STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION

In the Matter of the Quantification Of Environmental Costs	**Docket No. E-999/CI- 93-583**

MEMORANDUM IN SUPPORT OF CLEAN ENERGY ORGANIZATIONS' MOTION TO UPDATE EXTERNALITY VALUES FOR USE IN RESOURCE DECISIONS

Izaak Walton League of America - Midwest Office

Fresh Energy

Sierra Club

Center for Energy and the Environment

Will Steger Foundation

Minnesota Center for Environmental Advocacy

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STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION

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I. INTRODUCTION

The State is poised to make important, long-term decisions about major investments in its energy future—decisions that will affect generations of Minnesotans. It is imperative that decision makers have sound, up-to-date information about the costs and consequences of electricity resource choices. This requires the Minnesota Public Utilities Commission ("Commission") to reconsider the environmental cost values it adopted by order nearly two decades ago and still uses in resource decisions. Because those values are outdated and no longer scientifically defensible, it is urgent that the Commission move quickly to establish new values, especially for pollutants that impose significant costs on human health and the environment.

Therefore, pursuant to Minn. Stat. §216B.25, the Minnesota Center for Environmental Advocacy, Fresh Energy, Izaak Walton League of America – Midwest Office, Center for Energy and Environment, Sierra Club and the Will Steger Foundation (hereinafter "Clean Energy Organizations") move to reopen the Commission's 1994 investigation to quantify environmental

costs under §216B.2422 subd. 3.[1] The purpose of this reopener would be to update the environmental cost values for three of the pollutants the Commission established nearly 20 years ago, sulfur dioxide (SO_2), nitrogen oxides (NO_x), and carbon dioxide (CO_2); and to establish a cost value for fine particulate matter ($PM_{2.5}$). Scientific consensus has advanced significantly since the Commission's original environmental cost proceeding establishes that emissions of these pollutants cause public health and environmental damage substantially higher than Minnesota's current environmental cost values.[2]

In support of this Motion, Clean Energy Organizations submit a study prepared by Dr. Stephen Polasky and Andrew Goodkind, applied economists at the University of Minnesota.[3] This study examined the health and environmental costs of air pollution caused by electricity generation, and presents estimates of pollutant emissions costs for both urban and rural counties in Minnesota. The study concludes, based on established environmental science and analytical methodologies, that the quantifiable damages posed by this pollution are far higher than damages that the Commission estimated in the 1990s.

Clean Energy Organizations submit that the Commission has a duty to reopen the environmental costs docket, *In the Matter of the Quantification of Environmental Costs,* PUC Docket No. E-999/CI-93-583, and bring up to date the scientific evidence on which the

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[1] *In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993*, PUC Docket No. E-999/CI-93-583, Order Establishing Environmental Cost Values (January 3, 1997) and Order Affirming in Part and Modifying in Part Order Establishing Environmental Cost Values (July 2, 1997).

[2] Clean Energy Organizations recognize that all of the pollutants for which the Commission quantified cost values in Docket No. CI-93-583 have potential for significant environmental damage. For the purposes of this Motion, however, because SO_2, NO_x $PM_{2.5}$ and CO_2 dominate fossil-fuel-fired air emissions, narrowing the update to the Commission's cost values for these four pollutants is appropriate.

[3] *Health and Environmental Costs of Electricity Generation in Minnesota,* September 26, 2013 ("Polasky/Goodkind Report"), attached hereto as Exhibit A. Dr. Polasky's and Mr. Goodkind's curricula vitae are attached as Exhibit B.

Commission's environmental costs values depend. An update is crucial to the Commission's fair evaluation of electricity generation choices that utilities propose and which require Commission approval.

II. POLICY BACKGROUND

The production of electricity is central to Minnesota's quality of life, affecting all individuals and businesses in rural and urban communities alike. The benefits of electricity are clear; and their value is reflected in the market price that consumers pay. But electricity generation also has negative effects. Depending on its source, electricity generation can cause significant air pollution, habitat destruction, water pollution, and contribute to climate change. These negative effects are often not reflected in the market price paid for electricity. Instead, they are "externalized," paid for by society at large.

