

FINAL REPORT TO XCEL ENERGY



**REGION FIVE**  
Development Commission

# SOLAR SCHOOLS REPORT

Region Five Development Commission

**R5DC SOLAR SCHOOLS REPORT**

**CONTRACT NUMBER: EP4-44**

Solar Schools Report  
July 2019

# CONTENTS

|  |    |
|--|----|
| Overview/Executive Summary             | 5  |
| Project Objectives/Project Performance | 8  |
| Benefits                               | 11 |
| Lessons Learned                        | 18 |
| Usefulness of Project Findings         | 23 |
| Technical Progress                     | 24 |
| Attachments                            | 31 |

# RIDING THE SOLAR COASTER

A Comprehensive Evaluation of the RDF Region Five Solar Schools Project

## ACKNOWLEDGEMENTS

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We want to extend a special thank you to those who provided data, participated in the online survey, and participated in the telephone interviews. Editorial rights were retained by Region Five Development Commission and artistic design was provided by Angela Anderson, R5DC Marketing Director.

## DISCLAIMER

This report was prepared as a result of this work sponsored by the renewable development fund as managed by Xcel Energy. It does not necessarily represent the views of Xcel Energy, its employees, or the renewable



SOLAR INSTALLATION

REAL Solar employees Tonya Jones and Site Supervisor Anthony Fair completing solar installation at Pine River-Backus Schools in October 2018.

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Solar Schools

1.5 MEGAWATTS

SIX SOLAR ARRAYS INSTALLED AT PINE RIVER-BACKUS & PEQUOT LAKES SCHOOLS, AND CENTRAL LAKES COLLEGE

# TABLE OF CONTENTS

- I. **Overview/Executive Summary**
  - II. **Project Objectives (PO)/Project Performance (PP)**
    - PO#1: Increase the penetration of solar energy in Minnesota by recruiting new and existing solar energy businesses and related businesses.
    - PO#2: Promote Minnesota-based solar energy technologies including tracking of new solar-related businesses in region.
    - PO#3: Demonstrate a cost-effective model coordinating development of solar energy projects among multiple jurisdictions, including evaluation of RDF leveraged investment.
    - PO#4: Maximize regional economic development benefits, including new solar energy careers and business expansion.
    - PO#5: Provide increased knowledge to the public about solar energy and the under-utilized potential for solar energy in Minnesota.
    - PO#6: Reinforce Region 5 as a leader in promoting regional strategies for sustainability and renewable energy in Minnesota.
    - PP#1: Commission not more than 1,493kWDC solar capacity.
    - PP#2: Facility meets minimum design and manufacture's performance specifications.
    - PP#3: Performance measurements available to the public via the website analysis and audit of project costs including a strategy for dissemination of lessons learned to other regional economic development agencies.
    - PP#4: Conduct economic impact survey of solar contractors and vendors.
    - PP#5: Comparative cost study and demand charge study.
    - PP#6: Conduct four public solar presentations at participating school sites and an additional five public solar presentations.
    - Competitively total installed cost per watt of \$3.62 of nameplate capacity.
  - III. **Benefits**
    - A. Benefits to Schools
      1. Solar production leads to avoidance of increase in utility rates.
      2. School facilities are better able to manage peak loads.
      3. Economic and energy independence.
    - B. Regional Benefits
      1. Regional solar activity.
      2. Retaining regions expenditures for energy rather than exporting that capital to buy energy from other states and Canada.
      3. Regional benefits of using made-in-Minnesota (Mountain Iron) equipment.
      4. Strong regional/local economies.
    - C. Utility Benefits
      1. Benefits to state utilities and thus their rate payers.
      2. Benefits for Xcel Energy.
    - D. Environmental Benefits
      1. Offset of carbon dioxide from the environment.
      2. Decrease of carbon footprint by utilization of local contracts and equipment/materials that reduce long-distance transportation of said items.
    - E. Benefits for Region Five Development Commission
    - F. Educational Benefits
      1. Integration of solar production and STEAM development into K-12 STEAM curriculum.
      2. Higher education and workforce development.
  - IV. **Lessons Learned**
    - A. Factors/elements that promoted project success. (Includes role of R5DC)
    - B. Factors/Elements that limited project success.
    - C. Complex contracting required for CLC sites.
    - D. Value of Out-of-State Financier
    - E. Advice to Others: If you were responsible for teaching others...]
    - F. 6. Michael: EDA study should include the impact of having project financing from an out-of-state versus local financial partner – how does that impact the long-term financial benefits of this investment?
  - V. **Usefulness of Project Findings**
  - VI. **Technical Progress**
  - VII. **Attachments:**
    - A. NEE's Independent Engineering Review
    - B. Electric Car Charging Stations Specifications (CT4021 Model)
    - C. Heliene Module Specifications
    - D. Videos, Articles, Presentations Regarding the Solar Schools Project
    - E. Solar Schools Project Presentations
      1. RREAL Presentation to Teachers
      2. UofM Regional Partnerships Board Meeting (July 25, 2018)
      3. Region Five Solar Schools Project Summary (Updated July 18, 2018)
      4. Renewable Development Fund Grant Timeline
      5. Sample Report to Xcel Energy
    - F. University of Minnesota Extension Services - Economic Impact Analysis
    - G. EnSearch, Inc. Lessons Learned: A Compendium of Telephone Interview Results
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| <b>Contract Number:</b> EP4-44   | <b>Report Date:</b> 07.01.19   |
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**Congressional Districts:** Minnesota Senate District 5 (House districts A and B) includes Pine River site and RREAL offices. Senate District 10 (House district 10A) includes Pequot Lakes and Brainerd CLC Campus. Senate District 9 (House district 9A) includes Staples and R5.

# R5DC SOLAR SCHOOLS

## FINAL REPORT to Xcel Energy

Project funding provided by customers of Xcel Energy through a grant from the Renewable Development Fund (RDF).

## I. OVERVIEW/EXECUTIVE SUMMARY

This comprehensive evaluation was undertaken by EnSearch, Inc. (under the direction of the founder/CEO Dr. Stacey Stockdill) and the University of Minnesota (UMN) Extension Service (with Bridgid Tuck Senior Economic Impact Analyst and Ryan Pesch Extension Educator, West Central Minnesota). The UMN research was supported by the University of Minnesota’s Economic Development Administration (EDA) Center via a federal grant from the U.S. Department of Commerce Economic Development Administration. Data were obtained by EnSearch Inc. from review of 500 pages of project records and 18 telephone interviews. UMN Extension data was obtained from comprehensive review of project financials and online surveys to all vendors with a 30% response rate.<sup>1</sup>

**The R5DC Solar Schools portfolio included 1,494.72 Kw DC - 1,236 Kw AC, scattered site development consisting of one roof and five ground mounts.** The solar systems are installed at **six educational sites:** two K-12 sites, Pine River-Backus and Pequot Lakes, and four sites at Central Lakes College (CLC) – Brainerd and Staples campuses.

This solar project is the first major step toward a regional economic development goal to expand renewable energy capacity in the five-county region in central Minnesota. It is also leading to the expansion of local job training programs in the solar industry, building the region’s solar capacity, and helping the region’s remote rural K-12 and college students see how the sun can give them a career path to a much brighter future.

The project is a model in Minnesota for how to manage multiple projects among several schools districts and the local Minnesota State Colleges and Universities (MinnState)/Central Lakes College (CLC) campuses. The project is served by and interconnected with several power utilities. This scattered site solar project is strengthening the capacity of the region to deploy solar energy and showcases Heliene solar arrays, produced in Mountain Iron, Minnesota, as a solar energy equipment manufacturer.

Region Five Development Commission (R5DC), a regional development organization for five north-central counties, executed a grant agreement of \$1,993,660 with Xcel Energy through the Renewable Development Fund (RDF) for a “Region Five Solar Schools” project. The grant funded the majority of the \$3,508,550 project cost to construct solar arrays on multiple school-based sites in Cass, Crow Wing, Todd, and Wadena counties. R5DC secured New Energy Equity (NEE) – a Maryland based firm - as the financing partner to provide tax equity and project financing. NEE owns the solar arrays and sells electricity to the schools through the executed Power Purchase Agreements. Schools pay NEE \$.063/kWh. Average rates from utility providers range from 2-4 cents more per kWh. R5DC and RREAL acted as the point of contact with the individual school districts.

The goals of the project were to:

1. Install 1.493 megawatts of DC solar capacity, producing about 1,800,000 kilowatt-hours (kWh) of clean energy in the first year and more than 40 million kWh over 25 years.
2. Demonstrate the cost-effectiveness of a coordinated regional strategy for solar development.
3. Build expertise, experience and skills among local firms and providers for further solar development in Region Five.
4. Save schools money on their energy costs over time with a rate for solar energy that is at least 10% below current utility rates.
5. Create “living labs” for STEAM (Science, Technology, Engineering, Art, and Math) based curriculum integrated with solar energy technology.

<sup>1</sup> All quotes contained in this report were approved by the individuals cited. To honor the page requirement for the RDF grant final report, only a few illustrative quotes are provided. A more complete accounting of the hundreds of pages of testimony is provided in Attachment G. The full UMN Extension Service report may be found in Attachment F.

R5DC was responsible for managing the grant with Xcel, and is assisting participating schools with additional grants to support STEAM renewable energy related training. **In the first two months of deployment for the Pine River-Backus site – the actual savings is on a path to exceed the anticipated \$30,728.81 first year savings in that in the first two months the school district saved \$10,000.**

Rural Renewable Energy Alliance (RREAL), an experienced solar developer based in Backus, Minnesota – Cass County – acted as the project construction manager for the project. The total installed cost per watt was \$2.35 of nameplate capacity. **The installed cost for this project over the course of the development cycle, is 35% lower than the \$3.62/watt included in the original proposal.**

**The solar equipment installed was sourced from Mountain Iron, Minnesota by Heliene, a Tier 1 panel manufacturer.** One solar array was roof-mounted and five were ground-mounted when roofs were not suitable for solar. **The project included demonstration of solar-powered electric vehicle charging stations at both the Pequot Lakes and Pine River-Backus School Districts.** See Attachment B for specifications.

*Initially the project had planned to deploy a solar installation at the Leech Lake Tribal College (LLTC). After considerable review, it was decided that it would work best to shift the kilowatts from the Leech Lake Tribal College to other school sites to meet the name plate capacity. However, RREAL remained true to the original obligation to the Leech Lake Tribal College and secured funding from the Department of Energy’s Solar in Your Community program and the Initiative Foundation, from Central Minnesota. The 40-kilowatt solar garden was installed on the college’s campus during the 2017 fall semester.*

**Four students at Leech Lake Tribal College participated in LLTC and the Solar Schools project construction as trainees in solar installation work. Two worked at RREAL full time and three worked at RREAL on part-time internships. One of the two full time interns now works at RREAL as site supervisor and safety director.**

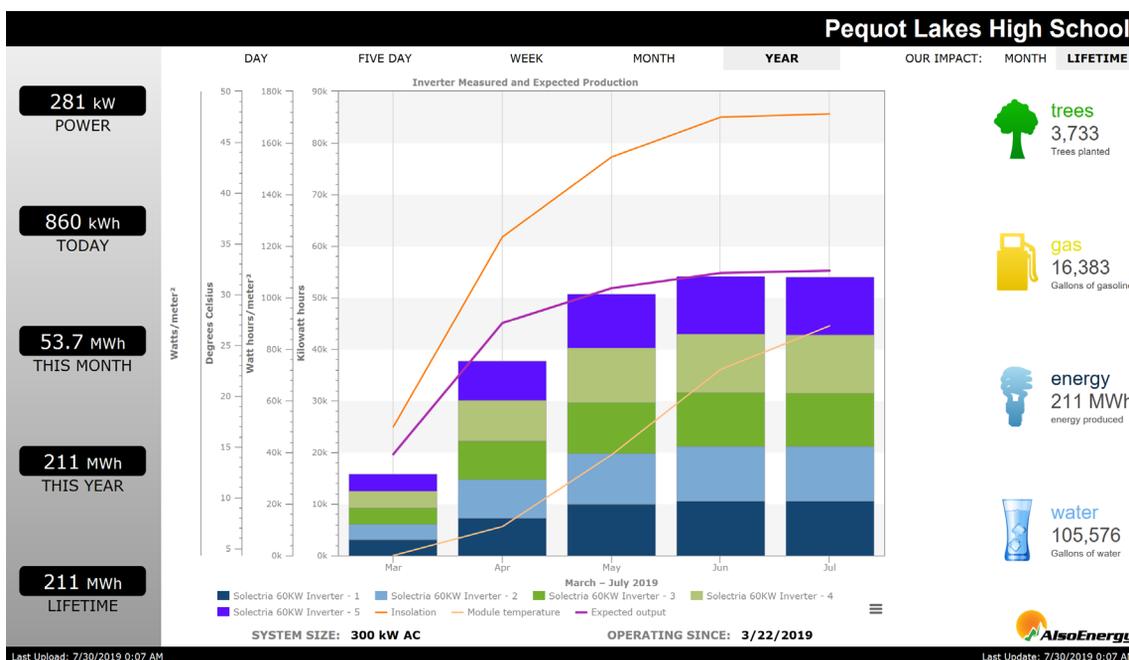
## THE SOLAR SCHOOLS PROJECT ALIGNS WITH RDF’S MISSION IN THE FOLLOWING WAYS:

**Increase market penetration of renewable energy at reasonable costs.** RDF funds represented 57 percent of the project cost. The project is a cost-effective demonstration of the latest generation of Heliene solar equipment. It is also some of the largest solar energy projects at K-12 schools sties in the state. The total projects costs are reasonable for solar energy development in scatter-site development. The project demonstrates important applications of Minnesota-made energy technologies.

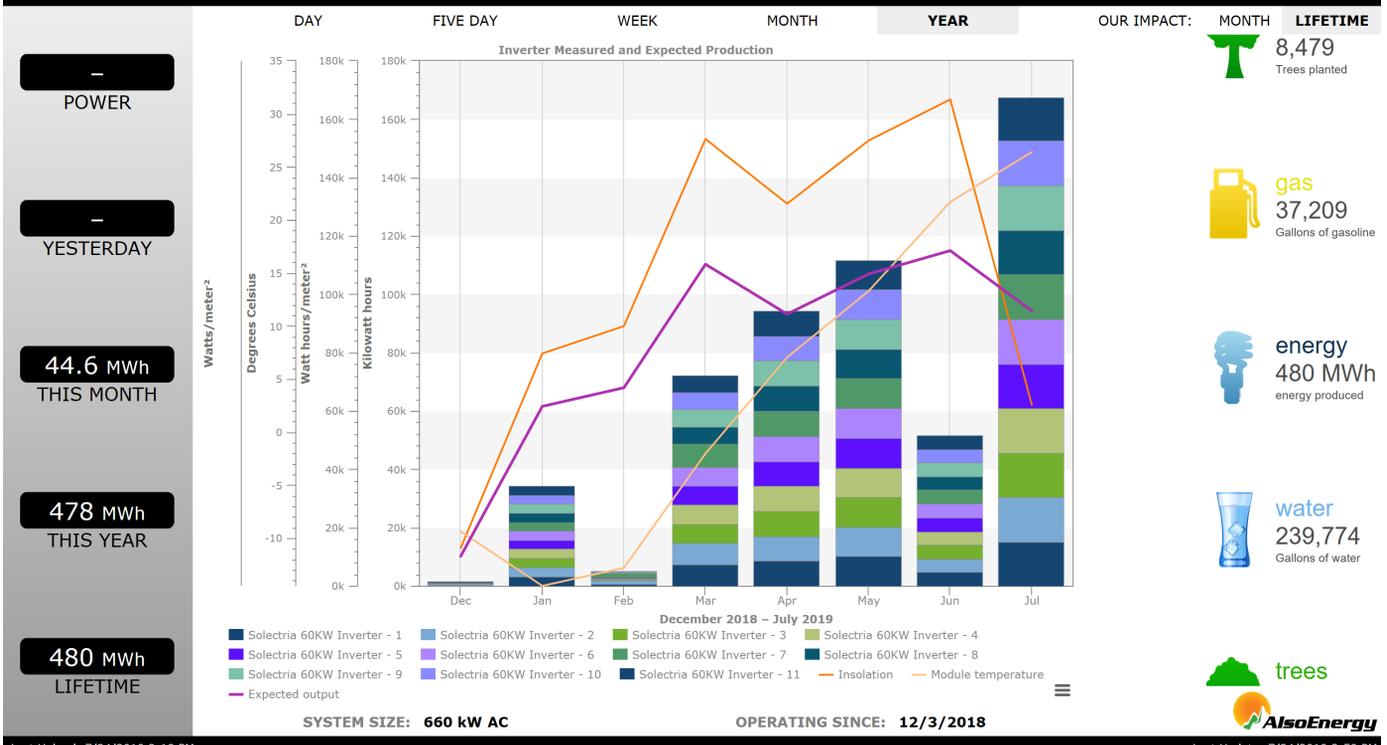
**Promote expansion of renewable energy projects and companies in Minnesota.** RREAL, the project primary developer, is based in Region Five service territory in Backus, MN and R5DC itself gained valuable experience in the solar industry. This allows the commission to support educational and workforce training efforts in the region and state to strengthen the use of renewable energy, solar specific, workforce development and training.

**Stimulate research and development into renewable energy technologies.** The solar projects already has, and will continue, to serve as a demonstration of a unique development model of coordinating six projects among multiple school districts and MinnState/CLC. The Region Five Solar Schools Project is demonstrating the performance characteristics for the latest generation of Heliene solar arrays.

**Develop near-commercial and demonstrate scale renewable energy projects.** This project is, and will continue, to serve as an important model for other K-12 schools in Minnesota that may be interested in developing their solar energy resources. The project led MinnState to think more broadly about their energy strategy for all of their campuses throughout Minnesota. It reinforces the market presence of Heliene and increases the capacity of RREAL, as a solar energy developer, and regional vendors to work with solar energy projects. The online monitoring sites demonstrate real-time performance and environmental impact data.



# Pine River Backus



Last Upload: 7/24/2019 2:18 PM Last Update: 7/24/2019 3:59 PM

Snow impacted the numbers in January, February and March at Pine River-Backus. The production data for June is also skewed due to a communication issue with the power supply on the energy meter.



Welcome, .  
Updated: July 16, 2019 2:56 PM  
[Help](#) | [Log Out](#)

Support
Home
How it Works
Reports
Settings

### Current Generation

**Instantaneous Power**  
111.24 kW

**Generated to Date**  
59,012.02 kWh

### Historical Generation

Generation (26,156.29 kWh)

Day Week Month Year Life

### Your System

### PV System

SIZE: 181.44 kW  
INVERTER TYPE: Solectria, Solectria, Solectria

### Environmental Benefits Since Installation

**TREES SAVED**  
39.73 trees

**HOMES**  
43,639.38 hours

**COAL OFFSET**  
17,514.77 lbs

This project is already receiving national attention. At the time of this report the project was covered by [Solar Power World](#), [Yahoo Finance](#), and [CISIÓN PR Newswire](#). Therefore, this project is serving to reinforce Xcel Energy and its customers as leaders in the advancement of clean, renewable solar-power energy at a state and national level. In addition, the project is already attracting attention by the general public to the Pequot Lakes on-line monitoring site. The same real time performance data will be available soon for all six sites.

The next step for solar deployment in Region Five has been made possible by a grant awarded July 1, 2019 by the Northwest Area Foundation. Through that grant, dollars are included for communities to deploy solar projects in their communities and will help us articulate systems changes that advance Equitable Economic Ecosystems in Central Minnesota.

## II. PROJECT OBJECTIVES

Per the Xcel Energy grant agreement, the following Project Objectives Project Performance measures accepted and delivered upon.

### **PO#1: Increase the penetration of solar energy in Minnesota by recruiting new and existing solar energy businesses and related businesses.**

The UMN Extension Economic Impact Analysis report indicates this goal was met. Of the project funds, two-thirds (66 percent) was spent at companies that directly market a solar product. For those companies, half reported this was their first solar project in the region. Other businesses, such as electric supply and installation companies, gained valuable solar project experience.

### **PO#2: Promote Minnesota-based solar energy technologies including tracking of new solar-related businesses in region.**

Extension did not uncover evidence of new solar-related businesses in the region. However, there is evidence the current solar companies increased their sales. Three reported minor increases in sales, while one reported significant increases, including hiring of new staff.

### **PO#3: Demonstrate a cost-effective model coordinating development of solar energy projects among multiple jurisdictions, including evaluation of RDF leveraged investment.**

The UMN Extension Economic Impact Analysis report provides evidence that RDF funds were leveraged for significant economic impact. The use of local businesses increases the amount of funds spent in the region, thus increasing the impact on businesses in the supply chain. In addition to the \$3.5 million in direct spending by the project, the project generated \$3.3 million of business-to-businesses transactions.

During the EnSearch interviews, project staff and industry experts weighed in on the degree to which the project demonstrated a cost effective model. Efficiencies were identified on the technical side of the project – in the purchasing of the equipment, the engineering and survey work that needed to be done, and in the installation of the solar arrays. Also by combining the scattered sites into one 1.5 megawatt solar project the project had sufficient mass to attract financial support. Opportunity costs identified included the time it took to put in place the legal documents as well as garnering the support and approval needed from the various public boards and entities. As a model, there may be some efficiencies for others in implementing the model; however, it isn't a plug and play and will always require some adjustments. A few illustrative quotes follow from responses to the interview question:

#### **To what degree did this project demonstrate a model to cost effectively manage multiple projects among several school districts and multiple jurisdictions?**

***That goal was achieved with incredible success.** The complexity of this project was way beyond anything that I have participated in. I have been part of building a couple of schools and those are complex projects; however, it is way harder when you include three different public entities and multiple jurisdictions. We also all have publically elected boards that need to be brought along and who ultimately have to give blessing to the project. **There is a lot of political nuance to that. I think this project was a wild success in demonstrating that it can be done and it can be done in a cost effective way that benefits public entities like schools.** (Chris Lindholm, Pequot Lakes School District.)*

*I think that was accomplished pretty well. I think that Cheryal's team was instrumental in keeping everything tied together. Therefore it was certainly easier than if we would have done each one of the six sites separately. **In fact, a company like ours would not have done them if they would have been done separately because it would not have had the critical mass necessary for us to focus on it and invest the human resource time necessary to complete the project. Therefore by grouping [the six sites] together made it an impactful project so that we would devote our energy to it.** (John Langhus, NEE)*

*Heliene was the manufacturer of the solar panels that were installed at all six sites. In our history at RREAL we have installed many 40 kilowatt systems. Up until this project, 40 kilowatt systems has been our maximum because of state of Minnesota rules. It was great for us and for our crew to do larger systems. **When you go back to your question about efficiency, it made it so much more efficient for our crew. They knew where they were going each day. They knew what the next task was. It wasn't constantly moving from job to job.** (BJ Allen, RREAL)*

*I think there was a little bit of an expectation in this project that because it was one investor, it is one grant, but several scattered sites – is that all the documents should be standardized. That there would be tweaks here and there that would relate to each individual entity. **That wasn't the case. That is generally never going to be the case, because it is Pine Pine River-Backus, because it is Pequot Lakes, because it is Central Lakes College. They each have their own governance structure. They each have their own agreements. And they are each, individually, contracting with NEE as the investor. Therefore, you always start from a template document and want to keep as close to that as possible so everyone is working from the same language, but there is also the complication here where some were ground mounted, some were roof mounted, some were a combination, there were multiple utilities involved. All of that created complexities that required tailoring of each individual agreement. So while the expectation is to keep as close to the template as possible, the reality is that it is a very difficult thing to do.** (Dan Listug, Sourcewell)*

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*I think it was achieved. Region Five and RREAL stepped out of the box to install and manage a larger installation than they were used to managing. We certainly hit some bumps along the road. I give them a lot of credit for effectively managing those bumps and ending up with a very successful installation for all parties involved. I think there was a great learning on all sides on how to effectively manage this from working with joint lawyers to negotiate the power purchase agreement to working with one contractor to efficiently scale the installation to complete the project in a cost-effective way. **We will be able to utilize this experience to complete better installations and make them more cost efficient in the future. Not every project will have the great grant that Xcel provided in order to drive that electricity cost down for the customer or the schools. Many of the efficiencies we picked up we can very quickly deploy into other projects, which in turn satisfies the goal which is to make this more of a deployable project.** (Matthew Hankey, President/CEO, NEE)*

*Without Region Five I do not think the project would have been able to manage multiple projects among several school districts, MinnState and multiple jurisdictions. That would have been very challenging. For us – we do a fair amount of capital project work. We have done a number of projects with multiple jurisdictions. **For the Region Five Solar Schools Project, the school districts and MinnState have a lot of similarities but there is some distinct differences that we had to navigate, which sometimes were not recognized.** I think for lessons learned – the sooner you have those partners at the table at the front end the better. We came in late to the transaction when the school districts had been in negotiations and had gone through a fair amount of conversations. Therefore there were some things that had been established before we became involved. **If we had been a part of the process at the beginning – we might have been able to streamline the process and speed up the process on our end. It is not a criticism of this deal at all; it is simply the reality of how we came into this project.** (Greg Ewig, MinnState)*

#### **PO#4: Maximize regional economic development benefits, including new solar energy careers and business expansion.**

The UMN Extension Economic Impact Analysis report shows that local businesses were the primary providers of services under the project, which maximizes the benefit to the region. Extension’s model and survey results indicate modest gains in business expansion and employment. Extension estimates 25 jobs were supported at the companies with direct solar products.

#### **PO#5: Provide increased knowledge to the public about solar energy and the under-utilized potential for solar energy in Minnesota.**

Multiple communication channels were used to disseminate information about this project. These included 3 videos, 14 news articles, 7 school presentations and 5 public presentations, and designated pages on the R5DC (<https://www.regionfive.org/solar-schools>) and Pequot Lakes School websites (<http://district.isd186.org/news-media/solar-panel-project>). In addition, six more national presentations were made by Cheryal Hills (Executive Director for R5DC) focused on the underutilized potential of solar energy as an economic development engine. See Attachment E for an itemized list.

