

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

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

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

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## INTRODUCTION

The Minnesota Department of Commerce, Division of Energy Resources (Department or DOC) and the Minnesota Pollution Control Agency (MPCA) (jointly, the Agencies) respectfully submit to the Minnesota Public Utilities Commission (Commission) the following Reply to the Exceptions of other parties to the Administrative Law Judge's Findings of Fact, Conclusions and Recommendations: Criteria Pollutants (ALJ Report).

## ARGUMENT

### I. REPLY TO EXCEPTIONS OF THE CLEAN ENERGY ORGANIZATIONS (CEOs)

The CEOs Exceptions make four main points to argue that the ALJ Report failed to include the best available science in recommending externality values for the Commission to employ. The following are the Agencies' responses to each of these points.

#### A. **The Use of a National Scope of Damages Follows Current Standard Practice in Modeling Air Pollution.**

The Agencies agree with the CEOs that the current standard practice in modeling air pollution includes a national scope of damages. They also agree that Minn. Stat. § 216B.2422 requires costs to be quantified "to the extent practicable" using today's science, and that modeling national impacts is scientifically feasible and thus practicable. See CEOs Exceptions at 8. Further, the Agencies agree with the CEOs that there need not be any particular threshold for the percentage of damages occurring outside of Minnesota to justify considering a national scope of damages. See CEOs Exceptions at 7.

#### B. **The PM<sub>2.5</sub>-Mortality Concentration Response Functions Used by the CEOs and the Agencies are the Most Scientifically Viable and are Relied on by the Academic Epidemiological Community.**

The Agencies agree with the CEOs that the PM<sub>2.5</sub>-mortality concentration response functions used by the CEOs and the Agencies are the two most credible, up-to-date, and widely-

accepted-in-the-scientific-community studies used to estimate the relationship between PM<sub>2.5</sub> exposure and premature mortality (See CEOs Exceptions at 9-10), as is reflected in the testimony of the Agencies' witness, Dr. Muller. DOC Ex. 808 at 16, 39-40 (Muller Direct).

In contrast to the CEOs, however, the Agencies do not strongly object to the ALJ Report's Conclusion of Fact No. 50, which recommended a 6.8%-7.3% value range for increased mortality risk per 10 micrograms per square meter ( $\mu\text{g}/\text{m}^3$ ) increase in PM<sub>2.5</sub> concentration. (ALJ Report at 102). This range is very close to the values estimated by Krewski et al (2009) (6.0% without ecological covariates and 7.8% with covariates). The Krewski et al (2009) study was one of the two studies relied upon by the Agencies and is generally used by the Environmental Protection Agency (EPA) in its regulatory impact analyses. The Agencies agree with the CEOs that there is an apparent inconsistency between the ALJ Report's Conclusions of Fact and its Recommendations. See CEOs Exceptions at 11. At Conclusion of Fact No. 50, the ALJ Report "concludes that 6.8% - 7.3% is both reasonable, and an acceptable dose-concentration response function range for Xcel, the Agencies and the CEOs." ALJ Report at 102. Recommendation No. 3, in contrast, recommends a "central value" of 6.8 percent. ALJ Report at 104. The 6.8 percent value is the low end of the range from the earlier conclusion, or a central value of a range of 6 to 7.3 percent, which does not correspond to the range in Conclusion of Fact No. 50. While the Agencies continue not to agree with the ALJ Report's decision to eschew the higher risk value (14% from Lepeule et al (2012)), they do not consider the ALJ Report's recommendation of a 6.8-7.3% range to be unreasonable.

Finally, the value range at issue solely deals with the risk of increased mortality from PM<sub>2.5</sub> exposure. It does not consider other impacts of PM<sub>2.5</sub> nor does it consider ozone impacts. While premature mortality from PM<sub>2.5</sub> exposure is the most important (and highest damage

value) impact considered in this proceeding, the damage values resulting from Dr. Muller's AP2 modeling include other impacts of PM<sub>2.5</sub> and ozone impacts. The Agencies continue to recommend that criteria pollutant damage values not be limited to those associated with increased mortality from ambient PM<sub>2.5</sub> exposure.

**C. The Value of a Statistical Life (VSL) Developed and Used by the EPA is the Best Supported Value in the Record.**

The Agencies continue to support a low-end VSL of \$3.7 million and a high-end VSL of \$9.5 million (both in 2011 dollars), but do not object to the ALJ Report's recommendation to use a \$7.7 million (or \$7.31 million in 2011 dollars) VSL. The Agencies generally agree with the CEOs that the EPA's VSL (currently about \$9.5 million in 2011 dollars) is a highly credible value that has been used many times in air pollution-related policy analyses. See CEOs Exceptions at 16-17. The Agencies also agree that using the EPA value will allow the Commission to easily update the values in the future if and when the EPA updates its value. See CEOs Exceptions at 20.

The Agencies disagree with the CEOs contention, however, that a second, lower value should not also be employed to create a range of values - with the EPA value establishing the high end of the VSL range. See CEOs Exceptions at 19-20. Use of a range of values acknowledges the uncertainties involved in estimating the VSL, and mitigates the risks involved in selecting only a single value. The CEOs correctly note that the EPA VSL is a central tendency; but a second value is appropriate, however, because the EPA value predominantly relies on one type of valuation approach (revealed preference). The other major valuation approach for increased mortality risk (stated preference) tends to produce lower values. This other valuation approach was used by Dr. Muller to form the low end of the VSL range; the second VSL he recommended was derived in the Kochi et al (2006) meta-analysis of stated-

preference studies, and it is also a highly credible and appropriate VSL to use to establish damage cost values for these emissions. DOC Ex. 808 at 42 (Muller Direct).

In summary, while the CEOs raised valid concerns in their Exceptions regarding the ALJ Report's recommended VSL, the Agencies continue to support a low-end VSL of \$3.7 million and a high-end VSL of \$9.5 million (both in 2011 dollars), but do not object to the ALJ Report's Recommendation No. 2 to use a \$7.7 million (or \$7.31 million in 2011 dollars) VSL. See ALJ Report at 104.

**D. Geographic Diversity of Sources and Other Source Characteristics (i.e., Stack Height) Should be Used in Modeling.**

The Agencies agree in several respects with the CEOs Exceptions regarding source characteristics. First, the Agencies agree with the CEOs Exceptions regarding the potential usefulness of county-level values. See CEOs Exceptions at 25-26. Dr. Muller found considerable heterogeneity in damage cost values depending on the source location, and the three geographical classes recommended by Xcel do not sufficiently capture this variability. DOC Ex. 810 at 5-6 (Muller Rebuttal); DOC Ex. 808 at Attachment 3 (Muller Direct). Whether emissions from an electric generating unit (EGU) are likely to impact Minnesota locations is irrelevant as long as power generated by the EGU is for use in Minnesota, and for this reason, the Agencies agree with the CEOs that Conclusion of Fact No. 31 (page 98) should not be adopted. See CEOs Exceptions at 21. Although the Agencies are still not entirely clear about the intended meaning of the ALJ Report's Conclusions of Fact Nos. 32 and 33, the Agencies do not disagree with the CEOs that these Conclusions seem to answer questions that the Commission never asked this proceeding regarding the modeling of out-of-state sources and the proportion of impacts in Minnesota (*see* CEOs Exceptions at 22-23), and thus should not be adopted, and either found to

be irrelevant, as the CEOs proposed, or amended in the ways suggested in the Agencies' Exceptions.<sup>1</sup>

Second, the Agencies agree with the CEOs that Conclusion of Fact No. 45 (ALJ Report at 101) is based on a misunderstanding of atmospheric science and should not be adopted. See CEOs Exceptions at 23. The CEOs correctly point out that, while emissions may cause only small increases in pollution levels, they nonetheless contribute to pollution levels and should be included in damage cost estimates to the extent practicable.

