93-583

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
100 Washington Square, Suite 1700
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Minneapolis, Minnesota 55401-2138

March 22, 1996

Dr. Burl W. Haar
Executive Secretary
MN Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101-2147

RE: In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Ch. 356, Section 3; OAH Docket No. 6-2500-8632-2

Dear Dr. Haar:

Enclosed and served upon you by mail is a copy of the Administrative Law Judge's Findings of Fact, Conclusions, Recommendation and Memorandum in the above-captioned matter. The official record will be hand-delivered to you at a later time.

Yours very truly,

Allan W. Klein

ALLAN W. KLEIN
Administrative Law Judge

Telephone: 612/341-7609

AWK:lr

Enclosures

cc: All Parties and Counsel of Record

6-2500-8632-2
E-999/CI-93-583

STATE OF MINNESOTA

OFFICE OF ADMINISTRATIVE HEARINGS

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3

FINDINGS OF FACT, CONCLUSIONS, RECOMMENDATION AND MEMORANDUM

The above-entitled matter came on for public and evidentiary hearings before Allan W. Klein, Administrative Law Judge from the Office of Administrative Hearings, between April 8, 1995 and June 28, 1995. The following parties made appearances:

Joan Peterson, Assistant Attorney General, and Sarah J. DeSanto, Assistant Attorney General, 1200 NCL Tower, 445 Minnesota Street, St. Paul, Minnesota 55101-2130, for the Office of Attorney General, Residential Utilities Division.

Joshua S. Wirtschafter, Assistant Attorney General, and Brent Vanderlinden, Assistant Attorney General, 1200 NCL Tower, 445 Minnesota Street, St. Paul, Minnesota 55101-2130, for the Department of Public Service.

Steven A. Shakman, Assistant Attorney General, and Barbara Freese, Assistant Attorney General, 1100 NCL Tower, St. Paul, Minnesota 55101-2130, for the Minnesota Pollution Control Agency.

Heidi Heitkamp, Attorney General, State Capitol, 600 East Boulevard, Bismarck, North Dakota 58505-0040, and Lyle Witham, Assistant Attorney General, 900 East Boulevard, Bismarck, North Dakota 58505, for the State of North Dakota.

Charles S. Miller, Attorney at Law, 400 East Broadway, Suite 600, P.O. Box 2798, Bismarck, North Dakota 58502, for the Lignite Energy Council.

Peter Glaser, Attorney at Law, 1401 New York Avenue, N.W., Suite 1100, Washington, D.C. 20036, and Lawrence Moloney, Attorney at Law, 3500 Fifth Street Towers, 150 South Fifth Street, Minneapolis, Minnesota 55402-4235, for Western Fuels Association, Inc.

Susan Hedman, Attorney at Law, 203 North LaSalle Street, Suite 1390, Chicago, Illinois 60601, and William Grant, for the Izaak Walton League, ME3, and the American Wind Energy Association.

Katherine E. Sasseville, General Counsel, and Todd J. Guerrero, Attorney at Law 215 South Cascade Street, Fergus Falls, Minnesota 56537, for Otter Tail Power Company.

Jeffrey L. Landsman, Attorney at Law, Suite 801, Anchor Building, 25 West Main Street, Madison, Wisconsin 53703, for Dairyland Power Cooperative.

Deborah A. Amberg, Attorney at Law, 30 West Superior Street, Duluth, Minnesota 55802, for Minnesota Power.

Robert S. Lee, Attorney at Law, 1600 TCF Tower, Minneapolis, Minnesota 55402-2859, for the Large Power Intervenors.

Audrey A. Zibelman, Attorney at Law, and Michael Connelly, Attorney at Law, 414 Nicollet Mall, Fifth Floor, Minneapolis, Minnesota 55401-1993, for Northern States Power Company.

Karen R. Hansen, Attorney at Law, 14615 Lone Oak Road, Eden Prairie, Minnesota 55344-2287, for Cooperative Power.

Catherine A. Dominguez, Attorney at Law, Blair A. Rosenthal, Attorney at Law, and Peter Gabauer, Attorney at Law, 3200 Minnesota World Trade Center, 30 East Seventh Street, St. Paul, Minnesota 55101, for the Center for Energy and Economic Development.

David B. Sogard, Attorney at Law, P.O. Box 13200, Grand Forks, North Dakota 58208-3200, for Minnkota Power Cooperative and the Northern Municipal Power Agency.

Roger Miller, Attorney at Law, 402 Drovers First American Bank Building, 633 South Concord Street, P.O. Box 298, South St. Paul, Minnesota 55075, for United Power Association.

Michael Bradley, Attorney at Law, 4800 Norwest Center, Minneapolis, Minnesota 55401-4129, for Natural Gas Utilities.

Carol Garland Wiessner, Attorney at Law, 26 East Exchange Street, Suite 206, St. Paul, Minnesota 55101-2264, for the Minnesota Center for Environment Advocacy.

Notice is hereby given that, pursuant to Minn. Stat. § 14.61, in the Rules of Practice of the Public Utilities Commission and the Office of Administrative Hearings, exceptions to this Report, if any, by any party adversely affected must be filed within 20 days of the mailing date hereof with the Executive Secretary, Minnesota Public Utilities Commission, Metro Square Building, Suite 350, 121 7th Place East, St. Paul, Minnesota 55101. Exceptions must be specific and stated and numbered separately. Proposed findings of fact, conclusions and order should be included, and copies thereof

shall be served upon all parties. If desired, a reply to exceptions may be filed and served within 10 days after the service of the exceptions to which reply is made. Oral argument before a majority of the Commission will be permitted to all parties adversely affected by the Administrative Law Judge's Recommendation who request such argument. Such request must accompany the filed exceptions or reply, and an original and 12 copies of each document should be filed with the Commission.

The Minnesota Public Utilities Commission will make the final determination of the matter after the expiration of the period for filing exceptions, as set forth above, or after oral argument if such is requested and had in the matter.

Further notice is given that the Commission may, at its own discretion, accept or reject the Administrative Law Judge's recommendation and that said recommendation has no legal affect unless expressly adopted by the Commission as its final order.

STATEMENT OF ISSUE

What values, if any, should the Commission establish as the "environmental costs associated with each method of electricity generation" within the meaning of Minn. Stat. § 216B.2422, subd. 3 (1994)?

Based upon the all the files and proceedings, the Administrative Law Judge makes the following:

FINDINGS OF FACT

Legislative Background and Procedural History

1. This case has its origins in a law passed by the Minnesota Legislature in 1991. See Minn. Session Laws 1991, Chapter 315, section 1. The statute was originally passed as an "adder" approach which required direct payments to certain energy suppliers that avoided environmental damage. See Minn. Stat. § 216B.164 (1991) (repealed). The original law required utilities to pay environmental costs directly to Public Utilities Regulatory Policy Act Qualifying Facilities as a component of the price paid for the purchase of energy and capacity.

2. The Commission formed a workgroup in order to implement Minn. Stat. § 216B.164, subd. 4. Primarily because of concerns raised in the workgroup about the initial statute, the Legislature re-examined the issue of environmental costs. In 1993, the Legislature repealed the "adder" statute and passed the current statute, Minn. Stat. § 216B.2422.

3. Minn. Stat. § 216B.2422 takes environmental costs out of the realm of payments to Qualifying Facilities and places their consideration within the context of resource planning. As the Commission observed: "The difference between the two laws represents movement from an 'adder' approach toward a 'total costs minimization'

approach." MPUC Order Establishing Interim Environmental Cost Values (March 1, 1994), p. 3.

4. Minn. Stat. § 216B.2422 required the Commission to set interim environmental cost values by March 1, 1994 and also codified the Commission's existing Resource Planning process. 1993 Session Laws, ch. 356, § 3. After passage of Chapter 356, the Commission initiated the interim environmental cost proceeding. In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, ch. 356, § 3; Docket No. E999/CI-93583; Order Establishing Procedure for Establishing Interim Environmental Cost Values, (August 17, 1993) ("Order Establishing Procedures").

5. The Commission determined that an expedited generic proceeding was the best procedural option for establishing interim environmental cost values within the statutory time frame. It concluded that neither a rulemaking nor a contested case proceeding would allow it to meet the March 1, 1994 deadline for interim values. MPUC Order Establishing Procedures, p. 3. The expedited proceeding was conducted as a notice and comment process in which any interested person was given the opportunity to provide written and oral comment to the Commission. Parties were directed to submit proposed interim values and to address a list of questions related to the quantification of environmental costs. Id. at 5. Over 20 parties participated in the interim proceeding.

6. By Order dated March 3, 1994, the Commission established a range of interim values for five emissions: (1) sulfur dioxide (SO_2); (2) nitrogen oxides (NOx); (3) volatile organic compounds (VOCs); (4) particulates (PM_{10}); and (5) carbon dioxide (CO_2). MPUC Order Establishing Interim Environmental Cost Values (March 1, 1994) ("Interim Values Order"). The Commission adopted the following range of values for each of these five emissions:

SO_2: $0 - $300 per ton;
NOx: $68.80 - $1640 per ton;
VOCs: $1180 - $1200 per ton;
PM_{10}: $166.60 - $2380 per ton;
CO_2: $5.99 - $13.60 per ton.

7. By Order dated March 3, 1994, the Commission also ordered the initiation of formal evidentiary hearings to set final environmental cost values. The Commission then ordered that the contested case proceeding begin with a prehearing conference on Monday, March 14, 1994.

8. The first prehearing conference was held on March 14. On March 18, the Administrative Law Judge ("ALJ") issued his First Prehearing Order, in which he set forth a procedure and schedule to define the scope of the proceeding. In addition, the Order named the following as the initial formal parties to the proceeding:

Northern States Power Company
Minnesota Power
Minnegasco
Otter Tail Power Company
Cooperative Power Association
United Power Association
Other "jurisdictional utilities" (to be determined later)
Department of Public Service
Office of Attorney General--RUD
Minnesota Pollution Control Agency
The American Wind Energy Association
The Center for Energy and Environment
District Energy of St. Paul
The Institute for Local Self Reliance
The Izaak Walton League of America
Minnesotans for an Energy Efficient Environment
Minnkota Power Cooperative
Western Fuels Association

9. On April 28, 1994, the ALJ issued his Second Prehearing Order, in which he withdrew the procedural schedule pending the enactment of legislation that could have affected the proceeding. On May 13, 1994, the ALJ issued his Third Prehearing Order, in which he reinstated the scoping process, but with a modified schedule. In addition, the Order named the following as parties:

Northern States Power Company
Minnesota Power
Minnegasco
Otter Tail Power Company
Cooperative Power Association
United Power Association
Other "jurisdictional utilities" who comply with the filing requirements of [the May 13] Order
Department of Public Service
Office of Attorney General--RUD
Minnesota Pollution Control Agency
American Wind Energy Association
Center for Energy and Environment
District Energy of St. Paul
Institute for Local Self Reliance
Izaak Walton League of America
Minnesotans for an Energy Efficient Environment
Western Fuels Association
Lignite Energy Council
Center for Energy & Economic Development

Potlatch Corporation
Northern Municipal Power Agency
Southern Municipal Power Agency
Large Power Intervenors
Boise Cascade Corporation

10. On June 28, 1994, the ALJ conducted a second prehearing conference. The ALJ's Fourth Prehearing Order, dated July 13, 1994, defined the scope of the proceeding. The ALJ determined that parties would be free to submit evidence on the following topics: any pollutant that the parties wished to have valued; the geographic sensitivity of the values; appropriate methodologies for establishing values; internalization of environmental costs; environmental benefits as well as detriments; any pathway for pollution; all types of electrical generation technologies; and upstream and downstream environmental costs. Fourth Prehearing Order, pp. 23. The Order further requested parties to submit memoranda on the question of whether evidence should be limited to environmental costs or whether it should also include socioeconomic and other factors. Id. at 3. The Order also determined the schedule for dispositive motions.

11. On August 24, 1995, the ALJ issued his Fifth Prehearing Order determining that testimony and arguments relating to non-environmental issues, such as socioeconomic costs and benefits, would be admitted only for the purposes of creating a record to support or defend constitutional challenges and would be excluded from consideration for purposes of the Findings of Fact, Conclusions, and Recommendation. Fifth Prehearing Order, p. 1. The ALJ then certified this determination to the Commission for its review. Upon review, the Commission confirmed that evidence regarding the possible social and economic consequences of applying environmental cost values should not be considered in setting the values. See MPUC Order Modifying Administrative Law Judge's Fifth Prehearing Order on the Consideration of Socioeconomic Factors (October 28, 1994). The Commission, however, modified the ALJ's Fifth Prehearing Order to permit the consideration of socioeconomic evidence that is relevant to quantifying environmental cost values. The Commission stated that the test for admissibility of evidence in the proceeding should be the extent to which the evidence helps to quantify environmental costs. Id. at 2.

12. The parties filed direct testimony on November 29, 1994, rebuttal testimony on March 15, 1995, and surrebuttal testimony on April 28, 1995. In a Memorandum dated April 26, 1995, the ALJ extended the filing date for surrebuttal testimony relating to mercury and all testimony relating to criteria pollutants except for the emissions trading aspects of SO_2 to May 19, 1995.

13. From April 18 to April 27, 1995, six public hearings were held throughout the state, including a three-city videoconference. Over 160 people presented testimony at the public hearings.

14. The evidentiary hearing was conducted over 27 days from May 8 to June 28, 1995. Over 50 witnesses presented testimony during the course of the proceeding.