When costs are externalized, markets do not function as efficiently as they should. As described in a 2010 report from the National Research Council of the National Academy of Sciences, "In the absence of government intervention, external effects associated with energy production and use are generally not taken into account in decision making. When prices do not adequately reflect them, the monetary value assigned to benefits and adverse effects (referred to as damages) are 'hidden' in the sense that government and other decision makers, such as electric utility managers, may not recognize the full costs of their actions."[4]

Electricity, despite its obvious benefits, has many negative impacts on the environment and human health that are not captured in the market price paid by consumers. In recognition of this, the Minnesota Legislature, in 1993, enacted a requirement that the Commission establish the

[4] Nat'l Research Council, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use* [hereinafter "NRC Report"], 2010, p. 3.

environmental costs of electricity generation.[5] The Legislature further required that Minnesota utilities use the costs when evaluating and selecting energy resources in planning proceedings before the Commission.[6]

The public policy motivating this action by the Legislature was that, by establishing the external costs of electricity production and applying those costs in utility planning decisions and selections, the Commission can correct a market failure and ensure that Minnesota's electricity resource mix reflects the most efficient and truly least-cost portfolio for Minnesota ratepayers and society. The result, however, can only be accomplished to the degree that the externality values established by the Commission accurately approximate the actual costs borne as a result of the negative effects of electricity generation.

III. SCIENTIFIC BACKGROUND OF PUBLIC HEALTH AND ENVIRONMENTAL DAMAGES FROM ELECTRICITY GENERATION

The pollutants emitted by generation of electricity from fossil fuels have significant adverse effects on the environment and on human health. The adverse consequences of air pollution from power production, and, in particular, coal plants, are well documented and well understood. Clean Energy Organizations focus here on greenhouse gases, fine particulates, sulfur dioxide, and nitrogen oxides because they are emitted in the greatest amounts from fossil-fueled power plants, and because they cause the most significant externalized damage.

Greenhouse gases ("GHG"): Burning of fossil fuels such as coal and natural gas to generate electricity results in the emission of carbon dioxide, a greenhouse gas, so known

[5] Minn. Stat. § 216B.2242, subd. 3; 1993 Minn Laws Ch. 356, sec. 3. ("The commission shall, to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation. A utility shall use the values established by the commission in conjunction with other external factors, including socioeconomic costs, when evaluating and selecting resource options in all proceedings before the commission, including resource plan and certificate of need proceedings.")

[6] *Id.*

because of the heat-trapping effect such gases have on Earth's atmosphere. Anthropogenic GHG emissions are known to contribute to climate change.[7] GHG emissions, particularly carbon dioxide ("CO_2"), remain in the atmosphere and will affect the climate for many decades.

Continued emissions of GHG are contributing to numerous, severe and irreversible environmental and public health problems. According to EPA, in the Midwest such impacts include, but are not limited to: extreme weather events; climate-sensitive disease outbreaks; air quality deterioration; water quality deterioration; more intense precipitation events leading to flooding, property damage, and fatalities; increased periods of drought; declining lake levels; changes causing stress to forests, habitat, and wildlife. Human health impacts include increased heat-related deaths, increased risk of certain diseases spreading and increased health problems due to worsening air quality.[8]

Sulfur Dioxide ("SO_2"): SO_2 emissions have gone down in recent years in response to Clean Air Act requirements, however SO_2 emissions continue to have negative health impacts. According to EPA, "[c]urrent scientific evidence links short-term exposures to SO_2, ranging from 5 minutes to 24 hours, with an array of adverse respiratory effects, including bronchoconstriction and increased asthma symptoms. These effects are particularly important for asthmatics at elevated ventilation rates (e.g., while exercising or playing). Studies also show a connection between short-term exposure and increased visits to emergency rooms and hospital

[7] "Climate Panel Cites Near Certainty on Warming", New York Times, August 19, 2013 (reporting that the Intergovernmental Panel on Climate Change ("IPCC") has drafted a report finding "with near certainty that human activity is the cause of most of the temperature increases of recent decades.")
[8] U.S. EPA, http://www.epa.gov/climatechange/impacts-adaptation/midwest.html

admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics."[9]

