Waste Policy Act of 1996", July 31, 1996.

4.3 Cost Estimates for Managing Waste

Northern States Power was unable to disaggregate those costs specifically dedicated to spent fuel management from the overall costs of Prairie Island's general operation and maintenance (O&M) budget. However, NSP did provide the following estimates of costs for the Independent Spent Fuel Storage Installation. The company estimates those future costs as follows:

Table 2. Future Estimated Costs for Prairie Island ISFSI[176]

Year	*Cost*
2002	$ 56,000,000
2015	$ 161,000,000
2015 (with all 48 casks)	$ 247,000,000

Source: Northern States Power, 1996.

The Department of Public Service has determined that if additional storage is unavailable and the Prairie Island units must shut down after 2004, ratepayers would be forced to absorb the sum of between $522 million and $800 million ($1995) in additional

[176] Those costs include: 17 casks; annual O&M; and costs for payment, dictated by statute, of $500,000 per year for each dry cask containing spent fuel located at the ISFSI after January 1, 1999.

costs through 2014.[177] This amount would result from the cost of replacement power and perhaps the inability to recover the full investment in the plants.

Both present and future ratepayers will continue to bear responsibility for costs relative to nuclear waste management so long as Northern States Power retains title to the waste.[178] Once the DOE takes title to the spent fuel, the cost burden shifts to all taxpayers, and therefore even if identical, not as readily identifiable.

If the catastrophic scenario depicted by the Department of Public Service come to pass, then there are any number of regulatory mechanisms that the Public Utilities Commission can use to cushion rate shock, including amortization of the debt.[179]

The question of whether funds should be set aside to ensure that present ratepayers pay the future costs of radioactive waste management based on volume of usage of electricity rather than on the rate structure of the utility involves two policy decisions. The first is the oft-discussed matter of intergenerational equity. One argument for fairness would dictate that those who benefit should pay, and thus such a fund would assign costs to the users of Prairie Island's electricity. On the other hand, a utility

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177 Minnesota Department of Public Service, Recommendations Regarding Payments to the Nuclear Waste Fund, p. 7.

178 To the extent that the cost of construction of the berm and pad for the ISFSI is embedded in rates, it will be paid by present and future ratepayers until fully depreciated.

179 Costs of this magnitude have been borne by ratepayers of other utilities in other states. For example, ratepayers of New York State's Long Island Lighting Company were required to bear the debt of the utility's never-opened Shoreham nuclear plant and the attendant costs amounting to about $4.5 billion. Rates were targeted to rise 5% per year for ten years to pay off that debt, but, due to a variety of factors -- including the introduction of performance-based regulatory schemes, improved operating efficiencies, and lower than expected inflation -- rate increases were often lower than the target. There are still several years to go on this amortization approach to compensation. Similar problems with its Seabrook nuclear facility led to the bankruptcy of Public Service Company of New Hampshire in the early 1990s. Following this event, rates to that company's customers also rose a total of about 5% annually.

customer base is not static. Inevitably, if such a fund were established, there would be unavoidable inequities created when, for instance, customers move out of the service territory. Further, some customers who have benefited from the electricity generated at Prairie Island have already left the service territory or the State and they would not bear any cost responsibility whatsoever, creating a larger and even more unfair burden for present customers.

Whether such a charge should be based on a volumetric formula or some other rate design methodology, such as a straight per customer surcharge, is also a complex issue. A volumetric charge appropriately assigns proportional costs to those using the most electricity, but often its effect is to have a disproportionate impact on the bills of large use customers. Cost allocation is complex and influenced by many factors and considerations.

Consequently, these decisions are best left to utility regulators who not only have the professional expertise to conduct in depth technical analysis, but also operate within formal, well-established and open adjudicatory processes that allow for a full and fair hearing of all interested parties and a decision based on sound regulatory principles and the pertinent facts in the particular case.

4.4 Accident Probability and Liability

Opinions vary concerning the probability of an accident occurring at a nuclear plant or in the transportation of nuclear waste.

4.4.1 Plant Accident Probability

The record in the United States with respect to nuclear plants in general shows a few major incidents (most notoriously, Three Mile Island) but little, if any, immediate and discernible damage to humans or property. Some, however, suggest that, in general, the probability of an accident occurring at a nuclear facility is not at all remote. For instance, MIT physicist Henry Kendall testified before the NRC in 1991 that there is a 50/50 chance of an accident the size of Three Mile Island or larger occurring in the next 20 years.[180]

With respect to Prairie Island in particular, the latest Nuclear Regulatory Commission assessment (the regular Systematic Assessment of Licensee Performance or SALP report) rates the Prairie Island facility "superior" in plant operations, maintenance, and plant support, and "good" in engineering. Those were the same ratings NSP received in the previous SALP report.[181] In addition, NSP recently conducted and submitted an Individual Plant Evaluation to the NRC, using an NRC engineering methodology (the "Probabilistic Risk Assessment") which the company indicates demonstrates that "Prairie

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[180] Mary Batten and Steven Krolak, "Henry Kendall: Calling Nuclear Power to Account," Calypso Log, October 1991, p. 12.

[181] U.S. Nuclear Regulatory Commission, "Prairie Island Plant Rated 'Superior' in Three Areas, 'Good' in One Area in Latest Systematic Assessment Report," SALP Report for the Prairie Island Nuclear Power Station, Press release: April 1, 1996.

Island meets all NRC safety requirements, and the probability of a major accident releasing radiation from the plant is exceedingly small."[182]

But others hold quite differing views as to the probability of an accident at Prairie Island. The Prairie Island Coalition Against Nuclear Storage (PICANS), for instance, impugns NSP's assessment of plant safety, citing documents it has obtained from the company. Review of these documents, PICANS warns, indicates the substantial risk of a potentially catastrophic event.

The Nuclear Regulatory Commission has identified several problematic conditions commonly associated with aging nuclear plants, including reactor pressure vessel embrittlement, steam generator integrity, and stress corrosive cracking.[183] PICANS charges that these very conditions exist at Prairie Island and could result in simultaneous, multiple steam generator tube ruptures. Such an event has not yet occurred at any plant, but the increased likelihood of it happening has been noted by NRC staff following recent inspection findings at other nuclear facilities around the country.[184] In support of its claims, PICANS points to the recent settlement of a lawsuit filed by NSP

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182 Northern States Power Company. NSP Responses to Questions from Ron Elwood of the Legislative Electric Energy Task Force. December 15, 1996, p. 1.

183 These categories of structural reactor problems were recently cited by Shirley Ann Jackson, Current Regulatory Challenges, Address to Nuclear Power Reactor Safety Course, Massachusetts Institute of Technology, Boston: July 22, 1996, pps. 7-8. http://www.nrc.gov/; Internet, accessed October 31,1996.

184 PICANS cites "Jackson Prods Staff to Expedite Steam Generator Rule as Cracking Surges," Inside NRC, 18, March 4, 1996, p. 1, which, in part, states: "Office of Nuclear Reactor Regulation (NRR) Director Bill Russell told the [Nuclear Regulatory] Commission...the number of cracking indications in steam generator tubes at a given plant [Prairie Island or any other plant was not cited specifically]...'will jump from the tens in one outage, to the hundreds -- or thousands -- in the next outage....'"

against Westinghouse Electric Corporation claiming the steam generators Westinghouse sold NSP were faulty. Although the terms of the settlement have not been made public, it is widely believed that Westinghouse will be obligated to replace the steam generators.

PICANS also raises concern about the release of radioactivity from the site, and alleges that the monitoring conducted by law by the Minnesota Department of Health (MDH) is inadequate, for it fails to test for certain dangerous particulates. MDH has not found any abnormal readings, and believes its tests, though admittedly not geared to identify all radioactive elements, would detect any condition that is dangerous to the public health.

Finally, PICANS recently petitioned the Nuclear Regulatory Commission seeking closure of the Prairie Island units due to alleged structural defects, problems with fuel storage pool design and inadequacy of review of procedures and certain equipment.[185]

4.4.2 Transportation Accident Probability

Over the past 25 years, about 2,500 shipments of spent nuclear fuel have taken place in the United States, mostly via rail, truck and ship. According to the DOE's Office of Civilian Radioactive Waste Management, the record shows that seven accidents have occurred, none causing fatality, injury or environmental damage.[186]

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[185] The petition was denied temporarily by the acting director of the reviewing office; it will be considered again when a permanent director of that office is named.

[186] U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Transportation of Spent Nuclear Fuel, http://www.rw.doe.gov/; Internet, accessed October 31, 1996.

4.4.3 Potential Damages and Liability

Several estimates of potential damage from a nuclear accident have been developed. The U.S. General Accounting Office in 1987 estimated that "under average weather conditions losses from a major nuclear accident could be as high as $15 billion," while an evaluation conducted for the NRC by Sandia National Laboratory (which is operated under the auspices of the DOE) found that "under a worst-case scenario, financial losses (not including on-site damages) could range from $56 billion to $314 billion, with 100,000 early deaths."[187]

Liability for payment of damages to humans and property resulting from a nuclear accident, including at-reactor or transportation events, is provided for and limited by the Price-Anderson Act, passed in 1957 as an amendment to the Atomic Energy Act of 1954 and renewed in 1966, 1975 and 1988.[188] In effect, it establishes a ceiling on liability.

Under the Price-Anderson Act, a certain amount of private insurance is required for licensees ($200 million for each large reactor site). Coverage for owners of large reactors is supplemented by a sharing provision in which each licensed plant would be assessed a prorated portion (up to $66 million per reactor per accident) to cover excess liability in the event of a major accident. Congress is authorized by the Price-Anderson Act to appropriate funds to pay claims in excess of the total of private insurance available

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[187] David Lapp, "Bankrolling Nuclear Power," Environmental Action, Spring 1993, p. 13.

[188] Under the Act, coverage is not required for spent nuclear fuel stored at interim facilities. With respect to transportation accidents. DOE transportation contractors are indemnified by the Federal Government.

(currently, about $8 billion).[189] Unless extended again, the law expires on August 1, 2002.

In addition, Minnesota utilities may be liable under State tort law for additional damages in connection with compensating workers experiencing "excessive contamination."[190]

4.5 Reprocessing

Reprocessing of nuclear spent fuel is technically feasible, but at present uneconomical and unavailable in the United States.[191] Many mistakenly believe reprocessing is currently outlawed; it is not, though in previous administrations it has been prohibited.

Once considered to be an integral part of the U.S. nuclear fuel cycle, the civilian reprocessing program was put off by President Ford in 1976, as nuclear power and nuclear proliferation became presidential campaign issues. In 1977, President Carter indefinitely deferred civilian reprocessing in the United States. The ban on reprocessing was lifted by President Reagan in 1981, and the Department of Energy sought to promote

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189 League of Women Voters Education Fund, The Nuclear Waste Primer (Washington, D.C.: League of Women Voters Education Fund, 1993), p. 89; and Council of State Governments, Midwestern Office, Handbook of High-Level Radioactive Waste Transportation (Lombard, IL: Council of State Governments, October 1992), p. 27. DOE/CH/10402-19.

190 John Helland and Linda Taylor, "The Prairie Island Nuclear Waste Storage Issue: Questions and Answers," House Research Information Brief, February 1994, p. 6.