Third, the Agencies agree with the CEOs that excluding out-of-state sources located in eastern Wisconsin, Michigan and Illinois and those currently without EGUs, as the ALJ Report recommends at Recommendation 4.b (ALJ Report at 104), is unnecessary. See CEOs Exceptions at 27. If a source is excluded, there will be no damage value associated with that location. Providing values for all counties within 200 miles of Minnesota gives the Commission the greatest versatility regarding how to apply them.

Fourth, the Agencies agree with the CEOs Exceptions that modeling different stack heights gives the Commission the most specific and useful information. See CEOs Exceptions at 27-28. Although Dr. Muller did not do this in his modeling, it could be useful to do so; with a relatively low level of effort, AP2 could be used to re-estimate values with different stack height assumptions.

Finally, the Agencies agree with the CEOs that, even if CAMx is ultimately used to estimate these values, more specific geographic variability in source locations than was proposed

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<sup>1</sup> The CEOs Exception's contention at 23, that "in order to have an accurate accounting of the actual damages caused by a generating unit in Wisconsin that provides electricity to Minnesota, the Agencies were required to prove that emissions from that plant *do* have an impact in Chicago – causing the premature deaths of millions over the lifetime of that facility," is an inaccurate and exaggerated statement.



by Xcel would improve the validity of the values, and the ALJ Report's suggested additional variations of geographical categories in Recommendation 4.a (ALJ Report at 104) are insufficient for that task. As the CEOs suggest, modeling source locations in all Minnesota counties and all counties within 200 miles of Minnesota, or alternatively, modeling the six EGUs modeled by Dr. Muller, potentially augmented with different stack heights to account for different potential types of plants (*see* CEOs Exceptions at 29, 31-32), is more appropriate than limiting the modeling according to Xcel's parameters.

## **II. REPLY TO EXCEPTIONS OF XCEL ENERGY (XCEL)**

Xcel's Exceptions addresses four general topics: 1) geographic scope of damages; 2) inclusion of additional source locations; 3) potential use of AP2 (or InMAP) to estimate damages from many source locations; and 4) model parameter values (VSL and concentration-response function). The Agencies respond in each of these four areas.

### **A. Geographic Scope of Damages**

The Agencies generally agree with Xcel that the ALJ Report's lack of a firm position on the appropriate geographic scope of damages is unfortunate, as it leaves this key decision for the Commission to determine without the benefit of definitive ALJ Findings. Xcel Exceptions at 10. Therefore, the Agencies offer the following, based on the record in this proceeding.

The Agencies disagree with several Xcel arguments regarding the appropriate geographic scope of damages.

#### **1. Percentage of Impacts In-State vs. Out-of-State.**

First, Xcel claimed that the preponderance of the evidence failed to demonstrate the percentage of impacts outside the state caused by SO<sub>2</sub> and NO<sub>x</sub> emitted within Minnesota. Xcel Exceptions at 10. The Agencies do not disagree with this claim, in itself, but do disagree that this implies that impacts outside the state should not be counted. As noted above in the

Agencies' discussion of the CEOs Exceptions, the percentage of impacts outside the state is irrelevant. What matters is that all parties who modeled damage cost values, including Xcel, found that there are impacts outside the state. Based on the Commission's statutory requirement to quantify to the extent practicable all the damages caused by Minnesota emissions, these out-of-state impacts should be counted. To this end, Xcel conceded that "a small proportion of concentration changes may occur outside of our CAMx modeling area". Xcel Exceptions at 11. Xcel went on to claim, however, that it is not practicable or reasonable to model these impacts across the contiguous U.S. Xcel Exceptions at 11. The Agencies disagree. This may have been true twenty years ago, at the time of Docket No. E999/CI-93-583, the first externalities proceeding, (the 93-583 Docket), but given the advancement of scientific knowledge and the modeling tools of today, it is both feasible and practicable to model impacts across the contiguous U.S.

## **2. National Scope of Damages.**

The Xcel Exceptions listed four main reasons for opposing a national scope of damages: Commission precedent, the fact that most criteria pollutant impacts are local and regional, the uncertainty involved in modeling national damages, and the claim that human health impacts in other states are already significantly protected through the National Ambient Air Quality Standards (NAAQS) and Cross-State Air Pollution Rule (CSAPR). Xcel Exceptions at 11. The Agencies respond to each of these four claims.

### **a. Commission precedent**

The capabilities of the modeling tools and scientific knowledge available twenty years ago in the 93-583 Docket should not dictate the choice of geographic scope, given the knowledge and modeling tools available today. Commission precedent, as well as a statutory requirement, supports quantifying impacts and damages *to the extent practicable*. Twenty years ago this

meant considering only damages within Minnesota, but the tools of today allow for a feasible and practicable accounting of national damages.

To support its mistaken assertion that Commission precedent requires a conclusion that it is not practicable or reasonable to estimate damages on a national or regional scale, Xcel's Exception strung together two fragments of a sentence from the Commission's January 3, 1997 Order in the 93-583 Docket<sup>2</sup> (the January 3, 1997 Order): "the quantification of all environmental impacts, however slight, difficult to measure, or irrelevant," would be a "bottomless and highly speculative task." Xcel Exceptions at 16. The full text of the Commission's Order however, places these fragments in their proper context:

... regarding the quantification of **all** environmental impacts, however slight, difficult to measure, or irrelevant, the Commission again notes that no party has undertaken such a bottomless and highly speculative task. The Commission finds that the absence of record evidence supporting values for this category of impacts conclusively shows the impracticability of establishing values for such impacts but does not preclude the Commission from quantifying costs for which there is reasonable record support.

January 3, 1997 Order at 12 (emphasis in original). Further, the quoted discussion was part of the Commission's analysis of certain parties' request that the Commission quantify categories of alleged costs that are not at issue in the present docket, including:

1. full fuel cycle costs, i.e. those that reflect **upstream costs** such as costs to the environment due to the extraction and transportation of the fuel used and **downstream costs** such as decommissioning of a plant and burial of wastes, as well as the environmental impacts resulting from the electrical generation itself;
2. **all** the associated costs, not just the most significant and relevant impacts; and
3. all such costs for **every** electric generating method, not just those likely to be most relevant in Minnesota.

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<sup>2</sup> 93-583 Docket, Order Establishing Environmental Cost Values at 12. (*see also* eDocket No. 20148-102561-01).

January 3, 1997 Order at 11 (emphasis in original).

The January 3, 1997 Order's discussion of speculative or difficult-to-measure environmental impacts did not refer to damages such as those in the present docket, which were quantified and reasonably supported by the record; rather, the Commission's January 3, 1997 Order referred to alleged impacts for which there was a complete "absence of record evidence supporting values for this category of impacts."

**b. Most criteria pollutant impacts are local and regional**

The Agencies agree that most impacts of criteria pollutants are local and regional (*see* Xcel Exceptions at 11), but also observe that "regional" in this context does not mean confined within a state's borders. All parties in this proceeding, as well as the ALJ, have acknowledged that pollution does not stop at state borders. ALJ Report at 100. More importantly, as has been mentioned above, just because the proportion of impacts outside the state may be small does not mean they should be ignored.

**c. Uncertainty**

Xcel correctly pointed out that the uncertainty in estimating health impacts is compounded by the fact that very small concentration changes are being predicted. Xcel Exceptions at 13-14. The issue, again, is whether the appropriate response to uncertainty is to ignore the impacts entirely or to account for them, to the extent practicable. The Agencies suggest that the latter is more appropriate.