In addition, SO_2 emissions from power plants, together with nitrogen oxides, trigger chemical reactions in the atmosphere that form fine particle pollution.[10] These "secondary particles" – as opposed to direct smokestack particulate emissions -- make up most of the fine particle pollution in the country.[11]

Fine Particulate Matter ($PM_{2.5}$): Both primary and secondary emissions of fine particulates (droplets less than 2.5 micrometers in diameter) have serious public health consequences. According to EPA, "[n]umerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- premature death in people with heart or lung disease,
- nonfatal heart attacks,
- irregular heartbeat,
- aggravated asthma,
- decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing."[12]

Particulate matter pollution also has negative environmental impacts, including impairing visibility by causing haze, causing lakes and streams to become acidic, depleting nutrients in soil, damaging sensitive forests and farm crops, and affecting diversity within ecosystems.[13] By blackening ice and snow and thereby reducing the reflection of solar radiation, particulate matter

[9] U.S. EPA http://www.epa.gov/airquality/sulfurdioxide/health.html
[10] Fine particulate pollution is that which is less than 2.5 micrometers in diameter.
[11] U.S. EPA http://www.epa.gov/oar/particlepollution/basic.html
[12] U.S. EPA, http://www.epa.gov/air/particlepollution/health.html
[13] *Id.*

is also a likely factor in climate change, especially in areas of higher latitude where ice and snow are common.[14]

Nitrogen Oxides (NOx): Nitrogen oxide compounds play an important role in the atmospheric reactions that create ground level ozone (smog). According to the EPA, "[b]reathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. 'Bad' ozone also can reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue."[15] Moreover, "[g]round-level or 'bad' ozone also damages vegetation and ecosystems. It leads to reduced agricultural crop and commercial forest yields, reduced growth and survivability of tree seedlings, and increased susceptibility to diseases, pests and other stresses such as harsh weather. In the United States alone, ground-level ozone is responsible for an estimated $500 million in reduced crop production each year. Ground-level ozone also damages the foliage of trees and other plants, affecting the landscape of cities, national parks and forests, and recreation areas."[16]

As discussed above, the combination of emissions from nitrogen oxide compounds and sulfur dioxide form "secondary" particle pollution. Secondary particle pollution constitutes most of the fine particle pollution in the country, responsible for significant health impacts to people and environmental damage.

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[14] Environmental Literacy Council. *Black Carbon.* http://www.enviroliteracy.org/article.php/1336.html.
[15] U.S. EPA, http://www.epa.gov/oar/oaqps/gooduphigh/bad.html#6
[16] *Id.*

IV. EXTERNALITY VALUES ESTABLISHED IN 1996

In March 1994, the Commission initiated a formal evidentiary hearing process to implement the 1993 law and establish final environmental cost values.[17] The hearing process was conducted by an Administrative Law Judge, who recommended that the Commission adopt "conservative values" because "the quantification of environmental costs is still in its infancy."[18]

After two years of evidentiary hearings, the Commission adopted a range of environmental cost values for airborne emissions of sulfur dioxide, nitrogen oxides, particulate matter less than 10 microns in size ("PM_{10}"), carbon dioxide, carbon monoxide ("CO"), and lead ("Pb"). The Commission determined that it would not set environmental cost values for fine particulate matter or mercury ("Hg").

As a consequence, resource decisions the Commission makes today are based on the externality values established for six pollutants in 1996 adjusted for inflation.[19] According to the Commission's most recent order adjusting the figures[20], the externality values are as follows:

URBAN – Range of 2012$/ton

	LOW	**HIGH**
SO2	0.00	0.00
PM10	6291.00	9056.00
CO	1.49	3.20
NOx	532.00	1379.00
Pb	4415.00	5464.00
CO2	0.42	4.37

[17] This proceeding followed the Commission's order setting "interim" environmental cost values, as required by Minn. Stat. §216B.2422 Subd. 3(b), Order Establishing Interim Environmental Cost Values (March 1, 1994).
[18] See, Administrative Law Judge's Findings of Fact, Conclusions of Law, Recommendation and Memorandum, at p. 17 (March 22, 1996), Docket No. E-999/CI-93-583.
[19] In the Matter of the Investigation into Environmental and Socioeconomic Costs, Order, Docket No. E-999/CI-00-1636 (May 3, 2001) [hereinafter "May 3, 2001 Order"].
[20] In the Matter of the Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. §216B.2422, Subd. 3, Notice, (June 5, 2013), Docket No. E-999/CI-00-1636.