15. Several parties submitted motions to strike portions of the prefiled testimony of a number of witnesses. The ALJ delayed ruling on these motions until after the evidentiary hearings at which time these motions and additional post-hearing evidentiary motions were considered. Given the numerous evidentiary issues raised, The ALJ ordered that two sets of post-hearing briefs be filed; one for the evidentiary issues and one for substantive issues. The parties filed initial evidentiary issues briefs on September 8, 1995. Reply briefs on evidentiary issues were filed on October 6, 1995. The ALJ issued his ruling on evidentiary issues on November 16, 1995. This ruling excluded evidence which related to the application of environmental cost values, reaffirming the pre-trial ruling of the Commission. See Post-Hearing Ruling on Evidentiary Motions, p. 3 (Nov. 16, 1995) and MPUC Order Modifying ALJ's Fifth Prehearing Order (Oct. 28, 1994).

16. In his November 16 Ruling, the ALJ further determined that there were no constitutional issues ripe for decision by the ALJ or the Commission. Post-Hearing Ruling on Evidentiary Motions, p. 3., n. 1. The ALJ rejected the argument that the phrase "to the extent practicable" in the statute requires the ALJ or the Commission to consider certain constitutional issues in considering the "practicability" of adopting environmental cost values. The ALJ concluded that the phrase must be read more narrowly to refer to consideration of the sufficiency of data or level of uncertainty involved in quantifying values. See Post-Hearing Ruling on Evidentiary Motions, ALJ Memorandum, p. 13.

17. Finally, the ALJ's ruling on the evidentiary issues confirmed that the appropriate rule of evidence to apply in this case is the rule of the Office of Administrative Hearings. This rule permits the admission of all evidence which possesses probative value, including hearsay, if it is the type of evidence on which reasonable, prudent persons are accustomed to rely in the conduct of their serious affairs. Minn. R. 1400.7300, subp. 1. The rule excludes evidence which is incompetent, irrelevant, immaterial or unduly repetitious. Id. The ALJ concluded that it is neither necessary nor appropriate to use stricter evidentiary standards. Post-Hearing Ruling on Evidentiary Motions, p. 4.

18. The following parties submitted substantive briefs in this matter: Center for Energy and Economic Development ("CEED"); Cooperative Power Association, Minnkota Power Cooperative and United Power Association ("CPA, et al."); Dairyland Power Cooperative ("Dairyland"); the Department of Public Service ("Department" or "DPS"); the Izaak Walton League of America, Minnesotans for an Energy Efficient Economy, the American Wind Energy Association, Clean Water Action, the American Lung Association, the Minnesota Center for Environmental Advocacy, and the Institute for Local Self Reliance ("Environmental Coalition"); Lignite Energy Council ("LEC"); Minnegasco, a Division of NorAm Energy Corp., Peoples Natural Gas Company, a Division of UtiliCorp United, Inc. (collectively "the Natural Gas Utilities"); Minnesota Pollution Control Agency ("MPCA"); Minnesota Power ("MP"); State of North Dakota ("North Dakota"); Northern States Power Company ("NSP"); Office of the Attorney

General's Residential Utilities Division ("OAG"); Otter Tail Power Company ("Otter Tail"); and Western Fuels Association, Inc. ("WFA").

19. The record closed on February 23, 1996, upon receipt of the final substantive filing.

Applicable Statutes and Rules

20. This proceeding arises due to legislative directives contained within Minn. Stat. § 216B.2422. This statute codifies a process for resource evaluation and selection. The statute sets forth requirements for periodic filings of resource plans, specifies certain content for those filings, and sets forth factors to be weighed by the Commission in making a resource determination.

21. The specific subdivision at issue in this case, Minn. Stat. § 216B.2422, subd. 4(a), reads as follows:

> Subd. 3. Environmental Costs. (a) The commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation. A utility shall use the values established by the commission in conjunctions with other external factors, including socioeconomic costs, when evaluation and selecting resource options in all proceeding before the commission, including resource plan and certificate of need proceedings.

22. Minnesota Rules also provide guidance regarding the role of environmental costs in resource planning. The Commission conducted resource planning prior to enactment of Minn. Stat. § 216B.2422. In 1989, the Commission engaged in a rulemaking procedure on the resource planning process and codified Minnesota Rules Chapter 7843. See MPUC Docket No. E999/R-89-201, Findings of Fact, Conclusions of Law and Order Adopting Rules, dated July 10, 1990. The Rule states, in part:

> Subp. 3. Factors to Consider. In issuing its findings of fact and conclusions, the commission shall consider the characteristics of the available resource options and of the proposed plan as a whole. Resource options and resource plans must be evaluated on their ability to:
>
> * * * *
>
> **Minimize adverse socioeconomic effects and adverse effects upon the environment.**
>
> * * * *

Minn. R. 7843.0500, subp. C (1990).

23. In all resource plans filed prior to enactment of Minn. Stat. § 216B.2422, utilities were required to follow this Rule and show how their plans would minimize adverse socioeconomic effects and adverse effects upon the environment. Thus, consideration of environmental impacts in a resource planning process has already been conducted by the Commission and the utilities in numerous cases. Ex. 37 at 5.

Overall Concepts and Policy Issues

Burden of Proof, Standard of Proof, and "Practicable"

24. Several parties identified the burden of proof and standard of proof applicable in this proceeding as that found at Minnesota Rule 1400.7300, subp. 5:

> The party proposing that certain action be taken must prove the facts at issue by a preponderance of the evidence, unless the substantive law provides a different burden or standard.

See CEED Initial Brief at 3; Dairyland Initial Brief at 3; DPS Initial Brief at 2; LEC Initial Brief at 45; MP Initial Brief at 89; North Dakota Initial Brief at 2425; Otter Tail Initial Brief at 45; WFA Initial Brief at 3.

25. Proving facts by a preponderance of the evidence means that the facts or evidence presented in favor of a proposed range of environmental cost values must outweigh the facts or evidence presented in opposition to the proposed values, or the burden of proof has not been met.

26. Several parties, notably Dairyland, LEC, Otter Tail and WFA, stated that they have no burden of proof to meet in this proceeding because they have no obligation to propose values. LEC summarized this position by stating:

> Quite simply, there is nothing in the externality statute, Minnesota's administrative law, or contested case procedures that imposes the burden and the expense of developing and proposing values on private parties, such as the LEC, who proposed no values and who have objected all along to the action being taken in this proceeding.

LEC Initial Brief at 4. The ALJ agrees that these parties are under no obligation to propose environmental cost values in this proceeding; but if they want to oppose the values proposed by other parties, they must either establish that the evidence offered in support of the proposed values is insufficient, or they must counter the evidence with a greater weight of evidence demonstrating the incorrectness of the proposed values. These requirements are implicit in the preponderance of evidence standard and

constitute an implicit "burden of proof" for opposing parties that arises after the proponents of environmental cost values have made an initial showing of credible facts in support of their proposals.

27. The question of how much evidence must be offered to sufficiently support environmental cost values was disputed by MPCA, which argued that the "preponderance of the evidence" standard did not apply, and that the appropriate standard was "to the extent practicable". The MPCA argues that unlike the typical contested case to which the preponderance standard would apply, the Commission here is subject to an explicit statutory requirement to establish cost values. Typically, an administrative agency has the authority to take a particular action, but is not required to do so. In such a situation, it is logical to subject the proponent of action to the burden of proof, and if that burden is not met, the agency could lawfully refuse to act. MPCA believes that in this case, the Commission does not have the legal option of refusing to act, except where the quantification is impracticable. MPCA argues that therefore the standard that governs the PUC's decision is "practicability".

28. The ALJ does not accept the MPCA's position that the statute's standard of "to the extent practicable" modifies or overrides the "preponderance of the evidence" standard. While there is undeniably some overlap between the two concepts, the ALJ and the Commission must have some test to determine which values to pick, and which to reject. The "preponderance of the evidence" test provides a widely understood basis for decision making. Both the ALJ and the Commission are used to working with it. There is insufficient evidence to suggest that the Legislature intended to override the longstanding rule. The ALJ has applied the "preponderance of the evidence" standard to this proceeding.

29. The ALJ believes that the term "practicability," as it is used in the Environmental Cost Statute, must be construed according to its common and approved usage. See Minn. Stat. § 645.08 (1994). The common and approved usage of "practicability" is "feasible," or capable of being accomplished. See Webster's New Universal Unabridged Dictionary (2d Ed. 1983). As will be discussed more fully below, there are some pollutants which are impossible to value, in the sense that there is just not enough data in this record to establish a value for them. As the ALJ interprets the term practicability, it is not practicable for the Commission to establish values for those pollutants at this time.

30. The Environmental Cost Statute, Minn. Stat. § 216B.2422, subd. 3(a) does not require that the Commission unconditionally adopt environmental cost values. Rather, if the parties proposing values fail to prove, by a preponderance of the evidence, that it is practicable to both quantify and establish environmental cost values for the various pollutants, the Commission need not, and indeed cannot, adopt environmental cost values.

Uncertainty

31. A major issue in this proceeding is the approach that should be taken in the face of uncertainty. At some point, the degree of uncertainty associated with a proposed value becomes so great that there is insufficient evidence to meet the preponderance standard, and the value cannot be adopted.

32. The quantification of environmental costs necessarily involves the consideration of scientific evidence that generally does not provide definitive answers, forcing the Commission to make inferences or judgments about the environmental cost in question.

33. A variety of economic methodologies can be employed to transform the scientific evidence of costs into dollar figures, and these methodologies produce varying estimates. Whatever methodology is applied, it necessarily involves making judgments and estimates in the face of some uncertainties.

34. When the Commission adopted the interim values, it noted:

> The statute implemented here requires the Commission to establish a range of values. Using a range appropriately acknowledges the uncertainty attending externality valuations.

Order Establishing Interim Environmental Cost Values (March 1, 1994), at p. 9. The ALJ agrees with the Commission that using ranges, rather than a precise number, more accurately expresses the reality of this whole process, and the reality of the record created in this proceeding -- that any number recommended herein must be recognized as an approximation, which is subject to refinement as new and better data become available. However, the resource planning process involves many other uncertainties as well, so there is no reason to demand precision for this factor. St. Paul Public Hearing, p. 117.

Other Policy Issues

35. In its Order, dated March 3, 1994, the Commission directed parties in this proceeding to explore specific issues in their testimony. Specifically, parties were directed to respond to the following four issues:

> (1) What range of environmental cost values should the Commission adopt for use in resource planning and other resource-selection proceedings as required by Minn. Stat. § 216B.2422? Specifically, for which pollutants or externalities should the Commission establish a range of values, and what are the appropriate boundaries of each range? Should these values be geographically sensitive?

(2) What methodology or methodologies should be used to establish these ranges of values (e.g., damage costs, control costs, other methodologies, or some combination of these)?

(3) Is it practicable for the Commission to quantify and establish a range of environmental cost values for methods of electric generation that do not generate significant air emissions? If so, how should the Commission establish such values and what are the appropriate boundaries of any such range?

(4) Is it practicable for the Commission to adopt environmental cost values which reflect the full cycle of electric generation, including both upstream and downstream costs? If so, how should the Commission establish such values and what are the appropriate boundaries of any such range?

Notice and Order for Hearing, (March 3, 1994) at 2.

36. The following criteria are appropriate for use in determining which environmental impacts to value and whether and how to value these impacts:

* Only the most significant and relevant environmental impacts should be quantified.

* Only impacts created during the operational phase should be quantified.

* The adopted values should be conservative.

* Whenever possible, a damage-cost approach should be used.

* At least some of the adopted values should be geographically sensitive.

Ex. 37 at 78.

DISCUSSION ON POLICY ISSUES

Only The Most Significant And Relevant Impacts Should Be Quantified; Only Impacts Created During The Operational Phase Should Be Considered.

Most attempts to quantify environmental costs focus on the impacts resulting from byproducts created at the point of generation, such as airborne emissions. Ex. 37, p. 8. However, other effects both downstream and upstream of the point of generation also impose environmental costs or benefits. For example, the (upstream) extraction

and transportation of coal or oil can impose environmental costs, as can the (downstream) decommissioning of a plant or burial of wastes.

Theoretically, all environmental costs or benefits should be considered in any comparison of resource alternatives. However, this task is daunting. Any assessment of total net costs would require a complex damage-cost study. No party even attempted to present such a study in this proceeding. The Department was unaware of any completed study with such an inclusive scope. Ex. 37, p. 9.

A September 1993 report by the National Association of Regulatory Utilities Commissioners (NARUC), entitled Environmental Externalities and Electric Utility Regulation, listed the major environmental impacts resulting from the generation of electricity:

* Impacts on agricultural crops, timber, and livestock.

* Impacts on the real and perceived risks of catastrophic accidents associated with some, especially nuclear technologies.

* Impacts on ecosystems and biodiversity, including impacts on rare, threatened, or endangered species.

* Impacts on environmental-cultural icons, such as wild anadromous fish.

* Impacts on global climate change.

* Impacts on human morbidity and mortality.

* Impacts on land use.

* Impacts on materials.

* Impacts on recreational opportunities.

* Impacts on regional economic structures.

* Impacts on visibility.

* Impacts on visual and audio aesthetics.

Ex. 37, pp. 10-11. These impacts are the actual damages (or benefits) to society resulting from electrical generation. However, these are not the environmental costs to which the Commission should assign values. To derive useful environmental costs to apply to various resource options, the impacts must be tied to the actual effects or byproducts of generating electricity. Id.

