PUC Docket No. E999/CI-14-643
OAH Docket No. 80-2500-31888
Clean Energy Business Coalition
Exhibit No. ______

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. E999/CI-14-643
OAH DOCKET NO. 80-2500-31888

Rebuttal Testimony

of

Shawn Rumery

SUBMITTED ON BEHALF OF:

WIND ON THE WIRES
MIDWEST RENEWABLE ENERGY ASSOCIATION
SOLAR ENERGY INDUSTRIES ASSOCIATION
("CLEAN ENERGY BUSINESS COALITION")

AUGUST 12, 2015

Q: Please state your name, job title, and business address.

A: My name is Shawn Rumery, and I am Director of Research at the Solar Energy Industries Association. My business address is 600 14th St. NW Suite 400, Washington D.C. 20005.

Q: For whom are you testifying?

A: I am testifying on behalf of the Solar Energy Industries Association (SEIA), Wind on the Wires, and the Midwest Renewable Energy Association (the "Clean Energy Business Coalition").

Q: Have you testified in proceedings in front of the Public Utilities Commission before?

A: No, I have not.

Q: What is your background and educational experience?

A: I hold a Bachelor of Art in Philosophy, Politics and Economics from Juniata College and a Master in Public Administration from the George Washington University. I have 4 years of experience as a researcher in the solar industry, including extensive work on solar deployment tracking and analysis, policy analysis, and economic development. Since 2012, I have co-authored the SEIA/GTM (Green Tech Media) Research U.S. Solar Market Insight Report series and have presented findings from that and other research to members of

Congress and their staff and at many energy industry events. My resume is presented as Attachment 1.

Q: What is the purpose of you testimony?

A: In general, my testimony is offered to support adoption of the federal Social Cost of Carbon values (as proposed by the Clean Energy Organizations and the Minnesota Department of Commerce testimony), as the best figure available to account for externalized damage costs of carbon emissions. Proper valuation of the costs associated with the environmental pollution generated by the electricity industry will send the right signals to the market to ramp up industries that can create jobs, strengthen the economy, and help support a cleaner and healthier environment. However, some of the testimony presented misrepresents the role that renewable energy plays in our economy, now and in the future. Specifically, my testimony responds to Peabody Energy Corporation witness Dr. Roger H. Bezdek's testimony that future economic growth requires fossil fuels and that solar energy is unreliable, intermittent, expensive and non-scalable. I understand that the Administrative Law Judge has determined that "[t]estimony regarding the efficacy of renewable energy or renewable energy policy is presumed to be irrelevant" to the issues in this case (Third Prehearing Order, April 16, 2015), however my testimony regarding the efficacy of solar energy is offered only to rebut the factually inaccurate and unsupported statements presented by Dr. Bezdek to support the flawed benefit-cost analysis presented in his testimony.

Q: Dr. Bezdek claims that fossil fuels provide energy at a price more affordable than solar. (See Direct Testimony at 15). Do you agree?

A: No, I do not.

Q: Why not?

A: Dr. Bezdek fails to provide current numbers on the price of renewables and fossil fuels, and does not consider the future of the renewables industry. Citing to an outdated 2011 study,[1] Dr. Bezdek claims that the Levelized Cost of Energy (LCOE) of photovoltaic (PV) systems is 40 cents/kWh and solar thermal is around 25 cents/kWh. Dr. Bezdek fails to cite to the current cost of solar technologies. Since 2011, installed solar photovoltaic capacity in the U.S. has increased dramatically from 4000 MW in 2011 to over 18,000 MW by the end of 2014.[2] Economies of scale and improvements in installation efficiency and manufacturing have allowed companies to significantly reduce the cost to install a solar photovoltaic system. According to SEIA and GTM Research, the average cost to install a residential solar PV system has dropped by 43% since the end of 2011, reaching $3.54/watt at the end of 2014. The price to install a utility-scale system has dropped by 50% since 2011, to $1.61/watt by the end of 2014.[3]

Reduced costs for solar installation are reflected in a number of studies on Levelized Cost of Energy (LCOE). Lazard, a financial advisory and asset

[1] Bezdek Testimony, Exhibit II, Figure II-16, "Levelized Costs of Electricity by Generation Sources."
[2] SEIA/GTM Research *U.S. Solar Market Insight* 2014 Year in Review.
[3] *Id*.