METROPOLITAN FRINGE – Range of 2012$/ton

	LOW	HIGH
SO2	0.00	0.00
PM10	2802.00	4069.00
CO	1.07	1.89
NOx	197.00	375.00
Pb	2329.00	2813.00
CO2	0.42	4.37

RURAL – Range of 2012$/ton

	LOW	HIGH
SO2	0.00	0.00
PM10	792.00	1206.00
CO	0.30	0.58
NOx	25.00	144.00
Pb	567.00	632.00
CO2	0.42	4.37

WITHIN 200 MILES OF MINNESOTA – Range of 2012$/ton

	LOW	HIGH
SO2	0.00	0.00
PM10	792.00	1206.00
CO	0.30	0.58
NOx	25.00	144.00
Pb	567.00	632.00
CO2	0.42	4.37

In 2001, after disputes arose over the way in which the externalities values had been used in a competitive bidding process, the Commission determined that the time had come to reopen the issue for further consideration.[21] The questions the Commission considered were 1) whether the environmental costs established in 1996 should be updated or expanded, and 2) whether and

[21] *See* In the Matter of the Petition of Northern States Power Company for Review of its 1999 All Source Request for Proposals, Order, at p. 1, (February 7, 2001), Docket No. E-002/M-99-888 ("In this case, the Commission has found that [Northern States Power's] application of environmental and socioeconomic cost factors to the bids submitted to it did not result in evaluations that need to be revisited. In the course of this docket, however, the Commission has concluded that it would be appropriate to open an investigation into whether the environmental costs established in 1997 should be updated or expanded and whether and how socioeconomic costs can be compared for all generating sources. The Commission will so order.")

how socioeconomic costs could be quantified to facilitate their consideration in resource selection proceedings.[22]

The 2001 proceedings resulted in a decision to adjust the 1996 externality values for inflation rather than re-visit the earlier-adopted values. With regard to the values for CO_2, the Commission found that "no party has provided evidence that these [1996] values are not appropriate under the 'to the extent practicable' standard."[23] After inviting an additional round of comments from parties, the Commission also declined a request to add values for $PM_{2.5}$ and mercury. With regard to $PM_{2.5}$, the Commission concluded "that the existing environmental cost ranges for PM_{10} should continue to be used at least until . . . EPA has articulated a clear direction on cost ranges for $PM_{2.5}$."[24] The Commission likewise concluded that it was premature to set values for mercury because EPA had expressed its intent to set standards for mercury but had not yet acted.[25]

The Commission's 1996 environmental cost values are no longer sufficient to meet the purposes of the statute. In the nearly two decades that have passed since the Commission first embarked on establishing externalities values, the science and technical understanding of fine particle pollution dispersion, the human health consequences of fine particle inhalation, environmental and health impacts from ozone created by NO_x emissions, and the probable environmental and human health impacts of climate change have grown immensely.[26] In

[22] May 3, 2001 Order, p. 1, Docket No. E-999/CI-00-1636.
[23] *Id.*, at 4
[24] *In the Matter of the Investigation into Environmental and Socioeconomic Costs*, Order Deferring Further Action on Quantifying Mercury and Particulates and Maintaining Purchased Power Policy, p. 3 (October 5, 2001), Docket No. E-999/CI-01-1636.
[25] *Id.*
[26] For example, with respect to $PM_{2.5}$ emissions, EPA has recently stated that "in looking across the extensive new scientific evidence available … our overall understanding of health effects

addition, the Commission's decision to assign a $0.00 value to SO_2 emissions after 2000 was based on an assumption that all damages associated with SO_2 emissions would be internalized following implementation of the federal acid rain trading program. Time and experience have proven that assumption incorrect.

V. CURRENT SCIENCE CONFIRMS THAT THE DAMAGE COSTS OF POLLUTION ARE MUCH HIGHER THAN REFLECTED IN THE 1996 EXTERNALITY VALUES.

