

**June 09, 2015**

STATE OF IOWA  
BEFORE THE IOWA UTILITIES BOARD

**IOWA UTILITIES BOARD**

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IN RE: )  
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 ) DOCKET NO. RPU-2015-0002  
MIDAMERICAN ENERGY COMPANY )  
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REVISED DIRECT TESTIMONY  
OF  
NATHANIEL BAER

On Behalf of

Environmental Law & Policy Center  
Iowa Environmental Council

June 9, 2015

1 **Q. What is your name and business address?**

2 A. My name is Nathaniel Baer. My title is Energy Program Director with the Iowa  
3 Environmental Council. Our offices are located at 521 East Locust Street, Suite 220, Des  
4 Moines, Iowa 50309.

5  
6 **Q. On whose behalf are you testifying today?**

7 A. I am testifying on behalf of the Iowa Environmental Council and Environmental Law &  
8 Policy Center.

9  
10 **Q. Please describe your background.**

11 A. I have a bachelor of arts degree from Earlham College in Richmond, Indiana and a law  
12 degree from the University of Iowa College of Law in Iowa City, although I am not a  
13 practicing attorney. I have worked for the Iowa Environmental Council (IEC) since 2007.  
14 The Iowa Environmental Council is a 501(c)(3) non-profit, member-based corporation  
15 that works to advance public policies that provide a safe, healthy environment and  
16 sustainable future for all Iowans. In my capacity at IEC, I have worked on a wide range  
17 of energy policy issues, including renewable energy, transmission, energy efficiency,  
18 biofuels, and transportation. This has included work on state and federal legislation and  
19 administrative rules both with federal and state agencies, as well as a range of dockets at  
20 the IUB. I have served on stakeholder committees, such as energy research or policy  
21 committees, established by the Iowa legislature, Midwestern Governors Association,  
22 Iowa Department of Transportation, and the University of Northern Iowa's Center for  
23 Energy and Environmental Education. I have participated regularly in the Iowa energy

1 efficiency stakeholder collaborative convened by the Office of Consumer Advocate since  
2 2009 and the Midwest Power Sector Collaborative since September 2014.

3  
4 **Q. Have you testified with the Iowa Utilities Board before?**

5 A. I provided testimony in MidAmerican Energy's general rate case, RPU-2013-0004. In  
6 addition, I have drafted or assisted in drafting our organization's comments and joint  
7 comments in various dockets before the IUB, including NOI-2006-0004, NOI-2009-  
8 0002, NOI-2011-0002, NOI-2011-0003, NOI-2014-0001, NOI-2014-0002, RMU-2014-  
9 0007, TF-2012-0546, and TF-2012-0574.

10  
11 **Q. What is the purpose of your testimony?**

12 A. The purpose of my testimony is to support and expand upon specific aspects of  
13 MidAmerican's proposal to construct 552 MW of new wind generation in Iowa and to  
14 supplement information comparing wind to other renewable resources. I am not  
15 providing testimony on ratemaking principles or every aspect of the Wind X proposal.

16  
17 **Q. MidAmerican Witness Fehrman stated that there is no upper limit on  
18 MidAmerican's wind development at this time. What is your response?**

19 A. MidAmerican is a national leader in owning wind energy, but the capacity it currently  
20 owns or is in the process of developing is well short of the potential to develop wind in  
21 Iowa. As pointed out by MidAmerican Witness Hammer, the National Renewable Energy  
22 Lab's analysis shows that Iowa has the potential to install approximately 571,000

1 megawatts of wind generation. Iowa's installed wind capacity of 5,688 MW<sup>1</sup> at the end  
2 of 2014 is approximately 1% of this potential, so there is clearly still significant room for  
3 growth in wind generation in Iowa.

