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May 16, 2016

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**VIA E-FILING AND U.S. MAIL**

Mr. Daniel P. Wolf  
Executive Secretary  
MN Public Utilities Commission  
121 7th Place East, Suite 350  
St. Paul, MN 55101

**Re: In the Matter of the Investigation into Environmental and Socioeconomic Costs  
Under Minn. Stat. § 216B.2422, Subd. 3  
Docket No. E-999/CI-14-643  
OAH Docket No. 80-2500-31888**

Dear Mr. Wolf:

Enclosed for filing please find the following on behalf of the Minnesota Large Industrial Group ("MLIG"):

1. Reply to Exceptions Filed by Other Parties to the Findings of Fact, Conclusions, and Recommendations of the Administrative Law Judge Regarding Phase I (CO<sub>2</sub> Track).

Very truly yours,

Stoel Rives LLP

A handwritten signature in black ink, appearing to read 'Marc A. Al', is written over a horizontal line. Below the signature, the name 'Marc A. Al' is printed in a standard sans-serif font.

Enclosure

cc: Service List (via e-filing) (with encl.)

**BEFORE THE MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS**

600 North Robert Street  
St. Paul, Minnesota 55101

**FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION**

121 Seventh Place East Suite 350  
St. Paul, Minnesota 55101-2147

In the Matter of the Further Investigation  
into Environmental and Socioeconomic  
Costs Under Minn. Stat. § 216B.2422,  
Subd. 3

MPUC DOCKET NO. E-999/CI-14-643

OAH Docket No. 80-2500-31888

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**MINNESOTA LARGE INDUSTRIAL GROUP'S  
REPLY TO EXCEPTIONS FILED BY OTHER PARTIES  
TO THE FINDINGS OF FACT, CONCLUSIONS, AND RECOMMENDATIONS OF  
THE ADMINISTRATIVE LAW JUDGE  
REGARDING PHASE I (CO<sub>2</sub> TRACK)**

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## REPLY INTRODUCTION

The Minnesota Large Industrial Group (“MLIG”) submits the following Reply to the May 5, 2016, separate Exceptions filed by the Clean Energy Organizations (“CEOs”), the Minnesota Department of Commerce-Division of Energy Resources and the Minnesota Pollution Control Agency (with the Department, the “Agencies”), Northern States Power Company d/b/a Xcel Energy (“Xcel”), and Great River Energy (“GRE”), Minnesota Power Company (“MP”), and Otter Tail Power Company (with GRE and MP, the Utilities Group) to the Findings of Fact, Conclusions, and Recommendations (the “Recommendations”) of the Administrative Law Judge (“ALJ”) in this matter regarding Phase I (CO<sub>2</sub>) dated April 15, 2016.

## ANALYSIS

### I. ADDITIONAL COMMENTS REGARDING THE LEGAL STANDARD

#### A. The Commission’s decision must be based on “actual damages”

As both the CEOs and the Utilities Group point out in their Exceptions to the [Administrative Law Judge’s April 15, 2016, CO<sub>2</sub> Recommendations](#), the foundation for the Commission’s ultimate conclusions and Order in this matter must be “actual damages.”<sup>1</sup> The Utilities Group further correctly notes that “[i]n the first proceeding in the 1990s establishing a CO<sub>2</sub> ECV, the Commission concluded that the terms ‘quantify and establish’ and ‘to the extent practicable’ require that values adopted possess an

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<sup>1</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3; [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 1. The CEOs further correctly refer to this proceeding as a “scientific investigation.” *Id.* at 16. *See also id.* at 6 (“best science”).

adequate quantitative evidentiary basis and not be overly speculative.”<sup>2</sup> As the Utilities Group and the MLIG noted in their Exceptions, the standard applied under Minn. Stat. § 216B.2422, subd. 3, recognizes that at some levels of uncertainty it is still practicable (feasible) to quantify environmental values, but that there is also a point on the uncertainty continuum where it becomes infeasible to quantify environmental costs even though the Commission is convinced that such costs exist.<sup>3</sup> The Utilities Group correctly notes that the ALJ erroneously recommends abandoning this legal principle, without legal authority.<sup>4</sup> The MLIG notes that the CEOs and the Agencies similarly abandon the statutory standard in their Exceptions, seeking instead to capture damages at any price of uncertainty, both as to whether damages may actually occur and as to the scope or extent of such damages.<sup>5</sup> Specifically, the CEOs ask the Commission to reject the ALJ’s recommendation that the Commission not consider the IWG’s 95th percentile environmental cost values at a 3% discount rate, although the use of the IWG’s 95th percentile FSCC value over-weights uncertain risks relative to more certain risks, and confuses “uncertainty” with “risk.”<sup>6</sup> That mistake is classical, and is known as the

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<sup>2</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5 (*citing* [Order Establishing Environmental Cost Values](#) dated January 3, 1997, at 27.)

<sup>3</sup> *See* [Order Establishing Environmental Cost Values](#) at 26, 30.

<sup>4</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3; *see also* [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 21, 23-24, 26-27, 36-38.

<sup>5</sup> *See* [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2 (The Commission should seek to set values that are protective of our most precious resources); [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3-7, 9.

<sup>6</sup> *See* Ex. [401](#) (Gayer Surrebuttal) at 14.

Ellsberg Paradox, which the ALJ correctly avoided.<sup>7</sup> The CEOs argue that the IAMs “did not fully account for the possibility of catastrophic damages from climate change,”<sup>8</sup> although it is entirely uncertain and speculative whether those damages might ever occur, such that the occurrence of damages is unduly uncertain and outside the range of ascertainable “actual damages.”

The CEOs and the Agencies also seek to rely on damages the scope or extent of which is entirely speculative when they ask the Commission to reject the ALJ’s Recommendation 1.a., which was to shorten the modeling-time horizon from the year 2300 to the year 2200. The ALJ shortened the modeling-time horizon because the IWG’s 200-year extrapolation of EMF-22 data “is a degree of uncertainty that is not reasonably supported by adequate evidence.”<sup>9</sup> For the reasons set forth in the [MLIG Exceptions to the ALJ’s CO<sub>2</sub> Recommendations](#) and as set forth below, neither the extrapolation of modeling inputs from the year 2100 through the year 2200 nor through the year 2300 is supported by adequate evidence, as properly recognized by the ALJ,<sup>10</sup> such that the scope

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<sup>7</sup> As set forth below in more detail, the Ellsberg Paradox is a paradox in decision theory in which people’s choices violate the postulates of subjective expected utility in that they demonstrate a preference for taking on risk in which they know the specific odds rather than an alternative risk in which the odds are completely ambiguous. It is generally taken to be evidence for ambiguity aversion. (Ex. [401](#) (Gayer Surrebuttal) at 15, n.3.)

<sup>8</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 16-17.

<sup>9</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 34.

<sup>10</sup> *Id.*

of extrapolated damages is unduly uncertain and outside the range of ascertainable “actual damages.”

**B. The CEOs, the Agencies, and the ALJ stand the statutory “conservative cost values” limitation on its head**

The CEOs argue that “[t]he Commission should seek to set values that are protective of our most precious resources.”<sup>11</sup> The Agencies meanwhile argue that “[i]t is more practicable and conservative for the Commission to conclude that the record in this docket supports accepting the assumptions made by the IWG.”<sup>12</sup> The ALJ furthermore recommended that CO<sub>2</sub> values should initially be set high until more is known about uncertainties such as tipping point or other catastrophic damages and that the Commission should abandon the original proceeding’s “conservative cost value” approach in this proceeding.<sup>13</sup>

These arguments fly in the face of the Commission’s 1997 interpretation of Minn. Stat. § 216B.2422, subd. 3, as affirmed by the Court of Appeals, inasmuch as the Commission has expressly determined that it is necessary that conservative cost values be applied in the face of uncertainty. The Utilities Group correctly notes that the ALJ, the CEOs, and the Agencies seek to stand the conservative-cost-values standard on its head by suggesting that the major uncertainties identified in this proceeding require high environmental-cost values. That approach confuses the Legislature’s broad role and

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<sup>11</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2.

<sup>12</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 9.

<sup>13</sup> *See, e.g.*, [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 43 & pp. 126-127 (Memorandum).



authority with the execution of the Legislature’s limited instruction to the Commission to quantify knowable values. Minn. Stat. § 216B.2422, subd. 3.<sup>14</sup>

**C. “Practicable” means “feasible,” rather than “convenient” or “practical,” and recalculating damages is very feasible**

The CEOs further seek to abandon the meaning of the statutory term “practicable” as interpreted by the Commission in its January 3, 1997, Order and affirmed by the Court of Appeals. The CEOs argue in their Exceptions that having to recalculate environmental cost values is not “practicable” because it might entail some work and cost, and “the Minnesota value would lag further behind the SCC.”<sup>15</sup> According to the CEOs, “it is unquestionably less practicable for the state to take on this burden rather than reasonably relying on federal agency expertise.”<sup>16</sup>

The CEOs overlook that there is no supportable finding of “federal agency expertise” in this instance or in this record. While ordinarily regulations are issued following the federal rules process, including advance public comment on draft

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<sup>14</sup> As noted in the [MLIG Exceptions to the ALJ’s CO<sub>2</sub> Recommendations](#), it “is elementary that the Commission, being a creature of statute, has only those powers given to it by the legislature.” *Great N. Ry. Co. v. Pub. Serv. Comm’n*, 284 Minn. 217, 220, 169 N.W.2d 732, 735 (1969). The Legislature states what the agency is to do and how it is to do it. While express statutory authority need not be given a cramped reading, any enlargement of express powers by implication must be fairly drawn and fairly evident from the agency objectives and powers expressly given by the Legislature. *Peoples Nat’l Gas Co. v. Minn. Pub. Utils. Comm’n*, 369 N.W.2d 530, 534 (Minn. 1985). Furthermore, “Neither agencies nor courts may under the guise of statutory interpretation enlarge the agency’s power beyond that which was contemplated by the legislative body.” *Peoples*, 369 N.W.2d at 534 (quoting *Waller v. Powers Dep’t Store*, 343 N.W.2d 655, 657 (Minn. 1984)).

