STOEL RIVES LLP

ATTORNEYS AT LAW

33 South Sixth Street, Suite 4200
Minneapolis, Minnesota 55402
Tel. (612) 373-8800
Fax (612) 373-8881
www.stoel.com

MARC A. AL
Direct (612) 373-8801
marc.al@stoel.com

July 15, 2016

VIA E-FILING AND U.S. MAIL

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

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

Dear Mr. Wolf:

Enclosed for filing please find the following:

1. Minnesota Large Industrial Group's Exceptions to the Findings of Fact, Conclusions, and Recommendations of the Administrative Law Judge Regarding Phase II (Criteria Pollutants Track); and

2. Certificate of service with service list.

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

Very truly yours,

Stoel Rives LLP

Marc A. Al

Encl: 8 hard copies

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

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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
EXCEPTIONS TO THE FINDINGS OF FACT, CONCLUSIONS, AND
RECOMMENDATIONS OF THE ADMINISTRATIVE LAW JUDGE
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

TABLE OF CONTENTS

<div align="right">**Page**</div>

TABLE OF AUTHORITIES

Cases

TABLE OF AUTHORITIES
(continued)

Page

Statutes

The Minnesota Large Industrial Group ("MLIG"), an ad hoc coalition of large industrial energy consumers whose energy costs can constitute approximately 30% of their overall cost of production,[1] hereby respectfully submits the following exceptions to the June 15, 2016, Findings of Fact, Conclusions, and Recommendations (the "Recommendations") of the Administrative Law Judge ("ALJ") regarding Phase II (Criteria Pollutants) based upon which it submits that the Recommendations must be rejected. Additionally, various Findings of Facts and Conclusions must be modified, as set forth in the attached Appendix.

INTRODUCTION

The Minnesota Legislature tasked this Commission in 1993 with quantifying and establishing a range of environmental costs associated with each method of electricity generation, to the extent practicable,[2] and directed utilities to use the values so established in all proceedings before the Commission, including resource plan and

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[1]   As the MLIG has noted with respect to the CO_2 phase, this proceeding is somewhat unique in that the large industrials also represent the economic interests of much smaller commercial ratepayers and the interests of regular households. While the (Division of Energy Resources) ("DOC") is a party to the proceeding, the Attorney General's Office as consumer advocate is not. And the DOC and the Minnesota Pollution Control Agency ("MPCA," and jointly with the DOC the "Agencies") have advocated very high damages 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.

[2]   "Practicable" has been defined by the Commission in its January 3, 1997, Order Establishing Environmental Cost Values, to mean "feasible" or "capable of being accomplished." Order Establishing Environmental Cost Values dated January 3, 1997, at 10-11.

certificate of need proceedings. Minn. Stat. § 216B.2422, subd. 3(a).

The Commission interpreted the statute in its January 3, 1997, Order Establishing Environmental Cost Values in Docket No. E-999/CI-93-583, which interpretation was upheld by the Minnesota Court of Appeals.[3] When the Minnesota Supreme Court denied review, the Commission's interpretation of the environmental-cost statute became law.[4]

In her June 15, 2016, Recommendations, the ALJ *sua sponte* adopted an entirely novel reading of the environmental-cost statute, effectively ablating the causal link between the emission of Criteria Pollutants and the damages this Commission must quantify. (*See* Recommendations at 108.) Presumably without realizing the significance of her reading of the statute, the ALJ's decision renders the statute unconstitutional, because the Due Process Clause of the Fourteenth Amendment to the United States Constitution and the Due Process Clause of the Minnesota Constitution require that such economic regulation anv intervention have a reasonable relationship to a proper legislative purpose. *Nebbia v. New York*, 291 U.S. 502, 510-11 (1934) (*citing* U.S. Const. amend. XIV); *Astrue v. Capato*, 132 S. Ct. 2021, 2033 (2012) (explaining that rational-basis analysis evaluates whether a regime is reasonably related to the government's interests sought to be addressed by the regime); *State v. Wiseman*, 816

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[3]   *See In re Quantification of Envtl. Costs Pursuant to Laws of Minn. 1993, Chapter 356, Section 3*, 578 N.W.2d 794 (Minn. Ct. App. 1998), rev. den., 1998 Minn. LEXIS 546 (Minn. Aug. 18, 1998).

[4]   *See In the Matter of Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3*, Docket No. E-999/CI-93-583, Order Establishing Environmental Cost Values (Jan. 3, 1997) at, for example, pages 15, 16, 18, 22, 28, 29, and 30.

N.W.2d 689, 692 (Minn. Ct. App. 2012) ("[T]he due-process protections of the United States Constitution and the Minnesota Constitution are coextensive") (*citing Sartori v. Harnischfeger Corp.*, 432 N.W.2d 448, 453 (Minn. 1988)); Minn. Const. art. 1, § 7. The legislation can be neither arbitrary nor discriminatory. *Nebbia* at 510-11; *Astrue* at 2033. Under the ALJ's reading of Minn. Stat. § 216B.2422, subd. 3(a), the Legislature would be instructing the Commission to determine damages without any proximate-cause connection to an underlying event, thus allowing for complete and arbitrary setting of damages numbers in violation of the Fifth and Fourteenth Amendments to the United States Constitution and Article 1, § 7 of the Minnesota Constitution, as well as Minn. Stat. § 14.69(f). There is no reason or basis for such a reading, and the MLIG accordingly urges the Commission to reject the ALJ's impetuous *sua sponte* statutory analysis, to return to the plain reading of the statute as previously construed in the Commission's 1997 Order, and to retain the constitutionality of Minn. Stat. § 216B.2422, subd. 3(a) by insisting on a causal relationship between emissions and the damages the Commission must quantify. *See, e.g.*, Minn. Stat. § 14.69(a) (administrative agency decisions cannot be in violation of constitutional provisions) & Minn. Stat. § 14.69(f) (administrative agency decisions cannot be arbitrary and capricious).

The MLIG secondarily objects to the ALJ's Recommendations because the ALJ erroneously speculated that future medical studies may at some point in time potentially establish causation between emissions and health-effects damages in areas with lower PM$_{2.5}$ ambient air concentrations, even if such causation is currently lacking. (*See* Recommendations at 108.) From this grossly speculative and uncertain basis of potential

future medical findings and developments to which no witness testified, the ALJ concluded that the MLIG did not meet its burden of proof. (*Id.*) The ALJ's conclusion is not only speculative, but also lacks a factual basis.

Third, as in her April 15, 2016, CO_2 Recommendations, the ALJ has summarized much of the parties' positions and a good portion of the pre-filed testimony, but ignored most of the live testimony. For the most part, the ALJ did not make findings in the "Findings of Fact" portion of the Recommendations. For example, the ALJ did not weigh the evidence in her "Findings." Nor did the ALJ state in her "Findings of Fact" what she believed the evidence showed. Instead, the ALJ reached "Conclusions," stating that one party or another had shown particular matters by a preponderance of the evidence, and relying for such conclusions on various "Findings of Fact" paragraphs, but those paragraphs only contain the parties' various contentions.[5] Where the ALJ has made actual findings and conclusions, they frequently lack record support or are directly contradicted by the record. Such findings and conclusions must be rejected.[6]

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[5]   *See, e.g.*, Conclusion 54 and footnote 640, relying on "Findings of Fact" 297, 299, 301, and 303-304, which "Findings of Fact" contain contentions by the Agencies and CEOs, without analysis by the ALJ.

[6]   *See, e.g.*, Minn. Stat. § 14.69 (administrative agency decisions must be supported by substantial evidence in view of the entire record as submitted and may not be arbitrary or capricious); 1997 Order at 12 (Commission previously held that it would quantify costs "for which there is reasonable record support"); *In re Quantification of Envtl. Costs Pursuant to Laws of Minn. 1993*, 578 N.W.2d at 799; *In re Grand Rapids PUC*, 731 N.W.2d 866, 871 (Minn. Ct. App. 2007) (agency decision is arbitrary and capricious if it reflects the agency's will and not its judgment (*citing In re Excess Surplus Status of Blue Cross & Blue Shield of Minn.*, 624 N.W.2d 264, 278 (Minn. 2001))).

The factual crux of the MLIG's case is that in calculating health-effects damages,

Drs. Desvousges (witness for Xcel Energy), Muller (witness for the Minnesota

Department of Commerce (Division of Energy Resources) ("DOC"), and the Minnesota

Pollution Control Agency ("MPCA" and jointly with the DOC the "Agencies")), and

Marshall (witness for the Clean Energy Organizations ("CEOs")) each assumed a

relationship for an increase in health-effects damages, over and above a baseline, per 10

$\mu g/m^3$ change in the Criteria Pollutant, but they assumed that such increased health

effects occurred in a linear fashion irrespective of the baseline (or local) air concentration

of the Criteria Pollutant in which the Criteria Pollutant was inhaled and where damages

were calculated.[7] This linear concentration-response relationship is key to the damage

values calculated by each of Drs. Marshall, Muller, and Desvousges.[8] But affirmative

evidence offered by the MLIG in the form of (a) epidemiological expert testimony of Dr.

Roger O. McClellan, DVM, MMS, DSC, (b) official findings of the United States

Environmental Protection Agency ("EPA"), relying upon thousands of epidemiological

studies and vetted by the EPA's Clean Air Scientific Advisory Committee ("CASAC"),

and (c) admissions on cross-examination by the proponents' experts, showed that the

causal connection between the emission of Criteria Pollutants and the assumed linear

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[7]   *See, e.g.*, Ex. 609 at 44; Ex. 811 at 33 (Muller surrebuttal); Transcript ("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.

[8]   *See* Ex. 604 at 6, Table 1; Ex. 808 at 72, Table 11; Ex. 115 at 27, Table 1.

concentration-response relationship for an increase in health effects is invalid in areas where the 3-year average $PM_{2.5}$ baseline air concentration is below $12 \, \mu g/m^3$. Importantly, the MLIG also showed (and the ALJ found in Finding 278 and Conclusion 51) that the $PM_{2.5}$ ambient air concentration in Minnesota and Wisconsin has generally been below or significantly below that $12 \, \mu g/m^3$ 3-year average $PM_{2.5}$ baseline air concentration,[9] rendering the assumed linear concentration-response relationship for an increase in health-effects damages invalid in Minnesota and Wisconsin, and further rendering that concentration-response relationship invalid in many other areas of the United States. As a result, each of the proponents' experts' health-damages opinions is invalid. Overlooking evidence, misreading epidemiological studies, and contradicting the record, the ALJ found to the contrary. The MLIG respectfully seeks correction of these errors.

Finally, although Drs. Muller and Desvousges testified that they had calculated damages relating to agriculture, materials, and visibility[10] (Dr. Marshall did not consider impacts on agriculture, materials, or visibility[11]), Drs. Muller and Desvousges did not

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[9]   *See* June 15, 2016, ALJ Finding of Fact 278 (*citing* Ex. 441, App. 2, at 6-7, 18 (McClellan Rebuttal)).

[10] *See* Ex. 604; Ex. 808; Ex. 115. Dr. Marshall has testified that damages relating to agriculture, materials, or visibility "don't contribute very much to the overall numbers." (Tr. Vol. 6 at 188:2-14.) Dr. Muller agreed that "most of the damage in terms of the monetized component is associated with human health effects." (Tr. Vol. 8 at 28:17-18.)

[11] Tr. Vol. 6 at 188:2-4.

break out those damages from the health damages in any of their testimony,[12] such that there is no record evidence of the quantity of non-health damages. Because the record evidence establishes that all of the proponents' nationwide Criteria Pollutants health-effects-damages calculations are invalid, because those damages have not been provided on a local geographic basis, and because the Agencies and Xcel Energy did not separately set forth the remaining non-health damages, they each failed to meet their burden of proof, leaving the Commission with no evidence to support any change in the current values for $PM_{2.5}$, SO_2, or NO_x. Because the ALJ's contrary findings and conclusions are either not supported by the record or are directly contradicted by the record, the ALJ's Recommendations must be rejected.

ANALYSIS

I. THE LEGAL STANDARD

A. The Commission's powers and limitations are well established

The Commission has broad authority to set rules, standards and practices governing service by public utilities.[13] But it bears emphasis that the Minnesota Supreme Court has held that

> "[i]t is elementary that the Commission, being a creature of statute, has only those powers given to it by the legislature." *Great Northern Railway Co. v. Public Service Comm'n*, 284

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[12]   *See, e.g.*, Ex. 604 (Desvousges Direct) at 5:1-11; Ex. 808 (Muller Direct) at 7, 38, 39, 59; Tr. Vol. 7 at 45:24-46:12, 47:1-12 & 130:12-21 (Desvousges and Muller did consider impacts on agriculture, materials, and visibility).

[13]   *See, e.g., Hoffman v. N. States Power Co.,* 764 N.W.2d 34, 44 (Minn. 2009) ("The MPUC further enjoys broad power to 'ascertain and fix just and reasonable' policies for all public utilities." (citation omitted)).

> Minn. 217, 220, 169 N.W.2d 732, 735 (1969). The
> legislature states what the agency is to do and how it is to do
> it. While express statutory authority need not be given a
> cramped reading, any enlargement of express powers by
> implication must be fairly drawn and fairly evident from the
> agency objectives and powers expressly given by the
> legislature.

Peoples Nat'l Gas Co. v. Minn. Pub. Utils. Comm'n, 369 N.W.2d 530, 534 (Minn. 1985).

Furthermore, "[n]either agencies nor courts may under the guise of statutory interpretation enlarge the agency's power beyond that which was contemplated by the legislative body." *Id.* (*quoting Waller v. Powers Dep't Store*, 343 N.W.2d 655, 657 (Minn. 1984)). When there is no ambiguous language to construe, courts will look to the "necessity and logic" of the situation. *Id.*; Minn. Stat. § 645.16(1). At the same time, the general rule of a reviewing court is to "resolve any doubt about the existence of an agency's authority *against* the exercise of such authority." *In re Qwest's Wholesale Serv. Quality Standards*, 702 N.W.2d 246, 259 (Minn. 2005) (emphasis added) (*citing In re N. States Power Co.*, 414 N.W.2d 383, 387 (Minn. 1987)). Based on long-standing guidance from the courts, the MLIG urges the Commission to reject the ALJ's novel reading of the environmental-cost statute.

B. Minn. Stat. § 216B.2422, subd. 3(a) requires a causal connection between emissions and the environmental cost values "associated" with those emissions

1. <u>Causation is a constitutional requirement</u>[14]

As set forth in the Introduction, when states exercise their police power to adopt economic regulation and intervention policies deemed necessary to promote public welfare, the means selected must have a reasonable relationship to a proper legislative purpose and can be neither arbitrary nor discriminatory. *Nebbia*, 291 U.S. at 510-11.[15] As applied to the states, this "rational basis approach" is founded on the Due Process Clause of the Fourteenth Amendment to the United States Constitution. *See, e.g.*, *Astrue*, 132 S. Ct. at 2033 (explaining that rational-basis analysis evaluates whether a regime is reasonably related to the government's interests sought to be addressed by the regime);

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[14] To be sure, the MLIG has not argued before, and does not argue here, that Minn. Stat. § 216B.2422, subd. 3(a) is unconstitutional. The MLIG seeks to avoid the ALJ *rendering* the statute unconstitutional by her novel reading of the statute. Accordingly, the Commission's 1997 analysis of its inability to declare a statute unconstitutional is not applicable here. *See* 1997 Order at 6 (*citing Neeland v. Clearwater Mem'l Hosp.*, 257 N.W.2d 366, 368 (Minn. 1977); *Holt v. Bd. of Med. Examiners*, 431 N.W.2d 905, 906 (Minn. Ct. App. 1988)).

[15] The Court held that "[t]he Fifth Amendment, in the field of federal activity, and the Fourteenth, as respects state action, do not prohibit governmental regulation for the public welfare. They merely condition the exertion of the admitted power, by securing that the end shall be accomplished by methods consistent with due process. And the guaranty of due process, as has often been held, demands only that the law shall not be unreasonable, arbitrary or capricious, and *that the means selected shall have a real and substantial relation to the object sought to be attained*. It results that a regulation valid for one sort of business, or in given circumstances, may be invalid for another sort, or for the same business under other circumstances, because the reasonableness of each regulation depends upon the relevant facts." *Nebbia*, 291 U.S. at 510-11 (emphasis added; footnotes omitted).