191 Reprocessing is the chemical process of recovering uranium and plutonium from spent nuclear fuel. During the process of nuclear fission, a number of fission by-products are produced, including plutonium. When nuclear plants are refueled every 12 to 18 months, the spent fuel that is removed contains unconsumed uranium and created plutonium. Reprocessing separates the uranium and plutonium from the other by-products for reuse.

its use. However, without federal financial support or guarantees, no private sector interest was forthcoming. Utilities, including NSP, have determined reprocessing to be economically nonviable.[192]

4.6 Emerging Nuclear Technologies

Although many emerging nuclear technologies are being studied, there are none that can or will generate electricity without environmental damage while producing little or no radioactive waste that are now or will be in the foreseeable future economically or practically feasible.

Of the new technologies, the Integral Fast Reactor (IFR) has many potential benefits -- in abnormal situations, the system shuts down without human operator intervention; its waste stays radioactive for 200, not 10,000 years; and the potential exists for it to use weapons material for fuel, thus eliminating it while producing electricity. Despite those attributes, the IFR Program was terminated by the Department of Energy on October 1, 1994 due to budget constraints.

The current focus of research at the Department of Energy is on advanced light-water reactors and fusion science. The DOE is proceeding with two advanced light-water plant designs which, it claims, have "the potential to lower the costs and increase the safety of future nuclear power production."[193] Light-water reactors are the most advanced of the new generation designs and the ones most likely to be the first to obtain

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[192] Different countries have different policies regarding reprocessing. France, Great Britain and Japan do reprocess their spent fuel; Canada, Sweden and the United States do not.

[193] U.S. Department of Energy, FY 1997 Budget Request, p. 23.

NRC certification. However, this is not expected to occur until well into the first quarter of the 21st Century.

During recent experiments at the Tokomak Fusion Test Reactor at the DOE's Princeton Plasma Physics Laboratory, scientists discovered new ways to operate the facilities to double performance, indicating that fusion may have more potential than previously thought to produce inexpensive and environmentally benign electricity. Despite the recent breakthrough, the federal fusion program's goal has shifted from developing and operating a demonstration reactor by 2025 to advancing the scientific knowledge of plasma science.[194] The DOE has requested an increase of $18.8 million (12.4%) in funding for fusion research for FY 1997. On the other hand, the DOE does not support any research into cold fusion technology. Once thought promising after early results from scientific research in Utah, this technology has since been discredited.[195]

4.7 Available Waste Handling Technologies

Several technologies have been advanced to minimize the handling of spent nuclear fuel. The dual-purpose canister would be used for both storage and transport, while the multi-purpose canister (MPC) system could be used for storage, transport and

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194 The four principle states of matter are solid, liquid, gas and plasma. Plasma science is the study of ionized states of matter, and the underlying core science of fusion energy.

195 Other technologies, none of which are not expected to be commercially deployable for at least 20 years, include: the Modular High-Temperature Gas-Cooled Reactor (MHTGR); the Safe Integral Reactor (SIR); the Process Inherent Ultimate Safety Reactor (PIUS); and the Liquid Metal Reactor (LMR). National Research Council, Commission on Engineering and Technical Systems, Energy Engineering Board, Committee on Future Nuclear Power Development, Nuclear Power, Technical and Institutional Options for the Future (Washington, D.C.: National Academy Press, 1992), p. 9.

final disposal.[196] (It is important to note that, currently, no canister has been approved for disposal in a repository because the criteria for such approval is not expected to be established by the Nuclear Regulatory Commission for at least another five years.)

The Department of Energy began development of an MPC, but in mid-1996 abandoned the project, transferring to the U.S. Department of the Navy lead agency responsibility for preparing the Environmental Impact Statement (EIS) for naval spent fuel container.[197] On December 26, 1996, the naval department issued a decision to implement a dual-purpose canister, rather than a multi-purpose canister because the dual-purpose system "might also be found to be acceptable for disposal purposes once the disposal requirements for a geologic repository have been formulated and finalized, making it functionally equivalent to a multi-purpose canister system."[198]

Storage, transport and/or disposal canisters require approval of the NRC. At present, there are no dual-purpose canisters that have an NRC license, although several applications are pending. Discussions with NRC staff reveal that one particular cask

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[196] The idea behind the MPC is to minimize the repeated handling of waste by utilizing the same sealed container at each transfer point in the waste management system. The key design feature of the MPC is that once it is sealed, the spent fuel assemblies never have to be handled again. The MPC would be placed in different overpacks for storage, transportation and disposal.

[197] Former Energy Secretary Hazel R. O'Leary recently revealed that, despite the cancellation of the MPC project, the Department of Energy set aside funds of obtain certification of a multi-purpose container that could be used to store waste at reactors until a permanent storage facility is completed.

[198] U.S. Department of Defense, U.S. Department of the Navy, Record of Decision for a Dry Storage Container System for the Management of Naval Spent Fuel, issued: December 26, 1996, p 10. The applicability of canisters approved for defense waste to commercial waste is questionable. The Department of the Navy insists that the nature of naval waste is unlike commercial waste and thus approval of a particular multi-purpose container for defense use is not automatically, if at all transferable for civilian use. The industry disputes this assessment, suggesting that a dual-purpose or MPC container approved for defense use would likely be applicable to civilian purposes.

(the NACSTC) has been approved for transport and, should a utility request approval for its use for storage as well, could very well become the first approved dual-purpose cask.[199]

If and when radioactive material currently in dry casks at Prairie Island will be moved off site, it will have to be transferred into a transportation (and perhaps a transportation/disposal) container. Procedures for such transfer are approved by the Nuclear Regulatory Commission. Despite the existence of approved procedures, PICANS has insisted that the transfer of spent nuclear fuel at Prairie Island from dry casks to transport casks is unproven and dangerous, and poses a threat to public safety.

Two other technologies for the minimization of the handling of nuclear waste -- vitrification and electrometallurgical processing -- are in the demonstration and research stage, respectively.

The West Valley Demonstration Project, functioning on the only nuclear waste reprocessing facility ever to operate in the United States, is now disposing of the radioactive by-products of its former reprocessing activities through a vitrification process, the immobilization of waste by converting it into glass or glass-like substances.[200] According to project managers, this process has potential "to provide a safe solution for

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[199] Mark Deligatti, U.S. Nuclear Regulatory Commission, Telephone Interview by author, February 4, 1997.

[200] The first of an expected 300 canisters was filled with the vitrified high-level radioactive waste on July 5, 1996. Three reprocessing facilities were built in this country -- one in Barnwell, South Carolina; one in Morris, Illinois; one in West Valley, New York. The West Valley facility, open from 1966 to 1972, was the only one that ever operated.

long term storage" of high-level waste.[201]

Argonne National Laboratory, which had been investigating the IFR, is now studying its key technology -- electrometallurgical processing, which involves the dissolution of spent nuclear fuel by use of an electric current in a molten salt mixture -- to determine its applicability to management of nuclear waste.

4.8 Alternative Storage Sites in Minnesota

In 1994, the Minnesota Legislature conditioned approval of the second set of Prairie Island dry casks on a finding by the Minnesota Environmental Quality Board that NSP had made an application for alternative, off-site storage in Goodhue County and made a good faith effort to implement such site.

In August 1995, NSP applied to the EQB for a Certificate of Site Comparability to fulfill State siting requirements. Finding that no site was comparable to the present one, the EQB, on October 2, 1996, denied NSP's request, found the company had met its obligations under the statute and, for the time being, effectively ended the search for an alternative site within Minnesota.

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201 West Valley Nuclear Services, Inc., "West Valley Demonstration Project Completed First Canister July 5; Third Canister Pour is Under Way," Perspective, 4, July 12, 1996, p. 1. High-level wastes (HLW) are defined as "the highly radioactive waste generated by the reprocessing...of used nuclear fuel and...the used [spent] nuclear fuel itself." HLW accounts for about 60% of all commercial radioactive waste. The other category of waste is low-level waste (LLW) and it consists of "short-lived...wastes generated by a wide range of institutions and facilities using radioactive materials...[LLW] takes a variety of forms, such as medical treatment and research material, contaminated wiping rags...protective clothing, hand tools, equipment, parts of decommissioned nuclear plants, and so forth." LLW accounts for about 30% of all radioactive commercial waste. (See League of Women Voters Education Fund, The Nuclear Waste Primer, pps. 21, 23. 28.)

The Prairie Island Dakota Community filed a petition with the Minnesota Court of Appeals on October 28, 1996 seeking reversal of the EQB's decision on the grounds that it violated both the letter of the law and the contract stipulated within it.[202]

The Dakota Community, whose representatives point out that, though its land abuts the ISIFI, its inhabitants receive neither any electricity nor tax revenues generated from the plant, has taken the consistent position that either the waste be moved to another location or compensation be provided in the form of payments to relocate to a collective site of their choosing the members of the tribe who desire to leave. The Dakota Community believes that Minnesota should recognize that nuclear waste is all citizens' responsibility, not just those residing near or benefiting from the plant's electricity, and that until a repository away from Prairie Island is found, the plant should discontinue producing more waste.[203]

Calls for a reconstitution of the Nuclear Waste Council have been voiced by the Prairie Island Dakota Community, representatives of PICANS and officers of Communities United for Responsible Energy (CURE), the organization representing the citizens of Frontenac, the proposed alternative storage site in Goodhue County.[204]

Though a settlement of the tribal issues, involving compensation to the Prairie Island Dakota Community, appeared likely during the 1996 Minnesota legislative

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[202] The Dakota Community bases its claims on Minn. Stat. § 116C.771 and Minn. Stat. §116C.773.

[203] Prairie Island Tribal Council, interview by author, October 4, 1996.

[204] The Nuclear Waste Council was established at the time that Minnesota was one of the candidate states to host the permanent disposal repository.

session, it did not materialize. This is an issue that demands attention and one that is unlikely to disappear until a resolution satisfactory to all parties is reached.

4.9 Transportation of Nuclear Waste

Federal, state, local and tribal authorities all have responsibilities for ensuring the public safety when nuclear waste is transported.[205]

4.9.1 Federal Responsibility

Transportation of nuclear waste is governed by the Hazardous Materials Transportation Act of 1975 (HMTA). The U.S. Department of Transportation (DOT), primarily, and the Nuclear Regulatory Commission, to a lesser extent, regulate the transportation of nuclear waste, by any means, throughout the country.[206]

The DOT is responsible for regulating carriers; training and certifying drivers; promulgating regulations for labeling, loading, unloading and general handling of containers; and establishing a system of highway routing. The NRC is responsible for safety and certification of waste packages and containers.[207]

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[205] Most of the information in this section is derived from: Council of State Governments, Midwestern Office, Handbook of High-Level Radioactive Waste Transportation (Lombard, IL: Council of State Governments, October 1992), pps. 6, 9. DOE/CH/10402-19; and National Council of State Legislatures, The State Role in Spent Fuel Transportation, (Denver: National Council of State Legislatures, May 1996), pps. 2-16.

[206] Together, rail and truck modes account for about 85% of all radioactive waste shipments.

[207] To ensure safety of containers, the NRC subjects models to hypothetical accident conditions, administered in sequence, including: a 30 foot free fall onto an unyielding surface; a puncture test allowing the container to fall onto a steel rod; a 30 minute fire at a temperature of almost 1,500 degrees, engulfing the entire package; and submersion in water at depths of three, fifty and six hundred fifty-six feet. (See U.S. Department of Energy. Office of Civilian Radioactive Waste Management, Transportation of Spent Nuclear Fuel (October 1994). DOE/RW-0356, Rev. 1.