<sup>15</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 6, 12-13.

<sup>16</sup> *Id.*

regulations, here unknown delegates of a variety of federal agencies met in secret, without the benefit of advance public comment, rendering blind reliance unreasonable.<sup>17</sup> The after-the-fact responses to public comments show that the IWG's mind was already made up. The record evidence shows that the IWG's current FSCC is out of date, misses important data such as the 7 percent discount rate and adaptation and mitigation concepts erroneously removed by the IWG from the IAMs, includes inappropriate reference points such as the 2.5 percent discount rate, is unreasonably speculative, and is accordingly unsuitable for application in the Minnesota context. Additionally, and importantly, the CEOs' argument shows that they define "practicable" in this context as "convenient" or "practical," but both ALJ Klein's Findings of Fact, Conclusions, and Recommendations in the original proceeding and the Commission's January 3, 1997, Order reject this interpretation of the term "practicable" and hold that the meaning of "practicable" in Minn. Stat. § 216B.2422, subd. 3, is "feasible."<sup>18</sup> The CEOs' practicability arguments are accordingly irrelevant and contrary to law.

In a matter as important as this one, where the MLIG alone has spent over \$1 million in legal costs and expert witness fees, not to count the costs incurred by all of the other parties, it is not only "feasible" and thus "practicable" to have Dr. Smith calculate modified values, but Dr. Smith has in fact testified what those values would be (*see, e.g.*,

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<sup>17</sup> *See, e.g.*, Tr. Vol. 1 at 87:19-88:1; 112:9-16; 113:4-9; 152:18-153:1; 156:5-9 (Polasky).

<sup>18</sup> Ex. [305](#) (March 22, 1996, Findings of Fact, Conclusions, Recommendation and Memorandum (ALJ Allan W. Klein), Docket 93-583) at ¶¶ 29-33 & pp. 17-18; [Order Establishing Environmental Cost Values](#) at 30, 31.

Ex. [307](#) (Table 4A)) and, should the Commission desire different calculations, she can do so for the Commission because out of all the economics experts she alone has taken the time and effort to obtain each of the models that the IWG used.<sup>19</sup>

**D. “Highly speculative” data has no place in this proceeding**

The MLIG agrees with the Utilities Group that the IWG’s use of the IAMs, as all witnesses admitted, results in many damage estimates that are highly speculative and lack significant scientific evidentiary support, especially in the period after 2100, and that the IWG used assumptions which substantially raise the level of uncertainty associated with the calculated values.<sup>20</sup> The Utilities Group accordingly properly submits in its Exceptions that the establishment of a Minnesota environmental cost of carbon cannot be based on a “best guess” relationship between higher temperatures and the economy, as the CEOs’ witness, Dr. Polasky, advocated.<sup>21</sup>

Xcel further properly points out that there are features of the IWG methodology that could cause it to underestimate climate damages,<sup>22</sup> other features that could cause it to overestimate climate damages, and that the proponents of the FSCC have not shown by a preponderance of the evidence that it is known how the omissions balance out, such that

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<sup>19</sup> See Ex. [302](#) (Smith Direct Report) at 2, 18, 33-39.

<sup>20</sup> See [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3.

<sup>21</sup> *Id.* (citing Tr. Vol. 1 at 124:7-13 (Polasky)).

<sup>22</sup> See also, e.g., [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5.

it impossible to conclude, as the ALJ did, that the FSCC “underestimates” damages.<sup>23</sup>

Xcel acknowledged that some aspects of the IWG’s methodology may underestimate climate damages, since not all types of damages are included, and highly uncertain “tipping point” or catastrophic damages may be incompletely characterized. But Xcel appropriately pointed to aspects that cause the IWG’s methodology to overestimate damages, such as the fact that adaptation, mitigation, and endogenous technological change are incompletely captured<sup>24</sup> and that the IWG did not run the IAMs in their native

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<sup>23</sup> While the IWG believed that the FSCC might underestimate damages, its analysis relies on outdated, and incorrect data, uses erroneous discount rates, an incorrect geographic scope (absent reciprocity), and removed the IAMs’ native adaptation mechanisms, all of which lead to the IWG’s FSCC in fact vastly overstating damages.

<sup>24</sup> See [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 20. Xcel appropriate points out, for example, that there is significant evidence that the FSCC does not fully capture measures that may be taken by future generations and governments to enhance CO<sub>2</sub> mitigation, that four out of the five emissions scenarios used in the IWG’s methodology—the four EMF-22 “business as usual” emission trajectories—assume no global coordination on mitigation by governments, while only one—the “550 ppm average” scenario—assumes international coordination sufficient to contain CO<sub>2</sub> concentrations at 550 parts per million, and that this means that 80 percent of the damage estimates affecting where the FSCC average values land are built on an assumption that no coordinated governmental action on CO<sub>2</sub> mitigation will ever exist. Xcel correctly points out that this is contrary to many recent regulatory efforts in the United States, some of which Mr. Martin listed in his testimony, and that it is contrary to recent international developments such as the United Nations Framework Convention on Climate Change (UNFCCC) 21st Conference of Parties in Paris, where 195 countries reached consensus on a global climate accord aimed at reducing global emissions of CO<sub>2</sub> on December 12, 2015. (See [https://unfccc.int/paris\\_agreement/items/9485.php](https://unfccc.int/paris_agreement/items/9485.php).) The agreement was opened for signature at a ceremony at the United Nations Headquarters in New York on April 22, 2016. As of 29 April 2016, there are 177 signatories to the Paris Agreement. (See [http://unfccc.int/paris\\_agreement/items/9444.php](http://unfccc.int/paris_agreement/items/9444.php).)

format, and cannot capture endogenous technological change and innovation to reduce the CO<sub>2</sub> intensity of economic growth because the EMF-22 emissions trajectories are set exogenously—fixed up front and not allowed to change in response to experienced climate damages.<sup>25</sup> This means that future societies are assumed to take no further action to reduce CO<sub>2</sub> emissions over the next 285 years, despite experiencing significant warming and severe damages beyond what is assumed up front in the EMF-22 emission trajectories.<sup>26</sup> This feature of the IWG methodology—the way the IWG chose to run the models, as opposed to the models themselves—means that emissions are likely overestimated and adaptation and mitigation underestimated.<sup>27</sup> Indeed, Xcel correctly notes that the IWG itself recognized that the FSCC only partially captures adaptation and technological change.<sup>28</sup> Xcel thus appropriately disagreed with the ALJ’s conclusion that the Agencies and CEOs demonstrated that the IWG adequately accounted for adaptation and mitigation (Conclusion 44), as the Agencies and CEOs in fact failed to present evidence to draw such a conclusion. Xcel further correctly submitted that both types of factors, *i.e.*, those that may cause overestimation and those that may cause underestimation, should be treated in the same manner because they are equally uncertain.

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<sup>25</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 21-22.

<sup>26</sup> *Id.* at 22 (*citing* Ex. [601](#) (Martin Rebuttal) at 47-51).

<sup>27</sup> *See, e.g.*, Ex. [302](#) (Smith Direct Report) at 68-69.

<sup>28</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 21-22 (citations omitted); Ex. [100](#) (Polasky Direct) at Schedule 2 (Feb. 2010 IWG Technical Support Document) at 30.

**E. The FSCC is not a “reasonable and the best available measure to determine the environmental cost of CO<sub>2</sub>” without, at a minimum, modifications to the IWG’s inputs**

The Utilities Group properly shows in its Exceptions that the FSCC is not a “reasonable measure to establish Minnesota’s CO<sub>2</sub> ECV” and that the legal standard applicable to this proceeding requires that the economic framing assumptions underlying the IWG’s federal social cost of carbon be modified to account for a shortened modeling-time horizon (the year 2100), the continued use of an average-cost approach to calculate marginal ton, and the rejection of the 2.5% discount rate.<sup>29</sup> The MLIG further joins the Utilities Group in its statement that “[t]here is no dispute that leakage occurs and reduces the efficacy of CO<sub>2</sub> reductions in emissions from Minnesota,”<sup>30</sup> and that while specific leakage percentages should not be developed in this proceeding, “the preponderance of the evidence [requires] that the ECV established in this docket be applied to *net* emissions reductions.”<sup>31</sup>

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<sup>29</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4, 18-19. While the Utilities Group accepts the calculation of CO<sub>2</sub> environmental-cost damages on a global scale, (see [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4), it has not made a showing, in the evidentiary hearing or in its Exceptions, why it is appropriate to do so. For the reasons set forth in the MLIG’s Exceptions, the MLIG respectfully disagrees, and submits that the record instead supports, by a preponderance of the evidence, calculation of damages using a Minnesota geographic scope. (See [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 83-93.)

<sup>30</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 19.

<sup>31</sup> *Id.* (emphasis in original).

**F. “Practical implications” and “public policy” cannot control this proceeding**

The MLIG disagrees with Xcel as to the central themes of its objections. Xcel suggests that the Commission “consider the practical implications of the ALJ’s recommendations,” and further claims that “practicability considerations are appropriate because of the Commission’s role as a public policy body, and because the factors most influential in the FSCC are in fact public policy judgments informing the modeling approach, rather than matters of objective scientific fact.”<sup>32</sup> Xcel specifically claims that “decisions such as the geographic scope of damages, the modeling horizon, the discount rate choice, and how to model damages from a marginal ton of emissions” are “public policy decisions.”<sup>33</sup> Xcel’s statements are not accurate and go much too far, as they omit that the environmental cost value or social cost of carbon must be set based on actual, quantifiable damages calculations and science.<sup>34</sup> Accordingly, and contrary to Xcel’s apparent position, these model inputs are not merely a matter of public policy.