management firm, publishes yearly estimates of unsubsidized LCOE across energy technologies and have found prices for residential solar PV to be $0.18/kWh - $0.265/kWh, commercial solar PV from $0.126/kWh - $0.177/kWh, utility-scale PV from $0.072/kWh - $0.086/kWh and solar thermal with storage from $0.118/kWh to $0.14/kWh. The same analysis finds the LCOE of coal plants to range from $0.066/kWh to $0.151/kWh while Natural Gas plants will range from $0.061/kWh to $0.087/kWh. Gas Peaking plants, which are often offset under higher penetrations of solar have an LCOE of $0.179/kWh - $0.23/kWh.[4]

In addition, the U.S. Department of Energy's (DOE) Energy Information Administration has provided their own LCOE estimates, which find the average unsubsidized LCOE of solar PV to be $0.125/kWh, compared with $0.115/kWh for advanced coal technologies and $0.075/kWh for conventional combined cycle natural gas technologies.[5]

The decrease in the cost of solar energy has led to lower power purchase agreement prices across country. In July 2015, NV Energy signed a power purchase agreement (PPA) for a utility-scale solar PV plant at $0.0387/kWh.[6] Earlier in 2015, Austin Energy signed a PPA for a utility-scale solar PV plant at

[4] Lazard, Levelized Cost of Energy Analysis Version 8.0, September 2014, http://www.lazard.com/media/1777/levelized_cost_of_energy_-_version_80.pdf.
[5] U.S. Energy Information Administration, "Levelized Cost and Levelized Cost of New Generation Resources in the Annual energy Outlook 2015" http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.
[6] http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2015-7/3615.pdf.

under 4 cents per kilowatt-hour,[7] after signing a PPA for solar at less than 5 cents per kilowatt-hour in 2014.[8]

Dr. Bezdek's data is out of date and incomplete. Solar can and does provide electricity at prices that are competitive with fossil fuels.

Q: Do you agree with Dr. Bezdek's assessment of the contribution of renewables to the energy mix in the future? (Direct Testimony at 14-15).

A: No, Dr. Bezdek significantly underestimates the role that solar and renewable energy will play in the overall energy mix moving forward. Renewable energy is predicted to make up more than 20% of total energy generation by 2040. Dr. Bezdek cites to the EIA for the proposition that renewables will make up no more than 20% of total energy generation by 2040. This is incorrect for multiple reasons.

First, the EIA's estimates have historically underestimated future renewable energy installations. For example, EIA predicts that 20.84 GWac of cumulative solar electric capacity will be installed by the end of 2015 and 27.5 GWac by the end of 2020. However, with more than 11 GWac of utility-scale solar capacity

[7] NV Energy buys utility-scale solar at record low price under 4 cents/kWh. *Utility Dive*. Jul. 8, 2015. http://www.utilitydive.com/news/nv-energy-buys-utility-scale-solar-at-record-low-price-under-4-centskwh/401989/
[8] Cheapest Solar Ever? Austin Energy Buys PV From SunEdison at 5 Cents per Kilowatt-Hour. *Greentech Media*. March 10, 2014. http://www.greentechmedia.com/articles/read/Cheapest-Solar-Ever-Austin-Energy-Buys-PV-From-SunEdison-at-5-Cents-Per-Ki

under contract and scheduled to come online by the end of 2016, and nearly 18 GWac already installed through Q1 2015, U.S. solar capacity will likely meet EIA's 2020 projections well before the end of 2016. SEIA and GTM Research estimate that by 2020, including all sectors of the U.S. solar industry (residential, commercial, utility-scale and solar thermal), cumulative installed solar capacity in the U.S. will reach 60 GWac.[9] Similarly, the EPA noted that EIA data for renewable energy underestimates the deployment potential of renewables, and as a result increased its expectation for renewable deployment under the Clean Power Plan (CPP) by nearly 30%.[10]

Furthermore, 29 states plus Washington, D.C. have renewable portfolio standards (RPS) that require states to procure increasing amounts of renewable energy into the future.[11] Additionally, several states are considering increasing their RPS laws. For example, California is currently considering legislation requiring 50% of its power to come from renewables, including solar, by 2030[12] and New York has recently put forth a goal of 50% renewables by 2030 in the New York State Energy Plan that includes 3 GW of distributed solar energy by 2023.[13] Minnesota

