Exhibit No: _____
Issues: Need, and Public Interest
Witness: Michael Goggin
Sponsoring Party: Wind on the Wires
Type of Exhibit: Direct Testimony, Schedules MG-1 to MG-8
Case No: EA-2017-0345
Date Testimony Prepared: October 6, 2017

Schedule MG-1

Michael Goggin

Education:

Harvard University class of 2004, B.A.

- Graduated *cum laude* in Social Studies
- Wrote thesis "Is it Time for a Change? Science, Policy, and Climate Change"

Experience:

AWEA Senior Research Director, other titles February 2008-present

- Provide analytical support and advocacy on transmission and grid integration and issues related to wind energy's impact on markets
- Communicate with the press, the public, and policymakers about wind energy
- Work with AWEA members to develop the organization's policy positions

Sentech, Inc. Research Analyst October 2005-February 2008

- Author white papers, feasibility studies, and economic analyses of solar, wind, geothermal, and energy storage technologies for Department of Energy officials
- Model performance and economics of innovative renewable energy and energy storage technologies
- Research and write fact sheets and presentations for DOE clients
- Provide analytical support for DOE's selection of recipients for renewable energy technology R&D funding

Union of Concerned Scientists Clean Energy Intern May 2005-October 2005

- Worked with the legislative and field staff to promote the inclusion of pro-renewable energy measures in the Energy Policy Act of 2005
- Mobilized clean energy businesspeople and advocates to lobby elected officials
- Prepared fact sheets to support passage of pro-renewable policies

State Public Interest Research Groups Policy Analyst August 2004-May 2005

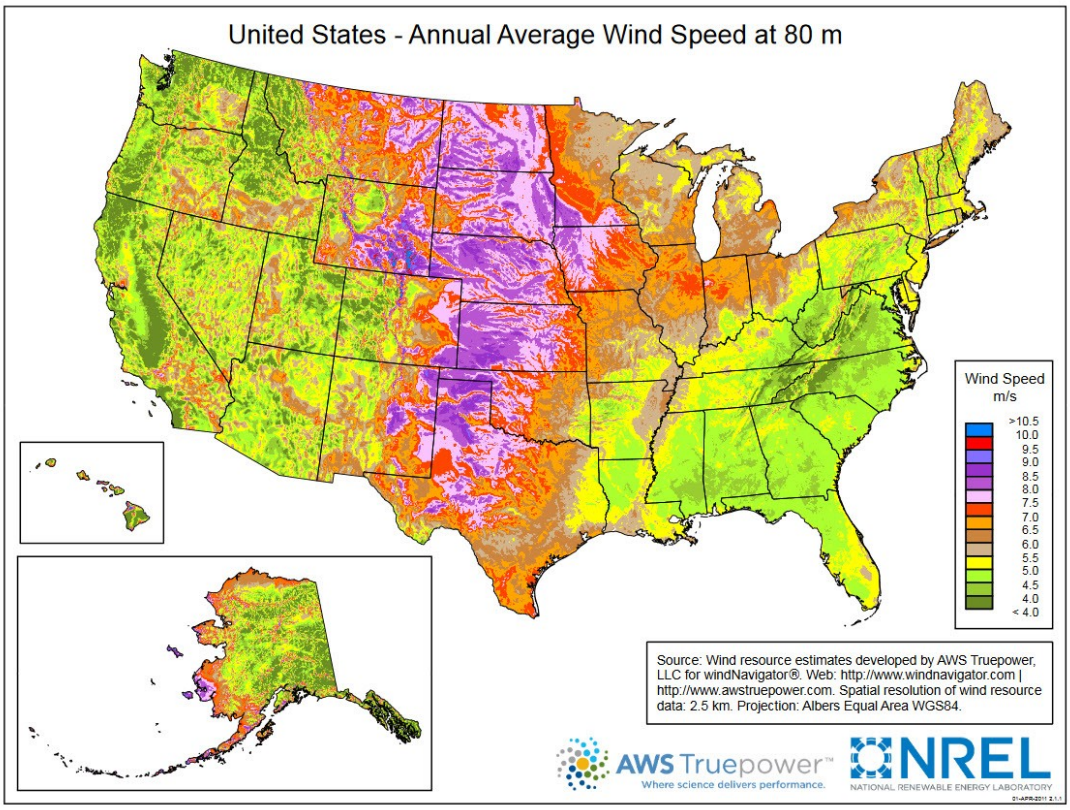
- Wrote reports advocating pro-renewable energy policies at the state, regional, and federal level
- Gathered and analyzed data to be included in advocacy reports

