



414 Nicollet Mall
Minneapolis, MN 55401

January 30, 2018

—Via Electronic Filing—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, Minnesota 55101-2147

RE: RENEWABLE DEVELOPMENT FUND OVERSIGHT PROCESS
1ST, 3RD AND 4TH CYCLE QUARTERLY STATUS AND PROGRESS REPORT
DOCKET NOS. E002/M-00-1583, E002/M-07-675 AND E002/M-12-1278

Dear Mr. Wolf:

Enclosed for filing is our quarterly status report on the various energy production projects, research and development projects and higher education block grant programs that have received a grant award from Xcel Energy's Renewable Development Fund.

This progress report is being provided for informational purposes only. We do not request a comment period concerning this information. If a party wishes to comment on a specific project, we believe they should do so through a request to the Minnesota Public Utilities Commission.

We have electronically filed this document with the Commission, and copies have been provided to parties on the service lists noted above. Please contact me at allen.krug@xcelenergy.com or (612) 330-6270 if you have any questions regarding this filing.

Sincerely,

/s/

ALLEN D. KRUG
ASSOCIATE VICE PRESIDENT, STATE REGULATORY POLICY

Enclosure
c: Official Service List

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Nancy Lange	Chair
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
John Tuma	Commissioner
Katie Seiben	Commissioner

IN THE MATTER OF THE PETITION OF
NORTHERN STATES POWER COMPANY
FOR APPROVAL OF A RENEWABLE
DEVELOPMENT FUND OVERSIGHT
PROCESS

DOCKET NOS. E002/M-00-1583
E002/M-07-675
E002/M-12-1278

QUARTERLY STATUS REPORT

INTRODUCTION

Northern States Power Company, doing business as Xcel Energy, submits to the Minnesota Public Utilities Commission this fourth quarter 2017 status report¹ on 20 RDF projects regarding Renewable Development Fund (RDF) project activity for the first, third, and fourth funding cycles.²

¹ This status report reflects updated information on all active RDF projects from the previous quarterly report. It does not include projects that have been completed during a prior quarter. A final report for all completed projects has been posted to the RDF website at: www.xcelenergy.com/rdf.

² All project and administrative costs and activities associated with Docket No. E002/M-03-1883 has been satisfied, as such the second funding cycle is not included in this quarterly report. See the *Petition of Northern States Power Company for Approval of a Renewable Development Fund Oversight Process*, Docket Nos. E002/M-00-1583 et al., COMPLIANCE FILING – QUARTERLY STATUS REPORT (July 29, 2015).

FIRST FUNDING CYCLE – PROJECT STATUS AND PROGRESS

AH-01: Crown Hydro (*3.2 MW Hydroelectric Generation Facility*)

Start Date: April 3, 2002

Grant Amount: \$5,100,000

End Date: 400 days from Property Acquisition Date

Funds Invoiced: \$1,538,591

Project Summary: This Renewable Energy Production Project is located on the Mississippi River as it flows through the City of Minneapolis and is designed to provide 3.2 MW of renewable hydropower near the historic St. Anthony Falls Milling District.

Fourth Quarter Activity: In this quarter project activity has focused on the State Historic Preservation Office (SHPO) 106 Process. A website designer has been hired to assist in updating content and modify design of the Crown Hydro website. An immediate change was made to facilitate public comments through the website. A public Consulting Parties meeting was held on October 25, 2017 at Minneapolis Public Library concerning the proposed Areas of Potential Effect (APE) and narrative. A request for concurrence on the APE was sent to Minnesota SHPO. A 30 day comment period on the APE began October 30, 2017. Comments were received from Friends of the Lock & Dam, Minnesota SHPO, and Streamline Associates. On December 6, 2017, the Federal Energy Regulatory Commission (FERC) held a public teleconference to discuss the status of consultation under section 106 of the National Historic Preservation Act for the application to amend the license of the unconstructed Crown Mill Hydroelectric Project. Minnesota SHPO indicated the area for project construction is not clearly delineated. Crown Hydro agreed to make the APE larger. The Minnesota SHPO noted that the FERC project boundary has been expanded and is much larger than originally defined. FERC reminded that the project boundary is to only include lands necessary for project purposes. Two Tribes have asked for a tribal survey of the area. Crown Hydro is working with the Tribal SHPO to conduct these surveys. It is anticipated that a Working Group is to be established as suggested in the FERC public teleconference.

THIRD FUNDING CYCLE – PROJECT STATUS AND PROGRESS

RD3-77: Coaltec (*Gasification of Alternative Fuels to Convert Waste Material to Energy*)

Start Date: October 22, 2008

Grant Amount: \$1,000,000

End Date: July 22, 2012³

Funds Invoiced: \$850,000

Project Summary: This Research and Development Project is intended to use one or more locally available biomass products, such as turkey litter, to supply a solid-fuel, fixed-bed gasifier to prove the feasibility of Combined Heat and Power (CHP) technology using alternative fuels in a commercial setting to generate electricity.

Fourth Quarter Activity: In this quarter, Coaltec continues to try and procure a power unit to complete the remaining two milestones. The final milestones consist of the operation of a fully commercial gasification to heat and power system to collect one year of heat and power generation data for analysis.

³ A contract extension is pending to allow for the discovery and acquisition of satisfactory financing for the acquisition of a power generator. If such funding is obtained, RDF administration will review the financing terms and determine, with input from the advisory group, if certain administrative amendments to the grant contract are warranted to facilitate completion of the final project milestones.

Fourth Funding Cycle –Project Status and Progress

Renewable Energy Production Projects

EP4-11: Innovative Power Systems (*0.96727 MW_{DC} Solar Generation Project*)

Start Date: December 1, 2015

Grant Amount: \$1,850,000

End Date: December 22, 2017

Funds Invoiced: \$1,850,000

Project Summary: This project installed 967.27 kW_{DC} of roof-top, solar photovoltaic (PV) capacity on four commercial buildings within the Energy Innovation Corridor along the Green Line Light Rail line in Saint Paul to demonstrate a development process utilizing private investment as a strategy for prudent commercial solar growth.