[9] SEIA/GTM Research *U.S. Solar Market Insight Q1 2015.*
[10] Fact Sheet: President Obama to Announce Historic Carbon Pollution Standards for Power Plants. Aug. 3, 2015. https://www.whitehouse.gov/the-press-office/2015/08/03/fact-sheet-president-obama-announce-historic-carbon-pollution-standards.
[11] Renewable Portfolio Standard Policies. June 2015. http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2014/11/Renewable-Portfolio-Standards.pdf.
[12] SB 350: Golden State Standards 50-50-50. http://focus.senate.ca.gov/sites/focus.senate.ca.gov/files/climate/505050.html.
[13] New York State Energy Planning Board. 2015. *The Energy to Lead; 2015 New York State Energy Plan*. Available at www.energyplan.ny.gov; http://ny-sun.ny.gov/.

requires at least 25% of its power to come from renewables by 2025 with an additional 1.5% from solar for investor-owned utilities.[14]

Renewable energy is also making up an increasingly large share of electric capacity added to the grid. Since 2006, at least 21% of electric capacity added every year has been from renewable sources. From 2012-2014, renewables made up 50% of all electric capacity added to the grid, peaking at 55% of installed capacity in 2014.[15]

Finally, the CPP will make renewables one of the most attractive sources of power in the future. Under the CPP, states must cut carbon dioxide emissions from power plants by 32% from 2005 levels by 2030.[16] To meet these goals, states will look to low-emission sources such as solar. Considering that the cost of solar is falling rapidly, and solar generates electricity with no carbon emissions, solar will be one of the most attractive new power sources in the CPP era. This also holds true for other renewable energy sources as well. Taken together, Dr. Bezdek greatly underestimates the future contribution of solar energy and renewables to the US energy mix.

[14] Minn. Stat. 216B.1691. Xcel Energy is required to meet 30% renewables by 2020. The state's solar requirement must be met starting in 2020.
[15] Compiled from EIA 860 and EIA Electric Power Monthly.
[16] Overview of the Clean Power Plan: Cutting Carbon Pollution from Power Plants. Aug. 3, 2015. http://www.epa.gov/airquality/cpp/fs-cpp-overview.pdf.

Q: Dr. Bezdek asserts that renewables (including solar) are not scalable. (Direct Testimony at 15). Do you agree?

A: No, I do not.

Q: Why not?

A: While Dr. Bezdek states that renewable energy sources, such as solar, are not scalable, his claims are unfounded and incorrect. Solar energy technology is scalable and modular. Solar systems can range from a small cell-phone charger to a 2 kilowatt residential system to a 500-plus MW utility-scale system. Additionally, solar energy is generated from a diverse suite of technologies including distributed PV, utility scale PV, concentrated solar power, and solar heating and cooling that can service both distributed and wholesale markets. Solar is also modular and can be scaled quickly. For example, the development and construction timeline for a large, centralized conventional fossil fuel power plant is typically a multi-year process (and longer for nuclear energy). By comparison, the time from conception to operation for renewable energy projects can be much faster. While very large solar and wind plants are still subject to some of the same siting and permitting-related requirements as large fossil plants, medium and small solar facilities can be built quickly, especially with the right policies in place. In places with streamlined permitting and interconnection procedures, it is possible for a three-person crew to install up to three residential PV systems in a day. For larger commercial flat-roof PV systems, a six-person crew can install 100 kW of PV in a day.[17]

Further, solar and renewables have been proven to perform at high penetration levels. For example, as of 2013, the three largest utilities in California receive over 21% of their power from renewables.[18] In fact, on an instantaneous basis, California is regularly serving above 25% of load with renewable resources, and recently began seeing over 5,000 MWh of solar energy.[19]

Q: Is Dr. Bezdek correct that solar energy is unreliable and threatens grid stability? (Direct Testimony at 15).

A: No, solar can be integrated into the grid at high penetration levels without affecting reliability or grid stability. In fact, many states have successfully increased the amount of power that they get from renewables because they have been proven to be a reliable source of energy. Additionally, many studies have shown that renewables can be integrated into the grid at significant penetration levels without impacting grid reliability.

