

**BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION
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Mathew Schuerger	Commissioner
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In the Matter of Further Investigation into
Environmental and Socioeconomic Costs under
Minnesota Statute § 216B.2422, Subdivision 3

OAH Docket No. 80-2500-31888
MPUC Docket No. E-999/CI-14-643

**THE MINNESOTA DEPARTMENT OF COMMERCE, DIVISION OF ENERGY
RESOURCES AND THE MINNESOTA POLLUTION CONTROL AGENCY
REPLY TO EXCEPTIONS**

Dated: May 16, 2016

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INTRODUCTION

As stated in their Exceptions filed on May 5, 2016, in which they noted a single exception, the Minnesota Department of Commerce, Division of Energy Resources (Department or DOC) and the Minnesota Pollution Control Agency (MPCA) (jointly, the Agencies) appreciate the thorough, detailed 142-page Findings of Fact, Conclusions, and Recommendations: Carbon Dioxide Values (ALJ Report) of the Administrative Law Judge (ALJ). Overall, the ALJ wrote an admirably well-reasoned and appropriately-detailed recommendation regarding this complex matter.

The Agencies respectfully submit to the Minnesota Public Utilities Commission (Commission) this Reply to the Exceptions of Northern States Power Company (Xcel), the Minnesota Large Industrial Group (MLIG) and the group of investor-owned utilities consisting of Great River Energy, Minnesota Power, and Otter Tail Power (GRE/MP/ OTP).

REPLY TO EXCEPTIONS

1. THE FSCC IS THE MOST REASONABLE AND BEST AVAILABLE MEASURE AND ALJ REPORT, CONCLUSIONS 55, 49, AND 50, ARE APPROPRIATE.

A. The ALJ Report Reached Correct Conclusions Regarding the Selection of Percentiles. (Conclusion 49).

The Xcel Exceptions argued semantics with the ALJ Report as to whether Xcel fully or only partly “ignored” information about the topmost and lowermost quartiles of the United States federal government’s Interagency Working Group’s (IWG’s) distributions and as to whether Xcel’s selection of percentiles “centers” on the median. Xcel’s semantic arguments are not persuasive.

The ALJ Report appropriately did not find reasonable Xcel’s proposal to modify the range of carbon costs by using a non-peer-reviewed truncation methodology. In its proposed methodology for determining a cost of carbon, Xcel proposed simply to truncate and remove the

upper and lower quartile of values from the federal social cost of Carbon (FSCC) data distribution.¹ The ALJ Report correctly concluded that, by truncating the values below the 25th and above the 75th percentiles, Xcel centered its FSCC range around the 50th percentile, which is the median of the distribution, rather than its mean.² Because the distribution is a skewed, non-normal distribution, in which the upper tail includes values that are less likely but higher in magnitude, Xcel's proposal to center its range around the median unreasonably excluded information about the magnitude and likelihood of significant damages, as reflected in the tails of the distribution.

The ALJ Report correctly found that these high damage outcomes are of great concern and it would be unreasonable to ignore them. The ALJ Report's discussion, analysis, and recommendation regarding the Xcel proposal to truncate the FSCC distribution of values was thorough, complete, and well supported by the record.³

¹ ALJ Report, Conclusion 49.

² Of course, Xcel could have, but did not, propose to remove the ends of the tails in a fashion that centered its proposed carbon costs around the mean, rather than the median.

³ ALJ Report, Findings 380-81, 384-419, 427-430, Conclusions 49-50. As noted by the ALJ Report, Findings 406 to 409, the Agencies disagreed with Xcel's use of the median instead of the mean in developing the distribution of its SCC values. (ALJ Report, Finding 406 (*citing* Ex. 801 at 66 (Hanemann Rebuttal))). Xcel had acknowledged that the FSCC values developed by the IWG are not normally distributed but instead are skewed with a long right tail, and the Agencies disagreed with Xcel's statement that the skewed distribution results in a mean that is greatly influenced by "outliers." (ALJ Report, Finding 406 (*citing* Ex. 801 at 66-67)). The Agencies' expert witness, Dr. Hanemann, explained that "outlier" is defined in the field of statistics as "an observation that is distant from other observations." ALJ Report, Finding 407 (*citing* Ex. 801 at 67, fn 47). The long right tail in the IWG distribution is a continuum of observations with increasingly large values, not outlier values disconnected from the rest of the observations on the continuum. The FSCC distribution is simply skewed, with a long right tail which includes some larger data points. ALJ Report, Finding 407 (*citing* Ex. 801 at 67). Valuation of the social cost of carbon is a risk management process, the goal of which is "to avoid the risk of possibly very harmful climatic outcomes in the right tail of the warming and SCC probability distributions." Because use of the median removes the tails of the distribution from consideration, that approach is contrary to the goal of a risk management policy. ALJ Report, Finding 409 (*citing* Ex. 801 at 70).

B. Treatment of Discount Rates (Conclusion 50)

Xcel continued in its Exceptions to advocate its unique and non-peer-reviewed “averaging” discount rate proposal. The ALJ Report correctly concluded that Xcel did not demonstrate that it had a reasonable basis on which to average the three FSCC discount rate values at the upper and lower ends of its range of values to establish its final FSCC range of cost values.⁴ ALJ Report, Conclusion 50. Xcel presented no evidence of theoretical, practical or scholarly support for its idea that averaging the values of the three discount rates for each end of its distribution range is an appropriate way in which to account for the controversy among the parties regarding a proper discount rate. ALJ Report, Conclusion 50.