Fourth Quarter Activity: Project activities during this quarter include the completion of the final report, submission of an invoice, and the final payment. A project presentation was given to the RDF advisory group on October 10, 2017. A 38.54kW_{DC} array was installed at 1000 University Avenue. Prior to executing the RDF contract, the original proposal was to install 120 kW but the structural engineer limited construction to only the newer portion due to uncertainty of the load capacity on the older structure. An 110.7kW_{DC} array was installed at 1919 University Avenue. To meet electrical code the entire switchgear was replaced which delayed the final interconnection and increased project costs. A 432.96kW_{DC} array was installed at 2550 University Avenue which was the largest and most challenging due to the roof was divided into 10 ‘drainage basins that created significant pitch changes. A 384.6kW_{DC} array was installed at 1000 Westgate Drive on a mixed-use commercial building that houses numerous bio-laboratories and clean rooms. The roof had numerous 4-6’ vent stacks that provided a design, engineering and installation challenge in order to minimize shading and a relatively light load-bearing roof capacity. All construction activities have been completed and the arrays are in service and producing power. The last facility was commissioned November 27, 2017. All power is delivered through a net-metering agreement with NSP.

All project activity has been satisfactorily completed as required by the RDF grant contract. A final payment has been made and the project file has been closed. A copy of the final report is posted on the RDF web page at www.xcelenergy.com/rdf.

EP4-15: Minnesota Renewable Energy Society (*1.0 MW_{DC} Solar Garden Pilot*)

Start Date: February 17, 2015

Grant Amount: \$2,661,320

End Date: May 17, 2017⁴

Funds Invoiced: \$0

Project Summary: The goal of this project is to install 1,000 kW_{DC} solar PV capacity and demonstrate the concept of collective Solar Garden ownership as a way to increase the penetration of solar renewable electric production in Minnesota.

Fourth Quarter Activity: During this quarter, the Department of Commerce provided comments on a proposed contract amendment. The contract amendment would allow third party ownership so that MRES could access to tax credit financing and use the CSG pricing tariff rather than a PPA pricing structure, thereby reducing the grant contract. The Company also requested feedback on whether MRES could use a portion of the unused grant monies to install a third garden for low-income subscribers in Minneapolis. In the Department's comments, it proposed an alternative that would allow third party ownership, but would keep energy pricing as originally proposed and the grant award would be reduced to \$514,352 due to reductions in the project budget. Reply comments will be submitted in January 2018.

EP4-20: Target Corporation (*350 kW_{AC} Target Midway Solar PV*)

Start Date: June 12, 2015

Grant Amount: \$583,513

End Date: December 11, 2017

Funds Invoiced: \$583,513

Project Summary: This project installed 418 kW_{AC} of roof-top solar PV capacity as part of a retail showcase development at the SuperTarget Midway store in St. Paul.

Fourth Quarter Activity: Project activities during this quarter include the completion of the final report, submission of an invoice, and the final payment. A project presentation was given to the RDF advisory group on August 8, 2016. The solar field is comprised of 1,638 Suniva MVX modules. The modules are polycrystalline units mounted on a fixed racking system oriented due south at a 30 degree tilt. The 30 degree tilt helps optimize system size on the roof and the tilt will help remove snow. The racking system is manufactured by Sunlink. Thirteen modules are wired together in a series string resulting in maximum open circuit voltage on the array of 580V_{DC}. Electricity from the series strings is fed to the DC circuit combiner,

⁴ Pending PUC approval of modifications to the RDF grant contract submitted on September 22, 2017.

which groups strings together in parallel and produces a single output circuit. All construction activities have been completed and the array is in service and producing power. The facility was commissioned April 28, 2016. To date the facility has produced 510 MWh of energy. All power is used on site and delivered through a net-metering agreement with NSP.

All project activity has been satisfactorily completed as required by the RDF grant contract. A final payment has been made and the project file has been closed. A copy of the final report is posted on the RDF web page at www.xcelenergy.com/rdf.

EP4-22: Minneapolis Park and Recreation Board (*200 kW_{DC} Solar Generation Facility*)

Start Date: October 28, 2014

Grant Amount: \$969,741

End Date: December 28, 2017

Funds Invoiced: \$0

Project Summary: This project intends to demonstrate the effectiveness of alternative solar designs, such as carports and canopies, when roof-mounted designs are not feasible. This is achieved through the installation of 200 kW_{DC} of solar PV capacity at five locations within the Minneapolis park system.

Fourth Quarter Activity: During the past quarter, the Minneapolis Park and Recreation Board (MPRB) presented their final report to the RDF advisory group and provided a tour of each array to RDF administration. Each of the arrays demonstrated an alternative technique and design for placement of solar at challenging sites that had installation barriers (i.e. structural, historical, security, etc.). All the arrays are producing power and used made-in-Minnesota panels, installers, and consulting firms. The Parade Ice Arena has the greatest electrical usage of any of the MPRB facilities and has the structural capacity to bear the weight of the array and is also has good visibility near the downtown core. The solar installation at Webber Park is located on the pump house for the natural swimming pool and the filtration pond. The site was selected since it met the criteria that the pump house was a new building with no shading and had a roof that was south facing. The park is used year around with swimming in the summer and ice-skating in the winter. The solar installation at Rev. Dr. Martin Luther King Junior Park is located on the roof of the park's multipurpose room. The site was selected since it was a south facing roof but shading restricted installation to the upper part of the roof. The solar installation at Lake Nokomis Beach is a shade structure. Although the beach is seasonal, the array is adjacent to the walk/jog/run/bike path which is used year around. The solar installation at East Phillips Park is located on the south facing wall of the gymnasium, on the Community Center. The site was selected since the facility is used year around with diverse and

numerous levels of program activities from ranging from community recreation and cultural events to support the great ethnic diversity of the neighborhood.

EP4-24: Bergey Windpower (*500 kW_{AC} Wind Generation Facility*)

Start Date: November 24, 2014

Grant Amount: \$1,106,600

End Date: November 24, 2017⁵

Funds Invoiced: \$0

Project Summary: This project intends to increase the market penetration of small wind turbines within Minnesota. The project achieves that goal by installing fifty 10 kW_{AC} wind turbines in Stearns, Benton, Meeker, Lincoln, Murray, Nobles and Pipestone Counties.