Publications:

- R. Gramlich and M. Goggin, "The Ability of Current U.S. Electric Industry Structure and Transmission Rules to Accommodate High Wind Energy Penetration," October 2008, presented at 7th International Workshop on Large Scale Integration of Wind Power and on Transmission Networks for Offshore Wind Farms
- M. Milligan, et al., "Impact of Electric Industry Structure on High Wind Penetration Potential," July 2009, NREL Technical Report TP-550-46273
- R. Gramlich and M. Goggin, "What's Next for Wind Power," March 2013, Electricity Journal
- Michael Goggin, "Wind Energy's Emissions Reductions: A Statistical Analysis," July 2013, presented at IEEE PES annual conference

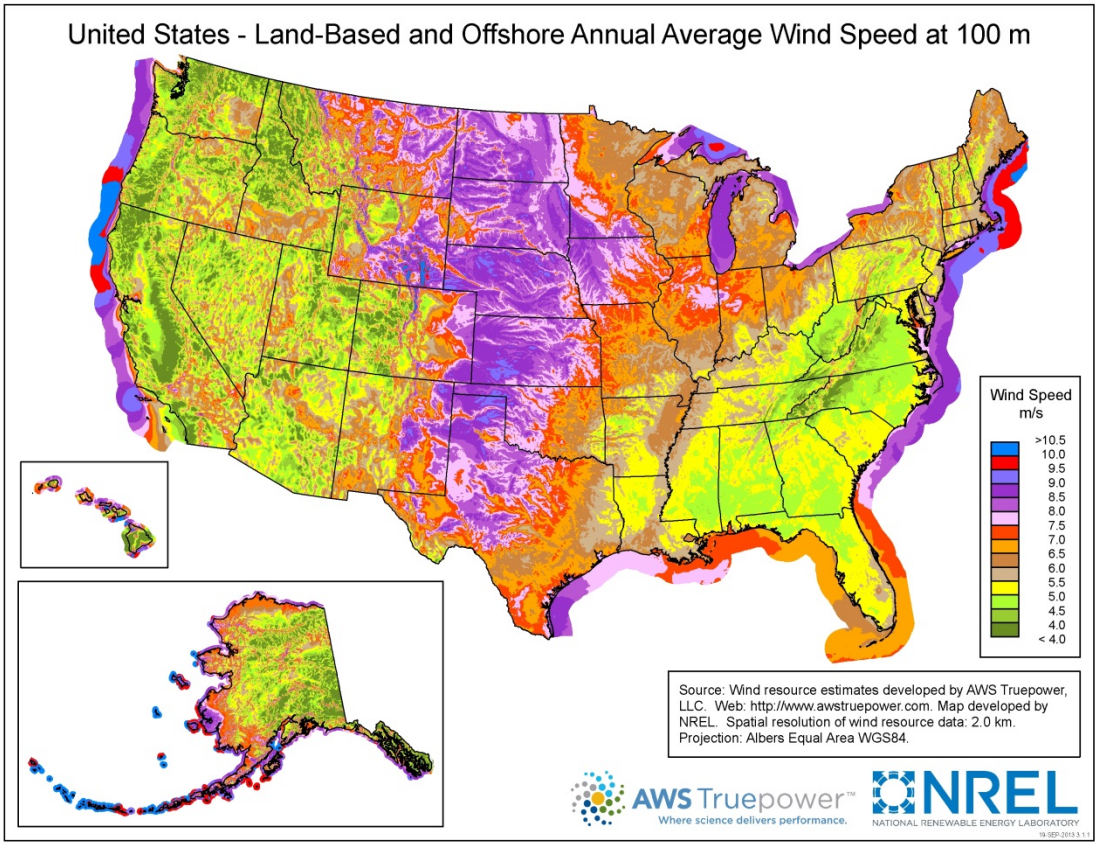
Schedule MG-2

NREL wind resource assessment map of the U.S. at 80m hub height, available at *https://windexchange.energy.gov/maps-data/319* as of September 2017.



