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May 5, 2016

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

**VIA ELECTRONIC SERVICE**

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

Dear Mr. Wolf:

In connection to Phase I or the Social Cost of Carbon portion of the above-referenced docket, please find enclosed Clean Energy Organizations' Exceptions to the Findings of Fact, Conclusions, and Recommendations filed on April 15, 2016. Also attached is an Affidavit of Service.

Please do not hesitate to contact me should you have any questions or concerns.

Sincerely,

/s/ Leigh Currie
Leigh Currie
Staff Attorney

LC/em

Enclosure

cc: Attached service list

**STATE OF MINNESOTA**

**OFFICE OF ADMINISTRATIVE HEARINGS**

**FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION**

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

**MPUC Docket No. E-999/CI-14-643, E-999/CI-00-1636**

**OAH Docket No. 80-2500-31888**

# PHASE I—SOCIAL COST OF CARBON
# EXCEPTIONS TO FINDINGS OF FACT, CONCLUSIONS, AND RECOMMENDATIONS: CARBON DIOXIDE VALUES

**of**

**CLEAN ENERGY ORGANIZATIONS**

**MAY 5, 2016**

TABLE OF CONTENTS

## INTRODUCTION

In 1993, the Minnesota Legislature passed Minn. Stat. § 216B.2422, subd. 3:

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

The Commission established these environmental costs, including a cost for carbon dioxide ($CO_2$), in the 1990s. On October 15, 2014, the Commission reopened the investigation into the environmental cost of electricity generation, stating with respect to the $CO_2$ value that "[t]he purpose of the proceedings shall be to determine whether the Federal Social Cost of Carbon is reasonable and the best available measure to determine the environmental cost of $CO_2$ and, if not, what measure is better supported by the evidence."[1] Underlying this quantification process is the understanding that this is not a frivolous exercise. The Minnesota Legislature meant for the Commission to account for actual damages that will flow from current and future pollution by addressing the ongoing market failure of carbon pollution and to improve decision-making so that we can avoid hidden costs that are currently part and parcel of energy production. The goal of the instant proceeding is to update these values based on the best available science. The record demonstrates that the Federal Social Cost of Carbon (SCC) is a reasonable reflection, based on the best science available, of the actual damages attributable to $CO_2$ pollution.

[1] Notice and Order for Hearing, Pub. Util. Comm'n Dockets No. E-999/CI-00-1636 & E-999/CI-14-643 at 8 (Oct. 15, 2014).

Administrative Law Judge (ALJ) Schlatter's Findings of Fact, Conclusions, and Recommendations: Carbon Dioxide Values[2] provide a useful starting point to determine the correct range of environmental cost values to assign to $CO_2$ pursuant to Minnesota law. In the years since the values were first established, the science has advanced significantly. ALJ Schlatter's recommendation synthesizes the voluminous evidence about the real threat that climate change poses to society and the significant costs—both current and future—that are attributed to the damage caused by climate change. The ALJ's conclusions make clear that the SCC, created by the United States Government Interagency Working Group on Social Cost of Carbon (IWG), is a reasonable reflection of the potential damages from emissions of $CO_2$, albeit likely an underestimate of the full costs. Her suggestion that the Commission seek to set values that are protective of our most precious resources strikes the correct balance in updating the environmental cost values.

Despite her generally correct findings, and exhortation to set sufficiently protective values to aid meaningful planning, ALJ Schlatter proposed two changes to the SCC that are not supported by the record. These proposed adjustments are inconsistent with the majority of her findings and conclusions and are unsupported by substantial evidence in view of the entire record. Moreover, as they run counter to the record evidence, the two changes would be arbitrary and capricious for the Commission to adopt.

The first of the proposed changes is to recalculate the SCC with a shorter timeline, ending the modeling at the year 2200 instead of 2300. A 2200 time horizon was considered by the IWG and rejected as unreasonable. Recalculating all of the SCC values in order to incorporate this change will likely place a huge burden on Minnesota agencies' resources, a burden repeated each

[2] Findings of Fact, Conclusions, and Recommendations: Carbon Dioxide Values. Pub. Util. Comm'n Dockets No. E-999/CI-00-1636 & E-999/CI-14-643 (Apr. 15, 2016).

time the values need to be calculated, verified, or updated. Also, the evidence in the record suggests that this change has a small effect on the ultimate values—removing this century of modeled results does not significantly change the SCC numbers relative to their current levels. As a result, this high-cost and small-effect change in time horizon should be rejected by the Commission, and the Commission should instead adopt the SCC values as calculated by the IWG.

The second proposed change is to omit the 95$^{th}$ percentile value, which is the value that the IWG calculated to reflect damages that would occur if the climate reached a precipitous tipping point. By removing the one value that accounts for the risk of catastrophe and what it would cost to avoid such catastrophe, the Commission would blind itself to an important piece of information that is currently absent from its calculus. Not having this 95$^{th}$ percentile value jettisons useful information without any benefit. In order to have the most accurate and helpful range of values in its future planning the Commission should reject this change and include the 95$^{th}$ percentile value along with the other SCC numbers.