Fourth Quarter Activity: Bergey's request to RDF Administration to use a new Bergey Excel 15 turbine, which is rated at 15 kW capacity and has a higher energy output rather than the Bergey Excel 10 which is rated at 10 kW capacity remains under consideration. During the past quarter the first 10 kW turbine installation in Ruthton has continued to operate at 100% availability since commissioning and produced 8,287 kWh during the fourth quarter. Marketing has been renewed to identify Xcel Energy customers to be project participants.

EP4-29: Dragonfly Solar (*997.5 kW_{DC} Solar Generation Facility*)

Start Date: September 8, 2016

Grant Amount: \$1,650,000

End Date: May 8, 2018

Funds Invoiced: \$0

Project Summary: This project intends to improve the infrastructure efficiencies and power production of an existing set of wind farm by installing up to 997.5 kW_{DC} solar capacity at a wind farm south of Dodge Center, Minnesota. By adding solar to the wind facility the net effect is an increase in production which is closer in the aggregate to firm capability.

Fourth Quarter Activity: During the past quarter, the Power Purchase Agreement (PPA) was approved by the PUC. In addition, a land lease was signed, a field survey of the property was completed, and an application for a Conditional Use Permit

⁵ On August 29, 2017 Bergey requested a two year contract extension and the ability to use a 15kW wind turbine rather than a 10 kW wind turbine as reported in the prior quarterly report. A contract extension is pending the review and analysis of the proposed amendment.

(CUP) was submitted to Dodge County for a setback variance. In discussions with the landowner to the east, it was determined that it would be easier to operate farm machinery in this field if a setback to the west was minimized. The Dodge County Board of Adjustments will take up the setback request early in the first quarter of 2018. A purchase order has been issued for Heliene 72P-325-SW PV modules to lock in pricing and delivery date. Dragonfly is getting quotes on pier installation before a selection decision on final racking is made. Because of the cold weather, there is a concern about the cost of driving the piers through frost and consequentially an alternate bid for a surface ballasted racking system has been made. Construction is anticipated to begin in early February 2018.

EP4-34: City of Saint Paul (*Lowertown Ballpark 103.5 kW_{DC} Solar Generation Facility*)

Start Date: February 9, 2015

Grant Amount: \$555,750

End Date: December 22, 2017

Funds Invoiced: \$555,750

Project Summary: This project installed 103.5 kW_{DC} of ground-mounted solar PV capacity at the new Lowertown Ballpark (CHS Stadium) in downtown Saint Paul.

Fourth Quarter Activity: Project activities during this quarter include the completion of the final report, submission of an invoice, and the final payment. A project presentation was given to the RDF advisory group on July 11, 2017. The facility consists of two arrays: a 58.3 kW_{DC} PV shade pavilion over a spectator terrace and a 44.16 kW_{DC} array at the northeast corner of the ballpark. This highly visible project is part of a larger sustainability initiative of the Saints and the City of Saint Paul and complies with the City of Saint Paul Sustainable Building Policy. Estimates indicate that approximately twelve percent of the ballpark's energy will be produced by the solar arrays. With a prominent presence at CHS Field and through interactive kiosks in the stadium concourse, the arrays have significant positive exposure to park visitors which has more than 400,000 spectators per year. Because one array is built as a pavilion amenity which provides shade and shelter for people to gather beneath, each visitor is given an opportunity to interact with the solar arrays directly. This helps establish a unique understanding of the project. It was important that the arrays were visually accessible to guests and a part of the experience of going to the ballpark. All construction activities have been completed and the array is in service and producing power. The facility was commissioned May 18, 2016 and produced 118,569 kWh of power during the first year. All power is used on site and delivered through a net-metering agreement with NSP.

All project activity has been satisfactorily completed as required by the RDF grant contract. A final payment has been made and the project file has been closed. A copy of the final report is posted on the RDF web page at www.xcelenergy.com/rdf.

Research and Development Projects

RD4-1: University of Minnesota (*Development of a Novel Gasification Technology for Distributed Power Generation from Solid Wastes*)

Start Date: January 4, 2017

Grant Amount: \$999,999

End Date: January 4, 2020

Funds Invoiced: \$139,221

Project Summary: The goal of this project is to develop a fast gasification-based electricity generation technology that based on microwave heating to raise the process temperature and increase heating rate enables distributed generation of electricity from biomass and other solid waste at the site of biomass generation.

Fourth Quarter Activity: During the past quarter, research focused on biomass conversion in the presence of microwave absorbent SiC and catalysts. The use of catalysts is intended to alter the gas composition and convert tar for a cleaner gas product. The University conducted gasification experiments using a system in which the microwave chamber was filled with SiC balls as the reaction bed. During the gasification process, the SiC bed was stirred continuously with an auger for even heating and char discharge. The gasification experiments yielded data for analysis. The temperature was monitored, fractional yields were determined, and the composition of the gas and bio-oil characterized. It was found that methane was the dominant gas at the lower temperature range of 450°C- 500 °C. The maximum heating value was obtained at 500 °C.

RD4-2: University of Minnesota (*Optimizing Renewable Electric Energy Generation on Minnesota Dairy Farms*)

Start Date: June 2, 2015

Grant Amount: \$982,408

End Date: June 2, 2018

Funds Invoiced: \$407,279

Project Summary: The goal of this project is to develop a renewable electric generation model that improves the long-term profitability of Minnesota dairy farms and reduces their carbon footprint by establishing a model net-zero energy dairy parlor. An integrated on-site generation system consisting of approximately 20 kW_{DC} of wind and 54 kW_{DC} of solar PV capacity will be designed, installed, and performance-tested as part of this project.