Armour v. City of Indianapolis, 132 S. Ct. 2073, 2080 (2012) (*citing United States v. Carolene Prods. Co.*, 304 U.S. 144, 152 (1938); *New Orleans v. Dukes*, 427 U.S. 297, 303 (1976)).

"Minnesota courts consider federal and state due process protections to be nearly identical." *State v. Associated Med. Assur. Ltd.*, No. 27-CV-08-1912, 2010 Minn. Dist. LEXIS 28, at *10 (D. Minn. July 27, 2010) (*citing Arcadia Dev. Corp. v. City of Bloomington*, 552 N.W.2d 281, 288 (Minn. Ct. App. 1996)); *see also Wiseman*, 816 N.W.2d at 692 ("[T]he due-process protections of the United States Constitution and the Minnesota Constitution are coextensive") (*citing Sartori*, 432 N.W.2d at 453). But contrary to federal law, when Minnesota courts apply a rational-basis review, they are "unwilling to hypothesize a rational basis to justify a classification, as the more deferential federal standard requires." *Everything Etched, Inc. v. Shakopee Towing, Inc.*, 634 N.W.2d 450, 453 (Minn. Ct. App. 2001) (*quoting State v. Russell*, 477 N.W.2d 886, 889 (Minn. 1991)). Instead, Minnesota courts require the proponent of a statute's constitutionality to establish "a reasonable connection between the actual, and not just the theoretical, effect of the challenged classification and the statutory goals." *Id.* (*quoting Russell*, 477 N.W.2d at 889).

As already noted in the Exceptions to the ALJ's April 15, 2016, Phase I (CO_2) Recommendations, it is axiomatic that the law thus cannot impose a liability, deprive citizens of resources, or prohibit them from engaging in an otherwise lawful activity based upon speculation and admitted uncertainty as to whether or not the activity is in fact causing harm. *See, e.g.*, Minn. Stat. § 14.69(f). Proof of causation of harm is a

fundamental and constitutional prerequisite to regulation. Causal uncertainty cannot be the basis for regulation. Fundamental notions of due process require more than guesswork, speculation, and regulation that lacks a current, actual empirical and factual basis. *Citizens Advocating Responsible Dev. v. Kandiyohi Cty. Bd. of Comm'rs*, 713 N.W.2d 817, 834 (Minn. 2006).

Where possible, Minnesota statutes must be read to as to preserve their constitutionality, as the Legislature is presumed not to intend to violate the federal or state Constitutions. Minn. Stat. § 645.17(3). The term "associated with" in Minn. Stat. § 216B.2422, subd. 3(a) must therefore include a causal relationship between the emission of Criteria Pollutants and the harm to be quantified by the Commission in this proceeding.

2. Causation is required by Minn. R. 1400.7300

According to Commission precedent, Minn. R. 1400.7300, subp. 5 applies in this proceeding.[16] The rule requires that "[t]he party proposing that certain action be taken must prove the facts at issue by a preponderance of the evidence, unless the substantive law provides a different burden or standard." The standard requiring the establishment of "facts" does not allow for the substitution of conjecture or pure speculation in lieu of a causal connection between an event and the damages resulting therefrom that the Commission is to quantify. Applying Minn. R. 1400.7300, subp. 5, the term "associated

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[16]   *See In the Matter of Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3*, Docket No. E-999/CI-93-583, Order Establishing Environmental Cost Values (Jan. 3, 1997) at 13-14.

with" must accordingly include a causal relationship between the emission of Criteria Pollutants and the harm to be quantified by the Commission in this proceeding.

> 3. The Commission has previously construed Minn. Stat. § 216B.2422, subd. 3(a) to require a causal connection between emissions and the environmental-cost values "associated" with those emissions

Consistent with the above foundational legal principles regarding proof of harm and causation, the Commission set forth the legal standard in its January 3, 1997, Order Establishing Environmental Cost Values in Docket No. E-999/CI-93-583. That decision was affirmed by the Court of Appeals in *See In re Quantification of Envtl. Costs Pursuant to Laws of Minn. 1993, Chapter 356, Section 3*, 578 N.W.2d 794, and the Minnesota Supreme Court denied review on August 18, 1998. With the denial of review, the Commission's 1997 interpretation of Minn. Stat. § 216B.2422 became the law, which the Commission is now bound to apply.

The Commission's 1997 Order correctly demanded proof of causation between emissions and damages to quantify environmental-cost values. The Order analyzed the "harm associated" with various gasses and particles in terms of "causation." For example, the Commission considered on page 15 of the 1997 Order that the statute required "quantifying the damage they [other pollutants] cause in Minnesota." The Commission further used the terms "damages caused by emissions originating in plants," "emissions do not cause ambient air concentrations to,"[17] and equated "harm associated"

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[17] *In the Matter of Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3*, Docket No. E-999/CI-93-583, Order (continued)

with "resulting in" exacerbation of respiratory and cardiovascular problems.[18] The Commission further equated "harm associated" with "cause" on pages 15 and 22 of the 1997 Order, and on page 28 of the Order rejected an arithmetic approach to methane damages "in the absence of more direct evidence that methane causes this range of damage." The Commission further discussed "harm associated" with mercury in terms of "effect" and damages causation.[19] On page 29 of the Order the Commission rejected establishment of recreation-damages resulting from mercury in the absence of a "quantitative link" between mercury-based fishing advisories and recreation choices and rejected "anecdotal suggestions of the link." On page 30 of the 1997 Order the Commission rejected the setting of mercury damages due to its inability to "quantify the damage 'resulting from' mercury emitted from electric generating plants…" The MLIG respectfully submits that the Commission's 1997 interpretation of the statute, affirmed by the Court of Appeals, is precedential, *see In re Whitehead*, 399 N.W.2d 226, 229 (Minn. Ct. App. 1987) (agency may not abandon its own precedent without reason or explanation) (*citing Peoples Natural Gas Co. v. Minn. Pub. Utils. Comm'n*, 342 N.W.2d 348, 352-53 (Minn. Ct. App. 1983); *McHenry v. Bond*, 668 F.2d 1185, 1192 (11th Cir. 1982)), and requires rejection of the ALJ's conclusion that the statute does not require causation.

(continued)

Establishing Environmental Cost Values (Jan. 3, 1997) at 16.

[18] Order Establishing Environmental Cost Values (Jan. 3, 1997) at 18.

[19] *Id.* at 28.

4. Dictionary definitions of "associated with" confirm the Commission's prior reliance on "causation"

Minn. Stat. § 216B.2422, subd. 3(a) states, in relevant part, that "[t]he commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation." The ALJ here held that "[t]he 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." (Recommendation at 108.)

In reviewing the first of these two ALJ sentences, the Commission must keep in mind that the object of all interpretation and construction of laws is to ascertain and effectuate the intention of the legislature. Minn. Stat. § 645.16, first paragraph. Every law shall be construed, if possible, to give effect to all its provisions. *Id.* Further, when the words of a law in their application to an existing situation are clear and free from all ambiguity, the letter of the law shall not be disregarded under the pretext of pursuing the spirit. Minn. Stat. § 645.16, second paragraph. Review by the appellate courts of the Commission's legal determinations courts is *de novo. See, e.g., In re Minn. Power for Auth. to Increase Rates for Elec. Serv.*, 838 N.W.2d 747, 757 (Minn. 2013).

Looking to the plain meaning of "association," even apart from the constitutional and statutory implications discussed above, one can look to dictionary definitions that universally describe the verb "associate" as "to join or connect in any of various intangible or unspecified ways (as in general mental, legendary, or historical relationship, in unspecified causal relationship, or in unspecified professional or scholarly

relationship,"[20] "something that is closely connected with or that usually accompanies another,"[21] "closely connected, joined, or united with another (as in interest, function, activity, or office),"[22] "anything usually accompanying or associated with another; an accompaniment or concomitant,"[23] "to connect or join together, combine,"[24] and "one that habitually accompanies or is associated with another; an attendant circumstance."[25] In short, as used in the statute, "associated" is synonymous with a "causal" relationship.

The ALJ's novel reading of the environmental-cost statute, effectively ablating the causal link that is a prerequisite to the proponents' burden of proof, cannot be accepted by the Commission. Indeed, the ALJ conceded that if the statute required "cause" or "causation," those same proponents had not met their burden of proof. (*See* Recommendations at 108.) This is in fact borne out by the testimony on cross-examination, as set forth in detail in sections IV and V below.

The ALJ also rejected "medical causation." (Recommendations at 108.) But all of the studies on which every expert in this proceeding relied to connect emissions with damages were based on epidemiological — that is medical — studies. The question is thus whether those studies medically connected emissions with health-effects damages.

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[20]   *Webster's Third New International Dictionary* 132 (2002).

[21]   *Id.*

[22]   *Id.*

[23]   *The Randomhouse Dictionary of the English Language* 90 (1973).

[24]   *The American Heritage Dictionary of the English Language* 109 (4th ed. 2000).

[25]   *Id.*

To say that no "medical causation" is required, is saying that no causation is required. As shown by the constitutional requirements, the requirement of Minn. R. 1400.7300, subp. 5, the Commission's application of the statute in its 1997 Order, and the plain reading of the statute looking at three well-respected dictionaries, the ALJ's summary statement lacks a legal or factual basis, is in fact unsupportable as a matter of law, and must be rejected.

C. The Commission's decision cannot be based on speculation

Rooted in principles of due process, the Commission in the original proceeding adopted ALJ Klein's recommendation to not adopt high values that were based on speculation and not data.[26] Pursuant to the Commission's 1997 Order, it is not sufficient in this proceeding to simply make a "call for immediate action" as the Agencies and the CEOs have done.[27]

In the original proceeding, the Commission held that "[h]owever enticing the MPCA's calls to immediate action may be, they do not add information that makes it any more practicable to quantify damages on the basis of this record nor do they alter the legislature's directive that the Commission is to quantify values only if (to the extent) it is

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[26]   Ex. 305 (Mar. 22, 1996, Findings of Fact, Conclusions, Recommendation and Memorandum (ALJ Allan W. Klein), Docket 93-583) at ¶ 31 ("At some point, the degree of uncertainty associated with a proposed value becomes so great that there is insufficient evidence to meet the preponderance standard, and the value cannot be adopted."). The Commission recognized ALJ Klein's recommendation as "well-reasoned and firmly based in the record," (Jan. 3, 1997, Order Establishing Environmental Cost Values at 26), and adopted the decisions and analysis in the ALJ's Report (*id.* at 34, ¶ 5).

[27]   Agencies April 15, 2016, Post-Hearing Reply Brief at 43.

feasible (practicable) to do so."[28] Instead, the ALJ was to consider, and the Commission

must now consider that there are

> varying levels or depths of uncertainty, a continuum of
> uncertainty involved in the science underlying the valuation
> of externalities. At some levels of uncertainty it is still
> practicable (feasible) to quantify environmental values. . .
> However, there is also a point on the uncertainty continuum
> where it becomes infeasible to quantify environmental costs
> even though the Commission is convinced that such costs
> exist.[29]

In its 1997 Order, the Commission considered the following apt analogy:

> not all fogs are of the same thickness: in some fog, it is still
> possible to land an airplane without instrumentation while in
> thicker fog, this task becomes impossible despite the certainty
> that both land and airplane exist.[30]

By adopting a novel and unsupportable reading of the environmental-cost statute,

abrogating the causation requirement, and relying on sheer speculation about potential

future scientific developments and only on the basis of that novel reading and potential

future scientific developments sustaining the proponents' burden of proof, the ALJ

showed that if the statute required "cause" or "causation," those same proponents had not

met their burden of proof. (*See* Recommendations at 108.) This is in fact borne out by

the testimony on cross-examination, as set forth in detail in sections IV and V below.

II.   BURDEN OF PROOF

The parties have been governed in this proceeding by a ruling that "no special

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[28]   Order Establishing Environmental Cost Values dated January 3, 1997, at 31.

[29]   Order Establishing Environmental Cost Values dated January 3, 1997, at 30.

[30]   *Id.* at 30 n.17.

burden of proof attaches to proceedings under Minn. Stat. § 216B.2422, and that any party advocating a position must support that position by a preponderance of the evidence."[31] Accordingly, "[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 ….."[32] Conversely, "[a] party opposing a particular proposal need only demonstrate that the proponent of proposed value cannot meet the preponderance requirement, because the proponent's evidence is flawed, or the proposal is impracticable."[33] "If the weight of the evidence [to determine whether a proposal is practicable[34]] 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."[35]

As in its Exceptions to the ALJ's April 15, 2016, Phase I (CO_2) Recommendations, the MLIG takes exception to paragraph 3 of the Order Regarding Burdens of Proof dated March 27, 2015 that requires that "[a] party or parties proposing that the Commission retain any environmental cost value as currently assigned by the

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[31]   Order Regarding Burdens of Proof dated March 27, 2015 at 5 (*citing* Minn. R. 1400.7300, subp. 5).

[32]   Order Regarding Burdens of Proof dated March 27, 2015 at 2, ¶ 1.

[33]   *Id.* at 6 (emphasis added).

[34]   As noted in the Introduction, "practicable" has been defined by the Commission to mean "feasible" or "capable of being accomplished." Order Establishing Environmental Cost Values dated January 3, 1997, at 10-11.

[35]   Order Regarding Burdens of Proof dated March 27, 2015 at 6 (emphasis added).

Commission bears the burden of showing, by a preponderance of the evidence, that the current value is reasonable and the best available measure to determine the applicable environmental cost."[36] Imposing a burden of proof on a party seeking to establish a new value is in accord with Minn. R. 1400.7300, subp. 5. But seeking to impose a burden of proof on a party who simply rejects values newly proposed by others, which then leaves the *status quo ante*, is contrary to law. *See* Minn. R. 1400.7300, subp. 5.

The ALJ's April 15, 2016, CO_2 Memorandum suggests that the ALJ lost sight of the burden of proof and the Legislature's mandate. Minn. Stat. § 216B.2422 does not delegate to the Commission the power to set arbitrary values to minimize the environmental impact of society; the Commission's task instead is to "quantify" damages where the requisite level of certainty exists to establish those damages.[37] Because the MLIG did not offer affirmative values for the Criteria Pollutants $PM_{2.5}$, SO_2, or NO_X and instead only challenged the foundation of the testimony and conclusions proffered by the CEOs, Xcel Energy, and the Agencies,[38] the MLIG did not have a burden of proof to meet in this Phase II (Criteria Pollutants).

III.   THE MLIG'S POSITION IN PHASE II

The ALJ correctly noted in her Recommendations that the MLIG did not offer affirmative values for the Criteria Pollutants, but instead questioned the foundation of the testimony offered by the CEOs, Xcel, and the Agencies and used to calculate their

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[36]   *Id.* at 2-3, ¶ 3.

[37]   Order Establishing Environmental Cost Values dated January 3, 1997, at 30.

[38]   *See* Recommendations at 86, Finding 276.

proffered values.[39] The ALJ further stated in Finding of Fact 294 that the "MLIG took

the position that it is not appropriate to estimate damages for PM$_{2.5}$ in Minnesota."[40] This

is an erroneous statement, and Finding 274 must accordingly be modified. Instead, as

reflected in Finding 276, it has always been the MLIG's position that the CEOs, Xcel,

and the Agencies did not meet their burden of proof, through a combination of invalid

health damages and the failure to specify or break out the amount of non-health

damages.[41] For example, the ALJ is correct that Minnesota's compliance with the U.S.

Environmental Protection Agency ("EPA") National Ambient Air Quality Standards

("NAAQS") does not reduce Criteria Pollutant health damages resulting from Minnesota

emissions to zero.[42] On the other hand, there is no epidemiological foundation for a

finding that there are health-effects damages in Minnesota or Wisconsin from those

emissions. Although Minnesota's emissions could theoretically contribute to health-

effects damages in another state where the ambient air PM$_{2.5}$ concentrations may be

above 12 μg/m^3,[43] there is no record evidence what those damages might be. It is this

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[39]   *See* Recommendations at 86, Finding 276.

[40]   *Id.* at 90.