Xcel's Exceptions appeared to mistakenly conflate relative air concentrations (i.e., changes in air concentrations) and absolute concentrations in its arguments against using epidemiological studies to predict impacts. Xcel Exceptions at 13-14. This clouds Xcel's argument against accounting for small concentration changes. Xcel claimed that "epidemiological research has not addressed adverse health effects at extremely low *ambient*

concentration levels (such as  $0.001\mu\text{g}/\text{m}^3$ ) or examined whether the linear application of concentration-response function still applies at very low concentration levels (such as  $0.00003\mu\text{g}/\text{m}^3$ )." Xcel Exceptions at 13-14 (emphasis added). The values cited, however, are not "ambient concentration levels;" on the contrary, these low values are *changes in* ambient concentration values. No party claims that there would be significant health impacts at these extremely low concentrations if they were absolute concentration levels; however, the Agencies continue to maintain that extremely small *changes* in concentration levels can be modeled, and damages estimated, with today's epidemiological knowledge and tools, and that holds true whether the ambient concentration level of pollutants is relatively high or relatively low. Xcel's Exceptions provided no analysis to show that impacts of small changes should be ignored and uncounted by the Commission.

Xcel also takes exception to the ALJ Report's Conclusion of Fact No. 54, which found persuasive the Agencies' and CEOs' evidence showing that there is no safe concentration threshold. Xcel Exceptions at 13. But, Xcel uses faulty reasoning, by claiming that absence of evidence is evidence of absence. Epidemiological studies have not found a safe concentration threshold for  $\text{PM}_{2.5}$ , and the ALJ Report was therefore correct in concluding that there is no evidence of a threshold in the record. ALJ Report at 103. This does not mean that there is no threshold, only that epidemiological studies, which have considered ambient  $\text{PM}_{2.5}$  concentrations below what currently exists in much of Minnesota<sup>3</sup>, have not found one.

**d. Federal regulatory scheme protects human health impacts in other states.**

Finally, Xcel claims that federal rules and regulations already minimize damages from interstate transport of emissions. Xcel Exceptions at 14-15. This topic was the subject of

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<sup>3</sup> Current air quality levels can be identified at [https://www3.epa.gov/airdata/ad\\_basic.html](https://www3.epa.gov/airdata/ad_basic.html)

extensive written and oral testimony. As the ALJ Report correctly found, the record reflects that there are numerous factors that determine the setting of federal regulations. ALJ Report at 103. The record reflects the fact that the EPA has continued to lower ambient air regulation thresholds as more becomes known about the health impacts of air pollution. ALJ Report at 108. It is reasonable to infer that this pattern continues. Finally, the EPA's own modeling for its CSAPR regulation has found that emissions in Minnesota do impact ambient pollution concentrations in neighboring states.<sup>4</sup>

### **3. Conclusions Regarding Geographic Scope of Damages**

Xcel's Exceptions on the geographic scope of damages concluded by asserting that Drs. Muller's and Marshall's modeling results showed very different proportions of damages occurring inside/outside Minnesota, and that, therefore, the results of neither are reliable. Xcel Exceptions at 16. Xcel further indicated that if the Commission opts to include damages nationwide or anywhere outside of the region already modeled by Xcel, CAMx is still the most reliable model to use.

The Agencies observe, as an initial matter that differing modeling results are to be expected when differing modeling inputs are used (such as the lower spatial grid used by Dr. Marshall) and are not, by themselves, an indication that the results are unreliable. Nevertheless, the Agencies have no objection to the use of CAMx. A point that repeatedly was made during the evidentiary proceeding (ALJ Report at 10) and which the Agencies continue to maintain, is that the choice of modeling assumptions, and above all the choice of the geographic scope of damages, is more important than the choice of the model used. The Agencies continue to

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<sup>4</sup> See: <http://www3.epa.gov/crossstaterule/techinfo.html>

support using CAMx to estimate damage values from Minnesota EGUs emissions, so long as appropriate parameters are employed, including use of a national scope of damages.

**B. Inclusion of Additional Source Locations**

Xcel agreed with the Agencies and CEOs, that adding two or three source location geographic categories, as discussed at Recommendation 4.a (ALJ Report at 104) is unnecessary. Xcel Exceptions at 17. Xcel's Exceptions, however, continued to claim that the three plants modeled by Xcel are representative of rural, metropolitan fringe and urban areas in Minnesota and are consistent with geographic groupings adopted in the 93-583 Docket. Xcel Exceptions at 18. The Agencies continue to disagree with Xcel's limited geographic groupings because the modeling results of the Agencies, as well as the CEO's modeling results showed significant heterogeneity of damage values within a geographic category. DOC Ex. 810 at 5-6 (Muller Rebuttal); DOC Ex. 809 at NZM-3 (Muller Direct).

The choice to use three geographic classes in the 93-583 Docket should not be determinative in the present case because the modeling tools of today are far more sophisticated than they were twenty years ago, and they allow for modeling specific geographic source locations. Again, using the standard of practicability, specific county-based source locations can readily be modeled using reduced-form models. Along these lines, Xcel contended that it is impractical to model out-of-state sources. Xcel Exceptions at 18, 25-26. This may be true for CAMx, but it is not impractical to use AP2 to model numerous in-state and out-of-state sources.

Procedurally, the Agencies are troubled by Xcel's assertion that, since the ALJ Report concluded that there is no need to develop county-by-county externalities values, that "this should no longer be an option in this proceeding." See Xcel Exceptions at 23. The ALJ's role in a contested case proceeding was to consider all the evidence in the record and to make a recommendation to the Commission. As the decision-maker, the Commission is free to adopt,

modify or reject any or all of the ALJ Report's findings and conclusions, and to make its own rational decision based on the record. The Agencies continue to recommend that the Commission consider establishing county-by-county externalities values, to have the most practicable, versatile and accurate damage values available for use in Commission proceedings.

If the Commission wishes for more sources to be modeled, besides the three hypothetical source locations modeled by Xcel, Xcel suggested a northern mid-urban location, such as Duluth, as a more viable option than the additional categories suggested in Recommendation 4.a (ALJ Report at 104). Xcel Exceptions at 18. Adding Duluth as a fourth source location could improve the validity of the values, but it is unclear how this fourth value would be applied (i.e., to what other geographic source locations could it be applied besides the specifically-modeled location in Duluth?); better is to have county-specific values, which would provide the Commission with the most comprehensive and versatile information to apply in each case.

If the Commission nevertheless opts to use CAMx, which would prohibit county-by-county modeling as a practical matter, then the proposal put forth by the CEOs to model the six actual plants modeled by Dr. Muller, but using CAMx rather than AP2 (*see* CEOs Exceptions at 30-31) would be a viable option and a significant improvement over using only three values to represent the entire state.

**C. Potential Use of AP2 (or InMAP) to Estimate Damages from Many Source Locations**

Xcel's Exceptions made several arguments against adding source locations to the three chosen by Xcel and against using AP2 for modeling impacts and damages outside and within Minnesota. Xcel Exceptions at 22, 26-42. The Agencies offer the following responses to several of Xcel's main arguments.



First, Xcel argued that CAMx is the most reliable and accurate model of the three models used in this proceeding. Xcel Exceptions at 4. The Agencies have no disagreement with this, but as was shown in the written and oral testimony, AP2 performs well relative to CAMx, and for this application, AP2 has the major advantage that it allows for easy and low-cost modeling of many different location-specific sources. Again, however, the choice of the model is less important than the choice of key parameters. If the Commission decides that limiting source locations is acceptable and opts to use CAMx, the Agencies would not object, as long as the model assumptions and parameters (geographic scope of damages, concentration-response functions, and VSL) were appropriate.