The discount rates historically used by the Commission, for example, are based on the 3 percent consumption rate of time preference (also called the “risk free” interest rate) and the 5 percent “risky investment” consumer interest discount rate. They are accordingly not merely figures arrived at by considering whatever “public policy” might move a “public body” on a particular day. Similarly, the 7 percent (pre-tax private

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<sup>32</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5.

<sup>33</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 6.

<sup>34</sup> *In accord*, [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 6, 16 (“scientific investigation”).

capital) discount rate that the MLIG submits must be used in this proceeding and that is required to be modeled in OMB-governed federal regulatory proceedings when a regulation displaces or alters the use of capital in the private sector,<sup>35</sup> is a market rate. All three rates of interest reflect rates that affected individuals and entities are willing to pay to shift consumption into the present.”<sup>36</sup> However, Xcel is correct to characterize the 2.5 percent discount rate as a purely political choice, driven more by moral philosophy than informed by empirical analysis, and lacking an evidentiary basis.<sup>37</sup>

Meanwhile, establishing a modeling horizon of the year 2300 may initially be a modeling-policy decision, but when damages are unduly speculative because it is both highly uncertain whether certain damages will ever occur and how large other damages

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<sup>35</sup> The IWG’s FSCC was not designed for regulations that primarily displace or alter the use of capital in the private sector. See [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Finding of Fact 62.

<sup>36</sup> See [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Finding of Fact 118. See also [Agencies November 24, 2015, Initial CO<sub>2</sub> Brief](#) at 121 (acknowledging that the 3% and 5% discount rates are respectively risk-free and risky-investment consumer interest rates); Ex. 417 (OMB Circular A-4) at 33 (“If we take the rate that the average saver uses to discount future consumption as our measure of the social rate of time preference, then the real rate of return on long-term government debt may provide a fair approximation. Over the last thirty years, this rate has averaged around 3 percent in real terms on a pre-tax basis.”); *id.* at 33 (“The 7 percent rate is an estimate of the average before-tax rate of return to private capital in the U.S. economy. It is a broad measure that reflects the returns to real estate and small business capital as well as corporate capital. It approximates the opportunity cost of capital, and it is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. OMB revised Circular A-94 in 1992 after extensive internal review and public comment. In a recent analysis, OMB found that the average rate of return to capital remains near the 7 percent rate estimated in 1992.”).

<sup>37</sup> See Ex. 302 (Smith Direct Report) at 80.



are, the statute and this Commission’s interpretation thereof restricts how far out the damages analysis may go. That statutory restriction cannot be set aside based on policy considerations.<sup>38</sup>

The MLIG further submits that while there is some policy judgment in the geographic scope of damages, the application of a worldwide geographic scope leads to an overstatement of damages because the social cost of carbon damages are driven upwards by the effect of all of the other nations’ uncontrolled CO<sub>2</sub> emissions. The failure to take this overstatement into consideration is not a mere matter of policy. Absent reciprocity, a global geographic scope renders damages excessive *per se*. Known “excessive damages” are not “actual damages,” and are accordingly outside the Commission’s statutory mandate.

Equally inappropriate is Xcel’s statement that the treatment of marginal emissions is merely a matter of a policy decision.<sup>39</sup> The IWG adopted a “last ton” approach without much discussion. But the record shows that it is inappropriate to assume that a particular ton of CO<sub>2</sub> emitted in the near future would be the last ton to be decided on as part of a 300-year “business as usual” baseline of otherwise unconstrained future emissions,<sup>40</sup>

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<sup>38</sup> See Minn. Stat. § 216B.2422, subd. 3; [Order Establishing Environmental Cost Values](#) dated January 3, 1997, at 26, 27, 30, 31.

<sup>39</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 11.

<sup>40</sup> For four of the five IWG scenarios, the baseline emissions projection reflects a business-as-usual world. Thus, each 2020 ton is valued against a future baseline projection in which no other reductions are ever made. However, if there is to be any actual climate benefit in reducing CO<sub>2</sub> emissions in Minnesota, those actions *have* to be part of a comprehensive policy. (Ex. [302](#) (Smith Direct Report) at 53  
(continued)

since many of the tons emitted that contribute to the FSCC value will not be emitted until much later than the Minnesota tons in question and by others than Minnesota, while the carbon emitted in Minnesota is no more or less harmful than carbon emitted elsewhere and is also no more or less harmful than any of the tons assumed to be emitted in the future.<sup>41</sup> As the Utilities Group properly notes, “[t]he ‘last ton’ approach thus greatly overstates the damages from Minnesota emissions as compared to a more balanced average cost approach.”<sup>42</sup> This, again, renders the damages calculation outside the statutory mandate, and shows why Xcel’s statement that the inputs into the IAMs are in large part “dependent on public policy decisions” is erroneous as a matter of law.

## **II. ADDITIONAL COMMENTS REGARDING THE BURDEN OF PROOF**

### **A. Findings and conclusions must be based on evidence**

The CEOs enthusiastically embrace the ALJ’s statement in her Memorandum that “there is now undeniable evidence that CO<sub>2</sub> emissions are already having a dramatic impact on the Earth and its climate.”<sup>43</sup> But the ALJ cites no evidence in support of this crucial proposition, which is contradicted by, for example, the “warming hiatus.” This

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(continued)

(emphasis in original).) The “5th scenario” has a baseline that reflects global emissions being reduced to achieve atmospheric concentration stabilization at 550 ppm, but this scenario receives only 20% weight in the calculation of the IWG’s SCC values, as it is only one of five scenarios that are averaged together. (Ex. [302](#) (Smith Direct Report) at 53.)

<sup>41</sup> Ex. [300](#) (Smith Direct) at 20:7-21:1.

<sup>42</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 17 (*citing* Ex. [300](#) (Smith Direct) at 15:5-9 and Ex. [601](#) (Martin Rebuttal) at 45:13-46:16).

<sup>43</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5-6 (*citing* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at 127 (Memorandum)).

term refers to the fact that observational data after 1998 shows a flat or even declining trend in atmospheric temperatures.<sup>44</sup> Because the ALJ made virtually no actual findings of fact, having instead chosen to attempt to summarize parties' positions and testimony,<sup>45</sup> the Commission will unfortunately have to make the factual determinations upon which it will base its conclusions and Order, as the Commission's decision will need to be made based upon the record evidence.<sup>46</sup>

**B. The ALJ improperly reversed the burden of proof regarding the design of the FSCC for the purposes for which it is now being offered, and the record evidence shows the IWG's FSCC is not appropriate for application in Minnesota**

Xcel correctly notes that the ALJ's conclusions that "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"<sup>47</sup> is puzzling at best, and shows how the ALJ improperly reversed the burden of proof.<sup>48</sup> The ALJ did reverse the burden of

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<sup>44</sup> See [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Findings 14-18 (*citing, e.g.*, Ex. [200](#) at 8 (Happer Direct); Ex. [221](#) at 6 (Spencer Direct)).

<sup>45</sup> See, e.g., "Findings of Fact" 14-18. *In accord*, [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 17 ("The ALJ also noted that the Agencies argued that" and "She also explained that the Agencies presented arguments that") & n.48 ("Findings of Fact at ¶ 170–71 (describing the Agencies account of recent science).") & n.50 ("Findings of Fact at ¶ 173; *see also id.* at ¶ 178 (listing additional damages not included in the models suggested by CEOs).")

<sup>46</sup> See, e.g., [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4, n.1 ("if agency decision runs counter to the evidence, it is arbitrary and capricious").

<sup>47</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 46.

<sup>48</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 23-25.

proof and the MLIG agrees that Xcel did, in fact discuss throughout its testimony that the FSCC is designed solely for federal regulatory impact analysis under Executive Order 12866, and the differences between this and state-level Commission decisions.<sup>49</sup> So did the MLIG and the Utilities Group.<sup>50</sup> Xcel properly points out that this ought to put “the burden of proof on proponents of the FSCC to demonstrate by a preponderance of the evidence that use of the FSCC in the proposed application is appropriate,”<sup>51</sup> that “the Agencies and CEO have not provided such evidence,” and that “[i]n fact, they never responded, and the ALJ does not respond, to the crux of Xcel’s argument about the differences between federal regulatory impact analysis and the proposed application to Minn. Stat. § 216B.2422, subd. 3.”<sup>52</sup> Xcel correctly highlights that “in federal regulatory impact analysis there may be greater tolerance for imprecise estimates, because the key point is whether the benefits of a regulation exceed its costs, not whether benefits (avoided climate damages) are precisely quantified.”<sup>53</sup> “As long as benefits exceed costs, and exceed costs at all four FSCC executive summary values, the premise of federal regulatory impact analysis would be that a regulation is warranted regardless whether the FSCC is ‘correct’ or precise.”<sup>54</sup> Xcel demonstrated this with an example of the

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<sup>49</sup> See, e.g., Ex. [600, pt. 1](#) (Martin Direct) at 12-14; Ex. [601](#) (Martin Rebuttal) at 20-22; Hearing Transcript Vol. 3B at 156-158 (Martin).

<sup>50</sup> See, e.g., Ex. [300](#) (Smith Direct) at 24-26; Ex. [304](#) (Smith Surrebuttal) at 25-30.

<sup>51</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 24.

<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

Environmental Protection Agency’s regulatory-impact analysis of the Clean Power Plan, where in EPA’s view the benefits exceeded costs at all four FSCC executive summary values, *i.e.*, regardless whether the “correct” estimate of climate damages is \$12 or \$120 per metric ton.<sup>55</sup> The FSCC played no role in dictating how states and regulated entities comply with the Clean Power Plan.<sup>56</sup> However, “when transplanted to resource planning and related Commission decisions, the environmental cost of carbon values are used to dictate resource decisions, and it matters a great deal whether the ‘correct’ value is \$12 or \$120: these two values would point to dramatically different resource mixes, with different implications for customer costs, reliability, fuel diversity, and other factors.”<sup>57</sup>

Xcel also correctly notes that the ALJ “merely hypothesized” in her Conclusions that the IWG might have derived the same FSCC values had it developed the FSCC for the purpose of complying with Minn. Stat. § 216B.2422, subd. 3. But given the above (and even absent the above), the ALJ’s hypothesis lacks any factual or logical foundation, requiring that the Commission reject Conclusion 46. As Xcel notes, it was “incumbent on the proponents of the FSCC to demonstrate[,] by a preponderance of the evidence[,] that the FSCC values are appropriate for resource planning,” and they “have not done

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<sup>55</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 24.