2. THE ALJ REPORT CORRECTLY FOUND THAT THE FSCC CONSTITUTES A RANGE. (CONCLUSION 51).

Noting that Minn. Stat. §216B.2422 subd. 3 requires that the Commission establish a range of environmental costs, Xcel’s Exceptions argued at 18-19 that by adopting the FSCC, the ALJ Report failed to establish a range of values for future Commission use. Xcel’s Exceptions characterizes the FSCC values as “three point estimates” rather than a “range” of values as the term may be used by statisticians. The Xcel Exceptions opined that to comply with the intent of the statute, the range must “have one specified beginning value and one specified end value, and

⁴ The ALJ Report, Findings 394-395 carefully explained and illustrated the non-peer-reviewed methodology Xcel proposed for creating a discount rate. Xcel equally weighed the values for each of the three discount rates the IWG used (2.5, 3.0, 5.0) at the low and high ends of Xcel’s initial range. For example, for the year 2020, the carbon cost at the 2.5% discount rate is \$21.13, at the 3 percent discount rate it is \$13.31 and at the 5 percent discount rate it is \$2.54. To equally weight those three numbers, Xcel averaged the three carbon cost amounts, resulting in a 25th percentile low bound of \$12.33 per short ton (in 2014 dollars) for emissions in 2020. Xcel performed the same calculations for the 75th percentile upper bound for 2020. For the 75th percentile, Xcel calculated that the amount at the 2.5 percent discount rate was \$67.73, the 3 percent discount rate was \$44.40 and the 5 percent discount rate was \$13.24. The average (equally weighted) amount of these three provided Xcel with a 75th percentile upper bound of the range of \$41.80 per short ton (in 2014 dollars) for emissions for 2020. Xcel discarded the 3 percent value for purposes of the proposal.

the values between are not identified.” Xcel offered no argument or evidence to support its claim that the legislature meant the term “range” to be defined exclusively as a mathematical function, rather than for the term to have its common meaning, “A set of different things of the same general type,”⁵ such as a “range” of options, choices, products, etc. Ordinary statutory interpretation is contrary to Xcel’s argument.⁶

The Agencies agree with the ALJ Report’s Conclusion 51, that Xcel failed to demonstrate that the FSCC does not offer a range of values.

3. THE ALJ REPORT CORRECTLY ADDRESSED UNCERTAINTIES REGARDING HIGH DAMAGES, TIPPING POINTS, MITIGATION, ADAPTATION AND ENDOGENOUS TECHNOLOGICAL CHANGE. (CONCLUSIONS 13, 43 AND 44)

The Xcel Exceptions disputed the ALJ Report, Conclusions 13, 43 and 44 (which were based in large part on the expert testimony of the Agencies’ witness, Dr. Hanemann) that the uncertainties such as the potential danger of a “tipping point” catastrophe, “reasonably require an initially high SCC until more is known about such uncertainties.” ALJ Report, Conclusion 43.⁷ The Xcel Exceptions contended that this conclusion is subject to “debate” and speculated whether “other features” of the IWG methodology (for example if adaptation, mitigation, and endogenous technological change are incompletely captured) could cause the FSCC to overestimate climate damages. The Xcel Exceptions argued against adoption of the ALJ’s Report based on a theory that it is not known precisely how these uncertainties may ultimately

⁵ Oxford English Dictionary (OED), published online at the following: http://www.oxforddictionaries.com/us/definition/american_english/range.

⁶ Minn. Stat. § 645.08 (1) states that, “words and phrases are construed according to rules of grammar and according to their common and approved usage....”

⁷ See also ALJ Report, Finding 173 and n. 363 (*citing* Ex. 801 at 55-63 (Hanemann Rebuttal)) and Conclusions 41-42.

“balance out.” Xcel Exceptions at 20 (*citing* Ex. 602 at 10-11 (Martin Surrebuttal)).⁸ See also MLIG Exceptions at 77-80, and GRE/MP/ OTP Exceptions at 11-12.

As an initial matter, the Xcel Exceptions overstated its witness’ concern. Mr. Martin only offered that the answer to the question--whether the modeling in the IAMs of adaptation, mitigation and technological change offsets the underestimation of damages --“is very difficult to know;” and further, the conclusion Mr. Martin drew regarding this topic was only that he did “not feel that the Commission should adopt a mean, median, 95th percentile, or any other falsely precise point estimate.” Ex. 602 at 10-11 (Martin Surrebuttal).⁹ See also ALJ Report, Finding 225. Moreover, Mr. Martin (who is neither a modeler, an economist nor a climate scientist, but is instead an in-house “environmental policy manager”¹⁰ for Xcel) offered nothing substantive to justify a rejection of the IAM modelers’ assumptions or of the IWG’s reasoning regarding adaptation/mitigation/technological change. The IWG participants explained the IWG’s reasoning as follows:

The three [IAM] models vary widely and how they account for compensatory adjustments, or adaptation, in response to climate change, which will mitigate the negative impacts on well-being... It is possible that the three models fail to account adequately for the various ways in which adaptation could occur. However, the evidence available on this issue is limited. Thus the interagency group retained the modelers’ assumptions in this regard.

Ex. 600 at 40 (Martin Direct)(citing Greenstone, Kopits and Wolverton (2013) at 26.)

⁸ The MLIG similarly and inaccurately argued that the FSCC is unreasonably uncertain. MLIG Exceptions at 14-17.

⁹ Mr. Martin restated his opinion about adoption of the 95th percentile value in his Rebuttal testimony as “[t]he IAMs’ poor modeling of adaptation and endogenous technological change also supports the view that it would be inappropriate for the Commission to adopt the IWG’s 95th percentile SCC value without the corresponding 5th percentile value.”) Ex. 601 at 49.

