

BEFORE THE MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS

600 North Robert Street
St. Paul, Minnesota 55101

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION

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

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

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

OAH Docket No. 80-2500-31888

**MINNESOTA LARGE INDUSTRIAL GROUP'S
POST-HEARING REPLY BRIEF REGARDING PHASE II
(CRITERIA-POLLUTANTS TRACK)**

STOEL RIVES LLP

Andrew P. Moratzka (322131)

Marc A. Al (247923)

33 South Sixth Street, Suite 4200

Minneapolis, MN 55402

Telephone: 612-373-8800

Facsimile: 612-373-8881

andrew.moratzka@stoel.com

marc.al@stoel.com

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INTRODUCTION

As admitted over and over by the Minnesota Department of Commerce (Division of Energy Resources), the Minnesota Pollution Control Agency (“MPCA” and jointly with the Department the “Agencies”), Xcel Energy, and the Clean Energy Organizations (“CEOs”), this matter is about “accurate quantification.”¹ For the most part, each of these three parties, as well as Otter Tail Power Company (which did not offer evidence or participate in Phase II but did submit an initial post-hearing brief), address the relative merits of their respective experts’ opinions, focusing on economic analysis, as well as the problems with the various economic models used by and the assumptions and analyses of the other testifying economics experts. Virtually absent is the matter of proximate cause with respect to alleged health damages: is there, in fact, a scientific basis to believe that the concentration-response functions used in the three economic-expert reports are valid at the very low Criterial Pollutant ambient air concentrations present in Minnesota and the surrounding area?² This is a critical error by those parties suggesting a change to the

¹ See, e.g., CEO Phase II—Criteria Pollutants Initial Post-Hearing Brief at 17, 18, 19, 27, 29, 31; Agencies’ Initial Criterial Pollutants Post-Hearing Brief at 2 (“reliable”), 3 (“accurate” and “reliable”), 12 (“accurate”), 13 (“credible results”), 17 (“reliable” and “accurate”), 19-20 (“accurate”), 26-39 (model performance testing), 41, 43 (“credible”), 56 (“decision needs to be supported by the evidence”); Xcel Energy Initial Criterial Pollutants Post-Hearing Brief at 1 (“externality values should be based on the best and most accurate method...”), 6 (methodology must *inter alia* “[d]evelop the most accurate and credible estimates for use in Minnesota for PM_{2.5}, SO₂, and NO_x environmental values” and “[u]se sound scientific and economic models”).

² *In the Matter of the Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B.2422, subd. 3*, PUC Docket No. E-999/CI-00-1636, Order Reopening Investigation and Convening Stakeholder Group to Provide

(continued)

criteria pollutant values, because this entire investigation was premised upon an assertion by the CEOs that the Commission’s environmental cost values “are outdated and no longer scientifically defensible.”³ Indeed, in finding that it was appropriate to reopen this matter, the Commission found that “The *scientific* evidentiary support for the existing values has been reasonably called into question.”⁴ That this support had reasonably been called into question does not relieve the CEOs, or other parties suggesting a change in values, from meeting their burden of proof. To the contrary, and as the ALJ specifically found, “[t]his language does not constitute a clear rejection by the Commission of the existing values.”⁵ And while the Minnesota Large Industrial Group (“MLIG”) accepts the fact that it bears a burden to offer scientific support for its conclusions, MLIG respectfully asserts it has done so in a way that proponents of change have not, and that those proponents indeed cannot achieve the required preponderance of the evidence.⁶ Further absent from the proponents’ testimony is a discussion of the quantity of non-health damages.

(continued)

Recommendations for Contested Case proceeding at 3 (Feb. 10, 2014) (emphasis added) (“Reopening Order”).

³ Oct. 9, 2013 [Mem. in Supp. of CEOs’ Mtn. to Update Externality Values for Use in Resource Decisions](#) in PUC Docket No. E-999/CI-00-1636 at 1.

⁴ Reopening Order, at 5 (emphasis added).

⁵ *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statute 216B.2422, subd. 3*, OAH 80-2500-31888; MPUC E-999/CI-14-643, ORDER REGARDING BURDENS OF PROOF, at pg. 5 (March 27, 2015) (“[Order Regarding Burdens of Proof](#)”).

⁶ See [Order Regarding Burdens of Proof](#) at 6.

Because the uncontroverted medical (*i.e.*, scientific) testimony of Dr. McClellan and the Environmental Protection Agency's scientific analysis of thousands of epidemiological studies in fact show no reliable evidence of harm to humans at the Criterial Pollutant ambient-air concentrations present in Minnesota and the surrounding area, because there is no scientific or other evidence in the record of the quantity of harm in areas outside of Minnesota where there might be some harm because the ambient-air concentrations of PM_{2.5} exceeds 12 µg/m³, and because there is no quantification in the record of non-human harm although that non-human harm was allegedly calculated, the Agencies, Xcel, the CEOs, and Otter Tail Power have failed to meet their burden of proof both as to damages within and without the "Minnesota Domain."⁷

Because of the failure to appropriately determine the very limited harm in areas outside of Minnesota that are not in attainment for PM_{2.5}, it is further not possible, and thus not practicable, to determine damages on a national scale.

The MLIG accordingly and respectfully submits that the ALJ is required to advise the Commission that the proponents of values failed to meet their burden of proof to modify the existing externalities values.

⁷ This term is used herein to describe the area consisting of the state of Minnesota and a roughly 100 mile border area used by Dr. Desvousges to calculate damages.