<sup>56</sup> *Id.* (citing Ex. [601](#) (Martin Rebuttal) at 20; Ex. [602](#) (Martin Surrebuttal) at 7-8).

<sup>57</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 24.

so.”<sup>58</sup> The CEOs’ and the Agencies’ failure to meet their burden of proof requires rejection of the FSCC.<sup>59</sup>

### C. The science must be up-to-date

The Commission’s precedent is to demand the most current data upon which to base its decisions, and to reject out-of-date information.<sup>60</sup> The Utilities Group correctly notes that “[t]he damage functions used by the IWG are based upon quantitative relationships between temperature changes and economic damages that are almost identical to those relied upon by the Commission to establish the CO<sub>2</sub> values in 1997,”<sup>61</sup> and that the “record, in other words, is lacking in evidence to support the claim made by petitioner CEOs that the current CO<sub>2</sub> values are no longer supported by scientific evidence.”<sup>62</sup> Instead, as the Utilities Group notes, “the record establishes the difference between the CO<sub>2</sub> values resulting from the IAM modelling performed by the IWG and

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<sup>58</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 25.

<sup>59</sup> The same is true for the Doctors for a Healthy Environment and the Clean Energy Business Coalition, who did not independently introduce admissible foundational evidence to support adoption of the FSCC and that the IWG’s FSCC is “reasonable” and “the best available measure to determine the environmental cost of CO<sub>2</sub>.” While the ALJ is correct that “other parties are free to join in support of the Agencies and CEOs,” their position rises or, as here, falls with the Agencies’ and CEOs’ positions. See [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at p. 128 (Memorandum).

<sup>60</sup> See [Order Establishing Environmental Cost Values](#) at 16-17 (rejecting out-of-date U.S. EPA NAAQS data).

<sup>61</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4 (*citing* Ex. 302 (Smith Direct) at 6-9 (“Differences Between IWG’s SCC Estimates and Those Adopted by the Commission in 1997”)).

<sup>62</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4.

the Commission's current values is largely the result of choices that the IWG made regarding the framing assumptions used in running the models rather than a deeper scientific understanding.”<sup>63</sup> “In fact, in undisputed testimony, Dr. Smith observed that ‘[i]f the IWG analysis were to be done with analytic framing consistent with Minnesota’s 1997 decisions, their range of SCC estimates would be much closer to the environmental cost values approved by the Commission in 1997 than to the values recommended by the Agencies.’”<sup>64</sup>

The CEOs have admitted that “the SCC ha[s] some catching up to do on the current science” and that the SCC currently fails to reflect all the science on climate change.<sup>65</sup> The CEOs, the Agencies, and the ALJ seek to fill this gap with the IWG’s “commitment to updating the SCC to reflect current science,” and the CEOs and the Agencies claim that these updates could be easily incorporated by the Commission if it selected the SCC.<sup>66</sup> This suggestion is misleading, however. Both the CEOs and the

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<sup>63</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4.

<sup>64</sup> *Id.* (citing Ex. [302](#) (Smith Direct) at 9).

<sup>65</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5.

<sup>66</sup> *Id.*; *see also id.* at 22-23 (“These numbers will be updated over time to reflect the best science”); [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 9; [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusions 9-10. As pointed out by the CEOs, the Agencies’ statement that “[t]he FSCC model was adopted in 2010” and “has been updated three times to date,” is inaccurate. While the IWG updated the FSCC once, in May 2013, its subsequent changes were technical revisions to correct errors, rather than updates. (See [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 14, n.38.)

MLIG cited part 1 of a two-part new review of the FSCC,<sup>67</sup> commissioned by the IWG from the National Academies of Sciences.<sup>68</sup> As shown in the [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#),<sup>69</sup> even if one were to set aside for a moment all the problems with the FSCC identified in this proceeding and identified to the IWG, the committee commissioned by the National Academies of Sciences to review to FSCC has found that the current FSCC is fraught with uncertainty that the IWG has not sufficiently addressed (contrary to the ALJ's supposition that it has), that none of the three SCC-IAMs (nor any others of which the National Academies of Sciences Committee is aware) are sufficiently comprehensive to include all of the uncertainties in the inputs that are likely to be important in calculating the SCC,<sup>70</sup> and that the current social cost of carbon values do not "reflect the most recent scientific consensus on how global mean temperature is, in equilibrium, affected by CO<sub>2</sub> emissions."<sup>71</sup> This development is not only a relevant, independent, factor providing support for the MLIG's Exceptions, which reject the FSCC as a viable, acceptable, current, reliable, and appropriate model for Minnesota resource-planning purposes, but furthermore contradicts the CEOs', the Agencies', and the ALJ's

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<sup>67</sup> See [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 13-14; [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 7-8.

<sup>68</sup> *Assessment of Approaches to Updating the Social Cost of Carbon: Phase I Report on a Near-Term Update* (Jan. 26, 2016) ("Phase I NAS Report") (available at [http://www.nap.edu/download.php?record\\_id=21898#](http://www.nap.edu/download.php?record_id=21898#)).

<sup>69</sup> See [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 8.

<sup>70</sup> [Phase I NAS Report](#) at 50.

<sup>71</sup> *Id.* at 1.



baseless assumption that the IWG will simply and timely update the FSCC.<sup>72</sup> In light of the National Academies of Sciences investigation, it is in fact just as—if not more—likely that the entire IWG FSCC program will be revised.

Xcel notes that “the FSCC is not immune from political influence.”<sup>73</sup> “Under a more conservative Administration, a future update of the FSCC may adopt different policy judgments ... that would drive the FSCC values down significantly.”<sup>74</sup> Xcel rightfully asks whether the Commission would simply revise its CO<sub>2</sub> environmental cost downwards because of political decisions in Washington.<sup>75</sup>

**D. The FSCC values are “highly uncertain”**

While the CEOs and the Agencies both urge the Commission to simply adopt the FSCC values, without modification,<sup>76</sup> the Utilities Group correctly notes that the CEOs and the Agencies have not offered any means to address that the damage functions themselves are derived from a very limited number of studies “which were neither up-to-date nor comprehensive”<sup>77</sup> and that “the outdated studies used to develop the damage functions used by the IAMs examine the economic impact of warming up to only 3

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<sup>72</sup> See, e.g., [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 9.

<sup>73</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 9-10, 26. The use of the 2.5 percent discount rate is one such political, non-empirical, decision.

<sup>74</sup> *Id.* at 10.

<sup>75</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 10.

<sup>76</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 4; [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 1-2, 8, 9.

<sup>77</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 11 (*citing* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 9).

degrees Celsius, which means IAM developers must extrapolate from these impacts to speculate about the impacts of temperatures above 3 degrees Celsius. Similar to the ALJ, the IWG itself has recognized that the representations reflected in the IAMs' damage functions are "incomplete and highly uncertain," and require "thorough review."<sup>78</sup> Based on this reason alone, the proponents of the FSCC cannot show by a preponderance of the evidence that the Commission should adopt the FSCC. This conclusion is further bolstered by each of the testifying experts' admissions that the FSCC values are "highly uncertain."<sup>79</sup>

As set forth above, the Utilities Group correctly notes that the ALJ, the CEOs, and the Agencies seek to stand the conservative-cost-values standard on its head by suggesting that the major uncertainties require high environmental-cost values,<sup>80</sup> although that approach confuses the Commission's role solely to quantify knowable values and the elected Legislature's function to determine the State's policies, in the

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<sup>78</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 11 (*citing* Ex. [100](#) (Polasky Direct) at Schedule 2 (Feb. 2010 IWG Technical Support Document) at 9).

<sup>79</sup> *See* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 41; *see also* [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 11-12; [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5 ("estimating damages, particularly far into the future, remains a difficult problem full of uncertainty..") (*citing* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at p. 127 (Memorandum)); Ex. [100](#) (Polasky Direct) at 15:20-22 ("major" uncertainty in FSCC); Ex. [802](#) (Hanemann Surrebuttal) at 45:1-9 ("large" uncertainty in FSCC).

<sup>80</sup> *See* [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 13; [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 43 and p. 127 (Memorandum); [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2; [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 7-9.

process weighing important policy considerations. The Commission has previously and correctly recognized that it cannot “alter the legislature’s directive that the Commission is to quantify values only if (to the extent) it is feasible (practicable) to so.”<sup>81</sup> As the Commission has further recognized, the inability to accurately monetize damages at this time does not mean that the effects have been overlooked; when damages cannot be quantified, the Commission is still free to consider unquantified impacts on a qualitative basis<sup>82</sup> at such time as policy determinations are properly made, such as at the actual time of application of the environmental cost of carbon in a resource-planning setting, where numerous factors are considered together.

### **III. ADDITIONAL COMMENTS REGARDING THE VALIDITY OF THE FSCC**

The Utilities Group correctly notes that “the IAMs do not follow a traditional cost damage approach” and “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.”<sup>83</sup> The MLIG agree that “[t]he step of identification and quantification of damages is crucial to ensuring there is [a] solid empirical foundation underneath the ultimate cost calculation. But this step is not included in the damage functions used by the IWG.”<sup>84</sup> Accordingly, and contrary to the

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<sup>81</sup> [Order Establishing Environmental Cost Values](#) at 31; *see also id.* at 30. *See also Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations* at 15.

<sup>82</sup> [Order Establishing Environmental Cost Values](#) at 31.

<sup>83</sup> [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 10.

<sup>84</sup> *Id.* at 11.