¹⁰ Xcel’s witness on these matters was not an economist, but an “environmental policy manager” with a graduate degree in “energy & resources” and an undergraduate degree in music, who appears never to have performed research or published in a peer-reviewed journal. Ex. 600 at Attachment 1, p. 1)(Martin Direct).

The Agencies believe that the ALJ Report reasonably concluded that the evidence demonstrated that “the IWG adequately accounted for adaptation and mitigation in the FSCC” and that “[n]o other party demonstrated by a preponderance of the evidence that it is reasonable to account for adaptation or mitigation to any extent beyond that included in the FSCC. There was no specific evidence presented regarding the efficacy of any specific mode of adaptation or mitigation.” ALJ Report, Conclusion 44.

The ALJ Report also was correct in its conclusion that the evidence demonstrated that the FSCC underestimates the negative effects that increased warming will have on human health (ALJ Report, Conclusion 11), that the IAMs’ damage functions do not account for a significant number of important environmental impacts which will occur as a result of climate change (ALJ Report, Conclusion 12), and that, based on unreported and underreported health and environmental impacts, along with the IWG’s acknowledgment that the FSCC is not based on the most current research, the preponderance of the evidence demonstrated that the FSCC understates the full environmental cost of CO₂. ALJ Report, Conclusion 13. Further, “uncertainties such as the potential danger of a “tipping point” catastrophe reasonably require an initially high SCC until more is known about such uncertainties.” ALJ Report, Conclusion 43.¹¹

The ALJ Report’s findings on this topic are correct and well supported by the record. Dr. Hanemann discussed the existence of uncertainties regarding the location in time of climate

¹¹ See also ALJ Report, Finding 173 and n. 363 (citing Ex. 801 at 55-63 (Hanemann Rebuttal)). The ALJ further concluded that “Peabody, and the Utilities and MLIG failed to demonstrate ... that a Ramsey rule discount rate that adjusts over time is reasonable to use” in calculating the FSCC. ALJ Report at Conclusion 15. The ALJ report noted that, in addition to the intergenerational nature of the FSCC damage calculation, “due to the uncertainties associated with the possibility of catastrophic damages from a “tipping point” event which may occur at an unknown time, and the understatement of impacts in the IAMs’ damage functions,” “an approach that is designed to begin with a higher discount rate and gradually declines is neither reasonable nor the best approach to for the purpose of calculating an SCC.” *Id.*

tipping points and how such tipping points could affect the FSCC. Dr. Hanemann discussed a heuristic assessment in the literature that uses an analogy to a bicyclist racing downhill, with an unknown curve ahead. He stated that a good cyclist would brake until he determined how the curve should be handled.¹² Similarly, Dr. Hanemann explained, the existence of an uncertain threshold for a tipping point lying ahead is shown to raise the current SCC value, and, once the tipping point danger is resolved, the SCC value drops down. Dr. Hanemann explained that this overturns the conventional pattern in which the SCC starts out low and rises over time: with tipping point uncertainty, the SCC would start out high. ALJ Report, Finding 321 (*citing* Ex. 801 at 59-60 (Hanemann Rebuttal)). *See also* ALJ Report, Findings 170-178 (discussing evidence showing that the FSCC is understated); Finding 227 (discussing the IWG’s observation that “[t]he IPCC Fourth Assessment Report, which was the most current IPCC assessment available at the time of the IWG’s 2009-2010 review, ... concluded that it was “very likely that [SCC] underestimates” climate change damages... [and] [s]ince then, the peer- reviewed literature has continued to support this conclusion.”); Conclusion 20 (concluding that the FSCC likely understates damages and ... the risk of a “tipping point” is not well-represented within the scope

¹² Dr. Hanemann explained this literature, briefly, as follows: “The question of how such uncertainty could affect the decision to mitigate GHG emissions and the SCC value has been examined by Lemoine and Traeger (2014) and by Cai et al. (2015). Their mathematical analysis validates a heuristic assessment given originally by Litterman (2013). Litterman makes an analogy with riding a bicycle downhill, especially in a bicycle race. Suppose, looking ahead, you see what might be a dangerous curve. What a good cyclist does is to apply the brakes until he gets a better sense of how bad the curve is. Once he determines that the curve won’t be a problem, or once he gets through it, then he can pick up the pace. Lemoine and Traeger (2014) and Cai et al. (2015) develop the mathematical analogy in the context of a stochastic optimal growth model. The equivalent of braking when facing an uncertain hazard ahead is to boost mitigation efforts when confronting an uncertain threshold for a tipping point. Once the tipping point danger is resolved, the pace of mitigation may fall back (unless another uncertain threshold for a tipping point lies ahead). There is a parallel impact on the SCC estimate. The existence of an uncertain threshold for a tipping point lying ahead is shown to raises [*sic*] the current SCC value. Once the tipping point danger is resolved, the SCC value drops down. Ex. 801 at 59-60 (Hanemann Rebuttal)(citations omitted).

of the 2.5, 3.0 and 5.0 percent rate of discount); page 128 (“[t]he conclusion the [ALJ] draws from [Doctors for a Healthy Environment’s] testimony is that the FSCC fails to account for the health impacts of climate change, to a significant extent. For that reason, according to [Doctors for a Healthy Environment], the FSCC damage functions are likely underestimates.”)

The Agencies’ witness Dr. Hanemann explained that one of the five emissions scenarios used by the IAMs to estimate damages includes significant adaption. Ex. 801 at 18 (Hanemann Rebuttal). Moreover, all five scenarios entail emissions projections that level off and decline sometime between 2100 and 2200. Ex. 801 at 19-23 (Hanemann Rebuttal).