ANALYSIS

I. THE AGENCIES, XCEL ENERGY, THE CEOs, AND OTTER TAIL POWER COMPANY HAVE NOT MET THEIR BURDEN OF PROOF WITH RESPECT TO MINNESOTA OR THE MINNESOTA DOMAIN

All the parties in this proceeding agree that “[a] party or parties proposing that the Commission adopt a new environmental cost value ... bears the burden of showing, by a preponderance of the evidence, that the value being proposed is reasonable and the best available measure of the environmental cost ...”⁸ Conversely, “[a] party opposing a particular proposal need *only* demonstrate that the proponent of a proposed value cannot meet the preponderance requirement, because the proponent’s evidence is flawed, or the proposal is impracticable.”⁹ The parties further agree that the term “practicable” in this context has the meaning adopted by the Commission in its January 3, 1997, [Order Establishing Environmental Cost Values](#), to mean “feasible” or “capable of being accomplished.”¹⁰ Finally, all the parties agree that “[i]f the weight of the evidence is evenly balanced, for and against, the *opponent* has met its burden because the proponent will not have achieved the required preponderance of the evidence.”¹¹

A. The Agencies and Otter Tail Power Company have not addressed proximate cause at all

The Agencies, Xcel Energy, the CEOs, and Otter Tail Power Company each submitted an initial brief regarding the Criteria Pollutants phase of this proceeding.

⁸ [Order Regarding Burdens of Proof](#) at 2, ¶ 1.

⁹ *Id.* at 6 (emphasis added).

¹⁰ [Order Establishing Environmental Cost Values](#) dated January 3, 1997, at 10-11.

¹¹ [Order Regarding Burdens of Proof](#) at 6 (emphasis added).

Although the relationship between PM_{2.5} air concentration and increased health-effect impacts is key to the damage values calculated by Drs. Marshall, Muller, and Desvousges,¹² neither the Agencies nor Otter Tail Power Company have in any way addressed the MLIG’s express challenge¹³ to the linear relationship assumed by each of Drs. Marshall, Muller, and Desvousges between an increase in exposure and an increase in health effects at the baseline Criteria Pollutants air concentration present in Minnesota and the surrounding areas.¹⁴ Dr. McClellan’s testimony is particularly important because it challenges (proximate) cause, absent which it is neither possible nor appropriate to calculate damage, as those witnesses have purported to do. Yet Dr. McClellan’s testimony has not been impeached, nor has conflicting medical testimony been introduced, for example from Dr. Jacobs, a professor of epidemiology and community health at the School of Public Health of the University of Minnesota, although Dr. Jacobs

¹² See, e.g., Agencies’ Initial Criteria-Pollutant Post-Hearing Brief at 10 (“(4) links exposure to specific health and other impacts”); CEOs’ Initial Criteria-Pollutant Post-Hearing Brief at 11 (“The third step of modeling translates exposures into health effects based on public health, or epidemiological studies”); Xcel Energy Initial Criteria-Pollutant Post-Hearing Brief at 23, Fig. 3, step 3 (linking changes in air quality to potential effects on human health, agriculture, materials, and visibility).

¹³ See, e.g., [Ex. 441](#) (McClellan rebuttal); [Ex. 441A](#) (errata to Ex. 441); [Ex. 443](#) (November 24, 2015, Dr. McClellan Response to Clean Energy Organizations Information Request No. 6 to Minnesota Large Industrial Group); Hearing Transcript, Vol. 7 at 165-207.

¹⁴ See, e.g., [Ex. 609](#) at 44; [Ex. 811](#) at 33 (Muller surrebuttal); Tr. Vol. 6 at 52:18-24 (Currie admission), 112:1-113:11 (Marshall) (“We used just one concentration-response function at a time. We don’t have any different function for different parts of the country”); Tr. Vol. 7 at 141:24-142:3 (Desvousges) (used linear function); Tr. Vol. 8 at 44:10-45:2 (Muller) (same); Tr. Vol. 7 at 141:24-142:3.

offered detailed testimony on other topics.¹⁵ The absence of such testimony and absence of impeachment is as telling as the affirmative evidence offered by Dr. McClellan.

The Agencies' and Otter Tail Power Company's failure to even address (proximate) cause should be fatal to their claims. The Agencies clearly seek to establish the values testified to by Dr. Muller, and Otter Tail Power Company has asked that Dr. Desvousges' analysis and values be adopted. Absent proof of (proximate) cause, however, the Agencies and Otter Tail Power Company cannot meet their affirmative burden of proof, requiring rejection of their demands. See [Order Regarding Burdens of Proof](#) at 2 and 6, Minn. Rules Part 1400.7300, subp. 5, and *In re Quantification of Env'tl. Costs Pursuant to Laws of Minn. 1993, Chapter 356, Section 3*, 578 N.W.2d 794, 801 (Minn. Ct. App. 1998).

B. Xcel Energy essentially confirms there is an absence of (proximate) cause

Xcel Energy referenced Dr. McClellan's testimony only in its summary of testimony on pages 14 and 15 of its Initial Criteria-Pollutants Post-Hearing Brief. Xcel did not otherwise address Dr. McClellan's testimony but did admit in its Initial Brief that

Every Party that conducted modeling, treated the results of health studies linearly, meaning that the relationship between mortality risk and PM_{2.5} concentration change are considered the same whether the concentration change is 10 µg/m³ or 0.00001 µg/m³. However, this linear relationship has been established based on correlations seen at the 8-23 µg/m³ range and has not been evaluated at very low concentration levels. Similarly, there is no existing health research that supports an association between very small PM_{2.5} concentration levels

¹⁵ See [Ex. 117](#) at 1-14.

and premature mortality; all epidemiological studies have focused on much higher levels of concentrations that can be observed and measured. Again, every Party that conducted modeling assumed that the very small changes in PM_{2.5} ambient concentrations are statistically different than zero, although there is no existing research to support that conclusion.¹⁶

Furthermore, Xcel Energy has admitted that:

From a scientific perspective, there is more uncertainty when air quality changes are modeled far away from the source and when the predicted concentration changes are very small (e.g., 0.000000643 µg/m³). Epidemiological research has not addressed adverse health effects at very small ambient concentration levels or examined whether the linear application of concentration-response function is appropriate at very small concentration levels.¹⁷

Based on this record and these admissions, like the Agencies and Otter Tail Power Company, Xcel has not met its affirmative burden of proof, requiring rejection of its demands. See [Order Regarding Burdens of Proof](#) at 2 and 6, Minn. Rules Part 1400.7300, subp. 5, and *In re Quantification of Env'tl. Costs Pursuant to Laws of Minn. 1993, Chapter 356, Section 3*, 578 N.W.2d at 801.