The HMTA and subsequent amendments passed in 1990 under the Hazardous Materials Transportation Uniform Safety Act (HMTUSA) preempt inconsistent state, local and tribal transportation regulations. In addition, the Nuclear Waste Policy Act of 1982 requires adherence to NRC and DOT regulations, and mandates the use of private industry for transportation of wastes whenever possible.

4.9.2 State, Local and Tribal Responsibility

States have responsibility for determining driver qualifications, ensuring safe operation of motor vehicles, and conducting inspection and enforcement activities. In addition "place-of-origin" inspections of spent nuclear fuel are required by state or federal officers. A federal grants program , mandated by the NWPA, provides funds to states through which nuclear waste will pass.

Nuclear Regulatory Commission rules require that state governors be notified when spent nuclear fuel will traverse their territories. The primary responsibilities of states, tribes and localities is for first response in case of emergency. Shipping routes include Minnesota, intersecting at the Twin Cities from the south, southeast or northwest.

A federal grant program is available to assist states and Indian tribes with funds for planning and training for hazardous materials incidents. When either a federal MRS facility or permanent repository is ready to accept waste, it is estimated that there will be almost as many rail and truck shipments *per month* as there have been *combined* over the last 25 years.

4.9.3 Public Perception

The National Council of State Legislators perhaps sums it up best when it observes that "[e]ven though the safety record of radioactive shipments in the United States is exemplary, the public perception of radioactive shipments is that they are more dangerous than other hazardous cargoes. With large numbers of future shipments expected once a storage or disposal facility opens, some number of accidents are anticipated, causing further public concern."[208]

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[208] National Council of State Legislatures, The State Role in Spent Fuel Transportation, p. 2.

Chapter 5

CONCLUSION

This report provides the views of experts on the findings of the Appel Report, which looked at future energy policy and the feasibility of the State becoming energy self-sufficient using indigenous resources.

The Appel Report determined that, within 20 years, renewable resources could be developed to meet all of Minnesota's energy needs, though at great additional cost. The experts polled generally agree that the Appel Report's findings with respect to renewable energy may perhaps be technically possible but implementation of such a scenario is both practically and economically infeasible and should not go forward. However, virtually all agree that the State should pursue a policy of steady advancement of renewable energy

The Appel Report also recommended expeditious State action to restructure the electric industry to allow full retail access and require complete divestiture of generation assets as quickly as possible.. On restructuring, there is less unanimity, with some favoring an aggressive move to restructure the industry and others questioning the urgency and suggesting a less hasty evaluation of restructuring options.

The report also provides information about nuclear waste management in the State, an issue not unrelated to questions of industry structure and the introduction of renewable energy. Minnesota relies heavily on its nuclear plants for electricity; nuclear energy represents about 20% of the in-State generating capacity available. But the spent fuel storage issue dominates all others. The 1994 legislation that authorized some dry casks storage at Prairie Island provided enough capacity until shortly after the turn of the century. Despite legal efforts by states, regulators and utilities, prospects for a permanent federal repository being available by the time capacity in the authorized dry casks would be filled are non-existent. On the other hand, interim storage, either at a federally constructed site or at a private and/or tribal installation, appears more likely. If neither of these options materialize, however, the State will be left with the difficult decision as to whether to allow additional storage to keep the Prairie Island nuclear plants open and operating or allow them to be closed, and formulate a plan for replacement.

Over the next years, the Minnesota State Legislature will necessarily have to make critical decisions about future energy policy, the foremost being whether and how to restructure the electric industry. Many states have taken bold steps to change the way electricity is delivered and regulated in their jurisdictions, while others have chosen a more deliberate path. This year or next, some direction from Congress on this issue is a virtual certainty.

Minnesota will need to determine the pace of its deliberations, deciding what structure is best to maintain affordable electricity prices and retain and attract business and economic development to the State. The deliberations on restructuring will

subsume all other energy policy matters. Positions on renewable energy promotion, energy efficiency implementation, environmental protection, low income assistance and consumer protections will be made within the context of determining whether and how to change the industry to accommodate greater customer choice and ensuring fair markets, equitable distribution of benefits, reliability of the grid, and fair disposition of stranded costs.

Within the context of these discussions about the future of the electric industry lies crucial determinations about the extent to which centralized energy planning, renewable energy requirements and government intervention in general is appropriate.

Perhaps the most pressing and significant decision the Legislature will have make is determining the most productive process to follow to facilitate the fairest discussion of the issues and, most importantly, the outcome which is most in the public interest.

List of Acronyms

AGA	American Gas Association
CEE	Center for Energy and Environment
CEED	Center for Energy and Economic Development
CIP	Conservation Improvement Program
CON	Certificate of Need
CURE	Communities United for Responsible Energy
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPS	Minnesota Department of Public Service
DSM	Demand-Side Management
ECC	Energy CENTS Coalition
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPACT	Energy Policy Act of 1992
EPRI	Electric Power Research Institute
EQB	Minnesota Environmental Quality Board
EWG	Exempt Wholesale Generator
FERC	U.S. Federal Energy Regulatory Commission
HLW	High-Level Waste
HMTA	Hazardous Materials Transportation Act of 1975
HMTUSA	Hazardous Materials Transportation Uniform Safety Act
IBEW	International Brotherhood of Electrical Workers
IFR	Integral Fast Reactor
IOU	Investor-Owned Utility
IPP	Intergovernmental Panel on Climate Change
IRP	Integrated Resource Plan
ISFSI	Independent Spent Fuel Storage Installation

ISO	Independent System Operator
IPP	Independent Power Producer
IWL	Izaak Walton League of America
KWH	Kilowatt-hour
LCMR	Legislative Commission on Minnesota Resources
LLW	Low-Level Waste
LMR	Liquid Metal Reactor
MAPP	Mid-Continent Area Power Pool
MDH	Minnesota Department of Health
MEC	Minnesota Energy Consumers
ME3	Minnesotans for an Energy Efficient Economy
MHTGR	Modular High-Temperature Gas-Cooled Reactor
MMUA	Minnesota Municipal Utilities Association
MPC	Multi-Purpose Canister
MREA	Minnesota Rural Electric Association
MRS	Monitored Retrievable Storage Facility
MW	Megawatt
NARUC	National Assn. of Regulatory Utility Commissioners
NCAEC	North Carolina Alternative Energy Corporation
NCSL	National Conference of State Legislatures
NERC	North American Electric Reliability Council
NRC	United States Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRR	Office of Nuclear Reactor Regulation
NSP	Northern States Power Company
NUG	Non-Utility Generator
NWF	Nuclear Waste Fund
NWPA	Nuclear Waste Policy Act of 1982
NWPAA	Nuclear Waste Policy Act Amendments of 1987
NWSC	Nuclear Waste Strategy Coalition

O&M	Operations and Maintenance
OASIS	Open Access Same-time Information System
OCRWM	Office of Civilian Radioactive Waste Management
PE	Power Exchange
PICANS	Prairie Island Coalition Against Nuclear Storage
PIUS	Process Inherent Ultimate Safety Reactor
PUC	Minnesota Public Utilities Commission
PUHCA	Public Utilities Holding Company Act of 1935
PURPA	Public Utilities Regulatory Policies Act of 1978
PV	Photovoltaic
QF	Qualifying Facility
R&D	Research and Development
REC	Rural Electric Cooperative
RPS	Renewables Portfolio Standard
RTG	Regional Transmission Group
SALP	Systematic Assessment of Licensee Performance
SBC	Systems Benefits Charge
SIR	Safe Integral Reactor
SMMPA	Southern Minnesota Municipal Power Agency
SNF	Spent Nuclear Fuel
VOC	Volatile Organic Compound
WAPA	Western Area Power Administration
WEC	Wisconsin Energy Corporation
WRAP	Wind Resource Assessment Program

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Meetings, Telephone Interviews and Written/Electronic Communications

Meetings

Name of Individual	*Organizational Affiliation*	*Date of Meeting*
Mr. Rory Artig	MN Dept. of Public Service	October 16, 1996
Mr. Robert P. Ambrose	Cooperative Power	September 16, 1996
Audrey Bennett	Prairie Island Indian Community	August 13, 1996
Mr. Oscar Bloch	Wisconsin Public Service Commission	September 13, 1996
Mr. Tracy Bridge	Minnegasco	October 11, 1996
Mr. Scott Brockett	MN Dept. of Public Service	August 8, 1996
Mr. Paul Cassidy	Winthrop & Weinstine	September 13, 1996
Ms. Judy E. Cook	MN Retail Merchants Assn.	November 19, 1996
Mr. Steven B. Corneli	Minnesota Office of Attorney General	September 19, 1996
Mr. George Crocker	Prairie Island Coalition Against Nuclear Storage	August 8, 1996
Mr. Robert Cupit	MN Environmental Quality Board	September 5, 1996
Mr. Orrin "Skip" DeLong	Southwestern Technical College/Sustainables Advocate	September 17, 1996
Betsy Engelking	Minnesota Public Utilities Commission	September 4, 1996
Mr. Paul Johnson	Minnesota Power	September 3, 1996

Mr. William Grant	Izaak Walton League	September 26, 1996
Mr. Dan Juhl	Minnesota Windpower Assn.	September 17, 1996
Mr. Steve Hoffman	University of St. Thomas/ Minnesotans for an Energy Efficient Economy	September 10, 1996
Ms. Nancy Hylden	MN Chamber of Commerce	October 24, 1996
Mr. Jack Kegel	MN Municipal Utilities Assn.	August 28, 1996
Mr. Larry Kitto	Representing the Prairie Island Indian Community	August 13, 1996
Mr. John Knapp	Winthrop & Weinstine	September 13, 1996
Mr. Thomas Koehler	International Brotherhood of Electrical Workers	October 8, 1996
Mr. Richard R. Lancaster	Cooperative Power	September 16, 1996
Ms. Susan M. Landwehr	MN Dept. of Public Service	October 3, 1996
Mr. Robert S. Lee	Mackall Crounse & Moore, PLC	October 22, 199
Mr. Carl Lehmann	Northern States Power Company	September 3, 1996
Ms. Pam Marshall	Energy CENTS Coalition	September 5, 1996
Ms. Grania McKiernan	MN Rural Electric Association	September 24, 1996
Mr. Michael Noble	Minnesotans for an Energy Efficient Economy	September 26, 1996
Ms. Kandace Olsen	Mid-Continent Area Power Pool	August 30, 1996
Mr. Greg Oxley	United Power Association	November 5, 1996

Rep. Dennis Ozment	MN House of Representatives	October 21, 1996
Mr. Douglas Peterson	Minnegasco	October 11, 1996
Mr. David E. Sampsel	MN Dept. of Public Service	August 8, 1996 October 3, 1996
Mr. Mike Sarofolean	Minnesota Energy Consumers	September 3, 1996
Ms. Katie Sasseville	Otter Tail Power	July 26, 1996
Ms. Linda Schutz	MN Municipal Utilities Assn.	August 28, 1996
Mr. Phil Smith	MN Department of Public Service	September 13, 1996
Mr. Sheldon Strom	Center for Energy and Environment	January 15, 1997
Mr. Lee Sundberg	MN Rural Electric Association	September 24, 1996
Mr. Ronald E. Sundberg	Appel Consultants, Inc.	July 30, 1996
Mr. Michael Sullivan	MN Environmental Quality Board	September 5, 1996
Mr. Michael Tennis	Union of Concerned Scientists	November 4, 1996
Prairie Island Tribal Council Alan Childs Jr. Michael J. Childs Sr. Darelynn Lehto Others	Prairie Island Indian Community	October 4, 1996
Ms. Susan Turbes	Minnegasco	October 11, 1996
Mr. John Wachtler	MN Environmental Quality Board	October 23, 1996
Rep. Jean Wagenius	MN House of Representatives	October 24, 1996