A complete list of the specific effects or byproducts of electrical generation that result in these impacts would be very long and require substantial caveats and

elaboration. But some general observations are possible. Virtually any large generating unit affects land use to some degree. Nuclear generation entails the greatest risk of catastrophic accidents. Hydroelectric generation has relatively large impacts on fish, water use and recreational opportunities. Wind generation can result in avian mortality. Id. at 12.

The Commission could estimate directly a range of total environmental costs for each method of generating electricity, consisting of the sum of the values assigned to the impacts listed above. However, the ALJ questions the practicality and reasonableness of that approach for several reasons. First, not all of the impacts are significant enough to justify quantification. It makes little sense to devote the scarce resources of the Commission and interested parties to quantifying relatively small impacts. Second, some of the impacts can vary significantly between two generating stations using the same "method" of generating electricity. By approving one range of values for a given technology, the Commission may fail to distinguish adequately between the costs imposed by the two resource options. Third, some impacts are extremely difficult to quantify. All else being equal, the Commission should begin by emphasizing impacts that are relatively easy to quantify. Id. at 12-13.

Fourth, any summing could potentially result in double-counting if the impacts are not specified properly. For example, the expected damages associated with global warming are not the higher atmospheric temperatures per se. Instead, it is the effects of these higher temperatures on crops, the flooding of coastal cities, etc., that constitute the actual damages. But if such damages are included under the rubric of "global warming," they should not also be counted under headings such as "impacts on agricultural crops." Fifth, not all of the impacts will be relevant for the types of generating stations Minnesota utilities are likely to add. Quantifying impacts that are irrelevant to potential resource additions is unnecessary. Id. at 13.

The Commission can mitigate these problems by adopting several guidelines. First, the Commission should not attempt to directly establish a range of environmental costs for each generic method of generating electricity. The Commission should instead quantify the costs attributable to as many effects or byproducts of generation as practical. The appropriate range of costs will then be assigned to any given generating addition, based on its own unique effects and/or byproducts. Most parties recommended a similar approach in the interim stage of this proceeding. Ex. 37, p. 14. Second, the Commission should focus on the effects or byproducts that cause the most significant costs. For example, modest noise pollution at a remote, non-recreational site probably imposes a lower environmental cost than ozone formation in large urban areas or acidic deposition in popular lakes. Third, the Commission should concentrate on the impacts that are easiest to quantify. Fourth, the Commission should emphasize effects attributable to the most likely resource decisions over the resource-planning horizon (15 years). Other effects should receive a lower priority. Id.

Given these criteria, the ALJ accepts the Department's recommendation to assign values only to the most significant air emissions. These emissions reasonably satisfy all four criteria: they are direct effects or byproducts of the generation of electricity; they impose or can potentially impose significant costs on society; they are

associated with many of the types of generation likely to be added by Minnesota utilities; and their damages are relatively easy to quantify. Id. at 15.

Three parties, LEC, North Dakota and the Natural Gas Utilities, took issue with the Department's conclusions and recommendation that only impacts created during the operational phase should be quantified and only the most significant and relevant environmental impacts should be quantified. Id. at 48. LEC and North Dakota argued that the Department's focus on quantifying environmental cost values for air emissions creates a bias against fossil fueled electricity generation. See LEC Initial Brief at 524; North Dakota Initial Brief at 512. Both parties asserted that because the statute requires quantification of "a range of environmental costs associated with each method of generation" (emphasis added), the Commission cannot adopt values that apply to coal burning facilities without also adopting values for nuclear power or non air emitting generation such as wind and hydroelectric facilities.

The ALJ disagrees with LEC's and North Dakota's statutory interpretation. Neither party has presented a credible basis for the assumption that all effects of all generating technologies must be quantified in order to fulfill the intent of the statute. The Commission has not interpreted the statute in this manner. The task of quantifying all environmental impacts in this proceeding has proven to be beyond the capability of any individual party. LEC's and North Dakota's position would ensure that nothing is done in this proceeding to satisfy the clear legislative intent for the Commission to quantify environmental costs to the extent practicable. It would be an contrary to the Commission's duty to implement the statute if it were to adopt the "all or nothing" standard put forth by LEC and North Dakota.

The difficult issue that all parties must address is *which* impacts should be quantified. The Department proposed specific criteria in its prefiled testimony and initial brief for determining which impacts to monetize. DPS Initial Brief at 4-8 Based on these criteria, the Department chose to concentrate on the most significant air emissions. The list of air emissions initially analyzed by the Department (mercury, nitrogen oxides, particulates, volatile organic compounds, sulfur dioxide and carbon dioxide) is very similar to the emissions analyzed in the NSP/TER study. Compare Ex. 200 at 2 with Ex. 135 at 3-5 (listing EPA's six criteria pollutants plus mercury and carbon dioxide). The Department reached its own conclusions about what pollutants to value, conclusions which were subsequently confirmed to a large extent by the NSP/TER study.

LEC and North Dakota are free to disagreed with the criteria the Department developed and relied upon in deciding which pollutants to value. LEC is incorrect when it states that "no credible evidence has been introduced in this proceeding that proves . . . that the particular environmental impacts for which values have been offered fairly represent the most significant environmental impacts associated with each resource option, or even for electric generation generally . . . ." LEC Initial Brief at 22. NSP witness Dr. William Desvousges noted that studies have shown that EPA's criteria pollutants "account for the majority of potential environmental damages." Ex. 135 at 4. DPS witness Dr. Mark Thayer, who has conducted extensive damage cost studies in California and New York, noted that "the environment cost values developed by TER for NSP are consistent with values developed in other jurisdictions." Ex. 186, p. 2. Dr.

Thayer pointed out that the values are dominated by particulate matter and human health effects, especially mortality. Id. at 2-3. This can be seen from Table 16 of Thayer and Associates' report (Ex. 187, p. 77), which shows that human health effects account for the overwhelming majority of environmental cost damages attributable to particulate matter (PM), nitrogen oxides (NO_2 and NOx with O_3), carbon monoxide (CO) and lead (Pb). LEC and North Dakota have offered no evidence to support a conclusion that other environmental impacts of electric generation cause human health effects at any levels, much less levels that approach the human health impacts associated with the air emissions valued by NSP/TER and the Department.

LEC and North Dakota also argued that the Department's decision not to pursue environmental cost values for wind generation, hydroelectric generation or nuclear generation, somehow creates an "inherent bias" in this proceeding against fossil-fueled generation. LEC Initial Brief at 19-21. For example, although LEC witness Dr. Robert Sansom was aware of externality values developed in other proceedings for nuclear generation and renewable energy resources, LEC made no effort to introduce these values into the record. LEC argued that it has no obligation to propose values, but if LEC believes other types should be valued, it was free to propose values for them.

Regarding nuclear power, one of the Department's criteria in this case was to establish values only for the most relevant impacts. Nuclear power is not a likely resource for utilities to add in the near future (Tr. 8, p. 144), especially in light of the statutory prohibition on new nuclear plant construction in the state. Minn. Stat. § 216B.243, subd. 3b. Department witness Scott Brockett noted that because of this restriction, it makes little sense to devote the scarce resources of the Commission and interested parties to quantifying the environmental costs of nuclear power in this proceeding. Ex. 37 at 12-13; Tr. 8, p. 144. North Dakota argued that because nuclear plant refurbishment is still an option, the lack of environmental costs for nuclear generation creates an inherent bias in the proceeding (North Dakota Initial Brief at 3, 6), yet North Dakota has provided no evidence to substantiate the alleged bias. The Department's decision not to propose values for nuclear generation derives from its belief that the Commission should emphasize effects attributable to the most likely resource decisions over the resource-planning horizon (15 years). Ex. 37, p. 14. Neither North Dakota nor LEC provided any evidence that any Minnesota utility is planning to construct or refurbish a nuclear power plant in the next 15 years. The Department stated that is has no objection to attempting to value the environmental costs of nuclear generation in a subsequent proceeding, but for purposes of this case, it is important to pursue the quantification of environmental cost values in a manner that best uses everyone's limited resources.

With respect to wind generation, Mr. Brockett noted that its potential environmental impacts include land use and avian mortality. Ex. 37, p. 12. LEC provided no evidence that either of these impacts are significant. Mr. Brockett, on the other hand, testified that these impacts are relatively insignificant compared with the health effects associated with other pollutants. Tr. 8, p. 145. His opinion is supported by the Commission's Order in NSP's certificate of need proceeding for 100 MW of wind

generation, wherein the Commission accepted the following finding of the ALJ (as paraphrased in the Order):

> The ALJ stated that the other potential environmental impacts of the project -- including increased noise levels, increased avian mortality, removal of land from existing agricultural uses, and aesthetic considerations -- will be addressed and minimized by NSP and are not expected to occur at a significant level.

Northern States Power, Docket No. E002/CN-94-795, Order Granting Certificate of Need, p. 4 (April 19, 1995). LEC's allegation of bias based on the absence of environmental cost values for wind generation is wholly unsupported given that wind generation does not cause significant environmental impacts.

Finally, the lack of quantification for a specific environmental cost is *not* equivalent to ignoring it in resource evaluations. As explained by Mr. Brockett, quantification simply allows for a more rigorous assessment of impacts that the Commission previously considered qualitatively. Ex. 37, p. 3-5. The Commission and other parties are free to continue to consider unquantified impacts on a qualitative basis.

The Natural Gas Utilities raised two arguments concerning the issue of which environmental impacts to value: (1) the failure to quantify non-air emission externalities may bias the results (Natural Gas Utilities Initial Brief at 6-9); and (2) as noted above, they argued that total fuel cycle externality costs should be considered. Id. at 9-11. Regarding the first issue, the ALJ reiterates the discussion above in response to LEC's and North Dakota's assertions of bias. Moreover, the ALJ notes that the Natural Gas Utilities' recommendation to use the low end of the range to correct for this alleged bias is essentially an application issue that is not properly before the Commission in this quantification proceeding.

In response to the second argument, the ALJ notes that the production and transportation of any fuel, including natural gas, may involve significant environmental costs (Ex. 38, p. 8), but as the Natural Gas Utilities recognize, no party has proposed environmental cost values in this proceeding that reflect the full fuel cycle. Natural Gas Utilities Initial Brief at 10. Moreover, the Natural Gas Utilities failed to consider (1) that the upstream fuel cycle may not entail environmental costs in Minnesota where, in the case of coal for example, the fuel extraction process occurs entirely out of state (Tr. 7, pp. 15-16); and (2) upstream and downstream costs may be internalized through taxes, fees, etc. Ex. 39, p. 19. Again, the ALJ believes that this issue can be addressed qualitatively in resource plan proceedings, as discussed above; or parties can submit quantification evidence in future proceedings.

Adopt Conservative Values.

The ALJ recommends that the Commission adopt conservative values in this proceeding because, despite the attention utility regulatory commissions have recently afforded environmental impacts, the quantification of environmental costs is still in its infancy. Ex. 37, p. 20. While using reasonably accurate estimates is better than imputing no values, not all estimates are better than zero. For instance, valuing an

impact at more than twice its "true" residual damage may lead to a worse allocation of resources than imputing no value. In other words, the possibility of utilities paying more for resources than their environmental benefits justify is just as bad as paying less than their benefits justify. Given the current uncertainty regarding the estimation process, overestimating the damages is a distinct possibility. Id. at 21. The Commission would then be forced to order reductions in future proceedings. This "yo-yo" pattern of values would be more confusing and disruptive than a pattern of gradual increases. A better alternative is to err on the side of conservatism initially, then increase the values gradually if better information in the future confirms the need for higher values.

The ALJ's preference for conservatism also explains his choice of impacts valued. In this proceeding the ALJ recommends that the Commission stick to valuing the most significant air emissions. These emissions are generally believed to have important impacts and are relatively more amenable to generic quantification than other impacts.

Large Power Intervenors (LPI) witness Randall J. Falkenberg argued that the preference for conservative values requires the inclusion of $0 in the recommended ranges of environmental costs. LPI Ex. 36 at 29. This order discusses NSP's and MP's recommendation of $0 for the low end of the range below in the environmental costs section. At this point it is sufficient to note that if the ALJ had concluded that $0 was a reasonable, conservative estimate of the low end of an emission damage cost, then he would have included $0 in the range. Ex. 39, p. 20. The ALJ did not reach this conclusion with regard to any of the emissions studied.

Whenever Possible, Use A Damage-Cost Approach.

The two methods that have been used most often to establish a range of values for environmental costs are the "damage-cost" approach and "cost-of-control" or "revealed-preference" approach[1] The damage-cost approach, as the name suggests, yields estimates of the actual damages attributable to a given environmental impact. These damages can rarely be obtained directly through market transactions. However, they can be estimated with reasonable accuracy using the following four-step process.

1. Emission amounts are estimated based on forecasted generation.

2. Computer models are used to determine the effects of those emissions on environmental quality in the affected areas. (Given that air emissions appear to have the greatest impact on environmental quality, most research efforts have focused on modeling air-quality impacts.)

3. A separate simulation model(s) that uses dose-response functions taken from various disciplines is used to determine the responses of different parts of the environment to the change in environmental quality from power plant emissions.

[1] Another seemingly separate method for establishing environmental cost values is the risk of regulation approach, which the ALJ discusses as a subset of the cost control method.

4. These environmental responses are monetized. The development of these monetized values relies on two general approaches: inferred values from observed behavior and direct elicitation.