Fourth Quarter Activity: During the past quarter, with the completion of construction and installation of the dairy thermal energy SCADA system and the

renewable electric generation systems (54 kW solar PV, 20 kW wind), activities have shifted to data collection, analysis, and presentation. A regional, public meeting was held at the WCROC facility in Morris, MN called the Midwest Farm Energy Conference which included many presentations related to swine and dairy energy systems including one about this project. About 75 people attended the conference. A literature review was conducted assessing best management practices for integrating renewable energy generation on dairy farms. Many farms have installed renewable energy systems, but nothing analogous to the system level energy re-design incorporated into the WCROC dairy parlor was found. A preliminary life cycle assessment model has been developed for the WCROC milking parlor. An LCA model is a tool that tracks inputs and outputs of the dairy system to look at how a change in inputs or processes will change the outputs and the downstream environmental impacts of the system. Fossil energy and greenhouse gas differences between the baseline dairy system and the energy enhanced system are being analyzed using renewable electricity production from the installed solar and wind energy systems.

RD4-7: InterPhases Solar (*New CIS Solar Cells with All-Solution-Based Roll-to-Roll Processing*)

Start Date: January 12, 2017
End Date: January 12, 2020

Grant Amount: \$1,000,000
Funds Invoiced: \$131,023

Project Summary: The goal of this project is to advance copper indium selenide thin-film (CIS) technology towards commercial production by combining the deposit of all the device components into a roll-to-roll (R2R) single step electrodeposition (SSE) process for CIS solar cell manufacturing.

Fourth Quarter Activity: During the past quarter, InterPhases has been developing and advancing a new rapid thermal annealing system for continuous R2R processing. New parts have been procured, and equipment has been adapted to work on the R2R system. For example, the controller system has been modified with two-stage digital programmable timers and is being integrated into the annealing R2R module. Characterization of the CISE film continues to investigate the many unusual properties, resulting from InterPhases' unique deposition process. A number of new instruments and techniques have recently emerged for characterization of nanomaterial properties. Since these instruments are beyond the project budget to be conducted in-house, InterPhases has been collaborating with a number of companies to gain access to high-resolution nano-techniques. Techniques such as an atomic force microscopy, capacitance microscopy, kelvin probe force microscopy, and scanning spreading resistance microscopy are providing invaluable information on the unique optoelectronic properties of the CISE films. The results from advanced

nanomaterial characterization are helping to redesign the device structures for better performance and easier processing. Current research focused on new photoluminescence imaging methods, which avoid the need for electrical contacts and can be applied after the absorber deposition, without the need for complete device fabrication.

RD4-8: City of Red Wing (City of Red Wing Refuse Derived Fuel Production Facility)

Start Date: February 6, 2017

Grant Amount: \$1,999,500

End Date: February 6, 2021

Funds Invoiced: \$0

Project Summary: The goal of this project is to demonstrate the production of a cleaner refuse derived biomass fuel by improving the recovery of more recyclables, the removal of fuel contaminants and achieve a reduction in fuel hauling costs.

Fourth Quarter Activity: During the past quarter Red Wing obtained bids for work to replace damage created by the June 7, 2017 fire within the Incinerator Building. Fire damage will require demolition of the incinerator building, replace and insulate the roof of the Material Recovery Facility (MRF) and construct a shop building. On December 11, 2017, the City Council approved a contract with Fitzgerald Construction to demolish the Incinerator Building with work anticipated to begin in first quarter 2018. Also on December 11, 2017 the Council awarded a contract for the replacement of the MFR roof and insulation with work also anticipated to begin in first quarter 2018. Cleaning of the MRF building is being contracted with a separate entity. The former Incinerator Building also housed a shop. A pre-engineered steel building will be erected. Challenges in preparing the site have been extensive as the ground was once a marsh and used to deposit waste materials in the past. Materials have been ordered, an excavation contracts approved and final design pieces are being prepared. The new shop will also serve in the short-term as the replacement to the Incinerator Building which will not be complete until the end of 2018. The City Council approved a professional service agreement with RRT Design and Construction for the design and construction oversight of replacing Incinerator. The City additionally approved a proposal from RRT to evaluate the current condition of all of the MRF equipment since the fire and oversee its restoration to pre-fire condition.

RD4-11: University of Minnesota (*Demonstrating Potential for Distributed Power Generation Using Converted Biomass*)

Start Date: September 3, 2015

Grant Amount: \$1,899,449

End Date: October 3, 2018

Funds Invoiced: \$17,482

Project Summary: The goal of this project is to reduce greenhouse gas emissions by using torrefaction to produce a biofuel that can be used for cost-effective distributed power generation.

Fourth Quarter Activity: During the past quarter the boiler and structure design was completed. The engineering review of boiler design work is underway, as is the production of boiler drawings. Focus has shifted towards the design of the steam engine and steam expander. Significant attention is being paid towards sizing of key valve gear components and relationships between the cylinders and the crankshaft. These inputs will shape overall final massing and the dimensioning of key components to accommodate internal pressure and forces. A purchase order for the live bottom feeder and feed bucket elevator was issued. Quotes are in for all manual and automated valves and quotes for instrumentation are about 75% complete. Orders are being placed as needed. Fabrication on system components is underway and some parts have been completed. The detailed design for the moving bed torrefaction system has been completed and reviewed. In addition, a process hazards analysis of the new unit has been prepared, reviewed, and approved for the new equipment. Site preparations have been reviewed with the staff at NRRRI's Coleraine facility and specific work is underway to accommodate the installation of the new equipment once manufactured. Site assembly will then commence at the Coleraine site.

RD4-12: University of Minnesota (*Wind Turbine Generated Sound*)

Start Date: June 2, 2015

Grant Amount: \$625,102

End Date: September 2, 2018

Funds Invoiced: \$312,351

Project Summary: The goal of this project is to provide technically defensible data on noise from wind turbines and usable information on how humans perceive and respond to wind turbine sound.

Fourth Quarter Activity: During the past quarter the wind farm analysis was completed and the milestone reports are being prepared for submission in the next quarter. Results from the field campaign are being used in the human response testing. A kick-off meeting on the algorithm development and implementation for forced air flow separation was held. Details on the variables used and how a new turbine control will be implemented are being developed. Results from the first series of human response were reviewed and the first 50 subjects did not indicate any adverse effects to infrasound or amplitude modulation from quasi-raw acoustic recordings in the field. Some characteristics of the recorded infrasound and amplitude modulation stimulus were enhanced to exaggerate the peak of the infrasound and the

modulation depth of the amplitude modulation. Therefore, a new infrasound stimulus for human response tests was created and underwent pilot testing with twelve individuals. No adverse effects were reported. The human response testing group presented their work at the Acoustical Society of America Conference. Analysis of the human response studies has begun. The team is developing methods for analyzing the data and continues to discuss variations for assessing the data. Development of guidelines on noise monitoring has also begun. Specifically the team has identified specifications of a new noise monitoring system that is similar to what noise regulators use and developed a method for characterizing amplitude modulation with the system.