4  
5 Several recent studies illustrate possible near-term installation rates for wind generation  
6 in Iowa. In 2008, the U.S. Department of Energy released a comprehensive study on  
7 achieving 20% of the U.S. electricity supply with wind energy by year 2030.<sup>2</sup> To reach  
8 the 300,000 MW of wind needed to supply 20% of U.S. electricity, each state would  
9 contribute a share of the total. Iowa's share in the study is 19,910 MW of wind by 2030.<sup>3</sup>

10  
11 Earlier this year, the U.S. Department of Energy updated and expanded this study with its  
12 *Wind Vision* study.<sup>4</sup> The *Wind Vision* study includes several scenarios for wind capacity  
13 development nationally and in each state in order to reach 20% wind by 2020 and 35%  
14 wind by 2050. Iowa's share of the capacity needed to reach these national goals is  
15 between 17,000 MW and 20,000 MW by 2030 and between 37,000 and 46,000 MW by  
16 2050 in several main scenarios.<sup>5</sup>

17  
18 While MidAmerican Energy would not be expected to own all of this wind generation,  
19 the proposal to add another 552 MW at this time seems modest and reasonable in the

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<sup>1</sup> AWEA, *U.S. Wind Industry Annual Market Report 2014* (2015), *State Capacity & Generation*, available at <http://www.awea.org/AMR2014>.

<sup>2</sup> U.S. DOE, *20% Wind Energy by 2030* (2008).

<sup>3</sup> U.S. DOE, *20% Wind*, Appendix A Data Tables (2008).

<sup>4</sup> U.S. DOE, *Wind Vision* (2015) at <http://energy.gov/eere/wind/wind-vision>.

<sup>5</sup> U.S. DOE, *Wind Vision Study Scenario Viewer*, at [http://en.openei.org/apps/wv\\_viewer/#](http://en.openei.org/apps/wv_viewer/#).

1 context of Iowa's potential for wind development and Iowa's potential wind development  
2 in the next ten to twenty years.

3  
4 **Q. Witness Hammer evaluates Wind X from the perspective of fuel diversity.**  
5 **MidAmerican also provided answers on fuel diversity and Wind X to IUB questions**  
6 **25 and 26. How do you respond?**

7 A. I support the addition of Wind X to enhance fuel diversity and resource diversity. The  
8 additional information provided by MidAmerican in response to IUB Questions 25 and  
9 26 is significant. According to MidAmerican's response to Question 25 Attachment, coal  
10 generation will be the largest source of generation in 2015. This is true for both total  
11 sales, with coal at 52% and wind at 32%, and for retail sales, with coal at 43% and wind  
12 at 40%. According to Question 25 Attachment, without Wind X, coal generation would  
13 continue to be the largest source of electricity generation in 2017 and 2020 for total sales  
14 and would be slightly higher than wind in 2020 in terms of retail sales. Wind X allows  
15 MidAmerican to continue to reduce reliance on coal as its dominant fuel source. All of  
16 MidAmerican's coal generation must be supported by imported coal for fuel at a real  
17 cost. MidAmerican reported in its 2014 Annual Electric Report that fuel costs to support  
18 steam generation totaled over \$285 million in 2014 alone.<sup>6</sup> Because wind has no fuel  
19 cost, it is an important resource to continue to add given the dominant role that coal  
20 generation currently has in MidAmerican's portfolio.

21  
22  

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<sup>6</sup> MidAmerican Energy, *Annual Report: Rate Regulated Electric Utilities*, Form IE-1, Iowa  
Utilities Board Docket No. A-2014-0156.

1 **Q. MidAmerican Witness Fehrman stated that Wind X would support MidAmerican’s**  
2 **compliance with the EPA’s proposed Clean Power Plan. What is your response?**

3 A. I expect wind energy to be a major compliance option for the Clean Power Plan in Iowa.  
4 The EPA has provided significant flexibility for states in the proposed Clean Power Plan,  
5 including the use of renewable energy generation to reduce carbon emissions for  
6 compliance.

7  
8 The Iowa Wind Energy Association released a report in May that examines the potential  
9 for wind energy to help Iowa comply with the emissions rate target in the proposed Clean  
10 Power Plan, as well as a more stringent target.<sup>7</sup> The IWEA report finds that by building a  
11 total of 2,300 MW of wind generation alone and taking no other actions, Iowa would  
12 comply with the emissions rate target of 1301 lbs/MWh.<sup>8</sup> Of this 2,300 MW, 1,212 MW  
13 is already being built by MidAmerican (Wind VIII and Wind IX), so only 1,100 MW of  
14 additional wind would be needed. Wind X represents about half of this, so it would  
15 certainly help position Iowa as a whole and MidAmerican specifically to comply with the  
16 proposed target.