#### **PO#6: Reinforce R5DC as a leader in promoting regional strategies for sustainability and renewable energy in Minnesota.**

Nearly all those interviewed strongly agreed that this performance objective is in the process of being achieved. They also believe that this will become more evident as the results of the Region Five Solar Schools Project become more visible through various public relations events and the online viewing of the solar power generated/environmental benefits. Those interviewed offered the following insights in response to the question:

**R5DC was to serve as a leader in promoting regional strategies for sustainability and renewable energy in Minnesota. Do you agree with this statement? Why or why not? (See Attachment G for additional perspectives.)**

***I think that part is still going to come to some extent as we do some public relationships events around the project. As we do the ribbon cutting.** The cool thing about the schools is integrating their projects with the students and the curriculum. Therefore, you are not only improving your energy balance but you are also educating these kids about what their energy choices are and the implications of choosing one over another. When they go home and they talk to their parents those conversations then ripple through to the State Capitol when they are debating state policies. More and more parents are saying, “My child’s school district is doing really well with using solar and I think we should be doing more of that.” We see that ripple happen very clearly. (John Langhus, NEE)*

***I absolutely do. I have never heard of two or three school districts working together on a project like this before.** The fact that it did happen and it was successful is all to Region Five. If that can be replicated elsewhere it is definitely worth doing so. They did very much demonstrate that it is possible. (Chris Lindholm, Pequot Lakes School District)*

***I think Region Five willingness to take a leadership role and have a vision to see this project come to fruition is a key benefit.** In and of itself, I think that school districts might have dabbled, individually, into looking at a renewable energy project using solar arrays. But there are incredibly complex. They are time consuming. As public entities subject to publically elected officials whims and public boards, the longevity needed to sustain that vision is difficult. Region Five took that burden on and took on the administrative burden which was significant to make it as easy as possible for the regional entities to continue their participation. (Dan Listug, Sourcewell)*

*I absolutely see that happening. **Region Five really stepped out as a leader to get the grant and to get this project underway with partners in this region.** We would not be successful without them. They have been central to leading this effort. Even as the project is continuing, there are still emails about other things that we can do in the areas of sustainability and renewable energy – such as getting students involved in this project and looking at electric vehicles and charging stations. **It is not just solar. I look at how Region Five supports the work at the Ag and Energy Center – and works to support that mission. When I think about all the ways they work with us on local foods, gleaned and providing funding along with people and ideas – there are so many examples of how they really are a leader in supporting sustainability and renewable energy in Minnesota and in our region.** (Kari Christiansen, CLC)*

*It is humbling to think so, and while I know that **we have been nominated for a number of awards that will likely be announced in 2020, the greater indicator Region Five potentially being viewed as a leader in this space are the calls I get from the other parts of the country.** For example, **the four corners area is suffering from coal fire plant closures and they are looking at how to rebuild their economy. I feel honored that areas of the country – looking at new strategies on how to sustain and build economies – are looking to Region Five to understand how we did it and how we think about it and how we measure it.** We don't just consider how this project has assisted the environment or the economics of the region, we truly consider how have people from the region who are the most disenfranchised residents positively impacted. These are tough questions, but we know we **DO** what we Measure so we can teach how to measure. That is gratifying.* (Cheryl Hills, R5DC)

## PROJECT PERFORMANCE

### **PP#1: Commission not more than 1,493kWDC solar capacity.**

The portfolio is 1,494.72 kilowatts on the DC side and 1,236 kilowatts on the AC side. That portfolio was divided up into six projects, five ground mounts and one roof mount. (See Technical Progress section for detailed site information).

### **PP#2: Facility meets minimum design and manufacture's performance specifications.**

According to Kevin Corcoran, Project Engineer/Manager, NEE, *When building the sites, RREAL used all manufacturer installation manuals for the specific components installed. This includes the Heliene modules, Solectria and Fronius Inverters, Unirac and RBI Racking, Locus and Also Energy monitoring equipment etc. In addition, RREAL was required to build the sites using New Energy Equity's Technical Specifications which outlines best practices for solar installations based on experience across the United States.*

### **PP#3: Performance measurements available to the public via the website analysis and audit of project costs including a strategy for dissemination of lessons learned to other regional economic development agencies**

Performance measures are tracked by both Pequot Lakes and Pine River-Backus Schools. Central Lakes College is working on a platform that allows staff to view performance. Each year, R5DC will gather and update solar production data on the [www.regionfive.org](http://www.regionfive.org) website. The Economic Impact analysis completed by the University of Minnesota Extension Services may be found in Attachment F. EnSearch, Inc., has provided an expanded lessons learned report in Attachment G.

In addition to the local and web dissemination of production performance, lessons learned and economic analysis, R5DC will present a summary of the information to over 800 colleague Regional Development Commission from across the nation at the 2019 Annual Training Conference of the National Association of Development Organizations in Reno Nevada. R5DC is also scheduled to deliver a breakout session at the Minnesota Regional Development Commissions Annual All Staff meeting on September 26, 2019.

### **PP#4: Conduct economic impact survey of solar contractors and vendors.**

According to the UofM Extension report, in total, **the Solar Schools project generated \$7.8 million in economic activity in the region. This includes \$3.2 million in labor income. The project supported 88 jobs.** Top industries affected by the project include construction of power structures, banking, and housing.

### **PP#5: Comparative cost study and demand charge study.**

According to BJ Allen, RREAL: *Of the six solar sites in Central Minnesota, the two will be subjected to utility demand charges: Pequot Lakes and the Staples Main site. Since demand charges are applied based on the highest amount of power consumed at any point during the billing cycle, and less power is consumed when solar energy is being produced, there is a possibility to reduce demand charges directly as a result of the installation. The reality with solar, however, is that it does not provide consistent demand charge cost savings because solar energy production is variable and does not necessarily coincide with the highest energy consumption in a given monthly billing cycle. As an example, solar can save Staples Main money by reducing energy consumption, but it will not consistently reduce demand charges. In July of a recent year, for example, Staples Main consumed a peak of 277.203kW during the month. If this coincided with peak solar production, that peak demand would have been reduced to about 121kW. For the sake of example, assuming that 121kW is the new highest amount of power consumed during the billing cycle, Staples Main would save \$1,270.50 on demand charges during the month of July alone. The same approach applies to Pequot Lakes.*

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## PP#6: Conduct four public solar presentations at participating school sites and an additional five public solar presentations.

At the time of this RDF report, 3 videos, 14 news articles, 7 school presentations, 5 public presentations, and one report were used to disseminate information about the solar schools project. In addition, Attachment E includes the School Presentations PowerPoint used with teachers to explain the value of solar given by RREAL and an agenda and presentation given at a statewide meeting of the UMN Regional Sustainable Development Partnerships (part of Extension) given by R5DC and Superintendent of Pequot Lakes School.

**Competitively total installed cost per watt of \$3.62 of nameplate capacity.** According to Jason Edens, RREAL, the installed Cost \$2.34 – for this type of project is competitive. The installed cost for this project was \$2.34 per watt over the course of the development cycle, which was **35 percent lower than the \$3.62/watt included in the original proposal.** Over the course of the development cycle, the project saw a significant decrease in the cost of installation per unit of power. Part of that was due to a decrease in the cost of the components. Because over the extended period of time from which the project development started – over the same period of time – there was a lot of decrease in the cost of solar components. So that drove some of that decrease. Also, as more partners became involved, particularly our financial partner, they had an expectation that it would be installed at a substantially lower rate. Part of that is, of course, because it conforms to their business model. The lower the installed cost the more margin the financier is able to harvest.

# III. BENEFITS

## BENEFITS TO SCHOOLS AND OTHER UTILITY RATE PAYERS

So why did the schools become involved in the Region Five Solar Schools Project? In part because of the energy savings. The leadership at the schools and CLC also reported that the reasons included being good stewards of the environment, believing in the mission, and providing an opportunity for students to learn about solar energy. Others reported that the benefits to schools are through the cost savings and energy stability. A few illustrative quotes from the leadership follow. At the time of this report, the K-12 schools are integrating the solar system production data into classroom discussion and working toward curriculum integration. CLC is advancing a solar schools certificate and degree programs as educational opportunities.

### In what ways does your school benefit from the solar schools project?

*One we all have an **obligation to be good stewards of our environment** and this is a great way for us to do that. The second reason is, along with being good stewards of our environment, we are stewards of children. It is a great learning opportunity for students to learn about solar energy ... **Therefore there is a fiscal benefit and there is a benefit for teaching students. It is also a great way to brand our district as a progressive district that is trying to do the right thing.** (Chris Lindholm, Superintendent, Pequot Lakes School District)*

*I think there are many reasons as to why it has been important for us to be involved in this project. First and foremost **having a solid partnership with Region Five and the regional high schools is really important to us.** In terms of the future, having this **allowed us to start conversations about having a solar construction program here at the College.** So we are not looking at this project just from the facilities side of it or the operational savings because **there will be some savings for us, but also the academic opportunities that come from establishing that program.** The other piece is that this **project aligns with our facility master plan – as we look at more green initiatives and sustainability issues.** Therefore there are multiple pieces that really drove us to come to the table to participate. (Kari Christiansen, Vice President of Administrative Services at Central Lakes College)*

*This sounds selfish in some respects, however, **certainly the possibility of having solar energy on our campus at little or no cost to the district is appealing.** We also had a **number of folks on our board, myself included, who believe in using sustainable energies whenever possible – in part to help with what our planet is dealing with.** It is also good for us to learn about these different industries that are available. **We are in the process of implementing some curriculum that will help our students understand what is going on and also have an opportunity to get a glimpse at potential job markets involving sustainable energies.** There was no losing here in any way, shape, or form. We get the benefit of the solar power. We get the benefit of students learning about solar energy and technologies. We also get the benefit of partnering with other organizations. (Dave Endicott, Superintendent, Pine River-Backus School District)*

*[Can you tell me more about what you mean when you say that the project can help support and sustain communities?] **We live in an area that has fairly significant poverty. So we have people who become energy poor. So I can see the benefits of having these kinds of projects that would perhaps reduce the stress on low-income families. By having solar they are not having to make choices between food and health care because of energy costs. So if we can find ways to do that and pull together resources to support that happening then I think we benefit our communities. In our situation, we had a piece of land that we were able to use for good service. Obviously we are a tax payer driven entity as a school district so when we can save money and use those dollars to benefit kids and learning then that is a win for everyone.** (Dave Endicott, Superintendent, Pine River-Backus School District)*

Others described the benefits for schools when they responded to the question:

### **Why did you choose to invest your time and resources in this project?**

***I believe in the importance of alternative energy, especially solar energy. I see that once it is installed it has minimal maintenance and the life expectancy can be up 50 years. The efficiency may go down about one percent per year or less. It also provides short term jobs. It will certainly reduce the demand charges these schools get penalized for if the schools meet their demand peaks. So there will be savings there. Also, there will be savings in offsetting their overall energy bill. Therefore, it is a wonderful blessing to those schools that were able to receive the solar energy. It also increases exposure for solar energy by the general public. Also the learning potential for these schools is a benefit. I hope that the solar industry can, some day, stand on its own.*** (Sheldon Monson, R5DC Commissioner)

***We love the profile of both public and private schools and we work with these types of clients quite often. The mission of our organization was to provide clean, renewable electricity for as many organizations throughout the country as we could. We have found a nice significant niche in Minnesota where we have done a number of transactions throughout the state. Many of our favorite transactions are with public and private school systems given that we are not only helping financially with those savings and budgetary measures for the school districts, but we also think that the impact socially is the most significant. The ability for the kids at these schools to interact with the project as well as see what the solar projects are producing on daily basis, to wrap it into curriculum – ( that is probably the biggest bang for your buck socially as we are able to educate people about the positive impacts of renewable electricity.*** (Matthew Hankey, CEO/ President, NEE)

***Education and community outreach is one of RREAL's programs and has been since our early inception. It is a passion of ours and we are very excited and motivated to see solar energy not only entering the classroom but also physical manifestations of it at local schools. Students can now learn how solar energy can apply to about every single topic that they are dealing with in school. In their social studies, history, mathematics, or computer science classes, students can apply those topics to the solar system that is located at their school. The educational aspects and learning opportunities for students has motivated us throughout this whole project. When RREAL started in 2000 solar energy was very new and people didn't understand it. Things have changed a lot since then – there is a lot more understanding about solar. But we have a long way to go. Therefore, this project is one of the ways in which we educate the public about how it works.*** (BJ Allen, Project Manager, RREAL)

**Solar production leads to avoidance of increase in utility rates.** The schools, through the Power Purchasing Agreement, have locked in their utility rates for the next 20 to 25 years. Those interviewed believe that the solar power will give the schools more certainty and predictability in their energy costs.

***It gives us more certainty because we can see what we are going to pay for 25% of our electricity for the next 20 years. So it definitely gives us certainty, more predictability.*** (Chris Lindholm, Pequot Lakes School District.)

***It will provide some certainty about energy costs, at least some baseline energy costs. This will be more so on the Staples Campus than the Brainerd Campus. Based on the forecasting there are some decent expectations of saving because the rates we are looking at will be more favorable for us. So we are going to achieve some cost savings but we will need to wait to see if the performance matches the projections. I am being cautiously optimistic that we will see some energy savings.*** (Greg Ewig, MinnState)

**How the model will lead to better management of peak loads at school facilities, transfer of this knowledge to other schools can reduce demand for high-cost peak power.** Because the solar arrays were only recently commissioned there is limited data regarding the impact the projection of solar electricity has on peak loads at the school facilities. Many interviewed believe that the data available in the future will show significant savings on peak loads when compared to the past because of when solar electricity is generated. Michael Krause addresses this element as follows:

***Solar energy production parallels, or is “coincident”, with both seasonal and daily load patterns for most utilities. In other words, solar energy panels are producing the most energy during the months of May through September, and from 12 noon to 6 p.m., when most utilities are also experiencing the greatest demand for electricity. This is somewhat less true for Minnesota Power, which has a large industrial customer base whose load is more consistent throughout the day and year.***

***Solar energy at schools is likely to have even greater benefits for utilities because most school buildings use less energy in the summer when school is out and there are fewer events and activities in school buildings. There is also a benefit for daily demand patterns when school is in session. Energy demand in school buildings is typically highest from about 10 a.m. to 1 p.m., due to energy used for preparation, service and cleanup of food services. This offsets the so-called “duck curve” for most utilities which have high demand in the morning, lower demand during the day, and rising demand again into the evening. Not only does school energy use peak during mid-day, energy use begins to taper off in midafternoon as school gets out, while demand for most utilities is growing from midafternoon into the early evenings as families get home from school and work.*** (Michael Krause, Kandiyo Consulting)

The transfer of the knowledge to other schools, again, will happen over time as the solar monitoring systems are all online. However, transferring the knowledge is already happening as described by Superintendent Endicott. *The number of people who stop me on the streets or when I am out to eat or when I am at meetings regarding our district – the number of people who come to me and say, “Wow! It is so cool what your district is doing with the solar. We think it is a fantastic project. We love what you have done here.” Then people start asking questions and start wondering if they can do that.*

**Economic and energy Independence.** The solar energy project will have some cost savings for Pine River-Backus, Pequot Lakes, and Central Lakes College – the savings will be greater for some sites than others. Those interviewed also see that the schools will gain energy independence and certainty regarding costs.

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*If you are on a school board and you have limited budget, which is the case for all public school districts, you can spend your limited resources on energy (electricity and natural gas) or you can spend them on teachers, teacher training, better chrome books, better facilities, better IT, etc. So the economic energy independence is a unique aspect of this project. What is really cool and really exciting about clean energy and solar energy, in particular, -- something that a lot of people are not familiar with -- is that when you buy a solar energy system you know for the service life of that system what every unit of energy is going to cost. Whereas if all your energy is coming from the grid, conventional energy sources, you have no idea. You do not know what it is going to cost to heat and power your schools in 5 years, 10 years -- you don't know. But if you are generating a portion of your energy from site based solar energy you most certainly know what every kilowatt hour is going cost at year 10, 15, and 20 -- with certainty, with complete certainty.* (Jason Edens, RREAL)

**Benefits to Utility Rate Payers.** The solar energy produced is already showing that there will be benefits through cost savings. The solar energy model also means that the rate payers, in this case the schools at Pine River-Backus, Pequot Lakes, and Central Lakes College will know with certainty what their energy will cost over the next 20 to 25 years. There are also extensive provisions built into the project to ensure that these rate payers will not pay more than they would for conventional energy. Other energy users in the region will now have a demonstration model for small-scale and larger-scale arrays. They can see in real time the energy that is being generated, the positive environmental impacts. They also will have neighbors in nearby schools and colleges who will be able to continue to talk about any cost savings.

The data provided by RREAL shows that over the next three years the systems should generate 6,546,424 kWh and yield \$112,926.70 in cost savings.

| Year                    | PRB expected production (kWh) | PRB total est. savings over 2018 | PL expected production (kWh) | PL total est. savings over 2018 | CLC expected production (kWh) | CLC total est. savings all sites over 2018 |                     |
|-------------------------|-------------------------------|----------------------------------|------------------------------|---------------------------------|-------------------------------|--|---------------------|
| 0                       | 1,145,000                     | \$30,728.81                      | 434,800                      | \$5,735.01                      | 623,710                       | \$4,199.93                                 |                     |
| 1                       | 1,139,275                     | \$29,093.18                      | 432,626                      | \$5,143.92                      | 604,999                       | \$3,288.21                                 |                     |
| 2                       | 1,133,578                     | \$27,586.47                      | 430,462                      | \$4,601.64                      | 601,974                       | \$2,549.53                                 |                     |
| <b>Total</b>            | <b>3,417,853</b>              | <b>\$87,408.46</b>               | <b>1,297,888</b>             | <b>\$15,480.57</b>              | <b>1,830,683</b>              | <b>\$10,037.67</b>                         |                     |
|                         |                               |                                  |                              |                                 |                               |  |                     |
| <b>Total Production</b> | <b>3,417,853</b>              |                                  | <b>1,297,888</b>             |                                 | <b>1,830,683</b>              |  | <b>6,546,424</b>    |
| <b>Total Savings</b>    |                               | <b>\$87,408.46</b>               |                              | <b>\$15,480.57</b>              |                               | <b>\$10,037.67</b>                         | <b>\$112,926.70</b> |

These savings are already evident in Pine River-Backus. In the first two months the school district saved approximately \$10,000. It was projected that for the entire year the savings would be \$30,728.81; therefore, the system is performing better than projected in part because savings in winter months (when the Pine River-Backus system was commissioned) should be significantly less due to much lower solar energy production in those months.

*The solar doesn't go directly to us. We have an investor who harvests that solar energy. We then buy that energy back at a reduced rate. In the first two months we saved approximately \$5,000 a month. We are estimating to produce about 80% of our electricity through the solar panels. I think we will see significant savings. Obviously we need to get through a year to see what that full spectrum of savings is, but we are excited about what it looking like so far. [In terms of the original projections, has it exceeded those projections or met those projections?] The solar energy produced has exceeded those early projections.* (Dave Endicott, Superintendent, Pine River-Backus School District)



## REGIONAL BENEFITS

**Regional solar activity: Solar Energy Facilities in Region Five.** A regional analysis conducted by Michael Krause, Founder and Energy Expert, Kandiyo Consulting, shows that the R5DC solar project represents a significant addition to the solar energy capacity in the region.

*Based on the Distributed Generation Interconnection Reports filed with the Minnesota Public Utilities Commission by utilities that serve Region Five, a total of 4,482 kilowatts of solar capacity was added in the territory of Minnesota Power in 2017 and 2018, about half of which was large-scale over 40 kilowatts or utility-scale. Most of this solar capacity is in areas of the Minnesota Power service territory that are outside of the five counties in Region Five.*

*The other cooperative and municipal utilities serving parts of Region Five added a total of 571.46 kilowatts of solar energy capacity in 2017 and 2018. This includes no solar energy facilities in the cities of Staples and Wadena that are served by municipal utilities. The breakdown of solar capacity added in 2017 and 2018, by individual utility is as follows:*

|                              |                               |
|------------------------------|-------------------------------|
| Minnesota Power              | 2,222.7 kW less than 40 kW    |
|                              | 2,259.9 kW greater than 40 kW |
| <b>TOTAL Minnesota Power</b> | <b>4,482.6 kW</b>             |
| Crow Wing Coop Power         | 228.20                        |
| Todd-Wadena Electric Coop    | 135.60                        |
| Beltrami Electric Coop       | 184.28                        |
| Brainerd Public Utilities    | 23.38                         |
| <b>TOTAL Other Utilities</b> | <b>571.46</b>                 |

*The R5DC solar project installed nearly three times the solar installed by these utilities over the previous two years.*

**Retaining regions expenditures for energy rather than exporting that capital to buy energy from other states & Canada pose economic and energy independence impacts.** The Region Five Solar Schools does mean that 1,494.75 kilowatts on the DC site and 1,236 kilowatts on the AC site are produced in Region Five. Industry experts agreed that the production of solar energy will enable the project to lessen the dependency on energy from outside sources. They agree there is value to that production when foreign energy sources are considered. Where they disagree is the value of buying energy from other states in terms of possible cost savings. The environmental value in decreased CO2 and mercury emissions was identified by many interviewed to outweigh the financial benefits of, for example, using coal fired plants to produce energy.

*So when Minnesota gets its energy from fossil-fuel sources, the state has none of those fuel sources. We don't have oil; we don't have gas. So we buy that from other places. In some cases we are even buying our energy once the conversion from fuel to electrical power has been done – we even buy it then too. The Minnesota Chamber of Commerce number, which is a year old now, estimates that about \$14 billion is spent by Minnesota consumers to buy energy from outside of the state; **\$11 billion of that from Canada.** Those dollars are then largely, not entirely because there is still some local economic activity from operating some of the plants, **a fair amount of that is money that is extracted out of the local economy and goes elsewhere.** So anytime you are able to generate energy locally and generate from a resource that is available locally you are then retaining those dollars. So every kilowatt hour you get from a solar facility on the roof of an area high school is a kilowatt that isn't subject to export of that dollar out of the local economy. (Michael Krause, Kandiyo Consulting)*

**Regional benefits of using made in Minnesota equipment.** The Region Five Solar Schools project was committed to using Minnesota manufactured solar arrays. In the original proposal the plan was to use TenKSolar; however, for a variety of reasons they exited the solar manufacturing business. The project then considered using Silicon Energy, but they ultimately went away as well. At the 11<sup>th</sup> hour, Heliene, a Canadian company opened up a manufacturing plant in Mountain Iron, Minnesota. Therefore the project was able to honor its commitment to growing the larger regional economy by supporting and expanding the workforce in Mountain Iron, MN. Another benefit, which will be described in greater detail later, has to do with lessening the carbon footprint of the project by sourcing materials locally.

**Strong local economies.** As presented earlier in this report, the data analysis by the University of Minnesota Extension service shows that the economic impact for Region Five was significant: The solar schools project generated \$7.8 million in economic activity in the region. This includes \$3.2 million in labor income. The project supported 88 jobs. Top industries affected by the project included construction of power structures, banking, and housing.

One of the motivations for advocating for clean energy by the founders of the Region Five Solar Schools Project was that investing in solar energy keeps dollars in the region's communities.

*One of the conversations we had with New Energy Equity is that they really wanted to leverage their national purchasing power in the procurement stage. But something that was important to Cheryal and also very important to RREAL was to use this project to develop the local capacity to be responsible for procurement. So in other words we wanted to own procurement in our region because that would recirculate more dollars in our community and also increase RREAL's ability to procure a competitive price ... That all happened and it happened very effectively we got very competitive pricing. **So it certainly did exactly as Cheryal had intended, which was to build the economic capacity of the players within her region.** (Jason Edens, RREAL).*

Region Five Development Commission was not interested in being a solar developer. **They were interested in building the capacity of the people they work with and making sure that the savings that come from the facilities are going to the schools** – either directly through the reducing of the energy costs or indirectly by providing a training platform for the school and community. (Mark Ritter, Former RDF Grant Administrator)

**They were also looking at energy as a source of economic development.** Even though it might not be like other economic development organizations who bring in a small business or a manufacturing business – it is looking outside the box as to what economic development means in your area. It is looking at economic development as capacity building. **It is a concept that is given lip service but not really understood or put into effect [as it was with within Region Five.]** (Mark Ritter, Former RDF Grant Administrator)

## BENEFITS FOR UTILITIES

**Benefit state utilities/the value to the overall infrastructure.** The Region Five Solar Schools project is producing solar energy and adding to the distributed energy mix. Five industry experts addressed how the production of solar energy is of benefit to the overall infrastructure, thereby beneficial to the states' utilities. In three interviews, the energy produced by the Region Five Solar Schools Project was described as *pretty small* and those interviewed did not think it would have a significant benefit to the utility. Two industry experts gave qualified answers. One in that the source of energy is unpredictable and at times creates some problems with managing the grid. The other talked about how utilities may have mixed feelings about solar energy projects such as the Region Five Solar Schools project because they have lost some revenue to NEE.