[41]   *See, e.g.*, MLIG March 15, 2016, Phase II Post-Hearing Brief at 5 and 50; MLIG April 15, 2016, Phase II Post-Hearing Reply Brief at 3 and 23.

[42]   *See* Recommendations at 103, Conclusion 56.

[43]   *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/m^3; *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/m^3); MLIG April 15, 2016, Phase II Post-Hearing Reply Brief at 3 (acknowledging potential for "some
(continued)

combination of the failure of the new-value proponents to provide a record upon which the Commission can make a determination that leads to the MLIG's conclusion that the Commission has been left with no evidence to support any change in the current values for $PM_{2.5}$, SO_2, and NO_x.[44] Therefore, the Commission's options are to either leave the current values intact, or to order new proceedings. However, adoption of any of the proponents' values is not an option in the absence of proof.

IV. THE ALJ ERRONEOUSLY CONCLUDED THAT A LINEAR RELATIONSHIP — WITHOUT A THRESHOLD — WAS SHOWN BETWEEN CHRONIC EXPOSURE TO $PM_{2.5}$ AND ALL-CAUSE CARDIOVASCULAR AND LUNG-CANCER MORTALITY AT $PM_{2.5}$ AMBIENT AIR CONCENTRATIONS BELOW 12 µg/m³

The CEOs, the Agencies, and Xcel have each proposed new values for the Criteria Pollutants $PM_{2.5}$, SO_2, and NO_x in this proceeding. They have undertaken efforts to connect estimated changes in ambient air concentrations of Criteria Pollutants from various power-plant emissions with monetized (damages) of those air-quality changes. The proponents did so in this proceeding by producing expert reports regarding their proposed revisions to existing values for $PM_{2.5}$, SO_2, and NO_x.

To calculate the Criteria Pollutant damages as contained in their Criteria Pollutant testimony and reports, Drs. Desvousges, Muller, and Marshall each used a model to first estimate changes in ambient air concentrations of Criteria Pollutants from various power-

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(continued)
harm" from Minnesota emissions in certain other states, but pointing out that the record evidence does not allow a determination of that harm).

[44]   *See, e.g.*, MLIG March 15, 2016, Phase II Post-Hearing Brief at 5 and 50; MLIG April 15, 2016, Phase II Post-Hearing Reply Brief at 3 and 23.

plant emissions.   Second, they estimated the potential effects (damages) of those air-quality changes.   Drs. Desvousges and Miller considered damages from human health effects (premature mortality and morbidity), agriculture (crop production), materials (corrosion and soiling), and visibility,[45] while Dr. Marshall considered only human health damages.[46]   Then Drs. Desvousges, Muller, and Marshall monetized the calculated effects by estimating values for each type of environmental cost considered.[47]

In calculating health effects (damages), each of these witnesses assumed a relationship for an increase in health effects, over and above a baseline, per 10 $\mu g/m^3$ change in the Criteria Pollutant.   This increase in health effects was assumed to occur in a linear fashion irrespective of the baseline (or local) air concentration of the Criteria Pollutant in which the Criteria Pollutant was inhaled and where damages were calculated.[48]   This linear concentration-response relationship is key to the damage values calculated by each of Drs. Marshall, Muller, and Desvousges.[49]

The ALJ found in Conclusion 54 that "a preponderance of the evidence

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[45]   The non-health damages were not specified separately from the health damages in any of the testimony, so that it cannot be quantified separately.

[46]   *See, e.g.,* Ex. 604 at 15:2-10; Ex. 808 at 4:1-16; Ex. 115 at 6:14-8:3; Tr. Vol. 6 at 188:2-4; Tr. Vol. 7 at 45:24-46:12, 47:1-12 & 130:12-21.

[47]   *See* Ex. 604 at 15:10-11; Ex. 808 at 4:1-16; Ex. 115 at 6:14-8:3.

[48]   *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.

[49]   *See* Ex. 604 at 6, Table 1; Ex. 808 at 72, Table 11; Ex. 115 at 27, Table 1.

demonstrates the relationship between chronic exposure to $PM_{2.5}$ and all-cause cardiovascular and lung-cancer mortality is linear without a threshold."[50] Implicit in the "no threshold" statement is the ALJ's conclusion that the concentration-response function is linear at 3-year average ambient-air concentrations below 12 $\mu g/m^3$. To support this "conclusion" (which is really a "finding"), the ALJ relied upon "Findings of Fact" 297, 299, 301, and 303-304.[51] Similarly, in Conclusion 55, and again relying on Finding of Fact 301, the ALJ found that "a preponderance of the evidence demonstrates that the CEOs, the Agencies and Xcel all met their burdens of demonstrating that it is appropriate to calculate mortality and morbidity damages for emissions of $PM_{2.5}$ in Minnesota, even if the ambient concentration of $PM_{2.5}$ is below 12 $\mu g/m^3$."[52] These "conclusions" are neither supported by actual findings of fact nor by the record, and must be rejected.

The "Findings of Fact" relied upon by the ALJ do not contain independent findings, but contain only a summary of various contentions made by the Agencies and CEOs, without any independent analysis by the ALJ. It is accordingly necessary to revisit the evidence to see what that evidence, including the witnesses' cross-examination testimony and the studies upon which those witnesses relied, actually showed. That review shows that there is no factual basis for the ALJ's Conclusions 54 and 55.

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[50]   Recommendations at 103.

[51]   Recommendations at Conclusion 54.

[52]   *Id.* at Conclusion 55.

A. No studies have shown proximate cause between exposure to PM$_{2.5}$ at 3-year average ambient-air concentrations below 12 μg/m^3 and human-health impact

Although damages numbers have been proposed in this proceeding for PM$_{2.5}$, SO$_2$, and NOx, those damages in reality all turn around calculations for PM$_{2.5}$, because as the result of chemical reactions the (primary) gasses SO$_2$ and NOx turn into solid or liquid "secondary PM$_{2.5}$" after being emitted into the environment.[53] Dr. Marshall clarified that "[t]he way in which we calculate those involves not the direct inhalation of SO$_2$ as SO$_2$."[54] After determining the dispersion patterns of the primary PM$_{2.5}$ and the formation and dispersion of the secondary PM$_{2.5}$, health impacts and other damages calculations are made.[55] The health impacts underlying damages calculations have been subjected to scrutiny in thousands of studies.[56] Doctors Desvousges, Marshall, and Muller relied on only a very few of those studies.

The ALJ, seemingly blindly adopting arguments made by the Agencies and the CEOs, concluded that there is a linear relationship, without a threshold, between

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[53]   Tr. Vol. 7 at 7:22-8:19 (Marshall) (SO$_2$); *see also* Tr. Vol. 7 at 135:22-137:4; 146:22-147:2 (Muller) (SO$_2$ and NO$_x$).

[54]   *Id.*

[55]   Ex. 115 at 7:15-16; Tr. Vol. 6 at 45:16-46:7.

[56]   Tr. Vol. 7 at 86:10-14 (Desvousges); 176:12-19 (McClellan); *see also* Ex. 444A at (78 Fed Reg. at 3097 (Air Quality Designations for the 2012 Primary Annual Fine Particle (PM$_{2.5}$) National Ambient Air Quality Standards (NAAQS); Final Rule)) ("a substantial amount of new research has been conducted since the close of the science assessment in the last review of the PM2.5 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.").

inhalation of $PM_{2.5}$ and mortality and morbidity damages.[57] Specifically, the CEOs relied on Exhibit 117 at Schedule 3 (Lepeule) at 967-68, Exhibit 809 (Muller Direct) at Attachment 2 at 5-6 (relying on Krewski and Lepeule studies), and Exhibit 811 at 33:6-13 (Muller surrebuttal, relying on Krewski and Lepeule studies). Relying on the Krewski and Lepeule studies, the CEOs further argued 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*."[58] The CEOs additionally cite Lepeule for the proposition that "[i]ncluding recent observations with $PM_{2.5}$ exposures well below the U.S. annual standard of 15 $\mu g/m^3$ and down to 8 $\mu g/m^3$, 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."[59]

These arguments appear to provide support for the ALJ's conclusion but, as it turns out and as was expressly highlighted to the ALJ in 7 pages of briefing, data, and arguments never referenced by the ALJ in her analysis,[60] the statements made by the Agencies, CEOs, and in the Krewski and Lepeule reports relate to a different issue and a

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[57] Recommendations at 103, Conclusion 54.

[58] CEOs' March 15, 2016, 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).

[59] CEOs' March 15, 2016, Initial Criteria-Pollutants Post-Hearing Brief at 48 (*citing* Ex. 117 at Schedule 3 at 970 (Lepeule)).

[60] *See* MLIG April 15, 2016, Phase II Post-Hearing Reply Brief at 9-16.

different type of data. There is no conflict between Dr. McClellan's opinions, the EPA conclusions, or the MLIG's no-causation argument on the one hand and any of the data relied upon by the Agencies or the CEOs on the other hand.

Both Krewski and Lepeule made statements regarding the concentration-response relationship (or correlation) between the inhalation of primary and secondary $PM_{2.5}$ and health damages. Neither observed a threshold *within the range of observed $PM_{2.5}$ concentrations*.[61] However, both the comments in the 2009 Krewski report[62] and the July 2012 Lepeule report[63] were commenting on the American Cancer Society Cohort Study and an extended follow-up and spatial analysis of study data linking particulate air pollution and mortality. Importantly, neither Krewski nor Lepeule added data to that supplied by the American Cancer Society Cohort Study data. Lepeule's report includes an important and helpful Table 1 and Figure 1 on page 967 summarizing the study data. That Table 1 and Figure 1 are reproduced here (ellipses added):

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[61]   Ex. 117 at 119, right column (Krewski); Ex. 117 at Schedule 3 at 968, middle column (Lepeule).

[62]   *See* Ex. 117 at Schedule 2.

[63]   *See* Ex. 117 at Schedule 3.

Table 1. Number of participants, mortality, and average 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	4.6
1974–2009 average of individual PM$_{2.5}$ concentrations	15.9	23.6	19.1	16.7	14.0	12.2	11.4
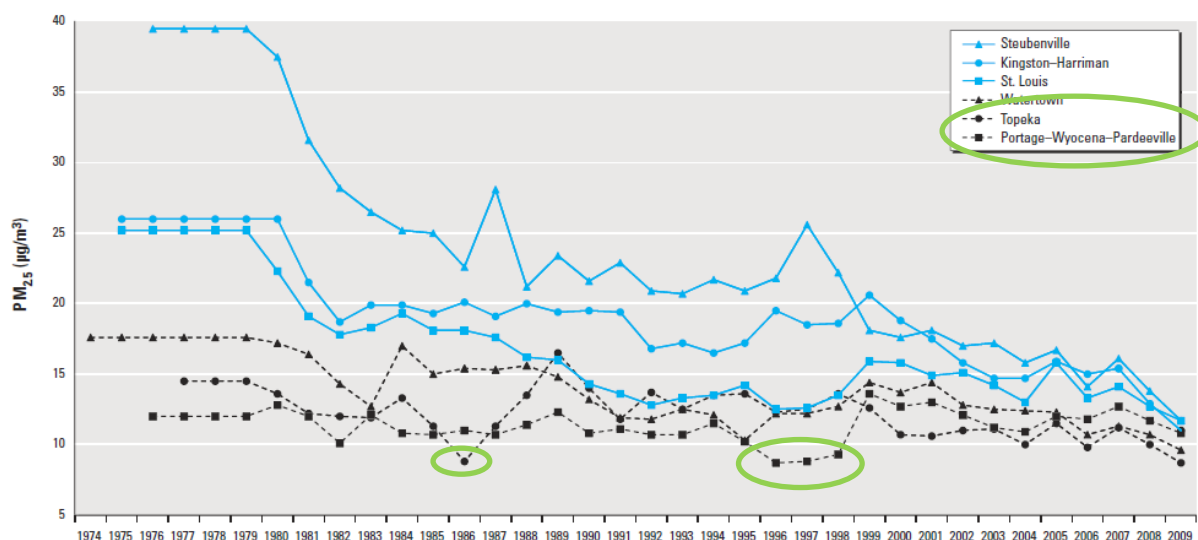
Figure 1. Annual mean PM$_{2.5}$ levels during 1974–2009 in the Harvard Six Cities study.

References by the CEOs, the Agencies, Krewski, and Lepeule are all to the lowest local average *one*-year PM$_{2.5}$ ambient air concentration point reached during the study. However, as all experts have admitted, including Krewski and Lepeule, all-cause, cardiopulmonary, cardiovascular, and lung-cancer mortality have been associated with *chronic* air pollution exposure.[64] "Chronic" means "persisting for a long time or

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[64] *See* Ex. 115 at 12:3-5 (Marshall Direct) (monetized health effects of PM$_{2.5}$ are most strongly connected to chronic exposures, *i.e.* for periods of more than a year).

constantly recurring," and at no time in the entire 35-year study period of the extended American Cancer Society Cohort Study was a particular study area chronically at the low Minnesota ambient air concentrations for $PM_{2.5}$. (*See* Table 1 and Figure 1 above.) While the concentration of $PM_{2.5}$ during the American Cancer study twice dipped to values near 8 μg/m^{3}, namely in 1986 in the city of Topeka and in 1996 in the combined study area of Portage-Wyocena-Pardeeville ("Portage") (*see* Lepeule Figure 1, above),[65] Figure 1 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. It is the three-year average that both Dr. McClellan and the EPA environmental and medical scientists considered, however, and it is that chronic (long-term) exposure that is relevant here.[66] Furthermore, the lowest air concentrations measured in linear concentration-response functions by definition dictates the lowest level of linearity, and the increased risk is dominated by the measurements and population of the *dirtiest* cities, rather than the baseline at the bottom of the data.[67]

The averages exposures of individual $PM_{2.5}$ concentrations over the 1974-2009 study period were 12.2 μg/m^{3} for Topeka and 11.4 μg/m^{3} for Portage (*see* Figure 1 above). Meanwhile, Portage's ambient air concentration has consistently been above or quite a bit above 10 μg/m^{3} since 1999.[68] Minnesota's $PM_{2.5}$ concentration on the other

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[65]   *See also* Tr. 8 at 54:14-55:3, 56:20-58:13.

[66]   *See* Ex. 441 (McClellan Rebuttal) at 21:3-4; Ex. 441 at App. 2 at 8-9.

[67]   Ex. 441 at App. 2 at 7.

[68]   Ex. 117 at Schedule 3 at 967 (Lepeule); *see also* Ex. 441 at Attachment 2 at 13.

hand has been below 10 μg/m^3 since 2001.[69] Specifically, as noted by the ALJ, the

average levels of PM$_{2.5}$ in 2012-2014 in various Minnesota cities ranged between 4.6

μg/m^3 and 10 μg/m^3.[70] Moreover, the relevant 3-year average "mean concentration of

PM$_{2.5}$ across the ACS [American Cancer Society] cohort, upon which the concentration-

response function was based, was 14[71] μg/m^3," well above that of Minnesota and

Wisconsin.

It is further important to recognize, as Dr. McClellan testified, that studies are

based on departures from a baseline.[72] Because the air quality in the Portage area was the

cleanest, that community became the baseline *against which* other populations were

measured.[73] One cannot measure the baseline against itself. In other words, the baseline

population is not assumed to be influenced by the exposure being studied.[74] But the

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[69]   Ex. 443 at numbered pages 12-14 at Figures 2-5.

[70]   *See* June 15, 2016, ALJ Finding of Fact 278 (*citing* Ex. 443 at 3-10 (McClellan Response to Information Requests)).

[71]   Ex. 441 at App. 2 at Attachment 2 (McClellan, *Hazard and risk: assessment and management* (book chapter)) at 78. As noted earlier, the value of 14 μg/m^3 is likely a typographical error, and should read "16 μg/m^3", 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/m^3); *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/m^3).

[72]   *See* Ex. 441 at Appendix 2 at 5-6.

[73]   *Id.*

[74]   *See* Ex. 441 at Appendix 2 at 6 ("Portage, WI, is used as the baseline city with an increase in the mortality rate ratios evident for each of the five *other* cities using different pollution indices." (emphasis added)).