## ARGUMENT

The Clean Energy Organizations (CEOs) believe that the ALJ did an admirable job of clarifying and providing insight on what was at times a highly technical record. Many of her findings are irrefutable facts demonstrating that the SCC is a reasonable measure of the true costs of $CO_2$ pollution. Nevertheless, the ALJ concluded that two changes should be made to the SCC, neither of which is supported by the record.

The ALJ's ultimate recommendation suffers from internal inconsistencies. While correctly stating many findings and conclusions about the record and the underlying science, the ALJ ultimately chose to second-guess the IWG and change the SCC values to impracticable and

less useful values that fail to account for the potentially large damages attributable to $CO_2$ emissions. The two changes the ALJ proposed to the SCC values—shortening the time horizon and removing the 95th percentile value altogether—are unsupported by substantial evidence and would be arbitrary and capricious if adopted by the Commission.[3] The Commission has the authority to modify or alter the ALJ's findings and to draw a conclusion distinct from her recommendation.[4] The Supreme Court of Minnesota has stressed "the importance of agencies employing their expertise to reach independent decisions and to not simply 'rubber stamp' the findings of a hearing officer."[5] The Commission is left with one clear choice: to follow the ALJ's reasoning and policy exhortations but reject her modifications, and thereby accept the SCC values as the best and most practicable values under Minn. Stat. § 216B.2422, subd. 3.

## I. THE ALJ'S CONCLUSIONS SUPPORT THE COMMISSION'S ADOPTION OF THE FULL SCC.

The majority of the ALJ's findings of fact and conclusions support adoption of the full SCC as developed by the IWG, and do not support her proposed modifications. CEOs briefly note these findings and conclusions as they demonstrate why CEOs present the two exceptions to the ALJ's recommendation below.

The ALJ found that the IWG's SCC is a damage-cost approach, that it is reasonable to rely on the modeling done to create the SCC, and that the evidence shows that the SCC's results

[3] To be upheld, an agency decision must be supported by substantial evidence in view of the entire record, and must not be arbitrary and capricious. *In re Excess Surplus Status of Blue Cross & Blue Shield of Minn.*, 624 N.W.2d 264, 277 (Minn. 2001). An agency decision is arbitrary and capricious if it runs counter to the evidence. *Citizens Advocating Responsible Dev. V. Kandiyohi Cnty. Bd. Of Comm'rs*, 713 N.W.2d 817, 832 (Minn. 2006).
[4] *City of Moorhead v. Minn. Pub. Util. Comm'n*, 344 N.W.2d 843, 846–47 (Minn. 1984).
[5] *Id.*

were based on empirical studies.[6] Along the same lines, the ALJ concluded that the IWG's work was based on peer-reviewed science and the work of "the IPCC, which is recognized by the Commission, the Minnesota Court of Appeals, and the United States Supreme Court as a credible source of expertise in the area of climate change."[7] Therefore, attacks on the IWG's transparency and review process were not supported by the preponderance of the evidence.[8]

Further, the ALJ determined that where the SCC had some catching up to do on the current science, parties had proven that the IWG has committed to updating the SCC to reflect current science, and these updates could be easily incorporated by the Commission if it selected the SCC.[9] The ALJ concluded that any failure of the SCC to currently reflect all the science on climate change tended to make the SCC an underestimate of the total damages now attributable to $CO_2$.[10]

Perhaps most significantly, the ALJ concluded that uncertainties and potential future harm require a conservative approach, explaining "uncertainties such as the potential danger of a 'tipping point' catastrophe reasonably require an initially high SCC until more is known about such uncertainties."[11] This is further explained in the ALJ's attached memorandum, which states:

> While estimating damages, particularly far into the future, remains a difficult problem full of uncertainty, there is now undeniable evidence that $CO_2$ emissions are already having a dramatic impact on the Earth and its climate. A modern proverb graphically illustrates the dichotomy of conservatism in the face of climate change: "When the last tree is cut down, the last fish eaten, and the last stream poisoned, you will realize that you cannot eat money." In establishing cost values in this proceeding, the Administrative Law Judge respectfully recommends that the Commission consider

[6] Conclusions at ¶ 6, 8–9.
[7] Conclusions at ¶ 47.
[8] Conclusions at ¶ 47.
[9] Conclusions at ¶ 9–10.
[10] Conclusions at ¶ 11–13.
[11] Conclusions at ¶ 43.

> applying conservative values to the well-being of future generations and the planet needed to sustain them, rather than primarily to the financial cost of providing that wellbeing.[12]

Such conservatism would err on the side of caution in light of the updated science that shows the potential damages from climate change could be significantly worse than previously expected.

The ALJ's final substantive conclusion before her recommendations was "that the Agencies and the CEOs demonstrated by a preponderance of the evidence that the Federal Social Cost of Carbon is reasonable and the best available measure to determine the environmental cost of $CO_2$[.]"[13] This conclusion is correct based on the record, and, as is discussed in the remainder of these exceptions, the ALJ's two adjustments to the SCC values are unsupported by and not consistent with the record evidence or the findings highlighted by CEOs above.