17  
18 In the event that Iowa has a more stringent target in the final rule, wind energy would still  
19 allow Iowa to comply. The IWEA report concluded that a 30% reduction target could be  
20 met with a total of 4,300 MW of wind.<sup>9</sup> Again, since 1,212 MW are currently being

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<sup>7</sup> Dan Turner and Tom Wind, *Iowa’s Wind Potential for Addressing 111(d) Goal* (2015) at <http://www.iowawindenergy.org/readmore.php?idnews=114>. .

<sup>8</sup> IWEA, *Iowa’s Wind Potential: An Executive Summary of Iowa’s Wind Resources to Reduce Carbon Emissions* (2015) at <http://www.iowawindenergy.org/readmore.php?idnews=112>.

<sup>9</sup> *Id.*

1 installed by MidAmerican, another 3,100 MW would be needed by year 2030. Wind X  
2 represents nearly 20% of that amount and would help position MidAmerican and the state  
3 as a whole to comply. Again, this assumes no other actions (e.g., energy efficiency, coal  
4 retirements, etc.) are counted for compliance.

5  
6 The IWEA report is consistent with a new report by the Energy Information  
7 Administration, which finds that wind energy is expected to be a major compliance  
8 option nationally under the Clean Power Plan.<sup>10</sup> For example, the report states that “Wind  
9 power plays an important role in Clean Power Plan compliance, with wind electricity  
10 generation capacity more than tripling over 2013 levels by 2040 in the Base Policy  
11 Case.”<sup>11</sup> EIA expects most of this increased wind generation to be installed between 2020  
12 and 2025.<sup>12</sup>

13  
14 The IWEA analysis is also consistent with analysis I have conducted with a modeling  
15 tool produced by Synapse Energy Economics,<sup>13</sup> including analysis I used to support the  
16 Iowa Environmental Council’s public comments to the EPA regarding the proposed  
17 Clean Power Plan in December 2014, as well as analysis I have since conducted as  
18 Synapse has released updated versions of the spreadsheet tool. Using the latest version  
19 (1.4), I recently modeled the impact on Iowa’s statewide emissions rate of adding Wind  
20 VIII, Wind IX, and Wind X , the additional 200 MW of wind requested in Interstate

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<sup>10</sup> U.S. Energy Information Administration, *Analysis of the Impacts of the Clean Power Plan* (May 2015).

<sup>11</sup> *Id.* at 36.

<sup>12</sup> *Id.*

<sup>13</sup> Synapse Energy Economics, *Clean Power Plan Planning Tool (CP3T)* at <http://www.synapse-energy.com/tools/clean-power-plan-planning-tool-cp3t>.

1 Power & Light's recent RFP, as well as the coal retirements or coal plant conversions to  
2 gas that have occurred since 2012 or will occur prior to 2020. The result of these actions  
3 would reduce Iowa's statewide emissions rate to 1,287 lbs/MWh by year 2020. Changes  
4 that are already underway regarding coal and gas plants, along with current and proposed  
5 wind additions – including Wind X – are very likely to put Iowa in compliance with the  
6 proposed EPA 2030 target of 1,301 lbs/MWh before year 2030.

7  
8 **Q. If the Clean Power Plan compliance obligation is not until 2030, why should**  
9 **MidAmerican add wind for possible compliance purposes now?**

10 A. Because MidAmerican expects Wind X to be eligible for the federal PTC, it makes sense  
11 to take advantage of this benefit now while it is available for wind energy that can  
12 support compliance with the Clean Power Plan. The PTC makes the economics of Wind  
13 X very compelling, and in light of the additional compliance benefit it would be a lost  
14 opportunity to not pursue Wind X. Furthermore, as wind energy installations increase for  
15 compliance purposes, such as under the EIA report I discussed above, turbine prices may  
16 increase or turbine supply may be more limited. Installing wind now ensures a  
17 competitive turbine price and more certain turbine supply.