C. The Clean Energy Organizations have failed to meet their burden of proof

Contrary to all other parties, the CEOs do address (proximate) cause, on pages 47 through 50 of their Initial Criteria-Pollutants Post-Hearing Brief. However, their arguments and factual citations are superficial and do not hold up.

¹⁶ Xcel Initial Criteria-Pollutants Post-Hearing Brief at 67 (*citing* [Ex. 608 \(Desvousges Surrebuttal\)](#) at 42-44; Hearing Transcript (“Tr. Vol.”) 8 at 113-117).

¹⁷ Xcel Initial Criteria-Pollutants Post-Hearing Brief at 71.

The CEOs argue that “evidence continues to grow in support of ‘health effects [] at lower ambient PM_{2.5} concentrations, including effects in areas that likely me[e]t the current standards’,” citing [Ex. 444A](#) at 3089, and cite Dr. McClellan for the proposition that “more recent NAAQS have been set at levels which the CASAC [Clean Air Scientific Advisory Committee] and EPA characterize as having residual health effects even if the Standard were to be attained.”¹⁸ The CEOs further argue that there is a linear relationship between PM_{2.5} air concentration and mortality, citing [Ex. 117](#) at Schedule 3 (Lepeule) at 967-68, Ex. 809 (Muller Direct) at Attachment 2 at 6, and [Ex. 811](#) at 33:6-13 (Muller surrebuttal). The CEOs further argue that “the literature shows that there is no threshold below which the relationship between PM_{2.5} and mortality is not linear; or below which there is no relationship.... Instead, the linear relationship exists at *all observed concentrations*.” (CEO Initial Criteria-Pollutants Post-Hearing Brief at 47-48 (emphasis in original) (*citing* [Ex. 117](#) at Schedule 3 at 967-68 (Lepeule); [Ex. 117](#) at Schedule 2 (Krewski) at 119).) Finally, the CEOs cite Lepeule for the proposition that “[i]ncluding recent observations with PM_{2.5} exposures well below the U.S. annual standard of 15 µg/m³ and down to 8 µg/m³, the relationship between chronic exposure to PM_{2.5} and all-cause, cardiovascular, and lung-cancer mortality was found to be linear without a threshold.”¹⁹

¹⁸ CEOs’ Initial Criteria-Pollutants Post-Hearing Brief at 49-50 (*citing* [Ex. 441](#) (McClellan rebuttal) at Appendix 2 at Attachment 1 at 250) (brackets in original).

¹⁹ CEO Initial Criteria-Pollutants Post-Hearing Brief at 48 (*citing* [Ex. 117](#) at Schedule 3 at 970 (Lepeule)).

While the CEOs have included correct citations, they overlook a number of items, ultimately eviscerating their arguments. First, the reference to “current standards” in [Ex. 444A](#) and “more recent NAAQS” in [Ex. 441](#) are to the 15 $\mu\text{g}/\text{m}^3$ $\text{PM}_{2.5}$ and even earlier standards, that is, standards in effect before the most recent reduction to 12 $\mu\text{g}/\text{m}^3$.²⁰ Similarly, Dr. Muller’s surrebuttal cites to materials which predate the $\text{PM}_{2.5}$ levels testified to by Dr. McClellan and the current 12 $\mu\text{g}/\text{m}^3$ NAAQS. As indicated throughout Dr. McClellan’s testimony, his position is not that one should simply look to the federal NAAQS, whenever issued, but that the epidemiological literature as analyzed by him and as analyzed by both EPA staff and the statutory expert Clean Air Scientific Advisory Committee (“CASAC”) panel has shown that at 12 $\mu\text{g}/\text{m}^3$ and below no reliable evidence of human harm has been found, and that this limit is protective of human health.²¹ Dr. Muller’s references, on the other hand, relate to a standard of 15 $\mu\text{g}/\text{m}^3$, which is not at issue in this case. *See* [Ex. 811](#) at 33-34 (HES report and Krewski comments both predate 2013 NAAQS revisions).

The 2009 Krewski report relied on by the CEOs is an extended follow-up and spatial analysis of the American Cancer Society study data linking particulate air pollution and mortality (without adding or changing data), which report similarly pre-

²⁰ *See* [Ex. 444A](#) at 3089 and [Ex. 441](#) at App. 2 at Att. 1 (2012 publication) at 250, referencing NAAQS in effect in 2012 and earlier NAAQS as part of a historical overview of a paradigm shift at the EPA.

²¹ [Ex. 441](#) at App. 2 at 9.

dates the current NAAQS and the exposure limits testified to by Dr. McClellan.²² It is true that this report states that “[t]here was no evidence of a threshold exposure level within the range of observed PM_{2.5} concentrations.”²³ Similarly, Lepeule reported in 2012 that “[t]he concentration-response relationship was linear without any threshold, even at exposure levels below the U.S. annual 15-µg/m³ standard (U.S. EPA 1997).”²⁴ However, the relevant 3-year averaged “mean concentration of PM_{2.5} across the ACS [American Cancer Society] cohort was 14 µg/m³,” well above that of Minnesota and Wisconsin.²⁵ While the concentration of PM_{2.5} during the American Cancer study twice dipped to values near 8 µg/m³, namely in 1986 in the city of Topeka and in 1996 in the combined study area of Portage-Wyocena-Pardeeville (“Portage”), Table 1 from the Lepeule study, reproduced on the next page, shows that the three-year average mean concentration (on which Dr. McClellan’s opinions as well as the EPA’s NAAQS are based) was never that low in either city, while the averages of individual PM_{2.5}

²² [Ex. 117](#) at Schedule 2 at cover (Krewski).

²³ [Id.](#) at 119, right column.