[17] Cutting Carbon Emissions Under 111(d): The Case for Expanding Solar Energy in America. *Solar Energy Industries Association*. May 27, 2014. http://www.seia.org/research-resources/cutting-carbon-emissions-under-111d-case-expanding-solar-energy-america.
[18] http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf.
[19] *Id*.; Testimony of Sean Gallagher, FERC Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure (AD15-4-000).

Q: Can you provide some examples of states increasing their renewable penetration targets?

A: Renewables have been successfully deployed at significant penetration levels in many states. In California, as of 2013, the "three large IOUs collectively serve 22.7% of their 2013 retail electricity sales with renewable power and approximately 25% of total load with renewables in 2014."[20] Due to this success, Governor Brown of California has proposed that the state get at least 50% of its power from renewables by 2030, with much of the power coming from distributed and utility scale solar.[21] New York is seeking to increase its renewable energy penetration to 50% by 2030 with 3 GW coming from distributed solar by 2023.[22] Hawaii, which has one of the highest penetration levels of solar in the country, recently passed a law mandating 100% renewable use by 2045.[23] Additionally, Minnesota and Illinois are currently considering increasing their renewable energy procurement under their RPS laws.[24]

[20] http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf; http://www.cpuc.ca.gov/PUC/energy/Renewables/.
[21] Governor Brown Establishes Most Ambitious Greenhouse Gas Reduction Target In North America. April 29, 2015. http://gov.ca.gov/news.php?id=18938.
[22] New York State Energy Planning Board. 2015. *The Energy to Lead; 2015 New York State Energy Plan*. Available at www.energyplan.ny.gov; http://ny-sun.ny.gov/.
[23] Hawaii Passes Legislation to Go 100% Renewable. Greentech Media. May 12, 2015. http://www.greentechmedia.com/articles/read/hawaii-passes-legislation-to-go-100-renewable.
[24] Illinois Lawmakers Introduce Far-Reaching Clean Energy Bill With Bipartisan Support. Feb. 20, 2015. *Think Progress*. (http://thinkprogress.org/climate/2015/02/20/3625138/illinois-clean-energy-bill/); Minnesota lawmakers consider bills on RPS, efficiency, CPP compliance. Mar. 19, 2015. *Utility Dive*. (http://www.utilitydive.com/news/minnesota-lawmakers-consider-bills-on-rps-efficiency-cpp-compliance/376899/).

Q: Can you point to additional evidence that solar energy and renewables can be integrated into the grid at significant penetration levels without negatively impacting reliability?

A: Yes, several studies have clearly shown that high levels of renewables, including solar energy, can be integrated into the grid without negatively impacting reliability or grid requirements. In fact, solar energy and renewables can improve grid reliability and provide benefits to the existing energy infrastructure, including reducing transmission losses and relieving congestion on the grid.[25]

As part of a balanced energy portfolio, solar energy can be configured and operated to provide various reliability services and transmission benefits that will be essential to electric power system operations. With supportive policies and standards in place, solar PV can include advanced features that enable it to operate more like conventional power plants and actively contribute to the stability and reliability of a regional grid.[26] Some of these features may include voltage regulation, active power controls, ramp-rate power controls, fault ride-through, and frequency response controls. These advanced features can enable solar PV to provide a state or region with additional system flexibility by responding to utility and independent system operator instructions.

[25] *See* NREL Renewable Electricity Futures Study, available here: http://www.nrel.gov/analysis/re_futures/; *See also* the study "Integrating High Penetration Renewables: Best Practices from International Experience" available here: http://www.jisea.org/high_pen.cfm.
[26] *See* "Grid-Friendly" Utility Scale PV Plants, First Solar at 3 and 12 (August 13, 2013).

Concentrating solar power plants (CSP) employ conventional synchronous turbine generators and inherently possess valuable system reliability attributes, such as, but not limited to, active and reactive power support, dynamic voltage support and regulation, voltage control and some degree of inertia response. With the integration of thermal energy storage, CSP facilities can be fully dispatched by utilities and system operators, meaning that the plants are capable of ramping power output up and down to meet changing energy demand, without material efficiency losses. In addition, CSP with storage plants are a significant source of essential grid flexibility services, such as ramping, regulation and spinning reserves, which are critical to a reliable system. These services are typically provided by fossil-fired generators operating at sub-optimal heat rates, which may increase their emissions.