In the spring of 2013, Clean Energy Organizations contracted with University of Minnesota Professor of Ecological/Environmental Economics Stephen Polasky to identify ranges of externality values for criteria pollutants and greenhouse gases based on information and studies developed after the Commission's 1996 decision. Dr. Polasky and his graduate student Andrew Goodkind issued the report, *Health and Environmental Costs of Electricity Generation in Minnesota*, which Clean Energy Organizations attach as Exhibit A and incorporate, in full, in their Motion. Sources cited by Dr. Polasky and Mr. Goodkind are also provided and incorporated in this Motion by reference.

Based on the most recent studies of damage costs for air pollution from electricity generation, Polasky and Goodkind estimated that total annual damages to human health and the environment from power plant emissions in Minnesota is $2.164 billion.[27] These damages affect Minnesota residents and those in surrounding and downwind states. Of the $2.164 billion, $877 million is from criteria pollutants, and $1.287 billion from greenhouse gas emissions.[28] They conclude that "[t]hese damage estimates are far higher than damages estimated using the current

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associated with fine particle exposures has been greatly expanded. 78 Fed. Reg. 3086, 3103 (January 15, 2013).

[27] Polasky/Goodkind Report, at p. 4.

[28] *Id.*

values of damages established by the Minnesota Public Utilities Commission 1997 final order."[29] Indeed, using the Commission's values, total damages from all power plants in Minnesota would range between only $58 and $257 million, orders of magnitude smaller than update values would likely show.[30]

The primary source of data for the Polasky/Goodkind report was the 2010 National Research Council ("NRC") Report that provided estimates of the external costs per ton of emissions from coal-fired electricity generation nationally.[31] As the Commission knows, the NRC is the research arm of the National Academy of Science and the National Academy of Engineering, and is operated jointly by these expert independent institutions.

In addition, the Polasky/Goodkind report summarizes and discusses the bases for estimates of the costs of air pollution from numerous other peer-reviewed studies. From this solid foundation, Dr. Polasky and Mr. Goodkind then developed Minnesota-specific estimates of external costs per ton of emissions from power plants.[32] Based on their in-depth literature review and assessments of the methodologies and findings of current environmental and health cost studies, Dr. Polasky and Mr. Goodkind concluded the following ranges of externalities values, in contrast to the Commission's existing damage costs, are supported by current science and applied economics, and much better reflect the actual externalities of power plant emissions in the state.

[29] *Id*.
[30] *Id*.
[31] See, *supra* at p. 2, n. 3.
[32] See, Polasky/Goodkind Report, Table 1, p. 4.

Commission "High" Externalities		Polasky "High" Updated Values	
Urban		**Urban**	
SO_2	0.00	SO_2	$ 13,600.00/ton
NO_X	$ 1379.00/ton	NO	$ 3,400.00/ton
CO_2	$ 4.37/ton	CO_2	$ 55.00/ton
$PM_{2.5}$	-----	$PM_{2.5}$	$ 30,800.00/ton
Rural		**Rural**	
SO2	0.00	SO2	$ 6,500.00/ton
NOX	$ 144.00/ton	NOx	$ 2,900.00/ton
CO2	$ 4.37/ton	CO2	$ 55.00/ton
PM2.5	-----	PM2.5	$ 6,600.00/ton

The Polasky/Goodkind report demonstrates that the Commission's current damage cost estimates for the criteria pollutants SO_2, NO_x and $PM_{2.5}$ are no longer supported by scientific evidence and must be updated. Indeed, the Commission's externality value for SO_2 is $0.00; Dr. Polasky and Mr. Goodkind found that a ton of SO_2 emitted in Minnesota has a damage cost value of between $1,900 and $6,500/ton if emitted in rural MN and $6,600 - $13,600/ton if emitted in urban or metro MN counties. $PM_{2.5}$ emissions costs, for which the Commission has no quantified value, have a damage cost range of $2,700 - $6,600/ton (rural) and $7,100 - #30,800/ton (urban). Dr. Polasky and Mr. Goodkind conclude that the updated damage cost range for NO_x is $1,300 – 2,900/ton (rural) and $3,000 – 3,400/ton (urban). These NO_x cost values compare to the Commission's current high externalities $144/ton (rural) and $1,379 (urban).