²⁴ [Ex. 117](#) at Schedule 3 at 968, middle column (Lepeule). Lepeule also notes that numerous other reports “did not show statistically significant associations between PM_{2.5} and all-cause mortality.” [Id.](#) at right column.

²⁵ [Ex. 441](#) at App. 2 at Attachment 2 (McClellan, *Hazard and risk: assessment and management* (book chapter)) at 78. The value of 14 µg/m³ is likely a typographical error, and should read “16 µg/m³”), but has been used here in uncorrected form as a conservative number. See [Ex. 117](#) at Schedule 3 at 967 (Lepeule), reporting an average mean ambient-air PM_{2.5} concentration of the American Cancer study of 15.9 µg/m³. See also Tr. Vol. 7 at 106:18-22 (Dr. Desvousges testified that the average mean ambient-air PM_{2.5} concentration of the studies relied upon was 16 µg/m³).

concentrations over the 1974-2009 study period were 12.2 $\mu\text{g}/\text{m}^3$ for Topeka and 11.4 $\mu\text{g}/\text{m}^3$ for Portage. Meanwhile, Portage's air-concentration has consistently been above or quite a bit above 10 $\mu\text{g}/\text{m}^3$ since 1999.²⁶ Minnesota's $\text{PM}_{2.5}$ concentration on the other hand has been below 10 $\mu\text{g}/\text{m}^3$ since 2001.²⁷

Table 1. Number of participants, mortality, and average $\text{PM}_{2.5}$ levels in the Harvard Six Cities study, 1974–2009.

Characteristic	Six cities (combined)	Steubenville	Kingston–Harriman	St. Louis	Watertown	Topeka	Portage–Wyocena–Pardeeville
Participants (n)	8,096	1,346	1,258	1,292	1,332	1,238	1,630
Person-years (n)	212,067	33,276	33,067	32,225	36,818	32,877	43,804
Cause of death							
All causes [n (%)]	4,495 (55.5)	822 (61.1)	733 (58.3)	827 (64.0)	700 (52.6)	617 (49.8)	796 (48.8)
Cardiovascular (%)	40.8	45.3	41.1	42.2	39.3	37.4	38.6
Lung cancer (%)	7.8	9.0	8.0	8.7	6.6	7.3	6.8
COPD (%)	5.5	4.9	7.0	5.1	4.9	7.3	4.8
1974–2009 average of individual $\text{PM}_{2.5}$ concentrations	15.9	23.6	19.1	16.7	14.0	12.2	11.4

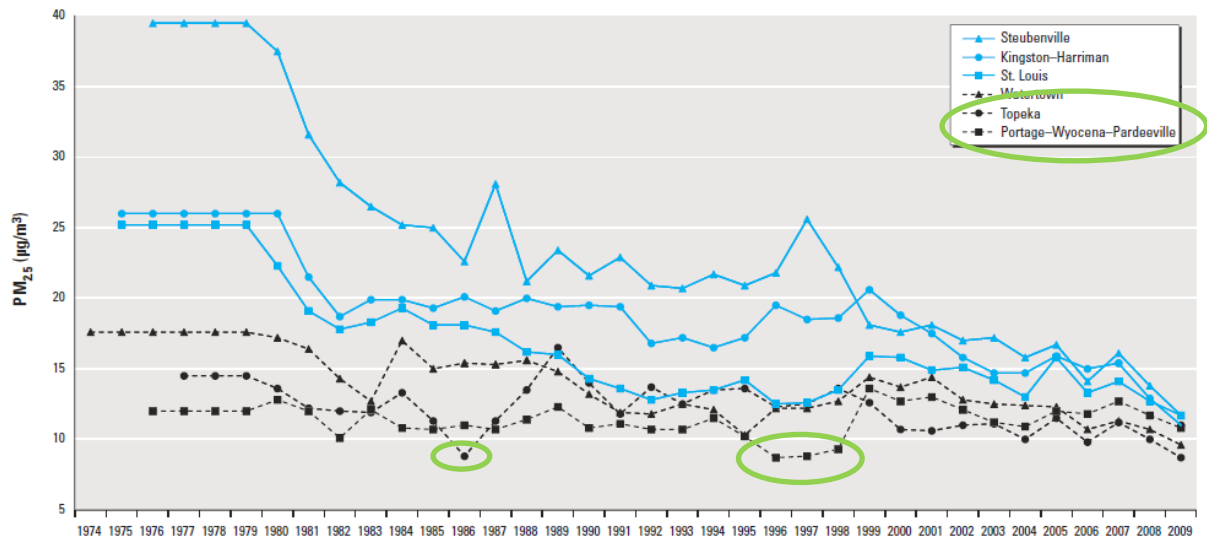


Figure 1. Annual mean $\text{PM}_{2.5}$ levels during 1974–2009 in the Harvard Six Cities study.

Accordingly, there is no conflict between Dr. McClellan's opinions and the sources cited by the CEOs; they simply relate to different items. The Lepeule and Krewski reports do not address the question whether the concentration-response functions are valid in areas

²⁶ [Ex. 117](#) at Schedule 3 at 967 (Lepeule). See also [Ex. 441](#) at Attachment 2 at 13.

²⁷ [Ex. 443](#) at numbered pages 12-14 at Figures 2-5.

