Quadrennial Energy Review
Second Installment
Electricity: Generation to End-Use
Stakeholder Meeting #4: Des Moines, IA
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State Historical Building
600 East Locust Street

<u>Panel 1</u>: Bulk Power Generation and Transmission: How Can We Plan, Build, and Operate the Appropriate Amount for Future Needs?

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Good morning. I am Josh Mandelbaum, an attorney with the Environmental Law & Policy Center (ELPC). ELPC is the Midwest's leading public interest environmental legal advocacy and eco-business innovation organization. We develop and lead successful strategic advocacy campaigns to improve environmental quality and protect our natural resources.

I would like to thank Secretary Moniz and the Department of Energy for the opportunity to participate in today's discussion, and for having this stakeholder meeting in Des Moines, Iowa. Iowa is a particularly fitting place to have a discussion about the future of the U.S. electricity system because Iowa has a history of being forward looking in its approach to energy. In 1983, Governor Branstad signed the first Renewable Portfolio Standard into law. Today, the state's largest electric utility, MidAmerican Energy, is taking steps to serve its Iowa customers with 85% renewable generation, and perhaps more importantly, talking about a vision for 100% renewables.

Iowa is helping lead the conversation on the transition away from fossil fuel generation to clean energy. As Iowa's old fossil fleet retires, it is being replaced with wind, solar and energy efficiency. A decade ago, Iowa had just over 800 MW of installed wind capacity. At the end of

2015, Iowa had over 6,200 MW of installed wind capacity.[1] This was second in the country behind only Texas in terms of wind capacity. As a percentage of the state's electricity mix, Iowa generates approximately 31% of its electricity from wind, which is the most of any state. Just last month, MidAmerican announced an additional 2,000 MW of wind. Iowa also has an emerging solar energy market. Since the passage of the state solar tax credit in 2012, there have been over 1,800 solar projects developed. This March, it was announced that a 100 MW solar project was currently under development in north-central Iowa. In addition, Iowa has some of the longest running and strongest utility energy efficiency programs in the country. At the same time that we're seeing significant new clean energy, we are continuing to see coal plants retire or convert to natural gas. In Iowa since 2012, twelve coal generating units have retired or will retire by 2017. There have been an additional five units that have converted to natural gas. There are an additional four units announced for retirement or conversion. This represents approximately 1,900 MW of coal generating capacity that will no longer be running.

Iowa has been successful at transitioning away from fossil fuels and integrating renewable resources into our energy mix while maintaining reliability, affordability, and safety. Energy efficiency has long been the cheapest means of meeting energy needs, and wind energy in Iowa has started to rival energy efficiency on a cost basis. MidAmerican has integrated significant wind resources while maintaining some of the lowest electric rates in the country. In addition, the transition to clean energy has been a significant economic driver. The wind industry supports over 7,000 jobs in Iowa. MidAmerican's recent announcement represents a $3.6 billion investment. Along with that comes $18 million in estimated annual payments to landowners and $12.5 million in additional annual local tax revenue. The low-cost renewable energy has made

[1] U.S. DOE, WINDExchange, Installed Wind Capacity Maps *available at* http://apps2.eere.energy.gov/wind/windexchange/wind_installed_capacity.asp.

Iowa an attractive place to do business. Companies like Google, Microsoft and Facebook have located operations in Iowa because the state offers affordable renewable generation.

The trend towards clean energy as old fossil fuel plants retire will continue because there is tremendous untapped potential, ongoing technological innovation, and demand for clean energy alternatives. These factors also suggest a continued role for Iowa in leading the transition to our nation's clean energy future.

There is significant untapped renewable energy and energy efficiency potential. Iowa has some of the best wind resources in the country with the potential to develop approximately 570,000 MW of wind, which translates to 44 times Iowa's current electricity needs.[2] Iowa also has the potential to build over 4,000 gigawatts (GW) of solar PV. This amount of solar would generate over 7,000,000 GWh of electricity per year. This is enough electricity to meet Iowa's current electricity needs 150 times over.[3] In addition, even though Iowa has long standing energy efficiency programs, there is significantly more achievable energy efficiency savings that these programs can capture in the future.[4] These examples are not to suggest renewable energy build out at this level or capturing all possible energy efficiency savings, but rather illustrate that there is significant room for growth and that harnessing even a small fraction of the renewable and energy efficiency potential would transform our energy mix.

Technology is making such a transformation possible, affordable, and imminent. Technological innovation is rapidly and dramatically changing the energy landscape. The cost of wind resources has fallen dramatically. In 2009, the cost per kWh for wind power purchase agreements (PPAs) was almost 7 cents. In 2014, the national average levelized cost for wind

[2] American Wind Energy Association, Iowa Wind Energy (last updated August 7, 2014).
[3] National Renewable Energy Laboratory, *Renewable Electricity Futures Study*, Data from U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis (2012).
[4] The Cadmus Group, *Assessment of Energy and Capacity Savings Potential in Iowa* (February 2012).