As the Administrative Law Judge and Commission recognized in setting values for GHG in the 1990's, the damage from GHG emissions is worldwide and not bound by the geographic area in which the emissions occur. Dr. Polasky and Mr. Goodkind likewise conclude that "impacts from GHG emissions are fundamentally different from criteria pollutant emissions."[33] Their report recommends that the Social Cost of Carbon damage estimates, developed by an

[33] *Id.* at 12.

interagency working group of the Federal Government to account for the damage costs of GHG emissions, are appropriate for use in Minnesota power plant decision-making.[34] These cost of carbon damage estimates, which are based on federal interagency review of the newest climate change models, results in a midpoint environmental cost value of $36/ton in 2015, in a range from $13/ton to $55/ton.[35] These damages increase significantly in later years.[36] By contrast, the Commission's externalities values for CO_2 only range from $0.42/ton to $4.37/ton, adjusted annually for inflation.[37]

That the Commission's 1996 externality values for criteria pollutants no longer reflect actual damage costs of pollution from Minnesota power plants is also confirmed by Minnesota Pollution Control Agency ("PCA") reviews of utility proposals to retrofit or repower existing Minnesota coal-fired power plants. For example, over ten years ago, in PCA's review of Xcel's Metropolitan Emissions Reduction Proposal ("MERP"), PCA stated that the PCA "is certain that the PUC's externality values, when applied to a project such as the MERP, greatly underestimate the health and environmental benefits of the proposal."[38] PCA calculated higher avoided cost benefits of the MERP project using "several alternative assumptions."[39] In PCA's more recent review of Minnesota Power's retrofit proposal for Unit 4 at the Boswell power plant, its analysis

[34] *Id.* at 4 and 25.
[35] The federal SCC also includes a fourth sensitivity damage cost of $104/ton, estimating the costs of climate impacts much larger than expected. *Id.* at 17.
[36] *Id.*at 25.
[37] Pursuant to §216H.06, the Commission is required to apply projected likely carbon regulatory costs in resource acquisition proceedings. Regulatory costs are not the same as externalities and to compare them would be an apples-to-oranges comparison. Externalized health and environmental damages from GHG emissions will not be fully internalized with carbon regulation, unless existing and future CO_2 emissions were eliminated entirely.
[38] Minnesota Pollution Control Agency's Review of Xcel Energy's Metropolitan Emission Reduction Proposal, Docket No. E002/M-02-633, p. 47.
[39] *Id*. at 38.

of the benefits of certain criteria pollutant reductions relied on EPA cost values rather than lower Commission externalities.[40]

Although the Commission has relied on PCA analyses of avoided damage costs that are many times higher than the Commission's own externalities values in power plant retrofit or repowering cases, the Commission does not use such higher damage costs when evaluating electric generation alternatives in resource planning or other resource acquisition or diversification proceedings. Instead, the Commission relies on the outdated damage cost estimates from 1996.

It is clear that the externality values currently used by the Commission in evaluating resource choices do not reflect the best science available, and significantly understate the actual damage costs of both criteria pollutants and greenhouse gases, and ignore the fact that our scientific understanding of the public and environmental health impacts of power plant emissions has grown substantially in the past two decades. It is imperative that the Commission begin to use more realistic, higher externality values for both criteria pollutants and greenhouse gases when evaluating the costs of alternatives in resource planning and similar decisions.

VI. SCOPE OF MOTION TO UPDATE EXTERNALITIES.

Clean Energy Organizations are mindful of the resources and time dedicated in the 1990s to establishing externality values, and, therefore limit the scope of their request to those

[40] *Review of Minnesota Power's Boswell Unit 4 Environmental Improvement Plan*, MPCA, March 1, 2013, PUC Docket No. M-12-920, p. 15-16. The PCA review concluded that the Boswell 4 project would result in 414 fewer tons of SO_2 emissions and 1,016 fewer tons of PM *Id.*, at 16. If the Commission's existing externality figures for a rural location (SO_2 = 0; PM_{10} = $792 to $1206) were used, the public health and environmental benefits from the pollutant reductions would only be between $740,664 and $1.2 million. But the PCA concluded that the environmental and human health benefits of the reductions in SO_2 and $PM_{2.5}$ were somewhere between $13.7 and $31.2 million. *Id*. at 21.