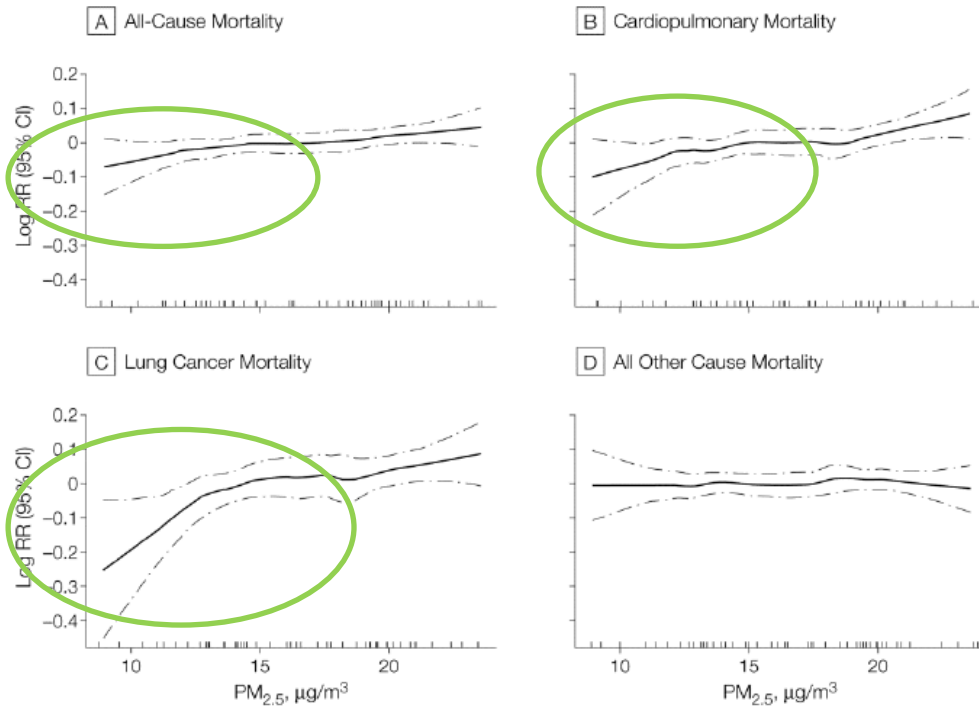
where the 3-year average mean ambient-air concentrations for PM_{2.5} are below 12 µg/m³, while Dr. McClellan's opinions are very specific to that issue and unequivocally both hold that and show why the epidemiological literature has found no such evidence.

As shown in the MLIG's Initial Criteria Pollutants Brief at 33-34, the data from the American Cancer Society study (unaltered by the Lepeule study) shows that a statistically significant effect is not observed below approximately 13.5 µg/m³ for all-cause mortality, nor below 13.8 µg/m³ for cardiopulmonary and lung-cancer mortality, or 13.2 µg/m³ for all-other-cause mortality,²⁸ with the central tendency for each trending below 0 toward the lower exposure end of the spectrum and even the upper confidence bound for lung-cancer mortality trending below 0 at that point (*see* Figure 5 in Appendix 2 of [Dr. McClellan's rebuttal testimony](#) (ellipses added)):²⁹

(Fig. 5 on next page)

²⁸ See [Ex. 441](#), App. 2 at 16.

²⁹ [Ex. 441](#) at App. 2 at 8, 16.



Vertical lines along x-axes indicate rug or frequency plot of mean fine particulate pollution; PM_{2.5}, mean fine particles measuring less than 2.5 µm in diameter; RR, relative risk; and CI, confidence interval.

Figure 5. Non-parametric smoothed exposure-response relationship. Vertical lines along the x-axes indicate a rug or frequency plot of mean fine particulate pollution. CI, confidence interval; PM_{2.5}, fine particles measuring less than 2.5 µm in diameter; RR, relative risk.

As noted in the MLIG’s Initial Criteria Pollutants Brief, “if one were to take this data as true, then exposure would be protective of health.³⁰ In other words, one should be more exposed, because it’s good for health.” As also noted, a more realistic interpretation of the data is that the data is simply unreliable at lower exposure levels.³¹ This is what the EPA found based on thousands of studies:³² the EPA and its scientific and

³⁰ Tr. Vol. 8 at 146:12-148:8 (Muller); Tr. Vol. 7 at 204:23-206:22 (McClellan).
³¹ Tr. Vol. 7 at 204:23-206:22 (McClellan).
³² Tr. Vol. 7 at 86:10-14 (Desvousges); 176:12-19 (McClellan). See also [Ex. 444](#) (continued)

epidemiological advisors determined that considering $PM_{2.5}$ concentrations down to the lowest concentration observed in a study would be “a highly uncertain basis for selecting alternative standard levels.”³³ Dr. McClellan testified that according to the studies relied upon by Drs. Muller, Marshall, and Desvousges, there is no medical evidence of any excess deaths associated with these low ambient concentrations of $PM_{2.5}$, such that in areas in Minnesota and Wisconsin that have mean annual $PM_{2.5}$ ambient-air concentrations averaged over 3 years of $12 \mu\text{g}/\text{m}^3$ or below there is no medical or other scientific basis for projecting mortality related to current or projected levels of $PM_{2.5}$.³⁴ No party has introduced evidence controverting this testimony, although the CEOs had retained Dr. Jacobs, who had ample opportunity to submit even a short surrebuttal if he had in fact disagreed with Dr. McClellan’s testimony.

The above analysis shows that the CEOs’ claim that damages may and can be calculated for Minnesota and the Minnesota Domain using the linear concentration-response functions used by Drs. Marshall, Muller, and Desvousges are not in fact supported by the record, and that Minnesota’s consistent attainment of the $12 \mu\text{g}/\text{m}^3$
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(Federal Register / Vol. 78, No. 10 / Tuesday, January 15, 2013 (Air Quality Designations for the 2012 Primary Annual Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS); Final Rule)) at 3097 (“a substantial amount of new research has been conducted since the close of the science assessment in the last review of the $PM_{2.5}$ NAAQS (U.S. EPA, 2004), with important new information coming from epidemiological studies, in particular. This body of evidence includes hundreds of new epidemiological studies conducted in many countries around the world.”).

³³ [Ex. 444A](#) at 3129-3130.

³⁴ [Ex. 441](#) at 21:3-4; [Ex. 441](#) at App. 2 at 9.

PM_{2.5} limit and the 12 µg/m³ PM_{2.5} NAAQS accordingly bar reliance on the damages as calculated by the testifying experts.