[What is the value of solar energy when it comes to the overall energy infrastructure?] **When the sun is shining and the panels are unobstructed (meaning we just didn't get 2 feet of snow and they are covered) the power generated by distributed energy definitely benefits the distribution system in many ways.** By giving the member the ability to generate their own power, giving them the ability to sell it back to us, and adding to our energy mix. So the distribution system has to be designed in such a way that when there is great power off these systems then our members can enjoy that. However, during nighttime hours, or cloudy days, or snow storms – when there isn't energy generation – then we, at the utility, still needs to have the infrastructure in place to make sure that no one misses a beat. So it is up to us to create that back-up plan when energy isn't necessarily there. (Allison Uselman, Todd Wadena Electric Cooperative)

The benefits of this project are that the electricity is going to be produced when the school needs it the most – throughout the day, when school is in session, which will therefore curb their electricity demand. **By curbing the demand of many customers throughout a local areas you can potentially either delay or offset significant upgrades to the grid that are necessary in order to support increased electricity usage and increased development.** Therefore we are doing a small part now and that should trickle down in the long term to the benefit of rate payers throughout Minnesota as Xcel Energy and other local municipal utilities do not need to complete a lot of those costly upgrades. (R5DC Proposal)

There are two ways of looking at it. From a commercial industrial perspective, if you have a large solar farm that actually provides power directly to the grid, it can then be a direct source of renewable energy power to the utility. That electron replaces electrons that might otherwise be generated through nuclear or coal or some other source. So it helps reduce the utilities options for power from nonrenewable sources. If it is a net metering, or connected directly to the customer, such as in the case of Region Five, it is reducing that's customers' need to get power from the grid. Therefore you do not have to put investment into replacing the generator that is going to produce the power for that customer's needs. **So when it comes to long-term planning, a utility may decide that they do not have to build as big of power plant because you have distributed generation producing that power.** There are a number of policy challenges surrounding distributed power so that things are not overbuilt; but, that is potentially part of the benefit. (Mark Ritter, Former RDF Grant Administrator)

**Meet market demand.** Two energy experts and two representatives from utilities who participated in this project reported that there is increasing demand by customers for alternative energy sources. Therefore, the Region Five Solar Schools project demonstrates ways these utilities have worked with their customers to meet their needs.

[In what ways will your utility benefit from this project?] **We want to be available for whatever it is that our members need. Whether they need help with their electrical needs or if they want to have renewable energy.** It all comes down to making sure that our members get what they want and do it the right way and that we guide them through that process. It is part of what I do, day in and day out, especially now that solar is getting much more popular. I would really say that this work is because of our investment in our members. We want to make sure that they have the right information and are doing things the right way. (Allison Uselman, Todd Wadena Electric Cooperative)

[Are there any public relationships benefits to MN Power by being a part of this project?] **I believe there is. Solar and schools is always a very positive image. It is good thing to pursue. I think also from the standpoint that we worked hard to be amenable to the project – to work with this group – to get this project through – that also helps. We are not trying to throw up road blocks. We are generally for new technologies and clean energy as we have demonstrated throughout the company's history. It remains an example of how we will continue to work with our customers for the opportunities that they want to pursue.** (Paul Helstrom, MN Power)

**Ways solar energy defers capital costs for grid upgrades.** The solar energy adds to the distributed energy mix. One way it defers capital costs for utilities for grid upgrades is that it reduces the need to build more peaker plants needed to serve just a few hours of peak demand. In addition, for MN Power, Brainerd Public Utilities, and Todd Wadena Electric Cooperative solar was installed without being paid for by their companies; thereby, their rate payers. Another perspective is that the model demonstrates how some of the capacity for renewable energy can get built with capital resources that do not come from the utilities, therefore from their rate payers, for capital upgrades.

*But I do think the project demonstrates how some of this capacity for renewable energy can get built with capital resources that are not the utilities' resources; so, it shows how a utility can leverage the investment of private capital that came from NEE – and from the grant fund, from Xcel. Therefore it saved the utilities' capital resources for other projects. (Michael Krause, Kandiyo Consulting)*

**The rate payers are getting a certain amount of energy and the capital cost of the system – not a single dollar of it came from the Minnesota Power, Brainerd Public Utilities or Todd Wadena Electric Cooperative rate payers. (Michael Krause, Kandiyo Consulting)**

*There is a global answer to that and a local answer. **Globally Distributed Generation Assets, which basically means, electrical generating facilities that are distributed around an electric grid. Distributed generation is academically proven to be useful to the electric utilities in that it helps the entire distribution grid wrestle with peak loading. Oftentimes utilities during times of high use they have to turn on peaker plants. Throughout the electric grid in the United States there are peaker plants that are basically on call they are ready to turn on at a moment's notice to handle the additional consumption. The more solar we put into the electric grid the less likely those peaker plants will have to turn on. So of course the benefits are environmental in that these natural gas peaker plants or oil peaker plants don't have to turn on at a moment's notice which eliminated the greenhouse gas emissions. It also creates resiliency for the distribution grid. A lot of the US electric grid is very antiquated and so it is very helpful to minimize the load on the electric grid. Also the 3 investor owned utilities in Minnesota are mandated to have a certain percentage of their total generation from solar. But they have solar energy aspirations, some of which are mandated, some of which are part of their own business plan. It certainly supports the utilities that have solar energy aspirations in their business plan or in their compliance plan. All the utilities have to submit an integrated resource plan to the Minnesota Public Utilities Commission – being able to refer to these projects, I think, is certainly beneficial both politically and in terms of their compliance. (Jason Edens, RREAL)***

*Exactly, it reduces the need to build more peaker plants or to maintain that peaker capacity. (Mark Ritter, Former RDF Grant Administrator)*

**Xcel Energy.** Those interviewed reported a number of ways that Xcel Energy will benefit from the Region Five Solar Schools project. These included continuing to reinforce Xcel Energy as a leader in renewable energies. It was also believed that Xcel Energy would benefit from the lessons learned from the Region Five Solar Schools Project. A few illustrative quotes to follow:

**To what extent did the Region Five Solar Schools Project increase visibility and positive exposure of Xcel in this region where Xcel has less of a market presence?**

*I think that will occur over time as the systems are built and people become familiar with them and they learn the history of how they came about. It certainly does give them some visibility in that. ... **I think the broader point you were making in the questions you sent me, is NPP pushing other utilities to be more active. I really think that that is the case. Xcel has been the leader, truly a national leader, in renewable energy in wind and it has become a leader with solar as well. They have a number of programs they are using that other utilities do not. I think it is getting a little bit harder for those utilities to say we are not going to do something with solar. A lot is being rate payer driven. The customers are insisting. They live in an area where their friends are being served by Xcel and saying, "My friend was able to do this great project, why can't I?" (Michael Krause, Kandiyo Consulting)***

*This project has already received a lot of press both locally, statewide, and nationally. Just today there was a national article in Solar Power World. There was also an article today in Market Insider. (Jason Edens, RREAL)*

**The focus isn't only on Xcel Energy. The focus is to serve as a means to integrate and develop renewable energy in the State of Minnesota. The Renewable Development Fund is established through state legislature and has a state-wide focus. Although only one utility, Xcel Energy, provides the funding. That is also why, even though Region Five is not in the Xcel Energy service area, they qualified for a grant award. Directly, the project benefits Xcel Energy through Renewable Energy Credits. Any RECs that are derived or obtained or created from the project are transferred to Xcel Energy. The terms of contract are that Region Five will give any conservation credits or RECs to Xcel Energy. [So did I understand correctly that one of the purposes of the RDF was to expand renewable energy throughout the state of Minnesota?] That is correct. That is where indirectly, since Xcel Energy provides energy to approximately 60% of the citizens of Minnesota, **any lessons learned from the Region Five can be of benefit to Xcel Energy's rate payers. So there is a value there. Any lessons learned regarding development, contracting, installation, or interconnection problems might be helpful to Xcel Energy. (Mark Ritter, Former RDF Grants Administrator)****

## ENVIRONMENTAL BENEFITS

**Decrease of carbon foot print by utilization of local contractors and equipment/materials that reduce long-distance transportation of said items.** The project also decreased the carbon footprint by purchasing solar arrays that were produced in Mount Iron, Minnesota. The shorter the supply chain the lower the carbon footprint and the lower the energy return on investment.

**Offset of carbon dioxide from systems.** RREAL, using the Minnesota Power's specific generation mix, from their integrated resource plan which is a public document they must submit to Minnesota Public Utilities Commission, calculated that on an **annual basis the system is preventing approximately 1,167 tons of carbon being emitted into the environment.** According to data from the EPA (Environmental Protection Agency), the EIA (Energy Information Administration) and Minnesota Power This translates into **29,171 tons of carbon dioxide over the life span of the system (25 years). The shorter the supply chain the lower the carbon footprint. So ever since we started our business in 2000, we have gone to great lengths to shorten our supply chain. But not only does that lead to a smaller carbon footprint, it also usually leads to greater efficiencies, lower costs, a more expeditious process and it recirculates those dollars locally – it builds the**

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**solar workforce** – there are so many qualitative and quantitative benefits it is hard to know where to start and stop – but it is very important to us to do our part to grow the Minnesota Solar Energy Manufacturing capacity and workforce capacity. The vast majority of solar modules are, not surprisingly, made in China – or in Southeast Asian in a Chinese company. So for us the priority is that the solar energy industry can provide benefit in our community, shorten our supply chain, decrease the carbon footprint associated with our work. (Jason Edens, RREAL)

**A priority for us is to decrease what is called the energy return on investment.** Not just the financial return on investment – it is an energy return on investment – because in the manufacturing of any kind of energy generating component there are what is called “embedded energy.” **So if closer to home the gear is made the lower the energy return on investment.** Typically the energy return on investment for a solar panel at the panel level is considered to be about 1 year. So it takes 1 year of generation for that component to compensate for the energy that was put into its manufacture. So in year 2 it has already overcome that embedded energy – it is not encumbered thereafter. That is another advantage of using a Minnesota products. The energy return on investments is lower because it is a shorter distance for the supply to get to the installation site. (Jason Edens, RREAL)

## ORGANIZATIONAL BENEFITS: BENEFITS FOR R5DC

Although R5DC may not take on becoming a solar energy developer, the Solar Schools Project has identified for R5DC ways to continue to be engaged in promoting renewable energy. According to Cheryal Hills, Executive Director, *I have seen some successes for our schools that are gratifying. To be able to serve them, in a way that we have not been able to in the past, creates relevancy of R5DC in our organization.* The Executive Director and Commissioners also saw that Region Five benefited from this project by developing intellectual and political capital. Although Region Five may not expand its work as a project developer, they will be committed to working in their core competency areas of workforce development and continue to support renewable energy in order to honor the mandate by the citizens of the five county region.

*Not only did [Region Five] benefit, monetarily because they received an administrative fee out of the project, but Region Five’s mission is to do work that benefits the community. This was a chance, because of the grant that Xcel had, to put in solar arrays and coordinate that with STEAM [Science, Technology, Engineering, Art and Math] schools. It has a huge benefit to the schools in our area.* (Tom Lillehei, R5DC Commissioner)

**This project impacted us on several levels. One was the individual and intellectual knowledge assets that we have built are beyond what we initially thought would transpire. The learning was exponential, which is an internal asset to the organization. Externally, an asset that has been developed are all of new relationships – thus, we have built some capital around our organizational relationships.** *I am talking about relationships with folks at Xcel Energy, the Public Utilities Commission, certainly with foundations that are invested in climate change and climate action projects and activities, such as the McKnight Foundation, our investors at NEE and more. The social and political capital that we have been able to earn as a result of being engaged in this project have had a positive impact. I am not sure that there will be a financial asset built to this organization because of this project. The \$100,000 developer fee probably has been absorbed multitude of times since 2012 when we began this work. Since that time, the time invested in the hundreds and hundreds and hundreds of hours of meetings, weekly calls, and fiscal administration – If we are looking at only a fee-for-service financial return on the developer fee, I’d have to say that this project has not been seen as a profit for R5DC. Hopefully the project has identified R5DC as a change-maker or an organization that has the courage to inter into projects in which we don’t have a depth of knowledge but do have a depth of relationships with people who do have the knowledge or that we are resourceful enough to build the necessary relationships.* (Cheryal Hills, R5DC)

## TEACHING/LEARNING & EDUCATIONAL BENEFITS

**Integration of solar production and system deployment to K-12 STEAM curriculum.** Students and the general public at Pequot Lakes are able to see in real time what is being produced by the solar arrays. In addition, proposals have been written to a number of Science, Technology, Engineering, Arts, and Math (STEAM) funders to continue to support future educational opportunities. These proposals include Kiosks, Solar Curriculum toolkits, in-service day for teacher workshops, and summer interns to assist with project outreach and Kiosk programming needs. Project staff at RREAL are already working with teachers to help them understand how integration of solar education into their curricula can help them achieve Minnesota Department of Education Learning Standards.

According to Superintendent Lindholm and Superintendent Endicott, the education benefits are an important reason for participating in the solar schools project. Michael Krause reported that utilities are also interested and aware of some of the ways that these solar demonstration sites help build the workforce pipeline. Paul Helstrom from MN Power reported that one of the reasons the company was interested in the project was because of the educational component.

[In what ways does Minnesota Power benefited from the Solar Schools Project?] **As our customers benefit, we benefit. There is not a lot of direct benefit of the project to MN Power from a business standpoint. However, as far as more renewables in our service territory, in particular at schools, there is a good opportunity for education and awareness about these new technologies as they become more prevalent in the energy mix.** *One of the reasons we remain interested is because there are opportunities for education and research. Throughout the process of working with Cheryal and the team, they have talked about developing more directed curriculum and education opportunities in the schools. So that is one of the areas in which we remain very interested.* (Paul Helstrom, MN Power)

**Higher ED and workforce development boards develop strategies to assist the local renewable energy economy.** The project also had educational benefit for Central Lakes College. According to Kari Christiansen, Vice President of Administrative Services at Central Lakes College *I think there are many reasons as to why it has been important for us to be involved in this project ... In terms of the future, having this allowed us to start conversations about having a solar construction program here at the College.*

The project also provided an opportunity to consider in a deeper way how to build better career pathways for high school students who become interested in pursuing solar energy careers. During the EnSearch, Inc. interview, Michael Krause, an energy expert, lamented that, *what is still missing from that picture – and if am finding this with other schools I have worked with – is that you have these programs at the schools and the students get really excited and interested in STEAM. They also get interested in solar and renewable energy and clean energy systems as a possible career path and we have not done good enough job, not much at all, frankly, in creating some career paths so we can answer that junior or senior in high school who is interested and says, “What can I do next if I want to pursue a clean energy, renewable energy, smart grid as a career option? What is next?”*

Cheryal Hills has been considering a number of options to address the need to build better career pathways: 1) partnering more intentionally with MinnState’s/CLC’s Ag and Energy Center, 2) having workforce centers partners such as Rural MN CEP provide training in the energy sector, and 3) continuing to help the regions career planning advisors, located in all the regional schools because of Sourcewell funding, learn about the benefits of the energy sector.

## IV. LESSONS LEARNED

Lessons learned come from a number of sources. A series of interview questions were created to explore in a deep and meaningful way the lessons learned. These questions included: What factors promoted success? What factors limited success? If you were responsible for teaching others about how to create and operate a successful solar projects – what would you teach them? During the interview the interviewee would often, at times, mention in their statements or closing statements, “That is a lesson learned.” Another source of lessons learned came from the monthly reports and review of the various newspaper articles written on this project. (See Attachment G for additional perspectives.)

### FACTORS/ELEMENTS THAT PROMOTED PROJECT SUCCESS

There are a number of heroes who made it possible to install 1,494.72 kilowatt of photovoltaic (PV) capacity at six different sites at the public schools of Pine Review Backus and Pequot Lakes and four sites at Central Lakes College (CLC) campuses in Brainerd and Staples campuses. First, Xcel Energy, the staff and the ratepayers through the investment of \$2 million. The time and devotion the project staff, especially Cheryal Hills, Jason Edens, and BJ Allen who jumped over countless unforeseen hurdles and addressed many more “hiccups”. New Equity Energy, LLC (NEE), who came to believe in the project, stuck with the project through the numerous ups and downs and invested \$3,508,550.00 and human talent to make the project possible. The school leadership who saw beyond the potential energy savings and saw a much bigger possibility of giving remote rural youth an opportunity to see how the sun may give them a career path to a much brighter future. Heliene solar panel producer – who at a time there was skyrocketing demand for their made-in-Minnesota product saw to it that the R5DC Solar Schools Project was the first in-line to get the product they needed. The responsive and helpful local utility staff at Minnesota Power, Brainerd Public Utilities, and Todd Wadena Electric Cooperative. Sourcewell’s commitment of lawyer expertise for R5DC. The skills of the other lawyers at the table who negotiated the complex 20-25 year contracts. The absorption of all legal fees for RREAL and the school districts by the project budget. The construction staff at RREAL who were dogged in their devotion to the vision and worked through the Polar Vortex (with minus 40 degrees and 30 mph winds; one of the most severe winters on record) and endured physical hardship to make construction deadlines. Region Five Development Commission, and their Executive Director, Cheryal Lee Hills who persevered and used their extensive network of connections to make this project possible. And last, but not least, the vision of using clean, renewable solar energy as a way to protect the environment and to serve as an economic driver in five of the poorest counties in the state of Minnesota. A few illustrative quotes follow, as these interviewees responded to the question:

#### What factors promoted project success?

*During the initial contract negotiations with Xcel we included one of the region’s school districts. The day after the school board meeting where they formally withdrew, I saw Keith Olander and he asked, “How are you Cheryal?” and I told him that I think the project is dead again. He said, “We want in!” I said, “Are you sure?” and he said, “Absolutely!” **He got ahold of Kari Christiansen (Vice President of Administrative Services, Central Lakes College) and Hara Charlier (President, CLC) and they championed this through in the beginning, and when the project hit MinnStates desk it was Greg Ewig who carried the water.** And it was not easy, in part, because the agreements had to go through the Attorney General. The attorney for MinnState/CLC is the Attorney General. And I, as R5DC, had to sign a Joint Powers Agreement with MinnState. I am glad I did. It was the right decision. It was the first for any Regional Development Commission to do. We had to guarantee that they would never pay more for their solar power than they would for conventional energy. **I give so much credit to Kari Christiansen and Greg Ewig.** This is the largest solar installation at a Minnesota State facility. It is very exciting. There is a lot of interest in solar energy by the MinnState system, but there are very few systems in place. (Cheryal Hills, R5DC)*

*Without **the RDF grant and the availability of that funding**, this project never even gets considered. Therefore, that is a consideration as well. Xcel Energy’s willingness to participate. The other factors too are you needed to have that **client support, you needed to have the schools, the superintendents, and school boards – willing to wait this out.** This required a tremendous amount of patience, a tremendous amount of time, a lot of education to make sure that they understood what they were doing. All those factors needed to be there. You needed to have willing partners. You had willing partners but they also needed to have patience and perseverance. (Dan Listug, Sourcewell)*

***The utilities being able to work with us even though they had not done many solar projects before was important.** BJ was the main point of contact with the utilities, and the utility staff were really willing to work with her which is always extremely important for a project to be successful. The schools were easy to work with too. BJ and I were constantly able to bounce ideas of each other – both of us are very experienced in the solar industry so as issues came up we brainstormed together and figured out how to get around them. I think we did that efficiently. (Kevin Corcoran, NEE)*

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*Relationships – I know that Cheryal/Region Five has a really good relationship with Pequot Lakes School District, the Superintendent there which helped promote success. Cheryal also has great relationships with Central Lakes College, so when Little Falls School District fell through we were able to shift to CLC in part due to the regional relationships she had with CLC. Her commitment to supporting the region and supporting regional jobs and keeping as many of the dollars recirculating in central Minnesota to the extent possible is a success factor. We had to go outside of the region for the GeoTech work – I could not find anyone in our region to do that work. But by and large all of this work has been done by regional subcontractors of RREAL which is pretty cool. That is a significant amount of money that is staying in Central Minnesota. (BJ Allen, RREAL)*

**[Additional insights?] The utilities were all really great to work with.** *Xcel doesn't think about that that much because they have a very codified process for interconnection. But in greater Minnesota many of the utilities do not have such a clear and codified process all the way from submitting your application to interconnect through testing. But for this project all the utilities were really great to work with. Over the past ten years the process of working with utilities in Northern Minnesota has become more standardized. (BJ Allen, RREAL)*

**NEE started and [even with] just some of the hiccups along the way, they hung in there.** *Obviously they were committed to this project. They need some accolades as well for staying in there and seeing the project through to completion. One of the things that made it so attractive to several of the investors was that it looks good on their corporate report. We are supplying money to do this school project. School Project would be in bold letters. They get a lot of PR out of that. The fact that it is a very green product as far as being environmentally neutral. You put up the solar arrays and get electricity out of it. There is virtually no carbon emissions. From an environmental standpoint, it was a great thing to do. A lot of the schools recognized that. The company that was doing the engineering on it, which is RREAL, they had a very good reputation for doing these kinds of projects. (Tom Lillehei, R5DC Commissioner)*

*The primary factor that promoted success was stick-to-it-ness, tenacity, gumption. If either Cheryal or I had given up this project would not have come fruition in my opinion. We were just not willing to let this project die. There were many times when it probably could have – but then one or the other continued to carry the water. We just had faith that eventually we could bring this project to the region. I think that was partially motivated by the fact that the RDF had agreed to support this project to the tune of almost \$2 million. So we could not let that opportunity not be brought to the region. So we were very committed to making sure that that opportunity was brought to the region. Once we got to the point where we were signing contracts then it was the skill set of everyone involved – from our electricians, to BJ as the project manager, Cheryal and her skills – but to bring it to the point where it was a green light – that was just that we were not willing to forego this opportunity provided by the Renewable Development Fund. Persistence! (Jason Edens, RREAL)*

**R5DC Role was Critical to Success.** Throughout the interviews Cheryal Hills, as Executive Director, and the network provided by the regional development commission were identified as a critical and essential success factor. The comment by Chris Lindhom, Superintendent of Pequot Lakes, reflected so many others: *None of this would have happened without Region Five.* Other responses regarding R5DC's role follow:

### **What role, if any, did R5DC play in promoting or limiting the success of this project?**

**Cheryal did a fantastic job of blending key parties who had not worked together before and translating the goals and desires of the contractors, the schools that were purchasing the electricity, and my company New Energy Equity.** *When you get that many large groups in the same room, you have to be very careful and precise with coordination to make sure that the project is completed successfully and on time. Region Five Development Commission was the reason the transaction got off the ground and she was the leader in navigating those speed bumps along the way. They were able to provide a project that has maximized the economic benefit that could have been provided locally through using local contractors as well as negotiating great power purchase agreements for the schools to where they will benefit from the electricity cost and budgetary benefits for many years to come. I can't speak highly enough about Cheryal and her team and the role they played in completing the transaction. (Matthew Hankey, NEE)*

*I have to give credit to Cheryal Hills and her network of relationships and her communication style, in particular. I came in in early 2016. This project had already been on the drawing board for a couple of years before that. She was able to maintain support from Pine River and Pequot throughout. Some others came and went as the project waned – when it looked like the project wasn't going to go; but then was a go – and their interest diverged at that point. Therefore you really needed to have that central figure who was willing to shoulder the burden of communication, do the due diligence and project development and make it as easy as possible for those participating districts to remain in the project. To take as much of that burden away from the schools as possible. So therefore the schools then only had to determine if the project made financial sense for them to do. (Dan Listug, Sourcewel)*

**In no small part, and this is not puffery, I think R5DC was the connective tissue for all of this.** (Greg Ewig, MinnState)

**Relationships were critical to success.** We probed more deeply to the degree to which relationships played a role in the success of the project. There were times, because of different philosophies, cultures, values, needs, and goals that the relationships experienced strain. In another case, the relationship developed between RREAL and Heliene enabled the project to get the needed solar panels at a time when there was skyrocketing demand because of tariffs placed on arrays manufactured outside the United States.

*Good open communication and willingness to sit down together and talk through anything that was difficult that came up. So we made several trips from Maryland to Minnesota to be in the same room with folks. We find that to be very important because it doesn't work to do everything over the phone. Sitting down with people and really listening to one another is critical for getting these projects done. The various partners were very good at that. (John Langhus, NEE)*

*The main lesson learned is that relationships do matter. There were times when this work got contentious and peoples' values conflicted and organizations found it hard to sometimes manage in the ways that this project required for us to be successful – collaboratively. At the end of the day, does everyone love each other? No. At the end of the day do we have an amazing project we can all be proud of? Yes! Hopefully we, at Region Five, played a role in making sure that those relationships maintained intact long enough to get through the project and some will be sustained beyond the project. (Cheryl Hills, R5DC)*

## FACTORS/ELEMENTS THAT LIMITED PROJECT SUCCESS

So many factors, all beyond the control of the project staff, extended the timeline for this project. These included that the proposal was submitted in April of 2013, was put on the reserved RDF project list on July 29, 2013, but then did not receive notice until December 21, 2015 that the Region Five Solar Schools grant award was approved. It then took until April 25, 2018 for all the due diligence to be completed. During the nearly 60 months between the time that the proposal was submitted and the due diligence was completed:

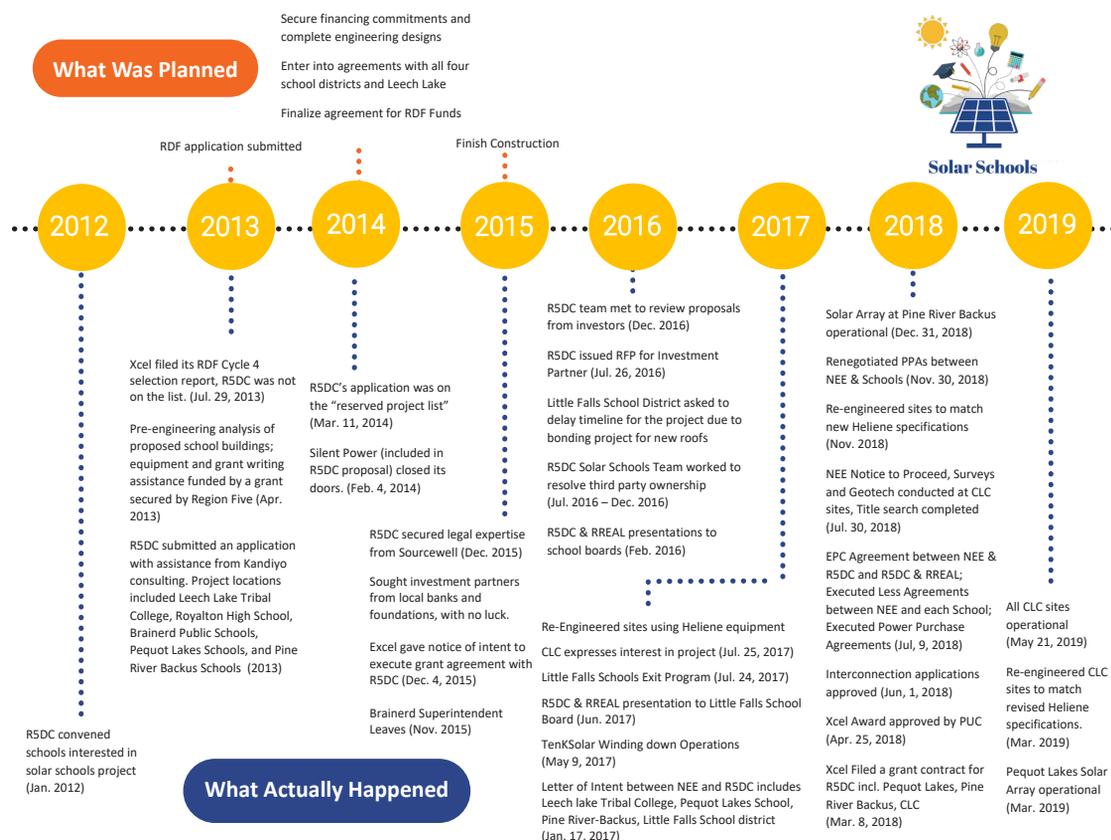
- Investors and schools who were willing to sign on then backed out at the last minute.
- The original solar manufacturer discontinued their operations out at the 11<sup>th</sup> hour when construction was ready to begin meant that all the site engineering had to be redone.