In summary, there is abundant evidence in the record to support the conclusions of the ALJ Report regarding the FSCC’s likely underestimation of damages, tipping points, mitigation, adaptation and endogenous technological change. Adoption of the ALJ Report in this regard is reasonable.

4. THE ALJ REPORT REACHED CORRECT CONCLUSIONS REGARDING THE USE OF THE FSCC OUTSIDE OF FEDERAL REGULATORY IMPACT ANALYSIS. (ALJ REPORT, CONCLUSION 46).

Relying on the testimony of the Agencies’ witness, Dr. Hanemann, the ALJ Report noted that the FSCC is a tool for evaluating the benefits and costs of proposed federal rules by accounting for the impact of greenhouse gas (GHG) emissions. ALJ Report, Finding 66 (citing Ex. 800 at 61 (Hanemann Direct)). The ALJ Report concluded that the FSCC could provide the Commission with the information it requires to implement Minn. Stat. § 216B.2422, subd.3, and that the preponderance of the evidence demonstrates that the IWG has not taken a position regarding whether it is appropriate for a state to adopt the FSCC for purposes such as those outlined in Minn. Stat. § 216B.2422, subd. 3. There was no evidence offered in this proceeding to demonstrate that the IWG’s FSCC values are different than they would have been had the

IWG developed an SCC specifically for the purpose of complying with Minn. Stat. § 216B.2422, subd.3.

The ALJ Report discussed at length (ALJ Report, Findings 145-181, and 336-343, and Conclusion 46) the questions that Xcel again raised in its Exceptions at 23-24 about whether the FSCC, developed for use in cost-benefit analyses for assessing the impact of proposed federal regulations on GHG emissions, should be used as a tool for state decisions that have significant costs.¹³ *See also* GRE/MP/ OTP Exceptions at 3,¹⁴ 10.

The record well supports the ALJ Report's Findings. Dr. Hanemann generally refuted the incorrect assertions by Xcel's witness that the FSCC was "designed for a specific, limited purpose: federal regulatory impact analysis under Executive Order 12866" and, therefore was not appropriate for use in a state resource planning process because the FSCC "is intended to help evaluate whether the benefits of a proposed federal regulation outweigh its costs." Ex. 601 at 10, 20 (Martin Rebuttal). Dr. Hanemann explained:

Resource planning is a form of cost-effectiveness analysis. A cost-effectiveness analysis seeks to identify the least cost means of achieving a given target or goal. In turn, a cost-effectiveness analysis is a particular type of cost-benefit analysis where the alternatives all have the same benefit. In that case, maximizing the net benefit (the object of a cost-benefit analysis) is equivalent to minimizing the cost (the object of cost-effectiveness analysis).

Ex. 800 at 17 (Hanemann Rebuttal); Ex 802 at 32-33 (Hanemann Surrebuttal).

¹³ The MLIG also raised this concern. MLIG Exceptions at 51-52, 56.

¹⁴ GRE/MP/OTP Exceptions claimed that the ALJ Report, Finding 124 states that the damage functions used in the IAMs were "simplified formulas which calculate a monetary estimate of the loss of value to society directly from temperature change levels." GRE/MP/OTP's statement is incorrect, as that quote is not found in Finding 124. The Agencies presume that GRE/MP/OTP meant to refer to, and mischaracterized, ALJ Finding 147, which states "The Utilities and MLIG criticized the IWG IAM damage functions, describing them as 'simplified formulas that largely circumvent a key attribute of the damage function approach.'"

In summary, the ALJ Report correctly concluded that even if the IWG did not specifically develop the FSCC for the purpose of resource allocation decisions, it nonetheless is a measure of damage costs of emissions, and is thus entirely appropriate to use in this context. ALJ Report, Conclusion 46.¹⁵ Furthermore, the ALJ Report correctly noted that there is no evidence that the FSCC values would be any different if they had been specifically developed for the purpose of establishing “to the extent practicable...a range of environmental costs associated with...electricity generation,” as directed by Minn. Stat. § 216B.2442.

5. THE ALJ RECOMMENDATION ON EMISSION LEAKAGE. (RECOMMENDATION 2).

The ALJ Report recommended that the Commission open an investigation into the questions of how to best measure leakage, and whether and how to take leakage into account in other proceedings.¹⁶ For differing reasons, GRE/MP/OTP,¹⁷ Xcel,¹⁸ and the MLIG¹⁹ asked that the Commission not adopt the ALJ Report recommendations regarding emission leakage.

The MLIG and GRE/MP/OTP suggested that, in this proceeding, leakage should be factored in by applying the social cost of carbon value to net tons emitted. MLIG Exceptions at 93-95, GRE/MP/OTP Exceptions at 2, 19. The MLIG’s and GRE/MP/OTP’s position is predicated on the assumption that the record contains evidence upon which the Commission could conclude that there will necessarily be an increase in emissions outside of Minnesota in

¹⁵ GRE/MP/OTP Exceptions at 10, last paragraph; stated, the “IAMS do not produce a descriptively realistic, spatially disaggregated response of climate change impact and damage variables,” because they “do not provide damage estimates for each physical change.” GRE/MP/OTP Exceptions at 10 (*citing* ALJ Report at Conclusions 45-46, Findings 145 and 149). The Agencies respond that the ALJ Report, Findings 4 – 13, correctly conclude that the FSCC damage-cost approach is consistent with the Commission’s Notice and Order for Hearing in this docket. Dr. Hanemann explained the lack of basis for GRE/MP/OTP’s criticism in Ex. 801 at 39 (Hanemann Rebuttal).