While admitting that Minnesota is in attainment of the PM_{2.5} NAAQS, the CEOs nevertheless claim that “the 98th percentile daily average PM_{2.5} concentration reached 29 µg/m³ in Minneapolis-St. Paul in 2014.”³⁵ The importance of this statement and the conclusions to be drawn therefrom are unclear. However, all of the expert witnesses agree that long-term, rather than 24-hour, exposure is most relevant and is accordingly the subject of the mortality studies upon which they relied.³⁶ Furthermore, even focusing on short-term exposure brings the CEOs no relief, because the PM_{2.5} NAAQS for short-term (24-hour or daily) exposure is 35 µg/m³.³⁷ This limit is based upon numerous and recent epidemiological studies,³⁸ such that reaching a lower limit of 29 µg/m³ is not

³⁵ CEO Initial Criteria Pollutant Brief at 48.

³⁶ See, e.g., [Ex. 115](#) at 22 (Marshall Direct); Tr. Vol. 6 at 57:1-19 (Marshall); Tr. Vol. 7 at 50:4-14, 85:21-25 (Desvousges); Tr. Vol. 8 at 19:10-22 (Muller). See also [Ex. 444A](#) at 3129 (EPA recognized that “the strongest evidence of associations occurs at concentrations around the long-term mean concentration.”)

³⁷ See [Ex. 453](#).

³⁸ See [Ex. 444A](#) at 3088 (“The EPA is retaining the level (35 µg/m³) and the form (98th percentile) of the 24-hour PM_{2.5} standard to continue to provide supplemental protection against health effects associated with short-term exposures.”) *Id.* at 3088-89 (“The final decisions for the primary annual and 24-hour PM_{2.5} standards are within the ranges that CASAC advised the Agency to consider. These decisions are based on an integrative assessment of an extensive body of new scientific evidence, which substantially strengthens what was known about PM_{2.5}-related health effects in the last review, *including extended analyses of key epidemiological studies, and evidence of health effects observed at lower ambient PM_{2.5} concentrations*, including effects in areas that likely met the current [referring to 15 µg/m³] standards. The revised suite of PM_{2.5} standards also reflects consideration of a quantitative risk assessment that estimates public health

(continued)

relevant here.

The CEOs ask the ALJ in this proceeding to make recommendations to the Commission, and ask the Commission to adopt, standards relying on the “professional judgment of the Scientific Advisory Board and the U.S. Environmental Protection Agency.”³⁹ The MLIG joins in this request, but adds that the ALJ and the Commission should furthermore consider the recommendations of the statutory EPA Clean Air Scientific Advisory Committee, which is composed of subject-matter experts.⁴⁰ In the context of this proceeding, the professional judgment of the EPA and its Advisory Board and the CASAC mean that the CEOs, like the Agencies and Xcel Energy, have failed to show that the inhalation of the incremental PM_{2.5} in Minnesota and the Minnesota Domain lead to human-health damages, given the ambient-air concentration of PM_{2.5} in Minnesota and in the Minnesota Domain.

II. ANY CONSIDERATION OF DAMAGES SHOULD BE LIMITED TO A LOCAL GEOGRAPHIC SCOPE

The MLIG agrees with the legislative history as set out in Xcel Energy’s Initial Criteria-Pollutants Post-Hearing Brief, which appears to be in accord with the Commission’s limited territorial jurisdiction as set forth in Minn. Stat. § 216B.08 (duties,

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risks likely to remain upon just meeting the current and various alternative standards.” (Emphasis added.)

³⁹ CEO Initial Criteria Pollutant Post-Hearing Brief at 5.

⁴⁰ See 42 U.S.C. § 7409(d)(2)(A). The independent review function has been performed by CASAC since the early 1980’s. [Ex. 444A](#) at 3088, 3090.

powers, rights, functions, and jurisdiction of the Commission) and § 216B.02, subd. 4 (limiting regulation to public utilities “in this state”).⁴¹

Whether a portion of the primary PM_{2.5} emitted in Minnesota and a portion of the secondary PM_{2.5} formed from SO₂ and NO_x emitted in Minnesota travel outside of Minnesota is not the issue here, as no showing has been attempted to be made in this proceeding that Minnesota PM_{2.5} is inhaled in areas of other states that have an ambient air PM_{2.5} concentration in excess of 12 µg/m³. That failure is the same fundamental flaw that bars calculation of damages in Minnesota. Further, and as in Minnesota, non-health damages have not been separated from health damages, making it impossible, and therefore impracticable, to set environmental damage costs.

As Dr. McClellan testified, there are areas of the United States where inhalation of PM_{2.5} would increase health concerns and concentration-response functions may be applied, namely those limited areas where the PM_{2.5} air concentrations are at least above 12 µg/m³. However, none of the proponents of environmental damages amounts have separated out those areas so that if one had a reliable emission disbursement model and if one had thus calculated reliable inhalation data, such data could then in fact be applied to the limited at-risk receptor populations.⁴²

⁴¹ The MLIG also agrees with the Agencies that the Commission, when establishing environmental costs, is restrained by practicability of quantification and the need of a supporting evidentiary record. (*See* Agencies’ Initial Criteria-Pollutants Post-Hearing Brief at 56.)