RD4-13: University of Minnesota (*Virtual Wind Simulator with Advanced Control and Aeroelastic Model for Improving the Operation of Wind Farms*)

Start Date: June 2, 2015

Grant Amount: \$1,391,684

End Date: June 2, 2020

Funds Invoiced: \$500,140

Project Summary: The goal of this project is to develop, demonstrate, and transfer into practice a numerical wind simulation model for optimization of performance, financial decision making, and operational planning for existing and new wind energy plants. The predictive capabilities of the Virtual Wind Simulator (VWS) developed and validated from Cycle Three research will be augmented by adding an aeroelastic model and integrating advanced turbine control algorithms.

Fourth Quarter Activity: During the past quarter field testing of the load reduction performance of the Individual Blade Control (IBC) at the Eolos wind turbine continued and data collection at the Pleasant Valley wind farm and the simulation of Vantage wind farm in the state of Washington were completed. SoDAR measurements at Eolos established a baseline for incoming wind and turbine wake when the turbine operates with its standard pitch control algorithm. Data from the wind turbine controller was also collected to validate IPC calculations and that the algorithm is robust enough to handle short communication losses as well as occasional bad data from strain sensors in the wind turbine blades. Once all the control algorithms have been vetted and all foreseeable scenarios have been tested in simulation, testing of the algorithm on the turbine will commence. A very large set of simulation data were collected for different wind farms including the Pleasant Valley wind farm, Horns Rev wind farm and Vantage wind farm. The large size of the data (more than 20 TB for each wind farm) and the complexity of the wind fields pose a great challenge for data analysis. The current effort in code development is to find ways to process the data for better analysis and the ability to transfer between different computing facilities.

RD4-14: Barr Engineering (*Development of Health Assessment Tool for Utility-Scale Wind Turbine Towers and Foundations*)

Start Date: November 16, 2016

Grant Amount: \$161,081

End Date: November 16, 2018

Funds Invoiced: \$66,300

Project Summary: The goal of this project is to develop portable sensors to assess the health and life expectancy of wind turbine towers and foundations.

Fourth Quarter Activity: During the past quarter the evaluation of the data processing methodology was completed with the exception of an analysis of the time period that measurements are collected. This measurement assessment will require a full analysis of a database that began in 2011 from the Eolos wind turbine which will necessitate a very significant amount of processing time. Determining the minimum amount of analysis time required for an accurate assessment of structural health and remaining useful life will significantly optimize the system by limiting the number of measurements required and the length of time the system needs to be deployed. The research team investigated combinations of sample rates and strain sensor quantities to optimize (minimize) the amount of data needed to accurately assess the health of a wind turbine foundation and estimate its remaining useful life. The Eolos sensor system is comprised of 20 strain gauges and ten thermocouples. The research team started with the assessment of all 20 strain gauges at 20Hz and repeated the calculation of damage equivalent load and foundation rotational stiffness multiple times with different subsets of sensors and sampling rate. The results show the calculations of foundation rotational stiffness and damage equivalent load (DEL) are sufficiently estimated when using a 10 Hz sampling rate and three strain gauges. This sample rate and number of strain gauges provides estimations of DEL and stiffness that are very similar to the estimations provided by the full Eolos system of 20 strain gauges measuring at a rate of 20Hz.

Higher Education Block Grant Programs

HE4-1: Minnesota State Higher Education Block Grant

Start Date: April 11, 2016

Grant Amount: \$5,500,000

End Date: April 11, 2019

Funds Invoiced: \$2,400,000

Program Summary: Minnesota State (aka Minnesota State Colleges and Universities) has formed a program administered by the Minnesota Energy Center (MnEC), to stimulate research and development into renewable electric energy technologies. MnEC will disburse funding for multiple projects within the MnSCU system. The primary focus is development of programming to prepare technicians for the energy production industry including biomass, solar, and wind.

Fourth Quarter Activity: During the prior quarter research activity has been progressing for all nine projects.

- Research at Riverland College in Albert Lea who are developing a universal and scalable smart grid power converter have completed electrical transfer function modelling using a resistive inductive model to develop a robust control design. The research group continues work on development of a Low Energy Bluetooth interface feature. Integration with a touch screen interface is in process. A grid simulator has been delivered and will be constructed in the next quarter.
- Researchers on vertical axis wind turbine (VAWT) performance at Minnesota State Mankato (MSM) are working through security issues for access to the Minnesota Supercomputing Institute for modeling tests. The flow model being developed can combine multiple geometric configurations and simulated VAWTs. Other campus based equipment is being tested for accuracy and needed calibration for application.
- An anaerobic digestion system has arrived at St. Cloud State University (SCSU) to move forward with microbial power and bioproduct production from food waste research. Installation and system start-up are expected during first quarter 2018 and experiments are expected to begin in the second quarter of 2018. A ribbon cutting is expected to coincide with Earth Day activities at SCSU.
- The first series of pilot experiments to fine-tune an anaerobic digester microbiome to maximize biogas production at SCSU has been completed. A second replication is in progress. The metagenomics pipeline for data analysis has been set up, tested with two data sets, and is now ready for the results from the first pilot.
- The PV panel solar soiling project at Century College in White Bear Lake has completed installation of power production monitor system. An irradiance meter has been installed. Sensor wires have been installed to monitor surface temperature, voltage, and current. Main control cabinet equipment is near completion. System is generating electricity and monitoring of varied outputs

continues. Data collection has begun and modifications have been implemented. The weather station and dust particulate collection data has presented several challenges with data management.