## II. CEOS' EXCEPTIONS.

Based on the above conclusions and the ALJ's findings, it is clear that the two adjustments to the federal SCC that the ALJ proposes—amending the time horizon and ignoring the 95$^{th}$ percentile value—would be contrary to the record, and would not be in accordance with the requirements of Minn. Stat. § 216B.2422, subd. 3. Instead of agreeing to these adjustments, the Commission should follow the record and the law and adopt the SCC values as reasonable and reflecting the best science available.

### A. The ALJ's Recommendation To Amend The Time Horizon Of Damages Should Be Rejected.

The ALJ concluded that the Agencies and CEOs failed to prove by a preponderance of the evidence that the time horizon used by the IWG to calculate the SCC was appropriate.[14] But

[12] Memorandum at 127 (citations omitted).
[13] Conclusions at ¶ 56.
[14] Conclusions at ¶ 34.

the record contains ample evidence supporting a time horizon to 2300 and no evidence that a time horizon to 2200 is more appropriate. Moreover, because no party has proposed values based on the amended time horizon, this amendment requires a recalculation of the SCC, which is not practicable or appropriate after the close of the evidentiary hearing. The proposed change to the time horizon is neither supported by the record nor practicable.

### 1. A shortened 2200 time horizon is unsupported by substantial evidence.

The record contains substantial evidence supporting the IWG's chosen time horizon. In contrast, the record contains no evidence supporting the ALJ's recommended time horizon and the IWG specifically considered and rejected it. Moreover, the ALJ's own findings of fact based on the record support the IWG's recommended time horizon. The ALJ's recommendation is therefore not only unsupported by substantial evidence in the record, but runs contrary to her own findings. Cutting the modeling horizon by a hundred years would make the consequent damages unreasonable based on current scientific understanding, and would not aid the Commission's decision-making compared with the existing SCC values set by the IWG.

The record demonstrates, and the ALJ concluded, "that a ton of $CO_2$ released into the atmosphere will not be fully absorbed into the land or the oceans for a minimum of two hundred years. . . . [and] that it will be hundreds of years before that ton will be fully absorbed."[15] The Agencies' expert reiterated that $CO_2$ is a particularly long-lived greenhouse gas: "Some GHGs are short-lived while others remain in the atmosphere for hundreds or thousands of years. The warming impacts of ozone or contrails last only days or months. Those of methane last for about 20 years. Those of $CO_2$ persist for hundreds of years."[16] In other words, $CO_2$ emitted in 2100

[15] Conclusions at ¶ 30.
[16] Ex. 800 at 11 n.3.

persists in the atmosphere contributing to warming until at least 2300; and damages caused by that $CO_2$ persist long after that. The IWG Technical Supporting Documents (TSD) demonstrate that damages attributable to an emitted ton continue on even after that ton has left the atmosphere. As one example, the 2013 TSD explained why the DICE model would continue to demonstrate increasing damages even after modeled $CO_2$ had left the atmosphere and the temperature increase started to decline from its peak: "The large increases in the far future years of the time horizon are due to the permanence associated with damages from sea level rise, along with the assumption that the sea level is projected to continue to rise long after the global average temperature begins to decrease."[17] Ignoring these impacts in a final Commission decision would run counter to the evidence in the record.

The ALJ agreed with the fact that the best science available shows that climate-change gases are at a historic high and that continued human-caused emissions will lead to hundreds of years of damages, quoting the IPCC:

> The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. . . . [m]ost aspects of climate change will persist for many centuries even if emissions of $CO_2$ are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of $CO_2$.[18]

She also quoted the U.S. Supreme Court's similar findings:

> The Government's own objective assessment of the relevant science and a strong consensus among qualified experts indicate that global warming threatens, inter alia, *a precipitate rise in sea levels, severe and irreversible changes to natural ecosystems, a significant reduction in winter snowpack with direct and important*

[17] Ex. 100, Schedule 3 at 7.
[18] Findings of Fact at ¶ 55 (quoting Ex. 405 at 20 (IPCC AR5)).

> *economic consequences, and increases in the spread of disease and the ferocity of weather events*.[19]

These damages continue long after emissions have ceased, as the ALJ explained, concluding that there is a "strong argument" that the modeling of damages should include the certain-to-occur damages caused by modeled emissions.[20]

The IWG dealt with the hundreds of years of consequent damages by calculating the benefits and costs of an emitted ton that year and the following years until 2300.[21] All of the IWG supporting materials[22] contain information on why the body chose to model to that point. As the ALJ explained, "[b]ecause $CO_2$ persists in the atmosphere for hundreds of years, $CO_2$ emitted in 2020 will continue to generate damages well past 2100, the terminal year for the EMF-22 scenarios. The IWG sought to capture substantially all of the damages from emissions in a given year. To do so, the IWG chose to estimate damages through the year 2300[.]"[23] The CEOs' expert further elaborated why the IWG correctly chose the time horizon based on the science, including how long the gas remains in the atmosphere.