ALJ's Conclusion 4, the IWG's FSCC does not comply with the Commission's instruction that a damage cost model be used.<sup>85</sup>

While the CEOs in other aspects of their Exceptions acknowledge that the IWG's FSCC does not rely on the most current science,<sup>86</sup> the CEOs on pages 13-14 of their Exceptions argue that the National Academies of Sciences have endorsed the IWG's FSCC in a peer-review process and held that it "reflects the best available science."<sup>87</sup> This statement is utter wishful thinking and a misrepresentation of the [Phase 1 NAS Report](#). The National Academies of Sciences Committee instead recognized that the IWG's data was out of date<sup>88</sup> and recommended that the IWG *not* merely update the FSCC with the IPCC's AR5, but instead "undertake efforts to adopt or develop a common 'module' that represent the relationship between CO<sub>2</sub> emissions and global mean surface temperature change, its uncertainty, and its profile over time."<sup>89</sup>

#### **IV. ADDITIONAL COMMENTS REGARDING XCEL'S ALTERNATIVE APPROACH**

The ALJ concluded that Xcel "failed to demonstrate by a preponderance of the evidence that its proposal for measuring CO<sub>2</sub> cost values is reasonable and the best

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<sup>85</sup> See [Notice and Order for Hearing dated Oct. 15, 2014](#) at 4.

<sup>86</sup> See, e.g., [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 14, n. 38 (acknowledging that the ALJ appears to have erroneously believed the IWG consciously elected to follow the IPCC's 2007 Fourth Assessment Report (AR4) rather than the IPCC's 2013 Fifth Assessment Report (AR5), and clarifying that the IPCC's AR5 issued after the IWG's most recent update to the FSCC.

<sup>87</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 13-14.

<sup>88</sup> See, e.g., [Phase 1 NAS Report](#) at 24-25.

<sup>89</sup> *Id.* at 45-46.

available measure of CO<sub>2</sub> cost values.”<sup>90</sup> Xcel takes exception to this conclusion, arguing that the ALJ “reaches this conclusion on the basis of only two stated objections: that Xcel failed to show that its proposal to use the 25th and 75th percentiles of the IWG data distribution, which she characterizes as having ‘centered’ on the 50th percentile or median, was reasonable;<sup>91</sup> and that Xcel Energy failed to demonstrate that it was reasonable to ‘average’ the three FSCC discount rate values at the upper and lower ends of our range.”<sup>92</sup> Xcel takes exception to these conclusions.

Xcel is correct that it did not “center on the median.”<sup>93</sup> Instead, despite correctly testifying that “the Federal SCC was not designed for integrated resource planning or other Commission decisions, and is inherently and irreducibly uncertain,”<sup>94</sup> Xcel’s “alternative” accepted all of the IWG’s underlying data without any modifications, selected a limited range consisting of only approximately 38 percent of the data points considered by the IWG,<sup>95</sup> and based its calculations off this 38 percent, ultimately arriving at “numbers for planning purposes [that] are virtually identical” to the FSCC’s

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<sup>90</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 55.

<sup>91</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 15 (*citing* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 49).

<sup>92</sup> *Id.* (*citing* [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 50).

<sup>93</sup> *Id.* at 15-17.

<sup>94</sup> Ex. [600, pt. 1](#) (Martin Direct) at 50:20-23. *See also id.* at 3:1-4:3, 4:22-7:4, and 11:5-14:9 for a veritable indictment of the IWG’s analysis.

<sup>95</sup> Tr. Vol. 4 at 112:6-9 (Martin). If Xcel had “centered on the median,” as the ALJ believed, it would have considered 50% of the IWG’s data, rather than 38%.

range under the 3% and 5% discount rates.<sup>96</sup>

Xcel's approach unquestioningly adopts every one of the IWG's subjective framing decisions, despite Xcel's Nicholas Martin's own criticism of those assumptions on pages 3:1-4:3, 4:22-7:4, and 11:5-14:9 of his pre-filed direct testimony (Ex. [600, pt. 1](#)), and then injects one more very strong—but unstated—subjective assumption of his own, which is that the discount rates of 2.5%, 3%, and 5% should be given equal probability of being the “correct” value.<sup>97</sup> As Dr. Smith testified, “[t]he IWG at least recognized that SCC estimates based on different discount rates should be reported separately, leaving SCC users the ability to decide for themselves which of the three discount rates to emphasize for their decision-making purposes.”<sup>98</sup> Any adjustment in any of the discount rates, or any adjustment in the weight to be accorded any of those rates, requires complete rejection of Xcel's numbers, because the Xcel data does not break out the discount rates.<sup>99</sup>

Of even greater concern is that Xcel's proposal omits the most likely damages numbers. Figure 3 of Xcel's Exceptions,<sup>100</sup> which is a copy of Figure 9 of Mr. Martin's

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<sup>96</sup> Tr. Vol. 4 at 124:24-125:18 (Martin). *See also id.* at 120:15-121:5 (Martin) (ECV difference of \$1.25 per ton would not “make a big difference” for resource planning purposes).

<sup>97</sup> *See* Ex. [303](#) (Smith Rebuttal) at 3:17-23.

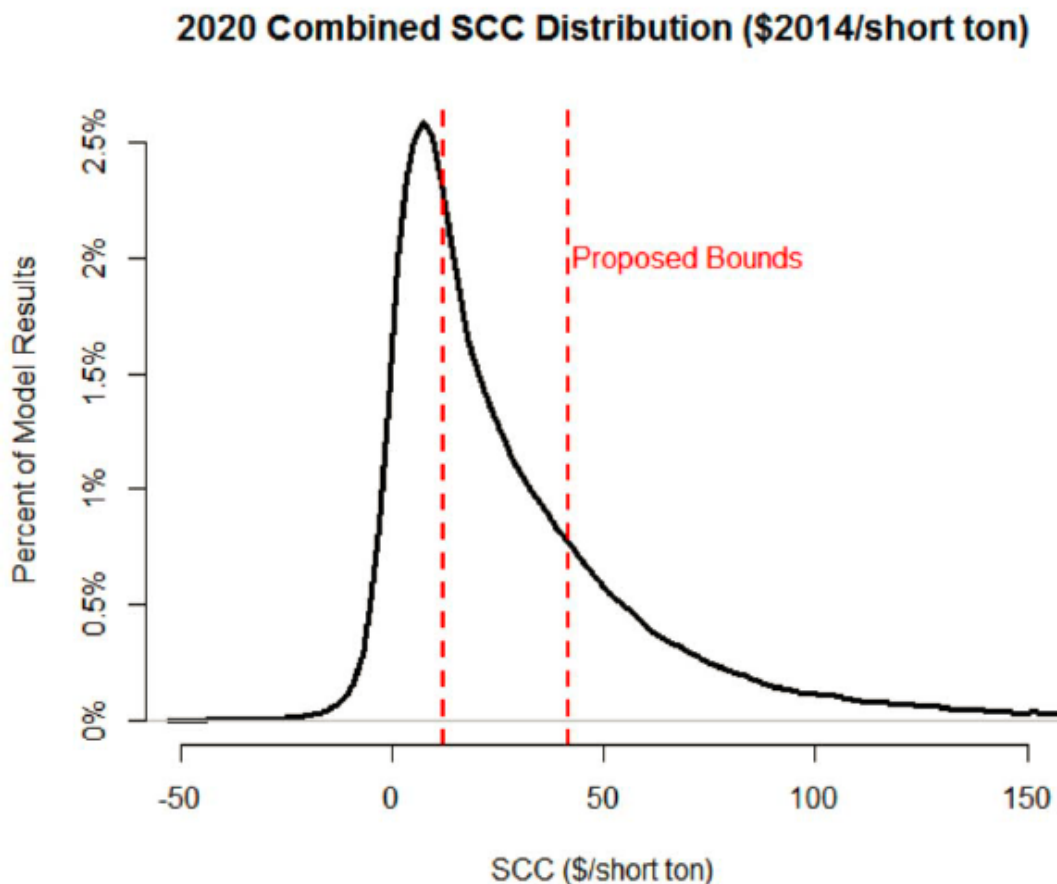
<sup>98</sup> *Id.* at 3:23-4:3.

<sup>99</sup> *See, e.g.,* Ex. [303](#) (Smith Rebuttal) at 4:3-7; Ex. [600, pt. 1](#) (Martin Direct) at 67:13-17 (new modeling required for change in discount rates).

<sup>100</sup> *See* [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 14.

pre-filed direct testimony,<sup>101</sup> shows a histogram of the 450,000 IWG values considered by Xcel for inclusion.<sup>102</sup>

**Figure 3: Probability Distribution of IWG Modeling Results with Xcel Energy's Proposed Bounds<sup>25</sup>**



This Figure shows that the most frequent damage number in the entire set of 450,000 values was approximately \$5 or \$6, as depicted by the histogram's peak, which "was a little bit below [Xcel's] lower bound and a little bit above zero."<sup>103</sup> A different way to

<sup>101</sup> Ex. [600, pt. 1](#) at 65 (Martin Direct).

<sup>102</sup> Tr. Vol. 4 at 240:12-22 (Martin).

<sup>103</sup> Tr. Vol. 4 at 241:10-21 (Martin); *id.* at 243:4-22 (Martin).

say this is that Xcel's recommendations are based on data that it knows exclude the most likely damages amount, which amount was below the lower bound of data considered by Xcel:

Q. So the \$5 to \$6, which was a kind of a guesstimate that you gave to Mr. Brown, [as] the tip of the histogram, that's the kind of data that was excluded from Xcel's study, right?