Ex. 37, pp. 16-17. The sum of the resulting estimates of these damage costs is the amount society would be willing to pay to avoid the environmental damage -- or the amount society would be willing to accept as compensation for the damage.

The cost-of-control approach, on the other hand, uses the cost of reducing an emission by some small amount as the value. In other words, the value is the marginal cost of further controlling an emission. Id. at 17. The cost-of-control approach is based on the assumption that regulators will carefully tailor their control requirements so that the costs of control equal the damages prevented. The ALJ does not accept that assumption.

The ALJ believes the damage-cost approach is superior to the cost-of-control approach. Theoretically, values established in this proceeding should equal the per-unit cost or damage of residual emissions. This damage is the sum of all of the various impacts listed in the previous section, i.e., impacts on agricultural crops, human health, land use, etc. Impacts that have already been eliminated through other controls or regulations are irrelevant, as are the costs of these controls and regulations. The damage-cost approach appropriately focuses on actual damages from uncontrolled emissions. Id.

In contrast, practitioners of the cost-of-control approach do not attempt to measure directly residual damages. They instead estimate the cost of reducing (or abating) an emission at its source, or the cost of reducing a given emission by a small increment beyond the reductions already attained under current conditions and regulations. A variation of this approach is to estimate the cost of mitigating or eliminating the harm or impact of a given emission -- not eliminating the emission itself at its source. An example of a mitigation strategy is planting trees to offset emissions of CO_2. Regardless of whether abatement or mitigation costs are used, they cannot be relied upon to accurately reflect the actual damages of concern in this proceeding. Consequently, the cost-of-control approach has a weaker theoretical basis. Ex. 37, p. 18.

A variation on the cost of control method is the "risk of regulation" method. Put simply, it is an estimate of future taxes (or similar costs) that a utility might have to bear. As with the traditional cost of control method, the risk of regulation method is founded upon the assumption that a future regulator would set the level of taxation at a point that equaled the damage caused. That is a dubious assumption. Rather than being based on an estimate of environmental costs, future taxes are as likely to be based on political clout, perceived ability to pay or ability to spread the cost, governmental need for revenue, and a variety of other non-environmental factors.

Despite the theoretical shortcomings of using control costs, they are sometimes much easier to estimate than actual damages. If no reasonable estimate of damages is obtainable, then using the cost of control may be the best alternative. Consequently, the ALJ does not recommend outright rejection of the cost-of-control approach. In

some cases its relative ease and accuracy may outweigh its theoretical disadvantages. However, for purposes of this proceeding, the ALJ recommends that the Commission use the damage-cost method for quantifying environmental cost values whenever practicable.

Adopt Geographically Sensitive Values. Whenever Possible.

The damage imposed by many pollutants depends largely on site-specific factors, such as the existing concentrations of the pollutants at or near the site and atmospheric conditions. Ex. 37, p. 19.

To reflect these differences the Environmental Protection Agency (EPA) varies its regulations for its six "criteria pollutants," based on whether an area has attained a specified minimum air quality. Ex. 37, p. 19. Likewise, states that set values for environmental costs must consider critical differences among the potential sites of new generating units. Among the most important factors are the proximity of the area to population centers, the surrounding air quality (including the concentration of the pollutant in question), and atmospheric conditions (including pollution reactions and pollution transport). If these factors vary significantly among the likely sites of new generating units for Minnesota utilities, then the damages attributable to emissions at these sites will also vary. Id. at 19-20. The ALJ recommends that Commission adopt geographically sensitive values to the extent practicable.

However, the Commission also should recognize that the need for geographically sensitive values varies with the specific emission considered. For example, global-warming damages from greenhouse gases are relatively insensitive to location, while damages from emissions such as particulate matter are relatively sensitive to location. Id. at 20. Consequently, to the extent there was reliable data in the record, the ALJ has evaluated the need for geographically sensitive values for each emission on a case-by-case basis.

Environmental Cost Values Must Reflect Damages In Minnesota From In-State And Out-Of-State Generation Sources.

The ALJ's recommended proposed environmental cost values are based on damages that would occur in Minnesota from generation sources located up to 200 miles from the Minnesota border.[2] The ALJ accepts the Department's focus on damages occurring in Minnesota because any assessment of a resource option for providing power to Minnesotans should consider the environmental cost to Minnesotans, regardless of the location of that resource. Ex. 39, p. 5. The Department did not attempt to quantify environmental impacts, whether positive or negative, in other jurisdictions. Tr. 6, p. 118. Rather, the Department's proposed values reflect the empirically supported conclusion that generating units located in another state may impose environmental damages in Minnesota. Ex. 38, p. 2.

[2] The ALJ's recommendation on CO_2 deviates from this premise because CO_2 damages are global rather than regional or local. Ex. 27, p. 20. This issue is discussed below.

Department witness Dr. Thayer summarized the issue as follows:

> Q. Do you agree with NSP that emissions from out-of-state generation should be valued at zero?
>
> A. No. Minnesota residents may suffer environmental damages from emissions originating outside the state's borders. Residual damages are almost certainly positive from such activity. At the same time, I recognize that the level and amounts of damages are a function of distance. Consequently, I recommend that the Commission adopt the Department's recommended Out-State environmental-cost values for facilities that are located within 200 miles of the state's borders. This recommendation is preferable to NSP's in that it recognizes that positive damages exist and should be valued. For sources beyond 200 miles I recommend zero values, but believe this issue should be studied further.

Ex. 186, p. 10.

Two NSP witnesses, Thomas Mol and Dr. Desvousges, agreed that Minnesota can experience in-state damages from plants located outside of Minnesota's border. Tr. 3, pp. 17-18; Tr. 16, pp. 89-90. Yet neither witness recommended values for out-of-state generation. The NSP witnesses took issue primarily with Dr. Thayer's use of the state border as the starting point for the 200 mile area around which out-of-state values would apply, indicating instead that an appropriate point for measuring the impact from out-of-state generation would center on the Twin Cities. Tr. 3, pp. 20-21; Tr. 16, pp. 90-91. Neither witness could recommend a specific distance in miles from the Twin Cities for which they would apply environmental cost values to out-of-state generation. Tr. 3, p. 21; Tr. 6, p. 91. However, while Dr. Desvousges stated that plants located up to 200 miles from Minneapolis "might be assumed to have little impact" (Ex. 139, pp. 12-13), he based this opinion on his modeling of primary pollutants (Tr. 16, p. 91), not secondary PM_{10} which he subsequently incorporated into his NOx value. The Thayer and Associates' study found that ignoring secondary particle formation results in larger factors of underestimation at more distant locations because secondary particles take several hours to days to form. Ex. 187, p. 30. Therefore, including secondary pollutants should greatly increase the distance of 200 miles from the Twin Cities for which Dr. Desvousges would conclude that environmental impacts are experienced.

Other parties that have taken issue with the Department's recommendation of values for out-of-state generation have supplied testimony and evidence supporting such values. For example, North Dakota, which opposes out-of-state values on constitutional grounds (North Dakota Initial Brief at 19-24), has nonetheless sponsored a modeling expert, Mr. Schock, who confirms that under "worst case" conditions Minnesota can experience in-state damages from a generating plant located up to 200 miles from the state border. Id. at 49-51. Even LEC witness Dr. Sansom stated that a sufficient basis for Minnesota to assign externality values to generation originating in other states would be "a showing these emissions cause specific damage to Minnesota." LEC Ex. 51 at 33. In fact, LEC's initial brief devotes several pages to the

proposition that Minnesota can and will experience environmental impacts from generation sources located up to 200 miles from the state border. LEC Initial Brief at 39-41. The ALJ believes that there is a evidentiary basis for its recommendation of environmental cost values for out-of-state generation up to 200 miles from the state border.

Public Hearings and Letters

37. There is substantial public interest in the Commission's adoption of cost values for carbon dioxide and mercury. There is much less interest in any of the other proposed values. The only other pollutant that drew much public comment was particulates (PM_{10}), which is of particular concern to asthmatics.

38. Public hearings in this matter, held in Duluth, Fergus Falls, Minneapolis, Rochester, and St. Paul, were well attended. In addition, a three-city video-conference was held involving Bemidji, Windom and Brainerd.[3]

39. Testimony at the public hearing and public letters showed a greater consensus in favor of establishing values for mercury than establishing values for carbon dioxide. Many persons referred to the mercury data in fish consumption advisories issued by the Minnesota Department of Health (which are in the record as Pub. Ex. 7, updated by Ex. 216). Persons testified about their anger that they could no longer eat unlimited amounts of fish (particularly Native Americans, for whom fish have both a subsistence and ceremonial value). Others reported a diminution of their enjoyment of the fishing experience just by knowing that the contamination existed. In addition, persons testified about the economic importance of tourism to Greater Minnesota, which they believed was threatened by the fish consumption advisories.

40. Public opinion on the carbon dioxide issue was more evenly divided than on the mercury issue. There appeared to be a geographic split on the carbon dioxide issue, with persons from the metro area indicating greater concern and willingness to pay than persons in Greater Minnesota. Opposition to carbon dioxide values was particularly keen from persons in Greater Minnesota who lived close to other states. The concern of this latter group was economic competitiveness -- that if Minnesota energy prices were "artificially raised" because of the assignment of a cost for carbon dioxide[4], it would be "just one more nail in the coffin" created by Minnesota business costs being higher than those of neighboring states. The most common solution

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[3] Both afternoon and evening hearings were held in each of the locations, as well as for the video-conference. At the close of the evening session of the video-conference, the Administrative Law Judge solicited comments from the participants about the use of a video-conference, rather than an "in-person" hearing. The responses were very positive. The video format provided benefits for the participants, as well as saving money. The Commission's attention is directed to pages 114-123 of the April 27 transcript.

[4] It appeared that some persons commenting along this theme believed that the adoption of an externality value would mean an automatic rate increase.

proposed by this group was voiced by a representative of Kandiyohi Cooperative Electric Power Association in Willmar, who argued that the proper implementation of restraints and environmental cost values for carbon dioxide should be applied on a national level at the very least, and more properly, on a global level. See April 27 transcript, at p. 101.

41. Minnesota Utility Investors had representatives at each hearing. They generally oppose the establishment of any externality values at this time, for reasons summarized at page 9 of the April 27 transcript.

CRITERIA POLLUTANTS

42. Several parties have submitted evidence in support of establishing and quantifying a range of environmental cost values for what are known as "criteria pollutants". A criteria pollutant is one for which there is a National Ambient Air Quality standard (NAAQS). The criteria pollutants are: sulfur dioxide (SO_2), particulate matter less than ten microns in diameter (PM_{10}), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), and lead (Pb).

43. Under sections 108 and 109 of the Federal Clean Air Act, the Administrator of the U. S. Environmental Protection Agency (USEPA) is required to issue primary and secondary ambient air quality standards for criteria pollutants. Under section 109(b)(1), the national primary ambient air quality standards shall be ambient air quality standards, the attainment and maintenance of which in the judgment of the Administrator of the USEPA based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health.

44. Some parties have argued that as long as emissions do not cause ambient air concentrations to exceed the NAAQS, there can be no costs associated with the emission. This argument assumes that there is indeed a discrete threshold concentration of the criteria pollutants below which no costs occur, and that the NAAQS are set at or below that threshold.

45. In general, Minnesota's air is within the NAAQS levels. However, there are some nonattainment areas. The designated nonattainment areas are: Duluth for CO, the Minneapolis/St. Paul metro area for CO, SO_2, PM_{10} and lead; and Olmsted County for SO_2 and PM_{10} due to violations in the Rochester metro area. Ex. 159, p. 25. Regardless of which parts of the state are attaining the NAAQS at any given time, the record shows that there are as yet no defined thresholds below which no effects occur. As science progresses, pollution concentrations previously thought to be safe are determined to cause negative effects. This has been acknowledged by both the EPA and Congress in the legislative history to the Clean Air Act Amendments of 1977. Lead Industries Ass'n v. Environmental Protection Agency, 647 F.2d 1130, 1152-1154 (D.C. Cir. 1980), cert. den. 449 U.S. 1042 (Dec. 8, 1980).

46. EPA has not been able to keep the NAAQS updated, and, therefore, the NAAQS do not reflect the latest scientific knowledge. In fact, there is substantial evidence of health effects or other environmental costs at concentrations below the NAAQS for several of the criteria pollutants, and particularly for PM_{10} and ozone. Ex. 175, attached paper at 1-5; Ex. 130; Ex. 132; TER Report, Ex. 136, Vols. 2 and 4. The EPA is continually behind in its attempts to review the NAAQS. Dr. Pratt testified that "[t]he NAAQS are required to be reevaluated every five years, but the EPA has not reviewed any of its standards in a timely fashion and has been challenged numerous times in the courts to get on with its work in this area." Pratt Direct, Ex. 175, attached paper at 1. As a result many of the existing NAAQS are based on criteria documents that are many years outdated and do not reflect the most recent evidence, which in many cases shows health and welfare effects below the NAAQS. The NAAQS for particulate matter less than 10 microns (PM_{10}) was established in 1987, but it was based on a criteria document which relied on published data as of 1985. Lippmann Surrebuttal, Ex. 132, p. 2. The EPA was sued for failure to keep this NAAQS up to date, had to concede to the court that it had indeed missed the statutory deadlines, and is currently under court order to finalize its particulate matter review process by January 1997. American Lung Association v. Browner, 884 F. Supp. 345 (D. Ariz. 1994); Pratt Direct, Ex. 175, attached paper at 5.