AP2 is the best model to use if the Commission wishes to have location-specific damage cost values for multiple sources. AP2 provides reliable and credible values. If the Commission deems it unnecessary to have multiple location-specific source values, then the Agencies would not oppose use of CAMx, but nonetheless offer the following responses to several of Xcel's mischaracterizations of AP2's performance.

Xcel contended that AP2's modeling of hypothetical plants is unreliable, presumably because its damage cost estimates for hypothetical plants are generally higher than its estimates for the six existing EGU facilities that AP2 modeled. Xcel Exceptions at 29-30. Contrary to Xcel's assertion that the Agencies did not respond to Xcel's criticisms, (*see* Xcel Exceptions at 30) the Agencies explained that the reason for the higher hypothetical values was due to the assumption of low stack height and not to any flaw of the model. DOC Ex. 811 At 21-23 (Muller Surrebuttal). If the Commission wants county-by-county values with higher stack height assumptions, or, as the CEOs suggested, county-by-county values at multiple stack heights, then

AP2 can easily be used to re-estimate damage values based on the changed stack height assumptions.

Xcel argued that the ALJ Report at 95 correctly found that modeling individual pollutants separately is not an approach commonly used, and because within-plume interactions are not considered, the reliability of AP2 model results is compromised. Xcel Exceptions at 31-33. It is true that the way the AP2 model functions requires pollutants to be considered individually. But, as the Agencies have shown, modeling emitted pollutants together and modeling emitted pollutants separately are each appropriate and commonly-used methods to model impacts of air pollution emissions. Dr. Muller stated that the approach to model emitted pollutants separately has been used in prominent studies to estimate environmental cost values (Fann *et al.*, 2009; Levy *et al.*, 2009). DOC Ex. 811 at 27-28 (Muller Surrebuttal); Agencies' Exceptions at 1-2.

Finally, Xcel argued that county-by-county values are not necessary or appropriate given the resource planning process, are generally not reasonable, and imply a false sense of precision. Xcel Exceptions at 24. The Agencies disagree. County-specific values give the Commission the most versatility, and Dr. Muller has proposed several different ways that the Commission could aggregate the values when it applies the values in future dockets. DOC Ex. 811 at 25-26 (Muller Surrebuttal). Xcel noted that the ALJ Report logically could have concluded that AP2 should be used to model all existing plants, when it concluded that county-by-county values were not necessary. Xcel Exceptions at 30. While it is unlikely that a power plant will be built in every county in Minnesota, and some locations are more likely to host a power plant than others, the specific location of all large electric generating units is not necessarily known long in advance. In the past, plants have been built on locations that never before hosted a large electric

generating plant. For example, the Mankato Energy Center<sup>5</sup> was built in Blue Earth County on a site where no large electric generating facility existed at that time. Similarly, the Faribault Energy Center was built on a site in Rice County that had not previously housed a power plant.<sup>6</sup> For this reason county-by-county values are reasonable and practicable.<sup>7</sup>

#### **D. Model Parameter Values for VSL and the Concentration-Response Function**

Xcel's Exceptions discussed three topics regarding the VSL and concentration-response function parameters: Xcel argued that ranges for these parameters are more appropriate than single values; Xcel stated that the range of 6 to 7.3 percent for the concentration-response parameter is reasonable; and Xcel argued that the ALJ Report's recommended VSL should be used to define the high end of a range, with an additional low end value added. Xcel Exceptions at 9-10. This Reply addresses these topics in turn.

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<sup>5</sup> See Environmental Assessment, *Calpine Mankato Energy Center Power Generating Plant*, Minnesota Environmental Quality Board, EQB Docket Number 04-76, PPS-CALPINE MANKATO ENERGY CENTER, at page 11. (The site and surrounding area contained only minor electricity generation-related features, consisting of an electric utility substation and an electric transmission line corridor. The area surrounding the site primarily contained industrial facilities and land uses, some agricultural land and a few farmsteads.) published online at [https://www.eqb.state.mn.us/sites/default/files/documents/Calpine-Mankato\\_1111CalpineJune30.pdf](https://www.eqb.state.mn.us/sites/default/files/documents/Calpine-Mankato_1111CalpineJune30.pdf). See also *In the Matter of the Application of Mankato Energy Center, LLC, a Wholly-Owned Subsidiary of Calpine Corporation, for a Certificate of Need for a Large Electric Generating Facility*. MPUC Docket No. IP6345/CN-03-1884.

<sup>6</sup> See Environmental Impact Statement, *Faribault Energy Park Project*, Minnesota Environmental Quality Board Docket Number 02-48-PPS-FEP at page 3-2. ("Both of the sites [preferred and alternate] are located on land historically used for agricultural purposes.") Published online at [https://www.eqb.state.mn.us/sites/default/files/documents/02-48-PPS-FEP\\_DraftEISMarch04.pdf](https://www.eqb.state.mn.us/sites/default/files/documents/02-48-PPS-FEP_DraftEISMarch04.pdf). See also *In the Matter of Faribault Energy Park, LLC for a Certificate of Need for a 250-Megawatt Electric Generating Facility*; MPUC Docket No. IP6202/CN-02-2006.

<sup>7</sup> As previously noted, if the Commission determines that county-by-county values are not needed, the Agencies would not object to using CAMx to estimate values using a national scope of damages. The suggestion put forth by the CEOs and restated by the Agencies above to use CAMx to model the six EGUs in Minnesota that were modeled by Dr. Muller, potentially with various stack heights, could be a viable option if the parameters were appropriate.

First, the Agencies agree that the record supports a decision that ranges are more appropriate than single values for the VSL and concentration-response parameters. Using ranges more appropriately captures the significant uncertainty of these parameters. The Agencies' witness Dr. Muller used ranges for both of these in all of his modeling.

Second, the Agencies do not greatly oppose Xcel's position on the appropriate PM<sub>2.5</sub>-mortality concentration-response parameter, but as noted above, offer a slight objection to eschewing the higher value derived by Lepeule et al (2012), and note that the ALJ Report contained a contradiction when it supported a 6.8% - 7.3% range (Conclusion of Fact No. 50, ALJ Report at 102) but then recommended a 6 to 7.3 percent range. (Recommendation No. 3, ALJ Report at 104). The Agencies do not object to the ALJ Report's recommended 6.8% - 7.3% range for the concentration response parameter.

Third, the Agencies mildly object to Xcel's proposal to convert the ALJ Report's recommended \$7.7 million (2015 dollars) VSL into a high-end of a range and adding a significantly lower value (\$4.1 million was recommended by Xcel) as the low-end of the range. Xcel Exceptions at 10. The Agencies proposed a range between \$3.7 million (from Kochi et al, 2006) and the EPA's \$9.5 million value. DOC Ex. 8-8 at 41-42 (Muller Direct). The \$7.7 million value recommended by the ALJ Report is within this range recommended by the Agencies, and if a single value is to be used, then the Agencies conclude that \$7.7 million is a reasonable choice. If the range were to be extended to a lower value than the ALJ Report's recommended \$7.7 million, then the Agencies argue that it should be extended on the higher end as well. The Agencies continue to recommend a VSL range of \$3.7 million to \$9.5 million (2011 dollars). DOC Ex. 808 at 41-42.