Minnesota population is exposed to less or no more PM$_{2.5}$ than the Portage baseline population.[75] Specifically, Tables 1 through 6 below, taken from Ex. 443 (ellipses added), show tabular data from the EPA website for all the criteria pollutants measured at monitoring sites in Wisconsin and Minnesota during 2012, 2013, and 2014, including PM$_{2.5}$:

Table 1:

Air Quality Statistics Report

Geographic Area: Minnesota
Summary: by CBSA
Year: 2012
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Brainerd, MN	.	.	.	.	0.07	0.062	.	.	.	16	4.6	.	.	.
Duluth, MN-WI	1.6	1	.	.	0.08	0.063	.	.	.	22	6.3	50	21	0.01
Fargo, ND-MN	0.6	0.4	34	5	0.07	0.063	4	1	0	23	7.5	92	21	.
La Crosse, WI-MN	.	.	.	.	0.08	0.069	.	.	.	22	8.2	.	.	.
Marshall, MN	.	.	.	.	0.07	0.067	.	.	.	20	7.3	.	.	.
Minneapolis-St. Paul-Bloomington, MN-WI	3.4	1.5	57	11	0.08	0.068	16	4	1	34	10.4	70	25	0.11
Red Wing, MN	.	.	.	.	0.07	0.065	.	.	.	.	.	.	.	.
Rochester, MN	.	.	.	.	0.08	0.069	.	.	.	19	7.8	.	.	.
St. Cloud, MN	.	.	.	.	0.07	0.064	.	.	.	20	8.4	.	.	0.01

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#con

AirData reports are produced from a direct query of the AQS Data Mart. The data represent the best and most recent information available to EPA from state agencies. However, some values may be absent due to incomplete reporting, and some values may change due to quality assurance activities. The AQS database is updated daily by state, local, and tribal organizations who own and submit the data. Please contact the appropriate air quality monitoring agency to report any data problems. <http://www.epa.gov/airquality/airdata/ad_contacts.html>

Readers are cautioned not to rank order geographic areas based on AirData reports. Air pollution levels measured at a particular monitoring site are not necessarily representative of the air quality for an entire county or urban area.

This report is based on monitor-level summary statistics. Air quality standards for some pollutants (PM2.5 and Pb) allow for combining data from multiple monitors into a site-level summary statistic that can be compared to the standard. In those cases, the site-level statistics may differ from the monitor-level statistics upon which this report is based.

Source: U.S. EPA AirData <http://www.epa.gov/airdata>
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Page 1 of 1

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[75] *See* Ex. 443 (Nov. 24, 2015, Dr. McClellan Response to Clean Energy Organizations Information Request No. 6 to Minnesota Large Industrial Group).

Table 2:   **Air Quality Statistics Report**
Geographic Area: Minnesota
Summary: by CBSA
Year: 2013
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Brainerd, MN	.	.	.	.	0.07	0.06	.	.	.	15	4	.	.	.
Duluth, MN-WI	4.6	1.5	.	.	0.07	0.059	.	.	.	19	7.7	59	24	0
Fargo, ND-MN	0.8	0.3	36	4	0.07	0.059	4	1	0	18	7.2	62	16	.
La Crosse, WI-MN	.	.	.	.	0.07	0.061	.	.	.	18	8.3	.	.	.
Marshall, MN	.	.	.	.	0.07	0.066	.	.	.	21	7.3	.	.	.
Minneapolis-St. Paul-Bloomington, MN-WI	3.3	2.5	45	13	0.08	0.067	15	15	1	23	10.2	70	27	0.11
Red Wing, MN	.	.	.	.	0.07	0.062	.	.	.	.	.	.	.	.
Rochester, MN	.	.	.	.	0.07	0.064	.	.	.	21	8.7	.	.	.
St. Cloud, MN	.	.	.	.	0.07	0.061	.	.	.	22	6.4	.	.	0

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#con

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Readers are cautioned not to rank order geographic areas based on AirData reports. Air pollution levels measured at a particular monitoring site are not necessarily representative of the air quality for an entire county or urban area.

This report is based on monitor-level summary statistics. Air quality standards for some pollutants (PM2.5 and Pb) allow for combining data from multiple monitors into a site-level summary statistic that can be compared to the standard. In those cases, the site-level statistics may differ from the monitor-level statistics upon which this report is based.

Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 1 of 1

Table 3:
Geographic Area: Minnesota
Summary: by CBSA
Year: 2014
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

<div align="center">**Air Quality Statistics Report**</div>

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Bemidji, MN	.	.	.	.	.	.	.	.	.	16	5.1	.	.	.
Brainerd, MN	.	.	.	.	0.07	0.057	.	.	.	18	5.1	.	.	.
Duluth, MN-WI	1.3	0.8	.	.	0.07	0.057	.	.	.	18	8.4	86	28	0
Fargo, ND-MN	0.5	0.3	34	4	0.07	0.059	3	1	0	17	6.7	72	16	.
La Crosse, WI-MN	.	.	.	.	0.07	0.063	.	.	.	22	8.1	.	.	.
Marshall, MN	.	.	.	.	0.07	0.062	.	.	.	17	5.9	.	.	.
Minneapolis-St. Paul-Bloomington, MN-WI	2.7	1.6	50	16	0.08	0.064	12	5	1	29	10.3	76	25	0.12
Red Wing, MN	.	.	.	.	0.07	0.063	.	.	.	.	.	.	.	.
Rochester, MN	.	.	.	.	0.07	0.062	2	1	1	20	8.2	.	.	.
St. Cloud, MN	.	.	.	.	0.07	0.062	.	.	.	19	6.2	.	.	.
Winona, MN	.	.	.	.	.	.	.	.	.	22	8.3	.	.	.

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#con

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 1 of 1

Table 4a:

Air Quality Statistics Report

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2012
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Appleton, WI	.	.	.	.	0.09	0.077	.	.	.	25	8.6	.	.	.
Baraboo, WI	.	.	.	.	0.09	0.073	.	.	.	23	10.1	39	12	.
Beaver Dam, WI	0.6	0.4	.	.	0.09	0.078	6	2	0	26	8.9	44	15	.
Chicago-Naperville-Joliet, IL-IN-WI	4	1.9	70	22	0.12	0.093	108	22	3	31	11.5	153	31	0.13
Duluth, MN-WI	1.6	1	.	.	0.08	0.063	.	.	.	22	6.3	50	21	0.01
Eau Claire, WI	.	.	.	.	0.08	0.068	.	.	.	23	8.1	40	17	.
Fond du Lac, WI	.	.	.	.	0.1	0.079	.	.	.	.	.	.	.	.
Green Bay, WI	.	.	.	.	0.11	0.086	72	14	2	28	9.6	.	.	.
Janesville, WI	.	.	.	.	0.09	0.08	.	.	.	.	.	.	.	.
La Crosse, WI-MN	.	.	.	.	0.08	0.069	.	.	.	22	8.2	.	.	.
Madison, WI	.	.	.	.	0.09	0.074	.	.	.	27	9.4	36	16	.
Manitowoc, WI	.	.	9	2	0.1	0.088	.	.	.	.	.	.	.	.
Milwaukee-Waukesha-West Allis, WI	.	.	45	12	0.11	0.093	21	6	1	30	10.9	47	23	.
Minneapolis-St. Paul-Bloomington, MN-WI	3.4	1.5	57	11	0.08	0.068	16	4	1	34	10.4	70	25	0.11

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 1 of 2

MLIG Exeptions to ALJ's June 15, 2016,
Criteria Pollutants Recommendations

Table 4b:

Air Quality Statistics Report

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2012
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Platteville, WI	.	.	.	.	.	.	.	.	.	22	9.1	.	.	.
Racine, WI	.	.	.	.	0.11	0.09	.	.	.	.	.	.	.	.
Sheboygan, WI	.	.	.	.	0.11	0.093	.	.	.	.	.	.	.	0.1
Watertown-Fort Atkinson, WI	.	.	.	.	0.09	0.078	.	.	.	.	.	.	.	.
Wausau, WI	.	.	.	.	0.08	0.069	.	.	.	.	.	.	.	.
Whitewater, WI	.	.	.	.	0.1	0.077	.	.	.	.	.	.	.	.

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#con

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 2 of 2

Table 5a   **Air Quality Statistics Report**

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2013
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Appleton, WI	.	.	.	.	0.08	0.067	.	.	.	2?	8	.	.	.
Baraboo, WI	.	.	.	.	0.07	0.063	.	.	.	1?	7.1	31	11	.
Beaver Dam, WI	0.9	0.3	.	.	0.08	0.067	9	2	0	1?	7.9	35	14	.
Chicago-Naperville-Joliet, IL-IN-WI	2.7	1.4	64	21	0.09	0.075	73	17	4	2?	11.3	121	39	0.1
Duluth, MN-WI	4.6	1.5	.	.	0.07	0.059	.	.	.	1?	7.7	59	24	0
Eau Claire, WI	.	.	.	.	0.07	0.06	.	.	.	2?	7.3	52	19	.
Fond du Lac, WI	.	.	.	.	0.08	0.065	.	.	.	.	.	.	.	.
Green Bay, WI	.	.	.	.	0.08	0.068	76	13	2	2?	7.7	.	.	.
Janesville, WI	.	.	.	.	0.07	0.067	.	.	.	.	.	.	.	.
La Crosse, WI-MN	.	.	.	.	0.07	0.061	.	.	.	1?	8.3	.	.	.
Madison, WI	.	.	.	.	0.07	0.067	8	4	1	2?	9.3	29	16	.
Manitowoc, WI	.	.	9	2	0.09	0.073	.	.	.	.	.	.	.	.
Milwaukee-Waukesha-West Allis, WI	.	.	50	10	0.09	0.07	23	5	1	25	10	38	17	.
Minneapolis-St. Paul-Bloomington, MN-WI	3.3	2.5	45	13	0.08	0.067	15	15	1	23	10.2	70	27	0.11

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#co?

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 1 of 2

Table 5b

Air Quality Statistics Report

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2013
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Platteville, WI	.	.	.	.	.	.	.	.	.	19	8.9	.	.	.
Racine, WI	.	.	.	.	0.08	0.066	.	.	.	.	.	.	.	.
Sheboygan, WI	.	.	.	.	0.09	0.078	.	.	.	.	.	.	.	0.11
Watertown-Fort Atkinson, WI	.	.	.	.	0.08	0.069	.	.	.	.	.	.	.	.
Wausau, WI	.	.	.	.	0.07	0.063	.	.	.	.	.	.	.	.
Whitewater, WI	.	.	.	.	0.07	0.067	.	.	.	.	.	.	.	.

Get detailed information about this report, including column descriptions, at http://www.epa.gov/airquality/airdata/ad_about_reports.html#con

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 2 of 2

Table 6a:

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2014
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Appleton, WI	.	.	.	.	0.08	0.07	.	.	.	24	8.6	.	.	.
Baraboo, WI	.	.	.	.	0.08	0.064	.	.	.	2	7.8	28	10	.
Beaver Dam, WI	0.4	0.4	.	.	0.08	0.071	6	4	0	27	8.5	30	12	.
Chicago-Naperville-Joliet, IL-IN-WI	5.3	1.9	67	21	0.09	0.076	53	12	2	31	12.1	93	46	0.15
Duluth, MN-WI	1.3	0.8	.	.	0.07	0.057	.	.	.	18	8.4	86	28	0
Eau Claire, WI	.	.	.	.	0.07	0.061	.	.	.	21	8.2	.	.	.
Fond du Lac, WI	.	.	.	.	0.08	0.067	.	.	.	.	.	.	.	.
Green Bay, WI	.	.	.	.	0.08	0.066	79	16	3	26	9.1	.	.	.
Janesville, WI	.	.	.	.	0.08	0.072	.	.	.	.	.	.	.	.
La Crosse, WI-MN	.	.	.	.	0.07	0.063	.	.	.	22	8.1	.	.	.
Madison, WI	.	.	.	.	0.08	0.069	10	4	1	25	9.3	41	18	.
Manitowoc, WI	.	.	6	1	0.07	0.066	.	.	.	.	.	.	.	.
Milwaukee-Waukesha-West Allis, WI	1.2	0.7	53	16	0.09	0.074	27	8	1	30	10.5	53	19	.
Minneapolis-St. Paul-Bloomington, MN-WI	2.7	1.6	50	16	0.08	0.064	12	5	1	29	10.3	76	25	0.12

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Source: U.S. EPA AirData <http://www.epa.gov/airdata>
Generated: November 18, 2015

Page 1 of 2

Table 6b:

Air Quality Statistics Report

Geographic Area: Wisconsin
Summary: by CBSA
Year: 2014
Exceptional Events: Excluded (if any)
Statistics in red are above the level of the respective air quality standard

CBSA	CO 1-hr 2nd Max	CO 8-hr 2nd Max	NO2 98th %ile	NO2 Ann. Mean	O3 1-hr 2nd Max	O3 8-hr 4th Max	SO2 99th %ile	SO2 24-hr 2nd Max	SO2 Ann. Mean	PM2.5 98th %ile	PM2.5 Wtd. Mean	PM10 24-hr 2nd Max	PM10 Annual Mean	Lead Max 3-mo Avg
Platteville, WI	.	.	.	.	.	.	.	.	.	2.	8.1	.	.	.
Sheboygan, WI	.	.	.	.	0.08	0.072	.	.	.	.	.	.	.	0.09
Watertown-Fort Atkinson, WI	.	.	.	.	0.08	0.071	.	.	.	.	.	.	.	.
Wausau, WI	.	.	.	.	0.07	0.064	.	.	.	.	.	.	.	.
Whitewater, WI	.	.	.	.	0.09	0.073	.	.	.	.	.	.	.	.

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Generated: November 18, 2015

Page 2 of 2

In 2009, the mean PM$_{2.5}$ ambient air concentration for Wisconsin communities was 9.5 µg/m^3, while the mean PM$_{2.5}$ ambient air concentration for Minnesota communities was 8.1 µg/m^3. The PM$_{2.5}$ ambient air concentration for Portage, Wisconsin, was 9.8 µg/m^3, while Tracy, Marshall, Rochester, and Minneapolis recorded PM$_{2.5}$ ambient air concentrations of 8.7, 8.4, 9.8, and 10.1 µg/m^3 respectively.[76]

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[76]   Ex. 443 at numbered page 11. Data provided by www.USA.com.