Ms. Heather Westra	Prairie Island Indian Community	October 4, 1996
Mr. George A. Wiltsee	Appel Consultants, Inc.	July 30, 1996
Mr. Lyle Wray	Citizens League	December 10, 1996

Telephone Interviews

Mr. Ken Boley	Office of Senator Paul Wellstone	October 23, 1996
Mr. William Booth	U.S. Federal Energy Regulatory Commission	October 30, 1996
Mr. Peter Bradford	Consultant to the Regulatory Assistance Project	November 21,1996 January 13, 1997
Mr. Richard Boyle	U.S. Department of Transportation	October 14, 1996
Mr. Kenneth Campbell	MN Valley Alfalfa Producers	December 18, 1996
Mr. Y.I. Chang	Argonne National Laboratory	November 4, 1996
Mr. Richard H. Cowart	Vermont Board of Public Utilities	November 22, 1996
Mr. Mark Delligatti	U.S. Nuclear Regulatory Commission	December 9, 1996
Ms. Linda Desell	U.S. Department of Energy Office of Civilian Radioactive Waste Management	November 19, 1996
Mr. Ralph Erickson	U.S. Department of Energy Office of Civilian Radioactive Waste Management	October 30, 1996
Mr. Tom Gallagher	Mescalero-Apache Tribe	October 30, 1996

Mr. Theodore J. Garrish	Nuclear Energy Institute	November 1, 1996
Mr. Dan Griffiths	Pennsylvania Public Utility Commission	November 7, 1996 December 22, 1996
Ms. Mary Hayes	MN Pollution Control Agency	October 21, 1996
Mr. Paul Helgeson	Wisconsin Public Service Commission	January 9, 1997
Ms. Anne Jackson	MN Pollution Control Agency	October 21, 1996
Ms. Mary Kilmarx	Rhode Island Public Utilities Commission	October 17, 1996
Ms. Olga Krueger	NARUC Nuclear Waste Program Office	October 21, 1996
Ms. Kimberly Lichy	Office of Senator Rod Grams	December 5, 1996
Mr. Elmer Naples	U.S. Department of Energy Office of Regulatory Affairs Naval Nuclear Propulsion Program	October 25, 1996
Mr. Al Optenaker	U.S. Department of Energy Office of Fusion Energy Services	December 18, 1996
Mr. Walter Polansky	U.S. Department of Energy Advanced Energy Projects Division	December 18, 1996
Mr. William Smith	Iowa Utilities Board	November 20, 1996
Mr. Paul Standish	TRW Environmental Safety Systems, Inc.	January 31, 1997
Mr. Eric Swanson	MN Office of Attorney General	October 31, 1996
Mr. John White	Center for Energy Efficiency and Renewable Technologies	August 11, 1996 October 23, 1996 December 20, 1996

Written/Electronic Communications

Mr. Y.I. Chang	Argonne National Laboratory	November 5, 1996
Ms. Judi Cooper	Iowa Utilities Board	December 16, 1996
Mr. Victor Dricks	U.S. Nuclear Regulatory Commission	January 22, 1997
Ms. Jan Hamrin	HMW International	October 15, 1996
Mr. Chris Seiple	Resource Data International, Inc.	February 4, 1997 February 6, 1997
Mr. Steven B. Smiley	Bay Energy Services	October 17,1996
Ms. Ellie A. Stack	Nuclear Energy Institute	November 4, 1996

APPENDIX A

Members of the Electric Energy Task Force

House of Representatives

Representative Willard Munger, Co-Chair
Representative Alice Hausman
Representative Loren Jennings
Representative Sharon Marko
Representative Carol Molnau
Representative Steve Trimble
Representative Ted Winter
Representative Ken Wolf

State Senate[1]

Senator Steven G. Novak, Co-Chair
Senator Ellen R. Anderson
Senator Steve Dille
Senator Bob Lessard
Senator Steve L. Murphy
Senator Pat Pariseau

[1] At the time it was constituted, Mr. Harold R. Finn and Mr. Kevin M. Chandler were members of the Task Force. They are no longer serving in the Legislature. In addition, the composition of the group may well change during the 1997 legislative session.

APPENDIX B

Members of the Expert Panel[1]

Member	*Affiliation*
Mr. Scott Brockett	Minnesota Department of Public Service
Mr. Steven B. Corneli	Minnesota Office of Attorney General
Mr. Orrin "Skip" DeLong	Sustainables Advocate
Ms. Betsy Engelking	Minnesota Public Utilities Commission
Mr. William Grant	Izaak Walton League
Mr. Steve Hoffman	Minnesotans for an Energy Efficient Economy
Mr. Paul Johnson	Minnesota Power and Otter Tail Power
Mr. Dan Juhl	Minnesota Wind Energy Association
Mr. Jack Kegel and Ms. Linda Schutz	Minnesota Municipal Utilities Association
Mr. Thomas Koehler	International Brotherhood of Electrical Workers
Mr. Carl Lehmann	Northern States Power
Ms. Pam Marshall	Energy CENTS Coalition
Ms. Kandace K. Olsen	Mid-Continent Area Power Pool
Mr. Mike Sarofolean	Minnesota Energy Consumers
Mr. Phil Smith	Minnesota Department of Public Service
Mr. Lee Sundberg	Minnesota Rural Electric Association
Mr. John White	Center for Energy Efficiency and Renewable Technologies

[1] Tim Seck of Kenetech Windpower, Inc. was named to the panel but did not serve. His company filed for bankruptcy protection prior to the convening of the group.

APPENDIX C

THE PROVISION, PRODUCTION AND CONSUMPTION OF ELECTRICITY IN MINNESOTA

This appendix is presented to place the preceding discussions about alternative energy and restructuring in a broader context. Provided are:

- The division of customers and population among the various types of energy providers in the State of Minnesota;
- A review of the power generation facilities and capabilities within the State; and
- A snapshot of projected electricity production, consumption and prices in the State and nation.

C.1 Customers, Population and Customer Classes

Electricity is provided to 4.6 million Minnesotans by five investor-owned utilities (IOUs),[1] forty-six rural electric cooperatives (RECs) and one hundred twenty-six municipal electric companies (Municipals). The relative share of in-State retail electricity sales, however, is inversely proportional to their number.

[1] They are: Interstate Power Company; Minnesota Power Corporation; Northern States Power Company; Northwestern Wisconsin Power Company; and Otter Tail Power Company.

Table C-1. Percent of Minnesota Retail Electricity Sales

Type of Utility	*Number in Minnesota*	*Percent of Retail Sales*[2]
Investor-Owned	5	71.4%
Cooperative	46	15.5%
Municipal	126	13.1%

Source: Minnesota Department of Public Service, 1996

The RECs cover 85% - 90% of the land mass, but serve only about 25% of the people in the State. The majority of the 4.6 million people and the 2.1 million electric customers in Minnesota are served by the IOUs, as can be seen in Tables C-2 and C-3 below.

Cooperatives range in size from Renville-Sibley Cooperative Power Association, which serves 2,000 customers, to Anoka Electric Cooperative, which serves 83,400 customers. Municipals vary in size as well, from the City of Whalen, the smallest of the municipal companies with 56 customers, to the City of Rochester, the largest with 34,300 customers. RECs and Municipals are largely unregulated by PUC, but are accountable to their local boards or governments.

[2] All percentages in this report are approximate due to rounding.

Table C-2. Customers Served

Category of Utility	*Customers*	*Percent of Total*
Investor-Owned	1,250,000	59.5%
Cooperative	558,000	26.5%
Municipal	294,000	14.0%
Totals	**2,102,000**	**100%**

Sources: Minnesota Department of Public Service, 1995
Minnesota Municipal Utility Association, 1996
Minnesota Rural Electric Association, 1995

Table C-3. Population Served

Category of Utility	*Population*	*Percent of Total*
Investor-Owned	2,598,000	56.8%
Cooperative	1,200,000	26.3%
Municipal	772,000	16.9%
Totals	**4,570,000**	**100%**

Sources: Minnesota Department of Trade and Economic Development, 1994
Minnesota Municipal Utility Association, 1996
Minnesota Rural Electric Association, 1995

Ninety percent of electric customers in Minnesota are residential. But, this customer segment accounts for less than one-third of the total amount of electricity usage Statewide and, except for RECs, only about one-third of total utility revenues.

Only for RECs, unlike their counterparts, does the residential class' contribution to total revenues approximate their total numbers. In fact, RECs are heavily dependent on the residential class for income, relying on it for three-quarters of their total revenue. This is not surprising since RECs were specifically created to bring reliable and affordable electricity to rural areas.

Table C-4. Customer Class Comparison

Category of Utility	*Residential Class*	*Nonresidential Class*[3]
Cooperative	95%	5%
Investor-Owned	88%	12%
Municipal	87%	13%

Sources: Minnesota Department of Public Service, 1995
Minnesota Municipal Utility Association, 1995
Minnesota Rural Electric Association, 1996

[3] Includes commercial, industrial, government and other customers.

Table C-5. Electricity Use By Customer Class, Statewide, 1994

Customer Class	*Percent of Use*
Nonresidential	68%
Residential	29%
Other	3%

Source: Minnesota Department of Public Service, 1996.

Table C-6. Percent of Total Revenues Contributed By Customer Class

Category of Utility	*Residential Class*	*Nonresidential Class*
Cooperative	74%	26%
Municipal	34%	66%
IOU	32%	68%

Source: Minnesota Department of Public Service, 1995
Minnesota Municipal Utility Association, 1996
Minnesota Rural Electric Association, 1995

C.2 Power Plants in Minnesota

The following is a review of the number, ownership, age, fuel sources and generating capacity of power plants located in the State of Minnesota. It focuses solely on Minnesota plants despite the fact that Minnesota is part of a regional, integrated and interconnected electricity grid, and the actual sources of electricity consumed by Minnesotans may come from other states and Canada. (For instance, in-State hydropower accounts for only 1.8% of Minnesota's electric generation capacity, but it provides 16% of the State's electricity needs, as much of this resource is available and contributed to utilities serving Minnesota through purchase agreements with Canadian utilities.)

Why, then, place so much emphasis on local production facilities when the power that finds its way into Minnesotans' homes may utilize a vastly different mix and come from neighboring states and Canada? The answer is simply that the Minnesota Legislature and Minnesota utility regulators are limited in their oversight authority (e.g., certification, siting and environmental impact review) to only those facilities that are located within the State. Therefore, for the purposes of Minnesota energy planning and this analysis, it appears that discussion of in-State facilities is the most productive.

C.2.1 Number and Ownership

According to the Mid-Continent Area Power Pool (MAPP), there are 192 electric generating units located in Minnesota. Southern Minnesota Municipal Power Agency (SMMPA) and NSP each own, co-own or operate though lease about one-quarter of all the plants in the State. Minnesota Power Corporation (Minnesota Power) owns or

co-owns about 20% of the total.[4] The State's power plants are among the most efficient and operationally inexpensive in the nation, according to the Minnesota Department of Public Service (DPS).

C.2.2 Age

A substantial number of all the power plants in Minnesota are of relatively recent vintage. About half were built since 1970 and more than six in ten since 1960. The 1980s saw the greatest spurt of plant construction, with over 25% of all currently operating Minnesota facilities coming on line during that decade.