¹⁶ ALJ Report at Findings 287-307 and Conclusion 40 - 41, Recommendation 2 at 124.

¹⁷ GRE/MP/OTP Exceptions at 2, 19.

¹⁸ Xcel Exceptions at 26-27.

¹⁹ MLIG Exceptions at 93-9.

response to a decrease in Minnesota emissions, and that those increases/decreases can be quantified. The Agencies disagree; the record does not contain either showing. Further, a determination as to whether and to what extent leakage will occur is outside the scope of this proceeding to estimate damage cost values; it is an application issue. The ALJ Report concluded this in Conclusion 41. The ALJ Report acknowledged and addressed the possibility of leakage by recommending that the Commission open an investigation into the questions of how best to measure leakage and take it into account in proceedings (Recommendation 2). Without this investigation, there is no way to calculate the amount of “net tons” emitted, as MLIG suggests, as opposed to actual tons emitted.

Xcel stated that leakage is a potential issue that could affect the total emission reductions achieved by a specific action, considering both emission reductions at sources in Minnesota and possible offsetting emission increases outside Minnesota. This would ultimately affect only the net emission reductions achieved, *not the CO₂ damage estimate*. Xcel therefore agreed that any quantification of emission leakage is outside the scope of this valuation proceeding. Further, Xcel noted the great degree of difficulty entailed in measuring potential leakage, stating that such an effort would be “quite difficult and speculative.”²⁰

The Agencies agree with the ALJ Report, Conclusion 40. Further, they did not take exception to Recommendation 2 of the ALJ Report, but appreciate and support the recommendation of Xcel’s observation that this topic would be very difficult to address in a general investigative docket and might best be addressed on a case-by-case basis. Xcel’s Exceptions observe that the amount of leakage will vary depending on the Commission decision in question, and the Commission could consider making case-by-case leakage adjustments in

²⁰ Xcel Exceptions at 27.

other proceedings where the CO₂ environmental cost values are used. Xcel Exceptions at 27²¹. The Agencies agree with this Xcel's observations, and note that similar challenges to assessing leakage in a general way may exist, to at least some extent, in the context of a case-specific proceeding.

6. THE ALJ REPORT CORRECTLY ALLOCATED THE BURDEN OF PROOF.

The MLIG Exceptions complained that the ALJ's "Order Regarding Burdens of Proof" dated March 27, 2015 did not properly allocate the burden of proof. MLIG Exceptions at 12-14. The MLIG argued without citation to authority, that the burden of proof should have been on the parties that advocate adoption of the FSCC, not on parties advocating for retention of the cost of carbon set in the 1990's proceeding.

As an initial matter, the Agencies observe that, in making its argument, the MLIG overlooked the Commission's October 15, 2014 Order,²² where the Commission, in referring this matter for a contested case proceeding, confirmed that scientific advances in the past 20 years called for a reconsideration of the damage costs of CO₂ emissions. In its October 15, 2014 Order, the Commission acknowledged that "[i]t would be premature at this stage to adopt the federal SCC values for CO₂ as the Agencies recommend." It went on to say that "...in light of the record so far, the Commission will ask the Administrative Law Judge to determine whether the Federal Social Cost of Carbon is reasonable and the best available measure to determine the

²¹ Xcel noted that deriving a generalized method would be difficult and more speculative than deriving a value on a case by case basis because a generalized method would require dispatch modeling to estimate the short-term rebalancing response of the MISO system in response to the removal or addition of specific generating resources; medium-term capacity planning modeling to hypothesize what resources might be built outside Minnesota to compensate for changes in the generation mix within Minnesota; and longer-term economic modeling to hypothesize whether businesses would relocate operations in response to differential electricity rates between Minnesota and other states and/or countries. Xcel Exceptions at 27.

²² MPUC Dockets E-999/CI-00-1636 and E-999/CI-14-643, Notice and Order for Hearing (October 15, 2014) (the Commission's October 15, 2014 Order).

environmental cost of CO₂ and, if not, what measure is better supported by the evidence.” In this Order, the Commission thus established that any party who wished to put forth a value that “is better supported by the evidence” than the FSCC could attempt to do so. The Commission specifically did *not* state that the values established in the 1990’s proceeding remained presumptively the “best available measure to determine the environmental cost of CO₂.”

The MLIG did not object to the Commission’s October 15, 2014 Order. It did not seek reconsideration by the Commission, as it could have done under the Minn. R. 7829.3000²³ if it believed that the values set in the 1990’s proceeding should be treated as presumptively the “best available measure.” Nor did it seek certification to the Commission of the ALJ’s Order Regarding Burdens of Proof, as it could have done under Minn. Rule 1400.7600, if it believed the ALJ had improperly construed the Commission’s October 15, 2014 Order.

Second, Minn. Rule 1400.7300 Subp. 5, which concerns the burden of proof, does not state, as the MLIG suggested, that a party urging adoption of the “status quo ante” enjoys relief from the need to shoulder any burden of proof. The rule instead imposes a burden of proof on any party “proposing that certain action be taken.” The MLIG plainly has advocated “certain action” in this proceeding.

The MLIG sponsored testimony of Dr. Smith, who offered “recommendations ... relating to the establishment of environmental cost values for Minnesota for carbon dioxide (“CO₂”)” which the MLIG characterized as “a defensible ECV [environmental cost value] for CO₂, assuming the Commission desires a damage-cost ECV for CO₂.” MLIG Initial Post Hearing Brief at 4; MLIG Ex. 300 at 11 (Smith Direct). MLIG, through its witness, Dr. Smith, had two

²³ Minn. Rule 7829.3000 subp. 1 limits the time in which to seek reconsideration to 20 days.

distinctive methodological schemes that it proposed. First, the MLIG proposed that the Commission adopt its “cost-of-compliance” methodology:

Minnesota should consider an alternative approach, such as consideration of societal preferences as revealed in the cost of compliance for actual and proposed Federal decisions on greenhouse gas regulations, rather than relying on IAMs to produce an SCC value.