On an aggregated basis, utility-scale and distributed solar resources provide significant reliability and transmission benefits to a state or regional grid, even if solar output varies at a few individual locations due to localized cloud coverage. When the sum of the solar installations in a geographic area is assessed, the variability is reduced and can be managed by the grid operator. In a recent study regarding the integration of wind and solar in PJM, General Electric International, Inc. (GE) found that PJM's large geographic footprint significantly reduced the magnitude of variability-related challenges as compared to smaller balancing areas.[27] GE noted that an individual solar plant's variability is significantly reduced when solar plants are aggregated and located in a geographically diverse manner throughout PJM.[28]

Further, targeted deployment of solar in congested areas provides relief to transmission systems, defers costly transmission upgrades, and helps maintain grid reliability. For example, unlike central station power plants, solar installed on-site does not experience transmission and distribution system losses, which can be as high as 7 percent on a utility distribution system and up to 20 percent at the time of system peak.[29] Similarly, utilities may site small utility-scale power plants in specific locations to ease congestion on a particular transmission line.

Finally, solar technologies that require transmission investment often do not require pipelines, coal transport or the associated production and processing infrastructure needed by coal and gas industries. This has the potential to save immense costs as the energy infrastructure in the U.S. ages and requires repairs.

As renewable energy becomes a larger component of the electricity sector, the generation profile of the electric resources available throughout the day is changing. For example, solar and wind resources peak at specific times depending

[27] *See* PJM Renewable Integration Study, General Electric International, Inc. at 12 (February 28, 2014) (GE Study).
[28] *See Id*. at 12 and 15.
[29] For more information, *see* "Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements" available at: www.raponline.org/document/download/id/4537.

on geography and other factors. While utilities previously sought to procure a least-cost mix of energy to meet a predictable load curve, the addition of renewable energy has spurred utilities and regulators to think differently about matching supply and demand.

Utilities and policymakers are already addressing the changes to grid operations presented by increased renewable penetration. For example, in areas of an electric grid where the peak energy use is in the late afternoon or evening, solar systems can be configured to coincide with peak demand later in the day or be coupled with storage technologies to match their output to local power demand patterns. This can be done economically, if supported through appropriate policies, pricing options, and program offerings.[30]

Taken together, Minnesota should be confident that grid stability can be maintained while increasing the use of renewables.

[30] *See* "Teaching the Duck to Fly: Integrating Renewable Energy," available here: http://www.raponline.org/featured-work/teach-the-duck-to-fly-integrating-renewable-energy.

Q: Bezdek contends that economic growth depends upon increased carbon dioxide emissions. (Direct Testimony at 18-20). Do you agree that increasing the role of solar and renewable energy in the U.S. energy mix (thereby reducing carbon emissions) will negatively impact economic development?

A: No, solar energy and renewables constitute a global industry that provides significant economic benefits while saving ratepayers money by protecting against the price risk of volatile fossil fuels and avoiding or delaying costly infrastructure upgrades.

Solar has become a key driver for the economy of the 21st Century. The value of the solar industry in the United States as of Q4 2014 was $17.8 billion, with 72% average year over year growth since 2006.[31] In 2014, the U.S. solar industry employed over 174,000 workers[32] at more than 8,000 companies.[33] In Minnesota, over 115 companies work in the solar industry,[34] employing more than 1,800 people, up from 500 in 2012.[35] Since 2010, over $91 million has been invested in solar installations in Minnesota, including $15 million in 2014 alone.[36]

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[31] *See, e.g.*, Solar Energy Facts: 2014 in Review. http://www.seia.org/sites/default/files/Q4%202014%20SMI%20Fact%20Sheet.pdf.
[32] The Solar Foundation, National Solar Jobs Census 2014, http://www.thesolarfoundation.org/solar-jobs-census/national/.
[33] SEIA, National Solar Database, http://www.seia.org/research-resources/national-solar-database.
[34] SEIA, http://www.seia.org/state-solar-policy/minnesota-solar.
[35] The Solar Foundation, State Solar Jobs Census, http://www.thesolarfoundation.org/solar-jobs-census/states/.
[36] SEIA/GTM Research U.S. Solar Market Insight.