Natural gas facilities are the youngest of all the plant types. More than half were built in the 1980s, and three-fourths of all natural gas facilities in the State are no more than 25 years old. Plants relying on oil are also relatively young. About 65% were constructed after 1970. (Paradoxically, the heaviest influx of oil plants in Minnesota came during the 1970s -- a decade fraught with concern over U.S. dependence on oil.)[5]

At the other end of the spectrum, hydroelectric facilities -- most of which belong to Minnesota Power -- are the oldest. In all, 36 hydroelectric plants were built prior to 1928. Several are near or over 90 years old, the oldest being Minnesota Power's two 400 KW Little Falls facilities, which were built in 1906.[6]

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[4] The number and percentage of power plants owned by each company, may be found in Appendix C-1. A list, displaying the owner, year in which operation began, the fuel source and nameplate capacity of each of the power plants located in Minnesota, may be found in Appendix C-2.

[5] The age of Minnesota power plants, by source, may be found in Appendix C-3.

[6] The age of Minnesota power plants, by decade, may be found in Appendix C-4.

Though about one-third of the power plants in the Minnesota are between 40 and 90 years old, what is of critical significance is the fact that almost three-quarters of the total generating capacity in the State is produced by newer plants that have come on line since 1970. (It is noteworthy, however, that nearly 30% of that is available from NSP's Monticello and two Prairie Island nuclear stations.) Only about 2% of Statewide capacity comes from those facilities built before 1949.[7]

C.2.3 Fuel Sources and Generating Capacity

There are more oil and natural gas facilities in the State than any other type -- together they represent more than half of the plants in Minnesota.[8] However, these sources provide, respectively, only about 10% and 5% of the total Statewide nameplate generating capacity, and even a smaller amount of its electricity.[9] Hydroelectricity, produced by almost 25% of the total number of plants in Minnesota, provides a mere 2% of the State's total capacity.

By far, the favored source of generation is coal. It accounts for about 62% of the Statewide total of almost 8,900 megawatts (MW). Nuclear power ranks second in terms of generating capacity, providing about 20% of the total.

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[7] The aggregate capacity of Minnesota plants, by decade in which they began operation, may be found in Appendix C-5.

[8] A list of the number of Minnesota plants ranked by the fuel sources they use may be found in Appendix C-6.

[9] Nameplate capacity is the manufacturer's rating of the amount of output a generating unit is expected to produce under standard operating conditions. The figures provided in this section of the report deal in capacity, rather than energy, because MAPP's data, on which this section is primarily based, is expressed only in terms of capacity.

The following table indicates the fuel sources of generation of Minnesota-based power plants, the aggregate nameplate capacity of each source, and the percent of the total Statewide capacity each fuel represents.

Table C-7. Aggregate Capacity of Power Plants in Minnesota By Fuel Source

Source	*Nameplate Capacity (MW)*	*Percent of Total*
Subbituminous Coal	5,402.4	60.7%
Nuclear	1,755.0	19.7%
No. 2 Oil	893.8	10.1%
Natural Gas	436.7	4.9%
Hydro	159.2	1.8%
Refuse	86.8	1.0%
Bituminous Coal	81.6	1.0%
Lignite	29.7	0.3%
Wind	25.0	0.3%
Wood/Waste	11.3	0.1%
No. 1 Oil	10.0	0.1%
Totals	**8,891.5**	**100%**

Sources: Mid-Continent Area Power Pool, 1996
Northern States Power Company, 1996

All three major investor-owned utilities in Minnesota -- Northern States Power, Minnesota Power and Otter Tail Power Company (Otter Tail Power) -- are overwhelmingly dependent on coal as their prime source of fuel. Of the three, NSP has the greatest fuel diversity, using (along with coal) nuclear, oil, natural gas, and alternative

fuels. Further, NSP already has 25 MW of wind capacity available and, by law, will add another 400 MW of wind capacity and 125 MW of biomass capacity within five years. A little over 60% of NSP's in-State mix is dedicated to coal resources, while its three nuclear facilities account for just about 27% of its generating capacity.[10]

Though Minnesota Power possesses 70% of the State's hydroelectric plants, it uses that source for only about 11% of its generation (though it contributes about nine-tenths of the State's hydropower capacity). About 90% of the company's generation capability is derived from coal.

Otter Tail Power is equally dependent on coal, also relying on it for 90% of its generating capacity. It owns the State's only operating investor-owned wood/waste plant, which generates about 7% of the company's power needs. Hydro and oil make up the rest.

Southern Minnesota Municipal Power Agency, though operating many natural gas units, depends principally on generation from its co-owned coal plant to meet electricity demand. The other companies owning generating facilities in Minnesota utilize natural gas and oil predominantly.[11]

How does Minnesota compare with the rest of the U.S. in terms of generating capacity? The State as a whole is much more heavily reliant on coal and significantly less reliant on natural gas and hydroelectricity than is the rest of the

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[10] NSP's system totals, as opposed to its in-State capacity, are somewhat different. According to the company, its generation/purchase mix is as follows: coal: 49%; nuclear: 30%; hydro/wind: 18%; RDF/wood: 2%; oil: 1%.

[11] The proportional reliance on generating fuels for each utility owning facilities in Minnesota may be found in Appendix C-7.

country.[12] On the other hand, Minnesota possesses four times the alternative energy generating capacity than does the rest of the nation as a whole. Capacity from nuclear and oil is relatively equivalent to the capacity those sources provide throughout the rest of the country.

Table C-8 below provides specific comparative figures.

Table C-8. Generating Capacity By Source in Minnesota and U.S.

	Minnesota	*U.S.*
Fuel Source	**% of Nameplate Capacity**	
Coal	62.1%	43.6%
Nuclear	19.8%	14.5%
Oil	10.2%	10.3%
Natural Gas	4.9%	19.2%
Alternative Fuels	1.2%	0.3%
Hydroelectric	1.8%	12.1%
	100%	100%

Sources: American Public Power Association, 1996
Mid-Continent Area Power Pool, 1996

[12] Some companies have a more favorable mix. Twenty percent of NSP's produced or purchased electricity, for instance, is derived from wind and hydropower, much of the latter from Canadian acquisitions.

C.3 Electricity Outlook

The following discussion centers on future electricity demand and price, what capacity additions are anticipated, and the projections for capacity reserve margins.

C.3.1 Usage and Prices

The projection in the Appel Report of a 1.8% net increase in consumption annually over the next 10 years is consistent with the current MAPP estimate, and consistent with the longer term projections made by both DPS, which forecasts about a 1.4% annual net Statewide increase through 2020, and the U.S. Department of Energy (DOE), which suggests a 1.5% annual net nationwide increase through 2015.[13]

Nationwide, coal is expected to remain the primary fuel for electricity production, although its dominance is expected to dip as natural gas-fired generators account for more added and replacement capacity, and renewable fuel use increases at an average national annual rate of 1.0%.[14]

The Department of Energy predicts that natural gas usage will increase by 1.7% annually, and the American Gas Association (AGA), the industry's trade group, claims its use will represent a 27% market share of the nation's primary energy use by

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[13] Minnesota Department of Public Service, Draft 1996 Energy Policy and Conservation Report, 1996, Chapt. 4, p. 5; and U.S. Department of Energy, Energy Information Administration, Annual Energy Outlook, 1997, http://www.eia.doe.gov/; Internet, accessed December 20, 1996. One of the panelists argues that the Appel estimate could well be understated, reasoning that the result of electricity industry restructuring -- the combination of lower energy prices (leading to increased usage) and diminished conservation and energy efficiency activity (leading to less energy saving) -- will result in higher than forecasted demand.

[14] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 4, p. 5; and U.S. Department of Energy, Annual Energy Outlook, 1997.

2015. According to industry analysts, use by utilities and independent power producers will experience the largest growth (76%), most of which will occur after 2005, when the structure of the reconfigured electric industry is in place and older nuclear plants have reached the end of their useful lives. With respect to natural gas prices, the DOE forecasts a slight rise in wellhead price over the next ten years, while AGA predicts a drop in retail prices.[15]

The reliability of natural gas projections is unclear, since expected increased reliance on it could alter the supply/demand ratio and seasonal demand affects price. Further, it is noteworthy that gas prices have risen over the past year (and especially more recently with the onset of the colder weather). It appears that gas prices will remain more volatile than coal prices over the long term.

C.3.2 Capacity Additions and Reserve Margins

According to the latest Integrated Resource Plans (IRPs) filed with the PUC, about 3,400 MW of new or repowered capacity will come on line by 2013 (more if Monticello and Prairie Island are not relicensed).[16]

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[15] U.S. Department of Energy, Annual Energy Outlook, 1997; and American Gas Association, "The 1996 A.G.A.-TERA Base Case," Policy Analysis Issues (October 4, 1996): p. 1. Some contended that the Appel Report did not place enough emphasis on the role natural gas can and is expected to play in the future energy mix.

[16] Minnesota Department of Public Service, 1996 Energy Policy and Conservation Report, Chapt. 4, p .9.

The amount of capacity necessary to meet system demand depends upon a number of factors, including time of day and year the power is required, and the status of planned and unplanned generator outages.

The cost of that power is a function of total system demand and the type of plants powered up to meet that demand.[17] The amount of "excess capacity" is also a function of demand. Most of the time, off-peak power will be both available and less costly.

Reserve margin -- the amount of power over and above that which is required to meet system demand and maintain system reliability -- is currently 22%. (MAPP's current policy calls for utilities supplying generation to maintain reserve margins of 15%.)[18] However, MAPP forecasts a precipitous decline in capacity reserve margin over the next ten years, with margins expected to be at only 7.6% in 2004.[19] Determining the exact amount of reserve margin required to maintain system reliability is a complex undertaking

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[17] "Baseload plants," which cover normal demand, typically exhibit the lowest operating costs. "Intermediate plants, which generate shoulder period and other additional requirements, are still relatively economical but have slightly higher operating costs than do baseload plants. "Peaking plants" are powered up only when demand spikes occur; they are the most expensive plants to operate.

[18] Kandace Olsen, interview by author, Minneapolis, MN., August 30, 1996. Ms. Olsen is Administrator of Communications and Information for the Mid-Continent Area Power Pool and one of the members of the Expert Panel.

[19] Mid-Continent Area Power Pool, MAPP Load and Capability Report (Minneapolis: Mid-Continent Area Power Pool, April 1, 1996), pps. VII-1 - VII-7.

APPENDIX C-1

Number of Power Plants in Minnesota

(By Company)

Company	No. Plants Owned	Percent of Total[1]
Southern MN MPA	52[2]	26.9%
Northern States Power	50[3]	25.9%
Minnesota Power	39[4]	20.2%
Otter Tail Power	14	7.3%
Missouri Basin MPA	10	5.2%
Hutchinson	10	5.2%
Interstate Power	7	3.6%
United Power Association	6	3.1%
Dairyland	3	1.6%
Cooperative Power	1	0.5%
Heartland	1	0.5%
TOTAL	**193**	**100%**

Source: Mid-Continent Area Power Pool, 1996

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[1] Approximate due to rounding.
[2] Co-owner, with NSP, of Sherburne Co. coal plant. All other plants are owned by municipalities and leased to SMMPA.
[3] Co-owner, with Southern MN Municipal Power Agency, of Sherburne Co. coal plant.
[4] Two plants jointly owned.