MLIG Ex. 300 at 33 (Smith Direct). The MLIG went on to propose as a second alternative, that if the Commission nevertheless used a damage cost approach, (as was specifically ordered in the Commission’s October 14, 2014 Order)

the Commission should adopt a range of values calculated using assumptions that are less speculative and more appropriate for Minnesota ... of \$1.62/net tonne to \$5.14/net tonne (2014\$).

MLIG Ex. 300 at 33 (Smith Direct).

In summary, the ALJ Report properly determined that the Federal Social Cost of Carbon is the most reasonable and the best available measure to determine the environmental cost of CO², “that MLIG failed to demonstrate, by a preponderance of the evidence, that any of the CO₂ environmental cost values it proposed are reasonable and the best available measure of CO₂ cost values,” and “that the Utilities and MLIG failed to demonstrate, by a preponderance of the evidence, that any of the CO₂ environmental cost values they proposed are reasonable and the best available measure of CO₂ cost values.” ALJ Report, Conclusions 53, 54, and 56; and Recommendation 1.

7. THE MLIG INACCURATELY ARGUED THAT THE FSCC IS BASED ON OUT-OF-DATE, AND UNREASONABLY SPECULATIVE OR UNRELIABLE INFORMATION.

A. Outdated Assumptions

Mostly in the context of discussing the equilibrium climate sensitivity (ECS), the MLIG argued that the ALJ Report was incorrect to recommend adoption of the FSCC because the assumptions on which the FSCC were based are uncertain, speculative and erroneous, and that

the IWG unreasonably relied upon “outdated” assumptions in the Intergovernmental Panel on Climate Change’s (IPCC)’s 2007 Fourth Assessment Report (AR4) rather than looking to the IPCC’s 2013 AR5. MLIG Exceptions at 14, 29-47.

Both of the Agencies’ expert witnesses, Dr. Hanemann and Dr. Gurney, addressed the issue of the timing of the IPCC’s Assessment Report 4 (2007) and Assessment Report 5 (2013) and the decisions made by the IWG to initially establish the FSCC in 2010 and then to update it in 2013. The AR5 findings (notably its conclusion regarding the likely range and distribution of the ECS value) were certainly not available to the IWG in 2010. Even in the IWG’s 2013 update, AR5 findings had not been released in time for the IWG to incorporate them in its estimate. Moreover, Dr. Gurney disagreed with the assertion that using the findings of AR5 instead of AR4 would change the FSCC values very much.

In either case, the IWG has made clear that it will continue to update the FSCC values in the future as more knowledge is developed about CO₂ emissions' impacts on climate and the economic consequences of these impacts. There will always be a timing issue between the state of the science and the process involved in updating the values. By tying damage values in Minnesota to the FSCC, the Commission would ensure that the most updated science-based values are used. The ALJ Report thus correctly decided that the ECS values used by the IWG (based on AR4) were the best available values to use to develop the IWG FSCC, (ALJ Report, Conclusion 24) and that the ECS values were certainly more scientifically justified than any alternative ECS values proposed by other parties in this proceeding. ALJ Report, Conclusions 22 and 23.

B. Uncertainty Fails Evidentiary Standard

GRE/MP/OTP contended that the ALJ's recommendations do not comply with the statutory requirement "to the extent practicable, quantify and establish" environmental cost values due to the inherent uncertainties reflected in the FSCC, noting that, "even when it is likely that future damages exist, it may no longer be reasonable or even practicable to quantify such damages because those estimates cannot be supported by sufficient evidence." GRE/MP/OTP argued that the ALJ in the 1997 proceeding established "practicable" as being the evidentiary standard to be applied by the Commission to establish the CO₂ values, citing Judge Klein's Findings 29 and 30. GRE/MP/OTP Exceptions at 2, 3, 5.

The Agencies disagree that Judge Klein established "practicable" as the evidentiary standard. Judge Klein's Finding 28 states that "practicable" does not override longstanding rule to apply preponderance of the evidence standard. Whether it was "practicable" to quantify a value did not depend on complete certainty or precision of the estimate, as ALJ Klein's Finding 34²⁴ indicated:

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.

²⁴ Findings of Fact, Conclusions, Recommendation and Memorandum; In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3; Docket No. E999/CI-93-583, 6-2500-8632-2 (March 22, 1996).

The above excerpt also clearly refutes GRE/MP/OTP's assertion that the Agencies:

. . .ask the Commission to embrace rather than reject uncertainty and to knowingly and deliberately set the new CO₂ ECV even when there is a lack of sufficient evidence to quantify those values. This approach, of course, is not only inconsistent with the Commission's past practice, it is directly contrary to the statutory requirement demanding that the Commission 'to the extent practicable, quantify and establish' ECVs.

GRE/MP/OTP Exceptions at page 13.

The Agencies conclude that GRE/MP/OTP's statement is false. Accepting uncertainty in the externality values is consistent with the Commission's past practice and statutory directive.