### **III. REPLY TO EXCEPTIONS OF THE MINNESOTA LARGE INDUSTRIAL GROUP (MLIG)**

#### **A. Parties' Roles in the Proceeding**

The MLIG claims in a footnote that the Agencies “have advocated very high damages [sic] values in both Phase I and this Phase without appropriate foundations. The MLIG thus remains troubled by what appears to be a disconnect between the DOC’s position in this docket and the ultimate rate impact that position could have if adopted by the Commission.” MLIG Exceptions at 1. The MLIG appears to misunderstand both the purpose of this proceeding and the DOC’s role of representing the public interest in Commission proceedings. Internalization of an externality does not, in and of itself, increase costs to society; instead, internalization *shifts* existing external costs to the cost causer. Further, the record of this proceeding does not encompass examination of rate impact, and therefore does not reflect a rate impact, one way or the other. The DOC will fully participate in any resource planning or acquisition proceeding in which the Commission considers the externality values the Commission sets. The DOC’s role in all proceedings is to represent the public interest. The public interest includes, but is not limited to, the rate impact of the proposal. Representing the public interest involves balancing the interests of all impacted by the decision, including ratepayers, the utility, and the environment.

#### **B. The MLIG Mischaracterizes the ALJ Report’s Findings Regarding the NAAQS**

##### **1. The Literature Shows that Exposure to PM<sub>2.5</sub> at Annual Average Concentrations Below the Current NAAQS for Annual Average PM<sub>2.5</sub> Concentration, 12 µg/m<sup>3</sup>, Causes Human-Health Impacts.**

The MLIG Exceptions insists that its witness, Dr. McClellan, offered evidence that the assumed linear concentration-response function used by the other parties is invalid in Minnesota, since the PM<sub>2.5</sub> ambient air concentration in Minnesota has generally been below the 12 µg/m<sup>3</sup> 3-year average. MLIG Exceptions at 5-6. This insistence is misplaced. Dr. McClellan’s testimony

did not offer such evidence, but indicated only that there is uncertainty as to the existence of a linear concentration-response relationship below certain levels. For example, Dr. McClellan testified:

Moreover, the total body of information available on PM<sub>2.5</sub> attributable morbidity and mortality supports acknowledging a high degree of uncertainty in any linear ambient air concentration morbidity or mortality function used for annual concentrations of PM<sub>2.5</sub> above 12 µ/m<sup>3</sup>. Ex 441A at Appendix 2, page 9 (McClellan Rebuttal).

And, citing himself:

The question then becomes one of whether the relationship is linear and whether there is a threshold level below which the coefficient for excess risk does or does not hold. The issue of whether there are or are not thresholds for non-cancer health endpoints is very contentious and a subject of on-going debate (White et al. 2009; Rhomber et al. 2011). Ex. 411A at Appendix 2, page 250 of *Role of science and judgment in setting national ambient air quality standards: how low is low enough?*” by Roger O. McClellan, online publication *Air Qual Atmos Health* (2012) 5:243-258.

And, citing himself:

As an aside, there has been ongoing debate for decades as to whether linear exposure-response relationships, especially for cancer, are realistic, i.e. whether an added level of exposure, regardless of how small it is, results in a calculable monotonic increase in cancer. Opponents of this view argue it is unrealistic to assume that each molecule of a chemical could have a calculable effect; certainly, normal homeostatic mechanisms must, or at least should, be operative with very low levels of exposure. Proponents of the view argue that a linear exposure-response model, especially for regulatory purposes for assessing cancer risk, is appropriate because every molecule of a new agent produces damage that is added to a background of genetic damage in somatic cells arising from multiple agents and endogenous factors. Ex. 411A at Appendix 2, page 65, from *Hazard and risk; assessment and management* by Roger O. McClellan.

And, again citing himself:

A recent report from the [National Research Council. *Science and Decisions: Advancing Risk Assessment. Committee on Improving Risk Analysis Approaches Used by the U.S. Environmental Protection Agency*. Washington DC: National Academy Press, 2009] offered suggestions for evaluating cancer end points. The Committee report expressed the view that non-cancer effects do not necessarily have either a threshold or low dose non-linearity. The current author does not

agree with this view and thinks that it is likely to be challenged.” Ex. 411A at Appendix 2, page 70, from *Hazard and risk; assessment and management* by Roger O. McClellan.

As with Xcel’s Exceptions discussed above, the MLIG Exceptions uses faulty reasoning by claiming that absence of evidence is evidence of absence. Epidemiological studies have not found a safe concentration threshold, and the ALJ Report was correct in finding that there is no evidence of a threshold. ALJ Report, Conclusions of Fact 54-56. Dr. McClellan’s opinion as to whether there is a linear concentration-response relationship below a certain threshold may certainly be acknowledged as an opinion and given its appropriate weight in this proceeding.

The MLIG Exceptions erroneously claimed that no studies have shown a causal connection between exposure to PM<sub>2.5</sub> at annual average concentrations below the current NAAQS for annual average PM<sub>2.5</sub> concentration, 12 µg/m<sup>3</sup>, and human-health impacts. MLIG Exceptions at 20-21, 54-63. This claim is inaccurate.

In his testimony, Dr. Muller made clear that both the peer-reviewed epidemiological literature, including both Krewski et al (2009) and Lepeule et al (2012) and EPA’s Science Advisory Board have determined that the NAAQS for both PM<sub>2.5</sub> and ozone do not represent safe thresholds below which no impacts occur. DOC Ex. 811 at 32-34 (Muller Surrebuttal). For example, the conclusion of the Lepeule et al (2012) paper was that “Including recent observations with PM<sub>2.5</sub> exposures well below the U.S. annual standard of 15 µg/m<sup>3</sup> and down to 8 µg/m<sup>3</sup>, the relationship between chronic exposure to PM<sub>2.5</sub> and all-cause, cardiovascular, and lung-cancer mortality was found to be linear without a threshold.” Lepeule et al (2012) go on to state that their findings showed “...a stable toxicity of PM<sub>2.5</sub>, even at lower exposure levels.” The Krewski et al (2009) study considered concentration ranges down to 5 µg/m<sup>3</sup> and concluded

that “There was no evidence of a threshold exposure level within the range of observed PM<sub>2.5</sub> concentrations.”

**2. The MLIG Mischaracterizes the ALJ Report’s Findings Regarding the NAAQS as “Speculating Regarding Future Medical Studies”**

The Commission’s January 3, 1997 Order, in its analysis of the relationship of NAAQS to externality costs, found that “the NAAQS *currently* are not necessarily set at no-cost levels,” that the EPA *historically* had not been able to keep the NAAQS updated, and that the *then-current* NAAQS did not reflect the latest scientific knowledge. January 3, 1997 Order at 16.

The ALJ Report in this present 14-643 docket similarly observed, at page 108, with respect to the NAAQS, that, *historically*, “the general trend *over the years has been* for the levels [of PM<sub>2.5</sub>] that are considered ‘safe’ to be lowered” (ALJ Report at 108 (emphasis added)) and that, *at present*, “researchers in the field *currently* have concerns about the long-term effects on human health of ambient concentration levels as low as 8 µg/m<sup>3</sup> of PM<sub>2.5</sub>.” *Id.* (emphasis added).

The MLIG Exceptions took issue with these observations on page 108 of the ALJ Report, and did so by erecting a straw man argument. The MLIG’s straw man argument inaccurately portrayed the ALJ Report’s statement on page 108 regarding the *past and present* NAAQS:

- The MLIG inaccurately portrayed the ALJ Report’s statement on page 108 as involving “speculation regarding potential *future medical studies*.” MLIG Exceptions at 65-67.
- The MLIG inaccurately portrayed the ALJ Report’s findings about the need to quantify externalities in the face of uncertainty as “speculation that *future medical studies* may at some point in time potentially establish causation between emissions and...damages.” MLIG Exceptions at 3.
- The MLIG inaccurately portrayed the ALJ Report as containing “grossly speculative and uncertain basis of *potential future medical findings* and developments.” MLIG Exceptions at 3-4.