APPENDIX C-2

Power Plants in Minnesota

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity* (MW)
Southern MN Municipal Power Agency[1]	Austin Downtown	1960	Nat. Gas	5.32
	(4 units)	1993	Nat. Gas	11.00 (2)
		1995	Nat. Gas	11.50
	Austin Northeast	1982	Lignite	29.70
	Blooming Prairie (2 units)	1982	Nat. Gas	1.75 (2)[2]
	Fairmont (5 units)	1982	Nat. Gas	23.00 (3)
		1982	No. 2 Oil	11.00
		1992	Nat. Gas	5.00
	Grand Marais	1969	No. 2 Oil	1.21
	(3 units)	1985	No. 2 Oil	.68
		1995	No. 2 Oil	1.14
	Litchfield (2 units)	1984	Nat. Gas	4.29 (2)
	Mora (3 units)	1984	Nat. Gas	13.91 (3)
	No. Branch (2 units)	1984	Nat. Gas	2.35 (2)
	New Prague (4 units)	1982	Nat. Gas	16.76 (4)
	Owatonna (2 units)	1982	Nat. Gas	39.60 (2)
	Princeton (4 units)	1984	No. 2 Oil	7.40 (4)
	Preston (3 units)	1982	No. 2 Oil	.675
		1982	Nat. Gas	3.22 (2)
	Rochester Cascade Cr	1982	No. 2 Oil	31.40
	Redwood Falls (2 units)	1982	Nat. Gas	9.75 (2)
	Sherburne Co.	1987 (J)[3]	Sub. Coal	See NSP
	Silver Lake (4 units)	1982	Sub. Coal	99.00 (4)
	Spring Valley (3 units)	1982	Nat. Gas	3.98 (3)
	Wells (5 units)	1982	Nat. Gas	6.90 (5)
	Lake Zumbro	1984	Hydro	1.00
Totals	**52**			**341.5**

[1] All except Sherburne Co. are owned by municipalities and leased to SMMPA.

[2] Indicates the total number of plants which account for the cumulative generation capacity figure listed to the left.

[3] Indicates joint ownership. Southern Minnesota Municipal Power Agency, with a 41% share, co-owns the plant with Northern States Power Company.

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity (MW)*
Northern States Power	Alliant Techsystems	1994	No. 2 Oil	1.60
	Black Dog (4 units)	1952	Sub. Coal	81.00
		1954	Sub. Coal	137.00
		1955	Sub. Coal	114.00
		1960	Sub. Coal	180.00
	Blue Lake (4 units)	1974	No. 2 Oil	226.80 (4)
	Granite City (4 units)	1969	Nat. Gas	72.00 (4)
	High Bridge (2 units)	1956	Sub. Coal	113.64
		1959	Sub. Coal	163.20
	Hennepin Island	1954	Hydro	4.96 (2)
	(5 units)	1955	Hydro	7.46 (3)
	Inver Hills (6 units)	1972	No. 2 Oil	326.40 (6)
	King	1958	Sub. Coal	598.40
	Key City (3 units)	1970	Nat. Gas	54.00 (3)
	Lake Benton	1995	Wind	25.00
	Minnesota Valley	1953	Sub. Coal	46.00
	Monticello	1971	Uranium	568.80
	Prairie Island	1973	Uranium	1,186.20 (2)
	(2 units)	1974		
	Red Wing	1949	Refuse	23.00
	Riverside (2 units)	1964	Sub. Coal	238.85
		1987	Sub. Coal	165.00
	Sherburne Co.	1976	Sub. Coal	666.00
	(3 units)	1977	Sub. Coal	666.00
		1987 (J)[4]	Sub. Coal	809.00
	United Health Care (2 units)	1993	No. 2 Oil	3.66 (2)
	United Hospital (3 units)	1992	No. 2 Oil	4.80 (3)
	Wilmarth (2 units)	1948	Refuse	12.50
		1951	Refuse	12.50
	W. Fairbault (2 units)	1965	Nat. Gas	32.40 (2)
Totals	**50**			**6,540.2**

[4] Northern States Power, with a 59% share, co-owns the plant with Southern Municipal Power Agency.

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity* (MW)
Minnesota Power	Blanchard (3 units)	1925	Hydro	12.00 (2)
		1988		6.00
	Clay Boswell	1958	Sub. Coal	75.00
	(5 units)	1960	Sub. Coal	75.00
		1973	Sub. Coal	364.50
		1980 (J)[5]	Sub. Coal	558.00
		1980 (J)	No. 2 Oil	.85
	Fond du Lac	1924	Hydro	12.00
	Knife Falls (3 units)	1922	Hydro	24.00 (3)
	Little Falls (6 units)	1906	Hydro	.80 (2)
		1919		1.60 (2)
		1920		1.05
		1979		1.20
	Pillager (2 units)	1917	Hydro	1.60 (2)
	Prairie River (2 units)	1920	Hydro	1.08 (2)
	Scanlon (4 units)	1923	Hydro	1.60 (4)
	Syl Laskin (2 units)	1953	Sub. Coal	116.00 (2)
	Sylvan (3 units)	1913	Hydro	1.20 (2)
		1915		.60
	Thomson (6 units)	1907	Hydro	39.30 (3)
		1914		10.80
		1919		10.80
		1949		12.00
	Winton (2 units)	1923	Hydro	4.00 (2)
Totals	**39**			**1,331.0**

[5] Minnesota Power, with an 80% share, co-owns these plants with Wisconsin Public Power, Inc.

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity (MW)*
Otter Tail Power	Bemidji (2 units)	1907	Hydro	.74 (2)
	Dayton Hollow	1909	Hydro	.45
	(2 units)	1928		.52
	Fergus Control Ctr.	1995	No. 2 Oil	2.00
	Hoot Lake (6 units)	1914	Hydro	1.00
		1948	Sub. Coal	7.50
		1959	Sub. Coal	54.40
		1964	Sub. Coal	75.00
		1967	No. 2 Oil	.43 (2)
	Pisgah	1918	Hydro	.52
	Potlatch Cogen	1992 (J)[6]	Wood and Waste	11.30
	Taplin Gorge	1925	Hydro	.56
Totals		**14**		**154.4**
Missouri Basin MPA	Alexandria (3 units)	1948	No. 2 Oil	1.24
		1966	No. 2 Oil	8.00 (2)
	Benson (3 units)	1939	No. 2 Oil	.60
		1946	No. 2 Oil	.92
		1955	No. 2 Oil	1.30
	Detroit Lakes	1955	No. 1 Oil	10.00
	Luverne (2 units)	1941	No. 2 Oil	.60
		1967	No. 2 Oil	3.50
	Moorhead	1960	No. 2 Oil	10.00
Totals	**10**			**36.2**

[6] Otter Tail Power, with a 50% share, co-owns this plant with Minnkota Power Cooperative, Inc.

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity (MW)*
Hutchinson Utilities Commission	Hutch 1 (7 units)	1941	No. 2 Oil	2.14
		1947	No. 2 Oil	2.14.
		1958	Nat. Gas	2.00
		1964	Nat. Gas	5.00
		1968	Nat. Gas	8.50 (2)
		1971	Nat. Gas	16.00
	Hutch 2 (3 units)	1977	No. 2 Oil	25.00
		1994	Nat. Gas	65.50 (2)
Totals	**10**			**126.3**
Interstate Power	Fox Lake (4 units)	1950	Nat. Gas	11.50
		1951	Nat. Gas	11.50
		1962	Bit. Coal	81.60
		1974	No. 2 Oil	29.40
	Hills	1960	No. 2 Oil	2.00
	Montgomery	1974	No. 2 Oil	29.40
	Rushford	1961	No. 2 Oil	2.00
Totals	**7**			**167.4**
United Power Association	Cambridge CT	1978	No. 2 Oil	29.40
	Elk River (3 units)	1951	Refuse	19.60 (2)
		1959	Refuse	19.20
	Maple Lake CT	1978	No. 2 Oil	29.40
	Rock Lake CT	1978	No. 2 Oil	29.40
Total	**6**			**127.0**

Company	*Name of Plant*	*Year*	*Fuel*	*Nameplate Capacity (MW)*
Dairyland	Lanesboro (3 units)	1931	No. 2 Oil	.30
		1968	No. 2 Oil	1.00
		1968	Hydro	.31
Totals	**3**			**1.6**
Cooperative Power	St. Bonifacius	1978	No. 2 Oil	47.60
Totals	**1**			**47.6**
Heartland Consumers Power District	Marshall	1969	No. 2 Oil	18.35
Totals	**1**			**18.3**

Source: Mid-Continent Area Power Pool, 1996

APPENDIX C-3

Age of Power Plants in Minnesota

(By Fuel Source)

Source	*1900 to 1909*	*1910 to 1919*	*1920 to 1929*	*1930 to 1939*	*1940 to 1949*	*1950 to 1959*	*1960 to 1969*	*1970 to 1979*	*1980 to 1989*	*1990 to 1996*	*Total*
No. 2 Oil				2	5	1	11	17	9	8	**53**
Nat. Gas						3	10	4	30	6	**53**
Hydro	8	11	17		1	5	1	1	2		**46**
Sub. Coal					1	11	4	3	7		**26**
Refuse					2	4					**6**
Nuclear								3			**3**
Bit. Coal							1				**1**
Lignite									1		**1**
No. 1 Oil						1					**1**
Wind										1	**1**
Wood/ Waste										1	**1**
Total	**8**	**11**	**17**	**2**	**9**	**25**	**27**	**28**	**49**	**16**	**192**

Source: Mid-Continent Area Power Pool, 1996.

APPENDIX C-4

Age of Power Plants in Minnesota

(By Decade)

Decade	Number of Plants	Percent of Total[1]
1900 - 1909	8	4.2%
1910 - 1919	11	5.7%
1920 - 1929	17	8.9%
1930 - 1939	2	1.0%
1940 - 1949	9	4.7%
1950 - 1959	25	13.0%
1960 - 1969	27	14.1%
1970 - 1979	28	14.6%
1980 - 1989	49	25.5%
1990 - 1996	16	8.3%
TOTAL	**192**	**100%**

Source: Mid-Continent Area Power Pool, 1996

[1] Approximate due to rounding.

APPENDIX C-5

Aggregate Capacity of Power Plants in Minnesota

(By Age)

Decade	Nameplate Capacity (MW)	Percentage of Total[1]
1900 - 1909	41.3	0.4%
1910 - 1919	28.1	0.3%
1920 - 1929	56.8	0.6%
1930 - 1939	.9	neg.
1940 - 1949	62.0	0.7%
1950 - 1959	1,598.7	18.0%
1960 - 1969	820.5	9.2%
1970 - 1979	4,295.5	48.4%
1980 - 1989	1,845.2	20.9%
1990 - 1996	142.5	1.4%
TOTAL	**8,891.5**	**100%**

Source: Mid-Continent Area Power Pool, 1996

[1] Approximate due to rounding.

APPENDIX C-6

Number of Power Plants in Minnesota

(By Fuel Source)

Source	Number of Plants	Percent of Total[1]
No. 2 Oil	53	27.6%
Natural Gas	52	27.1%
Hydro	46	24.0%
Subbituminous Coal	27	14.1%
Refuse	6	3.1%
Uranium	3	1.6%
Bituminous Coal	1	0.5%
Lignite	1	0.5%
No. 1 Oil	1	0.5%
Wind	1	0.5%
Wood/Waste	1	0.5%
TOTAL	**192**	**100%**

Source: Mid-Continent Area Power Pool
April 1, 1996.