> It would be inappropriate to arbitrarily exclude any future time period where damages will likely occur. At some point, both because of low probability of remaining in the atmosphere and discounting, future impacts become negligible. The IWG determined that the year 2300 was the appropriate time horizon required to capture all pertinent impacts associated with $CO_2$ emissions.[24]

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[19] Findings of Fact at ¶ 51 (quoting *Mass. v. EPA*, 127 S. Ct. 1438, 1442, 549 U.S. 497, 499 (2007)) (emphasis added).
[20] Memorandum at 129–30.
[21] Findings of Fact at ¶ 76.
[22] As the ALJ noted: "The IWG's Technical Support Documents are all part of the record in this proceeding, along with numerous commentaries regarding the IWG's process and the FSCC." Conclusions at ¶ 47. Therefore the Commission will find numerous other examples of record support for the 2300 horizon and inclusion of the 95$^{th}$ percentile value in addition to those highlighted here.
[23] Findings of Fact at ¶ 109.
[24] Ex. 101 at 15:13–17.

Despite these findings, the ALJ concluded that CEOs and the Agencies failed to prove that the IWG's time horizon was reasonable and substituted her judgment for that of the IWG and the experts offering testimony in this proceeding.[25]

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.[26] But this "compromise" clearly runs counter to the evidence and increases rather than decreases uncertainty. The IAMs used by the IWG had varying default time horizons—for PAGE it was 2200, but for DICE it was 2595, and for FUND it was the year 3000.[27] Using a time horizon of 2300 was already a compromise position taken by the IWG—and it was reasonable because after 2300 the discount rate effectively reduces the increase in damages to a negligible value. But shortening the time horizon even further omits damages that are certain to occur. Moreover, even though the EMF-22 emissions scenarios only went through 2100, there is nothing in the record suggesting that emissions of $CO_2$ cease in 2100 or 2200. It was reasonable of the IWG to model to 2300 and in order to do so they created credible and reasonable inputs based on the peer-reviewed EMF-22 foundation. Changing the time horizon to 2200 unreasonably assumes emissions cease and omits known damages—both of which increase rather than decrease the uncertainty of the values.

In contrast to the lack of record evidence supporting a 2200 time horizon, the record shows that the IWG explicitly considered and rejected the 2200 timeline as unreasonable, stating: "Many consider 2200 too short a time horizon because it could miss a significant fraction of

[25] Conclusions at ¶ 34.
[26] Conclusions at ¶ 35.
[27] Findings of Fact at ¶ 110.

damages under certain assumptions about the growth of marginal damages and discounting, so each model is run here through 2300."[28] Other Parties suggested alternative time horizons (not 2200), but as CEOs stated:

> The IWG's response to comments directly addressed this issue: "[B]ecause of the long atmospheric lifetime of $CO_2$, using too short a time horizon could miss a significant fraction of damages under certain assumptions about the growth of marginal damages." Ex. 101 sched. 1 at 29; *accord* ex. 100 sched. 2 at 25. $CO_2$ remains in the atmosphere for hundreds of years, and negative effects likely outlast the gas itself. Ex. 101 at 15. When assessing the damages $CO_2$ causes, the IWG reasonably let the nature of the gas guide its model horizon. Witnesses promoting the Federal SCC, and the IWG itself, acknowledge that there is uncertainty inherent in making future predictions, but reject the alternative, which is to ignore likely but uncertain damages altogether. *See* ex. 101 at 15. As Dr. Polasky noted, "[i]t is also not valid to conclude that the proper response to large uncertainty is to just ignore it." Ex. 101 at 6. A shorter model horizon, as Dr. Smith applied, effectively assumes that damages past that horizon are zero. Ex. 101 at 20. The IWG's model horizon reasonably incorporates likely future damages from present emissions of $CO_2$.[29]

Despite concluding that damages are not just $CO_2$-caused heat alone but also its aftereffects such as rising sea levels and increased vector borne diseases, which can last for hundreds of years after a ton of $CO_2$ is emitted, the ALJ proposed a shortened time horizon that effectively assumes that the damages after 2200 are zero. Neither the record nor the ALJ's findings support that assumption.

The ALJ's proposed horizon runs counter to the evidence in the record and her conclusion that relying on the IWG's modeling was reasonable.[30] There is no rational reason to cut off the calculations of damages from a greenhouse gas that remains in the atmosphere for hundreds of years in the middle of that chemical process. In fact, such zeroing out of known

[28] Ex. 100, Schedule 2 at 25 (2010 TSD).
[29] CEOs' Initial Brief at 20.
[30] Conclusions at ¶ 6–8.

damages has already been rejected by federal courts as arbitrary and capricious.[31] The ALJ's shortened timeline is irrational in that it reduces to zero a full century where modeled additional $CO_2$ will be in the atmosphere and causing damages. This unsupported and arbitrary recommendation should be rejected by the Commission.