⁴² The MLIG rejects the CEOs’ statement that “emission impacts vary more due to source location than due to any other factor.” (*See* CEOs’ Initial Criteria Pollutant
(continued))

For example, if one were to show that a certain amount of PM_{2.5} reached Steubenville, Ohio, and if one were to show that Steubenville currently had an ambient air concentration for PM_{2.5} above 20 µg/m³, as it did in the 1990's,⁴³ then one could review the population for that area, apply the correct concentration-response function and a correct VSL, and calculate the damages, at which point one could consider principles of reciprocity. See [Ex. 400](#) (Gayer Direct). However, no such local PM_{2.5} ambient-air

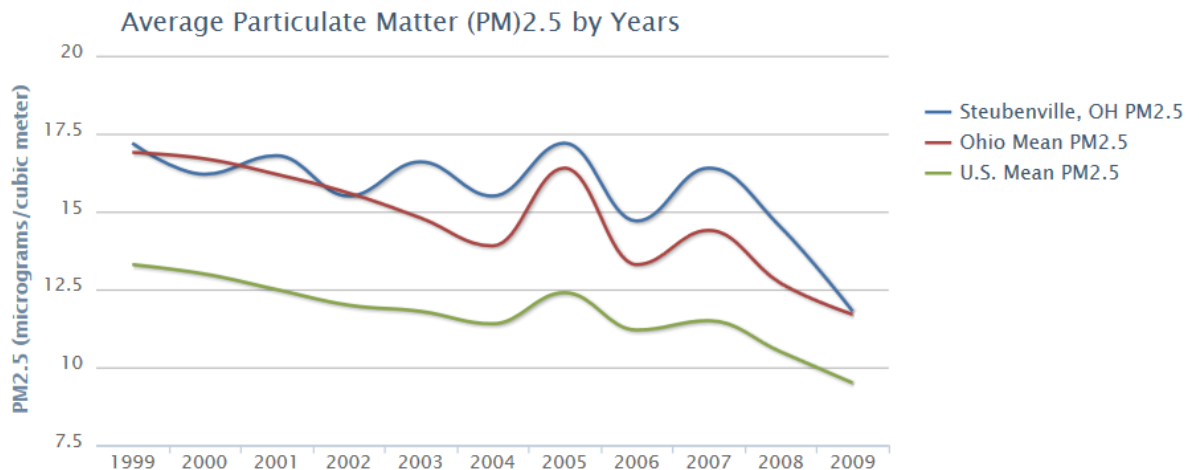
(continued)

Post-Hearing Brief at 33.) All of the testimony showed that for human-health damages the number of receptors is critical, which is why InMap, for example, listed significant damages in Chicago, Illinois, irrespective of the location of the origin (source) of the PM_{2.5}. (See, e.g., *id.* at 63 (“[t]he modelers agree that high-population areas are where damages from these pollutants concentrate.”).)

⁴³ See [Ex. 117](#) at Schedule 3 at 967 (Lepeule). Steubenville’s PM_{2.5} ambient-air concentrations have in fact much improved since the 1990’s, dropping to 11.8 µg/m³ in 2009, the last date for which data is available on [www.USA.com](http://www.usa.com). See <http://www.usa.com/steubenville-oh-air-quality.htm>:

Particulate Matter (PM)_{2.5}

Particulate Matter (PM)_{2.5} is used to describe particles of 2.5 micrometers or less.



concentration data has been gathered by any of the proponents in this case; they each simply applied their concentration-response functions and VSLs irrespective of the local PM_{2.5} ambient-air concentration.⁴⁴ In the absence of the requisite showing, the MLIG respectfully submits that the ALJ can only report that none of the proponents of new environmental-cost values for PM_{2.5}, SO₂, and NO_x have met their burden of proof with respect to the calculation of damages outside of Minnesota or the Minnesota Domain.

If the ALJ were to consider ordering further proceedings to supplement the record with respect to the area outside of Minnesota or the Minnesota Domain, the MLIG respectfully submits that the record does not support that potential exercise. The MLIG has significant concerns about the reliability of the AP2 and InMap models as applied in this proceeding, and joins in the analysis set forth on pages 31 through 47 of Xcel Energy's Initial Criteria-Pollutants Post-Hearing Brief. The MLIG further joins in Dr. Desvousges's concern that the separate modeling of SO₂ and NO_x emissions performed by InMap and AP2⁴⁵ grossly overstates secondary PM_{2.5} formation, as so eloquently stated during Dr. Desvousges redirect examination:

135:20 [Q] If you are modeling SO₂ and NO_x independently, what
135:21 impact does that have?
135:22 A I think when you model these things independently,
135:23 and I'm going to give you my economics explanation
135:24 of this, all right, so I'm not a chemist. But to me
135:25 as an economist what I understand is going on here

⁴⁴ See, e.g., [Ex. 115](#) (Marshall Direct); [Ex. 604](#) (Desvousges Direct); and [Ex. 808](#) (Muller Direct).

⁴⁵ See, e.g., CEOs' Initial Criteria-Pollutants Post-Hearing Brief at 32 n. 8 (admitting that InMap does not assess the interactions between SO₂ and NO_x).

136:1 is that this -- if you do it independently, you've
136:2 got two -- you've got both sulfates and nitrates
136:3 that come out of the stack. And if you assume
136:4 independently, these two things -- you're going to
136:5 do a calculation that's going to say, oh, well,
136:6 these sulfates are going to bind with ammonium in
136:7 the atmosphere and it's going to produce some of the
136:8 things that go into PM_{2.5}. But nitrates, if you do
136:9 it independently you're also assuming that the
136:10 nitrates are going to be bonding with that same
136:11 ammonium that's out there. And there's only a
136:12 certain amount of ammonium that's out there so that
136:13 as a result of that, if you just do it independently
136:14 I think what the assumption is is that you're going
136:15 to end up with an overstatement because you've
136:16 overstated the amount of chemical combination that
136:17 can take place.

136:18 You know, it's like -- you know, I like
136:19 to bake, all right. And so it's like, you know, if
136:20 I've got a recipe and I'm sitting there and I've got
136:21 two cups of almond flour and I'm trying to make this
136:22 paleo banana bread. I can't, you know, if I'm going
136:23 to do that, that's fine, but I don't have those same
136:24 two cups of flour to make a whole lot of these
136:25 really nice cookies that I also like to make.

137:1 There's only two cups of flour to go around.

137:2 So that's what I think is going on here.

137:3 So you can't make an assumption that this is
137:4 available to you.