These are all false characterizations of the ALJ Report’s observation at page 108.



First, the ALJ Report's observation about the relevance of the NAAQS in this docket was entirely appropriate and relevant, contrary to the MLIG's claim that there can be no damages as long as emissions do not cause ambient air concentrations to exceed the current NAAQS for annual average PM<sub>2.5</sub> concentration, 12 µg/m<sup>3</sup>. As noted above, this very claim was raised and addressed by the Commission in the prior externalities docket in a manner similar to the manner in which the ALJ Report here resolves the claim. See January 3, 1997 Order at 16.

Second, the ALJ Report's Finding 300, that "the EPA has lowered the NAAQS over time as scientific evidence has revealed health risks at increasingly lower levels of PM<sub>2.5</sub> and O<sub>3</sub>" is nothing more than a relevant observation of fact.<sup>8</sup> The finding says nothing about future medical research.

Third, contrary to the MLIG's exception, the ALJ Report's Conclusions Nos. 56 (that Minnesota's compliance with the NAAQS does not reduce criteria pollutant damages associated with human mortality to zero), and 52 and 53 (that "the EPA NAAQS standard for PM<sub>2.5</sub> is currently 12 µg/m<sup>3</sup>" and the "EPA Administrator's decision regarding the NAAQS standards is based on a combination of science and policy judgments, through which she weighs an acceptable level of risk against an adequate level of protection of public health"<sup>9</sup>) are abundantly supported by the record, and relevant to the ALJ Report's Conclusion No. 55, that "it is

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<sup>8</sup> The ALJ Report at paragraph 300 even conveniently hyperlinked the source documents at the EPA showing the lowering of the NAAQS over time.

<sup>9</sup> MLIG's Witness, Dr. McClellan explained that the EPA Administrator sets the NAAQS standards based on a mixture of "policy judgments as to acceptable levels of risk if the science does not identify a threshold level below which there are no identifiable risks." ALJ Report at 299. Dr. McClellan said that "[S]cience alone cannot identify an acceptable level of health risk, since such levels inherently represent a policy judgment call. Sound science can only inform what are ultimately policy judgments or political decisions. This is especially the case for the setting of NAAQS, in the absence of a clearly defined threshold, which involve decisions as to acceptable health risks which are linked to the level (and form) of the Standard. *Id.*; See also ALJ Report at 302.

appropriate to calculate mortality and morbidity damages for emissions of PM<sub>2.5</sub> in Minnesota, even if the ambient concentration of PM<sub>2.5</sub> is below the NAAQS standard of 12 µg/m<sup>3</sup>.” These findings concern the present, not the future insufficiency of the NAAQS. for purposes of determining damages in this matter.

In summary, the ALJ Report properly assessed the record regarding the usefulness of the present NAAQS for determining damages, and engaged in no “speculation” about “future medical studies.” These parts of the MLIG Exceptions should not be considered by the Commission. The Agencies support the ALJ Report Conclusions of Law Nos. 55 and 56 - that “it is appropriate to calculate mortality and morbidity damages for emissions of PM<sub>2.5</sub> . . . even if the ambient concentration of PM<sub>2.5</sub> is below 12 µg/m<sup>3</sup>” and that “Minnesota’s compliance with the NAAQS does not reduce CP damages associated with human mortality to zero.”

### **C. The MLIG Misapplies Concepts of Causation Relevant to this Proceeding.**

Minn. Stat. § 216B.2422 Subd. 3 (a) requires that the commission “to the extent practicable, quantify and establish a range of environmental costs *associated with* each method of electricity generation.” The ALJ Report stated that the words of the statute mean what they say:

MLIG focused on the incorrect standard when it insisted that the parties advocating for damages costs based on effects on human health had to prove a *causal link, as defined by the medical literature*, between increased ambient concentration of CPs and increased mortality. The applicable statutory language requires the Commission, “to the extent practicable” to “quantify and establish a range of environmental costs associated with each method of electricity generation.” *The language of the statute requires only that there be an association* between the cost established and the pollutant emitted as a result of the electricity generation. Medical causation is not the statutory standard.<sup>10</sup>

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<sup>10</sup> ALJ Finding 294 noted Dr. McClellan’s “medical” opinion, with what he described as a “reasonable degree of medical certainty,” that the current and projected levels of PM<sub>2.5</sub> in Minnesota will not cause additional mortality over and above that occurring naturally and from (Footnote Continued on Next Page)

ALJ Report at 108 (emphasis added).

**1. Proximate Causation is not needed.**

The MLIG Exceptions appear in several places to equate the concepts of “medical causation,” “proximate cause” and “cause” – arguing that these three disparate terms are synonymous. The MLIG argued that, under the ALJ Report’s reading of the statute, the Legislature would be instructing the Commission to determine damages “without any *proximate-cause* connection” to an underlying event, in violation of the due process (and/or equal protection) provisions of the US and Minnesota Constitution and the prohibition in Minn. Stat. § 14.69(f) against “arbitrary and capricious” decisions. MLIG Exceptions at 3 (emphasis added). MLIG asserts that in the absence of “any *proximate-cause* connection” there is no “rational basis”<sup>11</sup> for statute’s requirements to serve a government interests. MLIG Exceptions at 2-3 (emphasis added).<sup>12</sup>

The MLIG is wrong in arguing that the statute can be valid only if it requires a “proximate causation” link between emissions and damages. The concept of proximate causation has no place in the analysis of the statute’s constitutionality. “Proximate causation”

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(Footnote Continued from Previous Page)

other causes, and noted that, for this reason, MLIG took the position that it is not appropriate to estimate damages for PM<sub>2.5</sub> in Minnesota. The ALJ Report summarized the MLIG position at Finding 296, that “[u]ltimately, MLIG asserted that because the damages calculations presented by each expert witness retained by the CEOs, Xcel, and the Agencies are based on national data related to ambient air concentration of PM<sub>2.5</sub> rather than local data, and none of the opinions consider lack of a linear relationship between mortality levels and lower PM<sub>2.5</sub> air concentrations, the calculations are inadequate and invalid.”

<sup>11</sup> If a constitutional challenge does not involve a suspect classification or a fundamental right, it is reviewed under a rational-basis standard. *State v. Gresser*, 657 N.W.2d 875, 880 (Minn. App. 2003).

<sup>12</sup> Similarly, the MLIG contended that: “[t]o say that no “medical causation” is required, is saying that no causation is required” for the statute to be reasonably related to a government objective. MLIG Exceptions at 15.