### 2. Recalculating the SCC with a shortened 2200 time horizon is not practicable.

The law at issue here requires the Commission "to the extent practicable, quantify and establish a range of environmental costs . . ." Minn. Stat. § 216B.2422, subd. 3(a). While the Federal SCC provides Minnesota with values that will be updated by the IWG going forward, the ALJ instead proposes to reject those values and have Minnesota Agencies re-calculate the values now and potentially every time the SCC is updated. This proposal would mean that the Minnesota value would lag further behind the SCC and there will be a cost, both in additional computational and staff time, that would not be otherwise incurred by adopting the SCC values. While it may be possible to re-model these values again and again to update the values, it is unquestionably less practicable for the state to take on this burden rather than reasonably relying on federal agency expertise.

The ALJ acknowledged that the process of calculating the Federal SCC took a large computational toll on the IWG. Not only did the IWG have to calculate 150,000 estimates for each model at each modeled year,[32] when multiplied by the modeled years, emissions profiles, and different discount rates this resulted in approximately 2.25 million modeled data points.[33]

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[31] *See Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1200 (9th Cir. 2008) ("NHTSA's reasoning is arbitrary and capricious for several reasons. First, while the record shows that there is a range of values, the value of carbon emissions reduction is certainly not zero.").

[32] Findings of Fact at ¶ 135

[33] Findings of Fact at ¶ 386.

Additionally, the IWG had to run all its numbers through a Monte Carlo analysis to produce the final SCC values.[34] The ALJ also noted that Xcel argued against requiring "laborious new modeling each time the Commission updated its $CO_2$ environmental cost range."[35] But re-modeling all of the SCC values with a different time horizon would entail laborious new modeling. Hundreds of thousands, perhaps millions, of modeled data points will be required to calculate or re-calculate the values called for under the ALJ's recommendation on the shorter time horizon. This is not practicable.

In addition, even if it were possible and desirable to go through the time and expense of recalculating the SCC using the ALJ's recommended time horizon, there has been and there would be no opportunity for parties to review the process or results of that recalculation. CEOs and the Agencies argued to the Commission already that a contested case on the SCC was unnecessary because the IWG's process had been thoroughly explained in multiple TSDs, had been audited by the Government Accountability Office, and had been subject to public comment.[36] This argument is now strengthened by a recent assessment of the Federal SCC performed by the National Academy of Sciences at the IWG's request. [37] This peer review of the

[34] Findings of Fact at ¶ 113.
[35] Findings of Fact at ¶ 432 (quoting ex.602 at 5).
[36] DOC DER Comments, June 10, 2014; CEO Comments, June 26, 2014, Commission Hearing September 4, 2014.
[37] National Academies Press, Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update (2016), *available at* http://www.nap.edu/catalog/21898/assessment-of-approaches-to-updating-the-social-cost-of-carbon.

SCC showed that the most recent update to the SCC figures[38] reflects the best available science. Despite the public vetting of the IWG's process and results that had already occurred, the Commission disagreed with the Agencies' and CEOs' recommendation to adopt the SCC without a contested case after hearing arguments that due process required the opportunity for parties specific to this Minnesota proceeding to weigh in on the IWG's process and methodologies.[39] To adopt the ALJ's recommendation to recalculate the SCC based on a time horizon that was not discussed in the record would unmake the due process and public confidence gains made through the contested case proceeding.

It is also quite possible that the shortened time horizon will have a small impact on the overall values, since the final century of modeling is heavily discounted by the compounding discount rates used in different IWG scenarios. As the IWG 2013 TSD explains: "relative

[38] The most recent update of the SCC is from May 2013. The IWG first published a TSD in support of the SCC in 2010. The SCC has since been updated once—in May 2013—and revised twice—once in November 2013 and once in July 2015. The revisions were technical in nature; they were not full updates like the one that occurred in May 2013. Ex. 100, Schedule 4, at 1 (describing the 2010 and 2013 development and redevelopment of SCC estimates, as compared to the later 2013 "revisions" based on changes in the models); ex. 101, Schedule 1, at 2-3 (explaining the history of full updates as compared to "minor technical corrections" in November 2013); ex. 101, Schedule 1, at 5 n.6 ("Concurrently with this [2015 response to comments] document, the IWG is releasing a minor technical revision to the estimates. . . .").

Accordingly, two findings of fact in the ALJ's Recommendation must be clarified: (1) Paragraph 65 states that "[t]he IWG updated the FSCC in May and November 2013 and again in 2015," which is not accurate. *See* ex. Ex. 101, Schedule 1, at 2-3, 4 (indicating that the November 2013 IWG document is a "revision" not an "update") and ex. 101, Schedule 1, at 5 n.6 (indicating the same for the July 2015 IWG document); and (2) Paragraph 24 of the Conclusions states that the IWG could have updated the SCC based on the IPCC AR5 ECS value, but this is also not accurate. The IPCC AR5 was published in the latter half of 2013. Ex. 101, Schedule 1, at 12 ("At the time the 2013 SCC update was released, the most authoritative statement about ECS appeared in the IPCC's AR4. Since that time several commenters noted, the IPCC issued a Fifth Assessment Report . . . ."); ex. 101, 45:19–2 1 (same); ex. 101, Schedule 1, at 42 (citing to relevant AR5 document from 2013).) Although the IWG could decide to update the SCC at any time, there has been no update since the AR5 report was issued.