47. The ALJ, therefore, finds that the NAAQS are not necessarily set at no-cost levels, and will not disregard evidence of environmental costs simply because they are associated with ambient levels below the NAAQS. This is particularly appropriate in light of the Minnesota-specific damage cost study sponsored by NSP, known as the TER study.

48. NSP commissioned Triangle Economic Research (TER) to perform a state of the art damage study in Minnesota. Ex. 16., p. 4. Dr. William Desvousges, the lead author of the TER Study, is an expert in valuing natural resources and preparation of damage cost studies. Ex. 135, p. 1.

49. The TER Study examined the effects of the six criteria pollutants because they have been the major focus of air quality regulations, data on these pollutants generally are sufficient to implement a damage costs approach and previous studies show that these pollutants account for the majority of potential environmental damages. Ex. 135, Ex. WHD-2, p. 4.

50. The TER Study developed environmental costs for three planning scenarios in order to capture the relevant effects and the magnitude and location of potential damages. These planning scenarios included a rural scenario, a metropolitan fringe scenario and an urban scenario. Each planning scenario includes existing NSP resources as well as new resources located in specific areas throughout the study area in order to identify the effect of location on study results. Ex. 136, Executive Summary, pp. 2-4.

51. The TER Study shows that potential damages vary substantially depending on the scenario that is used to represent future generation sources. Emissions from a plant located in rural Minnesota clearly have a different externality value than the same plant located near an urban area. Ex. 16, p. 8. The TER Study results show the importance of having geographic specific estimates of damage costs.

52. For the criteria pollutants, the TER Study is the only study presented in this proceeding that focused on effects in Minnesota. Thus, it is the only study that accurately captures effects specific to Minnesota.

53. The TER study includes receptor sites throughout all of Minnesota, as well as western Wisconsin and southeastern South Dakota. Therefore, the potential damages from considering other locations overstates the damages for Minnesota alone. Ex. 135, p. 3.

54. In the TER Study emissions were modeled for over sixty resources in each scenario. Ex. 136, Vol. 1, Table A-2. Estimated damages were determined at the zip code level in order to account for differences in population and resources from one area to the next, as well as for pollution concentrations. Emission concentrations were estimated for each hour of the year in order to accurately account for effects of concentration response functions which are based on peak concentration levels. With 618 zip codes included in the design, the six pollutants examined by TER, and 8,760 hours in a year, a total of about 32.5 million concentrations were estimated for each scenario. Ex. 136, Executive Summary, p. 6.

55. The TER Study examined three main categories of potential effects: human health effects in the form of morbidity and mortality risks, agricultural effects in the form of reduced crop yields and material damages in the form of stone and metal corrosion and surface soiling. Ex. 135, pp. 5-6.

56. The TER Study used stringent criteria to evaluate these effects: scientific evidence must demonstrate that the effect is caused by exposure to ambient levels of the pollutant, scientific evidence must allow the determination of a concentration response function and estimate the prevalence of the effect, and the effect must be one people recognize and value the reduction of the pollutant. Ex. 135, p. 6. Using these criteria TER reviewed over four hundred studies related to health, materials, soiling and agriculture. Ex. 135, p. 6.

57. The Department of Public Service commissioned an expert, Dr. Mark Thayer, to review the TER study and provide a critique. Dr. Thayer presented a comprehensive evaluation of the TER study with his Rebuttal Testimony. Ex. 187. Dr. Thayer determined that the results of the TER study are consistent with the results and general trends found in recent research using the damage cost methodology to estimate the environmental costs of air emissions. Ex. 187, p. 18. In particular, the TER estimates vary significantly by location and scenario, with the highest values in the urban areas,

and the most significant effects are attributed to particulate matter (PM_{10}) and relate to health effects. Id.

58. Dr. Thayer's critique of the TER study did include several concerns about the study. One of the significant limitations of the TER study identified by Dr. Thayer was the scope of the geographic region analyzed by the study. The study did not include the effects of emissions transported much more than roughly 60 miles (100 kilometers) from the location of the plants in each scenario. Dr. Thayer testified that substantial research shows that some emissions are transported long distances and affect sensitive resources much farther than 100 km downwind of the emissions source. Ex. 187, p. 19. Although the air quality impacts of a given source diminish with distance, the total number of people affected can increase significantly. Id. at 20. Dr. Thayer noted that if the Chicago metropolitan area had been included in the TER analysis, the total environmental damages may have been much greater. Id. at 21.

59. Dr. Thayer's critique also included several recommendations that were adopted by Dr. Desvousges and incorporated into TER's final recommendations. Most notably, Dr. Thayer criticized the TER study for ignoring secondary particulate formation. Secondary particulate formation refers to the chemical transformation of nitrogen oxide and sulfur dioxide gases (the precursor gases) into sulfate and nitrate particulates (secondary particulates). The TER study did not account for this transformation and assumed that NOx and SO_2 were non-reactive. Ex. 136, Vol. 1, p. 4-2. Dr. Thayer testified that secondary particulates are the source of "[p]erhaps the most significant environmental effects associated with power plants." Ex. 187, p. 20. He calculated that including secondary particulates formation in the PM_{10} value would increase the total PM impacts in the urban scenario by a factor of three to four in Minnesota, with larger factors of underestimation at more distant locations. Id. at 30.

60. Dr. Desvousges agreed that secondary particulate formation is a significant effect which should be considered. Ex. 139, p. 7. He disagreed, however, with Dr. Thayer's recommendation to assign secondary PM damages to the primary PM emissions. Instead, Dr. Desvousges determined that the effects of secondary particulates should be assigned to the original emissions, NOx and SO_2. Id. Dr. Thayer subsequently agreed that allocating the effects of secondary particulates back to the original emissions was an appropriate method of accounting for the effects of secondary particulate formation. Thayer Surrebuttal Testimony, Ex. 189, p. 4. Using Dr. Thayer's calculations, Dr. Desvousges adjusted his NOx values upward to account for the effects of nitrates.

61. In his report on the TER study, Dr. Thayer also concluded that Dr. Desvousges' calculations for PM_{10} underestimated soiling and visibility damages. The TER study calculated zero soiling and visibility damages for all scenarios. Dr. Thayer provided data and calculations supporting positive damage estimates for these two effects. Ex. 187, pp. 69-73. Dr. Desvousges accepted Dr. Thayer's conclusions and, accordingly, revised his PM_{10} values upward. Ex. 139, p. 10.

62. The record of this proceeding supports adopting the results of the TER study, as modified in response to Dr. Thayer, as the environmental cost values for the six pollutants addressed. The final values are as follows:

	(1993 $ Per Ton)		
	Rural	Metropolitan Fringe	Urban
Particulates Smaller than Microns	530-806	1873-2720	4206-6054
Nitrogen Oxides with Ozone	17-96	132-251	350-922
Lead	379-422	1557-1881	2951-3653
Carbon Monoxide	.20-.39	.72-1.26	1.00-2.14
Sulfur Dioxide			
Before year 2000	9-24	43-104	106-178
After year 2000	0	0	0

63. It should be noted that the above figures are stated in 1993 dollars. The Department proposed that the numbers be updated to 1995 dollars. Dr. Desvousges did not expressly disagree with the use of 1995 dollars to express environmental cost values. In fact, he endorsed the concept. NSP Ex. 139 at 13. Dr. Desvousges pointed out that Dr. Thayer's assumption of a three percent annual inflation rate was higher than was actually experienced in 1994. Id. Dr. Desvousges' recommendations based on 1993 dollars are understated given that final cost values will likely be adopted by the Commission in 1996. Therefore, the ALJ believes that the use of 1995 dollars is more appropriate for establishing environmental cost values in this proceeding than the use of 1993 dollars.

64. There was not much discussion of what the appropriate escalation factor should be. The damage costs adopted above are stated in 1993 dollars. If those costs are not adjusted to account for inflation, the environmental costs will be understated. Both the Department and the Natural Gas Utilities recommend using an inflation index which adjusts past costs to equivalent current dollars. Brockett, Ex. 38, p. 10; Pehrson, Ex. 46, p. 19. The Natural Gas Utilities recommend using the Minneapolis Consumer Price Index for all urban consumers, for all items, because it is readily available and geographically appropriate. Pehrson, id. This is one reasonable index for this purpose. Dr. Desvousges recommended the CPI-U. There is insufficient information in the record for the ALJ to recommend which index is appropriate. The Commission in its order can simply state that the values are in 1993 dollars and direct utilities to escalate these values to the year to which they are applied using whatever appropriate inflation value the Commission chooses. This will provide clear direction to the utilities as to how the externality values should be escalated from this order to the date of future filings such as resource plans.

65. The Environmental Coalition sponsored a study of PM_{10} damages that resulted in a damage value for PM_{10} of $7,800 per ton. Ex. 234, p. 3. The Coalition PM_{10} value was developed using the basic steps of a damage cost study. Ex. 138, p. 19.

66. Dispersion models are used to estimate pollution concentration from electric generating plants. The concentrations used in the Coalition analysis were determined using a screening model. Ex. 138, p. 22. The concentrations used in the TER Study were determined using a detailed EPA recommended air dispersion model. Ex. 136, Executive Summary, p. 6.

67. Meteorological conditions of the area being modeled can vary in different regions of the country. Tr. 26, p. 82. The average concentration levels used to calculate the Coalition value is based on emission concentrations developed for the northwestern United States. Ex. 138, p. 20. The average concentrations levels used to calculate the TER value is based on Minnesota specific meteorological conditions. Ex. 136, Vol. 1, pp. 4-4 to 4-8.

68. The Coalition PM_{10} value is based on a single average concentration throughout a portion of Minnesota and upon the assumption that population is evenly distributed throughout the state. Ex. 136, p. 20. This approach leads to identical damages no matter where the emission sources are located because the same number of people will always be exposed to the same concentration. The TER Study demonstrated it is valuable to carefully examine the dispersion of emissions and to link the resulting site specific air quality to the people and the resources in that site. There is a substantial difference between damages caused by electric generating resources located in urban and rural areas. Ex. 138, p. 21. The TER study provides a more reliable estimate of damages than the Coalition study, and thus the ALJ has adopted the TER values, as modified by Dr. Thayer.

69. Although the TER study was sponsored by NSP, NSP did not adopt its conclusions as set forth above. Instead, NSP has proposed that in each case, the range begin with zero, and extend to the median of the TER numbers. The real reason for this position (which is supported by MP as well) is that it allows NSP, and the Commission, maximum flexibility to deal with the "piecemeal problem".[5] Without that justification, the only remaining basis for the zero figure is testimony from NSP witness Dr. David Harrison that resource planning requires certainty and accuracy in the values and if the ranges of values are either too low or too high, their use in resource planning will produce erroneous results. NSP Initial Brief at 10. MP echoed the uncertainty concern in its brief. MP Initial Brief at 20. NSP's and MP's recommendation of zero

[5] The "piecemeal problem" is alleged to arise because environmental values only apply to regulated utilities and not to other energy sources. This raises the possibility of higher electricity rates from regulated utilities relative to less-regulated energy suppliers. The higher rates may drive some customers to energy alternatives that have higher social costs, and in some cases higher overall emissions. The ALJ has granted motions to strike testimony related to this issue because it really goes to the wisdom of the legislature in mandating the establishmnet of environmental cost values at all. See Post-Hearing Ruling on Evidentiary Motions, (Nov. 16, 1995) at p. 8.

dollars for the low end of the range increases rather than decreases the uncertainty inherent in establishing environmental cost values. NSP witness Dr. Desvousges testified that the NSP/TER recommended ranges of values for the pollutants represent "the 90 percent confidence interval associated with the effects that we've estimated in terms of the damage costs." Tr., 16, p. 88. In other words, Dr. Desvousges is 90 percent confident that the actual damage value for a given pollutant would fall within the range he has provided for that pollutant. Id. at 89. Dr. Desvousges did not calculate confidence levels for the zero dollar values proposed by NSP. Id. at 88-89. However, given that zero does not fall within the range recommended by Dr. Desvousges as the 90 percent confidence interval for any pollutant, one can safely assume that a value of zero has a confidence level of sufficiently below 90 percent, thus decreasing the certainty of the damage cost value. The ALJ finds that the use of a range of environmental cost values around a given confidence interval is the more appropriate approach for dealing with uncertainty in the development of environmental cost values than is NSP's and MP's recommendation to use zero at the low end of the range. This view is supported by the Commission's adoption of ranges of interim values for which the Commission stated, "using a range appropriately acknowledges the uncertainty attending externality valuations." Docket No. E999/CI-93583, Order Establishing Interim Environmental Cost Values, p. 9 (March 1, 1994). The Commission did not use zero for the low end of the range for any pollutant except sulfur dioxide, which the Commission justified based on the internalization of costs through the allowance trading program under the Clean Air Act. Id. at 10-11.

70. Another issue where NSP and MP deviate from the damage cost study performed by TER is NSP's recommendation of zero environmental cost values for carbon monoxide and lead, which are not based on the values recommended by the TER damage cost study. Tr. 3, pp. 29-30. NSP and MP base their position on the argument that total damages from carbon monoxide and lead are relatively small. However, lead damages are second only to PM_{10} on a per ton basis (Ex. 136, Vol. 7, p. 33), and the Twin Cities metropolitan area is nonattainment under the NAAQS standards for both carbon monoxide and lead. Tr. 18, p. 36. Therefore, the ALJ finds that these pollutants are significant, relevant and should be valued in this proceeding.