Figure 1: Portage Wisconsin (1999 through 2009):
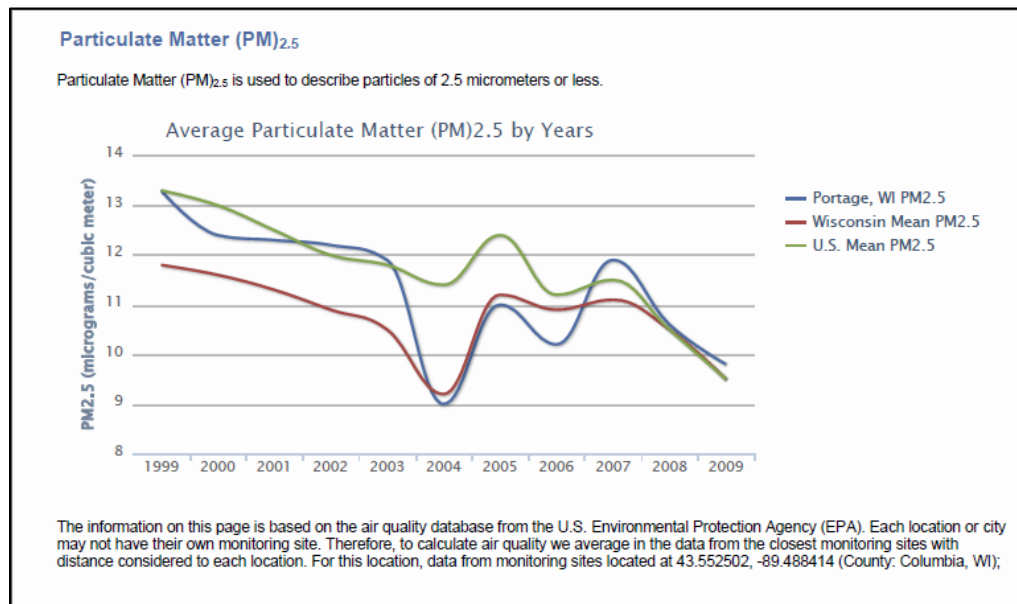
Figure 2: Marshall, Minnesota (1999 through 2009):
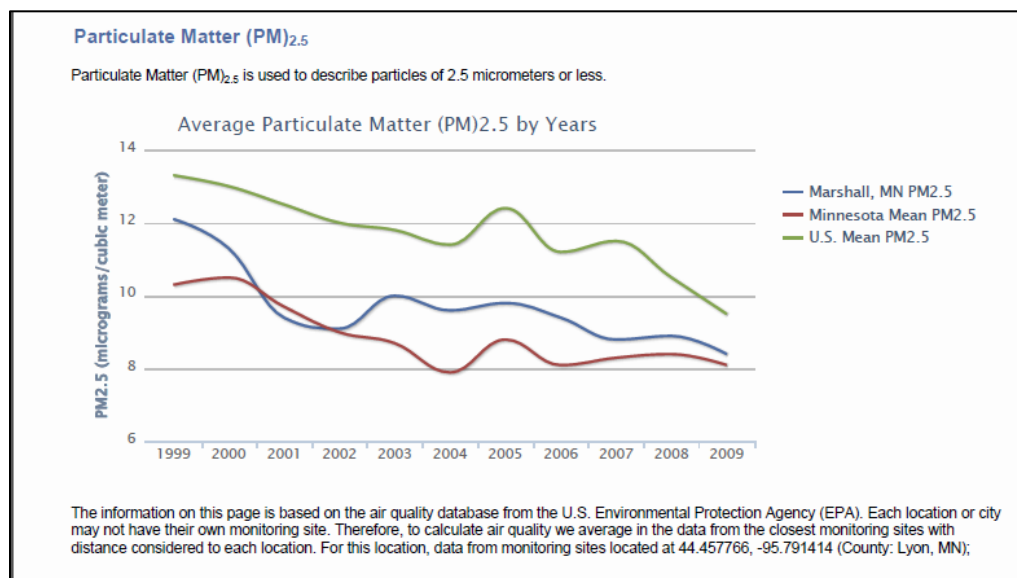
Figure 3: Tracy, Minnesota (1999 through 2009):

Particulate Matter (PM)2.5

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

Average Particulate Matter (PM)2.5 by Years

— Tracy, MN PM2.5
— Minnesota Mean PM2.5
— U.S. Mean PM2.5

The information on this page is based on the air quality database from the U.S. Environmental Protection Agency (EPA). Each location or city may not have their own monitoring site. Therefore, to calculate air quality we average in the data from the closest monitoring sites with distance considered to each location. For this location, data from monitoring sites located at 44.4438, -95.81789 (County: Lyon, MN);

Figure 4: Rochester, Minnesota (1999-2009):

Particulate Matter (PM)2.5

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

Average Particulate Matter (PM)2.5 by Years

— Rochester, MN PM2.5
— Minnesota Mean PM2.5
— U.S. Mean PM2.5

The information on this page is based on the air quality database from the U.S. Environmental Protection Agency (EPA). Each location or city may not have their own monitoring site. Therefore, to calculate air quality we average in the data from the closest monitoring sites with distance considered to each location. For this location, data from monitoring sites located at 44.008886, -92.472964 (County: Olmsted, MN);

Figure 5: Minneapolis, Minnesota (1999-2009):

Cross-examination testimony in this case has shown that none of the studies relied

upon by any expert in this proceeding uses the term "cause" or "causation."[77]   Drs.

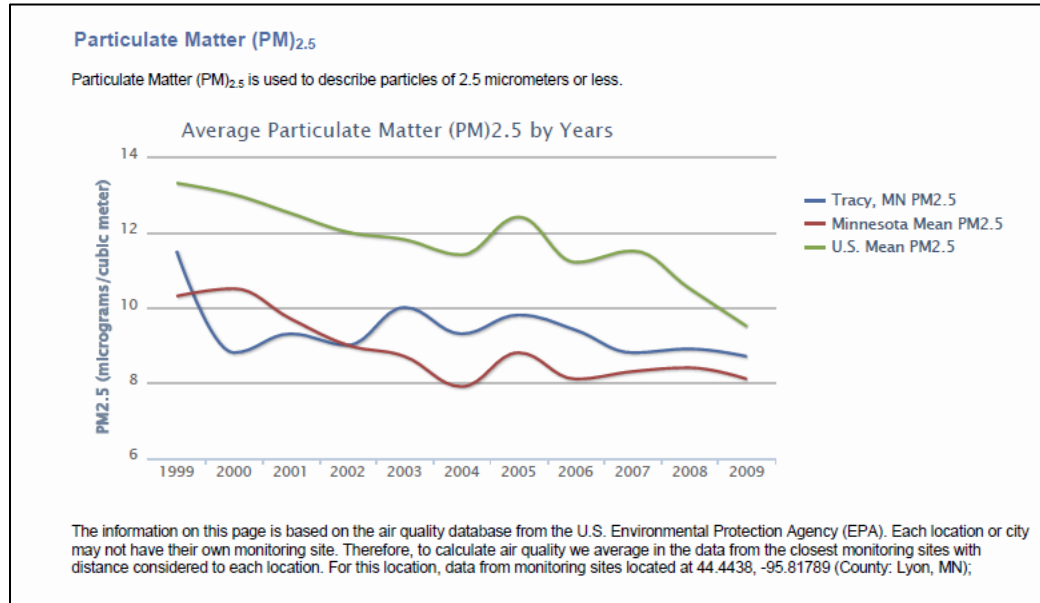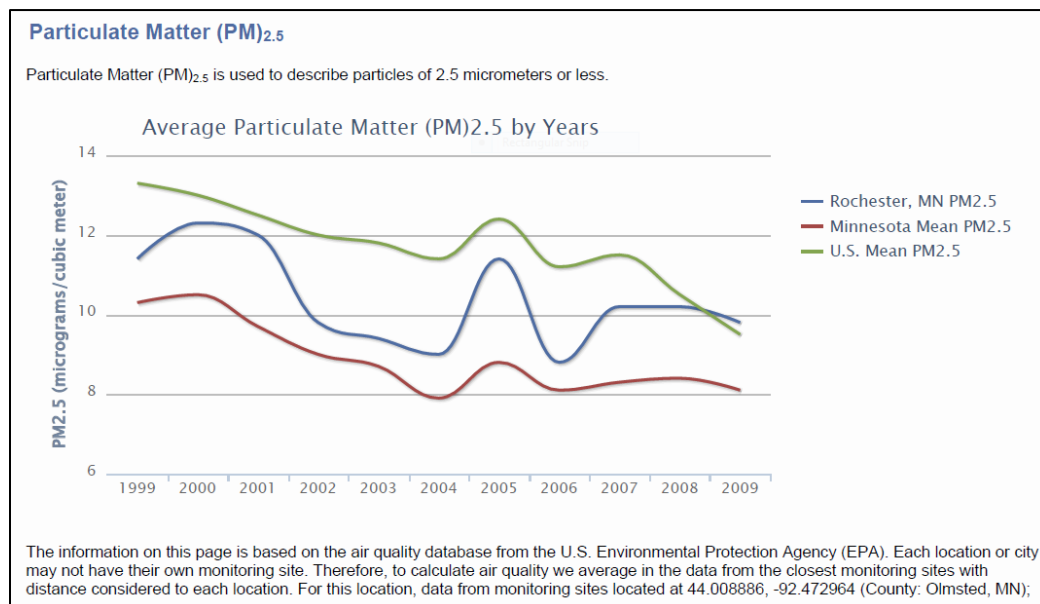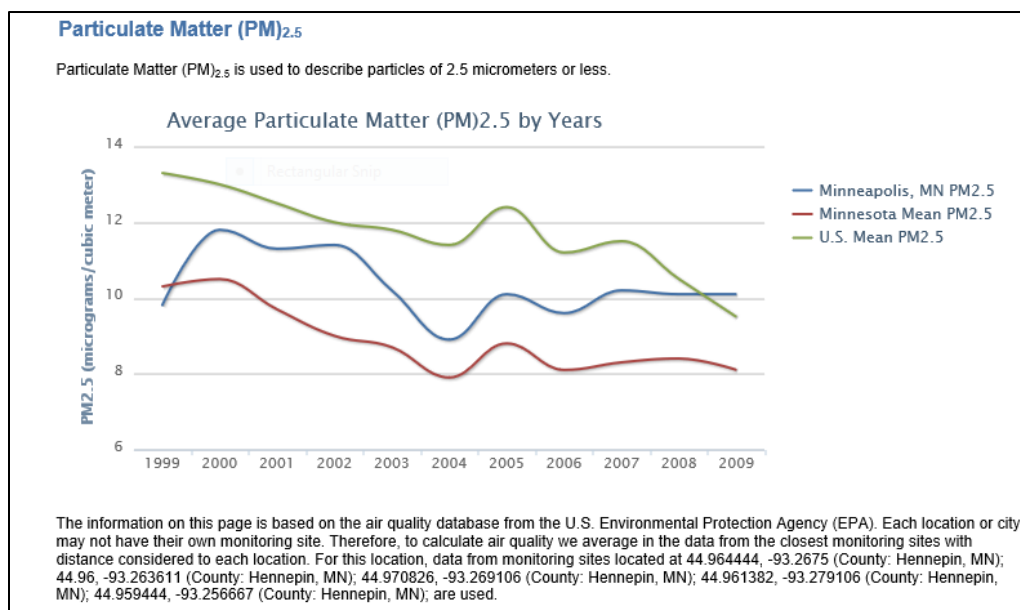Desvousges and Muller both testified that to show causation resulting from exposure to

$PM_{2.5}$, a showing is required (1) that the presence of particulate matter preceded

premature mortality or damage; (2) that exposure and damages move in the same

direction, like correlation or association; and (3) that all other explanations on premature

mortality have been ruled out.[78] Dr. Marshall admitted that "there are lots of things that

cause premature mortality," and that he had not ruled out causes other than $PM_{2.5}$

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[77]   Tr. Vol. 8 at 17:16-25 (Muller); *see also* Ex. 117 (Jacobs rebuttal) at Schedule 2
(Krewski report (no mention of causation)) & Schedule 3 (Lapeule report (no
mention of causation)).

[78]   Tr. Vol. 8 at 11-21 (Muller); Tr. Vol. 7 at 80:14-21 (Desvousges).

exposure,[79] while Dr. Desvousges testified that as far as he knew, *no study has shown the three causation factors for PM$_{2.5}$ exposure at ambient-air concentrations below 12 μg/m^3.*[80]

Only two medically trained experts testified in this proceeding. Dr. Jacobs is a professor of epidemiology and community health at the School of Public Health of the University of Minnesota. Dr. Jacobs submitted pre-filed testimony on behalf of the CEOs with respect to various matters,[81] but did not address causation or the link between emissions and health-effects damages in areas with 3-year average PM$_{2.5}$ ambient air concentrations below 12 μg/m^3. In fact, Dr. Jacobs submitted no surrebuttal testimony, and did not testify live.

Dr. McClellan holds a Doctor of Veterinary Medicine degree with highest honors from Washington State University in 1960, a Master of Management Science degree from the University of New Mexico in 1980, and is a Diplomat, by examination, of the American Board of [Human] Toxicology and the American Board of Veterinary Toxicology.[82] He is also a Fellow of the Academy of Toxicological Sciences, the American Association for Aerosol Research, the Society for Risk Analysis, the Health Physics Society, and the American Association for the Advancement of Science.[83] Dr.

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[79]   Tr. Vol. 6 at 75:21-76:6.

[80]   Tr. Vol. 7 at 80:22-81:1.

[81]   *See* Ex. 117 at 1-14.

[82]   Ex. 441 at 3 & App. 1.

[83]   *Id.*

McClellan has further been elected to membership in the Institute of Medicine (now the National Academy of Medicine) of the National Academy of Science based on his contributions to improving *human* health.[84]

Dr. McClellan has served on EPA scientific advisory committees and has chaired the CASAC.[85] He has received numerous awards from professional societies and other organizations for his service and scientific contributions, including an Honorary Doctor of Science degree in 2005 by the Ohio State University for his contributions to comparative medicine and the science undergirding improved air quality, and has been invited on 19 occasions to testify before U.S. Congressional committees about human-health impacting air quality issues.[86]

In the fall of 1966, Dr. McClellan became the Chief Scientist and Director of the Inhalation Toxicology Research Institute, a part of the Lovelace Medical Center, in Albuquerque, New Mexico.[87] From 1988 until 1999 he served as the President and CEO of the Chemical Industry Institute of Toxicology in Research Triangle Park, North Carolina, where he provided leadership for developing internationally recognized programs on the health effects of radioactive materials, chemicals, and vehicle emissions, with emphasis on understanding the mechanisms by which these agents may produce health effects and the information used to estimate human health hazards and risks of

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[84]   Ex. 441 (McClellan Rebuttal) at 3 & App. 1.

[85]   Ex. 441, App 1 & App. 2 at 2.

[86]   *Id.* at 4, 8-10 & App. 1.

[87]   *Id.* at 2-3.

occupational and ambient exposures to airborne agents.[88]

Since 1966, Dr. McClellan has been conducting research on the toxicity of airborne agents with emphasis on understanding the basic mechanisms or modes of action that govern their deposition, translocation in the body, the dose to critical tissues and cells and the pathogenesis of diseases in excess of those occurring naturally or from other factors.[89] Based on his education and his professional experience and training, as tested by professional examinations, Dr. McClellan was able to offer medical opinions about the critical inputs into the damage models used by Mr. Desvousges, Dr. Marshall, and Mr. Muller.[90]

Importantly, and despite the existence of Dr. McClellan's October 30, 2015, rebuttal testimony and the advance notice that their experts' health-damages testimony could not survive scrutiny and lacked a proper foundation, none of the proponent parties

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[88]   Ex. 441 (McClellan Rebuttal) at 3.

[89]   *Id.* at 11.

[90]   The ALJ correctly and expressly accepted Dr. McClellan's expertise. (Recommendations at 108 and note 645.) The ALJ erroneously held that because Dr. McClellan does not hold a human-health medical degree, he was not "qualified to provide his opinions as to a "reasonable degree of medical certainty." (*Id.*) No party challenged this characterization of Dr. McClellan's testimony, which was admitted, requiring rejection of the ALJ's remark. More importantly, however, the ALJ overlooked that not only a degree, but also training and experience can give grounds to expertise, *see* Minn. R. 1400.7300, subp. 1; Minn. R. Evid. 702, that laboratory animal investigations play an important role in determining the health effects of pollution, (Ex. 441, App. 2 at 4), and that Dr. McClellan holds both an appropriate medical degree and appropriate medical training and experience upon which he can base his opinions regarding causation from a medical perspective and thus "to a reasonable degree of medical certainty." The ALJ's remark has no support in the evidentiary procedure.

has offered conflicting medical surrebuttal testimony, for example from Dr. Jacobs. None of the economists in this matter can be relied up upon to provide any medical testimony, and Dr. McClellan's testimony remains uncontested.

An understanding of the potential hazard of any airborne pollutant requires an evaluation of the science extending from (a) emissions from particular sources, (b) transport and potential transformations in the atmosphere, (c) exposure of receptor populations, (d) the uptake and translocation of the inhaled material by individuals, (e) mechanisms of detoxification, damage and repairs, and (f) the occurrence of disease over and above that occurring naturally or from other causative factors.[91]

Dr. McClellan testified that the use of linear air-concentration-response models implies that the calculated damage values are applicable to all emissions irrespective of the air quality in a particular area, and that such use is incorrect below ambient air concentrations of $PM_{2.5}$ of 12 μg/m^3.[92] Instead, data from the American Cancer Society study as reflected in Figure 5 in Appendix 2 of Dr. McClellan's rebuttal testimony shows that a statistically significant effect is not observed below approximately 13.5 μg/m^3 for all-cause mortality, nor below 13.8 μg/m^3 for cardiopulmonary and lung-cancer mortality, or 13.2 μg/m^3 for all-other-cause mortality,[93] with the central tendency for each trending below 0 toward the lower exposure end of the spectrum and even the upper confidence

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[91]   Ex. 441 at App. 2 at 3.

[92]   Ex. 441 at 21 & App. 2 at 7-10.