8. THE TIME HORIZON SHOULD NOT BE LIMITED TO 2100.

Noting that the Stanford Energy Modeling Forum exercise (EMF-22) was based on a projection calculated for the year 2100, the MLIG argued that the time horizon for the FSCC should also be 2100, and that the ALJ Report²⁵ should not have recommended 2200 for the time horizon. The MLIG erroneously claimed that damages from high temperature increases (as are predicted by the "hot-running" IAMs after 2100) are overly uncertain and not based on empirical evidence. MLIG Exceptions at 17-29. See also the GRE/MP/OTP Exceptions at 2, 3, 16, 17.

As an initial matter, the Agencies note that the MLIG (and all parties) have acknowledged that emitted CO₂ has a residence time in the atmosphere of at least 200 years. Furthermore, all parties agreed that the farther into the future one tries to predict damages, the greater uncertainty there is. The point of contention certain parties have with the ALJ Report is what to do with that uncertainty – whether to ignore those damages, as the MLIG and other parties advocated or, to the best extent practicable, to estimate these damages in as scientifically reasonable a fashion as possible. The ALJ Report correctly concluded that uncertainty about damages is not a justification for ignoring damages. ALJ Report, Conclusions 30-35.

²⁵ The ALJ Report discusses the time horizon issues at Findings 255-267, 337, 366-67, Conclusions 30-35, and Recommendation 1(a).

Discounting of future damages already greatly reduces their contribution to current damage values. While the Agencies disagree with the ALJ's recommendation to truncate the time horizon to 2200 while the IWG chose a 2300 time horizon to derive the FSCC, the ALJ Report was certainly correct to consider damages past 2100.

As noted in the Agencies' own Exceptions, the Agencies continue to recommend to the Commission the adoption of the Federal Social Cost of Carbon (FSCC) methodology and damage values as developed by the federal Interagency Working Group (IWG), including the modeling time horizon of 2300 which the Agencies believe to be based on reasonable assumptions and methods, and to be practicable. The Commission may wish to consider these additional concerns when deciding whether to adopt or amend the ALJ Report on this issue of an appropriate model time horizon.

9. THE ALJ REPORT APPROPRIATELY ADOPTED THE 2.5, 3, AND 5 PERCENT DISCOUNT RATES OF THE FSCC.

The MLIG Exceptions at 47-75 reiterated the MLIG's various claims previously rejected by the ALJ Report,²⁶ the most substantial of which is that a 7 percent interest discount rate should be used in Minnesota's CO₂ externality value instead of the 2.5 percent employed in the FSCC. The MLIG Exceptions argued that 7 percent is an appropriate discount rate, and is required when regulation will affect capital spending because a 7 percent rate reflects the opportunity cost of capital. The MLIG argued that the ALJ Report incorrectly associated the MLIG's proposed 7 percent rate with a "cost of control" approach rather than a damage cost approach. The MLIG Exceptions renewed the MLIG's assertion that the ALJ Report's decision rejecting a 7 percent value conflicts with a directive of the federal Office of Management and

²⁶ The discount rate is discussed in the ALJ Report Findings 100, 102, 114-120, 126, 131-39, 182-229, and Conclusions 14-19.

Budget (OMB). See also the GRE/MP/OTP Exceptions at 2, 18, 19, which argued that no discount rate below 3 percent should be used in this docket.²⁷

The MLIG Exceptions claimed that a weighed discount rate of 5.66 percent would be the most appropriate single value (because it gives twice as much weight to the 7 percent value as to the 3 percent value) and renewed its claim that a 2.5 percent rate lacks any empirical basis (i.e., current societies' consumption rate of time preference).

All parties in this proceeding agreed that the discount rate is a highly important input into the calculation of CO₂ damage costs. The Agencies' witness Dr. Hanemann devoted much of his testimony to explaining discounting and why the IWG was correct in choosing the range of three discount rates (2.5, 3 and 5 percent). While some think that any positive discount rates, especially rates greater than 1 percent or so, are unfairly burdening future generations with the consequences of choices we are making today, Dr. Hanemann defended the use of a consumption rate of discount, which is derived from and a utility rate of discount, even for intergenerational discounting. Ex. 801 at 71-87) (Hanemann Rebuttal).

Dr. Hanemann did not agree that it is appropriate to use a market rate of interest, however, ("the opportunity cost of capital") as recommended by MLIG witness Dr. Smith for the purposes of determining the importance of the costs (or benefits) bestowed on future generations. This is due in part because the market rate of interest assumes a single infinitely-lived decision maker, which is clearly not the case in climate policy. Ex. 801 at 83-85 (Hanemann Rebuttal). Furthermore, Dr. Hanemann disagreed with the MLIG claim, that the federal guidance of the OMB requiring use of a 7 percent rate with regard to private-sector spending means that the

²⁷ GRE/MP/OTP supported ALJ Report Conclusion 14 in the ALJ Report regarding use of 3 percent and 5 percent discount rates, but disagreed with the ALJ Report, Conclusion 18 recommending use of the 2.5 percent discount rate.

7 percent rate should also be used in determining CO₂ damage costs. This is because the impacts of climate change are measured in consumption-equivalent units, (that is, it primarily affects private consumption), so a consumption rate of discount is the more appropriate metric in this context. Ex. 801 at 85-87 (Hanemann Rebuttal).

The Agencies also observe that, when determining an appropriate discount rate, one must first consider to what the discount rate is being applied. In this case, it is being applied to damage values that are based on impacts to Gross Domestic Product (GDP); it is not being applied to the impact of applying externality values. Claiming that the appropriate discount rate is that of investor-owned utilities' overall rate of return is illogical unless the GDP is made up of primarily utility consumption, which it is not. The MLIG is conflating monetized CO₂ damage values with the potential rate impact due to the use of the damage values. While the Agencies do not agree with the MLIG's mix-up, whether and to what extent the use of the FSCC in electric utility resource decisions will impact rates is beyond the scope of this proceeding.