71. The MPCA proposed an adjustment to the TER's NOx value and also proposed a value for VOCs which it believed is necessary to capture agricultural damages from ozone.

72. TER prepared damage estimates for three scenarios - the Rural, Metropolitan Fringe, and Urban. The TER study results for the Rural Scenario showed agriculture damages for ozone to range from -$11 to $33 per ton for the ninety percent confidence level. Ex. 136, Vol. 7, pp. 3-4.

73. PCA's Dr. Pratt testified that he had concerns regarding the TER ozone modeling because he expected the results for the Rural Scenario to show ozone damages for agriculture. He interpreted the results for this scenario as indicating the

TER ozone model results in a lowering of ozone concentrations when power plant emissions are present. Ex. 155, p. 11.

74. Mr. Ballentine (the modeler whose data was used in the TER study) explained that even though the mean ozone increment across all receptors in the Rural scenario is negative, indicating a decrease in ozone impacts for this scenario from the baseline, the decrease in ozone is likely due to statistical "noise." Ex. 155, p. 11. Mr. Ballentine explained that by referring to the term "noise" he meant the concentrations for this scenario are indistinguishable from zero in the statistical sense. Tr. 17, p. 229. Therefore, the ozone results from the TER Rural Scenario do not indicate the TER ozone model results in a lowering of ozone concentrations when power plant emissions are present.

75. Mr. Ballentine also explained that the results of ozone modeling can be counterintuitive because it is very difficult to presume what will happen with ozone formation in the atmosphere due to the fact that ozone modeling is a nonlinear process which depends on both VOC and NOx concentrations as well as meteorological conditions. Tr. 17, p. 226.

76. The MPCA did not perform ozone modeling to calculate these values. Ex. 139, p. 16. The MPCA damage estimates are not based on Minnesota specific agriculture information. Ex. 139, pp. 17-19. The TER ozone analysis relied on crop-specific dose-response functions, used county level ozone and agriculture data, and employed state of the art valuation techniques. Ex. 139, p. 18. The ALJ finds its ozone data to be the most reliable.

Sulfur Dioxide

77. A number of parties testified that SO_2 should be treated differently than other air pollutants because of the regulatory requirements affecting utility emissions of SO_2. Sulfur dioxide emissions are subject to federal regulation under the 1990 Clean Air Act Amendments ("CAAA"). The 1990 Clean Air Act Amendments established a nationwide cap on utility emissions of SO_2 as well as a national SO_2 allowance trading program. The nationwide cap starting in the year 2000 is approximately 8.9 million tons annually. The trading program allocates each existing source a fixed number of allowances, but allows sources to trade the allowances freely. Each allowance represents one ton of emissions. The owner of each source must submit sufficient allowances at the end of each year to cover its emissions. If a source emits more than its allocation, its owner must obtain allowances from within its system or buy them from another firm with excess allowances. Ex. 8, p. 47, Ex. 37, p. 25. The allowance trading program has been implemented in phases. In Phase I, beginning in 1995, some sources are covered. At least one existing facility in Minnesota, NSP's High Bridge Unit 6 facility, is covered by the Phase I allowance program. Ex. 8, p. 46. In Phase II, beginning in 2000, virtually all resources that emit SO_2 in Minnesota and the rest of the country will be included in the emission allowance trading program. Id. The effect of an emissions cap enforced through tradable allowances should be to reduce the amount of net new

emissions (nationally) to zero. If the total emissions are at the cap, any increase from a new source triggers requires a corresponding reduction from another existing source. Thus, as long as total emissions do not fall below the cap, there will be no net new emissions of SO_2 after the year 2000. Assuming that the environmental damages per ton are the same at different locations, there is no net increase in environmental damages; the damages from the new plant are exactly balanced by a reduction in damages from other plants (Ex. 246, pp. 4-5). Under these conditions the SO_2 allowance trading program internalizes damages related to SO_2.

78. It is impractical to trace the specific net change in damages related to allowance trades because it would require a determination of the change in market equilibrium, which may involve small changes in emissions at many different sites, estimating the associated changes in damages, and sum to get the new effect. Ex. 246, p. 11. While the underlying assumption (equal damages at both sites) is not correct, there is no practical way to compute what is really happening.

79. Given the impact of the 1990 Clean Air Act amendments, it is found that, before the year 2000, environmental cost values for SO_2 should be applied to those resources currently not included in the emission allowance trading program. Ex. 16, p. 8. No dollar value should be applied to SO_2 after that date.

Carbon Dioxide

80. Carbon dioxide (CO_2) is one of several gases known as greenhouse gases because they have the effect of warming the earth. Energy from the sun passes through the atmosphere, is absorbed by the earth, and then is emitted. When the radiation, instead of radiating directly into space, is absorbed and re-emitted by greenhouse gases, the surface and lower atmosphere of the planet are warmed. Ex. 72. (IPCC 1990 Report), at pp. xiii-xiv.

81. Since preindustrial times, atmospheric concentrations of CO_2 and other naturally occurring greenhouse gases have increased as a result of human activities, as have concentrations of new greenhouse gases that do not occur naturally, such as chlorofluorocarbons. Carbon dioxide concentrations have increased from preindustrial levels of about 280 ppm to 350 - 360 ppm as of 1990. The atmospheric concentration of CO_2 is increasing at a rate of 0.5% annually. Global mean surface air temperature has increased by 0.3 degrees C. to 0.6 degrees C. over the past 100 years. Id. at xii-xvi.

82. Carbon dioxide emissions have a long-term effect on global CO_2 concentrations. Once CO_2 is emitted, the resulting higher concentration of CO_2 in the atmosphere persists for substantial periods of time, possibly for centuries. Id. at 5.

83. The CO_2 emitted in any particular place on the planet is well-mixed in the atmosphere. Warming in Minnesota, for example, will be caused not just by

Minnesota's CO_2 emissions, but by the global concentration of CO_2. Similarly, Minnesota's CO_2 emissions cannot be said to warm Minnesota's environment any more than they warm the rest of the planet. Tr. 12, p. 17.

84. Electric utilities produce more than one-third of the CO_2 emitted from anthropogenic sources in the United States, and 80% of those emissions come from coal-fired power plants. Tr. 15, p. 179.

85. Carbon dioxide emissions in Minnesota are approximately 33 million tons per year; this constitutes approximately 0.1% of global CO_2 emissions, which are approximately 60 billion tons per year. Ex. 70, at 5. It is anticipated that Minnesota's contribution will become even smaller as other, more rapidly growing countries, industrialize.

86. In 1988 the United Nations Environment Program and the World Meteorological Organization created the Intergovernmental Panel on Climate Change (IPCC) to evaluate the environmental impacts associated with anthropogenic emissions of greenhouse gases such as CO_2.

87. IPCC reports are the most authoritative sources available for information on climate change issues. The IPCC research and peer review process evaluates all available scientific information on factors affecting climate change. Before publication, IPCC research reports are developed by technical committees composed of experts throughout the international scientific community and are subjected to a rigorous multi-level peer review process.

88. The amount of warming expected due to increased greenhouse gases is expressed in terms of "climate sensitivity." Specifically, climate sensitivity means the amount of warming expected to result from a doubling of the atmospheric concentration of CO_2 (above preindustrial levels) or a doubling of the equivalent CO_2 levels. According to the IPCC, doubling CO_2 concentrations in the atmosphere would lead to an increase in global average temperature that is likely to lie in the range of 1.5° to 4.5° C., which is 2.7 to 8.1 degrees F. Ex. 72 at xxv; 1992 IPCC Supplement, attached to Ex. 70, at p. 5.

89. The science underlying the global warming problem has been reviewed by many other scientific review panels in addition to the IPCC. In general, these panels have projected a range of warming in response to increased greenhouse gases consistent with the range projected by the IPCC. Ex. 72 at 11.

90. The IPCC 1990 Report provided the scientific basis for the global warming negotiations that took place in 1992 at the Rio de Janeiro "Earth Summit," which ultimately resulted in an international treaty known as the Framework Convention on Climate Change. The Framework Convention was signed by 128 countries, including the United States and most industrialized nations, and commits countries to actions to

limit global warming with the aim of reducing CO_2 emissions to 1990 levels by the year 2000. Ex. 72 at 3.

91. The IPCC's range of climate sensitivity, 1.5° to 4.5° C, is based largely on the results of general circulation models (GCMs). The climate forecasts made by the various GCMs in use today depend on relatively crude descriptions of some climate processes. As a result there is considerable uncertainty attached to projections of climate change, which is reflected in the range of climate sensitivity values. Within this range, the IPCC's "best estimate" of climate sensitivity is 2.5° C in light of current knowledge, although there is no compelling evidence to suggest in what part of the range the correct value is most likely to lie. Ex. 72 at xxv and 138-39.

92. Despite these uncertainties, GCMs are the best tools available for predicting the effects of increasing greenhouse gases. IPCC 1990 Report at xx. GCMs are able to simulate with considerable skill the large-scale distribution of pressure, temperature, wind and precipitation of the existing climate and the climates of the distant past, known as paleo-climates. IPCC 1990 Report at 125-26. The IPCC has substantial confidence in the ability of GCMs to predict broad-scale features of climate change. IPCC 1990 Report at xxvii-xxviii. The uncertainties associated with the GCM predictions are insufficient to discredit the IPCC's predictions of global warming.

93. Climate change in the predicted range could involve a number of potentially catastrophic impacts, including a rise in sea level, heightened climatic variability, and changes in vegetation. Although current limitations on GCMs make it difficult to draw conclusions about shifts in the distribution of precipitation, agricultural output, and frequency and severity of extreme weather events for any specific location or even a region, some climate change models show the "grain belts" of the Northern hemisphere shifting north by hundreds of kilometers and show significant die-back of Boreal forests -- the spruce/pine/fir forests found in parts of northern Minnesota. Other studies predict agricultural benefits to Minnesota from warming of the climate.

94. Based on past emission trends, known as the "business as usual" scenario, equivalent CO_2 concentrations are expected to double from preindustrial levels before 2030 and to quadruple before 2100. IPCC 1990 Report at xx, Figure 6, and xxxiv.

The Emissions Target Approach

95. The Environmental Coalition proposed a value of $25 per ton for CO_2 based on the testimony of Dr. Stephen Bernow. Dr. Bernow used an "emissions target" or "environmental target" approach in developing his proposed value.

96. This approach involves a two-step process: (1) selecting an environmental target; and (2) determining the marginal cost of achieving this target. This methodology does not attempt to determine the environmental cost of carbon dioxide; rather, it attempts to determine the cost of meeting particular environmental goals calculated to stabilize the earth's climate. Ex. 111, Attachment SB-2 at 21.

97. Dr. Bernow selected the target of reducing emissions by fifty percent below 1990 levels by the year 2050. After analyzing studies done by others, Dr. Bernow concluded that the cost of achieving this target was $25 per ton for CO_2 emissions associated with electric power generation.

98. The emissions target approach is not conceptually related to determining the environmental cost of CO_2.

99. The target selected by Dr. Bernow has not been adopted by any country or by signatories to any convention or treaty.

100. None of the studies relied upon by Dr. Bernow for determining the cost of achieving his emissions target actually examined the cost of achieving the emissions target he selected. The studies examine the cost of reducing CO_2 to achieve a number of different targets, and they use many different assumptions and methodologies..

101. For purposes of this proceeding, the emissions target approach is both conceptually unreliable as a method of placing a dollar value on the environmental cost of CO_2 emissions.

The Damage Cost Approach

102. The MPCA proposed a damage cost methodology based on the testimony of Peter Ciborowski. Ciborowski proposed a range of $4.28 to $28.57 per ton for CO_2 emissions.

103. Ciborowski's method involved estimating long-term discounted global costs based on the existing economic literature and dividing by long-term CO_2 emissions to arrive at an average cost per ton. Ciborowski essentially converted published damage estimates made by economists from percentages of gross domestic product (GDP) into costs per ton of CO_2. Ciborowski has a masters degree in public policy from the Humphrey Institute at the University of Minnesota and as a policy analyst he has been trained in making cost projections. He has 13 years of experience in analyzing global warming issues, including the underlying science and policy issues. Despite objections to his credentials, the record (including *thorough* cross-examination) reflects that he is qualified to perform these calculations.

104. Ciborowski's damage function is based on studies by Cline, Nordhaus, Fankhauser, and Scheraga, which estimate damages for the United States at mean global surface warming of 2.5° C. It is reasonable to estimate damages based on the assumption of business-as-usual emission trends and using the IPCC's best-estimate of climate sensitivity.

105. The above authors estimated damages for the United States at 1.1%, 1.0%, 1.3%, and 0.8% of GDP, respectively. Based on these damage estimates, Ciborowski

assumed U.S. damages of 1% of GDP. Based on other work by Nordhaus and Fankhauser, Ciborowski further assumed global damages of 1% of global GDP. In the table summarizing his calculation, Ciborowski refers to his assumption of damage of 1% of global GDP as the "lower damage function." Ex. 70, Table 4. These assumptions as to estimated environmental damage are reasonably reliable given the available evidence. The fact that they are based in part on GCM predictions of regional climate changes does not render them unreliable for purposes of this proceeding.