A. That's right....<sup>104</sup>

The MLIG respectfully submits based on the above that Xcel's alternative proposal, which excluded both 62 percent of the total data and the most likely damages, lacks an appropriate foundation and was properly rejected by the ALJ.<sup>105</sup>

## V. ADDITIONAL COMMENTS REGARDING THE MODELING-TIME HORIZON

The CEOs have argued that the ALJ's recommendation to shorten the modeling-time horizon by 100 years, from the year 2300 to the year 2200, is "arbitrary and capricious," and "runs counter to the evidence."<sup>106</sup> The Agencies are much more specific, and argue that "rather than accept[ing] the approach of the ALJ Report, the better policy is for the Commission to adopt the FSCC in its entirety, including modeling the time horizon to 2300, as the IWG did, and to modify the model to reduce the time horizon only if the FSCC is so changed in the future."<sup>107</sup> The Agencies first claim that "there is no factual basis for the assertion that economists can forecast the state of the

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<sup>104</sup> *Id.* at 243:23-244:6 (Martin).

<sup>105</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusions 49-51.

<sup>106</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2, 4.

<sup>107</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2-3.



economy in 2100 or 2200 more reliably than they can forecast it in 2300.”<sup>108</sup> “While the state of the economy in 2200 and 2300 are both uncertain, and 2300 is further in the future than 2200, there is no operational, or meaningful, sense in which one can compare those uncertainties and conclude that one prediction is more reliable than the other.”<sup>109</sup> The MLIG agrees that the calculation of damages through the years 2200 and 2300 are entirely speculative, but as to damages through the year 2100, the Agencies’ argument is contradicted by Dr. Smith’s testimony.

Dr. Smith testified that one can look to “the lifespan of technologies available or foreseeable today, and which can be reasonably anticipated to be installed when the extant but aging technologies are replaced. Even the longest-lived technologies, such as electricity generating plants, rarely remain economical to operate more than about 80 years; accounting for the period over which presently foreseeable technologies might be adopted could expand the reasonable horizon perhaps another 40 years.”<sup>110</sup> “This indicates that a modeling horizon for SCC estimates that do not contain undue speculative content regarding monetized damages would be about 2100 and no more than 2140.”<sup>111</sup> The ALJ implicitly found this evidence credible, as she held that the IWG’s extrapolation of the EMF-22 scenarios by an additional 200 years “is a degree of

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<sup>108</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2.

<sup>109</sup> *Id.* at 2-3.

<sup>110</sup> Ex. [302](#) (Smith Direct at Ex. 2 (Report)) at 75.

<sup>111</sup> *Id.*

uncertainty that is not reasonably supported by adequate evidence”<sup>112</sup> and that the evidentiary underpinning for extrapolation to the year 2200 “is not greater.”<sup>113</sup> The ALJ further concluded, based on the record before her, that there is “a significant drop-off in the reliability of how to predict those damages after 2100,” that “[t]he IWG’s extrapolation beyond that time frame [2100] with the scenarios is more tenuous,”<sup>114</sup> and that “[t]he best evidence supports recalculating the damages to the year 2100.”<sup>115</sup> The Agencies’ argument that “there is no operational, or meaningful, sense in which one can compare those uncertainties and conclude that one prediction is more reliable than the other”<sup>116</sup> is accordingly firmly contradicted by the record.

The Agencies next argue in their Exceptions that

EMF-22 was not a cost-benefit analysis of climate mitigation policies. It did not consider damages from climate change. Instead, it focused on cost minimization in reducing emissions to meet targets being considered in current climate policy debates.<sup>117</sup>

The Agencies further explain that “EMF-22 *did not consider damages*, either before or after 2100 and therefore sheds no light on the relative merits of damage projections that

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<sup>112</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 34.

<sup>113</sup> *Id.* at Conclusion 35.

<sup>114</sup> *Id.* at p. 129 (Memorandum).

<sup>115</sup> *Id.*

<sup>116</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3.

<sup>117</sup> *Id.* at 5 (*citing* Ex. [801](#) (Hanemann Rebuttal) at 24).

terminate before or after 2100.”<sup>118</sup> The Agencies further argue that “in fact, in EMF-22, damages were not considered at all.”<sup>119</sup> The Agencies explain that “[w]hat this means, among other things, is that the reasonable assumptions the IWG made when calculating FSCC damages were entirely the work of the IWG, as to all years before and after 2100.”<sup>120</sup> According to the Agencies, “[t]he credibility and reliability of those assumptions (noted in fn. 2 [of the Agencies’ Exceptions]) were independent of year 2100 being the year in which the EMF-22 atmospheric concentrations were projected.”<sup>121</sup> “The Agencies also note that, contrary to the ALJ Report’s descriptions of EMF-22 projections as being based on ‘data’ and subject to peer-review (ALJ Report, Conclusion ¶ 32) the EMF-22 projections were not based on a set of known data, facts, evidence, or peer-reviewed analyses; they were simply ‘projections into the far future based on reasonable assumptions.’”<sup>122</sup>

While all these statements may be accurate, none of them change the fact that the EMF-22 models have been peer reviewed, and that the data used in and produced by those models have withstood peer review and have, in fact, been deemed to be based on “reasonable assumptions,” as the Agencies concede.<sup>123</sup> The same cannot be said for the

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<sup>118</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5 (*citing* Ex. [801](#) at 24-25) (emphasis in Agencies Exceptions).

<sup>119</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5.

<sup>120</sup> *Id.*

<sup>121</sup> *Id.*

<sup>122</sup> *Id.* (*citing* Ex. [801](#) (Hanemann Rebuttal) at 25).

<sup>123</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 5.

IWG's 200 year extrapolations, however, which all witnesses in this proceeding have testified, and which the ALJ has found, to be highly uncertain and to lack any empirical basis.<sup>124</sup> As noted in the [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#), the IWG's extrapolations, for example, contain such major inconsistencies as the assumption that the world will emit many more times the CO<sub>2</sub> than the total available carbon available in the world.<sup>125</sup> The Agencies' second argument for the IWG's extrapolations, and for overruling the ALJ's rejection of the IWG's extrapolations, is accordingly irrelevant.

Third, the Agencies argue that "the existence of uncertainty is not a valid reason to truncate the analysis to the time period before such impacts occur."<sup>126</sup> The Agencies argue that "[i]t is reasonable for the Commission to find that there is not an unreasonably greater scientific uncertainty in the model after 2200 than there is in the model in 2100, and that the IWG's choices represent reasonable expert opinion and are not arbitrary."<sup>127</sup>

The first problem with this argument is that the make-up of the IWG is not known, and expertise cannot simply be presumed, as also stated above. Certainly the mere fact

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<sup>124</sup> See, e.g., Ex. [302](#) (Smith Direct Report) at 68-70; Tr. Vol. 1 at 114:16-17 (Polasky: "inherent uncertainty in predicting future damages"); Tr. Vol. 1 at 11:20-12:1; 81:6-12; 81:13-82:1; 82:24-83:6; 89:22-90:11; 124:7-13; 172:13-17; 211:21-25 (Polasky); Tr. Vol. 5 at 63:19-20 (Reich) ("a lot of uncertainty.").

<sup>125</sup> See [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 19-20 (citing Ex. [302](#) (Smith Direct Report) at 68-69, discussing a recent study by the Electric Power Research Institute (EPRI, 2014)). The Electric Power Research Institute is represented on the National Academies of Sciences' Committee that is reviewing the FSCC. (See [Phase 1 NAS Report](#) at v.)

<sup>126</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 6.

<sup>127</sup> *Id.* at 7.

that an unknown person is employed by a particular agency does not render that person an “expert.” Even if one were to assume, without any factual basis in or outside the record, that the agency representatives were senior representatives, that fact alone still does not render one an “expert.” On the other hand, numerous witnesses testified in this proceeding who truly are experts in their respective fields, and numerous of those experts have indicted the IWG’s methodologies, which were not peer-reviewed except for the pending National Academies of Sciences review.

Substantively, and as alluded to above, in the first significant formal review (cited by both the CEOs and the MLIG in their Exceptions<sup>128</sup>) since the IWG adopted the FSCC, the National Academy of Sciences has recommended against an interim update, because doing so “may not significantly improve the estimates” as the IWG relies only on equilibrium climate sensitivity to measure the relationship between emissions and climate change, whereas the National Academy of Sciences Committee notes that this is “not necessarily the most relevant physical parameter over the nearer-term timeframes particularly important to determining the [social cost of carbon].”<sup>129</sup> Instead, the Committee noted that “in 17 of the 22 global climate models participating in the Coupled Model Intercomparison Project Phase 3 (CMIP3)<sup>130</sup> the effective climate sensitivity at the

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<sup>128</sup> See [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 13-14; [MLIG Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 7-8.

<sup>129</sup> [NAS Phase 1 Report](#) at 45, Conclusion 1, and 17.

<sup>130</sup> CMIP provides a standard experimental protocol for IPCC-class global circulation models, and provides community-based support for climate model diagnosis, validation, intercomparison, documentation, and data access.

time of CO<sub>2</sub> doubling was less than ECS,”<sup>131</sup> and “the TCR [Transient Climate Response] is a much better predictor of climate response on time scales of less than a century.”<sup>132</sup> The National Academies’ Committee further noted that the TCR in the IPCC’s 2013 Fifth Assessment Report (AR5) was lower than it was in the IPCC’s 2007 Fourth Assessment Report (AR4).<sup>133</sup>

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<sup>131</sup> [\*NAS Phase 1 Report\*](#) at 22.

<sup>132</sup> *Id.* at 19-20.

<sup>133</sup> The Committee wrote

Regarding TCR, whereas AR4 concluded that TCR was “very likely above 1°C” and “very likely below 3°C” (i.e., an 80% probability of being between 1°C and 3°C),a the AR5 concluded

with high confidence that the TCR is likely in the range 1°C to 2.5°C, close to the estimated 5 to 95% range of CMIP5 [Coupled Model Intercomparison Project Phase 5] (1.2°C to 2.4°C), is positive and extremely unlikely greater than 3°C.

The AR5 thus reduced the probability of TCR values greater than 3°C from 10 percent to 5 percent. The estimate was based on the good agreement between the range of estimates from observationally constrained simple climate models and the CMIP5 range. One major driver of this change in observational estimates was the downward revision of the negative aerosol forcing. This revision reduced the probability that the historically observed warming was a response to a very low total forcing, which thereby reduced the probability of a correspondingly high TCR.