[1] Approximate due to rounding.

APPENDIX C-7

Proportional Reliance on Fuel Sources

(By Company)

Company	*Fuel Source*	*Nameplate Capacity (MW)*	*Percent of Total*[1]
Northern States Power	Coal	3,978.1	60.8%
	Nuclear	1,755.0	27.0%
	Oil	563.3	8.6%
	Natural Gas	158.4	2.4%
	Refuse	48.0	0.7%
	Wind	25.0	0.4%
	Hydro	12.4	0.2%
Total		**6,540.2**	**100%**
Minnesota Power	Coal	1,188.5	89.3%
	Hydro	141.6	10.6%
	Oil	.9	0.1%
Total		**1,331.0**	**100%**
Southern Minnesota Municipal Power Agency	Natural Gas	158.3	46.4%
	Coal	99.0	28.9%
	No. 2 Oil	53.5	15.7%
	Lignite	29.7	8.7%
	Hydro	1.0	0.3%
Total		**341.5**	**100%**

[1] Approximate due to rounding.

Company	*Fuel Source*	*Nameplate Capacity (MW)*	*Percent of Total*
Interstate Power	Bituminous Coal	81.6	48.8%
	Oil	62.8	37.5%
	Natural Gas	23.0	13.7%
Total		**167.4**	**100%**
Otter Tail Power	Coal	136.9	88.6%
	Wood/Waste	11.3	7.3%
	Hydro	3.8	2.5%
	Oil	2.4	1.6%
Total		**154.4**	**100%**
United Power Association	No. 2 Oil	88.2	69.4%
	Refuse	38.8	30.6%
Total		**127.0**	**100%**
Hutchinson Utilities Commission	Natural Gas	97.0	76.8%
	Oil	29.3	23.2%
Total		**126.3**	**100%**

Company	*Fuel Source*	*Nameplate Capacity (MW)*	*Percent of Total*
Cooperative Power	Oil	**47.6**	**100%**
Missouri Basin MPA	No. 2 Oil No. 1 Oil	26.2 10.0	72.4% 27.6%
Total		**36.2**	**100%**
Heartland Consumers Power District	Oil	**18.3**	**100%**
Dairyland	Oil Hydro	1.3 .3	80.6% 19.4%
Total		**1.6**	**100%**
GRAND TOTAL		***8,891.5***	

Source: Mid-Continent Area Power Pool
April 1, 1996.

APPENDIX D

Externality Values of Pollutants

(in 1995 dollars per ton)

Source	*Urban*	*Metropolitan Fringe*	*Rural*	*Within 200 Miles of Minnesota*
SO_2	$112 - $189	$46 - $110	$10 - $25	$10 - $25
PM_{10}	$4,462 - $6,423	$1,987 - $2,886	$562 - $855	$562 - $885
CO	$1.06 - $2.27	$0.76 - $1.34	$0.21 - $0.41	$0.21 - $0.41
NO_x	$371 - $978	$140 - $266	$18 - $102	$18 - $102
Pb	$3,131 - $3,875	$1,652 - $1,995	$402 - $448	$402 - $448
CO_2	$0.30 - $3.10	$0.30 - $3.10	$0.30 - $3.10	$0.30 - $3.10

SO_2 -- sulfur dioxide
PM_{10} -- particulate matter less than ten microns
CO -- carbon monoxide
NO_x -- nitrogen oxides
Pb -- lead
CO_2 -- carbon dioxide

Source: Minnesota Public Utilities Commission, Docket No. E-999/CI-93-583, Order Establishing Environmental Cost Values, issued December 16, 1996.

APPENDIX E

A Brief History of Utility Regulation in the United States[1]

In 1907, the first ***public utility commissions*** were established. The states of New York and Wisconsin created governmental oversight bodies to enforce rules by which monopoly utility companies could operate.

In the early part of the 20th Century, holding companies consolidated the electric industry. The collapse of utility stocks in the 1930s prompted investigations by the Securities and Exchange Commission and the Federal Trade Commission into the practices of these holding companies. The first industry restructuring took place in 1935 with the passage of the ***Public Utility Holding Company Act (PUHCA)***, which "transformed the multi-state, complex holding companies into simple corporate structures subject principally to regulation by state authorities."[2]

At the same time, the ***Federal Power Act*** created the ***Federal Power Commission***, which was vested with authority over interstate transmission and responsibility for ratesetting for wholesale sales of power.

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[1] The material in this appendix was gathered from a number of sources, including most prominently: Timothy J. Brennan and others, A Shock to the System (Washington, D.C.: Resources for the Future, 1996), pps. 21-35; Minnesota Public Utilities Commission, Docket No. E-999/CI-95-135, Investigation of Structural and Regulatory Issues in the Electric Utility Industry, Staff Memorandum, Proposed Scope of Investigation, April 13, 1996, pps. 2-4, 13-14; and Michael T. Maloney and Robert E. McCormick, Customer Choice, Consumer Value, An Analysis of Retail Competition in America's Electric Industry, (Washington, D.C.: Citizens for a Sound Economy Foundation), 1996.

[2] Brennan and others, A Shock to the System, p. 23.

The system remained virtually unchanged through three decades until November 19, 1965, when 30 million customers throughout a good part of the eastern seaboard -- from Canada to New Jersey -- experienced the ***Great Northeast Blackout***. Utilities responded to this unprecedented failure of the interconnection grid by establishing a voluntary organization -- the ***North American Electric Reliability Council (NERC)***. This organization is comprised of nine Regional Reliability Councils within the contiguous United States and parts of Canada,[3] of which the **Mid-Continent Area Power Pool (MAPP)** is one.[4] NERC's role is to maintain the reliability of the national transmission system by coordinating the balance of supply and demand and ensuring adequate system planning.

In 1977, the United States Department of Energy was created, and the Federal Power Commission was reconstituted into ***the Federal Energy Regulatory Commission (FERC)***. Several years earlier, a Supreme Court ruling provided the underpinning for the recent FERC decisions which opened the nation's transmission grid to all. In 1973, the Supreme Court found Otter Tail Power Company in violation of federal law for refusing to wheel over its network wholesale power sold from a federal utility to a municipal district utility in Elbow Lake, Minnesota.[5] This ruling would have critically important regulatory consequences some twenty years later.

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[3] A tenth covers one of the noncontiguous areas: the Alaska Systems Coordinating Council.

[4] The MAPP region covers all of the states of Minnesota, Iowa, Nebraska, North Dakota, the Canadian provinces of Manitoba and Saskatchewan, most of South Dakota, and portions of Illinois, Michigan, Montana and Wisconsin.

[5] Otter Tail Power Company v. United States 410 U.S. 366 (1973).

Meanwhile, one year earlier, the ***Public Utilities Regulatory Policies Act (PURPA)*** set in motion a series of events that has led to what will likely be the dissolution of traditional utility regulation in this country. Among other things, PURPA spurred the development of alternative energy by providing tax credits for generators using renewable energy sources and, most importantly, establishing a category of alternative suppliers known as non-utility generators (NUGs),[6] and *requiring* utilities to purchase all the power they produced at the utilities' avoided cost.[7] While PURPA's mandatory purchase requirements have led in some cases to the stranded cost dilemma states are facing today,[8] it has accelerated the production of alternative energy by guaranteeing sales and thus providing confidence for investors. By 1994, NUGs represented 60% of new capacity and 7% of the entire U.S. electricity generation.[9]

The Energy Policy Act of 1992 (EPACT) furthered the move to open the system by removing obstacles to ownership and transmission access. Specifically, it required the FERC to open transmission access to all generators and created a new category of generators not subject to the provisions of PUHCA: Exempt Wholesale

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[6] Non-utility generators (NUGs) that meet PURPA criteria and are eligible for utility guarantees to purchase the power they produce are known as "qualifying facilities" (or QFs). PURPA also spawned the development of other independent power producers (IPPs) that do not meet QF criteria, but that compete in utility bidding auctions for new capacity.

[7] Utility avoided cost is the cost at which utilities would otherwise have to procure power, either through purchase or self-generation. Specific avoided cost determinations were left to legislators or regulators on a state-by-state basis.

[8] That is because utilities often entered into long term contracts with independent power producers for electricity at prices which, at the time, using then-current long run avoided cost estimates, looked favorable but now, in retrospect, are (in some cases substantially) above what it costs those utilities to produce or purchase that electricity.

[9] Brennan and others, A Shock to the System, p. 30.

Generators (EWGs). EPACT also provided for a 1.5 cent per kwh income tax credit for wind or biomass generated energy.

In 1996, the FERC, implementing the mandates of EPACT, issued ***Order 888 and Order 889***. The first directs the utilities to file open access tariffs, establishing a common carriage system along the transmission line highway, while the second requires utilities to establish an electronic system -- the Open Access Same-time Information System (OASIS) -- to share information about available transmission capacity.

Also in 1996 three bills were introduced in Congress that would have required retail competition around the turn of the century nationwide and would have repealed all or key provisions of PUHCA and PURPA. Though no federal legislation was enacted, a federal mandate to fundamentally restructure the electric industry appears imminent and inevitable.

APPENDIX F

Summary of Major Federal Restructuring Legislation Introduced in 1996

During the 104th Congress, sixteen bills were introduced that would affect in some way electric industry restructuring. Three of those introduced would require comprehensive change, effectively dismantling of electric utility industry as we know it and replacing it with a system that would permit all retail customers -- whether residential, commercial or industrial -- to shop for the electricity supplier of their choice.[1] The following provides a brief summary of the key provisions of each proposal.

The Electric Consumers' Power to Choose Act of 1996 (H.R. 3790)

Introduced by **Rep. Dan Schaefer** of Colorado, this bill received much, if not the most, attention during the session. This bill mandated all electric utilities, including municipal utilities and cooperatives, to provide retail choice to all classes of customers no later than December 15, 2000. Transmission and distribution functions would continue to be provided under rate of return regulation.

States would have six months from passage to submit notice to the Federal Energy Regulatory Commission (FERC) of their plans to bring about retail choice. (The bill provides for a two-year extension should state legislative action be necessary to effectuate this clause.) If a state failed to provide the required notice within the prescribed time limit, the FERC was authorized to act in its stead, pre-empting state decision making.

[1] Rep. Markey introduced two bills which were later consolidated into a single piece of legislation.

In addition, states would be required to consider the following: (1) universal service and other consumer protection provisions; (2) terms that would ensure and enhance the reliability of electric service; (3) determinations as to "whether or not it is appropriate to apply...terms and conditions allowing any electric utility...to recover costs incurred prior to July 11, 1996"; and (4) terms to promote energy efficiency and environmental programs. Any terms would have to be implemented on a competitively neutral basis.

The bill would establish a minimum generation requirement for renewables, with all generators selling power in a state required to provide renewable energy equal to 2% of total generation through 2004. From 2005 through 2009, generators would be required to provide renewable energy equal to 3% of the total, and in 2010 and thereafter, 4% of total generation must be from renewable sources. These requirements could be met through the acquisition of tradable credits.

The bill would repeal the mandatory alternative energy purchase requirements of the Public Utilities Regulatory Policies Act (PURPA) once all customers were provided with choice of supplier and the minimum generation requirement for renewables were met. Similarly, the provisions of the Public Utility Holding Company Act (PUHCA) would cease to apply when the above conditions were met.