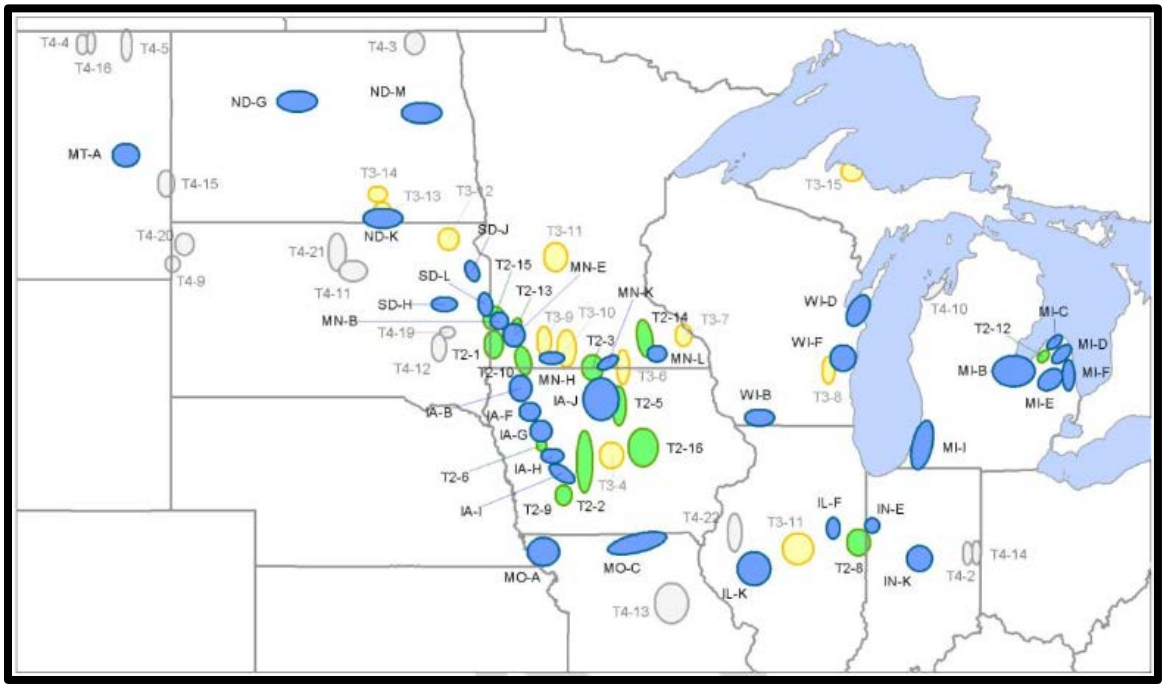
Schedule MG-3

NREL wind resource assessment map of the U.S. at 100m hub height, available at *https://www.nrel.gov/gis/images/100m_wind/awstwspd100onoff3-1.jpg*, as of September 2017.



Schedule MG-4

RGOS wind resources zones and New Wind Energy Zones identified in MTEP17, MTEP17 Appendix E2 at page 43 Figure 32: MTEP17 VCE Wind Tiers.



Schedule MG-5

AWEA's Estimate of Incremental Wind Capacity (MW) (beyond current levels) that will be needed to meet state RES/RPS through the year 2025, by MISO state

State	Estimate
IL	610
MO	840
MN	80

Schedule MG-6

Cost and benefits of MVP portfolio, by category; from MTEP17 MVP Triennial Review, fig. E1 at 6 (September 2017), available at https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MTEP17%20MVP%20Triennial%20Review%20Report.pdf