PPAs was 2.35 cents.[5] Projects in the central part of the country drove the 2014 numbers, and PPA prices at these levels suggest affordable wind resources will be available at less cost than other generating options even after the federal production tax credit is phased out. At the same, technology is improving with the average nameplate capacity for newly installed turbines in 2014 up over 172% since 1999.[6] The trajectory of solar is similar. PV module (panel) costs have dramatically dropped over the past seven years from almost $4.00 to 60 cents – 75 cents per watt[7], and overall solar installation costs have sharply declined to $2 – $4 per watt. As costs continue to come down and efficiencies go up, it will be possible to affordably integrate even more renewable energy into our resource mix.

Solar is particularly important as part of this discussion because it bridges the discussion of bulk generation and distributed generation and demand side resources. Any discussion of the future of bulk power generation should include demand side resources. In the context of bulk power generation, it is particularly important to properly account for and plan for increased amounts of demand side resources such as distributed generation, demand response and energy efficiency. These resources can reduce the need for additional bulk generation while providing important additional benefits.

Energy efficiency has frequently been touted as the best, fastest and cheapest way to meet energy needs, and it has helped hold down demand and avoid the need for additional generation. Technological innovation has helped make that possible while continued innovation will open up new horizons for efficiency gains. Efficiency standards for air conditioners, refrigerators, dishwashers and other appliances are reducing and will continue reduce household energy use.

[5] U.S. DOE, Lawrence Berkeley National Laboratory, *2014 Wind Technologies Market Report* (August 2015).
[6] *Id.* at 29.
[7] SEIA/GTM Research Market Insight Report for Q2 2015. http://www.seia.org/research-resources/solar-market-insight-report-2015-q2 at Figure 2.8.

The rapid transformation in the lighting sector with the adoption of LEDs is already having a major impact on savings across all customer classes. There is still room for immediate growth as smart thermostats, other smart devices, new home and business energy management systems gain adoption and present additional opportunities for energy efficiency savings. The electricity usage reductions will help with the transition as more coal plants retire without creating reliability problems, will better integrate renewable generation, and will achieve carbon pollution reduction goals in a cost effective way.

Battery storage represents another potential transformational technological innovation. It is clear that advanced battery and other energy storage technologies are improving. There are models for improvement in battery technologies in electronics such as computers, smart phones and cameras that indicate potential for rapid advancements in cost-effectiveness, efficiency, and deployment. In addition, there is significant governmental and private sector research in the field, and utilities learning from their own battery deployment. This means that major improvements in energy storage are on the horizon and could be here sooner than anticipated. Like innovation in other areas, as battery prices fall and efficiencies increase wider adoption will follow. This will facilitate integration of additional renewable generation at both the utility scale and as distributed resource while improving the value of that renewable generation as well as system reliability, flexibility and security.

The future will only see increased demand for clean energy. Consumers want clean energy. As part of the rollout of its recent wind project, MidAmerican noted that 91% of its customers wanted to see more renewable energy development.[8] Corporate leaders are adopting aggressive sustainability and clean energy goals. The Clean Power Plan will also create a demand for more clean energy options as states work on compliance plans to reduce carbon

[8] MidAmerican Energy Company, *Wind XI Something Big For Iowa*.

pollution. Iowa is well-positioned to provide clean energy options to help other states comply with the Clean Power Plan. Iowa's carbon emissions are down almost one-third from the state's historic peak. Iowa's continued implementation of energy efficiency programs, development of significant wind resources, and announced coal plant retirements and conversions make state compliance easily achievable. A recent report found that Iowa could provide a significant amount of affordable wind energy to neighboring states if wind development continued through 2030 at levels that would be considered modest when compared to the past decade.[9]

The future of energy generation will look very different than today. Utilities like MidAmerican are helping set the framework for what the future will look like with a vision of 100% renewable generation for its customers. As the Iowa example illustrates, there is more than enough potential to meet this vision with a mix of affordable clean energy technologies. Future generation will undoubtedly include significantly more wind and solar generation, and it will also include better accounting for and integration of energy storage, energy efficiency, and distributed resources such as solar and combined heat and power. Technological innovation is already making this transformation quicker and more affordable than previously imagined, while consumer demand and the need to curb carbon pollution will continue to drive this transformation. As we look to the future, we should recognize, embrace and facilitate these opportunities. I look forward to a vigorous discussion with my fellow panel members on how we can do just that.

Thank you.

[9] Dan Turner and Tom Wind, *Iowa's Wind Potential for Addressing 111(d) Goals: The potential for Tapping Iowa's Wind Resource to Reduce CO2 Emissions* (2015)