18  
19 I would add that even without the federal PTC, wind generation competes favorably from  
20 a cost perspective in Iowa against other forms of new generation. For example, a recent  
21 U.S. Department of Energy analysis, referenced by MidAmerican as well, shows that new  
22 wind costs in 2013 were lower in the Interior region of the U.S. than in any other



1 region.<sup>14</sup> The Interior region includes Iowa. In addition, the latest Lazard analysis of  
2 levelized costs of energy provide a range of possible levelized costs for different new  
3 generating resources.<sup>15</sup> The unsubsidized cost of wind, such as without the PTC, ranges  
4 from 3.7 cents/kWh to 8.1 cents/kWh. I would expect Iowa to be on the low end of this  
5 levelized cost range – 3.7 cents/kWh – given the wind resource and the recent U.S.  
6 Department of Energy study. The lowest ranges for other new generation resources starts  
7 at approximately 6 cents/kWh. As the Lazard analysis points out, there are other costs not  
8 accounted for, such as externalized environmental costs that would increase the cost of  
9 some resources (e.g., fossil fuels) and would likely further improve the cost comparison  
10 with a resource like wind. Given these factors, per the Iowa Utilities Board’s Question 8  
11 to MidAmerican, wind would likely be justified even if there is an incremental cost to  
12 customers.

13  
14 **Q. In MidAmerican Witness Hammer’s evaluation of the wind energy, he also**  
15 **evaluates solar energy. Do you agree with his evaluation?**

16 A. While I support MidAmerican’s selection of wind in this advanced ratemaking principle  
17 proposal, Witness Hammer appears to be understating some of the benefits for solar  
18 energy in his evaluation of wind as compared to other renewable resources. It is  
19 important to recognize that solar has the potential to meet a significant share of Iowa’s  
20 energy needs, that solar would be a good match to MidAmerican’s load, and that solar  
21 would complement MidAmerican’s wind assets.

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<sup>14</sup> U.S. Department of Energy, *2013 Wind Technologies Market Report* (2014) at ix.

<sup>15</sup> Lazard, *Lazard’s Levelized Cost of Energy Analysis – Version 8.0* (2014) at <http://www.lazard.com/PDF/Levelized%20Cost%20of%20Energy%20-%20Version%208.0.pdf>.

1 **Q. Please explain the scope of Iowa’s solar resource.**

2 A. As Witness Hammer appropriately references, the National Renewable Energy  
3 Laboratory has released a study that includes the capacity and energy potential for  
4 different renewable resources in each state.<sup>16</sup> According to this study, for solar PV in  
5 Iowa, there is potential for over 4,000 gigawatts (GW) of capacity and over 7,000,000  
6 gigawatt-hours (GWh) of annual electricity production from utility-scale solar PV in  
7 Iowa. This potential is much larger than Iowa’s current annual retail sales of  
8 approximately 46,000 GWh or annual generation of approximately 56,670 GWh. Iowa  
9 need only tap a small fraction of the overall potential of solar PV to meet a significant  
10 share of electricity needs. For example, realizing just one percent of Iowa’s solar  
11 potential would generate 7,000 GWh annually, or the equivalent of about fifteen percent  
12 of annual retail sales.

13  
14 **Q. How does solar fit with MidAmerican’s load?**

15 A. Solar PV can be expected to be a very good fit with MidAmerican’s load.  
16 MidAmerican’s annual peak occurs in the summer and its daily peaks in the summer  
17 typically occur during the afternoon. Solar PV systems located in Iowa would be  
18 expected to be producing significant electricity, frequently near nameplate capacity,  
19 during such hours on these summer afternoons.

20  
21 MidAmerican’s overall system peak in 2014 occurred on July 21<sup>st</sup> in the hour ending at  
22 5:00 pm. The top twenty hourly peaks occurred between the hours ending at 12:00 noon

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<sup>16</sup> Lopez et al, National Renewable Energy Laboratory, *U.S. Renewable Energy Technical Potential: A GIS-Based Analysis* (2012).

1 and 6 pm on dates in July, August, and early September, with fifteen of these top twenty  
2 hourly peaks occurring between hours ending at noon and 4 pm.<sup>17</sup> A typical solar PV  
3 array in Iowa would be expected to generate electricity very well during such hours.