[93]   *See* Ex. 441, App. 2 at 16.

bound for lung-cancer mortality trending below 0 at that point (ellipses added):[94]

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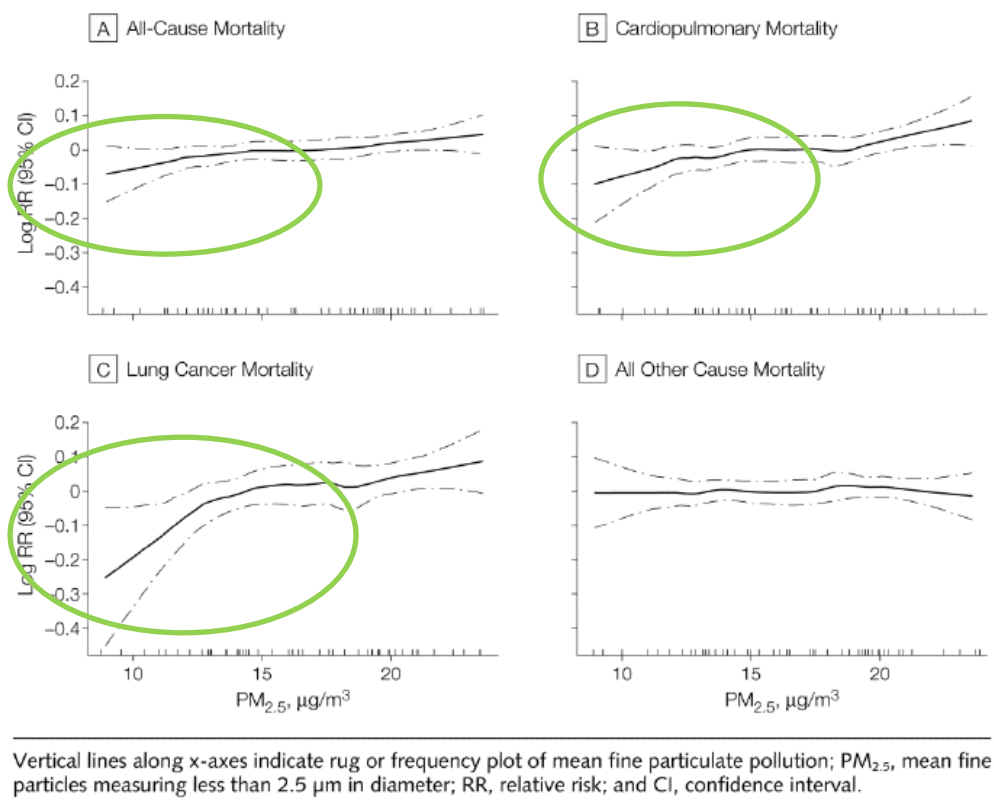
Figure 5. Non-parametric smoothed exposure-response relationship. Vertical lines along the x-axes indicate a rug or frequency plot of mean fine particulate pollution. CI, confidence interval; PM$_{2.5}$, fine particles measuring less than 2.5 μm in diameter; RR, relative risk.

One interpretation of this data is that exposure is protective of health.[95] In other words, one should be more exposed to more PM$_{2.5}$, because it's good for health. Another, more realistic, interpretation is that the American Cancer Society Cohort Study data is simply unreliable at lower PM$_{2.5}$ exposure levels, rendering reliance on a linear concentration-

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[94]   Ex. 441 at App. 2 at 8, 16.

[95]   Tr. Vol. 8 at 146:12-148:8 (Muller); Tr. Vol. 7 at 204:23-206:22 (McClellan).

response function at ambient air concentration values below 13.2 μg/m^3 invalid.[96] Where

the underlying data is unreliable, it is further, as a matter of law and fact, "impracticable"

under Minn. Stat. § 216B.2422, subd. 3(a), to quantify damages.

Dr. McClellan testified that according to the American Cancer Society Cohort

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 μg/m^3 or below, "there is no

medical or other scientific basis for projecting mortality related to current or projected

levels of PM$_{2.5}$."[97] Dr. McClellan therefore opined, "with a reasonable degree of medical

certainty, that the three damage reports prepared by Dr. Desvousges, Dr. Marshall, and

Dr. Muller all fail to provide an adequate scientific basis for their mathematical

exercises."[98] While their math is not wrong, they have taken an overly simplistic

approach to modeling this link between ambient-air and health:

> They all assume a linear association between any incremental
> increase in the ambient concentrations of the pollutant and
> increased health risks. Moreover, Dr. Marshall and Dr.
> Muller assume the statistical association represents a causal
> link. And I say a causal link between any increase in the
> pollutant and increased disease regardless of the baseline of
> PM in the ambient air. Dr. Marshall was unable to explain
> that causation is different from mere mathematical association
> and that it requires ruling out other explanations of premature

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[96]   Tr. Vol. 7 at 204:23-206:22 (McClellan).

[97]   Ex. 441 at 21:3-4; Ex. 441 at App. 2 at 8-9.

[98]   Tr. Vol. 7 at 174:3-7 (McClellan).

mortality. Responding to their criticism of my opinion, I note that no study has shown the presence of particulate matter preceding premature mortality and correlation in the absence of other explanations for mortality at PM concentrations below 12 μg/m^3, as would be required to show causation at those concentrations.[99]

In other words, "in [Dr. McClellan's] opinion the medical evidence [shows] that PM$_{2.5}$ at annual concentrations on the order of 12 micrograms [μg/m3] and lower do[es] not have associated identifiable medical effects."[100]

Dr. McClellan's opinion is supported by Dr. Desvousges, who volunteered that

the results of these health studies are considered linear, that is, with every increment or decrements of change in ambient concentrations, there is a presumed corresponding change in health damages. However, *this has not been researched.* That is, even though health studies are conducted on, for example, ambient concentrations of 12 μg/m^3, it is presumed that a 0.00001 μg/m^3 change in concentration will have a risk associated with it by using a scalar multiple based on the impacts seen at the 12 μg/m^3 level. However, *this linear relationship has not been evaluated at very low concentration levels* and thus this assumption is conservative and may over estimate impacts. EPA has evaluated impacts, however, and has determined that levels of PM below 12 μg/m^3 is protective of human health and these are the levels at which the NAAQS have been set.[101]

In addition to concluding that the linear concentration-response function used by Drs. Marshall, Muller, and Desvousges was not valid at PM$_{2.5}$ ambient air concentrations below 12 μg/m^3, Dr. McClellan referred to the 2011 Greven study, which shows that

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[99]   Tr. Vol. 7 at 174:11-175:3 (McClellan).

[100]   Tr. Vol. 7 at 193:10-22 (McClellan in response to question from T. DeBleeckere).

[101]   Ex. 609 at 44 (emphasis added).

there is no statistical or medical evidence of an association between exposure to $PM_{2.5}$ and adverse health effects in the Greven study at the local level.[102] Specifically, Greven *et al.* (2011) conducted a large retrospective cohort study of Medicare enrollees, linking ambient levels of $PM_{2.5}$ to mortality data by monitor site during the period 2000-2006. In this seminal paper Greven reported an increase in the national life expectancy for reductions in the yearly average $PM_{2.5}$, but further noted that the observation is based on national trends in $PM_{2.5}$ and mortality. Greven calls attention to confounding by other variables trending on the national level.[103]

Dr. McClellan noted that Greven observed major differences across the United States using sophisticated spatial modeling techniques, which included a local coefficient β_1 that measures the association between local trends in $PM_{2.5}$ and mortality and a global coefficient β_2 that measures the association between the $PM_{2.5}$ national trend and the national trend in mortality.[104] Greven found estimates of the local coefficient β_1 to be approximately zero and non-significant nationally and in all three regions of the United States (East, Center and West).[105] Estimates of β_1 indicate that after adjusting for the association between national trends in mortality and $PM_{2.5}$, there is no significant association between an increase in the local yearly average $PM_{2.5}$ concentrations and the

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[102]   Ex. 441 at App. 2 at 8.

[103]   *Id.*

[104]   *Id.*

[105]   *Id.*

risk of dying in a given month.[106] Dr. McClellan testified that this important finding is illustrated graphically in Figure 6 (ellipses added),[107] and "clearly applicable to the Minnesota case, since the data base used includes populations with monitored ambient-air concentrations of $PM_{2.5}$ substantially in excess of those measured in Minnesota":[108]
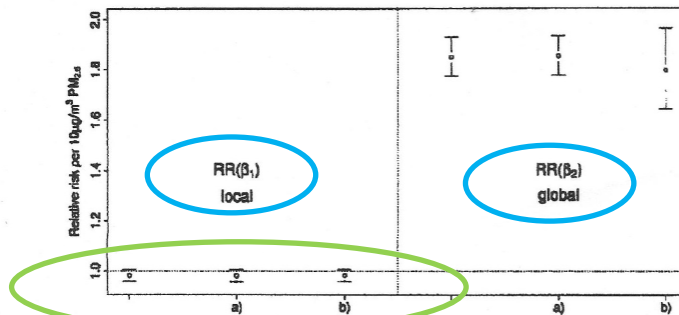
Figure 6. Sensitivity analysis using data on 173 locations with additional variables from the BRFSS-SMART survey. The left-most estimate shows estimate β_1 and β^2 from model (3) for this subset of the data. a) indicates the analysis including additional variables on the level of the monitor's county; the proportion of current smokers and of nonwhites, and the mean income and body mass index. b) gives the results for the same analysis allowing separate coefficients for the four variables' global and local trends [Greven, Dominici and Zeger, 2011]

Enlarging the relevant area shows clearly that the mean value for local sensitivity to $PM_{2.5}$ is below 1.0, and that even the statistical bands of uncertainty are almost entirely below 1.0:

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106 Ex. 441 at App. 2 at 8.

107 *Id.* at 8, 17.

108 *Id.* at 8-9.

Based on all of the above, Dr. McClellan concluded, without any contradicting evidence, and with a reasonable degree of medical certainty, that the primary (or health) damages conclusions reach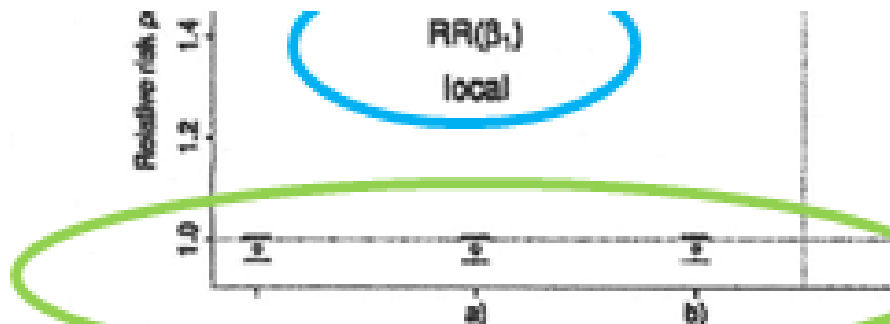ed by Drs. Muller, Marshall, and Desvousges are invalid because they were on national concentration-response data, rather than local data, and because they were based on linear air concentration-response models that were applied to all emissions irrespective of the air quality in a particular area and without considering the community-exposure level.[109]

In the absence of conflicting medical testimony, and because the ALJ's Conclusions 54 and 55 conflict with the epidemiological studies and analyses, the ALJ's conclusion that a linear concentration-response function may be applied at ambient air concentrations of $PM_{2.5}$ below 12 $\mu g/m^3$ lacks a factual basis.

B.   There is no existing health research that supports an association between very small $PM_{2.5}$ concentration levels and premature mortality or morbidity

In her Memorandum, the ALJ considered that "the record demonstrates that researchers in the field currently have concern about the *long-term* effects on human health of ambient concentration levels as low as 8 $\mu g/m^3$ of $PM_{2.5}$." (Recommendations at 108 (emphasis added).) For the reasons set forth above, this statement is not supported or supportable by the record. First, the statement does not appear in the record. Instead, the record shows that references by the CEOs, the Agencies, Krewski, and Lepeule are all

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[109]   *See, e.g.*, Ex. 441 at 21; Tr. Vol. 7 at 177:18-178:8. Additionally, Dr. Desvousges admitted that if the assumption of a linear relationship between $PM_{2.5}$ exposure and human-health effects were incorrect from a medical perspective, it would affect his analysis. (Tr. Vol. 7 at 84:7-85:6.)

to the lowest local average *one*-year $PM_{2.5}$ ambient air concentration point reached during the study. Furthermore, all experts have admitted, including Krewski and Lepeule, all-cause, cardiopulmonary, cardiovascular, and lung-cancer mortality have been associated with *chronic* air pollution exposure, meaning long-term, not one-year, exposure. [110] As set forth above, at no time in the entire 35-year study period of the extended American Cancer Society Cohort Study was a particular study area chronically at the low Minnesota ambient air concentrations for $PM_{2.5}$. (*See infra* at 27, Table 1 and Figure 1.)

Second, the ALJ's Recommendations erroneously overlook that the record shows that "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."[111] Specifically, Xcel admitted 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 $\mu g/m^3$ or 0.00001 $\mu g/m^3$. However, this linear relationship has been established based on correlations seen at the 8-23 $\mu g/m^3$ 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 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

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[110]   *See* Ex. 115 at 12:3-5 (Marshall Direct) (monetized health effects of $PM_{2.5}$ are most strongly connected to chronic exposures, *i.e.* for periods of more than a year).

[111]   Xcel March 15, 2016, Initial Criteria-Pollutants Post-Hearing Brief at 67 (*citing* Ex. 608 (Desvousges Surrebuttal) at 42-44; Hearing Transcript ("Tr. Vol.") 8 at 113-117).

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.[112]

Xcel Energy has additionally 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/m^3).[113]

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[112] Xcel March 15, 2016, Initial Criteria-Pollutants Post-Hearing Brief at 42-44 (*citing* Ex. 608 (Desvousges Surrebuttal); Hearing Transcript ("Tr. Vol.") 8 at 113-117).

[113] *See, e.g.*, Dr. Desvousges' surrebuttal report (Ex. 609) at 43 at Table 2 (ellipsis added), showing calculated increases in $PM_{2.5}$ exposures:

Table 2: Comparison of baseline ambient $PM_{2.5}$ concentrations from epidemiology studies with predicted concentration changes from air models[a]

	Concentration of $PM_{2.5}$ ug/m^3
Baseline from epidemiology studies (Table 3.2.1.2)[b]	16
Range in concentration from the epidemiology studies (Table 3.2.1.2)[b]	8 - 23
Average change in concentration from the epidemiology studies (Table 3.2.1.2)[b]	10
Average change in concentration from CAMx within 100 mile radius of MN	0.0000198
Average change in concentration from AP2 within 100 mile radius of MN	0.0000205
Average change in concentration from InMap within 100 mile radius of MN	0.0000323
Average change in concentration from AP2 beyond 100 mile radius of MN	0.00000298
Average change in concentration from InMap beyond 100 mile radius of MN	0.000000643

[a]Sherco model is used for comparison.
[b]From Direct Testimony of William H. Desvousges, Schedule 2

Xcel further admitted that

> 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.[114]

The ALJ has shut her eyes to these important admissions, applicable to all proponents, and not simply to Xcel. Because the ALJ's medical analysis lacks an evidentiary basis and is contradicted by the record, that analysis must be rejected.

C. The U.S. EPA agrees that there is no proximate cause between exposure to PM$_{2.5}$ at 3-year average ambient-air concentrations below 12 μg/m^3 and human-health impact

Dr. McClellan's epidemiological opinion is supported not only by a lack of impeaching data, cross-examination, and absence of contrary testimony, but is in fact affirmatively supported by a vast amount of research undertaken by the EPA pursuant to the United States Clean Air Act. The EPA issued a formal final updated rule when it set new NAAQS for Particulate Matter as announced in the January 15, 2013, Federal Register.[115]

By law, the primary NAAQS "shall be ambient air quality standards the attainment and maintenance of which in the judgment of the [EPA] Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the

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[114]   March 15, 2016, Xcel Initial Criteria-Pollutants Post-Hearing Brief at 71.