In addition, other elements that extended the timeline included:

- The lack of understanding by sites of the complicated financing arrangement –tax equity financing model.
- Working with a regulated entity which necessitated proposal elements, such as third party financing, had to be approved by the Public Utilities Commission.
- Being limited to 40 kilowatts at some sites lessened the economic savings of the solar production.
- Headwind from anti-solar advocates caused one of the original school districts to pull out of the project.
- There were different needs, values, goals, and assumptions which necessitated extensive legal negotiations.
- The polar vortex/one of the worst winters in Northern Minnesota on record occurred during the construction.

One interviewee stated that the number of barriers the project had to overcome was almost comical. The number of barriers is also why this project was referred to as the solar coaster. It was quite a ride and many times project staff bounced between a “go” and “no go” and “go” and “no go” reality – but in the end, they were able to overcome all the hurdles placed in their way and in May 2019 the last of the six sites successfully completed the anti-islanding test and was commissioned.

A more complete accounting of the factors that limited success may be found in Attachment G. View online: [www.regionfive.org/solar-schools](http://www.regionfive.org/solar-schools)



A FEW ILLUSTRATIVE QUOTES FOLLOW; THESE INTERVIEWEES WERE RESPONDING TO THE QUESTION:  
**WHAT FACTORS OR ELEMENTS LIMITED SUCCESS?**

*One of the factors that I have already mentioned was that the **Region Five proposal was on the reserved project list**. We learned in prior cycles that some projects don't move forward so it was important to have a reserved project list. **It was almost two years between when Region Five received notice that they had been approved for a grant and funds became available. That is a long time.** Yet the Region Five board of directors still felt it was an important project. **They were able to overcome the challenges of actually implementing the project much later than when the proposed costs and key elements were developed.** Another challenge with this project is **working with a regulated entity such as Xcel Energy. There were a lot more steps and processes that had to go through regulatory review with the [Public Utilities] Commission that would not be typical from a non-regulated funder.** (Mark Ritter, Former RDF Grant Administrator)*

***One factor is just the nature of the costs.** Solar has become more cost effective. But without the ability to monetize the existing federal tax credits through the investment tax credit that the US Congress passed through the use of a private sector financier such as NEE – **without that 30% the financing costs are still is extremely challenging for public school districts.** That added another layer of complexity to bring in that private sector ability to monetize those tax credits. Because these are school districts; they are public entities; they don't pay taxes. Therefore in order to get that advantage it added a number of layers of complexity [to the project]. (Dan Listug, Sourcewell)*

***One of the big factors here you had a grant from one utility in other utility territories.** So there was a degree of trying to understand, "What is this?" **and a questioning of why is Xcel Energy money being spent in another utility service territory?** That led to more explaining that needed to be done to help the utilities understand how this works. The requirements regarding where **the renewable energy credits (RECs) go**, who they belong to, was another factor that influenced the project. You also have these technical factors as well. **You have all these bodies of approvers.** You have to have approval from a myriad of groups – from school boards, to financiers, to utilities, etc., while trying to meet the requirements of this grant program. Also you have the unknowns going into it. **You do not know if the building is going to support it. I know they ran into some of those things where they had to relocate some of the arrays. So there were a number of technical factors as well that extended the timelines.** (Paul Helstrom, MN Power)*

*You triggered my memory into one of the bigger hurdles, and it is something, quite frankly that the **RDF needs to see in this report. Their standard grant contract is a rigid document.** They tried to have a one-size-fits all contract that they could execute with any grant recipient. One of the significant issues that has been worked around with the PUC and RDF process now – they initially did not want third party ownership of these systems. The original goal was to have public entities applying for these grant dollars. They public entities would then use the grant dollars to purchase their solar arrays and reduce their energy costs. I alluded to the investment tax credit earlier, that lack ability to have third party ownership significantly limited the ability to monetize those tax credits for public entities. This worked out in the end. This worked out in this project because Xcel and RDF and the PUC have done this several times where they have added special conditions to the agreement. To make sure that their concerns are met, that the public entities are really the ones who are taking advantage of these grant dollars, not an investor. They did that through the addition of several special conditions to the standard grant contract. As we look at economies and things to learn, the intent was true in having one standard agreement to make it plug and play for different entities. The reality is that that probably caused more problems than it solved. It needs to be looked at that they consider a more flexible contract process, a more flexible grant process in the future. [Was it specifically around **third party ownership** or was there some other aspect of that contract that needs to be addressed?] That was the primary impact. It doesn't necessarily exclude third party ownership. But the way the contract was structured it only presumed that the public entity would be the one contracting directly with a solar manufacture and solar entity. It didn't contemplate factoring in that solar investment tax credit option – which is a 30% value to the investors. That is a significant amount of money that they can bring to the table to deliver further savings to the public entity. (Dan Listug, Sourcewell)*

***Polar Vortex!** I cannot believe what our installation team had to work through! I am so grateful for their ability to work through those conditions. They shoveled gazillions and trillions of pounds of snow in order to make this project happen. I have to call out the polar vortex because it was a historic winter! (Jason Edens, RREAL)*

*[Interviewer and BJ talked about the **anti-island testing**.] It turned out that it was on the utility end. It wasn't anything on the inverter side. The project has been under a lot of change for so many different reasons. **One of our challenges too is that solar is such a political hot button topic.** We just heard from suppliers today that the tariffs are starting to drive up prices on our inverters. So the inverters that we installed at Pine River-Backus are going to go up 15% by quarter three. **It is very hard to deal with the constant changes in the solar industry.** (BJ Allen, RREAL)*

*In terms of our technical project success we passed all our performance tests on the first try. The financier stated, "We never have people passing performance on the first try." It is all, technically, has been really positive. (BJ Allen, RREAL)*

*Several – I wish I would have kept a list, but there were too many. I think there were a number of times when we had to have an internal discussion – is this feasible anymore? Does this still make sense? **Certainly the panel manufacturing going out of business was a significant hurdle.** Also, when we identified **NEE as our preferred finance partner we entered into a letter of intent with them. That had a term on it. That term came and went. We were still viewing each other as viable partners after that term expired.** When it finally looked like we had a solid enough information to **submit the grant documents with RDF that started another clock.** And then there were some **significant issues in terms of executing the EPC contract** and the way we had to structure that contract as a back to back agreement. In NEE hiring Region Five and Region Five hiring RREAL to make it work. That was a challenge as well. **Then you got to the realities of meeting NEE calendar year obligations in regard to certain tax credits and that having significant cost impact if they were able to deliver more kilowatts before the end of the last calendar year then they would have received a better tax benefit and could have passed the savings onto the schools.** We had to **make sure that the contractor RREAL was able to absorb the consequences,** and everybody had to agree that it made financial*

sense for them to meet the current construction schedules. So there are numerous examples, those are the big ones. (Dan Listug, Sourcewell)

*The only thing I haven't remarked about – I think it wasn't really a limitation but it has been a challenge – is the business structure that the energy company financing has used for this project. That has been a challenge because they changed their LLC structure a few times. This may be standard practice; however, generally when we enter into an agreement, we enter into an agreement with a specific party. So changing the company structure, from a public sector viewpoint, was a little bit disconcerting at times. That is one of the things we had a little bit of a challenge with and I don't know if the school districts share that. Generally the other party [NEE] have been very willing to negotiate with issues that we have raised. (Greg Ewig, MinnState)*

*In Minnesota, obviously, you always have the weather to contend with. The contract discussions took us a little late into the building season which then meant that we had to pause on some of the pieces during the deepest part of the winter. So that is always a bit of a schedule game in Northern Minnesota. (John Langhus, NEE)*

**The impact of having project financing from an out-of-state versus local financial partner.** Although NEE is headquartered in Maryland, they have and plan to continue to invest in solar in the State of Minnesota. During the interview with Dr. Stacey Stockdill, Matt Hankey, Owner/CEO, NEE described NEE's interest in this project:

***While we are technically out of state** in that we are headquartered in Annapolis, Maryland, my entire team spends a tremendous amount of time in Minnesota. **We have completed over 100 megawatts of installations in the state and we plan to be involved for many years to come.** This project is just under 1.5 megawatts – so that gives you a scale of comparison.*

***The largest economic benefit of these projects** is not the financing that goes into them, which is rather immaterial. **It is more the construction jobs, operation and maintenance jobs, and savings/financial benefits that the schools get.** One of the **largest financial impacts is the jobs created and kept by RREAL as well as their subcontractors during the heavy construction periods late last year and early this year.** That is when we have the most folks working, we are paying the most salaries and supporting the most individuals locally. **The second significant financial impact is going onward for the entire term of the project, we will have an operations and maintenance contract for a local individual to maintain the project.** This individual will work on the project when things break as well as semi-annually to do maintained checks on the system. Not unlike if you take your car in for service. They are doing a detailed maintenance checklist to make sure the system is providing the electricity that is expected both by the schools as well as our investors on our end.*

***The third significant financial impact is the financial savings and budgetary impacts for the school.** The solar industry is a very competitive industry, therefore the return on investment is driven by the amount of savings that the schools are able to achieve, which is significant in this case. Most of that financial benefit actually goes back to the schools over time in terms of both electricity savings from the array as well as the ability to budget that portion of the electricity for 20 to 25 years. The solar installation will provide them a fixed electricity rate for electricity produced by the project in a relatively uncertain electricity cost environment.*

**Complex Contracting Required for CLC sites.** Central Lakes College is part of the Minnesota State Colleges and University System (MinnState) and as such is classified as a state agency. This meant that there were different rules and procedures. We were asked to document the complex contracting requirements to do the project at CLC.

**Joint Powers Agreement. For CLC to participate a Joint Powers Agreement between Region Five Development Commission and MinnState/CLC had to be created:** *[The State] wanted to minimize the risk – that they would not be locked into an agreement where they might have to pay more for the solar generated energy than they could on the open market. That is where Region Five took on some burden and some slight risk in terms of indemnify them in that regard. It was a formalization of the role Region Five played between Central Lakes and NEE. (Dan Listug, Sourcewell)*

*There was a team here at CLC – our facilities director was very involved, our maintenance staff on each of the campuses, the Director of the Ag and Energy Center, and our Executive Team. **There was a CLC component in terms of identifying locations at our 4 sites. And like our K-12 school partners, we also had to do the testing and work through the logistics.** I was also working with the Director of Capital Development for Minnesota State and the Attorney General's office to review all the leases, the interconnection agreements, and other legal agreements along the way. **As we received documents, we needed to make sure that they were reviewed and approved by the CLC team, Minnesota State, and the State of Minnesota's Attorney General.** (Kari Christiansen, CLC)*

## **ADVICE TO OTHERS: IF YOU WERE RESPONSIBLE FOR TEACHING OTHERS ...**

We are providing a more extensive and in-depth presentation of the lessons learned. This is because we learned that one of the reasons the R5DC project was funded was because an evaluation documenting the lessons learned was included in the proposal as a critical element of the project. We are highlighting the advice of a few in the following. See Attachment G for additional perspectives.

## IF YOU WERE RESPONSIBLE FOR TEACHING OTHERS HOW TO CREATE AND OPERATE A SUCCESSFUL SOLAR PROJECT, WHAT WOULD YOU TEACH THEM? (MAKE SURE AND DO A, B, AND C! WATCH OUT FOR X, Y, Z).

*Being a novice in the space of renewables was sometimes a detriment to the bottom line, in other times it was an asset. Because I didn't know what was possible and what wasn't. So I kept saying, "Can we do this?" and "Can we do that?" and "Can we go through this window?" "Can we go through that door?" "Can we travel that road for a while?" People would laugh at me and say, "We never thought of that!" But I didn't know that it hadn't been done before. So I think the being a novice that I stated earlier about being a factor that limited our ability to be cost effective – it also allowed us to think differently because it was a voice that had never been at the table. So to that degree that was fun. And it made the ride fun because we got to be innovative. (Cheryal Hills, R5DC)*

*I will stick to my subject area expertise which is in the legal area. It is always best to set expectations ahead of time in terms of what obligations the organization may have. Obviously you want to have the vision and you want to be able to work toward promoting solar energy if you can put more money into the classrooms that is great. But you also have to recognize that there might be some investment on the front end and you need to realize how the structure of this market works. A little basic level of telling you that you might be looking at a 20 to 30 year lease. You might be looking at a 20 to 30 year Power Purchase Agreement. Just to get that initial shock out of the way. Because that is a long term agreement and that is not the type of agreement that school districts and school boards routinely [deal with]. Therefore, managing expectations and having clients know what the potential risk are at the outset is helpful. You always want to balance that against the potential benefits of the project; but, I would focus on that. Make sure that that is a small piece when you are pitching what the vision is – to know that there is a little bit of work and a little bit of challenge to be addressed. That helps identify solid partners in the beginning. (Dan Listug, Sourcewell)*

*It is counter intuitive, in that from a business perspective you want as few pieces as possible. One stop where one person or one organization gets to make all the decisions. The conversations are streamlined and simplified. But that, realistically, doesn't happen much in almost all the projects we have. This project was a little bit more than usual but only in scale rather than in type. We had lots of stakeholders; therefore, recognizing that different stakeholders have different priorities and different needs. I think if you can keep that in the back of your mind then you can have an open discussions that ultimately are successful. If you lose sight of that and you try to make every project like every other project – then those either tend to fail or be very slow or people are not very happy with them at the end. (John Langhus, NEE)*

*Patience. I would teach them a little bit about how electricity is charged and costed. That was a big learning curve for me and it is a key reason why Little Falls dropped out. The threshold of savings for them was so small that when it was calculated on projections they were not going to save any money and in fact might be charged more. So I would teach them about how that works and how to project that out over time so that the decision makers are making a safe bet when moving forward. (Chris Lindholm, Pequot Lakes School District.)*

## V. USEFULNESS OF PROJECT FINDINGS

The Region Five Solar Schools RDF-funded project at Pine River-Backus, Pequot Lakes, and Central Lakes College has resulted in important lessons that will be useful to so many including the State of Minnesota; customers at Xcel Energy, Brainerd Public Power, Minnesota Public Power, and Todd Wadena Electric Cooperative; and the general public.

In addition, colleges and schools in Minnesota as well as throughout the country are beginning to ask about the value of solar energy. A new study by Stanford Research states that solar is an under-tapped resource that could help shrink electricity bills and that taking advantage of all viable space for solar panels could allow schools to meet up to 75% of their electricity needs and reduce the education sector's carbon footprint by as much as 28%. Other benefits were highlighted in an article by Betsy Lillian in her May 7, 2019 article in Solar Industry Magazine<sup>2</sup>.

All of these audiences will be able to learn from the Region Five Solar Schools RDF-funded project today and in the future in these ways:

- Customers and the general public are able to view real time data regarding the solar energy production and environmental benefits at the Pequot Lakes site. Overtime the same data will be available at all five sites.
- The Region Five Solar Schools Project shows how scattered site, multi-site, multi-jurisdiction solar development may be deployed and financed through third party ownership.
- Over time, Region Five Development Commission will be able to document the energy savings and generated and positive environmental and economic impacts from the solar arrays at the five sites.
- A detailed accounting of these lessons learned and the economic impact of this project may be viewed by others in Attachment F and G.

<sup>2</sup> Lillian, B. (May 7, 2019). Stanford Research: Why solar makes sense for schools. *Solar Industry Magazine*. Retrieved from <https://solarindustrymag.com/stanford-research-why-solar-makes-sense-for-schools>

## VI. TECHNICAL PROGRESS

The Solar for Schools project included the installation of 4,152 - 360 Watt PV modules from Heliene, a Minnesota manufacturer. The modules were installed with 19 Solectria inverters and 12 Fronius inverters, and installed on racking systems from 2 different racking manufacturers. The PV modules at the 5 ground-mount systems were installed at a 30-degree tilt, while the roof-mount system was installed at a 10-degree tilt. The PV modules for 4 of the ground-mount systems and the roof-mount system were all installed at an azimuth of 180 degrees, while one of the ground-mount systems was installed at an azimuth of 150 degrees.

The total DC-rated system capacity is 1,494.7 kilowatts. The ground-mount systems have system combiners at the arrays and system disconnects at the points of interconnection. The roof-mount system also has system combiners, as well as a main rapid shutdown initiators located at grade. The revenue-grade data monitoring platform deployed for the two largest systems at Pine River-Backus schools and Pequot Lakes school is manufactured by Also Energy, with publicly accessible data. The data monitoring platform deployed at the Central Lakes College sites is manufactured by Locus Energy, without publicly accessible data. However, both platforms will allow for system monitoring of production separately from onsite energy consumption at each array. Energy storage deployed takes the form of dual-head car charging stations installed at both Pine River-Backus and Pequot Lakes. While the car charging stations are not directly linked to the solar arrays there, solar production can be expected to offset grid power when the solar panels are producing power.

The system was installed by RREAL and subsidiary REAL Solar, a solar design-build firm that was selected due to its location in Region Five, its experience in community education, and involvement in the RDF process from the outset. Financing was provided by New Energy Equity, which has entered into a Power Purchase Agreement with all 3 of the schools, and includes measurement and verification requirements, and annual operation and maintenance of the solar facilities. System mechanical plans were submitted for review to the Department of Labor and Industry (DOLI) as the AHJ for publicly owned property, but the five ground-mount systems were transferred to local jurisdictions by DOLI.

System commissioning began at the largest site, Pine River-Backus in December 2018, and followed with Pequot Lakes in March 2019 and Central Lakes College sites in May 2019. The project installed solar arrays at six sites.



| SOLAR SCHOOL SITES  | PHOTOGRAPHS<br>Credit for Site Photos: Kevin Corcoran, NEE                           |
|---|--|
| <p><b>Central Lakes College – Brainerd campus</b></p> <ul style="list-style-type: none"> <li>✓ Mobilized</li> <li>✓ Module type: Heliene 72M-360 360W modules</li> <li>✓ # modules: 140</li> <li>✓ System DC rating: 50,400W</li> <li>✓ System AC rating: 39.98kW</li> <li>✓ Azimuth: 150 degrees</li> <li>✓ Tilt: 30 degrees</li> <li>✓ Racking: Driven Pile per soil conditions</li> <li>✓ Inverter: Qty. 4 Fronius Symo 10.0-3 208V</li> <li>✓ Data monitoring: Locus</li> <li>✓ System design 100% completed</li> <li>✓ Construction: 100% complete</li> <li>✓ Inspections and interconnection: 100% complete</li> </ul>                            |    |
| <p><b>Central Lakes College – Staples Ag campus</b></p> <ul style="list-style-type: none"> <li>✓ Mobilized</li> <li>✓ Module type: Heliene 72M-360 360W modules</li> <li>✓ # modules: 140</li> <li>✓ System DC rating: 50,400W</li> <li>✓ System AC rating: 39.98kW</li> <li>✓ Azimuth: 180 degrees</li> <li>✓ Tilt: 30 degrees</li> <li>✓ Racking: Driven Pile per soil conditions</li> <li>✓ Inverter: Qty. 4 Fronius Symo 10.0-3 480V</li> <li>✓ Data monitoring: Locus</li> <li>✓ System design: 100% complete</li> <li>✓ Construction: 100% complete</li> <li>✓ Inspections and interconnection: 100% complete</li> </ul>                          |   |
| <p><b>Central Lakes College – Staples Main campus</b></p> <ul style="list-style-type: none"> <li>✓ Mobilized</li> <li>✓ Module type: Heliene 72M-360 360W modules</li> <li>✓ # modules: 504</li> <li>✓ System DC rating: 181,440W</li> <li>✓ System AC rating: 156.0kW</li> <li>✓ Azimuth: 180 degrees</li> <li>✓ Tilt: 30 degrees</li> <li>✓ Racking: Driven Pile per soil conditions</li> <li>✓ Inverter: Qty. 2 Solectria PVI60TL and Qty. 1 Solectria PVI36TL</li> <li>✓ Data monitoring: Locus</li> <li>✓ System design: 100% complete</li> <li>✓ Construction: 100% complete</li> <li>✓ Inspections and interconnection: 100% complete</li> </ul> |  |

Central Lakes College – Staples West campus

- ✓ Mobilized
- ✓ Module type: Heliene 72M-360 360W modules
- ✓ # modules: 140
- ✓ System DC rating: 50,400W
- ✓ System AC rating: 39.98kW
- ✓ Azimuth: 180 degrees
- ✓ Tilt: 30 degrees
- ✓ Racking: Driven pile per soil conditions
- ✓ Inverter: Qty. 4 Fronius Symo 10.0-3 480V
- ✓ Data monitoring: Locus
- ✓ System design: 100% complete
- ✓ Construction: 100% complete
- ✓ Inspections and interconnection: 100% complete



Pequot Lakes School

- ✓ Mobilized
- ✓ Module type: Heliene 72M-360 360W modules
- ✓ # modules: 984
- ✓ System DC rating: 354,2400W
- ✓ System AC rating: 300kW
- ✓ Azimuth: 180 degrees
- ✓ Tilt: 10 degrees
- ✓ Racking: Unirac ballasted RM10
- ✓ Inverters: Qty. 5 Solectria PVI60TL
- ✓ Data monitoring: Also Energy
- ✓ System design: 100% complete
- ✓ Construction: 100% complete
- ✓ Inspections and interconnection: 100% complete



Pine River-Backus School

- ✓ Module type: Heliene 72M-360 360W modules
- ✓ # modules: 2,244
- ✓ System DC rating: 807,840W
- ✓ System AC rating: 660kW
- ✓ Azimuth: 180 degrees
- ✓ Tilt: 30 degrees
- ✓ Racking: Unirac Driven Pile per soil conditions
- ✓ Inverters: Qty. 11 Solectria PVI60TL
- ✓ Data monitoring: Also Energy
- ✓ System design: 100% complete
- ✓ Construction: 100% complete
- ✓ Inspections and interconnection: 100% complete



**"WE'RE LIVING THE FUTURE, RIGHT HERE."**

**JAMES VOLD, R5DC INTERN**

The following is a high-level summary of the technical progress on this project, prior to and including the final execution of the RDF grant contract and commercial operation of the RDF-funded solar facilities.

| Payment Milestone | Description  | Date                            |
|-------------------|--|---------------------------------|
| 1                 | NTP (All Sites) (COMPLETE)   | June 27th, 2018                 |
| 2                 | Mobilization Pine River-Backus   | September 13 <sup>th</sup> 2018 |
| 3                 | Mobilization Pequot Lakes  | October 30 <sup>th</sup> 2018   |
| 4                 | Mobilization Ag Campus   | November 27 <sup>th</sup> 2018  |
| 5                 | Mobilization West Campus   | November 27 <sup>th</sup> 2018  |
| 6                 | Mobilization Main Campus   | November 27 <sup>th</sup> 2018  |
| 7                 | Mobilization Brainerd Campus   | October 31 <sup>st</sup> 2018   |
| 8                 | 100% Equipment on site (Pequot Lakes)  | November 1 <sup>st</sup> 2018   |
| 9                 | 100% Equipment on Site (Pine River-Backus)   | October 1st, 2018               |
| 10                | Guaranteed Substantial Completion Date Pequot Lakes  | December 31st, 2018             |
| 11                | Guaranteed Substantial Completion Date Pine River-Backus   | December 31st, 2018             |
| 12                | Final Payment (Pequot Lakes and Pine River-Backus): Startup, Commissioning, Inspection and Punchlist Complete. Final Acceptance Certificate issued | March 31st, 2019                |
| 13                | 100% Equipment on Site (Remaining Systems)   | March 31st, 2019                |
| 14                | Guaranteed Substantial Completion Date (Remaining Systems)   | May 31st, 2019                  |
| 15                | Final Payment (Remaining Systems): Startup, Commissioning, Inspection and Punchlist Complete. Final Acceptance Certificate issued                  | June 30th, 2019                 |

## CONCLUSIONS & FINAL INSIGHTS

In the end the partners agree that although the journey was difficult they have much of which to be proud. A few offered these additional insights:

**Overall the message is that we, at Minnesota Power, support our customers in working to accommodate new systems and new technologies and learning. We look forward to continuing to work with the schools and RREAL and RSDC on their efforts and maybe even in a more active way. And as the systems go on I think there will be further learning. Does the system perform as expected? What demand savings do we see? Before it wasn't possible to really see the impact a system like this. But, now we have a larger system in a public venue and it will be easier to access the data and use it as a teaching tool.** (Paul Helstrom, MN Power)