4  
5 I compared the production from MidAmerican's solar PV array located at the Iowa State  
6 Fairgrounds during the top twenty peak hours for MidAmerican's load. On fourteen of  
7 the top twenty hours, the PV array was producing at 54% to 91% of its annual maximum  
8 hourly production of 52.422 kWh (which occurred at 1 pm on March 22 and 3 pm on  
9 May 13) and was producing approximately 30% to 40% of the annual maximum hourly  
10 production during the other six hours.<sup>18</sup> Using a single solar array provides only an  
11 example of the correlation between solar production and MidAmerican's load. I would  
12 note that this particular array is south-facing and at a 10 degree tilt, so it is not installed as  
13 well for meeting peaks that occur in the late afternoon (that could be accomplished by  
14 facing it southwest and at a higher tilt to capture more of the late afternoon sun). A more  
15 robust analysis would need to combine the hourly production of many solar systems over  
16 several years to account for factors like weather variability, system installation, and

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<sup>17</sup> MidAmerican Response to ELPC and IEC Data Request 12 filed as Baer-Exhibit 1 (Confidential).

<sup>18</sup> MidAmerican Second Supplemental Response to ELPC and IEC Data Request 15, Attachment DR15 Varied Industries Building Solar Output 2014-2015 filed as Baer-Exhibit 2. As the response notes, "From July 3, 2014 through July 25, 2014, the facility was producing at approximately half of its capability, which was related to the operation and maintenance contractor's failure to reclose a disconnect switch after performing washing/cleaning activities." For the period where the facility was producing approximately half its capability, I double the production. I recognize that those values are not exact, but they are consistent with values from when the facility was operating at full capacity. In addition, the solar output hourly data appears to be in an 'hour beginning' format, with each day starting at 0 and ending at 23, while the system load data in DR 12 appears to be in 'hour ending' format, starting at 1 and ending at 24. For example, if the system load hour was 14:00, the corresponding solar output hour would be 13:00.

1 system performance changes as well as use PV system modeling tools. Since I am not  
2 recommending that MidAmerican change its proposal to build 552 MW of wind, I did not  
3 undertake a more thorough analysis in this testimony.

4  
5 **Q. How would solar PV interact with MidAmerican's wind assets?**

6 A. Solar would be expected to complement MidAmerican's wind assets well. Wind energy  
7 in Iowa tends to generate electricity at greater levels at night and during the winter, while  
8 solar PV generates electricity at greater levels in the summer and during the day.<sup>19</sup> Now  
9 that MidAmerican has added significant wind energy to its system, solar PV can be  
10 expected to complement that wind generation well on a daily and seasonal basis. This is  
11 an additional benefit to solar energy that Witness Hammer did not include in his  
12 evaluation.

13  
14 **Q. What do you recommend with regard to solar PV?**

15 A. MidAmerican should more thoroughly evaluate how solar PV would meet its energy and  
16 capacity needs as it evaluates new resources for future advanced ratemaking principle  
17 applications. I expect that a more detailed and complete analysis would significantly  
18 improve the cost-effectiveness and overall case to support solar PV.

19  
20  
21  

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<sup>19</sup> See *Real Potential, Ready Today: Solar Energy in Iowa* (2014) page 14, Figures 14 and 15, at [www.iaenvironment.org/solar](http://www.iaenvironment.org/solar).

1 **Q. MidAmerican Witness Wright outlines the economic development benefits for Wind**  
2 **X. What is your response?**

3 A. In addition to all the benefits to MidAmerican's ratepayers, Wind X provides important  
4 economic benefits to the state of Iowa broadly. Wind energy provides a number of  
5 significant economic benefits to Iowa, MidAmerican's wind projects have been an  
6 important driver for this, and Wind X will help to continue to drive these economic  
7 benefits. Witness Wright discusses the specific economic development benefits for Wind  
8 X, including property tax revenue, land lease payments, local job creation for the  
9 construction, operations and maintenance for Wind X, and the ability of wind projects  
10 like Wind X to attract firms like Google and Facebook to Iowa. I agree with Witness  
11 Wright's characterization of these benefits. I would like to expand upon them by also  
12 summarizing the broader context for wind energy's economic benefits in Iowa.