[115]   Ex. 444A (78 Fed. Reg. 3086, 3087-3167 and 3265 (Jan. 15, 2013) (Air Quality Designations for the 2012 Primary Annual Fine Particle (PM$_{2.5}$) National Ambient Air Quality Standards (NAAQS); Final Rule)).

public health."[116]   In the new NAAQS rules, the EPA made revisions to the suite of standards for particulate matter ("PM") "to provide requisite protection of public health and welfare and to make corresponding revisions to the data handling conventions for PM and to the ambient air monitoring, reporting, and network design requirements," "[b]ased on its review of the air quality criteria and the national ambient air quality standards (NAAQS) for particulate matter."[117]   Among other changes, the EPA revised the annual primary (health-based) standards for $PM_{2.5}$ by lowering the level to 12.0 μg/m^3 "so as to provide increased protection against health effects associated with long- and short-term exposures (including premature mortality, increased hospital admissions and emergency department visits, and development of chronic respiratory disease), and to retain the 24-hour $PM_{2.5}$ standard at a level of 35 μg/m^3."[118]

Sections 108 and 109 of the Clean Air Act, 42 U.S.C. §§ 7408 and 7409, govern the establishment, review, and revision, as appropriate, of the NAAQS to protect public health and welfare.   The Clean Air Act requires periodic review of the air quality criteria—the science upon which the standards are based—and the standards themselves.[119]   The final rule announced in the January 15, 2013, Federal Register was

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[116]   42 U.S.C. § 7409(b)(1).

[117]   78 Fed. Reg. at 3086 (Jan. 15, 2013), https://www.gpo.gov/fdsys/pkg/FR-2013-01-15/pdf/2012-30946.pdf ("2013 NAAQS Fed. Reg."); *see* 42 U.S.C. § 7409(d).

[118]   2013 NAAQS Fed. Reg. at 3086.

[119]   Ex. 444A at 3088.

made pursuant to these statutory requirements.[120]   Between 2007 and 2011, the EPA prepared draft and final Integrated Science Assessments, Risk and Exposure Assessments, and Policy Assessments.[121] Multiple drafts of all of these documents were subject to review by the public and were peer reviewed by CASAC, the independent scientific review committee established pursuant to 42 U.S.C. § 7409(d)(2)(A).[122] The EPA proposed revisions to the primary and secondary PM NAAQS on June 29, 2012.[123] The final rulemaking announced in the January 15, 2013, Federal Register was the final step in the review process.[124]

The EPA announced that "[t]his action provides increased protection for children, older adults, persons with pre-existing heart and lung disease, and other at-risk populations against an array of $PM_{2.5}$-related adverse health effects that include premature mortality, increased hospital admissions and emergency department visits, and development of chronic respiratory disease.   The EPA also is eliminating spatial averaging provisions as part of the form of the annual standard to avoid potential disproportionate impacts on at-risk populations."[125]

In preparing the 2013 PM NAAQS, the Administrator of the EPA recognized that

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[120]   Ex. 444A at 3088.

[121]   *Id.*

[122]   Ex. 444A at 3088, 3090 (independent review function performed by CASAC since early 1980's).

[123]   *See* 77 Fed. Reg. 38890 (June 29, 2012).

[124]   Ex. 444A at 3088.

[125]   Ex. 444A at 3088.

the Clean Air Act "requires her to reach a public health policy judgment as to what standards would be requisite—neither more nor less stringent than necessary—to protect public health with an adequate margin of safety, based on scientific evidence and technical assessments that have inherent uncertainties and limitations. This judgment requires making reasoned decisions as to what weight to place on various types of evidence and assessments, and on the related uncertainties and limitations. Thus, in selecting the final standards, *the Administrator is seeking not only to prevent fine particle concentrations that have been demonstrated to be harmful but also to prevent lower fine particle concentrations that may pose an unacceptable risk of harm, even if the risk is not precisely identified as to nature or degree.*"[126] In other words, the judgment exercised by the Administrator was exercised with a thorough eye on public safety.

In addition to previously-considered or existing epidemiological studies, the EPA considered "hundreds of new epidemiological studies conducted in many countries around the world."[127] Not surprisingly, the EPA "placed greater weight on U.S. and Canadian studies using $PM_{2.5}$ measurements, since studies conducted in other countries may reflect different demographic and air pollution characteristics."[128] The newly available research studies as well as the earlier body of scientific evidence presented and assessed in the Integrated Science Assessment underwent intensive scrutiny through

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[126] Ex. 444A at 3097 (emphasis added).

[127] *Id.*

[128] *Id.*

multiple layers of peer review and opportunities for public review and comment.[129] In developing the final rule, the EPA drew upon "an integrative synthesis of the entire body of evidence concerning exposure to ambient fine particles and a broad range of health endpoints," "focusing on those health endpoints for which the Integrated Science Assessment concludes that there is a *causal or likely causal relationship* with long- or short-term PM$_{2.5}$ exposures."[130] (*See, e.g.*, Ex. 444A at 3131-3133, 3135.) But the EPA also considered health endpoints for which the Integrated Science Assessment concluded there was evidence *suggestive of a causal relationship* with long-term PM$_{2.5}$ exposures.[131] (*See, e.g.*, Ex. 444A at 3131-3133, 3135.) The EPA further drew upon "a quantitative risk assessment based upon the scientific evidence described and assessed in the Integrated Science Assessment."[132] These analyses also underwent "intensive scrutiny through multiple layers of peer review and multiple opportunities for public review and comment."[133] It should be noted that while Dr. Marshall provided extensive testimony in this case, he proved at the evidentiary hearing to be wholly unfamiliar with the NAAQS rule, the scientific information underlying the rule, and the process used by the EPA to arrive at the rule; an astonishing feat for one who would hold himself out to be an expert

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[129]   Ex. 444A at 3097.

[130]   *Id.* (emphasis in original).

[131]   *Id.*

[132]   *Id.*

[133]   *Id.*

in this case.[134]

Dr. Desvousges testified (and showed) that he was familiar with the EPA's 2013 PM Final Rule and agreed that the rigor of the EPA review made the studies upon which the EPA relied in issuing that Final Rule "the most reliable source of scientific information on which to base decisions."[135] The EPA recognized that "the strongest evidence of associations occurs at concentrations around the long-term mean concentration."[136] "Thus, in earlier reviews, the EPA focused on identifying standard levels that were somewhat below the long-term mean concentrations reported in $PM_{2.5}$ epidemiological studies. The long-term mean concentrations represented air quality data typically used in epidemiological analyses and provided a direct link between $PM_{2.5}$ concentrations and the observed health effects."[137] "These data were available for all long- and short-term exposure studies analyzed and, therefore, represented the data set available for the broadest set of epidemiological studies."[138]

The EPA explored ways to take into account additional information from epidemiological studies, focusing on evaluating different statistical metrics, beyond the long-term mean concentration, to characterize the part of the distribution of $PM_{2.5}$

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[134]   *See, e.g.,* Tr. Vol. 6 at 58 (denying 12 μg/m³ NAAQS in effect), 72-73, 101-102; Tr. Vol. 7 at 43 (admitting 12 μg/m³ NAAQS in effect based on Ex. 453); *see also* 2013 NAAQS Fed. Reg. at 3086 ("The final rule is effective on March 18, 2013.").

[135]   Tr. Vol. 7 at 85:10-17, 86:15-87:7, 87:25-88:2.

[136]   Ex. 444A at 3129.

[137]   *Id.*

[138]   *Id.*

concentrations in which it continued to have confidence in the associations observed in epidemiological studies and below which there was a comparative lack of data such that confidence in the relationship was appreciably less.[139] This would also be the part of the distribution of $PM_{2.5}$ concentrations which had the most influence on generating the health effect estimates reported in epidemiological studies.[140] The EPA's Policy Assessment concluded that focusing on concentrations within the lower quartile of a distribution, such as the range from the 25th to the 10th percentile, was reasonable to consider as a region within which to begin to have appreciably less confidence in the associations observed in epidemiological studies.[141]

Contrary to Drs. Marshall, Muller, and Desvousges, the EPA spent significant time and resources determining whether concentration-response functions should be trusted at all ambient-air concentrations. Following those studies, the EPA and its scientific and 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."[142] Dr. Desvousges "would not disagree with" this approach to the reliability of the study data.[143] Notwithstanding this "restriction," the

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[139] Ex. 444A at 3129.

[140] *Id.*

[141] *Id.*; *see also* Tr. Vol. 7 at 102:24-103:3 (Desvousges), 52:8-16 (Dr. Desvousges explains why he relied on the inner quartile to address major uncertainties in the underlying data).

[142] Ex. 444A at 3129.

[143] Tr. Vol. 7 at 104:1-15.

EPA took into consideration "studies that were very much towards the low end of the PM$_{2.5}$ ambient air concentrations."[144]

The EPA graphically displayed the most important studies in the Final Rule announcement, including the following graphic, taken from Exhibit 444A at page 3135 (*see also* at 3131-3133), which showed for all studies suggestive of a causal or likely causal relationship *and* all studies merely suggestive of a causal relationship a 3-year average mean ambient air PM$_{2.5}$ concentration well above 12 μg/m^3:

Source: U.S. EPA, 2011a, Figure 2-8

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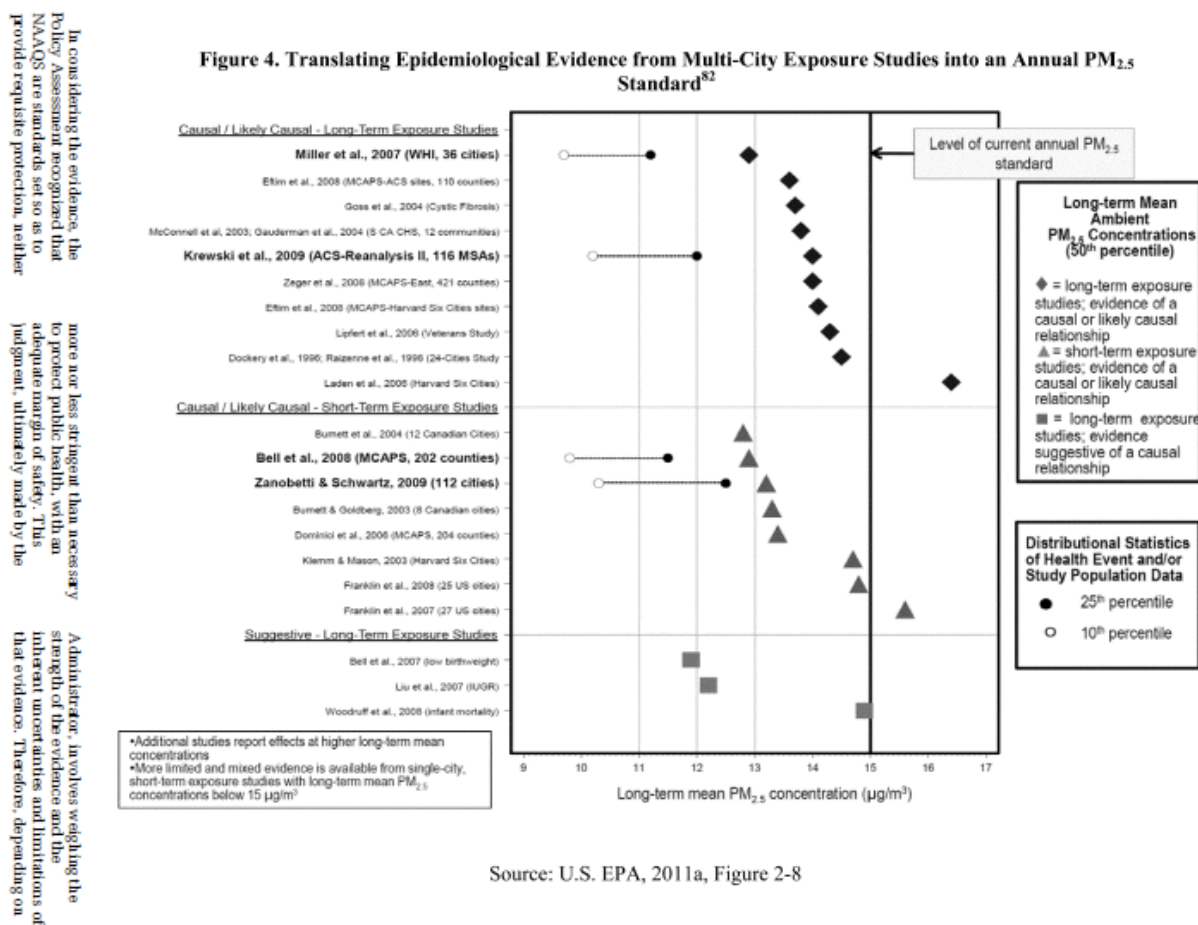
144   Tr. Vol. 7 at 106:1-4; Ex. 444A at 3135.

Against the legal background that the requirement that primary standards provide an adequate margin of safety was intended to address uncertainties associated with inconclusive scientific and technical information available at the time of standard setting, and to provide a reasonable degree of protection against hazards that research has not yet identified, *see Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1154 (D.C. Cir. 1980); *Am. Petroleum Inst. v. Costle*, 665 F.2d 1176, 1186 (D.C. Cir. 1981); *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 533 (D.C. Cir. 2009); *Coal. of Battery Recyclers Ass'n v. EPA*, 604 F.3d 613, 617-18 (D.C. Cir. 2010), and based on all of the available studies, materials, and scientific advice available to the federal government, the EPA found that it could protect public health with an adequate margin of safety in setting the NAAQS limit at 12 $\mu g/m^3$.[145] The EPA found no evidence of a reliable causal relationship between $PM_{2.5}$ exposure and human health risk below this standard.[146]

The ALJ is correct that Minnesota's compliance with the NAAQS does not reduce nationwide Criteria Pollutants damages associated with human mortality to zero.[147] But this conclusion (which is really a finding), is entirely irrelevant here. The question is not whether there are nationwide health effects from $PM_{2.5}$ exposure, but whether the

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[145] <u>Ex. 444A</u> at 3088-3089.

[146] <u>Ex. 444A</u>.

[147] *See* Recommendations at 103, Conclusion 56; *See also* <u>Ex. 441</u> (McClellan Rebuttal), App. 2 at 9 ("… for downwind areas that may not be in attainment of the $PM_{2.5}$ NAAQS [12 $\mu g/m^3$], any calculated increase in mortality attributable will be extraordinarily small compared to the baseline mortality. This is emphasized by the findings of Lepeule et al (2012) discussed above.") *See also* <u>Dr. Desvousges' surrebuttal report (Ex. 609)</u> at 43 at Table 2, showing calculated increases in $PM_{2.5}$ exposures of 0.000000643 $\mu g/m^3$.

proponents of changes to Minnesota's current Criteria Pollutants have met their burden of proof to show that the values they calculated were correct. As set forth above, their experts' failure to break down damages by locality, based on local $PM_{2.5}$ ambient air concentrations, and the experts' failure to separately provide non-health damages calculations, means that the Commission has no valid evidence regarding such damages because one must at least subtract from those damages all health-effects damages related to those geographic locations where $PM_{2.5}$ ambient air concentrations are below 12 $\mu g/m^3$. Dr. McClellan's Figure 5 (*see infra* at 46), shows that one should actually subtract health-effects damages related to those geographic locations where $PM_{2.5}$ ambient air concentrations are below 13.2 $\mu g/m^3$.[148] The proponents' experts' failure to recognize this fact, and their failure to break down their data means that they cannot even in part meet their burden of proof, and Conclusions 54 and 55 and the resulting Recommendations must be rejected.

> **D.** **According to the California Air Resources Board, a $PM_{2.5}$ ambient-air concentration standard of 12 $\mu g/m^3$ adequately protects the health of the public with an adequate margin of safety**

Similar to the EPA's NAAQS, the California Air Resources Board sets state ambient-air quality standards ("AAQS") for particulate matter.[149] Similarly to the EPA, the California Board is charged by statute with establishing the ambient-air standards "at levels that adequately protect the health of the public, including infants and children, with

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[148]   *See* Ex. 441, App. 2 at 16.