**I think having an entity like Region Five that has the bigger picture in mind is super helpful because they see the forest despite the trees. They can see how different options at the micro level can impact the macro level. They can help people achieve their priorities while still all rowing in the same direction toward the regional and statewide goals. It seems like it is a super valuable piece of the puzzle to have working. Of course, that is dependent upon the effectiveness of the people in those roles. Cheryal seems to have a great team there doing that well.** (John Langhus, NEE)

**I would do it again in a heartbeat. This is exactly the kind of work that we want to do – workforce development, integrating solar energy into the curriculum, saving our local school districts money for clean energy, decarbonizing our Minnesota grid, recirculating dollars into our community. This is exactly why we started our company.** (Jason Edens, RREAL)

**It was a pleasure to work with Region Five and Cheryal's team. It is an example of how through perseverance and keeping your eye on what you want to accomplish really helps the project even though it started out with a two year delay. A lot of times companies may not have the stability in their management or their board of directors – so priorities change – so what might have been a priority when you submitted the proposal may have changed.** (Mark Ritter, Former RDF Grant Administrator)

**From my own personal perspective, this is a very challenging but also a very rewarding project. It stretched it out – I don't remember the final hour count – but it was in the hundreds over a number of years. There were a number of challenges. It was very complex, very interesting, and hopefully replicable – but I think there are always better ways to do things. I hope we can provide a blueprint for future projects.** (Dan Listug, Sourcewell)

**We are looking for ways to build resilience in our power systems. We consume a lot of energy and solar energy is one way to build that resilience. I think if we can build a repeatable model that works, there is a lot of potential here. Region Five brought this all together. But it made me think a little bit more about our regional institutions – and if our regional institutions banded together, could do something similar. It made me think more broadly about our energy strategy. I am glad we participated in the project.** (Greg Ewig, MinnState)

*I would reiterate the strong role that Region Five Development Commission plays in our region. The support, encouragement, and their involvement in making this project successful. It has been a heavy lift on the Minnesota State side. There were multiple times when there was a change we had to say, "Stop, take a step back, get all the players together, talk about it and figure it out." **There was a lot of work to this project and there were some ups and downs with it, but in the long run it has been worth it and there are great outcomes from the project.** I also need to say that R5DC's leadership and their willingness to roll up their sleeves and pull people together to help Central Lakes and our Minnesota State system understand how some of these things work, and help bring us through it so we can be a partner in this project, [was crucial]. **Hopefully this paves the way for other projects like this within our system.** We have learned a lot through the process and that has been really valuable. I know I have had some of my colleagues in the system reach out to ask questions as they have heard that we are working on this solar project. I know there will be more projects coming for our system and I know that this project has helped pave that way. (Kari Christiansen, CLC)*

*No I think you have captured everything. It was a much longer project than was anticipated. The things that slowed this down primarily were in coordinating the financing, the technical aspects – were pretty much straight forward – but the tariffs that were imposed created an issue. It was a challenge pretty much for everyone, not only for the vendors but also for Region Five in coordinating all that. **It was very complicated and that was one of the major things that you need to be aware of – projects like this take a long time to get results.** (Tom Lillehei, R5DC Commissioner)*

**"THE ENTIRE PROJECT TEAM EXPRESSES GRATITUDE FOR THE RDF XCEL ENERGY INVESTMENT INTO OUR CENTRAL MINNESOTA RURAL COMMUNITIES. WITHOUT THIS INVESTMENT AND PARTNERSHIP THIS OPPORTUNITY WOULD NOT HAVE BEEN POSSIBLE, AND WE ARE FOREVER GRATEFUL."**

**CHERYAL HILLS, R5DC EXECUTIVE DIRECTOR**

## WHAT ARE THE NEXT STEPS?

The Northwest Area Foundation grant (awarded July 1, 2019) will allow the project to continue to benefit communities within Region 5. Solar is one of the value chains for economic development being addressed through this two-year, with the potential of three-more-year project. Dollars have been set aside for communities to integrate solar energy. This project will also deepen the evaluation of the benefits of solar energy deployment. The degree to which solar energy builds the eight forms of capital – financial, political, built, natural, individual, social, intellectual and cultural – and the degree to which solar energy improves the livelihoods of the regions poor and marginalized populations will be evaluated. The core team will publish an annual report of community efforts and lessons learned around the 8 forms of wealth previously listed. Therefore, although the solar school's coaster has been quite a ride –in the end it will yield benefits to the region in ways far beyond those first envisioned.



Pictured left to right: Pine River-Backus Superintendent Dave Endicott, Xcel Energy Regulatory Administrator Pam Gibbs, NEE Project Manager Kevin Corcoran, RREAL Project Manager BJ Allen, R5DC Executive Director Cheryal Hills, RREAL Executive Director Jason Edens.



# VIII. ATTACHMENTS

## ATTACHMENT A

### NEE INDEPENDENT ENGINEERING REVIEW

The 6 sites that make up the Region 5 portfolio of projects were reviewed at several stages by New Energy Equity's engineering team. Additionally, all 6 sites have been stamped and reviewed by a professional engineering firm called SEI. The site list is as follows:

1. Pine River-Backus
2. Pequot Lakes
3. CLC Main Campus
4. CLC Ag Campus
5. CLC Brainerd Campus
6. CLC West Campus

New Energy Equity's review process includes a detailed review of site diligence including but not limited to: Cultural reports, Environmental site assessments, Geotech analysis, Alta Surveys, etc. Once the site diligence phase is complete and the projects don't show any significant issues, the drawing review phase starts. NEE reviews the 50% drawings, 90% drawings, Issued for Construction drawings (sometimes called construction set), and As-built set for each of the 6 projects.

NEE's engineering team have their NABCEP certification and prior experience designing and building solar arrays. Our review covers all aspects of the drawing set from low level organization of the pages and information displayed on each page all the way to checking the current calculations on the single line and three-line diagrams.

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# ATTACHMENT B

## ELECTRIC CAR CHARGING STATIONS SPECIFICATIONS



### CT4000 Level 2 Commercial Charging Stations

#### Specifications and Ordering Information

#### Ordering Information

Specify model number followed by the applicable code(s).  
 The order code sequence is: **Model-Options. Warranty** and **Misc** are ordered as a separate line item.

| Description |                                 | Order Code          |
|-------------|---------------------------------|---------------------|
| Model       | 6' Single Port Bollard Mount    | CT4011              |
|             | 6' Dual Port Bollard Mount      | CT4021              |
|             | 6' Single Port Wall Mount       | CT4013              |
|             | 6' Dual Port Wall Mount         | CT4023              |
|             | 8' Dual Port Bollard Mount      | CT4025              |
|             | 8' Dual Port Wall Mount         | CT4027              |
| Options     | Integral Gateway Modem - USA    | -GW1                |
|             | Integral Gateway Modem - Canada | -GW2                |
| Misc        | Power Management Kit            | CT4000-PMGMT        |
|             | Bollard Concrete Mounting Kit   | CT4001-CCM          |
| Warranty    | ChargePoint Assure              | CT4000-ASSURE $n$ * |

\*Substitute  $n$  for the duration of the additional coverage (1, 2, 3, or 4 years)

#### Order Code Examples

| If ordering this   | the order code is            |
|--|------------------------------|
| Dual Port Bollard Mount USA Gateway Station with Concrete Mounting Kit                 | CT4021-GW1<br>CT4001-CCM     |
| Single Port Wall Mount Station with 4 Additional Years of Assure Coverage              | CT4013<br>CT4000-ASSURE4     |
| Dual Port Wall Mount Canada Gateway Station with 2 Additional Years of Assure Coverage | CT4023-GW2<br>CT4000-ASSURE2 |

Note: All CT4000 stations come with 1 year of ChargePoint Assure coverage at no charge.

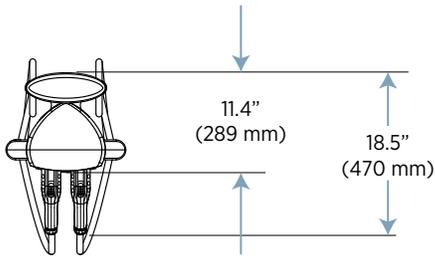
#### Recommended Companion Products

| Description  | Order Code       |
|--|------------------|
| ChargePoint Commercial Service Plan, 3-year Subscription | CTSW-SAS-COMM-3  |
| Station Initial Activation                               | CPSUPPORT-ACTIVE |
| Station Management Service, 3-year Subscription          | CPSUPPORT-MGMT3  |

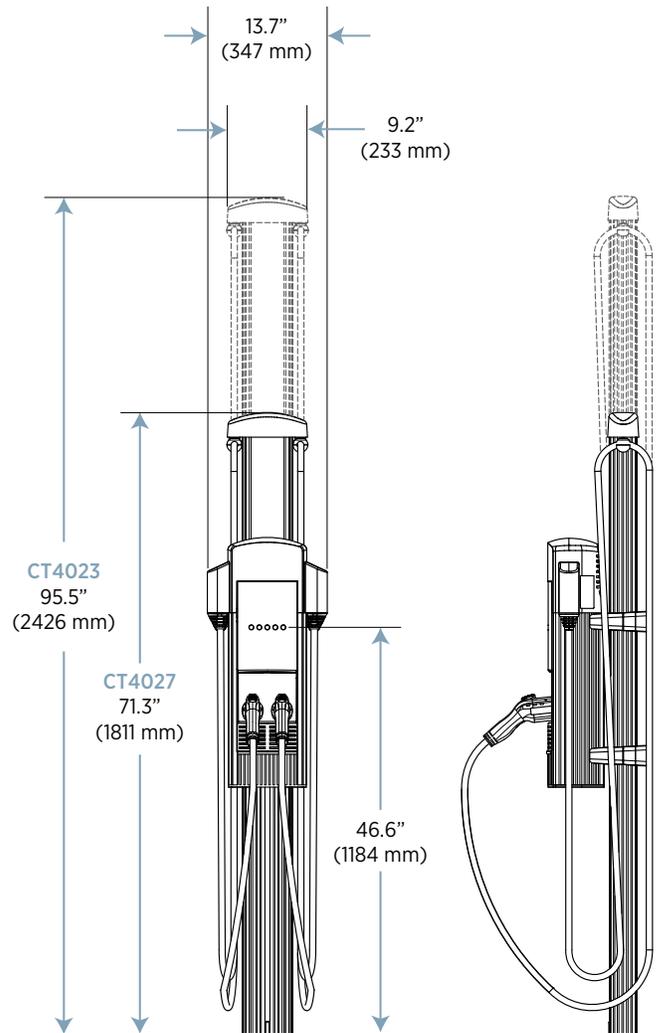
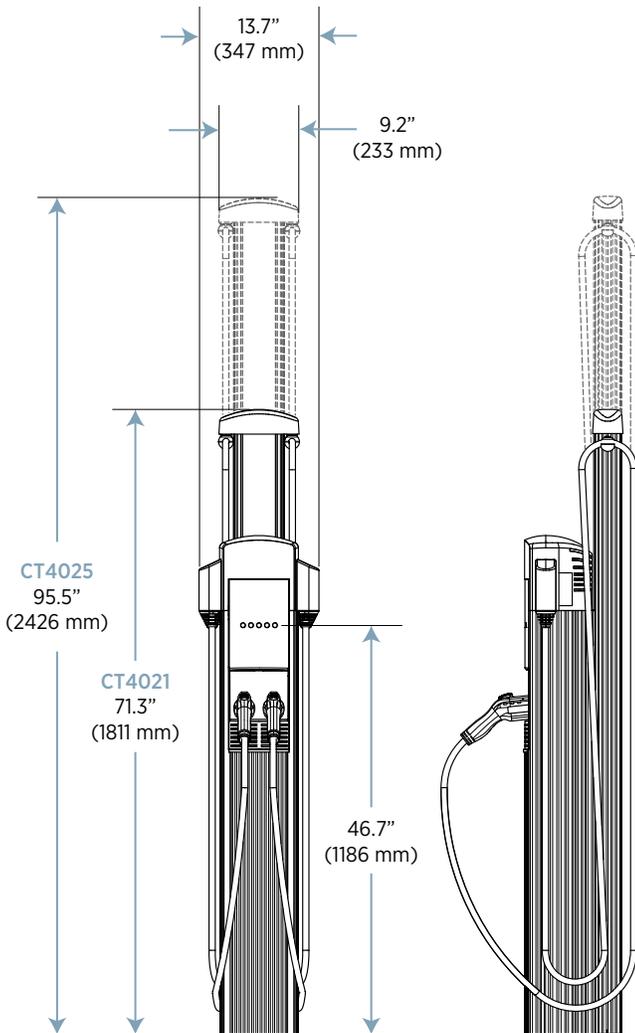
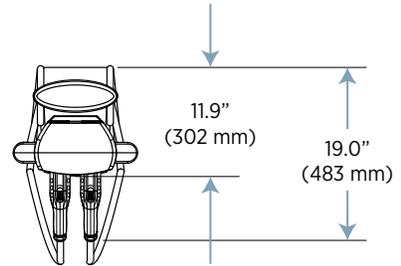


CT4021 bollard station with 6' cable management

### CT4021 (6') and CT4025 (8') Bollard



### CT4023 (6') and CT4027 (8') Wall Mount



## CT4000 Family Specifications

| Electrical Input             | Single Port (AC Voltage 208/240VAC)                                       |                        |                                | Dual Port (AC Voltage 208/240VAC) |                                     |                                   |
|------------------------------|---|------------------------|--------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
|                              | Input Current   | Input Power Connection | Required Service Panel Breaker | input Current                     | Input Power Connection              | Required Service Panel Breaker    |
| Standard                     | 30A   | One 40A branch circuit | 40A dual pole (non-GFCI type)  | 30A x 2                           | Two independent 40A branch circuits | 40A dual pole (non-GFCI type) x 2 |
| Standard Power Share         | n/a   | n/a                    | n/a                            | 32A                               | One 40A branch circuit              | 40A dual pole (non-GFCI type)     |
| Power Select 24A             | 24A   | One 30A branch circuit | 30A dual pole (non-GFCI type)  | 24A x 2                           | Two independent 30A branch circuits | 30A dual pole (non-GFCI type) x 2 |
| Power Select 24A Power Share | n/a   | n/a                    | n/a                            | 24A                               | One 30A branch circuit              | 30A dual pole (non-GFCI type)     |
| Power Select 16A             | 16A   | One 20A branch circuit | 20A dual pole (non-GFCI type)  | 16A x 2                           | Two independent 20A branch circuits | 20A dual pole (non-GFCI type) x 2 |
| Power Select 16A Power Share | n/a   | n/a                    | n/a                            | 16A                               | One 20A branch circuit              | 20A dual pole (non-GFCI type)     |
| Service Panel GFCI           | Do not provide external GFCI as it may conflict with internal GFCI (CCID) |                        |                                |                                   |                                     |                                   |
| Wiring - Standard            | 3-wire (L1, L2, Earth)  |                        |                                | 5-wire (L1, L1, L2, L2, Earth)    |                                     |                                   |
| Wiring - Power Share         | n/a   |                        |                                | 3-wire (L1, L2, Earth)            |                                     |                                   |
| Station Power                | 8W typical (standby), 15W maximum (operation)                             |                        |                                |                                   |                                     |                                   |

## Electrical Output

|                              |                      |  |
|------------------------------|----------------------|--|
| Standard                     | 7.2kW (240VAC @ 30A) | 7.2kW (240VAC@30A) x 2                           |
| Standard Power Share         | n/a                  | 7.2kW (240VAC@30A) x 1 or 3.8kW (240VAC@16A) x 2 |
| Power Select 24A             | 5.8kW (240VAC@24A)   | 5.8kW (240VAC@24A) x 2                           |
| Power Select 24A Power Share | n/a                  | 5.8kW (240VAC@24A) x 1 or 2.9kW (240VAC@12A) x 2 |
| Power Select 16A             | 3.8kW (240VAC@16A)   | 3.8kW (240VAC@16A) x 2                           |
| Power Select 24A Power Share | n/a                  | 3.8kW (240VAC@16A) x 1 or 1.9kW (240VAC@8A) x 2  |

## Functional Interfaces

|                                    |  |                      |
|------------------------------------|--|----------------------|
| Connector(s) Type                  | SAE J1772™   | SAE J1772™ x 2       |
| Cable Length - 6' Cable Management | 18' (5.5 meters)   | 18' (5.5 meters) x 2 |
| Cable Length - 8' Cable Management | n/a  | 23' (7 meters)       |
| Overhead Cable Management System   | Yes  |                      |
| LCD Display                        | 5.7" full color, 640x480, 30fps full motion video, active matrix, UV protected |                      |
| Card Reader                        | ISO 15693, ISO 14443, NFC  |                      |
| Locking Holster                    | Yes  | Yes x 2              |

### Safety and Connectivity Features

|                              |   |
|------------------------------|---|
| Ground Fault Detection       | 20mA CCID with auto retry   |
| Open Safety Ground Detection | Continuously monitors presence of safety (green wire) ground connection |
| Plug-Out Detection           | Power terminated per SAE J1772™ specifications                          |
| Power Measurement Accuracy   | +/- 2% from 2% to full scale (32A)                                      |
| Power Report/Store Interval  | 15 minute, aligned to hour  |
| Local Area Network           | 2.4 GHz Wi-Fi (802.11 b/g/n)  |
| Wide Area Network            | 3G GSM, 3G CDMA   |

### Safety and Operational Ratings

|  |   |
|--|---|
| Enclosure Rating                                 | Type 3R per UL 50E  |
| Safety Compliance                                | UL listed for USA and cUL certified for Canada; complies with UL 2594, UL 2231-1, UL 2231-2, and NEC Article 625                        |
| Surge Protection                                 | 6kV @ 3000A. In geographic areas subject to frequent thunder storms, supplemental surge protection at the service panel is recommended. |
| EMC Compliance                                   | FCC Part 15 Class A   |
| Operating Temperature                            | -22°F to 122°F (-30°C to +50°C)   |
| Storage Temperature                              | -22°F to 140°F (-30°C to +60°C)   |
| Non-Operating Temperature                        | -40°F to 140°F (-40°C to +60°C)   |
| Operating Humidity                               | Up to 85% @ 122°F (+50°C) non-condensing  |
| Non-Operating Humidity                           | Up to 95% @ 122°F (+50°C) non-condensing  |
| Terminal Block Temperature Rating                | 221°F (105°C)   |
| Maximum Charging Stations per 802.11 Radio Group | 10. Each station must be located within 150 feet "line of sight" of a gateway station.  |

ChargePoint, Inc. reserves the right to alter product offerings and specifications at any time without notice, and is not responsible for typographical or graphical errors that may appear in this document.

### Contact Us

To order your CT4000 charging station:

 Call +1.408.841.4500 or +1.877.370.3802 (US toll free)

 Email [sales@chargepoint.com](mailto:sales@chargepoint.com)



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 +1.408.841.4500 or toll free +1.877.370.3802  
[chargepoint.com](http://chargepoint.com)

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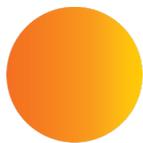
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Listed by Underwriters Laboratories Inc. 



MONO

POLY



**HELIENE**

**ATTACHMENT C**  
**HELIENE MODEL SPECIFICATIONS**

**72<sup>M</sup>**

72-CELL MONOCRYSTALLINE MODULE



**360 Wp**

MAX POWER OUTPUT

**18.6%**

MAX EFFICIENCY

**10 YEAR**

PRODUCT WARRANTY

**25 YEAR**

LINEAR PERFORMANCE GUARANTEE



GUARANTEED POSITIVE POWER SORTING: [-0 : +4.99 WP]



AVAILABLE IN 1000V OR 1500V SYSTEM VOLTAGE RATING



MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001



H-BLACK INTEGRATION AVAILABLE (ALL-BLACK MODULE)

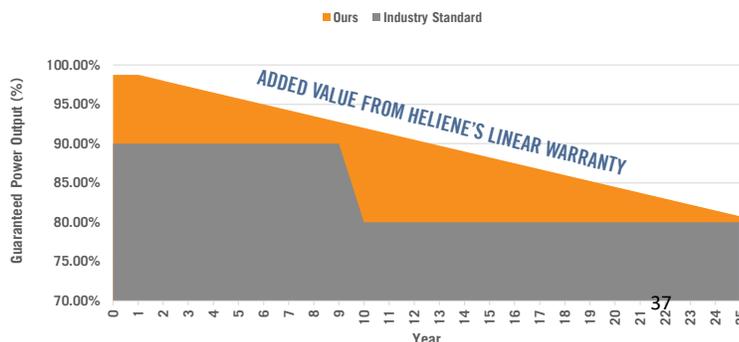
HELIENE INC. IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

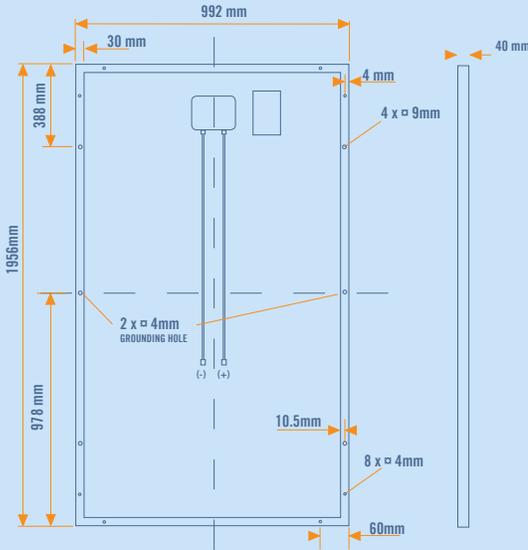
**HELIENE**  
[www.heliene.com](http://www.heliene.com)

**LINEAR PERFORMANCE GUARANTEE**

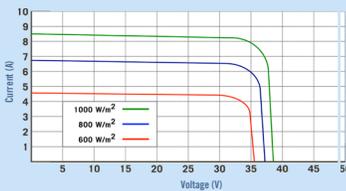
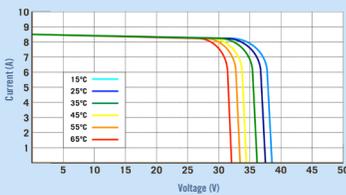
10 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE



## DIMENSIONS FOR HELIENE 72M SERIES MODULES



## I-V CURVE FOR HELIENE 72M SERIES



## CERTIFICATIONS



## ELECTRICAL DATA (STC)

|                            |               |                   |
|----------------------------|---------------|-------------------|
| Peak Rated Power           | $P_{mpp}$ (W) | 360               |
| Maximum Power Voltage      | $V_{mpp}$ (V) | 37.3              |
| Maximum Power Current      | $I_{mpp}$ (A) | 9.65              |
| Open Circuit Voltage       | $V_{oc}$ (V)  | 45.3              |
| Short Circuit Current      | $I_{sc}$ (A)  | 10.18             |
| Module Efficiency *        | Eff (%)       | 18.6              |
| Maximum Series Fuse Rating | MF (A)        | 20                |
| Power Output Tolerance     |               | [- 0 , + 4.99] Wp |

STC - Standard Test Conditions: Irradiation 1000 W/m<sup>2</sup> - Air mass AM 1.5 - Cell temperature 25 °C

\* Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

## MECHANICAL DATA

|                        |   |
|------------------------|---|
| Dimensions (L x W x D) | 1956 x 992 x 40 mm (77 x 39 x 1.6 inch)                       |
| Weight                 | 21.9 kg (48.28 lbs)   |
| Output Cables          | 1.2 m (47.2 inch) symmetrical cables with MC4 type connectors |
| Junction Box           | IP-67 rated with 3 bypass diodes                              |
| Frame                  | Double webbed 15 micron anodized aluminum alloy               |
| Front Glass            | Low-iron content, high-transmission PV solar glass            |
| Solar Cells            | 72 Monocrystalline cells (156 x 156 mm)                       |

## CERTIFICATIONS

|                   |   |
|-------------------|---|
| UL Certification  | ULC/ORD-C1703-1 , UL1703, UL1703 Fire Classification Type 1 |
| IEC Certification | Optional  |

All Heliene modules are certified under the California Energy Commission (CEC) Listing Report

## TEMPERATURE RATINGS

|   |              |
|---|--------------|
| Nominal Operating Cell Temperature (NOCT) | +45°C (±2°C) |
| Temperature Coefficient of $P_{max}$      | -0.39%/°C    |
| Temperature Coefficient of $V_{oc}$       | -0.31%/°C    |
| Temperature Coefficient of $I_{sc}$       | 0.045%/°C    |

## PACKAGING CONFIGURATION

|                          |            |
|--------------------------|------------|
| Modules per box:         | 26 pieces  |
| Modules per 53' trailer: | 780 pieces |

## MAXIMUM RATINGS

|                         |                             |
|-------------------------|-----------------------------|
| Operational Temperature | -40°C - +85°C               |
| Max System Voltage      | 1000V (*1500V)<br>*Optional |

## WARRANTY

|   |
|---|
| 10 Year Manufacturer's Workmanship Warranty |
| 25 Year Linear Power Guarantee              |

(Refer to product warranty page for details)

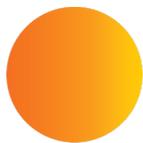
CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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MONO

POLY



**HELIENE**

**72<sup>M</sup>**

72-CELL MONOCRYSTALLINE MODULE



**370 Wp**

MAX POWER OUTPUT

**19.1%**

MAX EFFICIENCY

**10 YEAR**

PRODUCT WARRANTY

**25 YEAR**

LINEAR PERFORMANCE GUARANTEE



GUARANTEED POSITIVE POWER SORTING: [-0 : +4.99 WP]



AVAILABLE IN 1000V OR 1500V SYSTEM VOLTAGE RATING



MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001



H-BLACK INTEGRATION AVAILABLE (ALL-BLACK MODULE)