[39] Due process arguments were raised by Minnesota Chamber of Commerce, Peabody Energy, Lignite Energy Council, and Great River Energy in comments dated June 26, 2014.

increases in damages in later periods are discounted more heavily, all else equal."[40] Without running the models it is not easy to say how small this change will be, but the evidence in the record suggests that shortening the time value will have a high cost without creating a significantly different set of values. For example, Dr. Anne Smith provided a sensitivity analysis of the SCC models by running the SCC with a different end date, ending the simulation of damages at 2140.[41] Taking her data and extrapolating a linear difference between the end dates, we can estimate a rough number for what the 2200 value would be.[42] These calculations reveal that the SCC value drops from 46.88 to 40.20 at a 3 percent discount rate, and it drops from 13.39 to 12.46 at the 5 percent discount rate.[43] These differences amount to 14 percent and 7 percent of the 2300 SCC values,[44] respectively, but with actual modeling these differences would be even smaller.[45]

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[40] Ex. 100, Schedule 3 at 7.
[41] Ex. 300, at 31.
[42] This is a rough estimate that essentially would draw a straight line from her 2140 estimate to the 2300 SCC value on a graph, it is not presented here as a definitive number for a 2200 SCC estimate. In order to get the actual number the models must be recalibrated and re-run many thousands of times.
[43] The 2300 values are taken from Dr. Smith's chart. *See* ex. 300, at 31. The math here is first to calculate the difference from 2140 to 2200, i.e. 60 years, and then apply that to the difference in Dr. Smith's 2300 and 2140 values, which are 160 years apart. For the 3 percent discount rate the difference is 46.88 - 36.19 = 10.69 over 160 years, and for the 5 percent discount rate values the difference is 13.39 - 11.90 = 1.49 over 160 years. With these values we can then calculate what the 60-year difference in each number would be as a linear proportion: 10.69*(60/160) = 4.01 and 1.49*(60/160) = 0.56. When you add these results to Dr. Smith's modeled 2140 values you arrive at 36.19 + 4.01 = 40.20 and 11.90 + 0.56 = 12.46. These results have all been rounded to two significant digits to create results that reflect whole dollars and cents.
[44] This calculation is a matter of finding the difference between the 2300 SCC modeling number and the rough 2200 estimate, then dividing that difference by the 2300 value. So for the 3 percent discount rate the calculations are: 46.88 - 40.20 = 6.68 and 6.68/46.88 = 0.14. And for the 5 percent discount rate the calculations are: 13.39 - 12.46 = 0.93 and 0.93/13.39 = 0.07. These results are rounded to two significant digits.
[45] Since the total damages begin to level off at long time horizons (which is the effect of compounding discount rates offsetting the increased modeled damages), the linear estimate does not reflect exactly what you would arrive at with modeling. It is likely that running the numbers

Re-running the models with an arbitrary new end date is neither practicable nor defensible under the applicable Minnesota law.

### B. The Commission Should Adopt All Four SCC Values, Including The 95th Percentile Value That Reflects The Possible Costs Of Catastrophic Warming Damages.

The ALJ's recommendation explains how the 95th percentile value is meant to fit with the other values to form the SCC:

> The IWG presented four values of the FSCC for each given year. The IWG presented the average FSCC across all scenarios and models discounted at 2.5 percent, again at 3 percent, and again at 5 percent. The IWG used three discount rates because the cost estimates are highly dependent on the discount rate applied and the appropriate rate to be used is controversial. The IWG's fourth value is calculated by taking the SCC values at the 95 percentile of the FSCC distribution for each model at the 3 percent discount rate. This is intended "to represent the higher-than-expected economic impacts from climate change further out in the tails of the SCC distribution."[46]

A preponderance of the evidence, as reflected in the ALJ's findings of fact, supports including the 95th percentile value in the SCC values used by utilities appearing in front of the Commission. Eliminating it 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.

#### 1. A preponderance of the evidence supports including the 95th percentile value.

The ALJ's findings reflect the scientific underpinnings of including the 95th percentile value. The ALJ correctly noted that the SCC is artificially low. The IWG acknowledged that the models used did not assign values to all the resources harmed by climate change and that the

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would add several cents to each 2200 value and thus make the differences between the SCC and the 2200 recalculation even less significant than shown by these estimates.

[46] Findings of Fact at ¶ 136 (quoting ex. 800 at 23).

models did not fully account for the possibility of catastrophic damages from climate change.[47] The ALJ also found that there is more evidence for such catastrophic damages in the more recent science on the topic.[48] The ALJ further found: "The Agencies determined that . . . damage functions in DICE, FUND, and PAGE likely understate the actual SCC because they do not include all damages, do not account for climate tipping points, and reflect the level of GDP in a given year rather than the year's growth rate."[49] The ALJ also noted that the Agencies argued that the models exclude all damages other than those caused by annual average temperature, such as precipitation causing "flooding, water-borne disease, impacts on vegetation and ecosystems, and other types of impacts."[50]