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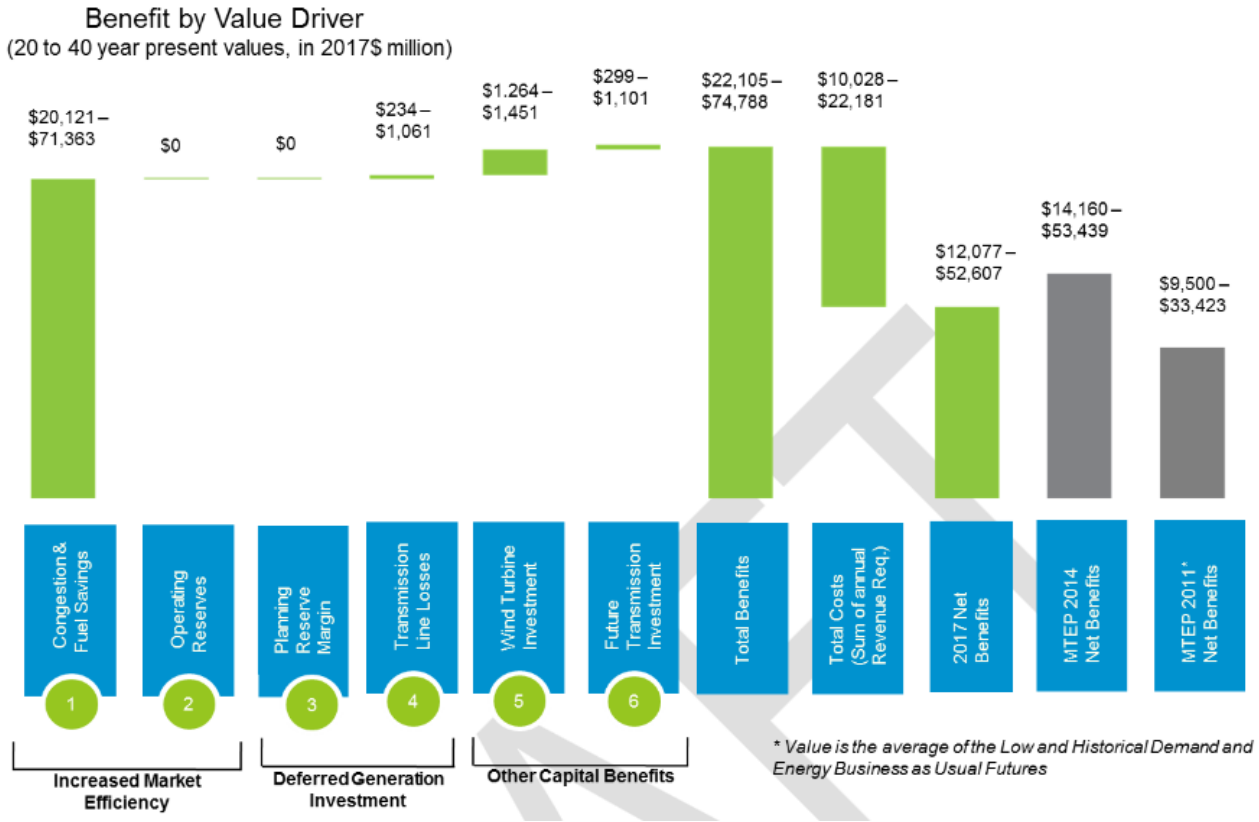
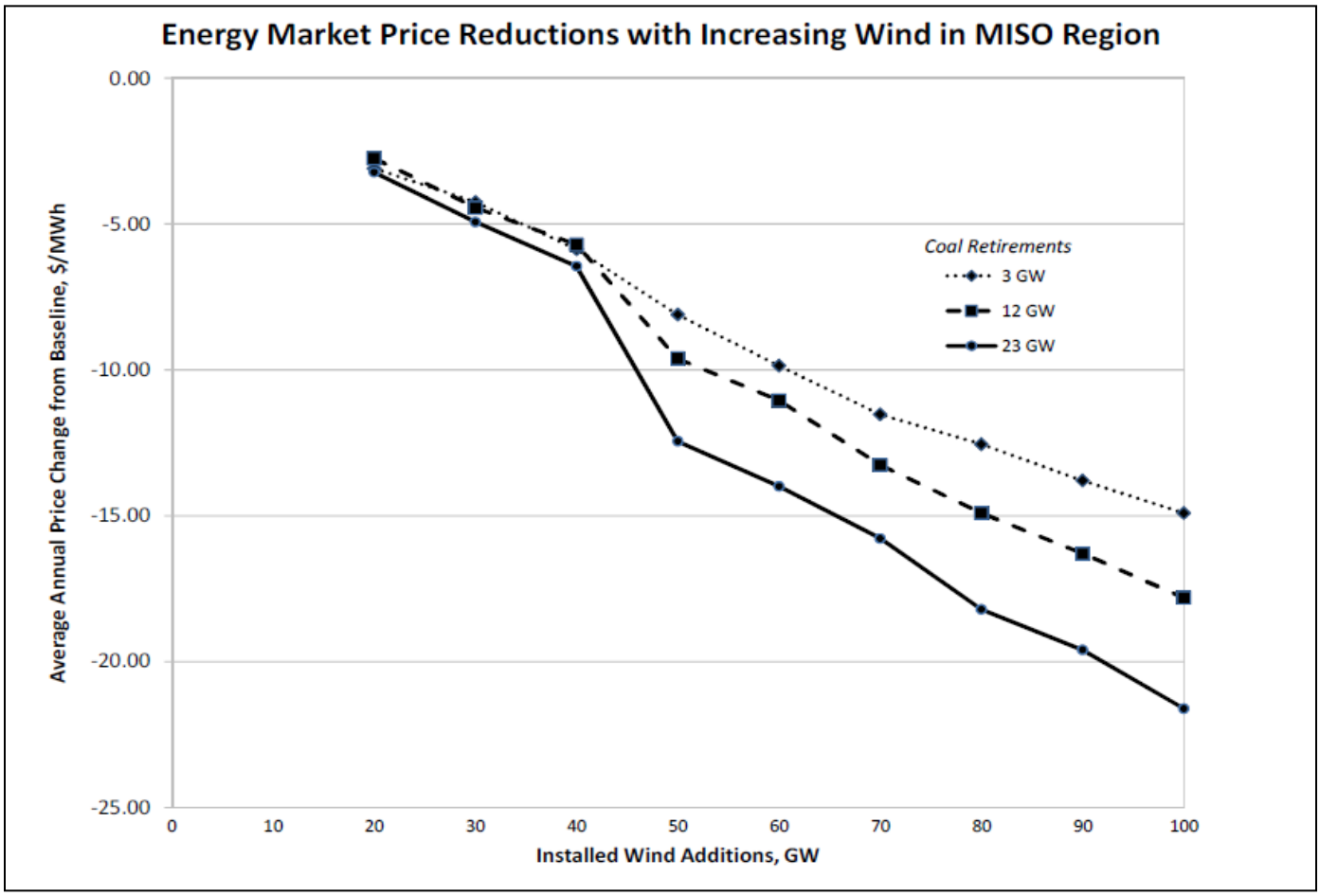