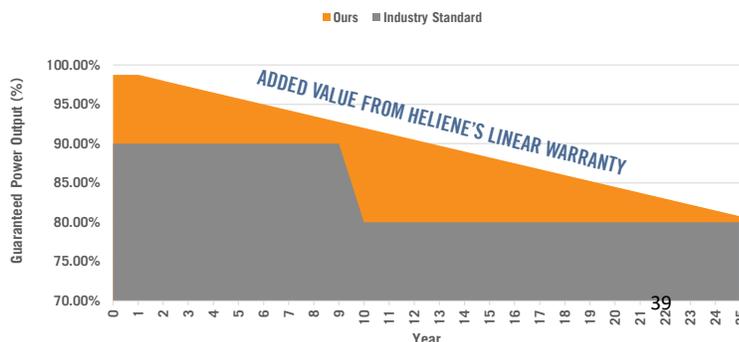
HELIENE INC. IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

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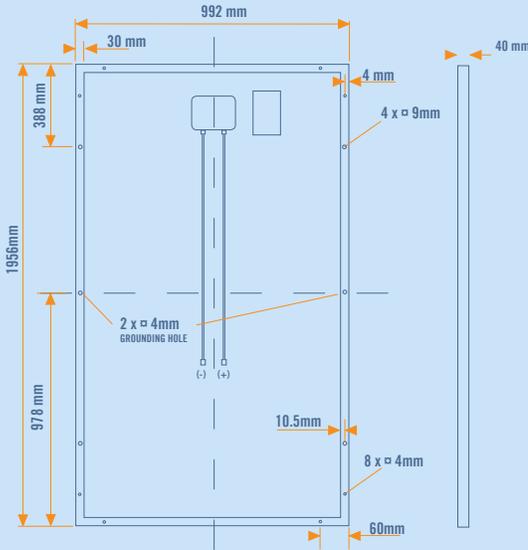
**HELIENE**  
[www.heliene.com](http://www.heliene.com)

### LINEAR PERFORMANCE GUARANTEE

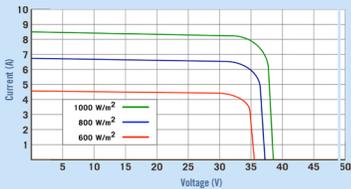
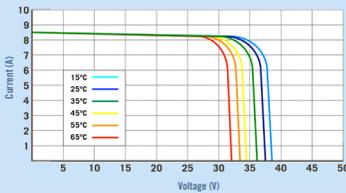
10 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE



## DIMENSIONS FOR HELIENE 72M SERIES MODULES



## I-V CURVE FOR HELIENE 72M SERIES



## CERTIFICATIONS



## ELECTRICAL DATA (STC)

|                            |               |                   |        |        |        |        |
|----------------------------|---------------|-------------------|--------|--------|--------|--------|
| Peak Rated Power           | $P_{mpp}$ (W) | 370               | 365    | 360    | 350    | 345    |
| Maximum Power Voltage      | $V_{mpp}$ (V) | 40.233            | 39.900 | 39.173 | 39.133 | 38.843 |
| Maximum Power Current      | $I_{mpp}$ (A) | 9.26              | 9.20   | 9.13   | 9.01   | 8.95   |
| Open Circuit Voltage       | $V_{oc}$ (V)  | 48.66             | 48.50  | 48.10  | 47.57  | 47.26  |
| Short Circuit Current      | $I_{sc}$ (A)  | 9.77              | 9.75   | 9.71   | 9.65   | 9.57   |
| Module Efficiency *        | Eff (%)       | 19.1              | 18.8   | 18.6   | 18.0   | 17.8   |
| Maximum Series Fuse Rating | MF (A)        | 20                | 20     | 20     | 20     | 15     |
| Power Output Tolerance     |               | [- 0 , + 4.99] Wp |        |        |        |        |

STC - Standard Test Conditions: Irradiation 1000 W/m<sup>2</sup> - Air mass AM 1.5 - Cell temperature 25 °C

\* Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

## MECHANICAL DATA

|                        |   |
|------------------------|---|
| Dimensions (L x W x D) | 1956 x 992 x 40 mm (77 x 39 x 1.6 inch)                       |
| Weight                 | 21.9 kg (48.28 lbs)   |
| Output Cables          | 1.2 m (47.2 inch) symmetrical cables with MC4 type connectors |
| Junction Box           | IP-67 rated with 3 bypass diodes                              |
| Frame                  | Double webbed 15 micron anodized aluminum alloy               |
| Front Glass            | Low-iron content, high-transmission PV solar glass            |
| Solar Cells            | 72 Monocrystalline cells (156 x 156 mm)                       |

## CERTIFICATIONS

|                   |   |
|-------------------|---|
| UL Certification  | ULC/ORD-C1703-1 , UL1703, UL1703 Fire Classification Type 1 |
| IEC Certification | IEC 61215, IEC 61730  |

All Heliene modules are certified under the California Energy Commission (CEC) Listing Report

## TEMPERATURE RATINGS

|   |              |
|---|--------------|
| Nominal Operating Cell Temperature (NOCT) | +45°C (±2°C) |
| Temperature Coefficient of $P_{max}$      | -0.39%/°C    |
| Temperature Coefficient of $V_{oc}$       | -0.31%/°C    |
| Temperature Coefficient of $I_{sc}$       | 0.045%/°C    |

## PACKAGING CONFIGURATION

|                          |            |
|--------------------------|------------|
| Modules per box:         | 26 pieces  |
| Modules per 53' trailer: | 780 pieces |

## MAXIMUM RATINGS

|                         |                             |
|-------------------------|-----------------------------|
| Operational Temperature | -40°C - +85°C               |
| Max System Voltage      | 1000V (*1500V)<br>*Optional |

## WARRANTY

10 Year Manufacturer's Workmanship Warranty

25 Year Linear Power Guarantee

(Refer to product warranty page for details)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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# ATTACHMENT D

## VIDEOS, ARTICLES, PRESENTATIONS REGARDING THE SOLAR SCHOOLS PROJECT

### VIDEOS

Grimler, T. The Solar Schools Project. *Pine and Lakes Echo Journal*. Retrieved from <https://www.pineandlakes.com/video/P53C0XgW?fbclid=IwAR2rbkyzK6tsOYMPdcM6CrFj1QljCDpUs1nJzrHXdLyW4gNtpHhblhOSXgRREAL>. (February 1, 2019) *660 KW AC Solar Array Pine River Solar for Schools Time-lapse*. Retrieved from [https://www.youtube.com/watch?v=4B\\_7xFKVqFw&feature=youtu.be](https://www.youtube.com/watch?v=4B_7xFKVqFw&feature=youtu.be)  
Lakeland Public TV. (April 22, 2019) *Solar Arrays Installed at Pequot Lakes and Pine River-Backus School Districts*. <https://youtu.be/6pSjV8zhKs>

### ARTICLES

1.5 MW for 3 schools in Minnesota. *PV Magazine*. Retrieved June 5, 2019 from <https://pv-magazine-usa.com/2019/05/03/duke-compromises-on-sc-solar-freedom-bill-spruce-closes-on-208-million-securitization-pvmb-05-03-19/>  
*The Pilot-Independent*. WalkerMN.com. Retrieved June 5, 2019 from [https://www.walkermin.com/news/major-school-solar-project-slated-for-completion-with-six-solar/article\\_0541e8ba-6da9-11e9-8513-bbbe128376ff.html](https://www.walkermin.com/news/major-school-solar-project-slated-for-completion-with-six-solar/article_0541e8ba-6da9-11e9-8513-bbbe128376ff.html)  
Major School Solar Project Slated for Completion May 2019 in Central Minnesota. (May 2, 2019). *Finance.Yahoo.Com*. Retrieved June 5, 2019 from <https://finance.yahoo.com/news/major-school-solar-project-slated-142400948.html>  
Pequot Lakes Public Schools. *Solar Energy Project*. Retrieved June 5, 2019 from <http://district.isd186.org/news-media/solar-panel-project>  
Pequot Lakes High School Solar Schools Dashboard. Retrieved June 5, 2019 from <http://s44931.mini.alsoenergy.com/Dashboard/2a566973496547444441454b772b71633d>  
Ludt, B. (May 2, 2019). Minnesota schools 1.5-MW solar project slated for completion May 2019. *Solar Power World*. Retrieved 06.05.2019 from <https://www.solarpowerworldonline.com/2019/05/minnesota-schools-1-5-mw-solar-project-slated-for-completion-may-2019/>  
Johnson, R. (April 22, 2019). *Solar Arrays Installed At Pequot Lakes and Pine River-Backus School Districts* <https://lptv.org/solar-arrays-installed-at-pequot-lakes-and-pine-river-backus-school-districts/>  
Grimler, T. (April 11, 2019). SOLAR SAVINGS: Superintendents say savings may be higher than estimated. *Brainerd Dispatch*. Retrieved from <https://www.brainerddispatch.com/news/4597637-solar-savings-superintendents-say-savings-may-be-higher-estimated>  
Kohls, S. (March 27, 2019). Solar array installation at CLC underway. *Brainerd Dispatch*. Retrieved from: <https://www.brainerddispatch.com/business/technology/4590285-solar-array-installation-clc-underway>  
Grimler, T. (March 27, 2019). Pine River-Backus School: School to highlight solar program. *Pine and Lakes*. <https://www.pineandlakes.com/news/government-and-politics/4589142-pine-river-backus-school-school-highlight-solar-program>  
*Brainerd Dispatch*. (February 4, 2019). PR-B School District now home to large solar array. *Brainerd Dispatch*. <https://www.brainerddispatch.com/news/education/4605354-major-school-solar-project-slated-completion-6-solar-arrays>  
Grimler, T. (October 27, 2018). Solar array going up at Pine River-Backus School. *Brainerd Dispatch*. <https://www.brainerddispatch.com/news/4519176-solar-array-going-pine-river-backus-school>  
Krause, M. & Smith, D. (August 18, 2017). Don't let misinformation prevent Central Minnesota students from preparing for a renewable energy future. *Morrison County Record*. Retrieved from [https://www.hometownsource.com/morrison\\_county\\_record/don-t-let-misinformation-prevent-central-minnesota-students-from-preparing/article\\_5aea38d8-8f02-55ae-ab22-860ecff49533.html](https://www.hometownsource.com/morrison_county_record/don-t-let-misinformation-prevent-central-minnesota-students-from-preparing/article_5aea38d8-8f02-55ae-ab22-860ecff49533.html)  
Jensen, T. (July 24, 2017). Little Falls schools formally withdraw from solar project. *Morrison County Record*. Retrieved from [https://www.hometownsource.com/morrison\\_county\\_record/news/education/little-falls-schools-formally-withdraw-from-solar-project/article\\_5a4ba64b-443a-569d-ab54-c533ae0a5d86.html](https://www.hometownsource.com/morrison_county_record/news/education/little-falls-schools-formally-withdraw-from-solar-project/article_5a4ba64b-443a-569d-ab54-c533ae0a5d86.html)  
*R5DC Request for Proposals: Region Five Solar Schools project. (Re-posted: September 29, 2016)*. Retrieved April 30, 2019 from [http://regionfive.org/cms/files/Investor%20RFP%207\\_21\\_2016-%20September%20Reposted%20Version%202.pdf](http://regionfive.org/cms/files/Investor%20RFP%207_21_2016-%20September%20Reposted%20Version%202.pdf)

### REPORTS

Grimely, M. & Giavarini, C. (2017). *The Solar Coaster: Putting Solar on Schools in Northern Minnesota Means More Than Energy*. CAP Report #220. Minneapolis, MN: University of Minnesota Center for Urban and Regional Affairs (CURA). Retrieved 06.05.2019 from <https://conservancy.umn.edu/handle/11299/184800>

### PUBLIC PRESENTATIONS

April 22, 2019 Public Safety Orientation Pequot Lakes system 14 people  
March 21, 2019 Public Safety Orientation Pine River-Backus system— 6 people  
October 25, 2018 RREAL delivered a presentation to the R5DC/NCEDA Economic Development District Governing Body. — approx. 50 people

October 23, 2018 Staples City Council – 11 people

October 22, 2018 Crow Wing County Township Association – approx. 75 people.

## **SCHOOL PRESENTATIONS**

February 21, 2019: Pequot Lakes High School. 60+ students and teachers in attendance to multiple classes

February 18, 2019: PRB School District. Teachers' inservice breakout session, SFS Introduction to teachers, 6 teachers in attendance plus elementary principal

February 14, 2019: Pequot Lakes High School. 30 students and 1 teacher in attendance

December 12, 2018: Pequot Lakes High School. 60+ students and teachers in attendance

November 27, 2018: PRB School District, SFS Introduction. Chris Halverson, Rick Aulie, Sue Peet, Dave Endicott

November 26, 2018: Pequot Lakes 5th Graders. 25 students & Alyssa Horpedahl

October 30, 2018: Pequot Lakes Teachers, SFS Introduction. Jon Kotaska, Alyssa Horpedahl, Chuck Eggert, Mike O'Neil, Chris Lindholm

## **ARTICLES RELATED TO HISTORICAL EVENTS THAT AFFECTED THE PROJECT**

Merchant, E.F. (July 30, 2018). Heliene Will Become First Foreign Solar Company to Produce Modules After Trump Tariffs.

*GreenTechMedia*. Retrieved 4/25/2019 from <https://www.greentechmedia.com/articles/read/donald-trump-solar-tariffs-heliene#gs.7dkxyu>

Roselund, C. (July 23, 2018). Heliene retools its Minnesota module factory. *PV Magazine USA*. Retrieved 4.25.2019 from <https://pv-magazine-usa.com/2018/07/23/heliene-retools-its-minnesota-module-factory/>

An Array of Opportunities: Building a Sustainable Future at Leech Lake Tribal College. (February 18, 2018). *Tribal College Journal*.

Retrieved April 30, 2019 from <https://tribalcollegejournal.org/array-opportunities-building-sustainable-future-leech-lake-tribal-college/>

Pyper, J. (January 22, 2018). Trump Administration Issues 30% Solar Panel Tariff. *GreenTechMedia*. Retrieved April 30, 2019 from

<https://www.greentechmedia.com/articles/read/breaking-trump-admin-issues-a-30-solar-tariff#gs.8eoloj>

Richardson, R. (February 4, 2014). Silent Power quietly closed its doors last week. Retrieved from:

<https://www.brainerddispatch.com/business/3163010-silent-power-goes-dark>

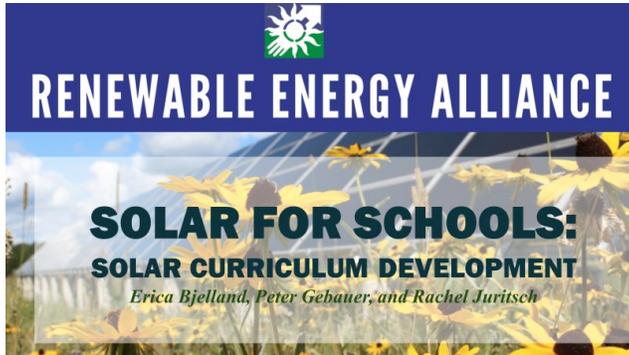
Wesoff, E. (May 9, 2017). TenKsolar winding down operations after a series of field failures. Retrieved from

<https://www.greentechmedia.com/articles/read/sources-ten-k-solar-winding-down-operations-after-a-series-of-field-failure>

# ATTACHMENT E

## SOLAR SCHOOLS PROJECT PRESENTATIONS

### 1. RREAL PRESENTATION TO TEACHERS



## Solar Data



## Outcomes/Goals

- Curate a comprehensive source of age-appropriate solar STEAM curricula for all grade levels
- Integrate solar data into all 23 school districts
- Create hands-on learning opportunities that support kids of all backgrounds

## Our Future – Leading the Way

- Providing home-grown opportunities for our kids
- Generating energy locally
- Continuing stewardship of our natural resources in Minnesota and beyond

| COMPARISON OF CLEAN ENERGY MARKET DEVELOPMENT Minnesota, 2000-2012 |                    |
|--|--------------------|
|  | 2000-2012 % change |
| Energy Efficiency cumulative savings                               | 524%               |
| Bioenergy electricity production                                   | 40%                |
| Installed wind energy capacity                                     | 935%               |
| Installed solar energy capacity                                    | 9670%              |
| Biofuel (Ethanol) production capacity                              | 408%               |

## Future Economy

- \$26 trillion to be gained; Over 65 million jobs
- Air pollution = -\$240 billion/year
- A healthy and beautiful future

## Citations

- Minnesota Clean Energy Economy Profile 2014 <https://mn.gov/deed/data/research/clean-energy-economy/>
- Unlocking the Growth Story of the 21<sup>st</sup> Century <https://newclimateconomy.report/2018/>
- Clean Energy Jobs Midwest [https://www.cleanjobsmidwest.com/wp-content/uploads/2018/08/CJM-Executive-Summary-ALL\\_2018.08.08.pdf](https://www.cleanjobsmidwest.com/wp-content/uploads/2018/08/CJM-Executive-Summary-ALL_2018.08.08.pdf)



## STEAM Program

## Budget: \$200,000

### Expenses

1. Labor: \$104,000; Benefits: 60,000
2. Travel: \$9,775
  1. 23 districts x 5 visits x avg. distance of 100 miles x \$0.55/mile = \$30 x 115 days x 2 = \$9,775
3. Materials: \$25,000
  1. 23 meetings \* 2 events \* \$500 = \$23,000
  2. SMART Monitors: \$200 \* 6 \* 1.5 = \$1,800

### Expected Revenue

1. In kind: \$78,000; i.e. Curriculum, AmeriCorps VISTAs, Teachers' Time
2. Grants: Laura Jane Musser Foundation Pending: \$25,000; MN Commerce Education Grant: \$5,000
3. Individual donors: \$15,000

## BRIGHTER FUTURE

### Growth of Solar Schools

**5,489**  
K-12 solar schools in U.S.

### WHY ARE SCHOOLS GOING SOLAR?

- Saving Money**  
An investment in solar can reduce electricity bills.
- Staying Safe**  
Solar can provide backup power during emergencies and outages.
- Helping the Environment**  
Solar schools offset about 1 million metric tons of carbon dioxide per year. That's equivalent to taking 221,000 cars off the road or planting 27 million trees.

**New Learning Opportunities**  
Students gain hands-on exposure to solar power to help with their education in STEM subjects.

ABOUT 9% OF U.S. SCHOOLS USE SOLAR. THAT'S 91% LEFT TO GO!

## Sunny Regards!

Erica Bjelland [erica@rreal.org](mailto:erica@rreal.org)  
Rachel Juritsch [rachel@rreal.org](mailto:rachel@rreal.org)  
Peter Gebauer [peter@rreal.org](mailto:peter@rreal.org)

[www.rreal.org](http://www.rreal.org)

## 2. U OF M REGIONAL PARTNERSHIPS BOARD MEETING (JULY 25, 2018)



UofM Regional Partnerships Board meeting  
July 25, 2018 1:30 pm to 2:15 pm at  
Crosslake US Army Corps Recreation Area Picnic Pavilion

### *SOLAR COASTER*

#### 1:30 - 5 min

All parties-

- Kandiyó Consulting, LLC, RREAL, NJPA, NEE
- The UofM Partnership & Interns, R5DC's SS Committee
- PRB, PQL, CLC/MnState
- LLBO, WSN
- Utilities – MN Power, BPU, Todd/Wadena Co-op

#### 1:35 - 5 min

See timeline below.

Signed Xcel Agreement February 2018 - 27 months - UG!

Details & Challenges

- INVESTOR. Finding one - relationships necessitated we offer to local partners....this took time.....and the project was to big for locals, to small for big guys.
- SCHOOLS. changing - this is a construction project and construction numbers change. Little Falls referendum to put new roofs on and then waited another month for them to decide the project did not save them enough money and wanted out. Good decision but cost the project time.
- LONG list of items we needed to gather for Xcel
- INSURANCE challenges worked through

Issues, Issues, Issues

- Silent Power was not an option for storage due to leadership changes
- Lost our supplier - 10k....had to redo feasibility , still needed to be MIM
- The federal Tariff on Solar
- Threat of utility rates changing
- MnPower changing mind on Interconnection study – needing to pay for distribution upgrade equipment

#### 1:40 - 10 min

Good news

- we will still work with LLBO via workforce. RREAL was able to do their small solar project.
- UofM Interns published a phase 1 report
- We worked with some good attorneys – Attorney General/MnState's, R5DC's/NJPA, NEE's, RREAL's, Schools
- Our schools were AMAZING!!!!

Agreements, Agreements, Agreements

- Xcel Grant
- Joint Powers w/MnState, very unique
- Developer
- Interconnection
- Power Purchase
- EPC's

Where are we today? WE HAVE A PROJECT!!!!

What lessons have we learned?

- a. The Risk is very real
- b. That timelines are meant to be broken with solar projects.
- c. Project management was VERY emotional - these are our friends, these are schools we care about....we work with COURAGIOUS PEOPLE

Join us for the ribbon cutting when the entire project is installed.

1:50 - 10 min

Comments from Chris

2:00 - 15 min

Q&A

2:15 – done

How could we partner with the UofM RSDP going forward?

Could have a student led – outside assessment/studies of project to

- Conduct economic impact survey/study of solar contractors and vendors.
  - RREAL's income and # job creation
  - Building permit \$ to LUGs
  - Increased revenue to schools
  - State tax revenues increased as result of # of good paying jobs
  - Utilization of federal tax incentives in MN rural regional economy
  - Any deferment or elimination of capital costs to upgrade local distribution systems.
- Comparative cost study and demand charge study.
  - Stabilization of energy rates to schools. Solar production avoidance of sharp increase in utility rates.
  - Competitive total installed cost per watt of \$2.45 of nameplate capacity. Demonstration of how to lower the delivery cost. Our installed rate is \$2.35 per KW already lower
  - Explain model of how to better manage peak loads at school facilities, transfer of this knowledge to other schools can reduce demand for high-cost peak power.

Studies done to demonstrate a cost-effective model coordinating development of solar energy projects among multiple jurisdictions, including evaluation of RDF leveraged investment.

Also any knowledge of grant funds available for the EV Stations.

Pursuing VW \$ that may or may not be a good fit.

Thinking about artistic partners to beautify fencing or EV Stations with student involvement.....as a "later, later" idea.

### 3. REGION FIVE SOLAR SCHOOLS PROJECT SUMMARY (UPDATED 7/18/2018)



## REGION FIVE SOLAR SCHOOLS PROJECT SUMMARY

Updated 7/18/2018

### Synopsis

Region Five Development Commission (R5DC), a regional development and planning organization for five north-central counties, has been offered a grant of \$1,993,660 from Xcel Energy through the Renewable Development Fund (RDF) for a “Regional Schools Solar PV Demonstration” project. The grant will fund the majority of the projected \$3,508,550.00 project budget to construct solar arrays on multiple school buildings in two school districts, Pine River-Backus and Pequot Lakes and two MnState/ Central Lakes College campuses. R5DC has secured New Energy Equity – a Maryland based firm - as the financing partner to provide tax equity and other financing. NEE owns the solar arrays and sells electricity to the schools and through the executed Power Purchase agreements. Schools pay NEE \$.063/kwh. Average rates from utility providers range from 3-4 cents per Kwh for usage charges.

R5DC will act as the point of contact with the individual school districts. The goal is to achieve at least a 10 percent discount for schools on their current utility rates. R5DC will be responsible for managing the grant with Xcel grant, and is willing to assist participating schools with additional grants that support STEM renewable energy related training.

Rural Renewable Energy Alliance (RREAL), an experienced solar developer based in Backus, is acting as the project construction manager for the project. The total installed cost per watt of \$2.45 of nameplate capacity.

The projects will total 1,493 kilowatts of DC-rated solar capacity using solar equipment from Heliene, a Tier 1 panel manufacturer. A portion of the systems will be roof-mounted, with others being ground-mounted system where roofs are not suitable for solar. All but one small solar arrays are in the service territory of Minnesota Power with Todd-Wadena Cooperative and Brainerd Public Utilities as the other utility providers. The project also includes demonstration of solar-powered electric vehicle charging stations at a site to be determined.

In addition to building this initial round of solar projects, Region Five’s goals are to:

- Demonstrate the cost-effectiveness of a coordinated regional strategy for solar development
- Build expertise, experience and skills among local firms and providers for further solar development in Region Five
- Save schools money on their energy costs over time
- Integrate the solar arrays with STEM-based and workforce curriculum for students

Students at LLTC may participate in project construction as trainees in solar installation work. The visibility of these projects may lead to other clean energy projects and additional local job creation that will benefit residents of the region.

The timeline of the project has had to respond to several external changes. Including changes in locations and in equipment providers. The expectation is to have Pine River-Backus and possibly Pequot Lakes school systems completely installed by end of 2018 with remaining systems completed at CLC sites in 2019

## 4. RENEWABLE DEVELOPMENT FUND GRANT TIMELINE

### Renewable Development Fund grant timeline:

General Background. Xcel's Renewable Development Fund (RDF) program was established in 1994 to satisfy its obligations under Minnesota Statutes section 116C.779. The statute directs the owner(s) of the Prairie Island and Monticello nuclear power plants—Xcel—to fund a renewable development account in connection with the dry-cask storage of spent nuclear fuel at those facilities.

The first grant funding cycle began in 2001. As of December 31, 2016, the RDF program has disbursed about \$74 million for RDF grant projects across four grant cycles and about \$181 million for specific legislative mandates. These costs, in turn, are charged to Xcel's ratepayers, for actual expenditures only when projects meet designated milestones.

On November 29, 2012 – Xcel filed a notice of its intent to proceed with the 4<sup>th</sup> funding cycle of its RDF program.

In January 2012 – R5DC convened schools interested in a solar project/application and began to prepare an application.

In February 2012 – Xcel issued the RFP

In April 2012 – R5DC submitted our application

On July 29, 2013, Xcel filed its RDF Cycle 4 selection report, recommending selection of 20 projects with a total price tag of \$30 million. Xcel Energy received 67 qualifying proposals with a combined funding request of about \$133.5 million, more than four times the available funding.<sup>4</sup> Xcel requested that the Public Utilities Commission approve its recommended grant awards and list of reserve projects.