- Research on axial flux systems at MSM has begun modeling of generator fields to develop the simulation model. Additionally, this project is developing a wind gust modeling for use in development of a new VSG model.
- Microwave plasma generation researchers at MSM have been working through space issues to install and operate equipment. The microwave plasma system has been ordered and is expected to arrive next quarter. The project has also received a donated biomass gasifier from the U of M.
- Researchers at MSM who are developing a microgrid model with Wide Bandgap Multiport Converter have built the basic modules for power converter design testing. Model and simulation platforms development are about 80% completion. New wide bandgap device development is at 50% development and component construction has begun.
- The Riverland Community College Plug and Play generation project in Austin is well into the research of current installed costs for varied designs. Analysis is focused on methods to control installation costs and evaluation of alternate materials for installations.

HE4-2: University of St. Thomas Higher Education Block Grant

Start Date: August 12, 2015

Grant Amount: \$2,157,215

End Date: August 12, 2018

Funds Invoiced: \$1,438,143

Program Summary: The University of St. Thomas (UST) will install a sustainable, 0.25 MW peak, multi-purpose microgrid at their Saint Paul Campus and establish an Engineering Senior Design Clinic to provide a platform for power systems engineering education for undergraduate and graduate students in the School of Engineering. UST will establish a K-12 educational curriculum developed in conjunction with Minnesota State Academic Standards for renewable energy, which will integrate live remote access to the facility across Minnesota.

Fourth Quarter Activity: In the past quarter planning with the general contractor, Ryan Construction and Hallberg Engineering, continues to progress into the Request for Information (RFI), Request for Proposal (RFP), and Request for Quote (RFQ) stages for the microgrid hardware and equipment. The hardware and equipment needed is comprised of: the microgrid relaying-and-protection system, the diesel gensets, the battery storage node, the solar PV array, the load bank, the substation, and the control-system/communications system. The relaying-and-protection hardware was received on schedule in December. The RFP process for the diesel gensets and battery storage node was also completed in December. Cummins, a

Minnesota company, was selected as the diesel genset vendor and the units have been ordered. Enersys was selected for the battery storage node and the storage node was ordered. Responses to the RFPs/RFQs for the solar PV array and the load bank were received and are being evaluated. Preliminary details of the substation have been specified by Xcel Energy Distribution. A state-of-art distributed intelligence control system is being developed through a 3-way arrangement between Xcel Energy, Amzur Technologies, and the University of St Thomas. Amzur Technologies is an Information Technology solutions and support firm and a leading developer of smart-grid control software. Responses to the RFP/RFQ for the general electrical sub-contractor have been received and are being evaluated.

HE4-3: University of Minnesota Higher Education Block Grant

Start Date: August 20, 2015

Grant Amount: \$3,000,000

End Date: August 20, 2018

Funds Invoiced: \$3,000,000

Program Summary: The University of Minnesota has formed the Renewable Electricity for Minnesota's Future, a \$3 million block grant for funding research in renewable electric energy. The grant will be managed by the Institute on the Environment (IonE) and used to support research in renewable electric energy generation and management by University of Minnesota scientists and engineers.

Fourth Quarter Activity: In the past quarter the Renewable Electricity for Minnesota's Future project made significant progress. The *Controlling Wind Plant Power* group conducted more field deployments to characterize the atmospheric flows at unprecedented spatial and temporal resolution. They also identified the spatio-temporal signature of turbine wakes from both measurement data and computer simulation results, and applied the analysis to wind turbine control. A graduate student from the *Pyrite Iron Disulfide: Low-cost Solution for Renewable Electricity* project presented his work on missing sulfur atoms as the origin of doping in this material at a major international conference. Two graduate students from this group also independently competed for and won second prize in the Dow Sustainability Challenge in December—an achievement entirely based on their progress with pyrite as a solar cell material, as funded by the RDF. The *Grid Interface for Renewables, Storage and Green Micro-grids* group added inertial control and synthetic damping functions to the proposed Microsoft Management Console (MMC)-based interface. This scheme will allow the MMC-interfaced renewable sources to closely emulate conventional (synchronous machine based) power plants and help with grid stability. The Net-load aggregation algorithm has been tested and validated with a network of distributed computational units (Raspberry Pi Model 3) in real time to meet an aggregated demand service request. A Network-reconstruction algorithm was developed and tested in simulation to recover network topology. The *Direct Conversion of Heat*

to Electricity group developed a metal electrode for an all-epitaxial device structure and through demonstration tests the proof of concept of heat to electricity conversion was demonstrated. A predictive model of ferroelectric energy conversion that serves as the basis to design energy conversion devices with optimal ferroelectric performance was developed. Finally, a provisional patent application was approved for this team.

Other Cycle 4 Activity

During the fourth quarter of 2017, activities have progressed related to development of the remaining Cycle Four grant contracts. 25 Cycle Four grant contracts have been executed. As of the end of the fourth quarter of 2017, one Energy Production contract is pending approval by the PUC, eight Energy Production projects have been completed and one Energy Production project was terminated. The remaining executed Cycle 4 contracts include 12 Energy Production and Research and Development project contracts and three Higher Education Block Grant program contracts currently active, as described above.

As reported previously, the Company continues to collect requested due diligence materials, develop contract exhibits to be attached to the remaining RDF grant contracts, and work with the three remaining grantees to move their projects forward. Drafts of contract exhibits have been prepared and provided to all three grant recipients for review and modification. Xcel Energy continues to keep the RDF advisory group updated on the progress of these projects.

CONCLUSION

Xcel Energy appreciates this opportunity to provide this report summarizing the projects funded by the RDF during the fourth quarter of 2017.