106. In the alternative Ciborowski assumed environmental damage of 2% of global GDP. In the table summarizing his calculation, Ciborowski refers to this assumption as the "higher damage function." Ciborowski testified that the 2% figure was justified because various costs (such as costs to unmanaged ecosystems, species diversity, and air pollution) were omitted from the studies upon which he relied; because assumptions were made about linear warming; and because certain "inherent risks" of global warming were excluded; however, these omitted costs, assumptions, and risks were never valued by anyone, including Ciborowski. Consequently the assumption that damages can be estimated at 2% of global GDP is factually unsupported by the record and is highly speculative given the available evidence.

107. Ciborowski then made two assumptions as to growth rate of global GDP based on forecasts of global GDP growth done by the EPA. What Ciborowski calls the "low EPA GDP growth case" in Ex. 70, Table 4, assumes global GDP growth of 2% per year for 1995-2025, and 1.5% per year for 2025-2100. The "high EPA GDP growth case" assumes global GDP growth of 3.4% per year for 1995-2025, and 2.6% per year for 2025-2100. The EPA used these growth rate projections in its 1989 report to Congress on policy options to slow the rate of global warming. The initial size of global GDP was taken from figures generated by the Central Intelligence Agency. Although some parties to the proceeding have criticized Ciborowski's use of the EPA's forecasts in this context, there is no evidence in the record to suggest that these numbers are unreliable. These assumptions appear to be reasonably reliable based on the available evidence.

108. Ciborowski assumed damages from CO_2 emissions would occur in the period from 2010 through 2100, based on the fact that any warming predicted from 1995 to 2010 could fall within the range of natural variability as opposed to being emitted from anthropogenic sources. These assumptions are based on facts in the record and appear to be reliable.

109. Ciborowski made adjustments to the damage estimates above to factor out future damages that would result from greenhouse gases other than CO_2 and to factor out any damages from past emissions of CO_2. These calculations were based on data contained in the IPCC reports. Again, some parties criticize these adjustments because they do not appear in any published material or in the IPCC reports themselves; however, there is no evidence in the record to suggest that the calculations were performed improperly or that the assumptions made are factually unsupported. These assumptions appear to be reliable based on the facts in the record.

110. Ciborowski calculated the damage estimates using discount rates of 1, 2, 3, and 5 percent. He proposed the use of a discount rate of approximately 1.5%, based on a study performed by Cline.

111. Selection of a discount rate largely controls the ultimate cost figure. This is apparent from Table 4 of Ex. 70. There is substantial evidence in the record criticizing the use of discount rates of 1% to 2% because they result in deceptively large estimates of global warming damages. Although Cline maintains that these rates are appropriate when discounting across generations, there is insufficient support for this position in the record.

112. The MPCA's proposed range of environmental costs of CO_2 of $4.28 to $28.57 per ton is unreliable because it is based on a speculative measure of damage (2% of global GDP) and uses an unreasonably low discount rate to reduce the stream of damages to present value.

113. The weight of authority in the record suggests that discount rates in the range of 3% to 5% are more appropriate in reducing future environmental damages to present value. Ex. 13 (3% rate used by the New York State Environmental Cost Study in valuing environmental externalities); Ex. 83 (DICE model uses 6% discount rate, then declines to about 3% as growth slows; Lind model recommends 4.6% discount rate); Tr. 12 at 74 (Nordhaus contends rates of 4% to 5% are appropriate); Tr. 11 at 196 (National Academy of Sciences used discount rates of 3%, 6%, and 10% without recommending any single rate as being most appropriate).

114. The range of costs for CO_2 emissions, when using Ciborowski's lower damage function (1% of global GDP) discounted at rates of 3% to 5%, is $0.28 to $2.92 per ton. Based on the available evidence, this range represents a reasonable estimate of costs. It is also consistent with the policy goal of using conservative values in the face of uncertainty.

OAG Recommendation

115. The OAG proposes a range of costs for CO_2 emissions of $1 to $11 per ton.

116. The low end of this range is based on the OAG's reliance on testimony that "there is the possibility that the damages to the environment from carbon dioxide emissions may be quite small." OAG Initial Brief at 29. The high end of this range is based on the damage stream calculated by Ciborowski discounted at a rate of 2%, and on OAG's disagreement with Dr. Bernow as to whether "bottom up" or "top down" studies should be used in selecting the cost of controlling environment emissions.

117. No qualified witness proposed this range of costs, and there is no factual support in the record for either endpoint of the range or for using a range assembled in this manner.

118. **The range proposed by OAG is not supported by a preponderance of evidence in the record.**

Other Proposals

119. Other parties have proposed that no value or that a zero value be set for carbon dioxide emissions on the basis that it is not practicable at this point in time to value CO_2 emissions because existing data is insufficient or unreliable. This proposal is rejected. There is a substantial body of literature reflected in the record that attempts to calculate the environmental cost of these emissions. The uncertainties underlying these estimates are acknowledged in the scientific community. The available data, however, provide a sufficiently reliable basis for estimating environmental damage now. It is more reasonable to use the data available now, in a conservative fashion, rather than to disregard the problem entirely.

DISCUSSION

The Administrative Law Judge agrees with the public testimony from Willmar cited earlier to the effect that the real resolution of the global warming problem must come from a global emissions reduction effort, or at the very least, a national effort. One state, especially a state like Minnesota, can not make much of a difference. In fact, even if Minnesota's utilities stopped emitting any carbon dioxide, the global problem would be virtually unaffected by our act, *except* as our action, and similar actions of others in this country and abroad, cause national governments to take the kind of actions that *will* make a difference.

The IPCC is a response to the global warming problem, and its work has spurred actions by a variety of governments and entities. Both the cities of Minneapolis and St. Paul, for example, have adopted CO_2 reduction plans, as part of a global effort by cities sponsored by a UN-affiliated organization called the International Council for Local Environmental Initiatives. St. Paul Public Hearing Tr., pp. 83 and 111. The record is replete with data about what other cities, states, and countries are doing in response to the problem. In the face of these actions, the legislature has made a political and policy judgment that we should proceed to place a value on environmental costs "to the extent practicable". The Administrative Law Judge has concluded that the record contains enough data to support a value for carbon dioxide, albeit a lesser value than many had sought. Therefore, he has proceeded to recommend a value to the Commission for their consideration despite the fact that Minnesota utilities alone can not make a difference.

MERCURY

120. **No knowledgeable witness either denied or disputed that mercury causes damage to the environment or has consequences that people care about. Ex. 200,**

pp. 17-18; Tr. 22, p. 14; Ex. 184; Ex. 174; Ex. 227; Ex. 226, p. 16; Ex. 136; Vol. 6, p. 41; Ex. 230; Public Hearings and Public Letters, generally.

121. Mercury is a contaminant found in even the most remote lakes of the Upper Midwest and virtually all mercury in these lakes is believed to have reached them by atmospheric transport. Bacteria found in the lakes convert the mercury deposited to methylmercury which is taken up through the food chain and "bioaccumulated" up to a million-fold. Ninety-four percent of lakes surveyed by the Minnesota Department of Health, many selected because of their popularity with anglers, have fish consumption advisories because of mercury. These fish advisories have been posted because consumption of fish with high mercury concentrations poses risks of nervous system damage, especially for pregnant women and young children. Wildlife which eat contaminated fish also are at risk. Ex. 213; Ex. 216 (1995 Minnesota Fish Consumption Advisory Update); Tr. 24, p. 56; Tr. 26, p. 180.

122. Substantial public comment was received about mercury contamination negatively impacting recreational fishing. Several persons also noted that mercury poses greater risks to communities dependent on local fisheries. Native Americans testified at several hearings about additional risks posed to Indian anglers, and their families, who rely on locally caught fish and consume up to nine times as much fish as non-Indian people. E.g., April 27 Public Hearing Tr. at 40-42. Similar dependence on locally caught fish by recent Southeast Asian immigrants was described by a public health nurse. April 25 Public Hearing Tr. at 40-41. Also see Ex. 213 at 11.

123. Only in the last decade has the "cycling" of mercury in the biosphere been well understood. It is now believed that the emissions from a given anthropogenic source will be divided roughly equally between a global-hemispheric pool and local-regional deposition (with the regional share about four times greater than the local share). Mercury does not degrade, is highly mobile, and can be re-emitted to the atmosphere after initial deposition to soil or water. The process of coal mining and burning adds mercury to the atmosphere which otherwise would have remain locked in geological formations for millions of years. Ex. 213; Ex. 215; Tr. 23, pp. 84-85.

124. Three-fourths of mercury deposited in Minnesota can be ascribed to human-generated sources. Although mercury emissions from coal-fired power plants are, compared to most criteria pollutants, not well quantified and quite small, coal-fired plants are estimated to be the source of one-sixth to one-fourth of the anthropogenic mercury emissions in the state. With the effects of the 1991 federal ban on mercury in paints and fungicides, coal burning has become the leading source of mercury emissions to the air in Minnesota. Ex. 213, especially exhibit 2 thereto; Ex. 226 at 6-7; and Ex. 234 at 17-18.

125. While mercury is a pollutant of concern, there are significant omissions and uncertainties in data regarding the effect of mercury emissions from electrical generators. Ex. 230, p. 7.

126. The United States Environmental Protection Agency (USEPA) is required by the 1990 Amendments to the Clean Air Act to conduct a study on atmospheric mercury emission. Ex. 230, p. 3. The USEPA has not issued its study and it is uncertain when regulations would be promulgated if they are promulgated. Id.

127. The MPCA has proposed to wait for federal regulations to be implemented before determining whether to promulgate regulations. Ex. 230, p. 6.

128. One area of omissions and uncertainty in data is in the area of the cycling of mercury in the atmosphere. Ex. 230, pp. 9-10. Current models do not exist which account for the complexity of the atmospheric chemistry of mercury and its deposition. Ex. 136, p. 5-1.

129. A second area of omissions and uncertainty in data is in the amount and form of mercury emissions from coal combustion. Id. The form of mercury emitted not only determines how much of the mercury may be removed, but it will also determine the fate, health effects and risk assessment of the mercury emissions. Ex. 230, p. 8.

130. A third area of omissions and uncertainty in data is the amount and form of mercury emissions from natural as compared to anthropogenic sources. Id.

131. If mercury emissions from anthropogenic sources in Minnesota, including coal combustion and other methods of electrical generation were reduced to zero, it is unclear to what extent deposition would decrease in Minnesota. Tr. 23, p. 29.

132. A fourth area of omissions and uncertainty in data and models to estimate accurately the effect of changes in mercury concentration on fish. Ex. 136, p. 5-2.

133. In addition to uncertainties arising from the behavior of mercury in the environment, there are also major uncertainties about valuation. No model has been developed to quantitatively link mercury based fishing advisories to recreation choices. Id. The record of this hearing contains anecdotal suggestions of the link, but there is no quantitative evidence of the amount of recreational activity actually deterred by the advisories.

134. No data has been developed that allows monetization of health damages from mercury emissions. Tr. 24, p. 10.

135. The TER study concluded that the absence of adequate data and models, and the resulting uncertainty make it impossible to quantify the potential damages from mercury emissions. Id.

136. The absence of a proposed value for mercury in the TER study caught some parties by surprise, and they were forced to attempt to fashion a value under serious time constraints. Ex. 163, p. 28. Estimates of mercury damages based on benefit transfer analyses were offered by the Environmental Coalition (EC) and the MPCA.

137. **The Environmental Coalition proposed a $50 million per ton ($25,000 per pound) cost value associated with mercury, which it derived by coupling an estimated $850 million spent on recreational fishing in Minnesota each year, with an argument** suggesting that the Exxon Valdez oil spill stigmatized the salmon industry and reduced its value by approximately 20-40 percent. From there, the Environmental Coalition selected the midpoint of the 20-40 percent range (i.e., 30%), and multiplied it by the $850 million to derive an estimate of the reduction of value to Minnesota recreational fishing industry resulting from mercury stigmatization, or $255 million. Finally, the Environmental Coalition attributed 19% of this reduction, or $50 million, to coal combustion, based upon an estimate that air emissions from coal combustion represent 19% of total emissions. Through this methodology, the Coalition derived a value of $25,000 per pound of mercury. Ex. 234, pp. 20-22.

138. The record contains no evidence that the stigmatization to the *recreational* fishing industry in Minnesota will be of the same magnitude as the stigmatization that occurred in relation to the Exxon Valdez oil spill, which related solely to *commercial* fishing. As discussed above, other than some anecdotal testimony, the record contains no evidence that there has been, or will be, any significant stigmatization to Minnesota's recreational fishing industry resulting from mercury contamination. See Tr. 26, pp. 184-185.

139. The MPCA's benefit transfer analysis relied on two basic building blocks: the findings of the TER study regarding criteria pollutants, and, an air toxics index that was developed by the MPCA staff. The index ranks toxic air pollutants according to their potential to cause environmental harm.

140. The MPCA benefit transfer methodology does not have the same magnitude of certainty as the estimates of the environmental costs of criteria pollutants presented by Triangle Economic Research. Ex. 138, p. 11; Ex. 163., pp. 37-39. It only provides a rough idea of the magnitude of the damages. Ex. 235, pp. 5-6.

141. The MPCA presents a range of values for mercury of $4,359 to $9,781 by utilizing TER's SO_2, NOx and PM_{10} values. Ex. 163, pp. 35-36. Mr. McCarron based the upper end of his range on the inclusion in his analysis of the TER particulate values. Id. at 36. However, Mr. McCarron recognized, in his testimony, that this may be inappropriate and may result in overestimates of the damages. Nonetheless, Mr. McCarron included the lowest value produced by the inclusion of particulate values as the high end of his range in order to offset what he perceived as underestimation of the SO_2 and NOx costs in the TER study. Id. at 36.