(or medical causation, a variant of proximate cause) is a legal concept in the law of torts that is generally intended to prevent a negligent party from being held liable for his conduct, when he actually causes<sup>13</sup> damage but the specific damage caused is not foreseeable. It has no place in analysis of the rational basis test for statute's alleged constitutional infirmity. The concept of "proximate cause" was explained in *Lietz v. Northern States Power Co.*, where a plaintiff sued the power company over damages to its restaurant after a gas line explosion. The court said that "[t]here is proximate cause between a negligent act and an injury when the act is 'one which the party ought, in the exercise of ordinary care, to have *anticipated was likely to result* in injuries to others. *Lietz v. Northern States Power Co.*, 718 N.W.2d 865, 872 (Minn. 2006) (*quoting Canada ex rel. Landy v. McCarthy*, 576 N.W.2d 496, 506 (Minn. 1997)). Courts searching for proximate cause regularly engage in a fact-specific analysis of the foreseeability of an injury, where a lack of foreseeability mandates a conclusion that there is no duty. Michael K. Steenson, Minnesota Negligence Law and the Restatement (Third) of Torts: Liability for Physical and Emotional Harms, 37 *Wm Mitchell L. Rev.* 1055 at 1129 (2011) (citations omitted) (published online at <http://open.mitchellhamline.edu/facsch/251/>). To illustrate, proximate cause may not be found, for example, in a circumstance of a drowsy driver negligently choosing to drive a car, and hitting a telephone pole, which sets off a Rube Goldberg-like chain of events, (i.e. the noise of the crash frightens a cat who dashes up its owner's leg, causing him to shout in pain, frightening a passing bicyclist, who falls and becomes injured). The end result is an injury to the bicyclist that was directly caused by the drowsy driver, but it could not have been a specifically foreseen or anticipated result of a person negligently being asleep at the wheel. The lack of "proximate

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<sup>13</sup> Actual cause is sometimes called "cause in fact," "but-for" causation," or the "substantial factor" test, depending on the type of alleged tortious conduct at issue.

cause” may allow the driver in this illustration to avoid liability for unanticipated damage he actually caused.

Proximate cause is not part of the test for constitutionality of a law, such as Minn. Stat. § 216B.2422, subd. 3, and MLIG has cited no authority suggesting otherwise. To the contrary, legislation will be upheld if “any state of facts reasonably may be conceived to justify it.” *Doll v. Barnell*, 693 N.W.2d 455, 463 (Minn. App. 2005), *review denied* (Minn. June 14, 2005).<sup>14</sup> The ALJ Report’s plain reading of Minn. Stat. § 216B.2422 subd. 3 (a) and its rejection of MLIG’s argument, that the statute requires “proximate cause or “medical causation,” was appropriate.

## **2. Actual Causation**

Contrary to its position that proximate cause is needed, the MLIG Exceptions also acknowledges in places that, “as used in the statute, “associated” is synonymous with a simple causal relationship.” MLIG Exceptions at 15. The MLIG Exceptions further acknowledges that “the term ‘associated with’ in Minn. Stat. § 216B.2422, subd. 3(a) must therefore include a causal relationship between the emission of CP and the harm to be quantified . . . .” MLIG Exceptions at 11. The literature demonstrates that the type of damages here are actually causally linked to emissions of criteria pollutants. *See also* ALJ Report at Findings 297- 304, Conclusion 54-55. Clarification of the methods that epidemiological studies (including the Krewski et al (2009) and the Lepeule et al (2012) studies, as well as more general epidemiological methods) use to isolate the effects of air pollution on mortality and health from other factors may be helpful to the Commission in considering the MLIG’s arguments about causation.

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<sup>14</sup> To prevail, the challenging party [here, the MLIG] must demonstrate beyond a reasonable doubt that the statute at issue violates the Minnesota Constitution. *In re Haggerty*, 448 N.W.2d 363, 364 (Minn. 1989); *see also Miller Brewing Co. v. State*, 284 N.W.2d 353, 356 (Minn. 1979) (“A statute will not be declared unconstitutional unless the party challenging it demonstrates beyond a reasonable doubt that the statute violates some constitutional provision.”)

When peer-reviewed epidemiological studies estimate dose-response relationships, they also control for other factors that the researchers expect may also be causing the response. For example, when a study seeks to estimate the dose-response relationship between PM<sub>2.5</sub> exposure and premature mortality, the researcher(s) also include in their statistical modeling all the other factors that may also cause premature mortality in the population being studied. “Controlling for” other causative factors in the statistical modeling isolates the proximate cause of the variable of interest in the study, i.e., air pollution. Specifically, in the two epidemiological studies examining PM<sub>2.5</sub>-attributable mortality—Krewski et al (2009) and Lepeule et al (2012)—the researchers also included other factors that may affect mortality risk, including smoking status (never, former, current); age; sex; education level; body mass index; and other chronic conditions. Including these other factors in their analyses allowed these researchers to separate other factors’ influence on mortality risk and to quantify the specific cause of PM<sub>2.5</sub> exposure. See DOC Ex. 809 at NZM-2, pages 11-16 (Muller Direct Attachments) for additional explanation.

In summary, the record demonstrates, and the ALJ Report correctly found that the plain language of the statute “requires only that there be an association between the cost established and the pollutant emitted . . . Medical causation is not the statutory standard.” ALJ Report, Memorandum at 108. The requirement of Minn. Stat. § 14.69(f), that the MPUC decision not be “arbitrary and capricious” is satisfied, and the requirement that the Commission’s decision have a rational basis to satisfy due process and equal protection requirements (to the extent that they apply to this value-setting process) are satisfied because the epidemiological studies cited and relied upon in the record were conducted under scientific protocols intended to separate other

factors contributing to mortality risk in order isolate the effects of air pollution on mortality and health.

**D. The MLIG Wrongly Claims that There is No Factual Basis from Which to Estimate Health Impacts and Damages from Emissions of Criteria Pollutants.**

The MLIG claimed that a linear relationship between change in ambient PM<sub>2.5</sub> concentration and health effects damages, irrespective of the baseline concentration, was not proven, and thus there is no factual basis from which to estimate health impacts and damages from emissions and accordingly assign damage cost values. The Agencies clarify several points that may be useful to the Commission when considering MLIG's argument.

First, the MLIG Exceptions revealed a poor understanding of what is at issue in this proceeding. The Exceptions repeatedly refers to "air concentration of Criteria Pollutant" and health effects "per 10 µg/m<sup>3</sup> change in the Criteria Pollutant." MLIG Exceptions at 5, 22. The criteria pollutants in this proceeding are the *pollutants being emitted* – SO<sub>2</sub>, NO<sub>x</sub> and directly emitted PM<sub>2.5</sub>, not the ambient results (in the form of PM<sub>2.5</sub> and ozone concentrations in the air) of those emissions that result in health impacts and damages.

Second, in its Exceptions, the MLIG repeatedly misattributed the Lepeule et al (2012) study, one of the two landmark epidemiological studies relied upon by the Agencies in this proceeding and by the EPA in its regulatory impact analyses, to have used the American Cancer Society Cohort (MLIG Exceptions at 26, 28). In fact, the Lepeule et al (2012) study used the Harvard Six Cities population, (which was correctly identified on the tables that MLIG copied and pasted from the Lepeule paper (MLIG Exceptions at 27)). This is a significant error; the American Cancer Society Cohort and the Harvard Six Cities population were entirely different populations that provided the data for two entirely different sets of studies of the health effects of air pollution.

Third, and more important, is the MLIG's misleading and faulty interpretation of the figure on page 46 of its Exceptions. This figure, which was excerpted from Dr. McClellan's book, was the central thrust of its argument that at lower ambient concentrations of PM<sub>2.5</sub> there is not a clear relationship between increased concentration and mortality risk. The vertical axes of these graphs are the log of relative risk, which the MLIG neglected to explain. These graphs simply show that risk of mortality—all-cause, cardiopulmonary, and lung cancer—from PM<sub>2.5</sub> exposure is lower the lower the ambient concentration. The fact that all three of these lines are downward sloping, even at the lowest end of the concentration range, directly contradicts the arguments that the MLIG seemed to be attempting to make. These show that as concentration goes down, even to the lowest end of the concentration range considered, so too does mortality risk. In fact, some of these graphs (e.g., the one for Lung Cancer Mortality) show the steepest downward sloping curve at the lowest end of the concentration range, which suggests that the benefits to reducing PM<sub>2.5</sub> concentration are highest at low concentrations, or conversely, the increased mortality risk from rising PM<sub>2.5</sub> concentrations is higher at lower absolute concentrations. This is suggestive of a non-linear concentration response relationship, but not the type that the MLIG was arguing. This suggests that additional health risks of emissions are *higher* at low concentrations than they are at moderate or high concentrations, which would indicate that applying these concentration-response relationships to Minnesota's generally low PM<sub>2.5</sub> concentrations is underestimating the health impacts response to Minnesota emissions.