On March 11, 2014, the PUC issued an order (2014 Order) approving Xcel's recommended grant awards for energy production (EP) projects, research and development (RD) projects, higher-education block grants, and reserve-project list, as set forth in the Xcel Energy's December 12, 2013 reply comments. R5DC's application was on the "reserve project list".

On December 4, 2015, Xcel filed a letter requesting approval to cancel four Cycle 4 RDF projects that were at an impasse (EP4-4, EP4-9, EP4-21 and RD4-4) and move forward with the next three projects on the Commission-approved Reserve List (EP4-36, EP4-44 and RD4-8). The Commission's December 21, 2015 Notice approved Xcel's request. As a result, a grant award of \$1,993,659 was approved for EP4-44 (Project)...which is OUR Solar Schools Project! Late December 2015 R5DC was invited to execute a contract. Signed agreement February 2018.

On March 8, 2018, Xcel filed a grant contract in the EP category (EP4-44) to comply with the 2013 Order. 27 MONTHS of DUE Diligence!

The Xcel Energy provided the following description of the Project:

Project Description Region Five Development Commission (EP4-44) Funding granted: \$1,993,659 This project will install not more than 1,493 kilowatts of direct current (kWDC) solar capacity at multiple community schools and one college in Cass, Crow Wing, Morrison, Todd or Wadena Counties. The facilities will include roof and ground mount photovoltaic (PV) arrays that utilize Made-In-Minnesota panels and equipment. Electric storage and Electric Vehicle (EV) charging stations that total 144kW storage capacity will be installed at a minimum of two locations.

The solar projects will be the first major step toward a regional economic development goal to expand renewable energy capacity in the area including the expansion of local job training programs for jobs in the solar energy industry. The project will be designed, installed and financed exclusively with resources from Minnesota based companies and organizations that also contribute to statewide efforts to promote and expand the renewable energy business sector in the state. This project will be a model in Minnesota for how to cost-effectively manage multiple projects among several school districts and multiple jurisdictions

April 25, 2018 – the Xcel Award was formally approved by the Minnesota Public Utilities

*Disclaimer:*

*This report was prepared as a result of this work sponsored by the renewable development fund as managed by Xcel Energy. It does not necessarily represent the views of Xcel Energy, its employees, or the renewable development fund Advisory Group. Xcel Energy, its employees, contractors and subcontractors make no warranty, expressed or implied, and assume no legal liability for the information in this report; nor does Xcel Energy, its employees or the renewable development fund advisory group represent that this information will not infringe upon privately owned rights. This report has not been approved or disapproved by NSP nor has NSP passed upon the accuracy or adequacy of the information in this report.*

## 5. SAMPLE REPORT TO XCEL ENERGY

**Project Title:** Region Five Development Commission Solar Schools

**Contract Number:** EP4-44

**Project Period:** April 25, 2018 – April 25, 2020

**Report Number:** 2

**Report Date:** July 9, 2018

**Reporting Period:** **May 25, 2018 through June 25, 2018**

**Progress Summary:** Milestone #1

(.2 complete)

**Principal Investigator:** Jason Edens, RREAL  
Rural Renewable Energy Alliance  
**Phone:** 218-947-3779

**Contract Contact:** Cheryal Lee Hills, R5DC  
Region Five Development Commission  
**Phone:** 218-894-3233 or 218-270-0188

### MONTHLY PROGRESS REPORT

Acronym list attached.

#### ***Executive Summary:***

The process of managing several projects simultaneously has proven to be a monumental task and execution of the many agreements has consumed more time than expected, and involved more parties than expected, however we are progressing in achieving the goals of the Solar Schools project proposal and agreement deliverables.

During the second month of the project, activity primarily consisted of preparation of contracts, agreements and the initial coordination of project partnerships. The overall project will consist of the installation of 1,493 kW of photovoltaic (PV) capacity at six different systems with two public schools and multiple sites at Central Lakes College (CLC) – Brainerd and Staples campuses. The project objectives and anticipated benefits are identified in the appendix to this report.

During this reporting period the following tasks have been completed:

- Executed Engineering, Procurement and Construction Agreement (EPC) between -
  - NEE and R5DC
  - R5DC and RREAL
- Executed Lease Agreements between -
  - NEE and Pine River-Backus School District
  - NEE and Pequot Lakes School District, imbedded in the PPA
  - NEE and MnState/Central Lakes College
- Executed Power Purchase Agreements between –
  - NEE and Pine River-Backus District
  - NEE and Pequot Lakes School District
  - NEE and MnState/Central Lakes College

**Technical Progress:**

Back to back EPC agreements were executed to fulfill all obligations per the Xcel agreement. The first EPC between New Energy Equity and R5DC executed on June 26, 2018 outlays NEE as the owner and R5DC as the Contractor with full representation and intent to subcontract with Rural Renewable Energy Alliance (RREAL). A separate EPC also executed June 26, 2018 between R5DC as the “prime contractor” and RREAL as the “SubContractor” to provide, among other things, certain design, engineering, procurement, installation, construction, testing, commissioning, start up, and related services. The official Notice to Proceed from NEE was issued July 3, 2018 which was triggered by execution of the EPC agreements.

Central Lakes College – Staples Main campus

- ✓ EPC & Lease Agreement executed June 2018.
- ✓ PV Systems design capacity: qty. 504 Heliene 72M-360 PV modules, 3 Solectria inverters (2xPVI 60TL and 1xPVI 36TL), 30 degrees of tilt, azimuth 180 degrees, 181.44kW DC, 156kW AC, Todd Wadena Electric Co-op grid.

Central Lakes College – Staples Ag campus

- ✓ EPC & Lease Agreement executed June 2018.
- ✓ PV Systems design capacity: qty. 140 Heliene 72M-360 PV modules, 4 Fronius Symo 10.0-3 inverters, 30 degrees of tilt, azimuth 180 degrees, 50.4kW DC, 39.998kW AC, Todd Wadena Electric Co-op grid.

Central Lakes College – Staples West campus

- ✓ EPC & Lease Agreement executed June 2018.
- ✓ PV Systems design capacity: qty. 140 Heliene 72M-360 PV modules, 4 Fronius Symo 10.0-3 inverters, 30 degrees of tilt, azimuth 180 degrees, 50.4kW DC, 39.998kW AC, Todd Wadena Electric Co-op grid.

Central Lakes College – Brainerd campus

- ✓ EPC & Lease Agreement executed June 2018.
- ✓ PV Systems design capacity: qty. 140 Heliene 72M-360 PV modules, 4 Fronius Symo 10.0-3 inverters, 30 degrees of tilt, azimuth 180 degrees, 50.4kW DC, 39.998kW AC, Brainerd Public Utilities grid.

Pegot Lakes School

- ✓ EPC & Lease Agreement executed June 2018.
- ✓ PV Systems design capacity: qty. 984 Heliene 72M-360 PV modules, 5 Solectria PVI 60TL inverters, 10 degrees of tilt, azimuth 180 degrees, 354.24kW DC, 300kW AC, Minnesota Power grid.

Pine River-Backus School

- ✓ EPC & Lease Agreement executed May 2018.

- ✓ PV Systems design capacity: qty. 2,244 Heliene 72M-360 PV modules, 11 Solectria PVI 60TL inverters, 30 degrees of tilt, azimuth 180 degrees, 807.84kW DC, 660kW AC, Minnesota Power grid.

**Milestones:**

Please see the attached “Milestones Addendum: with highlighted milestones our team is addressing during this reporting period.

**Project Status:**

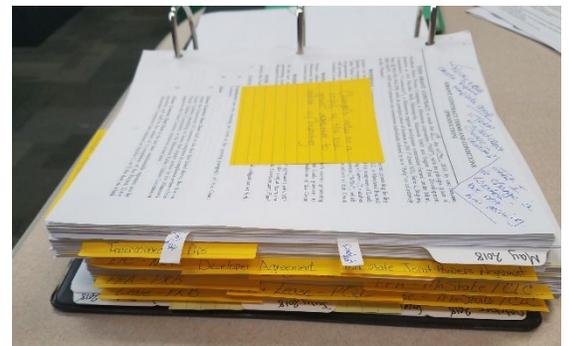
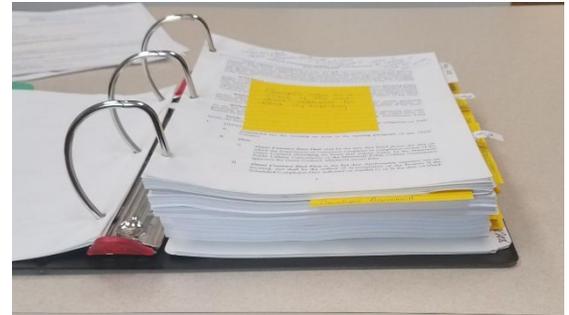
While we are not moving at the pace we expected, we are still on schedule and no delays are anticipated and are easily within budget.

**Appendix: 3 attachments**

1. EPC’s
2. PPA’s, Lease Agreements
3. Notice To Proceed

**Acronyms:**

- R5DC – Region Five Development Commission
- NEE – New Energy Equity
- RREAL – Rural Renewable Energy Alliance
- NJPA – National Joint Powers Alliance (new name as of June 6, 2018 “Sourcewell”)
- EPC – Engineering Procurement and Construction
- PPA – Power Purchase Agreements



# Economic Impact of the Solar Schools Project

**Authored by Brigid Tuck and Ryan Pesch**



# Economic Impact of the Solar Schools Project

A REPORT OF THE ECONOMIC IMPACT ANALYSIS PROGRAM

June 2019

Authored by Brigid Tuck, Senior Economic Impact Analyst, Center for Community Vitality and Ryan Pesch, Extension Educator

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# Table of Contents

- EXECUTIVE SUMMARY** **1**
  
- PROJECT BACKGROUND** **2**
  
- ECONOMIC IMPACT** **2**
  - Direct Effect 2
  - Indirect and Induced Effects 3
  - Total Effect 3
  - Tax Impacts 4
  - Top Industries Affected 4
  - Impact on Solar Companies 5
  
- SOLAR SCHOOLS IN THE CONTEXT OF THE REGIONAL ECONOMY** **5**
  
- REFERENCES** **6**
  
- APPENDIX: METHODS AND TERMS** **7**



## EXECUTIVE SUMMARY: ECONOMIC IMPACT OF THE SOLAR SCHOOLS PROJECT

In the mid-2010s, the Region Five Development Commission developed a bold plan to install solar panels on public school buildings. The plan envisioned working in partnership with the region's public school districts and local renewable energy companies. The project presented an opportunity to raise awareness of renewable energy, develop a skilled renewable energy workforce, and support locally based renewable energy companies, all while potentially providing cost savings and reliable energy to schools. In 2015, Xcel Energy's Renewable Development Fund awarded nearly \$2 million to the project in the form of a grant. A private tax credit investor also contributed to the project. Total project costs were slightly more than \$3.5 million.

Four schools, in collaboration with three utility companies, installed six solar arrays. The arrays will generate 1.5 MW of energy. Project schools include Pine River/Backus and Pequot Lakes K-12 schools and two Central Lakes College sites (Staples and Brainerd). The development and installation of the solar panels has generated economic activity in the region. To measure this, the Region Five Development Commission asked University of Minnesota Extension to quantify the economic impact of the project on the region. The IMPLAN model 3.1 with SAM multipliers and 2017 data was used.

Major findings include:

**Direct Effect:** In total, the Solar Schools project spent \$3,508,500 to install the solar panels. The largest expense was for equipment, accounting for 42 percent of total project costs. The IMPLAN model estimated that 74 workers were hired to complete that work and were paid \$1.6 million in labor income.

**Total Economic Impact:** The Solar Schools project generated an estimated \$7.8 million of economic activity in the region. Of this, \$3.2 million was labor income paid to area residents. The project also supported an estimated 88 jobs.

**Tax Impact:** The Solar Schools project generated an estimated \$197,460 in taxes. The highest amount of taxes paid include sales tax of \$75,380 and property tax of \$54,350.

**Top Industries Affected:** Of the estimated \$7.8 million in economic activity generated by Solar Schools, \$3.5 million was directly for solar schools work. The other \$4.3 million was at other businesses in the region. Top industries affected include owner-occupied dwellings (home-owners), real estate, and hospitals.

Of the \$3.5 million in direct spending by the Solar Schools project, 66 percent was spent at companies that have a solar product line. Extension sent a survey to the companies involved in the project and received four full responses. For the responding companies, half reported this was their largest solar-related project in the region, indicating the project was increasing the capacity of solar companies. For three of the companies, solar remains a relatively minor component of their business model, accounting for less than 25 percent of their total sales. For the other company, solar accounts for more than 75 percent of sales.

**Solar in the Regional Economy:** Solar power generation is part of the utility industry. According to IMPLAN, the utility industry is one of the region's smallest, employing fewer than 50 people and generating \$10.8 million in output. Power generation in the region currently comes primarily from hydroelectric sources. Thus, increasing solar capacity is helping to diversify the local economy and the power supply.

## PROJECT BACKGROUND

In the mid-2010s, the Region Five Development Commission developed a bold plan to install solar panels on public school buildings. The plan envisioned working in partnership with the region's public school districts and local renewable energy companies. The project presented an opportunity to raise awareness of renewable energy, develop a skilled renewable energy workforce, and support locally based renewable energy companies, all while potentially providing cost savings and reliable energy to schools (Grimley & Giavarini 2017). In 2015, Xcel Energy's Renewable Development Fund awarded nearly \$2 million to the project in the form of a grant. A private tax credit investor also contributed to the project. Total project costs were slightly more than \$3.5 million.

Four schools, in collaboration with three utility companies, installed six solar arrays. The arrays will generate 1.5 MW of energy. Project schools include Pine River/Backus and Pequot Lakes K-12 schools and two Central Lakes College sites (Staples and Brainerd). On average, each school's carbon footprint is expected to decrease by 1,420 metric tons of carbon dioxide. In addition, schools were provided with curriculum around the economic and environmental benefits of solar energy (Brainerd Dispatch, 2019).

The development and installation of the solar panels has generated economic activity in the region. To measure this, the Region Five Development Commission asked University of Minnesota Extension to quantify the economic impact of the project. This report presents the results of the analysis.

The University of Minnesota EDA University Center, along with Extension, provided funding for this economic impact study. University Centers have the mission of connecting University resources with the economic development community and are funded by the U.S. Economic Development Administration, which is bureau of the U.S. Department of Commerce.

## ECONOMIC IMPACT

Economic impact is comprised of direct, indirect, and induced impacts. Direct impacts are primary changes occurring in the economy due the project. In this case, it was the spending and employment related to the Solar Schools project and the installation of the solar panels. Indirect and induced effects measure the secondary or "ripple" effects across industries affected the project. They are measured using input-output models. In this analysis, Extension used the input-output model, IMPLAN, to calculate the indirect and induced effects. The IMPLAN model 3.1 with SAM multipliers and 2017 data (most recent) was used.

A critical component of an economic impact analysis is the study area. In this report, the study area was the five counties of North Central Minnesota, include Cass, Crow Wing, Morrison, Todd, and Wadena counties.

### Direct Effect

The Region Five Development Commission provided Extension with the project's financial records. In total, the Solar Schools project spent \$3,508,500 to install the solar panels (Table 1). The largest expense was for equipment, accounting for 42 percent of total project costs.

**Table 1: Direct Effect of Solar Schools Project, 2018-2019**

|                        |                    |
|------------------------|--------------------|
| Equipment              | \$1,477,202        |
| Construction Materials | \$580,469          |
| Professional Services  | \$555,852          |
| Other Direct Costs     | \$410,372          |
| Labor                  | \$484,655          |
| <b>Total</b>           | <b>\$3,508,550</b> |

Source: Region Five Development Commission

### Indirect and Induced Effects

As mentioned, indirect and induced effects are the ripple effects generated by the Solar Schools project. In this study, they were quantified using the input-output model, IMPLAN. Input-output models trace the flow of goods and services throughout an economy. Once the flow is known, the model can estimate how a change in one part of the economy will affect other areas.

Indirect effects are associated with business-to-business transactions. As the Solar Schools project purchased solar panels, electrical supplies, and services, this caused the suppliers to increase purchases from their suppliers. These are indirect effects.

Induced effects are associated with consumer-to-business transactions. People employed to install the solar panels received income. As they spent that income in the community, they triggered suppliers to increase their purchases. For example, if they bought groceries, the grocery store had to restock, pay its employees, etc. to meet the demand. These are induced effects.

### Total Effect

The Solar Schools project generated an estimated \$7.8 million of economic activity in the region (Table 2). Of this, \$3.2 million was labor income paid to area residents. The project also supported an estimated 88 jobs.

**Table 2: Economic Impact of Solar Schools Project, 2018-2019**

|              | Output             | Employment | Labor Income       |
|--------------|--------------------|------------|--------------------|
| Direct       | \$3,508,550        | 74         | \$1,613,800        |
| Indirect     | \$3,268,800        | 4          | \$1,319,400        |
| Induced      | \$1,018,200        | 10         | \$303,200          |
| <b>Total</b> | <b>\$7,795,550</b> | <b>88</b>  | <b>\$3,236,400</b> |

Source: University of Minnesota Extension estimates

As detailed, the direct output effect was \$3.5 million. The IMPLAN model estimated that 74 workers were hired to complete that work and were paid \$1.6 million in labor income.

**Tax Impacts**

The Solar Schools project generated an estimated \$197,460 in taxes (Table 3). The highest amount of taxes paid include sales tax of \$75,380 and property tax of \$54,350.

**Table 3: Tax Impact of Solar Schools Project, 2018-2019**

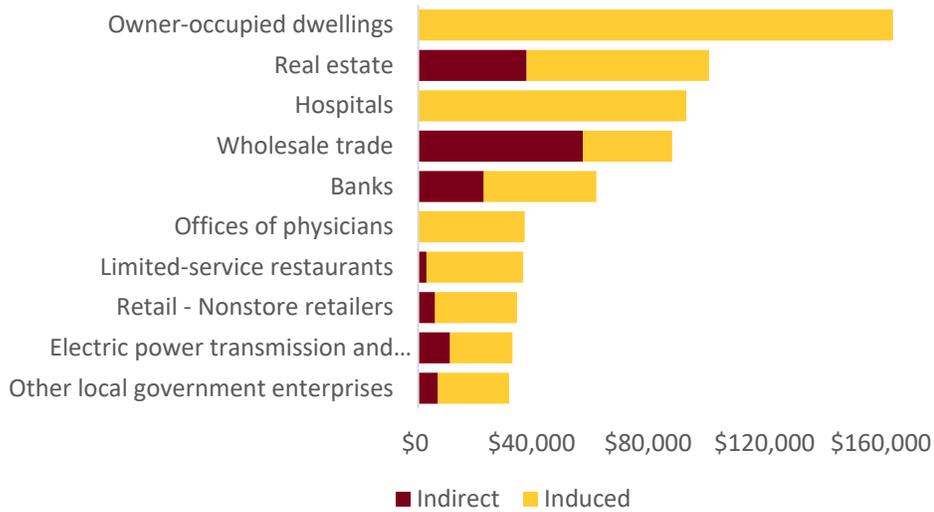
| Tax Type             | Value            |
|----------------------|------------------|
| Dividends            | \$500            |
| Social Insurance     | \$390            |
| Sales Tax            | \$75,380         |
| Property Tax         | \$54,350         |
| Corporate Profit Tax | \$15,240         |
| Income Tax           | \$5,000          |
| All Other Taxes/Fees | \$46,600         |
| <b>Total</b>         | <b>\$197,460</b> |

Source: University of Minnesota Extension estimates

**Top Industries Affected**

Of the estimated \$7.8 million in economic activity generated by Solar Schools, \$3.5 million was directly for solar schools work. The other \$4.3 million was at other businesses in the region (Chart 1). Top industries affected include owner-occupied dwellings (home-owners), real estate, and hospitals. Indirect effects (business to business) are highest in wholesale trade, banking, and real estate. Induced effects (consumer to business) are highest in housing, hospitals, and office of physicians. Since housing and health care are the biggest portion of a household’s income, this is not surprising.

**Chart 1: Top Industries Affected by Solar Schools Project, Sorted by Output**



### Impact on Solar Companies

Of the \$3.5 million in direct spending by the Solar Schools project, 66 percent was spent at companies that have a solar product line. Extension sent a survey to the companies involved in the project and received four full responses. Extension emailed a survey invitation to 20 companies, so this is a 20 percent response rate. However, four responses is a limited dataset. The results of the survey are presented here, but not incorporated into the economic impact analysis.

For the responding companies, half reported this was their largest solar-related project in the region, indicating the project increased the capacity of solar companies. For three of the companies, solar remains a relatively minor component of their business model, accounting for less than 25 percent of their total sales. For the other company, solar accounts for more than 75 percent of sales.

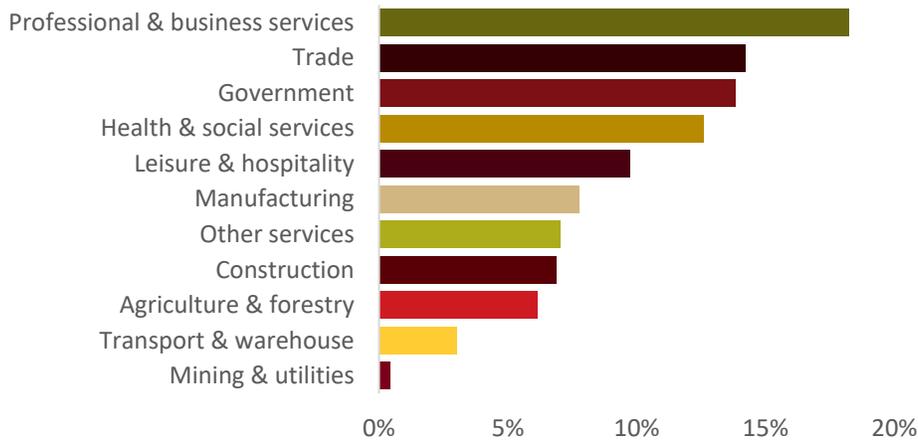
Growth for the companies has been moderate. Two companies reported their solar-related sales increased significantly between 2010 and 2018. The other two reported sales were about the same. One company plans to significantly increase their sales in the next five years. The other three plan to remain about the same.

### SOLAR SCHOOLS IN THE CONTEXT OF THE REGIONAL ECONOMY

In 2017, businesses in the region employed 13,100 people. In terms of industries, the largest employer in the region is professional and business services, accounting for nearly 20 percent of the jobs. Trade and government are other major employers.

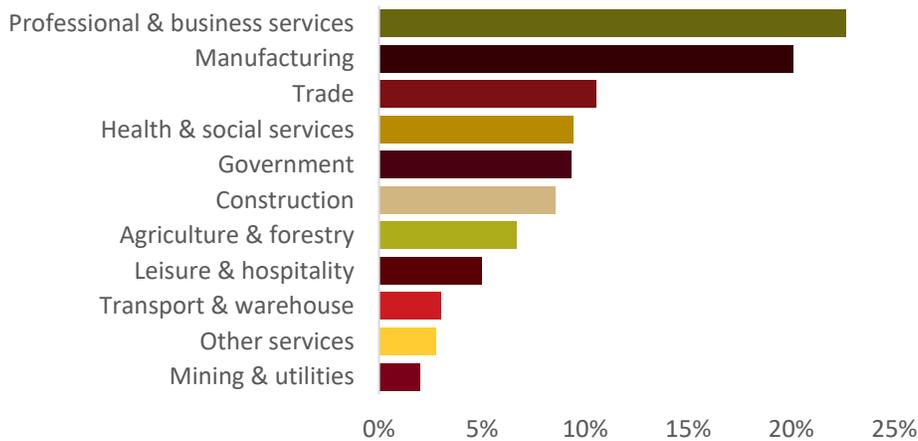
Solar power generation is part of the utility industry. According to IMPLAN, the utility industry is one of the region’s smallest, employing fewer than 50 people and generating \$10.8 million in output. Power generation in the region currently comes primarily from hydroelectric sources. Thus, increasing solar capacity is helping to diversify the local economy and the power supply.

**Chart 2: Percent of Employment by Industry, Cass, Crow Wing, Morrison, Todd, and Wadena Counties, 2017**



In 2017, businesses in the region created \$12.4 billion of output. Of this, nearly one-quarter came from professional and business services businesses (Chart 3). Other major sources of output in the region include manufacturing and trade.

**Chart 3: Percent of Output by Industry, Cass, Crow Wing, Morrison, Todd, and Wadena Counties, 2017**



**REFERENCES**

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Grimley, M. & Giavarini, C. (2017). *The solar coaster: Putting solar on schools in Northern Minnesota means more than energy*. (Community Assistance Program report No. 220) Minneapolis, Minnesota: University of Minnesota. Retrieved from <http://www.resilientregion.org/cms/files/Report%20from%20Matt%20and%20Chris.pdf>.

## **APPENDIX: METHODS AND TERMS**

Special models, called input-output models, exist to conduct economic impact analysis. There are several input-output models available. IMPLAN (Impact Analysis for PLANning, MIG)<sup>1</sup> is one such model. Many economists use IMPLAN for economic impact analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available to economists for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations will help ensure the best results from the model.

One of the most critical aspects of understanding economic impact analysis is the distinction between the “local” and “non-local” economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this analysis, the study area includes Cass, Crow Wing, Morrison, Todd, and Wadena counties in North Central Minnesota.

A few definitions are essential in order to properly read the results of an IMPLAN analysis. The terms and their definitions are provided below.

### **Output**

Output is measured in dollars and is equivalent to total sales. The output measure can include significant “double counting.” Think of corn, for example. The value of the corn is counted when it is sold to the mill, again when it is sold to the dairy farmer, again as part of the price of fluid milk, and yet again when it is sold as cheese. The value of the corn is built into the price of each of these items and then the sales of each of these items are added up to get total sales (or output).