The record shows that the IWG made a thorough review of the discounting literature before it ultimately chose the three values, and the IWG was entirely justified in making that choice. The ALJ Report astutely agrees agreed with the IWG (and with the Agencies) on all of these counts. ALJ Report, Conclusions 14-19.

10. LAST TON SHOULD BE USED FOR DAMAGE COST VALUE

The MLIG Exceptions argued that the ALJ Report²⁸ should not have adopted the FSCC because the IWG erred by using the value of a marginal ton, which, the MLIG claimed, does not allow for future adaptation and technological change, and thus overestimates the social cost of carbon. MLIG Exceptions at 76-83. See also the GRE/MP/OTP Exceptions at 2, 17, 18.

²⁸ Marginal damages are discussed at ALJ Report, Findings 171, 244-254, 303, 329, and Conclusions 26-29.

The ALJ Report, Conclusions 26-29 correctly concluded that damage cost values should be based on a marginal, or incremental, additional emission. To estimate the damages caused by an additional ton of CO₂ emitted at any given time, it is necessary to consider all the preceding emissions (i.e., the “stock” of CO₂ in the atmosphere). Because the damages caused by this additional emitted ton take place over time, to correctly account for the future damages of that one emitted ton, future emissions must also be taken into account. To estimate the damages of that ton of emissions, the damages over time with this emitted ton needs to be compared to the damages without the additional emitted ton. Dr. Hanemann explained this in his testimony. Ex. 801 at 27-29 (Hanemann Rebuttal). Dr. Hanemann pointed out that MLIG witness Dr. Smith’s decision to not consider future emissions in estimating damage values of present emission is unreasonable and does not produce actual damage values. The ALJ Report correctly reached these conclusions and confirmed that the IWG correctly considered the last ton of CO₂ emitted as the marginal ton to calculate damages for the FSCC. The ALJ Report correctly reasoned that this approach “most closely matches the scientific understanding of what is known about the nature of CO₂, which is that each ton of CO₂ emitted has a cumulative impact, both with respect to the CO₂ emitted in the past and the CO₂ emitted in the future, as long as that ton of CO₂ remains in the atmosphere.”

11. GEOGRAPHIC SCOPE OF DAMAGES SHOULD BE GLOBAL

The MLIG Exceptions argued that a global scope of damages is inappropriate in the absence of reciprocity, that Minnesota CO₂ emissions’ contribution to global climate change is insignificant, and that, in the absence of the ability to calculate Minnesota-only damages, U.S.-only damages is the next best choice. MLIG Exceptions at 83-93.

Judge Klein's 1997 ruling to assign externality values to CO₂ emissions was based on a global scope of damages.²⁹ The ALJ Report in the present docket correctly agrees that use of a global scope of damage is the appropriate and required geographic scope. ALJ Report, Conclusions 36-39. The ALJ Report's reasoning is based on the fact that CO₂ emissions in Minnesota have global impacts (which the MLIG acknowledged to be true) as well as the ALJ's correct interpretation of Minn. Stat. § 216B.2442, and the Commission's requirement that the parties use a damage-cost analysis, which necessarily requires accounting for all known impacts.

CONCLUSION

For the reasons stated above, and consistent with its testimony, post-trial briefs and proposed facts in this matter, the Agencies respectfully request that the Commission adopt the Report of the ALJ, with the single exception discussed in the Agencies Exception dated May 5, 2016.

Dated: May 16, 2016

Respectfully submitted,

/s/ Linda S. Jensen

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²⁹ The MLIG Exceptions repeatedly looks to Judge Klein's 1997 decision as a guide to current decision making, but notably departs from that stance with respect to the global scope of damages Judge Klein recommended.



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May 16, 2016

Mr. Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
350 Metro Square Building
121 Seventh Place East
St. Paul, MN 55101

Re: In the Matter of Further Investigation into Environmental and Socioeconomic Costs
under Minnesota Statute § 216B.2422, Subdivision 3
The Minnesota Department of Commerce, Division of Energy Resources And The
Minnesota Pollution Control Agency Reply to Exceptions
OAH Docket No. 80-2500-31888
MPUC Docket No. E-999/CI-14-643

Dear Mr. Wolf:

On behalf of the Minnesota Department of Commerce, Division of Energy Resources,
and the Minnesota Pollution Control Agency, please find enclosed Reply to Exceptions for filing
in the above referenced matter.

Respectfully submitted,

s/ **Linda S. Jensen**

Linda S. Jensen

Attorney for the Minnesota Department of Commerce,
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the Minnesota Pollution Control Agency

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Enclosure
cc: Service List

AFFIDAVIT OF SERVICE

Re: In the Matter of Further Investigation into Environmental and Socioeconomic Costs under Minnesota Statute § 216B.2422, Subdivision 3
The Minnesota Department of Commerce, Division of Energy Resources And
The Minnesota Pollution Control Agency Reply to Exceptions
OAH Docket No. 80-2500-31888
MPUC Docket No. E-999/CI-14-643

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

I, Annabel Foster Renner, hereby state that on May 16, 2016, I filed by electronic eDockets the attached **The Minnesota Department of Commerce, Division of Energy Resources And The Minnesota Pollution Control Agency Reply to Exceptions** and eServed or sent by US Mail, as noted, to all parties on the attached service list.

See attached service list.

/s/ **Annabel Foster Renner**
ANNABEL FOSTER RENNER

Subscribed and sworn to before me on
this May 16, 2016.

/s/ **LaTrice Woods**
Notary Public – Minnesota
My Commission Expires January 31, 2020.

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