Finally, states would be permitted to impose licensing or permit fees, but only on a "nondiscriminatory and competitively neutral basis," while states and local governments would be allowed to impose facility siting requirements.

The Electric Power Competition and Customer Choice Act of 1996
(H.R. 2929 & H.R. 3782)

Rep. Edward J. Markey of Massachusetts introduced two bills, which together form the Electric Power Competition and Customer Choice Act of 1996.

The bills link repeal of PUHCA and PURPA with state actions to open systems to full retail access by all classes of customers. In addition, to obtain relief from these two laws, states would have to certify that they have met certain standards in the areas of provision of renewable energy sources, energy efficiency programs and low-income customer protections.

PUHCA and PURPA would cease to apply once a state certifies that federal standards of competition, a minimum renewable portfolio standard and minimum energy efficiency and low-income standards have been met.

A state could meet the federal standards of competition in one of two ways: (1) if utilities permit competition in retail sales to all customers, the opportunity to build, own and operate new generating capacity is open to all sources, and the incumbent electric utilities do not gain competitive advantage over competitors; or (2) if the incumbent utilities have divested themselves of all existing generation

The minimum standards for renewable energy, energy efficiency and low-income protections are as follows: (1) all suppliers must have "both the incentive and opportunity to provide energy-efficiency and renewable energy resources that are less costly on a life-cycle basis than displaced generation"; (2) a nonbypassable charge on use of or access to local distribution services is "in effect and adequate to ensure sustained and equitable allocation of costs associated with low-income services and other investments,

including those in fuel diversity and energy-efficiency, that deliver system wide benefits in the form of equity among, or reduced life-cycle costs of service to, electricity consumers...."; (3) current levels of reliance on renewable energy are maintained or improved; and (4) all customer classes share burden for "legitimate, verifiable, nonmitigatable stranded costs for which there is a reasonable expectation of recovery."

The bills also gives states and FERC authority to guard against utility mergers and acquisitions that are anti-competitive and to regulate utility market power to ensure fair markets. Among the remedies the FERC can order is the sale of assets to either an affiliated or non-affiliated company.

Electricity Competition Act of 1996 (S. 1526)

This bill, introduced by **Sen. J. Bennett Johnston** of Louisiana,[2] affirms states' authority to implement retail access and to do so under a timetable they so choose, but in no event later than 2010. State public utility commissions and nonregulated suppliers are directed to initiate proceedings to consider adopting one of three options: wholesale competition that meets certain "competitive standards"; retail access by January 1, 2002; or any "alternative plan." The alternative plan must ensure that: (1) any regulated or nonregulated utility does not "unduly discriminate in favor of its own...or its affiliate's sources"; (2) regulated or nonregulated utilities do not engage in self-dealing; and (3) any above market costs for renewable generation are spread among all consumers.

[2] Sen. Johnston retired from the Senate, declining to run for reelection in 1996.

The Johnston Bill would repeal the mandatory purchase provisions of PURPA. It explicitly states that nothing in it "shall be construed to prohibit states from encouraging the production of renewable electric generation under applicable State law or the voluntary purchase of renewable electric generation by any electric utility or electric customer."

The act would direct the FERC to "provide for the recovery of all stranded costs...." Stranded costs are defined as those which "the utility has made reasonable attempts to mitigate" and which are "legitimate, prudently incurred and verifiable."

Finally, this proposed legislation would "authorize and ensure the recovery in rates...all costs associated with...the decommissioning of...nuclear generating units."

COMPARISON OF SCHAEFER, MARKEY AND JOHNSTON BILL PROVISIONS

Provision	*Schaefer*	*Markey*	*Johnston*
Date by which Retail Competition is required	December 15, 2000	No date stipulated.	2010
Stranded Cost	States decide if appropriate to recover.	Legitimate, verifiable, and mitigatable costs may be recovered. Shared by all customer classes.	May recover prudent, legitimate and verifiable costs. Utilities must attempt to mitigate.
Renewables	Portfolio Standard: 2% to 2004 3% to 2009 4% in 2010	Portfolio Standard: Maintain or improve current levels.	Nothing prohibits states from encouraging.
Energy Efficiency	States must consider terms to promote.	Minimum standard to be established. Nonbypassable charge to fund.	Does not address.
PURPA/PUHCA	Repealed	Repealed if states meet criteria.	PURPA repealed. Does not address PUHCA.
Other	States may license suppliers. States may adopt siting rules.	Authorizes PUCs and FERC to prevent market power and anti-competitive mergers.	Authorizes recovery of all nuclear decommissioning costs.

APPENDIX G

Comparison of Restructuring Provisions in States with Legislative or Regulatory Mandates

State	Market Structure	Stranded Cost Recovery	RPS	SBC	DSM	Low Income	Munis/Coops
Arizona	Retail	Yes	Yes	Yes	Yes	Yes	May choose to participate
California	Retail	Yes	No	Yes	Yes	Yes	Authorized, not required to participate.
Maine	Retail	Yes	Yes	Yes	Yes	Yes	Need not separate/divest gen. assets.
Massachusetts	Retail	Yes	Yes	No	Yes	Yes	Encouraged, not required to participate.
New Hampshire	Retail	Yes	Yes	No	No	Yes	Not included.
New York	Wholesale, then Retail	Yes	No	Yes	Yes	Yes	Not included.
Rhode Island	Retail	Yes	No	Yes	Yes	Yes	May aggregate; may not resell.
Pennsylvania	Retail	Yes	No	Yes	No	Yes	Reciprocity required if choose to enter.
Vermont	Retail	Yes	Yes	Yes	Yes	Yes	Need not separate generation assets.

APPENDIX H

Restructuring Activity Around the Country[1]

Restructuring Legislation Passed

California
New Hampshire
Pennsylvania
Rhode Island

Legislation Introduced or Under Study

Alabama
Alaska
Arizona
Colorado
Connecticut
Delaware
Hawaii
Illinois
Indiana
Iowa
Kansas
Louisiana
Maine
Massachusetts
Michigan
Minnesota
Missouri
Montana
Nevada
New Jersey
New Mexico
New York
North Carolina
Ohio
Oklahoma
Oregon
South Carolina
Texas
Utah
Vermont
Virginia
Washington
Wisconsin

[1] As of February 14, 1997.

Commission Restructuring Order, Rules, Plan or Principles Issued

Arizona
Iowa
Louisiana
Maine
Massachusetts
New York
Vermont
Washington

Formal Commission Inquiry In Progress

Arkansas
Colorado
Connecticut
Delaware
Dist. of Columbia
Hawaii.
Kansas
Maryland
Michigan
Minnesota
Mississippi
Montana
Nevada
New Jersey
New Mexico
North Carolina
North Dakota
Oklahoma
Texas
Utah
Virginia
West Virginia
Wisconsin

Informal Commission Investigation

Alabama
Florida
Georgia
Illinois
Indiana
Kentucky
Missouri
Missouri
Ohio
Oregon
South Carolina
West Virginia
Wyoming

Pilot Approved/Under Review

Idaho
Illinois
Massachusetts
Michigan
Missouri
New Hampshire
New York
Oregon
Washington

Restructuring Considered and Rejected

Idaho

No Activity

Nebraska[2]
South Dakota
Tennessee[3]

[2] Nebraska has no investor-owned utilities.

[3] Tennessee has no investor-owned utilities; it is served primarily by the Tennessee Valley Authority.

State	Action Taken	Competition Begins
Arizona	December 1996 (Commission order issued)	1999
California	Sept. 1996 (Law signed)	1998
Massachusetts	May 1996 (Commission proposal issued)	1998
Maine	December 1996 (Commission plan presented to Legislature)	2000
New Hampshire	May 1996 (Law passed)	1998
New York	May 1996 (Commission order issued)	Wholesale: 1997 Retail: 1998
Pennsylvania	November 1996 (Law passed)	1999
Rhode Island	August 1996 (Law signed)	1997
Vermont	December 1996 (Board order issued)	1998

APPENDIX I

Nuclear Waste Management Questions

Chapter No. 641
S.F. No 1706
Subd. 4

RADIOACTIVE WASTE MANAGEMENT; FUTURE AND ECONOMIC ANALYSIS

The legislative task force shall analyze the future of and the economic effects of the continued generation of electric power and radioactive waste at the Prairie Island nuclear power plant. The task force shall include in its report..., a specific discussion of:

(1) when radioactive waste will be removed from Prairie Island for permanent storage outside of the state, who will bear the costs of the future management of the radioactive waste generated by the Prairie Island nuclear generating plant; when that shift in responsibility is likely to occur; and to what extent utility ratepayers and shareholders and state taxpayers will be shielded from the costs to manage the waste in the future;

(2) the probability of an accident and the extent to which persons who may be at risk of personal injury or property damage due to foreseeable or unforeseeable catastrophic events that may allow the release of radioactivity from the nuclear power plant and associated activities could be fully compensated for the injuries or damage and by whom;

(3) a range of reasonable estimates of the costs to manage radioactive waste generated by the nuclear power plant under scenarios to be developed by the task force, ranging from monitoring the waste in the storage pool at Prairie Island to removal of waste from the state beginning in 1998 to permanent storage of the waste in the state; to the extent those costs will necessarily fall on present and future utility ratepayers and shareholders and state taxpayers, how to ensure they can be met without catastrophic disruption of the state's economy in the future; and whether funds should be set aside to ensure that present ratepayers pay the future costs of radioactive waste management based on volume of usage of electricity rather than on the rate structure of the utility;

(4) whether reprocessing and reuse of spent nuclear fuel generated by the Prairie Island nuclear generating plant is technically and economically feasible; if so, how to encourage development of reprocessing and reuse;

(5) whether emerging nuclear technologies, such as integral fast reactors, which can generate electricity without environmental damage while producing no or minimal radioactive waste, are economically feasible and practical electric energy alternatives in the foreseeable future and, if so, how to encourage and take advantage of such technologies;

(6) if the waste is likely to be removed from the state, whether technologies are likely to be economically feasible in the relatively near future for minimizing the handling of the waste and minimizing contamination of additional materials that will need special management prior to transport out of the state, including the availability of combination storage and transport containers;

(7) if the waste unlikely to be removed from the state or if the waste will need to be indefinitely stored outside the power plants after decommissioning, whether sites for storage of the waste outside the structure of the Prairie Island power plant potentially can be found that minimize economic and social disruption, maximize environmental, health, and safety protection, minimize transportation distance, and place the burden of storage of the waste on other communities that enjoy the immediate economic benefits of the existence and operation of the power plants; if potential sites exist, what process should be used to identify and utilize them if necessary; the entity that is searching for an alternative site within the state for the disposal of spent nuclear fuel from the Prairie Island nuclear generating plant, is seeking permits for the site, or is constructing the site shall report progress on those activities every six months to the task force commencing January 1, 1995;

(8) factors to be used in siting a high-level radioactive waste management facility to include at least:

(i) the proximity of the site to residents and businesses;

(ii) the proximity of the site to surface waters;

(iii) the vulnerability of the site to tornadoes and other natural phenomena;

(iv) the benefits received and the costs incurred by the host and adjacent communities due to the operation of the nuclear generating facility that produced the high-level radioactive waste to be managed at the proposed facility;

(v) the benefits received and costs incurred by the host and adjacent communities due to the operation of the proposed waste management facility;

(vi) the availability of transportation routes between the nuclear generating plant and the proposed waste management facility; and

(9) federal law related to the interstate transportation of high-level radioactive waste and how that law may operate in relation to an independent spent fuel storage installation located in the state.