[149]   *See* Cal. Health & Safety Code § 39606.

an adequate margin of safety."[150] In June of 2002, after study and a peer review process, California adopted new, revised PM AAQS for outdoor air, lowering the annual PM_{10} standard from 30 µg/m^3 to 20 µg/m^3 and establishing a new annual standard for $PM_{2.5}$ of 12 µg/m^3.[151] The new California PM AAQS became effective on July 5, 2003.[152]

The MLIG respectfully submits that the unchallenged testimony of Dr. McClellan, the epidemiological evidence, and both the EPA's and the California Air Resources Board's setting of a 12 µg/m^3 $PM_{2.5}$ average mean ambient-air quality standard as "protective with an adequate margin of safety," prove that Dr. Marshall's, Dr. Desvousges' and Dr. Muller's failure to base their primary (or health) damages conclusions on local concentration-response data, rather than national data, and their failure to consider the community-exposure level render their methodology and opinions invalid with respect to impacts and damages resulting from Minnesota emissions of primary $PM_{2.5}$ and the formation of secondary $PM_{2.5}$ at ambient-air exposure levels below 12 µg/m^3. Again, therefore, the proponents' experts' failure to recognize this fact, and their failure to break down their data means that they cannot even meet their burden of proof in part, and Conclusions 54 and 55 and the resulting Recommendations must be rejected.

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[150] *See* Cal. Health & Safety Code § 39606(d)(2).

[151] *See* Cal. Code Regs., tit. 17, §§ 70100, 70100.1, and 70200; *see also* Ex. 444A at 3110.

[152] *See* Cal. Code Regs., tit. 17, §§ 70100, 70100.1, and 70200.

V. THE ALJ ERRONEOUSLY HELD THAT THE MLIG FAILED TO MEET ITS BURDEN OF PROOF BASED ON THE ALJ'S UNSUPPORTED SPECULATION REGARDING POTENTIAL FUTURE MEDICAL STUDIES

It appears that the ALJ credited an argument made by the CEOs in their March 15, 2016, Initial Post-Hearing Brief, 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'."[153] This argument is both misleading and not relevant to the present case, as the "current standards" in the CEOs' Initial Brief and in Ex. 444A refer to early EPA NAAQS standards of 15 μg/m^3 or greater, rather than to the 12 μg/m^3 level testified to by the MLIG's expert witness Dr. McClellan and that form the current EPA NAAQS.

The ALJ nevertheless held that the general trend "over the "years has been for the levels of $PM_{2.5}$ that are considered "safe" to be lowered, (Recommendations at 108), such that research may show at some undetermined point in the future that exposure levels currently deemed protective of human health may not, in fact, have been "safe." (Recommendations at 108.) As noted in the Introduction, the ALJ concluded from this grossly speculative and uncertain basis of potential future medical findings and developments to which no witness testified that the MLIG did not meet its burden of proof. (*Id.*)

The ALJ's conclusion is not only speculative, but also lacks a factual basis. While

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[153]   CEOs' March 15, 2016, Initial Criteria-Pollutants Post-Hearing Brief at 49-50 (*citing* Ex. 444A at 3089).

the federal government has lowered its exposure levels for $PM_{2.5}$ as recently as January

15, 2013, from a 3-year average long-term exposure of 15 μg/m^3 to 12 μg/m^3,[154] the

California Air Resources Board set its 3-year exposure standard at 12 μg/m^3 over 14

years ago, in June 2002, after study and a peer review process.[155] The California PM

ambient air quality standard became effective on July 5, 2003, and has not been changed

since.[156] In fact, there is no record evidence that a PM 3-year averaged exposure standard

of 12 μg/m^3 has ever been lowered.

Even if one were to consider the EPA's historical lowering of the NAAQS limits

as a factor, that fact has no bearing on the proponents' ability to meet their burden of

proof. The damages calculated by Drs. Marshall, Muller, and Desvousges become no

more valid, because the invalidity of the linear concentration-response function below 12

μg/m^3 is not impacted by historical lowering of the $PM_{2.5}$ NAAQS limits to ambient air

concentrations far above Minnesota's $PM_{2.5}$ ambient air concentration. If the medical

science and studies develop further, then change to the concentration-response functions

may well develop. But whether those changes might be linear or not is entirely unknown

and unknowable. The Commission cannot quantify damages based on such speculation.

Instead, the Commission should remain open to revisiting the medical science as it

develops in the future, and meanwhile follow its statutory mandate to quantify those

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[154] *See* Ex. 444A (selected pages from 78 Fed. Reg. 3086).

[155] *See* Cal. Code Regs., tit. 17, §§ 70100, 70100.1, and 70200; *see also* Ex. 444A at 3110.

[156] *See* Cal. Code Regs., tit. 17, §§ 70100, 70100.1, and 70200.

damages that can be determined at this time, based on admissible and non-speculative evidence submitted at this time in this proceeding. Although the conclusion that the proponents have not met their burden of proof is clearly not appealing to the ALJ, neither the ALJ nor the Commission may impose their will. *In re Grand Rapids PUC*, 731 N.W.2d 866, 871 (Minn. Ct. App. 2007) (agency decision is arbitrary and capricious if it reflects the agency's will and not its judgment) (*citing In re Excess Surplus Status of Blue Cross & Blue Shield of Minn.*, 624 N.W.2d 264, 278 (Minn. 2001)).

CONCLUSION

The MLIG respectfully seeks rejection of that portion of the Order Regarding Burdens of Proof dated March 27, 2015 that imposes a burden of proof on parties that object to changes in the existing Criteria Pollutant environmental costs and do not affirmatively advance new values. The ALJ's contrary ruling is contrary to Minn. R. 1400.7300, subp. 5.

On the basis of the substantive due process guarantees set forth in the Fourteenth Amendment to the United States Constitution, and Article 1, § 7, of the Minnesota Constitution, based upon Minn. Stat. § 14.69 and §§ 645.16 and 645.17, based upon Minn. R. 1400.7300, subp. 5, based upon a plain reading of Minn. Stat. § 216B.2422, subd. 3(a), and based upon this Commission's prior interpretation of that statute in its 1997 Order (as affirmed by the Minnesota Court of Appeals), the MLIG respectfully urges the Commission to reject the ALJ's novel reading of Minn. Stat. § 216B.2422, subd. 3(a) and her holding that the Legislature did not intend a causal link between emissions and the environmental-cost damages to be quantified by the Commission under

that statute. The ALJ's reading erroneously renders the environmental-cost statute unconstitutional, which interpretation is not warranted and violates Minn. Stat. § 645.17.

The MLIG further urges the Commission to reject the ALJ's speculation that at some point in the future medical science may be able to make a connection between primary and secondary $PM_{2.5}$ emissions in areas where the $PM_{2.5}$ ambient air concentration is below 12 μg/m^3, and that in light of such potential future medical advances the Commission should already now assume a linear concentration-response function for which there is no medical foundation.

Finally, the MLIG seeks rejection of the ALJ's Conclusions 54 and 55 on the basis that they lack a factual basis in the record and are, in fact, contradicted by the record. As set forth in the uncontroverted expert testimony of Dr. McClellan and official EPA reporting, there is no reliable connection between exposure to primary and secondary $PM_{2.5}$ and health-effects damages in areas with a $PM_{2.5}$ ambient air concentration below 12 μg/m^3, such as Minnesota and Wisconsin. Because this fact renders the health-effects damages calculations by Drs. Marshall, Muller, and Desvousges invalid, there is no factual support to quantify health-effects damages. Because Dr. Muller and Desvousges further did not separately set forth the non-health damages portion of their total calculated damages, the Commission is left without a factual record in this proceeding upon which to quantify Criteria Pollutant damages. The Commission's options are to either leave the current values intact, or to order new proceedings. However, adoption of any of the proponents' values is not an option in the absence of proof.

Respectfully submitted,

STOEL RIVES LLP

Dated: July 15, 2016

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**

APPENDIX

<u>Should be</u>

Finding of Fact 3, first sentence

Delete sentence. This statement is entire irrelevant, and the goal of this proceeding is only to quantify certain damages if it is practicable to do so. This proceeding is judicial, a-political, and not "aimed at reducing environmental damages."

Finding of Fact 9

The MLIG, the fourth party actively involved in this proceeding, posited that none of the other parties carried their burden of proof. The MLIG asserted that Minnesota's ambient air concentration of $PM_{2.5}$ is below a three-year average of 12 micrograms per cubic meter ($\mu g/m^3$), and that no studies exist which show health-effects damages below that limit. In fact, data would suggest that exposure below that limit is "protective." The MLIG does not suggest increasing exposure, but simply points out that below this limit the study data is at best unreliable, a fact with which the EPA agreed in setting the NAAQS standard at 12 $\mu g/m^3$ in 2013. The 12 $\mu g/m^3$ standard was adopted in California in 2002, and has been in effect there since 2003. Because the proponents of changes in the Criteria Pollutant environmental-cost values have not broken out damages by geographic location and have also not identified how much of their calculated damages relates to non-health damages, the MLIG argued that none of the proponents could meet their burden of proof given the invalidity of a large portion of their health-effect damages calculations.

Finding of Fact 280, second sentence	… Furthermore, Dr. McClellan noted that he is not aware if any study showing "the presence of particulate matter preceding premature mortality and correlation in the absence of other explanations for mortality at $PM_{2.5}$ concentrations below 12 µg/m^3, as would be required to show causation at these concentrations.
Finding of Fact 294, last sentence	For this reason, and because there are no epidemiological studies showing an increased health risk at ambient air concentrations of $PM_{2.5}$ in Minnesota and Wisconsin, the MLIG took the position that it is not appropriate to calculate health damages for $PM_{2.5}$ in Minnesota or Wisconsin. The MLIG further took the position, and the Commission agrees, that no party has broken down or otherwise specified non-health damages, leaving the Commission with no record upon which to modify the current values for $PM_{2.5}$.
Conclusion 54	Rejected as lacking a factual foundation.
Conclusion 55	Rejected as lacking a factual foundation.
Recommendation 1	Delete as irrelevant given the proponent parties' failure to meet their overall burden of proof.
Recommendation 2	Delete as irrelevant given the proponent parties' failure to meet their overall burden of proof.
Recommendation 3	Delete as unsupported by the record at $PM_{2.5}$ ambient air concentrations in Minnesota below 12 µg/m^3.
Recommendation 4	Delete as irrelevant given the proponent parties' failure to meet their overall burden of proof.

CERTIFICATE OF SERVICE

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

> Minnesota Large Industrial Group's Exceptions to the Findings of Fact, Conclusions, and Recommendations of the Administrative Law Judge Regarding Phase II (Criteria Pollutants Track)

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

Dated this 15th day of July, 2016

/s/ Marc A. Al
Marc A. Al

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Aafedt	daafedt@winthrop.com	Winthrop & Weinstine, P.A.	Suite 3500, 225 South Sixth Street Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Michael	Ahern	ahern.michael@dorsey.com	Dorsey & Whitney, LLP	50 S 6th St Ste 1500 Minneapolis, MN 554021498	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Marc	Al	marc.al@stoel.com	Stoel Rives LLP	33 South Sixth St Ste 4200 Minneapolis, MN 55402	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Hugh	Brown	brown.hugh@dorsey.com	Dorsey & Whitney LLP	Suite 1500 50 South Sixth Street Minneapolis, Minnesota 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List
B. Andrew	Brown	brown.andrew@dorsey.com	Dorsey & Whitney LLP	Suite 1500 50 South Sixth Street Minneapolis, MN 554021498	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Carl	Cronin	carl.cronin@xcelenergy.com	Xcel Energy	414 Nicollet Mall Minneapolis, Minnesota 55401	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Leigh	Currie	lcurrie@mncenter.org	Minnesota Center for Environmental Advocacy	26 E. Exchange St., Suite 206 St. Paul, Minnesota 55101	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Patricia	DeBleeckere	tricia.debleeckere@state.mn.us	Public Utilities Commission	Suite 350 121 Seventh Place East St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
James	Denniston	james.r.denniston@xcelenergy.com	Xcel Energy Services, Inc.	414 Nicollet Mall, Fifth Floor Minneapolis, MN 55401	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Jessica	Dexter	jdexter@elpc.org	Environmental Law & Policy Center	394 Lake Avenue, Ste. 309 Duluth, MN 55802	Electronic Service	No	OFF_SL_14-643_Official CC Service List

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Brian	Draxten	bhdraxten@otpco.com	Otter Tail Power Company	P.O. Box 496 215 South Cascade Street Fergus Falls, MN 565380498	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Tristan	Duncan	tlduncan@shb.com	Shook Hardy & Bacon, L.L.P.	2555 Grand Blvd. Kansas City, MO 64108	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Bret	Eknes	bret.eknes@state.mn.us	Public Utilities Commission	Suite 350 121 7th Place East St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Jim	Erickson	jim.g.erickson@xcelenergy.com	Xcel Energy	414 Nicollet mall 7th Flr Minneapolis, MN 55401	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Bruce	Gerhardson	bgerhardson@otpco.com	Otter Tail Power Company	PO Box 496 215 S Cascade St Fergus Falls, MN 565380496	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Emerald	Gratz	emerald.gratz@state.mn.us	Office of Administrative Hearings	PO Box 64620 Saint Paul, Minnesota 55164-0620	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Thomas J.	Grever	tgrever@shb.com	Shook, Hardy &Bacon L.L.P.	2555 Grand Blvd. Kansas City, MO 64108	Electronic Service	No	OFF_SL_14-643_Official CC Service List
J Drake	Hamilton	hamilton@fresh-energy.org	Fresh Energy	408 St Peter St Saint Paul, MN 55101	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Linda	Jensen	linda.s.jensen@ag.state.mn.us	Office of the Attorney General-DOC	1800 BRM Tower 445 Minnesota Street St. Paul, MN 551012134	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Kevin D.	Johnson	kdjohnson@stoel.com	Stoel Rives LLP	Suite 4200 33 South Sixth Street Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Sarah	Johnson Phillips	sjphillips@stoel.com	Stoel Rives LLP	33 South Sixth Street Suite 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Hudson	Kingston	hkingston@mncenter.org	MN Center for Environmental Advocacy	26 East Exchange Street, Suite 206 St. Paul, Minnesota 55101	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Brad	Klein	bklein@elpc.org	Environmental Law & Policy Center	35 E. Wacker Drive, Suite 1600 Suite 1600 Chicago, IL 60601	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Kevin	Lee	kevin@kevinleelaw.com		400 S. 4th St. Suite 401-111 Minneapolis, MN 55415	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Jonathan	Massey	jmassey@masseygail.com	Massey & Gail LLP	1325 G Street NW Washington, DC 20005	Electronic Service	No	OFF_SL_14-643_Official CC Service List
David	Moeller	dmoeller@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022093	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Andrew	Moratzka	apmoratzka@stoel.com	Stoel Rives LLP	33 South Sixth Street Suite 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Jeff	Oxley	jeff.oxley@state.mn.us	Office of Administrative Hearings	600 North Robert Street St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Michelle	Rebholz	michelle.rebholz@state.mn.us	Public Utilities Commission	Suite 350121 Seventh Place East St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Kevin	Reuther	kreuther@mncenter.org	MN Center for Environmental Advocacy	26 E Exchange St, Ste 206 St. Paul, MN 551011667	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Laureen	Ross McCalib	lrossmccalib@grenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 55369-4718	Electronic Service	No	OFF_SL_14-643_Official CC Service List
LauraSue	Schlatter	LauraSue.Schlatter@state.mn.us	Office of Administrative Hearings	PO Box 64620 St. Paul, MN 55164-0620	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Janet	Shaddix Elling	jshaddix@janetshaddix.com	Shaddix And Associates	Ste 122 9100 W Bloomington Frwy Bloomington, MN 55431	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Sean	Stalpes	sean.stalpes@state.mn.us	Public Utilities Commission	121 E. 7th Place, Suite 350 Saint Paul, MN 55101-2147	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Donna	Stephenson	dstephenson@grenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 55369	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Eric	Swanson	eswanson@winthrop.com	Winthrop Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_14-643_Official CC Service List
SaGonna	Thompson	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Erin	Vaughn	evaughn@shb.com	Shook, Hardy &Bacon L.L.P.	2555 Grand Blvd. Kansas City, MO 64108	Electronic Service	No	OFF_SL_14-643_Official CC Service List

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Colin	Wicker	wicker.colin@dorsey.com	Dorsey & Whitney LLP	50 6th Street South Suite 1500 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Alexis	Williams	williams@fresh-energy.org	Fresh Energy	408 St. Peter St Suite 220 St. Paul, MN 55102	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Cam	Winton	cwinton@mnchamber.com	Minnesota Chamber of Commerce	400 Robert Street North Suite 1500 St. Paul, Minnesota 55101	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List