The ALJ correctly found that both the Agencies and CEOs provided record evidence and arguments supporting the inclusion of the 95$^{th}$ percentile SCC value in order to account for the fact that the SCC modeling otherwise undercounts damages and leaves out damages that known to the climate change literature.[51] She also explained that the Agencies presented arguments that the SCC properly includes the 95$^{th}$ percentile value when it is used for risk management in planning.[52]

The ALJ found that the IWG thought it was important to account for potential extreme temperature increases and the consequential damage that would occur as a result. She explained: "There may be a very low probability of very high temperature increases, but the damages from a low probability catastrophic event could be so enormous as to raise damage estimates well

[47] Findings of Fact at ¶ 143.
[48] Findings of Fact at ¶ 170–71 (describing the Agencies account of recent science).
[49] Findings of Fact at ¶ 173.
[50] Findings of Fact at ¶ 173; *see also id.* at ¶ 178 (listing additional damages not included in the models suggested by CEOs).
[51] Findings of Fact at ¶ 227–29, 347.
[52] Findings of Fact at ¶ 229.

above the most likely values."[53] The Agencies explained that the high damages predicted in the "long right tail" of modeled damages, those captured by the 95th percentile, are not outliers but are actually damages on the same continuum as the other three SCC values.[54] The Agencies argued 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.[55] The ALJ agreed, rejecting one party's proposal as unreasonable because it excluded the high damages reflected in the right side of the SCC's modeling distribution. In rejecting Xcel's statistical re-calculation of SCC data the ALJ concluded: "Xcel unreasonably excluded information about the magnitude, as well as the likelihood of significant damages, as reflected in the higher end tails of the distribution. *These high damage outcomes are of great concern and it would be unreasonable to ignore them.*"[56]

Despite agreeing that the SCC is artificially low, despite understanding the purpose of the 95th percentile values, and despite the evidence supporting the need for its inclusion in order to account for the "long tail" of the distribution, the ALJ concluded that CEOs and the Agencies failed to prove that the IWG's 95th percentile value was a reasonable expression of the high side of SCC damages.[57] This runs counter to the evidence in the record as well as the logic behind the SCC and why the IWG chose to have a low-probability/high-damage value in the first place. Based on these findings and the ALJ's correct reading of the law to encourage conservative values,[58] it is within the Commission's authority to adopt all four SCC values as a reasonable estimate of the damage costs attributable to $CO_2$ pollution. There is no credible evidence in the record to support removing one of the values.

[53] Findings of Fact at ¶ 124.
[54] Findings of Fact at ¶ 407.
[55] Findings of Fact at ¶ 409, 420.
[56] Conclusions at ¶ 49 (emphasis added).
[57] Conclusions at ¶ 21.
[58] Memorandum at 127.

### 2. Eliminating the 95th percentile is a policy decision not appropriate for this scientific investigation.

These values, including the 95th percentile value, are information presented to and used by the Commission in making policy determinations. CEOs explained how the 95th percentile value is a useful planning tool representing one possible result of carbon pollution:

> The IWG noted that the IAMs do not capture all possible adverse consequences of climate, or catastrophic impacts. [Ex. 100 sched. 2] at 31. By reporting the 95th percentile figure, the IWG provides policy-makers additional information about possible consequences from climate change.
>
> MLIG's argument [that the 95th percentile value is unreasonable] might have some value if the IWG or a witness to this proceeding were suggesting that the 95th percentile value be adopted as the sole externality value for $CO_2$ in Minnesota. No party takes that position. Instead, the 95th percentile value should be adopted for the same reason the IWG reports it—to provide information about possible, higher-than-expected impacts from climate change.[59]

Though the ALJ recognized the importance of accounting for tipping points and catastrophic damage, she made the inconsistent choice to remove the very value in the SCC intended to account for these tipping points and high damages. The 95th percentile value is representative of an important possibility identified by the current science, and that value is an important balance in the context of the other SCC values—no party has ever argued for only adopting the 95th percentile rather than the full range of four SCC values.

Indeed, the 95th percentile value is necessary to counter an undervaluation practice that Minnesota utilities already adopt in filings to the Commission. CEOs explained that "it is appropriate for the Commission to have the 95th percentile figure available to it as a

[59] CEOs' Reply Brief at 9.

counterbalance to the zero-value scenarios all utilities provide when doing resource planning."[60]

This is because:

> The IWG included the value in order to provide decision-makers with more information. That rationale holds true in this context. No one is recommending adopting the 95th percentile value divorced from what it represents. Moreover, Xcel's purported concern that over-estimates of the SCC will somehow unduly influence the Commission is disingenuous given that in *every proceeding* Xcel provides the Commission with scenarios in which Xcel inputs *zero* as the external cost for $CO_2$. *See, e.g.*, Xcel Energy 2016-2030 Upper Midwest Resource Plan, Appendix J at 38-39, Pub. Util. Comm'n Docket No. E002/RP-15-21 (reporting as the "North Dakota" plan the present value of societal costs for all sensitivities with zero $CO_2$ external costs). All other utilities that are party to this proceeding do the same. *See* Great River Energy Resource Plan 2013-2027 at 37, Pub.Util. Comm'n Docket No. ET2/RP-12-1114; Minnesota Power 2015 Integrated Resource Plan at 48, Pub.Util. Comm'n Docket No. E015/RP-13-53; Otter Tail Power Company Application for Resource Plan Approval 2014-2028 at 2-4, Pub.Util. Comm'n Docket No. E017/RP-13-961. If it is, as Xcel states, "equally undesirable" to overestimate as to underestimate damages from $CO_2$, Xcel Initial Br. 25, then the Commission needs information about potentially high damages to balance what it already receives from the utilities.[61]