The consensus on TCR appears to have been maintained since the publication of the AR5: for example, despite being critical of the IPCC’s estimates of ECS, Lewis and Curry (2014) arrive at a 5 to 95 percent confidence interval for TCR of 0.9°C-2.5°C, almost identical to the IPCC

(continued)

The Agencies, with the CEOs, carry the burden to affirmatively prove that the FSCC is current, reasonable, and the best available measure to determine the environmental cost of CO<sub>2</sub> under Minn. Stat. § 216B.2422, subd. 3.<sup>134</sup> Merely wishing that data is accurate and reliable and that it meets the statutory certainty standards is insufficient. Here, no showing of accuracy or reliability has been made, every expert witness has acknowledged that data beyond the year 2100 is highly uncertain and speculative, and such testimony fully supports both the ALJ's findings that there is "a significant drop-off in the reliability of how to predict those damages after 2100,"<sup>135</sup> and

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(continued)

AR5 "likely" range. (IPCC statements on indirectly observable quantities are typically given at one level lower confidence than the formal evidence suggests, to account for unknown structural uncertainties). The only dissent is from Shindell (2014), who argues that TCR estimates based on recent observations may have been biased low by the assumption that spatially homogenous and inhomogenous forcings have identical efficacy. The attribution approach of Gillett et al. (2013), however, does not make this assumption of equal efficacies, and it arrives at a 5 to 95 percent range for TCR of 0.9°C-2.3°C. In contrast to TCR, ECS remains much more contested.

...

The AR4 did not give a likely range for TCR that is directly comparable to that in the AR5, but the AR5 did reduce the probability of TCR values greater than 3°C from 10 to 5 percent, reflecting greater confidence and consensus on the upper bound for this parameter.

([NAS Phase I Report](#) at 24-25, Box 3-2.)

<sup>134</sup> [Notice and Order for Hearing dated Oct. 15, 2014](#) at 4-5.

<sup>135</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at p. 129 (Memorandum).

that “[t]he best evidence supports recalculating the damages to the year 2100”<sup>136</sup> and her conclusions that the IWG’s extrapolation of the EMF-22 scenarios by an additional 200 years “is a degree of uncertainty that is not reasonably supported by adequate evidence”<sup>137</sup> and that the evidentiary underpinning for extrapolation to the year 2200 “is not greater.”<sup>138</sup> These record-supported findings and conclusions preclude use of the years 2300 and 2200 as time-modeling horizons in this proceeding.<sup>139</sup>

The Agencies correctly note that “the ALJ’s recommendation on this one issue – the truncation of damages after 2200 – was neither proposed by a party to the proceeding nor assessed by any of the expert witnesses; indeed, nothing in the record suggests that such a proposal has been assessed by any expert in this field.”<sup>140</sup> The CEOs are similarly correct that the ALJ “substituted her judgment” for that of the experts offering testimony in this proceeding.<sup>141</sup> The MLIG submit that the record, and the ALJ’s own admissions in her Memorandum at page 129 that there is a “significant drop-off in the reliability of

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<sup>136</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at p. 129 (Memorandum).

<sup>137</sup> *Id.* at Conclusion 34.

<sup>138</sup> *Id.* at Conclusion 35.

<sup>139</sup> See [Order Establishing Environmental Cost Values](#) at 26, 30.

<sup>140</sup> [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 8. See also [Agencies Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 10 (“It is notable that there is nothing in the record that shows that a time horizon ending in 2200 is reasonable. No party offered evidence supporting a 2200 time horizon. The ALJ viewed 2200 as a “compromise” between the last year of emissions in the EMF-22 scenarios (2100) and the undeniable fact that damages continue well beyond 2300. But this “compromise” clearly runs counter to the evidence and increases rather than decreases uncertainty.”)

<sup>141</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 10.



how to predict those damages after 2100” and that “the best evidence supports recalculating the damages to the year 2100,” and the ALJ’s statement in Conclusion 35 that “the evidentiary underpinning is no greater [for extrapolation through the year 2200] than it would be to extend the model to the year 2300” preclude the use of the year 2200 as an alternative time-modeling horizon.

Because the record establishes, as the Utilities Group also submits, that damage estimates beyond the year 2100 are based purely on extrapolations, for which no empirical data of any nature exists, and which are pure guesses and speculation, damages beyond the year 2100 can be neither quantified nor supported by sufficient evidence as required by the environmental-cost statute, Minn. Stat. § 216B.2422.<sup>142</sup> Thus, the MLIG joins the Utilities Group in urging the Commission to use a modeling-time horizon of the year 2100.

## **VI. ADDITIONAL COMMENTS REGARDING THE DISCOUNT RATE**

The ALJ recommended that the FSCC be adopted, but recalculated with a year 2200 modeling-time horizon (discussed above), and without the 95th percentile of environmental cost values calculated at a 3 percent discount rate.<sup>143</sup> The CEOs argue that the omission of the 95th percentile of environmental cost values is arbitrary and capricious.<sup>144</sup> The CEOs also argue that “[e]liminating the 95th percentile value in the

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<sup>142</sup> See also [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 17.

<sup>143</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at 124 at Recommendation 1.a. and 1.b.

<sup>144</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 2.

SCC values from consideration is a policy decision that the Commission can choose to make in a given proceeding, but it is inappropriate to make that policy decision as part of this scientific investigation.”<sup>145</sup>

The crux of all of the CEOs’ arguments relating to the 95th percentile environmental cost values is the following statement from their Exceptions: “Additionally, the 95th percentile figure is designed to be valuable in helping planning incorporate how society might react to the opportunity to pay to avoid global catastrophe. The IWG sought to better capture:

the possibility that individuals may have a higher willingness to pay to reduce the likelihood of low-probability, high-impact damages than they do to reduce the likelihood of higher probability but lower-impact damages with the same expected cost. (The inclusion of the 95th percentile estimate in the final set of SCC values was largely motivated by this concern.) If individuals do show such a higher willingness to pay, a further question is whether that fact should be taken into account for regulatory policy. Even if individuals are not risk-averse for such scenarios, it is possible that regulatory policy should include a degree of risk aversion.<sup>146</sup>

The CEOs argue that “it is inappropriate to remove this long right tail from the SCC values when using the values for risk management planning, as is the case here.”<sup>147</sup> This argument is very similar to the CEOs’ argument to the ALJ, which advocated for the use of the 95th percentile FSCC value as an “insurance policy.”

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<sup>145</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 16, 19.

<sup>146</sup> *See id.* at 21 (*citing* Ex. [100](#) (Polasky Direct) at Schedule 2 (Feb. 2010 IWG Technical Support Document) at 30).

<sup>147</sup> [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 18.

The CEOs' arguments regarding adoption of the 95th percentile figure seek to compel the Commission to do something extra-statutory, as the Commission's goal in this proceeding is neither "risk management" nor "helping to incorporate how society might react to the opportunity to pay to avoid global catastrophe." Nor is the Commission's statutory purpose in this proceeding to minimize CO<sub>2</sub> emissions, lower sea levels, or combat climate change. While any or all of these may have been part of the background for the legislative mandate in Minn. Stat. § 216B.2422 that "the Commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation," the sole goals here are to determine first whether it is feasible to quantify the environmental cost of CO<sub>2</sub>, and, if so, to then set that environmental cost based on actual damages and empirical evidence.<sup>148</sup> "Risk management," "risk management planning," and societal studies are not at issue, and the CEOs' pleas to the contrary are extra-statutory and must be ignored. *Peoples*, 369 N.W.2d at 534.

Consideration of the 95th percentile FSCC value as an "insurance policy" is equally inappropriate, and, as Dr. Gayer explained in his [surrebuttal testimony](#) (Ex. 401), the use of the IWG's 95th percentile FSCC value over-weights uncertain risks relative to more certain risks, and confuses "uncertainty" with "risk."<sup>149</sup> Dr. Gayer explains that the

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<sup>148</sup> See, e.g., [Utilities Group Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 3; [CEOs Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 1.

<sup>149</sup> Ex. 401 (Gayer Surrebuttal) at 14.

mistake made is classical, and is known as the Ellsberg Paradox.<sup>150</sup> The ALJ appropriately avoided this paradox.<sup>151</sup>

Risk is the probability of an event occurring; uncertainty is the degree of imprecision in the estimate of risk.<sup>152</sup> For example, consider two new automobiles. One poses a well-known defect risk of 2 in 1,000 over the lifetime of the vehicle. The other is newer to the market, and there is a 50-50 chance that the defect risk is either 1 in 1,000 or 3 in 1,000. Both of these automobiles have the same average risk (2 in 1,000), but the latter has greater uncertainty about the risk.<sup>153</sup> In this example the vehicles should be equally insured against defect risk, since they both have the same average risk (2 in 1,000).<sup>154</sup> However, the Ellsberg Paradox has demonstrated that people mistakenly exhibit a form of ambiguity aversion that makes the precisely known risk of the first automobile less fearsome than the uncertain risk of the second automobile.<sup>155</sup>

Ambiguity aversion is a form of irrational behavior and should not be confused with risk aversion in which people are averse to the risk of incurring a large loss. People

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<sup>150</sup> As referenced above in footnote 7, the Ellsberg Paradox is a paradox in decision theory in which people's choices violate the postulates of subjective expected utility in that they demonstrate a preference for taking on risk in which they know the specific odds rather than an alternative risk in which the odds are completely ambiguous. It is generally taken to be evidence for ambiguity aversion. (Ex. [401](#) (Gayer Surrebuttal) at 15, n.3.)

<sup>151</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusions 20-21.

<sup>152</sup> Ex. [401](#) (Gayer Surrebuttal) at 14:18-19.

<sup>153</sup> Ex. [401](#) (Gayer Surrebuttal) at 14:19-15:1.

<sup>154</sup> *Id.* at 15.