142. **It is found that the MPCA analysis provides only a rough estimate of the magnitude of damages caused by mercury. If it were to be used for valuing mercury in this proceeding, it would have to be adjusted downward (as proposed by OAG, which recommended a range of $1,429 to $4,359, to adjust for an overestimation).** See OAG Initial Brief, pp. 32-33.

143. The ALJ cannot support the MPCA's or OAG's recommendations of environmental cost values for mercury based on the MPCA's methodology. MPCA readily admits that the analysis does not comport with the damage cost approach. Instead, it is an attempt to estimate damages from mercury by mercury's position on the air toxics index vis-à-vis other pollutants whose damages are known, such as SO_2, NOx and PM_{10}. The damages from mercury are dependent on a number of functions that do not occur in with SO_2, NOx or PM_{10}. Therefore, the relative position on the list is not a reliable indicator of relative damages. See "Discussion" below.

144. There are several current research efforts targeted at estimating mercury's environmental damages. At the federal level, the Clean Air Act requires the EPA to perform several studies dealing with mercury. Two of those studies will be of particular interest to the Commission. The first is a general review of mercury sources, emission rates, control technologies and health and environmental effects. The second is a study focusing on toxic emissions from coal-burning power plants. The first report was due to Congress late in 1994, the second late in 1995. Ex. 200, p. 18. At the state level, the MPCA has developed a mercury task force. This task force recently completed its report entitled "Strategies for Mercury Control in Minnesota" and will report annually on mercury-related issues in the state. The 1995 Minnesota Legislature appropriated $50,000 for a Minnesota-specific valuation study for mercury. The results of that study are due to the Legislature in mid-1996. See Laws of Minnesota 1995, ch. 220, subd. 5(f) and Ex. 221. That same legislative appropriation bill also appropriated $250,000 to synthesize and interpret a five-year mercury deposition database and an evaluation of fish contamination trends in 80 high-value lakes. Id. at subd. 5(g). This should give some idea of the relative contributions from "local" sources of mercury as opposed to "distant" sources. Ex. 221. Given this current level of pertinent research, the ALJ believes that the Commission will have adequate information to assign a reliable value to mercury in the near future. In particular, the Minnesota-specific studies should provide a sound basis for developing a value for residual mercury emissions in the state. For purposes of this proceeding, however, the ALJ does not believe there is sufficient evidence in the record to support a quantified range of environmental cost values for mercury emissions. Therefore, the ALJ recommends that the Commission defer adoption of an environmental cost value for mercury until better information becomes available.

145. The ALJ also recommends that until the Commission has adopted a numerical value, it require utilities to explain, in their filings subject to the statute, how they considered mercury.

DISCUSSION

It is frustrating to conclude that there is insufficient evidence to recommend a value for mercury in light of the broad consensus about mercury's toxicity and the need to reduce human (as well as animal) exposure. The federal government, as well as the State of Minnesota, have collectively spent millions of dollars studying mercury, and

devising strategies for its control. But because of a variety of what are essentially timing issues peculiar to this proceeding, this record does not contain the information necessary to establish a reliable value. Two years from now, that information will be available. But right now, it is not. Two years from now, the state studies, as well as some of the federal studies, should be completed. In addition, it is possible that the MPCA will be better able to justify the use of the air toxics index, and its underlying fugacity model, in light of the unique properties of mercury. Mercury is unusual because it cycles through the environment, taking on different chemical forms at different times. The ability of mercury to transform from one form to another is known as speciation. The uncertain ability of the fugacity model to deal with the speciation phenomenon makes its application to mercury problematic. Until scientists have had an opportunity to study the reliability of the fugacity model in dealing with mercury, values based upon the model must be viewed with some doubt. It may well turn out that the differences imposed by mercury speciation do not affect the outcome all that much, so that the technique of benefit transfer using the index is a reasonable way to come up with a value for mercury. But the record does not support that conclusion at the current time, and only additional analysis and peer review will resolve the doubt.

The Office of Attorney General, which did not sponsor an expert on mercury, recognized the uncertainty presented by the PCA's values, and weighed them against the uncontroverted evidence that mercury causes significant environmental harm about which Minnesotans care greatly. The Office's resolution of this dilemma was to look at the factors that went into the PCA's values, and exclude the highest one. The PCA's range of $4,359 to $9,781 was based upon a benefits transfer analysis utilizing TER's SO_2, NOx, and PM_{10} values. The upper end of the range was based upon the inclusion of TER's PM_{10} values. In order to try to compensate for any overestimation that might have occurred in the PCA's values, the Attorney General's Office recommended that the highest of the three (PM_{10}) be excluded. Removing PM_{10} values from consideration leads to a range of $1,429 to $4,359 per pound.

The OAG calculation is the best one in the record if the Commission, as a matter of policy, wanted to "send a message" to utility companies about the seriousness of mercury. However, the OAG values still rest upon the legitimacy of the PCA's benefits transfer analysis and its underlying components. In light of the substantial doubt that must be accorded to that methodology, and in light of the fact that significantly better data will be available in a short period of time, the Administrative Law Judge has recommended that the Commission defer adopting any value, but that it instead require utilities to explain how mercury was taken into account in their filings.

METHANE

146. The Environmental Coalition's Stephen Bernow is the only witness to provide an externality value for methane ($550 per ton). The only justification given for his cost value is the statement, Ex. 111, Attachment SB-2, page 38: We also recommend that the MPUC adopt a value of $550 per ton of methane, based on its 100 year Global

Warming Potential of 22 relative to CO_2. This value of 22 also includes the indirect effects of methane and is consistent with the value adopted during the Ninth Session of the INC (US Climate Action Report, 1994).

147. Dr. Bernow's estimated value of $550 per ton of methane is derived by multiplying a regulatory cost for reducing CO_2 using a carbon tax approach ($25 per ton of CO_2) by a ratio of the comparative damages of methane to CO_2 (22 to 1). This is a combination of two different methodologies. Pehrson, Ex. 46, p. 12.

148. Dr. Bernow's CO_2 value of $25 per ton is based on his estimated cost of reducing CO_2 by 50% below 1990 levels through application of a tax. There is no evidence that the damage caused by methane is a ratio of the regulatory cost of controlling CO_2. Id.

149. There is insufficient evidence in the record to support an environmental cost being assigned to methane.

REMAINING PROCEDURAL MATTERS: Motion for Reconsideration of Mills Testimony, Request to Withdraw Falkenberg Testimony and Similar Issues Relating to the Contents of the Record

150. The Administrative Law Judge, having reconsidered his November 16 ruling striking portions of the testimony of Mark P. Mills, reaffirms that ruling, for the reasons stated at that time.

151. The request to withdraw portions of the testimony of Randall J. Falkenberg and similar requests to exclude from the record evidence which responds to evidence stricken by the Post-Hearing Ruling of November 16, is denied.

Both of these rulings are made for the reasons set forth in the following Discussion.

DISCUSSION

On November 16, 1995, the Administrative Law Judge issued the Post-Hearing Ruling on Evidentiary Motions, which resolved numerous evidentiary issues that had arisen during the course of the proceeding. One of the matters was a motion by OAG, DPS, PCA and the Environmental Coalition to strike certain testimony in the direct and rebuttal submissions of Mark Mills. Most of the motion was granted, except for a relatively small portion of his testimony. On January 12, 1996, as a part of the initial briefing, CPA, Minnkota and UPA requested reconsideration of the earlier ruling. The Administrative Law Judge gave other parties an opportunity to comment on the request. Having now reconsidered the matter, the Administrative Law Judge affirms his earlier ruling, for the reasons stated therein.

The November 16 post-hearing ruling did grant a number of the motions to strike various pieces of oral or written testimony. On January 11, the day before initial substantive briefs were due, counsel for the Large Power Intervenors circulated a letter, requesting that the testimony of LPI witness Randall Falkenberg be deemed to have been withdrawn.

The basis for this request was that Falkenberg's testimony was a response to the testimony of Christopher Davis. In November, the Administrative Law Judge had granted a number of motions to strike testimony of Davis. Large Power Intervenors reasoned that since the testimony of Davis had been stricken, there was no reason to have Falkenberg's testimony in the record either. The request specified certain portions of the prefiled testimony of Falkenberg, as well as certain portions of the transcript of his cross-examination.

On that same date, counsel for Western Fuels indicated that he had realized that the November ruling striking certain testimony placed in doubt the validity of a number of related pieces of evidence. He noted that it was unclear whether a striking certain portions of a witnesses' prefiled testimony also affected the following items: (a) live cross-examination of that witness, and (b) prefiled and live examination testimony of other witnesses which responded to the stricken testimony. He indicated that with regard to Christopher Davis' testimony alone, there was responsive testimony from not only Falkenberg, but also from five other witnesses. He urged that the record be clarified on this matter. The next day, the Administrative Law Judge received a letter from counsel for the Department indicating that it needed more time to consider these matters, and urged that no ruling be made until reply briefs were filed on February 16.

On January 29, the Administrative Law Judge wrote to the parties, offering them an opportunity to comment on the issue, both from a conceptual standpoint and a practical one. Reply briefs, which were received on February 16, offered a variety of suggestions. The Administrative Law Judge will not catalog them all, but would characterize them as falling into two groups: those who thought that the request to withdraw was filed too late, and should not be allowed, while, on the other hand, there was a group that thought that the request was a legitimate one and that someone would have to go through the entire record and deal with not only the evidence which was stricken based on the November 16 ruling, but also the cross-examination based on that evidence, prefiled evidence from other parties that responded to it, and cross-examination on that responsive evidence as well.

The Administrative Law Judge believes that the request to withdraw Falkenberg's testimony, as well as similar requests (either explicitly stated or implicit in later argument) should have been made at an earlier point in time, closer to November 16, so that parties would have an opportunity to respond to them, the Administrative Law Judge could rule on them, and parties could proceed to frame their final arguments accordingly. It would add several months to the schedule of this proceeding if the Administrative Law Judge were to now require parties to enumerate all of the evidence which they think ought to be excluded from the record as a "logical

outgrowth" of the November 16 ruling. Once they had done that, the ALJ would likely have to resolve disputes, and then allow the parties an opportunity to refile initial and reply briefs based upon the "new" record.

The realities of the record of this case do not require that this additional time be added to an already lengthy schedule. After reviewing the record and considering the scope of the "logical outgrowths" in comparison to what would remain in the record, the Administrative Law Judge does not believe that going through the exercise of identifying those logical outgrowths would affect the outcome of the matter. This is not a situation where there is one critical piece of evidence that is going to determine any of the values proposed herein (or not proposed herein). To use a simplistic analogy, this is not a murder trial where the only piece of evidence linking the defendant to the crime is, for example, a confession. If the confession is excluded, the defendant goes free, while if it is included in the record, the defendant is found guilty. For each of the values at issue here (except, perhaps, for methane, which is not even affected by this procedural snarl), there is a large volume of evidence. Excluding some and leaving the rest in the record would not affect the outcome.

For the reasons stated above, the Administrative Law Judge has decided that the record shall remain intact, as it was at the time of the end of the hearing, only as modified by the November 16 rulings.

Based upon the foregoing Findings, the Administrative Law Judge makes the following:

CONCLUSIONS

1. Any of the foregoing findings that should more properly be deemed a conclusion is hereby adopted as such.

2. The Administrative Law Judge and the Minnesota Public Utilities Commission have jurisdiction over the subject of this hearing pursuant to Minn. Stat. §§ 216B.2422 and 14.50 (1994).

3. The Commission gave proper notice of the hearing in this matter, has fulfilled all relevant substantive and procedural requirements of law or rule, and has the authority to take the action proposed herein.

4. The evidentiary rules which apply in this case are those which govern contested cases, Minn. Rule pt. 1400.7300. That rule also apportions the burden of proof and establishes the standard of proof.

THIS REPORT IS NOT AN ORDER AND NO AUTHORITY IS GRANTED HEREIN. THE PUBLIC UTILITIES COMMISSION WILL ISSUE THE FINAL ORDER IN THIS

MATTER. THE COMMISSION MAY ADOPT, REJECT OR MODIFY THE FOLLOWING RECOMMENDATIONS.

Based upon the foregoing, the Administrative Law Judge makes the following:

RECOMMENDATIONS

1. That the Commission establish the following ranges of environmental costs for criteria pollutants, to be used in proceedings subject to Minn. Stat. § 216B.2422 (1994):

(1993 $ Per Ton)

	Rural	Metropolitan Fringe	Urban
Particulates Smaller than 10 Microns	530-806	1873-2720	4206-6054
Nitrogen Oxides with Ozone	17-96	132-251	350-922
Lead	379-422	1557-1881	2951-3653
Carbon Monoxide	.20-.39	.72-1.26	1.00-2.14
Sulfur Dioxide			
Before year 2000	9-24	43-104	106-178
After year 2000	0	0	0

2. That the Commission establish a range of $0.28 to $2.92 per ton as the environmental cost of carbon dioxide.

3. That the Commission specify what escalator should be used to escalate the above figures from 1993 dollars to current dollars at the time of filings under the statute.

Dated this 22nd day of March, 1996.

Allan W. Klein

ALLAN W. KLEIN
Administrative Law Judge

NOTICE

Pursuant to Minn. Stat. § 14.62, the Agency is required to serve its final decision upon each party and the Administrative Law Judge by first-class mail.

Reported: Janet Shaddix Elling, Janet Shaddix & Associates, Bloomington, MN