Based on the record as developed, including the EPA's restriction of the use of reduced-form models such as AP2⁴⁶ to a 50 km radius, neither AP2 nor InMap should be relied upon for a national evaluation. But based on Dr. Desvousges's own concerns

⁴⁶ InMap is so new it has not even been independently evaluated, while a peer-review article has apparently been rejected. This fact alone should give the ALJ and the Commission great pause before relying on the program that generates the highest damages without even considering non-human health damages.

about the reliability of CAMx for the purposes of this proceeding, as opposed to other uses such as the Cross-State Air Pollution Rule (“CSAPR”) process,⁴⁷ it is similarly not appropriate to employ CAMx for a national evaluation. Dr. Desvousges has credibly testified that the uncertainty already present in the damages calculations for Minnesota and a 100 mile rectangular grid around Minnesota, even using the complex CAMx photochemical grid model, becomes significantly greater as the distance from the source increases.⁴⁸ As set forth in the MLIG’s Initial Criteria-Pollutants Post-Hearing Brief,

While the EPA used CAMx for analysis under the Cross-State Air Pollution Rule (“CSAPR”),⁴⁹ Dr. Desvousges explained that there is a difference between the way CAMx was used by the EPA in the CSAPR process and the way the model is used here, “because in this particular proceeding what we are trying to do is to come up with reliably estimated externality values that involve combining information with a lot of different uncertainties. What EPA [was] looking at [in the CSAPR process] [was] trying to predict various changes in air emissions that would happen under different regulatory scenarios.”⁵⁰ Accordingly, EPA’s correct use of CAMx for the CSAPR analysis has no relevancy to endorsing that, or any other model, for national calculations of the sort made here.⁵¹

In the absence of reliable data, the MLIG accordingly respectfully submits that nationwide consideration of damages is “impractical” as that term has been defined for

⁴⁷ See Tr. Vol. 8 at 68:5-9 (CSAPR); Tr. Vol. 7 at 61:15-62:9 (Desvousges).

⁴⁸ See, e.g., [Ex. 609](#) at at 35:8-14, 45:26-46:2; Tr. Vol. 7 at 115:2-116:6, 133:24-134:13, and 135:16-18.

⁴⁹ Tr. Vol. 8 at 68:5-9.

⁵⁰ Tr. Vol. 7 at 61:15-62:9 (Desvousges).

⁵¹ MLIG Initial Criteria-Pollutant Post-Hearing Brief at 48-49.

use in these proceedings. As much as “there is no valid reason to support [the use of] deliberately inaccurate values,”⁵² there is also no valid reason to support the use of data that is known to be wrong or as to the reliability of which there is grave doubt. As ALJ Klein so aptly recognized in 1996, it is not practicable for the Commission to establish values for pollutants for which there is just not enough data in this record to establish a value.⁵³ Thus, any consideration of damages, including agricultural, materials, and visibility damages, should be limited to a local geographic scope due to the significant uncertainties and unreliability of national scope calculations by the models.

CONCLUSION

At the outset of this proceeding, the MLIG urged the Commission and the Administrative Law Judge to proceed in this proceeding in a statistically sound, evidence-based approach,⁵⁴ an approach which has been embraced by the other parties.⁵⁵

⁵² CEOs’ Initial Criteria-Pollutants Post-Hearing Brief at 25.

⁵³ See [Ex. 305](#) (March 22, 1996, Findings of Fact, Conclusions, Recommendation and Memorandum (ALJ Allan W. Klein), Docket 93-583) at 10, Finding of Fact 29.

⁵⁴ Tr. Vol. 6 at 24.

⁵⁵ See, e.g., CEO Phase II—Criteria Pollutants Initial Post-Hearing Brief at 17, 18, 19, 27, 29, 31; Agencies’ Initial Criterial Pollutants Post-Hearing Brief at 2 (“reliable”), 3 (“accurate” and “reliable”), 12 (“accurate”), 13 (“credible results”), 17 (“reliable” and “accurate”), 19-20 (“accurate”), 26-39 (model performance testing), 41, 43 (“credible”), 56 (“decision needs to be supported by the evidence”); Xcel Energy Initial Criterial Pollutants Post-Hearing Brief at 1 (“externality values should be based on the best and most accurate method...”), 6 (methodology must *inter alia* “[d]evelop the most accurate and credible estimates for use in Minnesota for PM_{2.5}, SO₂, and NO_x environmental values” and “[u]se sound scientific and economic models”).

The MLIG submitted that the outcome of this proceeding should be based on empirical evidence, sound analysis, that it should avoid undue speculation, and that it should be respectful of Minnesota and Minnesota commerce and industry.⁵⁶

This phase of the case begins and ends with the burden of proof. Neither the CEOs, nor the Agencies, nor Xcel can meet their burden of proof, because each of their experts has failed to make the required proximate-cause connection between PM_{2.5} emission and PM_{2.5} formation from SO₂ and NO_x emitted in Minnesota and human-health damages in a low-PM_{2.5} ambient-air environment, as testified to by Dr. McClellan and recognized by the EPA and the State of California based on epidemiological literature and studies. Similarly, the human-health damages calculations outside of Minnesota do not take this deficiency into consideration, causing a complete lack of proof with respect to the human-health damages. Additionally, and absent a breakout of the remaining (non-health) damages studied by Dr. Desvousges and Dr. Muller, no evidence as to any admissible damages exists in the record.

The MLIG additionally submits that any consideration of non-human-health damages, such as agricultural, materials, and visibility damages, should be limited to a local geographic scope due to the significant uncertainties and unreliability of national scope calculations by the models, as testified to by Dr. Desvousges. Acceptance of a national geographic scope would accordingly be neither statistically sound nor based upon reliable evidence.

⁵⁶ Tr. Vol. 6 at 24.

Respectfully submitted,

STOEL RIVES LLP

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s/ Marc A. Al

Andrew P. Moratzka (322131)

Marc A. Al (247923)

33 South Sixth Street, Suite 4200

Minneapolis, MN 55402

Telephone: 612-373-8800

Facsimile: 612-373-8881

andrew.moratzka@stoel.com

marc.al@stoel.com

**ATTORNEYS FOR THE MINNESOTA
LARGE INDUSTRIAL GROUP**