January 30, 2018
Northern States Power Company

CERTIFICATE OF SERVICE

I, Carl Cronin, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

**DOCKET NOS. E002/M-00-1583
E002/M-07-675
E002/M-12-1278 (OFFICIAL SERVICE LIST)**

Dated this 30th Day of January, 2018

/s/

Carl Cronin
Regulatory Administrator

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Steven J.	Almos	salmos.wn@bsm.com	Bay State Milling Company	55 Franklin Street Winona, MN 55987	Electronic Service	No	OFF_SL_0-1583_1
Janet	Anderson	jainstp@q.com	-	1799 Sargent St. Paul, MN 55105	Electronic Service	No	OFF_SL_0-1583_1
Karen	Anderson		American Sustainable Energy Council	80 South 8th Street, #900 Minneapolis, MN 55402	Paper Service	No	OFF_SL_0-1583_1
John	Bailey	bailey@ilsr.org	Institute For Local Self-Reliance	1313 5th St SE Ste 303 Minneapolis, MN 55414	Electronic Service	No	OFF_SL_0-1583_1
Edna C	Brazaitis	ednab@mac.com	Friends of the Riverfront	PO Box 580545 Minneapolis, Minnesota 55458-0545	Electronic Service	No	OFF_SL_0-1583_1
Michael J.	Bull	mbull@mncee.org	Center for Energy and Environment	212 Third Ave N Ste 560 Minneapolis, MN 55401	Electronic Service	No	OFF_SL_0-1583_1
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_0-1583_1
George	Crocker	gwillc@nawo.org	North American Water Office	PO Box 174 Lake Elmo, MN 55042	Electronic Service	No	OFF_SL_0-1583_1
Carl	Cronin	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_0-1583_1
Lisa	Daniels	lisadaniels@windustry.org	Windustry	201 Ridgewood Ave Minneapolis, MN 55403	Electronic Service	No	OFF_SL_0-1583_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Executive	Director	N/A	Onanegozie RC&D	42290 Ginger Ave. Harris, MN 55032-3361	Paper Service	No	OFF_SL_0-1583_1
Ian	Dobson	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012130	Electronic Service	Yes	OFF_SL_0-1583_1
John R.	Dunlop, P.E.	JDunlop@RESMinn.com	Renewable Energy Services	Suite 300 448 Morgan Ave. S. Minneapolis, MN 554052030	Electronic Service	No	OFF_SL_0-1583_1
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	Yes	OFF_SL_0-1583_1
Doug	Fredrickson			400 County Road 50 Avon, MN 56310	Paper Service	No	OFF_SL_0-1583_1
Gary	Gillet		University Of Minnesota	Suite 450 200 Oak Street SE Minneapolis, MN 554552070	Paper Service	No	OFF_SL_0-1583_1
Andy	Herring		Colorado School Of Mines	1500 Illinois Street Golden, CO 80401	Paper Service	No	OFF_SL_0-1583_1
KDV c/o Mary	Hoffman	mhoffman@kdv.com	Crown Hydro LLC	3800 American Blvd W Suite 1000 Bloomington, MN 55431-4420	Electronic Service	No	OFF_SL_0-1583_1
Jerry	Horgan		Pipestone-Jasper Public Sch Dist #2689	1401 Seventh Street SW Pipestone, MN 561641877	Paper Service	No	OFF_SL_0-1583_1
Cindy	Jepsen	ccjepsen@capitolresource.mn.com	Capitol Resources	Box 254 Marine On St. Croix, MN 55047	Electronic Service	No	OFF_SL_0-1583_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
John	Johnson		Stewart Energy Products	22739 Highway 212 E. P.O. Box 219 Stewart, MN 55385	Paper Service	No	OFF_SL_0-1583_1
Michael	Krikava	mkrikava@briggs.com	Briggs And Morgan, P.A.	2200 IDS Center 80 S 8th St Minneapolis, MN 55402	Electronic Service	No	OFF_SL_0-1583_1
Sheryl	Landis		Energy & Environmental Research Center	PO Box 9018 15 North 23RD Street Grand Forks, ND 582029018	Paper Service	No	OFF_SL_0-1583_1
Michael	Loeffler	mike.loeffler@nngco.com	Northern Natural Gas Co.	CORP HQ, 714 1111 So. 103rd Street Omaha, NE 681241000	Electronic Service	No	OFF_SL_0-1583_1
Pam	Marshall	pam@energycents.org	Energy CENTS Coalition	823 7th St E St. Paul, MN 55106	Electronic Service	No	OFF_SL_0-1583_1
Richard	Mattocks		Environomics	2517 Rte. 44, 11-221 Salt Point, NY 12578	Paper Service	No	OFF_SL_0-1583_1
Clark	McDonald			504 - 20Th Street North Benson, MN 56215	Paper Service	No	OFF_SL_0-1583_1
David	Planting		Archer Daniels Midland	400 West Erie Rd. Marshall, MN 56258	Paper Service	No	OFF_SL_0-1583_1
Kellye	Rose	kellye@roseconserve.com	Rose Consulting Service, Inc.	10915 Pioneer Drive Burnsville, MN 55337	Electronic Service	No	OFF_SL_0-1583_1
Richard	Savelkoul	rsavelkoul@martinsquires.com	Martin & Squires, P.A.	332 Minnesota Street Ste W2750 St. Paul, MN 55101	Electronic Service	No	OFF_SL_0-1583_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Dean	Sedgwick	N/A	Itasca Power Company	PO Box 457 Bigfork, MN 56628-0457	Paper Service	No	OFF_SL_0-1583_1
Scott	Vreeland		Seward Neighborhood Group	2437 - 33Rd Avenue South Minneapolis, MN 55406	Paper Service	No	OFF_SL_0-1583_1
Heather	Westra		Prairie Island Indian Community	5636 Sturgeon Lake Road Welch, MN 55089	Paper Service	No	OFF_SL_0-1583_1
Paul	White	paul.white@prcwind.com	Project Resources Corp./Tamarac Line LLC/Ridgewind	618 2nd Ave SE Minneapolis, MN 55414	Electronic Service	No	OFF_SL_0-1583_1
Robyn	Woeste	robynwoeste@alliantenergy.com	Interstate Power and Light Company	200 First St SE Cedar Rapids, IA 52401	Electronic Service	No	OFF_SL_0-1583_1
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_0-1583_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Steven J.	Almos	salmos.wn@bsm.com	Bay State Milling Company	55 Franklin Street Winona, MN 55987	Electronic Service	No	OFF_SL_7-675_1
Christopher	Anderson	canderson@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022191	Electronic Service	No	OFF_SL_7-675_1
Karen	Anderson		American Sustainable Energy Council	80 South 8th Street, #900 Minneapolis, MN 55402	Paper Service	No	OFF_SL_7-675_1
James J.	Bertrand	james.bertrand@stinson.com	Stinson Leonard Street LLP	50 S 6th St Ste 2600 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_7-675_1
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_7-675_1
Carl	Cronin	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_7-675_1
Ian	Dobson	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012130	Electronic Service	Yes	OFF_SL_7-675_1
John R.	Dunlop, P.E.	JDunlop@RESMinn.com	Renewable Energy Services	Suite 300 448 Morgan Ave. S. Minneapolis, MN 554052030	Electronic Service	No	OFF_SL_7-675_1
Larry	Espel	lespel@greeneespel.com	Greene Espel, P.L.L.P.	222 S 9th St Ste 2200 Minneapolis, MN 55402-3362	Electronic Service	No	OFF_SL_7-675_1
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	Yes	OFF_SL_7-675_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Gary	Gillet		University Of Minnesota	Suite 450 200 Oak Street SE Minneapolis, MN 554552070	Paper Service	No	OFF_SL_7-675_1
Cindy	Jepsen	ccjepsen@capitolresource mn.com	Capitol Resources	Box 254 Marine On St. Croix, MN 55047	Electronic Service	No	OFF_SL_7-675_1
John	Johnson		Stewart Energy Products	22739 Highway 212 E. P.O. Box 219 Stewart, MN 55385	Paper Service	No	OFF_SL_7-675_1
Timothy M.	Kelley	timothy.kelley@stinson.co m	Stinson Leonard Street LLP	50 S 6th St Ste 2600 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_7-675_1
Paul	Kramer		Rahr Malting Co.	800 1st Ave. W. Shakopee, MN 55379	Paper Service	No	OFF_SL_7-675_1
Sheryl	Landis		Energy & Environmental Research Center	PO Box 9018 15 North 23RD Street Grand Forks, ND 582029018	Paper Service	No	OFF_SL_7-675_1
Renee	Landwehr	N/A	Clean Power Markets, Inc.	303 Monroe St Little Chute, WI 54140-1722	Paper Service	No	OFF_SL_7-675_1
Patrick	Mulloy		Mulloy Environmental Services, Inc.	3636 Garfield Ave. S. Minneapolis, MN 55409	Paper Service	No	OFF_SL_7-675_1
Rolf	Nordstrom	rnordstrom@gpisd.net	Great Plains Institute	2801 21ST AVE S STE 220 Minneapolis, MN 55407-1229	Electronic Service	No	OFF_SL_7-675_1
Kellye	Rose	kellye@roseconserve.com	Rose Consulting Service, Inc.	10915 Pioneer Drive Burnsville, MN 55337	Electronic Service	No	OFF_SL_7-675_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Richard	Savelkoul	rsavelkoul@martinsquires.com	Martin & Squires, P.A.	332 Minnesota Street Ste W2750 St. Paul, MN 55101	Electronic Service	No	OFF_SL_7-675_1
Keith A.	Schimel	cengr@bci.net	Technology Matrix Corporation	P.O. Box 11236 Syracuse, NY 13218	Paper Service	No	OFF_SL_7-675_1
Dean	Sedgwick	N/A	Itasca Power Company	PO Box 457 Bigfork, MN 56628-0457	Paper Service	No	OFF_SL_7-675_1
Zeviel	Simpser	zsimpser@briggs.com	Briggs and Morgan PA	2200 IDS Center80 South Eighth Street Minneapolis, MN 554022157	Electronic Service	No	OFF_SL_7-675_1
Byron E.	Starns	byron.starns@stinson.com	Stinson Leonard Street LLP	50 S 6th St Ste 2600 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_7-675_1
Heather	Westra		Prairie Island Indian Community	5636 Sturgeon Lake Road Welch, MN 55089	Paper Service	No	OFF_SL_7-675_1
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_7-675_1