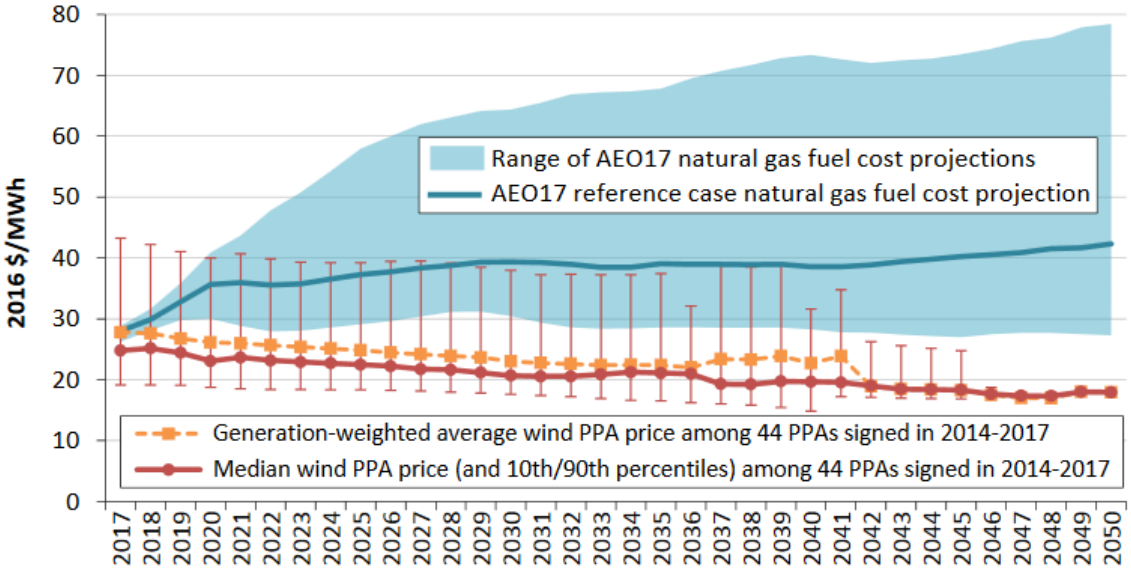
Schedule MG-7

Electricity Market Prices Decline as Wind Capacity is Added, from *Synapse Energy Economics, Inc.*, The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region, at 4 (May 22, 2012), *available at* http://cleanenergytransmission.org/wp-content/uploads/2012/05/Full-Report-The-Potential-Rate-Effects-of-Wind-Energy-and-Transmission-in-the-Midwest-ISO-Region.pdf.



Schedule MG-8

Wind PPA Prices over the life of their contract compared to natural gas fuel cost projected over time using EIA forecast, from Lawrence Berkeley National Laboratories, 2016 Wind Technologies Report, fig. 51 at 61 (August 2017) available at https://energy.gov/sites/prod/files/2017/08/f35/2016_Wind_Technologies_Market_Report_0.pdf



Note: The 10th/90th percentile range narrows considerably in later years as the PPA sample dwindles.
Source: Berkeley Lab, EIA