The logic underlying Minn. Stat. § 216B.2422, subd. 3 is to give the Commission and regulated utilities the best possible information about environmental costs borne by society from different forms of electrical generation. The more accurate the range of values, the better that planning and decision-making can be. By contrast, intentionally leaving out a significant data point from an established distribution harms the planning process. That is what the ALJ's decision to leave out the 95th percentile value would do—by removing a necessary and credible value from the range, this decision makes the SCC less useful and informative in Commission decision-making.

[60] CEOs' Reply Brief at 10.
[61] CEOs' Reply Brief at 13.

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.[62]

The IWG also cautioned: "For purposes of capturing the uncertainties . . . we emphasize the importance and value of considering the full range."[63] This "full range" is the four values included in the SCC.[64]

The decision to omit this value is out of step with the rest of the ALJ's report. She was clear, as explained above, that the SCC values are under-estimates. She argued that the Commission should adopt protective values in order to guard our most treasured resources. But then she inconsistently suggested the Commission remove the value that best reflects the potentially large costs of $CO_2$ pollution.

It is not appropriate to prohibit the Commission from even considering the possibility of catastrophic damage in its decision-making by removing that value from consideration in advance of any particular decision context. Ignoring the potential for catastrophic damages due to climate change is a policy decision that the Commission can make within a given docket, or in

[62] Ex. 100, Schedule 2 at 30.
[63] Ex. 100, Schedule 2 at 3.
[64] Ex. 100, Schedule 2 at 3, 25.

the context of a particular decision. There is no scientific or evidentiary basis to eliminate this value from consideration.

## III. Recommendation.

CEOs recommend that the Commission reject paragraphs 1.a. and 1.b. from Judge Schlatter's recommendations, and consequently adopt the SCC values as reasonable and best available environmental cost values under Minn. Stat. § 216B.2422, Subd. 3.

The ALJ was correct in her findings, conclusions, and recommendation stating that consideration of leakage is not properly part of this docket. CEOs assert that any potential leakage concerns should be addressed in specific dockets and that it would not be helpful to try to address leakage divorced from the facts under consideration.

## CONCLUSION

Based on the above, and the evidence in the record, the most reasonable choice is to reject adjustments to the SCC and adopt the IWG's proposed values as an appropriate range of environmental cost values. These four values reflect considered scientific opinions that have been vetted by the public and various experts. These numbers will be updated over time to reflect the best science. Such a valuable range of damage cost estimates is exactly what the Minnesota Legislature called for in Minn. Stat. § 216B.2422, Subd. 3.

The ALJ's proposed 2200 time horizon should be rejected by the Commission. Some amount of uncertainty is present in all future forecasts of chemistry, economics, and social change. The fact that we cannot say for certain what the exact GDP will be two hundred years hence is not a reason to give up on estimating damages that are known to occur for hundreds of years following the emission of a ton of $CO_2$. The IWG's analysis shows that a 2200 time horizon is unreasonable, and that a 2300 time horizon is reasonable. The IWG's commitment to

update and assess the SCC also argues for adopting that time horizon, as the state of Minnesota likely does not have additional resources to duplicate the federal government's work every time the numbers are updated.

Similarly, the ALJ's proposed removal of one of the four SCC values should be rejected by the Commission. There is no logical reason to both concede that the SCC is an underestimate of damages that does not fully account for tipping points and catastrophic damages, and also remove the 95$^{th}$ percentile value that attempts to correct for these issues. The IWG explicitly included this value to address the uncertainty in the SCC values. By removing the 95$^{th}$ percentile value the Commission would make the SCC less useful in future planning. Responsible policymaking includes looking at all possible damages, including those that are catastrophic but less likely to happen.

For all of these reasons, CEOs ask that the Commission follow the ALJ's findings and reasoning in order to approve the SCC, without adjustments, as the appropriate cost value for future Commission proceedings and utility planning.

Dated: May 5, 2016

/s/ Leigh Currie

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STATE OF MINNESOTA
FOR THE PUBLIC UTILITIES COMMISSION

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

**AFFIDAVIT OF SERVICE**

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

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STATE OF MINNESOTA )
)ss.
COUNTY OF RAMSEY )

Erin Mittag being duly sworn says that on the 5th day of May, 2016, she served via electronic service the following:

- Clean Energy Organizations Exceptions

on the following persons, in this action, by filing through e-dockets:

Attached Service List

Erin Mittag

Subscribed and sworn to before me
this 5th day of May, 2016

Karen Moss

KAREN E. MOSS
NOTARY PUBLIC - MINNESOTA
My Commission Expires 01/31/2021

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