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Mara	Ascheman	mara.k.ascheman@xcelenergy.com	Xcel Energy	414 Nicollet Mall Fl 5 Minneapolis, MN 55401	Electronic Service	No	OFF_SL_12-1278_Official
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_12-1278_Official
Carl	Cronin	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_12-1278_Official
Ian	Dobson	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012130	Electronic Service	Yes	OFF_SL_12-1278_Official
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	No	OFF_SL_12-1278_Official
James	Gibson	james.gibson@farmamerica.org	Farmamerica	7367 360th Avenue Waseca, MN 56093	Electronic Service	No	OFF_SL_12-1278_Official
Cheryal Lee	Hills	chills@regionfive.org	Region Five Development Commission	200 First Street NE Suite 2 Staples, MN 56479	Electronic Service	No	OFF_SL_12-1278_Official
Thomas	Melone	Thomas.Melone@AllcoUS.com	Minnesota Go Solar LLC	222 South 9th Street Suite 1600 Minneapolis, Minnesota 55120	Electronic Service	No	OFF_SL_12-1278_Official
Shalini	Menezes	smenezes@interphases.com	InterPhases Solar	668 Flinn Avenue Moorpark, CA 93021	Electronic Service	No	OFF_SL_12-1278_Official
Robert	Messerich	b.messerich@gmail.com	Dragonfly Solar, LLC	10583 202nd St West Lakeville, MN 55044	Electronic Service	No	OFF_SL_12-1278_Official

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Brian	Millberg	brian.millberg@minneapolismn.gov	City of Minneapolis	661 5th Avenue North Minneapolis, Minnesota 55405	Electronic Service	No	OFF_SL_12-1278_Official
Alan	Muller	alan@greendel.org	Energy & Environmental Consulting	1110 West Avenue Red Wing, MN 55066	Electronic Service	No	OFF_SL_12-1278_Official
David	Shaffer	shaff081@gmail.com	Minnesota Solar Energy Industries Project	1005 Fairmount Ave Saint Paul, MN 55105	Electronic Service	No	OFF_SL_12-1278_Official
Pamela A.	Webb	N/A	University of Minnesota	450 McNamara Alumni Center 200 Oak St SE Minneapolis, MN 55455-2070	Paper Service	No	OFF_SL_12-1278_Official
Dr. Don	Weinkauf	N/A	University of St. Thomas	Mail OSS 101 2115 Summit Ave St. Paul, MN 55105-1079	Paper Service	No	OFF_SL_12-1278_Official
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_12-1278_Official