<sup>155</sup> *Id.*

might quite rationally choose to purchase a homeowners insurance policy for \$1,000 even though the expected losses are only \$800, but losses could be significant. Dr. Gayer accordingly testified that a very low probability of a catastrophic loss would make such insurance attractive to a risk-averse person and could be quite rational. What would not be rational is to be swayed by the uncertainty regarding the risk probability.<sup>156</sup>

Similarly, the use of the 95th percentile value of a risk estimate (as Dr. Polasky is suggesting) is a mistake.<sup>157</sup> Doing so over-weights uncertain risks relative to more certain risks and distorts policies and regulations in harmful ways. This may be illustrated by another hypothetical example, where there is enough money to clean up one hazardous waste site and one must decide between two sites. Site A contains a chemical contaminate that is well studied by researchers and presents a cancer risk of 1.25 in a million, known with certainty. Site B presents a relatively less researched contaminant that has an estimated cancer risk of 1 in a million, but there's a 50 percent chance of no risk and a 50 percent chance of a risk of 2 in a million. Site A presents a higher average risk (25 percent higher than the risk at Site B), so the resources should be devoted to cleaning it up before Site B, since doing so will prevent more cancer cases. But if one puts undue weight on uncertainty, as Dr. Polasky and the IWG did, then the resources will be devoted to cleaning up the more uncertain Site B, which decision, on average,

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<sup>156</sup> Ex. [401](#) (Gayer Surrebuttal) at 16.

<sup>157</sup> *Id.* at 15.

would result in *more* expected cancer cases because of the higher average risk of cancer by not cleaning up Site A.<sup>158</sup>

Dr. Hanemann uses an example similar to Dr. Polasky's example to support the use of the 95th percentile: "We wouldn't get on a plane if there was a 5% chance of the plane crashing, but we're treating the climate with that same level of risk in a very offhand, complacent way." (Ex. [801](#) (Hanemann Rebuttal) at 71.) Although Dr. Gayer agrees that we should not ignore climate risks, he noted that Dr. Hanemann, like Dr. Polasky and the IWG, confuses risk with uncertainty. Dr. Gayer testified that "[t]he correct analogy is to suppose that Plane 1 has a 5 percent chance of crashing and we know with certainty that the risk is 5 percent (*i.e.*, it will definitely crash 5 in 100 times). Suppose Plane 2 has an average risk of crashing of 4 percent, but there's a 50 percent chance that its risk of crashing is really 0 percent and a 50 percent chance that its risk of crashing is really 8 percent. Plane 2 has a lower average risk, so the rational choice is to choose to fly on Plane 2 rather than Plane 1. Of course, the Ellsberg Paradox suggests that numerous people (including apparently Dr. Polasky and Dr. Hanemann) would choose to fly on Plane 1, not understanding the higher risk they are taking. By including the 95<sup>th</sup> percentile of the SCC distribution (and not including the 5<sup>th</sup> percentile), Dr. Hanemann is in effect putting more weight on regulating uncertain, lower average, risk

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<sup>158</sup> Ex. [401](#) (Gayer Surrebuttal) at 16:10-17:2.

over more certain, higher average, risk. A classic Ellsberg-Paradox analytical mistake.”<sup>159</sup>

The MLIG urges the Commission to carefully distinguish between risk and uncertainty; to avoid the Ellsberg Paradox; and to reject reliance on the 95th percentile damages calculations.

Even if the Commission was empowered, or otherwise desired to have information relevant to risk management, risk management planning, and possible societal responses to various future environmental developments, and even if the Commission were to place a premium on uncertainty over risk, the ALJ correctly concluded that while the 95th percentile value provided a larger damages number, there was no specific evidence or reasoning to demonstrate that the number is a meaningful estimate of the uncertainties it represents, whether in the IWG technical documents or in the CEOs’, the Agencies’, the Doctors’, or the Clean Energy Business Coalition’s testimony.<sup>160</sup> The CEOs’ Exceptions do not address the evidentiary hole identified in the ALJ’s Conclusion 21, and the CEOs, the Agencies, and the other proponents of the FSCC have simply failed to submit any evidence on point, requiring rejection of their arguments.

## **VII. ADDITIONAL COMMENTS REGARDING LEAKAGE**

Xcel correctly notes that contrary to the statement in the ALJ’s Recommendation 2, the issue of emission leakage was initially raised not by Xcel but by Drs. Smith,

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<sup>159</sup> Ex. [401](#) (Gayer Surrebuttal) at 17:14-18:5.

<sup>160</sup> [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at Conclusion 21.

Mendelsohn and Gayer in Direct Testimony,<sup>161</sup> and that it was Dr. Smith in her Direct Testimony who first proposed the estimation of leakage in other proceedings.<sup>162</sup> Xcel notes that “leakage is a potential issue, and 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.”<sup>163</sup> Xcel is correct that the ALJ’s recommendation to open a separate, generalized investigation into how best to measure and take into account leakage in other Commission proceedings would be quite difficult and speculative. It is for that reason that the MLIG and the Utilities Group had sought an expression of the environmental cost value of CO<sub>2</sub> in net tons to account for leakage. The amount of leakage can then be determined in each docket in which it is an issue, on an appropriate case-by-case basis. By expressing the environmental-cost value of CO<sub>2</sub> in net tons, and requiring the utilities to advise the Commission in each affected docket as to anticipated leakage, the Commission can achieve all objectives, without the speculation that the ALJ’s recommendation would bring about.

## CONCLUSION

The MLIG respectfully submits that the law requires application of conservative cost principles and not to adopt high values based on speculation. The environmental-

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<sup>161</sup> See [April 15, 2016, ALJ CO<sub>2</sub> Recommendations](#) at 124; [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 26.

<sup>162</sup> [Xcel Exceptions to ALJ CO<sub>2</sub> Recommendations](#) at 26.

<sup>163</sup> *Id.* at 27.



cost value or social cost of carbon must be set based on actual, quantifiable, damages calculations, up-to-date science, and empirical evidence. Because the science should be the most current, and because the IWG's FSCC is based on outdated information, the Commission cannot simply adopt the FSCC (based on the IPCC's 2007 AR4) as argued by the CEOs and the Agencies. Because it is further entirely uncertain whether, when, and how the IWG's FSCC will be updated in light of the National Academies of Sciences' review and [Phase 1 NAS Report](#), the CEO's and the Agencies' suggestion that the Commission can simply update its numbers later is equally erroneous.

Because Xcel's proposal omits the most likely damages numbers and excluded 62 percent of the data, and because Xcel's proposal is furthermore based on the IWG's flawed data despite Xcel's own indictment of the IWG's assumptions and calculations, that alternative proposal lacks an appropriate foundation and was properly rejected by the ALJ. But the MLIG respectfully submits that the ALJ, guided by the CEOs and the Agencies, lost sight of the burden of proof and the mission she was tasked with: to quantify values only if (to the extent) it is feasible (practicable) to do so.<sup>164</sup>

The CEOs' and the Agencies' suggestion that the major uncertainties in the IWG's FSCC require high environmental-cost values improperly confuses the Legislature's broad role and authority with this Commission's execution of the Legislature's limited instruction to quantify knowable values under Minn. Stat. § 216B.2422, subd. 3, and

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<sup>164</sup> [Order Establishing Environmental Cost Values](#) dated January 3, 1997, at 31.

exceeds the powers given the Commission by the Legislature in this matter. *See Great N. Ry. Co.*, 284 Minn. at 220, 169 N.W.2d at 735 (1969); *Peoples*, 369 N.W.2d at 534.

The MLIG further submits that the FSCC is not a reasonable measure to establish Minnesota's CO<sub>2</sub> environmental-cost value, and that the legal standard applicable to this proceeding requires that the economic framing assumptions underlying the IWG's federal social cost of carbon be modified to account for a modeling time horizon extending no further than the year 2100; application of a correct equilibrium climate sensitivity based on the IPCC's Fifth Assessment Report (AR5), in the lower part of the likely range of 1.5°C to 4.5°C, which translates to an ECS range from 1.5°C to 3°C or a conservative averaged ECS of 2.5°C; the use of only discount rates of 3%, 5%, and 7%, or an alternative usage-averaged discount rate of 5.66%; calculation of damages using the average ton; and calculation of damages using a Minnesota geographic scope. The MLIG further joins the Utilities Group in requesting that the environmental-cost value of CO<sub>2</sub> established in this docket be applied to *net* emissions reductions.

As applied, the MLIG respectfully submits that the Commission should adopt a range for the environmental cost value of CO<sub>2</sub> of \$0.37 to \$5.14 per net metric ton (in 2014 dollars).<sup>165</sup>

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<sup>165</sup> If, on the other hand, the Commission desires to afford 100 percent altruistic weight to all other U.S. States, the MLIG supports Dr. Smith's proposed range for emissions in the year 2020 of \$0.90 to \$5.14 (in 2014 dollars per net metric ton) *See* Ex. [307](#) at lines 32 and 42.

Respectfully submitted,

**STOEL RIVES LLP**

Dated: May 16, 2016

*s/ Marc A. Al*

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LARGE INDUSTRIAL GROUP**

## CERTIFICATE OF SERVICE

I, Marc A. Al, hereby certify that I have this day served a true and correct copy of the following document via electronic filing to all persons indicated on the attached service list

1. Minnesota Large Industrial Group's Reply to Exceptions Filed by Other Parties to the Findings of Fact, Conclusions, and Recommendations of the Administrative Law Judge Regarding Phase I (CO<sub>2</sub> Track)

In the Matter of the Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B.2422, Subd. 3  
PUC Docket No. E-999/CI-14-643  
OAH Docket No. 80-2500-31888

Dated this 16th day of May, 2016

/s/ Marc A. Al

Marc A. Al

Subscribed and sworn to before me  
this 16th day of May, 2016

/s/ Jennifer L. Wagner

Jennifer L. Wagner

Notary Public - Minnesota

My Commission Expires Jan. 31, 2020

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