Fourth, the MLIG Exceptions erroneously claimed that the Agencies and the CEOs selectively chose epidemiological studies to support their claims, i.e. Krewski et al (2009) and Lepeule et al (2012), and ignored the vast majority of the thousands of studies of health impacts from PM<sub>2.5</sub> exposure. MLIG Exceptions at 24. It is true that there are numerous other studies,



but, as discussed above, these two studies are the most widely-accepted and widely-used in both the academic and regulatory communities. They are the U.S. studies that have followed the most extensive populations (the American Cancer Society cohort and Harvard Six Cities population) over the longest time frame, and are the most up-to-date. There are numerous other studies, dating back to the 1980's that have followed these same two populations (and may be among the multitude of other studies that the MLIG claimed are being ignored), but the Krewski et al (2009) and Lepeule et al (2012) studies are the most recent updates to those previous studies and thus consider the most complete and comprehensive data. The EPA sees these two studies as the two most definitive investigations of the relationship between PM<sub>2.5</sub> exposure and mortality risk and exclusively uses these two studies in its PM<sub>2.5</sub> regulatory impact analyses.<sup>15</sup> DOC Ex. 811 at 17-18, 20-21 (Muller Surrebuttal).

In summary, the MLIG's claim, that there is no factual basis from which to estimate health impacts and damages from emissions of criteria pollutants, is ill-informed and should not be given weight by the Commission.

**E. The ALJ Report Correctly Allocated the Burden of Proof.**

The MLIG Exceptions in this Phase of the docket, as in the earlier CO<sub>2</sub> Phase, complained that the ALJ's "Order Regarding Burdens of Proof" dated March 27, 2015 did not properly allocate the burden of proof. MLIG Exceptions at 17-19. The MLIG argued without citation to authority, that the burden of proof should have been on the parties that advocate

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<sup>15</sup> Along these lines, when the MLIG Exceptions erroneously tried to contradict the fact that the Lepeule et al (2012) study considered exposures to ambient PM<sub>2.5</sub> concentrations as low as 8 µg/m<sup>3</sup> and concluded that there is a linear relationship at all observed concentrations, the MLIG claimed that "the statements made by the Agencies, CEOs, and in the Krewski and Lepeule reports relate to a different issue and a different type of data." MLIG Exceptions at 25-26. The Agencies are confused by this statement and would require the MLIG to clarify what "different issue" or "different type of data" the MLIG was referring to, in order to respond.

adoption of the a new damage values, not on parties advocating for retention of values set in the 93-583 Docket, which the MLIG calls the “status quo ante.”

First, there is no existing value for the most significant emission, PM<sub>2.5</sub>; the 93-583 Docket concerned PM<sub>10</sub>. As a result, it appears to be MLIG’s position that the status quo ante is that there be no value for PM<sub>2.5</sub>.

Second, the Agencies observe that, in making its argument, the MLIG continued to overlook the Commission’s October 15, 2014 Order,<sup>16</sup> where the Commission, in referring this matter for a contested case proceeding, confirmed that scientific advances in the past 20 years called for a reconsideration of the damage costs. In its October 15, 2014 Order, the Commission directed the Parties to specifically and thoroughly address the “appropriate values for PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub> under Minn. Stat. §216B.2422, subd. 3. In this Order, the Commission thus established that any party who wished to address any appropriate value could attempt to do so. The Commission specifically did *not* state that the present values – or the present lack of any damage value--remained presumptively the appropriate value.<sup>17</sup>

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

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<sup>16</sup> MPUC Dockets E-999/CI-00-1636 and E-999/CI-14-643, Notice and Order for Hearing (October 15, 2014) (the Commission’s October 15, 2014 Order).

<sup>17</sup> The MLIG did not object to the Commission’s October 15, 2014 Order, seek reconsideration under the Minn. R. 7829.3000, nor seek certification to the Commission of the ALJ’s Order Regarding Burdens of Proof, as it could have done under Minn. Rule 1400.7600, if it believed the ALJ improperly construed the Commission’s October 15, 2014 Order.

the Commission not estimate damages for PM<sub>2.5</sub> in Minnesota. ALJ Report's Finding of Fact 294. The MLIG Exceptions now claims that the ALJ Report's finding is erroneous. MLIG Exceptions at 20. MLIG Ex. 441, Appendix 2 at 10 states, however, that, "In conclusion, based on recent ambient monitoring data for Minnesota and communities in Wisconsin, it is my opinion, with a reasonable degree of medical certainty, that there is no medical or other scientific basis for projecting mortality attributable to PM<sub>2.5</sub>."

In summary, in the Order Regarding Burdens of Proof" dated March 27, 2015 and in the ALJ Report, the ALJ properly allocated the burden of proof.

### **RECOMMENDATIONS**

Based on the reasoning above, the Agencies continue to request that the ALJ Report be adopted by the Commission, subject to the amendments enumerated in the Agencies initial Exceptions.

### **CONCLUSION**

For the reasons stated above, and consistent with its testimony, post-trial briefs and proposed facts in this matter, the Agencies respectfully recommend that the Commission adopt the ALJ's Findings of Fact, Conclusions and Recommendations: Criteria Pollutants, with the clarifications, exceptions and amendments discussed herein.

Dated: August 4, 2016

Respectfully submitted,

**s/ Linda S. Jensen**

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# STATE OF MINNESOTA

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August 4, 2016

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

RE: In the Matter of the Further Investigation in to Environmental and Socioeconomic Costs  
Under Minnesota Statute 216B.2422, Subdivision 3  
PUC Docket No. E-999/CI-14-643;  
OAH Docket No. 80-2500-31888

Dear Mr. Wolf:

Enclosed for filing please find the Minnesota Department of Commerce, Division of Energy Resources and the Minnesota Pollution Control Agency Reply to Exceptions – Criteria Pollutants in the above referenced matter.

Respectfully submitted,

**s/ Linda S. Jensen**

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Enclosure  
cc: Service List

**AFFIDAVIT OF SERVICE**

RE: In the Matter of the Further Investigation in to Environmental and Socioeconomic Costs Under Minnesota Statute 216B.2422, Subdivision 3 (2014)  
PUC Docket No. E-999/CI-14-643;  
OAH Docket No. 80-2500-31888

STATE OF MINNESOTA )  
 ) ss.  
COUNTY OF RAMSEY )

I, Ann Kirlin, hereby state that on the August 4, 2016, I filed by electronic eDockets the attached **Minnesota Department of Commerce, Division of Energy Resources and the Minnesota Pollution Control Agency Reply to Exceptions – Criteria Pollutants** and eServed or sent by US Mail, as noted, to all parties on the attached service list.

See attached service list for PUC Docket No. E-999/CI-14-643;  
OAH Docket No. 80-2500-31888

/s/ Ann Kirlin  
ANN KIRLIN

Subscribed and sworn to before me on  
this 4<sup>th</sup> day of August, 2016.

/s/ Laura Capuana  
Notary Public - Minnesota  
My Commission Expires on January 31, 2018

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