pollutants and issues that require immediate attention. To that end, Clean Energy Organizations submit that the Commission re-open the externalities docket to address the following issues:

1. Establish a value for $PM_{2.5}$;
2. Establish a value for SO_2 emissions; and
3. Update values for CO_2 and NO_x.

1. Establish Environmental Cost Values for $PM_{2.5}$ Emissions.

When the Commission established environmental cost values in this docket, it decided not to set an externality value for $PM_{2.5}$ because of uncertainty with how EPA was going to regulate the pollutant and related pending litigation.[41] In the most recent EPA rule for $PM_{2.5}$ emissions that was issued at the end of 2012, EPA found that "[i]n looking across the extensive new scientific evidence available . . . our overall understanding of health effects associated with fine particle exposures has been greatly expanded."[42]

Scientific understanding of the health impacts of small particle pollution has increased tremendously in the last two decades. There is now abundant information and modeling focused on the damage costs of $PM_{2.5,}$ from which the Commission could develop a damages estimate.

2. Establish Environmental Cost Values For SO_2 Emissions.

The Commission's current externality cost value for SO_2 is $0.00. This is because its 1996 decision incorrectly assumed the 2000 Clean Air Act regulation that placed a cap on total emissions would eliminate damage costs from future emissions. The scientific literature makes clear that SO_2 emissions, despite the regulatory cap, still have very damaging and costly impacts to human health.

[41] See, October 5, 2001 Order, Docket No. E-999/CI-00-1636, p.4. Although EPA established the first annual and 24-hour NAAQS for $PM_{2.5}$ in July 1997, implementation of those standards was delayed until 2002.

[42] See, 78 Fed. Reg. 3086, 3103 (January 15, 2013).

According to PCA in its review of the Xcel Energy MERP proposal, for example, although the Acid Rain Program required fifty percent reductions in SO_2 emissions from 1985 levels, "it is generally acknowledged in the scientific and regulatory communities that further substantial reductions in [SO_2 and NOx] are needed" to prevent continuing environmental damage.[43] The PCA added that further reductions of 50 to 80 percent from the electric power industry are still necessary.[44]

Indeed, EPA took steps as recently as 2010 to issue a new short-term SO_2 emissions standard to reduce health impacts from exposure to SO_2 pollution.[45] Moreover, there is no safe level of exposure to the fine particulates that form from SO_2 emissions, and no threshold beneath which no adverse health effects are seen.[46]

The Commission's 1996 finding that all environmental costs to society from power plants' continuing SO_2 emissions would be "paid in full" through the Acid Rain Program is unjustified. Continuing SO_2 emissions have environmental and health costs, and Minn. Stat. §216B.2422, subd. 3 requires the Commission to quantify and utilize these costs in its decision making.

3. Update Cost Values For CO_2 And NO_x.

The Legislature passed Minn. Stat. §216B.2422, subd. 3 to account for the true costs of pollution from electricity generation. The cost estimates that the Commission and utilities use must be based on the best scientific evidence available. However, this motion and the supporting

[43] MPCA Review of Xcel Energy's Metropolitan Emission Reduction Proposal, p. 46-47. (December 30, 2002), Docket No. E002/M-02-633.
[44] *Id*. at 47.
[45] See, 75 Fed Reg. 35520 (June 22, 2010).
[46] World Health Organization, *Health Effects of Particulate Matter* (2013), available at http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf.

Polasky/Goodkind Report demonstrate that the environmental cost values the Commission uses today do not reflect current scientific and economic understanding of the costs of pollution. At present, the Commission is not carrying out Minnesota's environmental costs statute, either by the statute's terms or in its spirit.