13  
14 According to the latest data from the American Wind Energy Association, wind energy is  
15 responsible for between 6,001 and 7,000 direct and indirect jobs in Iowa.<sup>20</sup> This total jobs  
16 number includes a mix of jobs in construction, operations and maintenance,  
17 manufacturing, and the wind energy supply chain. A recent report by the Environmental  
18 Law & Policy Center identifies 75 companies engaged in the wind industry supply chain  
19 in Iowa.<sup>21</sup> Wind X will be supplied by and directly support some of these businesses. The  
20 ELPC report includes a map showing that these businesses are distributed across Iowa,

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<sup>20</sup> American Wind Energy Association, *Iowa Wind Energy* (2015), available at <http://www.awea.org/resources/statefactsheets.aspx?itemnumber=890>.

<sup>21</sup> Environmental Law & Policy Center, *Iowa Wind Power & Solar Energy Supply Chain Businesses* (2015) at <http://elpc.org/tag/iowa-clean-energy-supply-chain-report>. Note that this report was published before the latest industry reports by AWEA and The Solar Foundation, so the ELPC job numbers are lower than the AWEA information I am using in this testimony.

1 meaning that communities throughout the state benefit from job and business creation  
2 from wind energy in Iowa.

3  
4 Wind turbines are also becoming significant sources of local property tax revenue in the  
5 counties that host wind farms. For example, according to the Iowa Wind Energy  
6 Association, wind energy accounted for almost 10% of the county tax base in Pocahontas  
7 County and brought in over \$3M in tax revenue in a recent three-year period.<sup>22</sup>

8  
9 **Q. MidAmerican responded to a question from the Iowa Utilities Board about whether**  
10 **the economic benefits of Wind X were a wealth transfer between Iowa residents.**  
11 **What is your response to the question and MidAmerican's response?**

12 A. Iowa's purchases of coal, as well as other non-renewable fuels, from other states  
13 represents a significant wealth transfer from Iowa to other states and one that will be  
14 reduced by Wind X. In 2012, the cost of imported coal from out of state to Iowa was  
15 \$590 million.<sup>23</sup> This ranks Iowa as one of the ten most coal dependent states in terms of  
16 per capita expenditures on coal and net coal imports by weight.<sup>24</sup> Reducing the use of  
17 imported coal and other non-renewable fuels by increasing wind generation will keep  
18 more energy dollars in Iowa and circulating in the Iowa economy.

19  
20  
21  

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<sup>22</sup> Iowa Wind Energy Association, *Wind Power Facts* at  
<http://www.iowawindenergy.org/whywind.php>.

<sup>23</sup> Union of Concerned Scientists, *Burning Coal, Burning Cash* (2014).

<sup>24</sup> *Id.*

1 **Q. What is your recommendation regarding MidAmerican's Wind X proposal?**

2 A. I support the timely approval and construction of Wind X. Wind X provides important  
3 economic and environmental benefits to MidAmerican ratepayers and to the state of  
4 Iowa, including compliance with the proposed Clean Power Plan, increased fuel  
5 diversity, reduced use of imported coal and other non-renewable fuels, job creation and  
6 economic development and the addition of a low cost generating resource. I support  
7 Wind X and hope to see additional renewable energy proposals from MidAmerican and  
8 other utilities in Iowa in the near future.

9

10 **Q. Does this conclude your testimony?**

11 A. Yes.

STATE OF IOWA  
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AFFIDAVIT OF  
NATHANIEL BAER

**FILED WITH  
Executive Secretary  
June 09, 2015  
IOWA UTILITIES BOARD**

STATE OF ILLINOIS )  
 ) ss.  
COUNTY OF COOK )

I, Nathaniel Baer, being first duly sworn on oath, depose and state:

1. that I am Energy Program Director at the Iowa Environmental Council;
2. that I have personal knowledge of the facts alleged in the attached testimony; and
3. that said facts are true and correct to the best of my knowledge and belief as of the date of this Affidavit.

Further affiant sayeth not.

/s/ Nathaniel Baer

Nathaniel Baer

Subscribed and sworn to before me,  
a Notary Public in and for said County and  
State, this 9 day of June 2015.

/s/ Elizabeth Praker  
Notary Public

My commission expires: 11/12/17