As the solar industry grows both nationally and in Minnesota, jobs and economic investment in the state are expected to increase. From 2015-2020, 651 MWdc of solar PV capacity are expected to be installed in the state, on top of the 22 MW already installed.[37]

Additionally, solar offerings are becoming more popular with large corporate employers such as retail stores and technology companies because they allow energy intensive companies to save money on energy prices and are popular with employees and customers. For example, as of Q4 2014 Walmart had 105 MW of installed solar capacity, Kohl's had 50 MW, and Apple had 41 MW.[38] In fact, states that invest in solar and other renewables are often able to lure business investment interested in taking advantage of renewable energy offerings.[39]

In addition, increased use of renewables improves the stability of electricity prices. First, renewables such as solar will insulate electricity prices from fluctuations in fossil prices. Once a renewable energy system is installed, costs no longer depend on commodity price, whereas energy from fossil fuel plants varies in price with the price of fossil commodities.[40]

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[37] SEIA/GTM Research U.S. Solar Market Insight.
[38] Solar Means Business Report. Oct. 15, 2014. SEIA. http://www.seia.org/research-resources/solar-means-business-report.
[39] Solar Means Business Report. Oct. 15, 2014. SEIA. http://www.seia.org/research-resources/solar-means-business-report; http://www.ceres.org/.
[40] The Use of Solar and Wind as a Physical Hedge against Price Variability within a Generation Portfolio. Aug. 2013. http://www.nrel.gov/docs/fy13osti/59065.pdf.

Additionally, solar can reduce costly upgrades to the grid. Strategic placement of solar systems can reduce strain on aging infrastructure which means that upgrades are not needed. As a result, ratepayers can avoid paying for costly capital expenditures. For example, the New York Reforming the Energy Vision docket is designed to increase reliance on distributed resources like solar in New York in part to reduce costs for ratepayers by avoiding expensive distribution system upgrades.[41]

The expanded use of solar and renewable energy is driving significant investment and job growth, while lowering and helping to stabilize the cost of electricity for ratepayers.

Q: Does this conclude your testimony?

A: Yes, it does.

[41] *See* Order Adopting Regulatory Policy Framework and Implementation Plan Feb. 26, 2015 (NY PSC Case 14-M-0101).

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SUMMARY

Research and Policy Analyst with extensive experience in solar energy markets. Demonstrated abilities in data management and analysis, project leadership and strategic thinking. Master of Public Administration graduate with strong communication skills, professional work ethic and unwavering attention to detail.

PROFESSIONAL EXPERIENCE

Director of Research, Solar Energy Industries Association
Washington, DC (July 2015 — Present)

- Provide timely, original research and analysis on wide variety of policy and industry topics for communications and government affairs staff.
- Develop and implement data management strategies for all internal data assets. Supervise staff involved in data acquisition and analysis.
- Co-author and present findings for SEIA/GTM Research *U.S. Solar Market Insight* report series
- Leverage industry research to advise sales teams on effective solar market targets and strategies.
- Identify and scope possible revenue opportunities for proprietary data products.

Research Manager, Solar Energy Industries Association
Washington, DC (February 2014 — July 2015

- Led multi-organization team involved in production of Solar and Schools report.
- Spearheaded data management efforts for full-scale data migration across platforms.

Research Associate, Solar Energy Industries Association
Washington, DC (January 2012 — January 2014)

- Managed all solar company research activities. Supervise temporary staff involved in data collection.
- Developed data visualization concepts and strategies. Created custom maps using GIS applications.
- Authored industry whitepapers, factsheets and other materials for web and print publication.

Research Assistant, Solar Energy Industries Association
Washington, DC (June 2011 — December 2011)

- Oversaw Excel database of over 6,000 companies and 20,000 data points. Formulated research methodology, created data gathering strategies and ensured consistency in analysis and evaluation.
- Designed and delivered survey and marketing materials to supplement data gathering activities.

Survey Researcher, University of Illinois at Chicago
Chicago, Illinois (March 2011 — May 2011)

Student Affairs Specialist, Wrocław University of Economics
Wrocław, Poland (September 2009 — June 2010)

EDUCATION

Master of Public Administration, in Managing State and Local Governments
The George Washington University, Washington, DC; May 2014

Bachelor of Arts, *cum laude*, in Philosophy, Politics and Economics
Juniata College, Huntingdon, PA; May 2008

TECHNICAL SKILLS

Computer: Proficiency in Microsoft Office Suite and Google applications including Fusion tables.
Administrator-level ability in Salesforce. Experience with ArcGIS and SPSS.
General: Data research, modeling and analysis. Professional writing for web and print. Basic survey design.