VII. CLEAN ENERGY ORGANIZATIONS' PROCEDURAL RECOMMENDATIONS.

Clean Energy Organizations recommend that the Commission use the following procedure to update the 1996 externalities values:

1. Retain An Independent Consultant To Supply Environmental Damages Analysis For SO_2, NO_x, And $PM_{2.5}$ Emissions.

Clean Energy Organizations recommend that the most efficient way to begin the reopened environmental cost docket is for the Commission to issue a request for proposals for an independent consulting firm to provide an analysis of the costs of environmental and health damages from emissions of SO_2, NO_x, and $PM_{2.5}$. Upon the Commission's receipt of the analysis from the consultant, the Commission could invite comments on the analysis or, alternatively, refer the matter to the Office of Administrative Hearings for a contested case hearing.

Beginning the docket with a Commission-retained consultant would provide greater focus for parties and ultimately provide more efficient record development. Because the Commission has authority under Minn. Stat. §216B.62 to assess the public utilities it regulates for the costs of the investigations necessary for the Commission to carry out its duties, Clean Energy Organizations suggest that the Commission consider using this authority to fund the independent consultant's analysis of damages from emissions of SO_2, $PM_{2.5}$, and NO_x.

2. Adopt The Federal Social Cost Of Carbon Values As Externalities For CO_2.

Because the scientific basis for the federal government's Social Cost of Carbon ("SCC") ranges are well-developed and supported by numerous peer-reviewed studies, it would be most

efficient for the Commission to rely on the federal government's analysis and adopt the SCC as the externality value for carbon. Minnesota-specific modeling is unnecessary to establish damage costs for global carbon pollution impacts. The SCC would update the Commission's damage-function environmental cost values with current science quantifying climate change impacts.

Indeed, PCA recommended in its comments on the Xcel study of the Life Cycle Management for SherCo Units 1 and 2 that the Commission use the federal SCC in its evaluation of retirement of the coal units.[47] Using the SCC in the Commission's resource decisions would result in the Commission using an updated range of $11/ton to $55/ton (with a $36/ton central value) to quantify the damages from CO_2 emissions in 2015.[48]

3. Complete The Update To The Commission's Externalities Values Within One Year.

The Commission should set a goal to conclude the reopened externalities docket within one year from the date of this Motion. Long-term decisions about major investments in Minnesota's energy future are imminent. To comply with Minn. Stat. §216B.2422, subd. 3, these Commission decisions must be based on the current science of the environmental costs of power plant pollution. Otherwise, Commission decisions could unjustifiably favor highly polluting generation sources over clean energy choices such as energy efficiency and renewable sources of energy by ignoring the true costs of electricity generation.

Moreover, having a deadline will help to keep interested parties focused on efficient resolution of issues that may arise in the docket.

[47] See, Minnesota Pollution Control Agency Comments on Xcel Energy's SherCo Units 1 and 2 Life Cycle Management Study, PUC Docket No. RP-13-368 (October 1, 2013).
[48] Polasky/Goodkind Report, p. 25.

VIII. CONCLUSION

Decisions affecting Minnesota's energy future are vitally important, affecting generations of people to come. The 1993 Minnesota Legislature recognized that electricity choices are made by comparing the costs of alternatives, and that to ignore the costs of damage to the environment and public health gives the dirtiest energy alternative an unjust cost advantage. Minnesota law therefore requires the Commission to quantify the costs of damage to health and the environment, and ensure that these costs are included in all of its electricity resource decisions. Quite clearly, it does not satisfy this state law requirement to use inaccurate or obsolete environmental cost data.

Therefore, on the basis of this Memorandum, and Exhibits thereto, Clean Energy Organizations respectfully request that the Commission grant their Motion to Update Externalities Values for Use in Resource Decisions and reopen Docket No. E-999/CI-93-568 to:

(1) establish environmental cost values for $PM_{2.5}$ emissions;

(2) establish environmental cost values for SO_2 emissions; and

(3) update the current cost values for CO_2 and NO_x.

Clean Energy Organizations believe that these actions could be carried out most efficiently by beginning with a Commission-retained consultant to provide analysis of the costs of damages from SO_2, NO_x, and $PM_{2.5}$ emissions from Minnesota electric generating facilities. For carbon emissions, Clean Energy Organizations recommend adoption of the federal government's Social Cost of Carbon values.

Finally, Clean Energy Organizations request that the Commission set a 12-month schedule for completing the Commission's update to Minnesota's current environmental cost values.

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Respectfully submitted,

s/ Elizabeth Goodpaster

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