### **Employment**

Employment includes full- and part-time workers and is measured in annual average jobs, not full-time equivalents (FTE’s). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

### **Labor Income**

Labor income measures the value added to the product by the labor component. So, in the corn example, when the corn is sold to the mill, a certain percentage of the sale goes to the farmer for his/her labor. Then when the mill sells the corn as feed to dairy farmers, it includes some markup for its labor costs in the price. When dairy farmers sell the milk to the cheese manufacturer, they include a value for their labor. These individual value increments for labor can be measured, which amounts to labor income. Labor income does *not* include double counting.

<sup>1</sup> IMPLAN Version 3.0 was used in this analysis. The trade flows model with SAM multipliers was implemented.

## Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is spending by the Solar Schools project for equipment, labor, and related services.

## Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to **spending for inputs** (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase in output by the plant. As the plant increases output, it must also purchase more inputs, such as electricity, steel, and equipment. As the plant increases purchases of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts. In this study, indirect impacts are those associated with spending by the Solar Schools project for operating items.

## Induced Impact

The induced impact is the summation of changes in the local economy that occur due to **spending by labor**. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to spend to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. Induced impacts also include spending by labor generated by indirect impacts. So, if the Solar Schools project purchases services from a local fence installation company, spending of the installer's wages would also create induced impacts. Primarily, in this study, the induced impacts are those economic changes related to spending by those directly employed to install solar panels.

## Total Impact

The total impact is the summation of the direct, indirect, and induced impacts.

## Input-Output, Supply and Demand, and Size of Market

Care must be taken when using regional input-output models to ensure they are being used in the appropriate type of analysis. If the models are used to examine the impact of an industry so large that its expansion or contraction results in major supply and demand shifts causing the price of inputs and labor to change, then input-output can overstate the impacts or impacts. While the Solar School project contributed to North Central Minnesota's economy, it is not likely that its existence has an impact on national prices for its inputs. Hence, the model should estimate the impacts reliably.

## ATTACHMENT G

### LESSONS LEARNED: A COMPENDIUM OF TELEPHONE INTERVIEW RESULTS

To honor the page requirement for the RDF grant final report, only a few illustrative quotes were provided in the final report. Attachment G is a compendium of the telephone interview responses for these questions:

- To what degree did this project demonstrate a model to cost effectively manage multiple projects among several school districts and multiple jurisdictions?
- R5DC was to serve as a leader in promoting regional strategies for sustainability and renewable energy in Minnesota. Do you agree with this statement? Why or why not?
- What factors/elements promoted project success?
- What factors/elements limited project success?
- If you were responsible for teaching others how to create and operate a successful solar project, what would you teach them? (Make sure and do A, B, and C! Watch out for X, Y, Z).

The following individuals participated in the EnSearch telephone interviews. Their verbatim responses to the telephone interview questions follows. All quotes contained in this attachment were approved by the individuals cited.

Allison Uselman, Distributed Energy Resources Coordinator, Todd Wadena Electric Cooperative  
BJ Allen, Project Manager, Rural Renewable Energy Alliance (RREAL)  
Cheryl Lee Hills, Executive Director, Region Five Development Commission (R5DC)  
Chris Lindholm, Superintendent, Pequot Lakes School District  
Dan Listug, Government Relations Associate, Sourcewell  
Dave Endicott, Superintendent, Pine River-Backus School District  
Greg Ewig, Senior System Director, Minnesota State Colleges and Universities (MinnState)  
Jason Edens, Executive Director, RREAL  
John Langhus, Vice President of Business Development/General Counsel, New Energy Equity, LLC (NEE)  
Kari Christiansen, Vice President of Administrative Services at Central Lakes College, Central Lakes College  
Kevin Corcoran, Project Manager, NEE  
Mark Ritter, Former RDF Grant Administrator  
Matthew Hankey, President/CEO, NEE  
Michael Krause, Owner, Kandiyo Consulting  
Paul Helstrom, Renewable Energy Program Lead, Minnesota Power, Inc.  
Sheldon Monson, Commissioner, R5DC  
Tom Lillehei, Commissioner, R5DC

*TO WHAT DEGREE DID THIS PROJECT DEMONSTRATE A MODEL TO COST EFFECTIVELY MANAGE MULTIPLE PROJECTS AMONG SEVERAL SCHOOL DISTRICTS AND MULTIPLE JURISDICTIONS?*

#### Perspectives Included in the Summary Report.

***That goal was achieved with incredible success.** The complexity of this project was way beyond anything that I have participated in. I have been part of building a couple of schools and those are complex projects; however, it is way harder when you include three different public entities and multiple jurisdictions. We also all have publically elected boards that need to be brought along and who ultimately have to give blessing to the project. **There is a lot of***

**political nuance to that. I think this project was a wild success in demonstrating that it can be done and it can be done in a cost effective way that benefits public entities like schools.** (Chris Lindholm, Pequot Lakes School District.)

*I think that was accomplished pretty well. I think that Cheryal's team was instrumental in keeping everything tied together. Therefore it was certainly easier than if we would have done each one of the six sites separately. In fact, a company like ours would not have done them if they would have been done separately because it would not have had the critical mass necessary for us to focus on it and invest the human resource time necessary to complete the project. Therefore by grouping [the six sites] together made it an impactful project so that we would devote our energy to it.* (John Langhus, NEE)

*Heliene was the manufacturer of the solar panels that were installed at all six sites. In our history at RREAL we have installed many 40 kilowatt systems. Up until this project, 40 kilowatt systems has been our maximum because of state of Minnesota rules. It was great for us and for our crew to do larger systems. When you go back to your question about efficiency, it made it so much more efficient for our crew. They knew where they were going each day. They knew what the next task was. It wasn't constantly moving from job to job.* (BJ Allen, RREAL)

**I think there was a little bit of an expectation in this project that because it was one investor, it is one grant, but several scattered sites – is that all the documents should be standardized. That there would be tweaks here and there that would relate to each individual entity. That wasn't the case. That is generally never going to be the case, because it is Pine River-Backus, because it is Pequot Lakes, because it is Central Lakes College. They each have their own governance structure. They each have their own agreements. And they are each, individually, contracting with NEE as the investor. Therefore, you always start from a template document and want to keep as close to that as possible so everyone is working from the same language, but there is also the complication here where some were ground mounted, some were roof mounted, some were a combination, there were multiple utilities involved. All of that created complexities that required tailoring of each individual agreement. So while the expectation is to keep as close to the template as possible, the reality is that it is a very difficult thing to do.** (Dan Listug, Sourcewell)

*I think it was achieved. Region Five and RREAL stepped out of the box to install and manage a larger installation than they were used to managing. We certainly hit some bumps along the road. I give them a lot of credit for effectively managing those bumps and ending up with a very successful installation for all parties involved. I think there was a great learning on all sides on how to effectively manage this from working with joint lawyers to negotiate the power purchase agreement to working with one contractor to efficiently scale the installation to complete the project in a cost-effective way. We will be able to utilize this experience to complete better installations and make them more cost efficient in the future. Not every project will have the great grant that Xcel provided in order to drive that electricity cost down for the customer or the schools. Many of the efficiencies we picked up we can very quickly deploy into other projects, which in turn satisfies the goal which is to make this more of a deployable project.* (Matthew Hankey, NEE)

**Without Region Five I do not think the project would have been able to manage multiple projects among several school districts, MinnState and multiple jurisdictions. That would have been very challenging. For us – we do a fair amount of capital project work. We have done a number of projects with multiple jurisdictions. For the Region Five Solar Schools Project, the school districts and MinnState have a lot of similarities but there is some distinct differences that we had to navigate, which sometimes were not recognized. I think for lessons learned – the sooner you have those partners at the table at the front end the better. We came in late to the transaction when the school districts had been in negotiations and had gone through a fair amount of conversations. Therefore there were some things that had been established before we became involved. If we had been a part of the process at the beginning – we might have been able to streamline the process and speed up the process on our end. It is not a criticism of this deal at all; it is simply the reality of how we came into this project.** (Greg Ewig, MinnState)

#### **Additional Perspectives.**

*I don't know because I haven't seen the end plan as far as the operation of the facilities. I think that it does serve as a model for other organizations that do not have renewable energy as their primary focus. They can learn how to find an entity that can provide that capacity for them. My personal thought is that there are a lot of developers that can come in and install a system; however, when they leave who is going to maintain and operate the solar array. When I talked earlier about how this benefits rate payers and how this benefits Minnesota – the Region Five project will be one that has benefits at a higher level. It is a model that can be used state-wide, beyond just Xcel Energy.* (Mark Ritter, Former RDF Grant Administrator)

Having all six projects made it more cost effective for us to order components. **It made it more efficient from the perspective of needing to do similar engineering requirements on each of the sites.** So for our partners too – they were able to do all sites, for example, on one day or two days instead of having to schedule one day one site and then wait three months for another site. **Our components cost less because we able to order a significant quantity all at once.** (BJ Allen, RREAL)

Technically I am not really sure we learned a lot new. These bigger systems are a whole bunch of 40 K systems in one location. That is **the cool thing about solar energy is that it is very scalable. From a very small system size to a very large system size, you are essentially using the same components no matter what the system size is. This demonstrated that.** That wasn't particularly new to RREAL but this project effectively demonstrated it. (BJ Allen, RREAL)

**It is hard to know though whether there were efficiencies offered by doing this project as a scattered site.** Typically projects of this size and scale and scope are done in one greenfield, which is how much of the solar is done. You find some raw land that is either fallow or not being used to its fullest – it is on that land that the system is deployed. It is one big rectangle, although I am oversimplifying a bit. In this case, we had 4 utilities (5 if you include Leach Lake). We had all of these stakeholders. It certainly could not have been done without the regional coordination of Region Five and to a lesser extent RREAL, but I am not sure it created a lot of efficiencies. That is not to be disparaging of anyone, it is just that there were a lot of players in the sand box. **I think we would have to do it again to better understand how this offers efficiencies.** (Jason Edens, RREAL)

**I guess I would say this, there is no way that a regional scatter site development this major could have happened without entity like Region Five.** There is no doubt about that. Because to do each one of these projects with tax equity would probably have been impossible **because some of these systems are quote unquote small in the traditional solar industry. To do 40 Kwh at CLC campus that would not have happened because no tax equity financier is interested in a system that size.** The transactional costs of setting up these legal agreements in and of itself were in excess of the project's cost. So the system at CLC wouldn't have happened, the system at Staples would not have happened – so the main advantage was to be able to aggregate all of these with one tax equity financier partner. So that was the main way in which efficiencies were offered. The main way in which these projects were made possible. Doing these on an individual basis would have been really, really hard – maybe impossible. The system at Pine River – Backus – that probably could have been done as a standalone system – but that was probably the only one. **So the primary way there was efficiencies was in the aggregation of all these systems into one transaction.** (Jason Edens, RREAL)

“Cost-effectively” are the words that I am pulling out of that. To have a single developer develop multiple sites seems like there would be an economy of scale. Doing multiple projects simultaneously through one site developer is a model that is used by many in the private sector, like New Energy Equity and others. This is what they do every day and is how they manage their costs. With that said, **I think we have had some economies of scale, but I think there would have been a more cost-effective result had the developer (us) been a little more experienced.** Had this been my second or third project with multiple sites, a scattered site development for renewable energy, aka solar in this case, I could say undoubtedly and with confidence that there would have been more cost savings had everything not been new to me, to Region Five, the project developer. (Cheryl Hills, R5DC)

**The first thing is that I think the goal was achieved because the project did finally come to fruition; we were able to put the pieces together after several years of development.** A key element to that is **having a central source of administrative burden** – and in this case that would be Region Five. Region Five took significant efforts to make sure that their time was compensated but nothing else. There was no benefit but for that which flowed to the schools, that is a key element. I am going to give a bit of a more challenging answer as it relates to the legal component for a project of this nature. **As I alluded to earlier, any potential deal like this where you are taking to investors, grant funding organizations, regulators, schools of all types, whenever there is a partnership of this nature there is the potential that that partnership can go bad and could end up in litigation.** There could be disputes about the agreements. In that regard, it is crucial that each partner feel that they are represented and understand the risks and the potential benefits that they are assuming when they are entering into these agreements. These are long term agreements; they are binding the schools to a very long term contract by energy from the investor. So in regards to the economy of legal services, there is an inherent challenge in being able to do that. **I think part of the goal originally was to minimize that burden to the schools and have Region Five act as their surrogate in those discussions. That was partially achieved. But there are still individual interests.** There are questions about putting equipment on school

roofs. There are questions about 25 or 30 year contracts. There are questions about entering into an energy contract with an investor whom you might not familiar with; therefore, to that extent, each school really needed to rely on their own counsel interpretation to make sure that their interests were being served. Overall R5 was able to help economize some legal services by coordinating the project. However, **the challenge will always be each individual party needs to have their own legal counsel. We tried to minimize that as best as possible but that would be an area where you could look for further efficiencies in the future.** (Dan Listug, Sourcewell)

[Interviewer: Did the schools have to pay for legal services?] Region Five shouldered the burden in that they incorporated into the project budget opportunity to cover the schools' legal expenses. (Dan Listug, Sourcewell)

[Interviewer: So when you talk about efficiencies in the future is it that some of these documents like the Purchase Power Agreement and lease agreements – were not standardized and there wasn't a template you could use?] **I think there was a little bit of an expectation in this project that because it was one investor, it is one grant, but several scattered sites – is that all the documents should be standardized.** That there would be tweaks here and there that would relate to each individual entity. **That wasn't the case. That is generally never going to be the case, because it is Pine River-Backus, because it is Pequot Lakes, because it is Central Lakes College. They each have their own governance structure. They each have their own agreements. And they are each, individually, contracting with NEE as the investor.** Therefore, you always start from a template document and want to keep as close to that as possible so everyone is working from the same language, but there is also the complication here where some were ground mounted, some were roof mounted, some were a combination, there were multiple utilities involved. All of that created complexities that required tailoring of each individual agreement. So while the expectation is to keep as close to the template as possible, the reality is that it is a very difficult thing to do. (Dan Listug, Sourcewell)

From a management perspective, the ability to replicate using the same equipment, same manufacturer and same installers – and using the same installation company – these are efficiencies in managing multiple projects. (Sheldon Monson, R5DC Commissioner)

It was a very complicated project. Therefore the transactional costs, the amount of time it took Region Five and RREAL to get this project through was probably taxing. I think that adding solar at load centers is a good thing. However, when you are working with institutions where you have a school board, superintendence, maintenance folks, and different utilities – it becomes a very complicated balancing act. Therefore I don't know how cost effective the project was. (Paul Helstrom, MN Power)

In terms of my involvement, with everyone I worked with all the way from the electrician to solar company to Cheryal and BJ – everyone was very professional. Everyone was always in the loop. The communication was great. Cost was always a question when a few hiccups came up. We needed to talk through all those things and they always listened to what the options were. In my experience, especially with the second part of the goal – they achieved that. (Allison Uselman, Todd Wadena Electric Cooperative)

**I think it was done extremely well.** The partnership between Region Five, RREAL, and NEE was done extremely well to get these six projects done and done on time. (Kevin Corcoran, NEE)

R5DC WAS TO SERVE AS A LEADER IN PROMOTING REGIONAL STRATEGIES FOR SUSTAINABILITY AND RENEWABLE ENERGY IN MINNESOTA. DO YOU AGREE WITH THIS STATEMENT? WHY OR WHY NOT?

#### **Perspectives Included in the Summary Report.**

**I think that part is still going to come to some extent as we do some public relationships events around the project. As we do the ribbon cutting.** The cool thing about the schools is integrating their projects with the students and the curriculum. Therefore, you are not only improving your energy balance but you are also educating these kids about what their energy choices are and the implications of choosing one over another. When they go home and they talk to their parents those conversations then ripple through to the State Capitol when they are debating state policies. More and more parents are saying, "My child's school district is doing really well with using solar and I think we should be doing more of that." We see that ripple happen very clearly. (John Langhus, NEE)

I absolutely do. **I have never heard of two or three school districts working together on a project like this before.** The fact that it did happen and it was successful is all to Region Five. If that can be replicated elsewhere it is definitely worth doing so. They did very much demonstrate that it is possible. (Chris Lindholm, Pequot Lakes School District.)

***I think Region Five willingness to take a leadership role and have a vision to see this project come to fruition is a key benefit. In and of itself, I think that school districts might have dabbled, individually, into looking at a renewable energy project using solar arrays. But there are incredibly complex. They are time consuming. As public entities subject to publically elected officials whims and public boards, the longevity needed to sustain that vision is difficult. Region Five took that burden on and took on the administrative burden which was significant to make it as easy as possible for the regional entities to continue their participation. (Dan Listug, Sourcewell)***

***I absolutely see that happening. Region Five really stepped out as a leader to get the grant and to get this project underway with partners in this region. We would not be successful without them. They have been central to leading this effort. Even as the project is continuing, there are still emails about other things that we can do in the areas of sustainability and renewable energy – such as getting students involved in this project and looking at electric vehicles and charging stations. It is not just solar. I look at how Region Five supports the work at the Ag and Energy Center – and works to support that mission. When I think about all the ways they work with us on local foods, gleaning and providing funding along with people and ideas – there are so many examples of how they really are a leader in supporting sustainability and renewable energy in Minnesota and in our region. (Kari Christiansen, CLC)***

***It is humbling to think so, and while I know that we have been nominated for a number of awards that will likely be announced in 2020, the greater indicator Region Five potentially being viewed as a leader in this space are the calls I get from the other parts of the country. For example, the four corners area is suffering from coal fire plant closures and they are looking at how to rebuild their economy. I feel honored that areas of the country – looking at new strategies on how to sustain and build economies – are looking to Region Five to understand how we did it and how we think about it and how we measure it. We don't just consider how this project has assisted the environment or the economics of the region, we truly consider how have people from the region who are the most disenfranchised residents positively impacted. These are tough questions, but we know we DO what we Measure so we can teach how to measure. That is gratifying. (Cheryl Hills, R5DC)***

#### **Additional Perspectives.**

***I can only speak to my district and where I live. The number of people who stop me on the streets or when I am out to eat or when I am at meetings regarding our district – the number of people who come to me and say, “Wow! It is so cool what your district is doing with the solar. We think it is a fantastic project. We love what you have done here.” Then people start asking questions and start wondering if they can do that. We also see that at the farm. People are saying, “Tell me about this. How did you get this going? What does it do?” So it brings an awareness to folks that, first of all it is possible to do and secondly that it has a positive impact and third it is not as cumbersome a project on an individual basis as it may seem. (Dave Endicott, Superintendent, Pine River-Backus School District)***

***This was one of the goals that Region Five had as a part of the Resilient Region Plan. Solar energy was a part of that plan and this is meeting one of Region Five's regional goals. That goal was one that the community came up with; it was not a goal that Region Five came up with on their own. (BJ Allen, RREAL)***

***Region Five is into many things, but the project is showing that Region Five is promoting the value of alternative energy sources. They are also showing the benefits that solar energy can have for our Region Five region. For instance, the short term work that has been created on the installations. There aren't any ongoing jobs created, because once it is built there is generally some minor maintenance off and on. The economic impacts you have are the short term impacts of the jobs created for the installations. The long term impacts are that the schools are going to be paying less. Therefore, money that would have been spent on utility bills are being spent for other educational resources. (Sheldon Monson, R5DC Commissioner)***

***I definitely think so. It starts with the coordinator: the energy, the positivity, the communication, and collaboration all was seen there. So I would say that that was true. (Allison Uselman, Todd Wadena Electric Cooperative)***

***I think that certainly is meeting that goal. As I think you are getting out of this interview, it is not easy to bring multiple public jurisdictions together in a meaningful way. It is not an easy task. Cheryl was very instrumental in pulling us all together and in outlining her vision and the potential benefit of the Xcel grant. (Greg Ewig, MinnState)***

***There have been lots of other national projects where we have been brought in as an expert because of how we evaluate success. We don't call them industry sectors anymore; we call them value chains. We have evolved our***

thinking as to how we are engaged to when building values to regional economies. **We have been able to highlight our work in the agricultural sector. Now we are starting be recognized as a leader around the energy value chain as well. That is humbling and exciting for us. We do this with full knowledge that we have not yet arrived. That we are still learning as well. While we have a systematic approach to making sure that what we are doing has positive environmental impacts and economic impacts – as well as positive social impacts – we recognize that we have to continue to plan, do, learn, and adjust in order to truly earn the title of Industry Leader.** (Cheryal Hills, R5DC)

[Did the project help Region Five be seen as a leader in solar energy?] *Yes definitely.* [Are you seeing Region Five being talking about within the energy field?] *When you talk about 1,400 kilowatts of solar energy in the five county area that is a pretty small drop in a pretty good sized ocean. **Yet Region Five got a lot of recognition and accolades especially from Xcel Energy, Minnesota Power, and the school districts with which we interfaced. That, in itself, was a feather in the cap of Region Five.*** (Tom Lillehei, R5DC Commissioner)

## WHAT FACTORS/ELEMENTS PROMOTED PROJECT SUCCESS?

### Perspectives Included in the Summary Report.

*During the initial contract negotiations with Xcel we included one of the region's school districts. The day after the school board meeting where they formally withdrew, I saw Keith Olander and he asked, "How are you Cheryal?" and I told him that I think the project is dead again. He said, "We want in!" I said, "Are you sure?" and he said, "Absolutely!" **He got ahold of Kari Christiansen (Vice President of Administrative Serves, Central Lakes College) and Hara Charlier (President, CLC) and they championed this through in the beginning, and when the project hit MinnStates desk it was Greg Ewig who carried the water.** And it was not easy, in part, because the agreements had to go through the Attorney General. The attorney for MinnState/CLC is the Attorney General. And I, as R5DC, had to sign a Joint Powers Agreement with MinnState. I am glad I did. It was the right decision. It was the first for any Regional Development Commission to do. We had to guarantee that they would never pay more for their solar power than they would for conventional energy. **I give so much credit to Kari Christiansen and Greg Ewig.** This is the largest solar installation at a Minnesota State facility. It is very exciting. There is a lot of interest in solar energy by the MinnState system, but there are very few systems in place.* (Cheryal Hills, R5DC)

*Without **the RDF grant and the availability of that funding**, this project never even gets considered. Therefore, that is a consideration as well. Xcel Energy's willingness to participate. The other factors too are you needed to have that **client support, you needed to have the schools, the superintendents, and school boards – willing to wait this out.** This required a tremendous amount of patience, a tremendous amount of time, a lot of education to make sure that they understood what they were doing. All those factors needed to be there. You needed to have willing partners. You had willing partners but they also needed to have patience and perseverance.* (Dan Listug, Sourcewell)

***The utilities being able to work with us even though they had not done many solar projects before was important.** BJ was the main point of contact with the utilities, and the utility staff were really willing to work with her which is always extremely important for a project to be successful. The schools were easy to work with too. BJ and I were constantly able to bounce ideas of each other – both of us are very experienced in the solar industry so as issues came up we brainstormed together and figured out how to get around them. I think we did that efficiently.* (Kevin Corcoran, NEE)

*Relationships – I know that Cheryal/Region Five has a really good relationship with Pequot Lakes School District, the Superintendent there which helped promote success. Cheryal also has great relationships with Central Lakes College, so when Little Falls School District fell through we were able to shift to CLC in part due to the regional relationships she had with CLC. Her commitment to supporting the region and supporting regional jobs and keeping as many of the dollars recirculating in central Minnesota to the extent possible is a success factor. We had to go outside of the region for the GeoTech work – I could not find anyone in our region to do that work. But by and large all of this work has been done by regional subcontractors of RREAL which is pretty cool. That is a significant amount of money that is staying in Central Minnesota.* (BJ Allen, RREAL)

*[Additional insights?] **The utilities were all really great to work with.** Xcel doesn't think about that that much because they have a very codified process for interconnection. But in greater Minnesota many of the utilities do not have such a clear and codified process all the way from submitting your application to interconnect through testing. But for this project all the utilities were really great to work with. Over the past ten years the process of working with utilities in Northern Minnesota has become more standardized.* (BJ Allen, RREAL)

**NEE started and [even with] just some of the hick-ups along the way, they hung in there.** Obviously they were committed to this project. They need some accolades as well for staying in there and seeing the project through to completion. One of the things that made it so attractive to several of the investors was that it **looks good on their corporate report. We are supplying money to do this school project. School Project would be in bold letters. They get a lot of PR out of that.** The fact that it is a **very green product** as far as being environmentally neutral. You put up the solar arrays and get electricity out of it. There is virtually no carbon emissions. From an environmental standpoint, it was a great thing to do. A lot of the schools recognized that. **The company that was doing the engineering on it, which is RREAL, they had a very good reputation for doing these kinds of projects.** (Tom Lillehei, R5DC Commissioner)

The primary factor that promoted success was **stick-to-it-ness, tenacity, gumption.** If either Cheryal or I had given up this project would not have come fruition in my opinion. **We were just not willing to let this project die.** There were many times when it probably could have – but then one or the other continued to carry the water. We just had faith that eventually we could bring this project to the region. I think that **was partially motivated by the fact that the RDF had agreed to support this project to the tune of almost \$2 million.** So we could not let that opportunity not be brought to the region. So we were very committed to making sure that that opportunity was brought to the region. Once we got to the point where we were signing contracts then it was the skill set of everyone involved – from our electricians, to BJ as the project manager, Cheryal and her skills – but to bring it to the point where it was a green light – that was just **that we were not willing to forego this opportunity provided by the Renewable Development Fund.** Persistence! (Jason Edens, RREAL)

#### Additional Perspectives.

The fact that we have Pine River-Backus, Pequot Lakes and CLC all with their sites up and running that this point speaks well to the fact that it was an effective process. **There is no way that our district could have afforded to do this project without the support from the RDF grant, the investors, and Region Five folks – who kept this project together. We would not have been able to have the size of system that we have or seen the results that we have without that kind of investment from others.** We have seen the efficiencies of bringing these kinds of projects in, folding them together, and making it happen for all of us. **I would venture to guess that all three entities in this project would have had nothing or much small solar arrays if they were reliant on themselves. Also an investor would not have been interested in smaller projects.** (Dave Endicott, Superintendent, Pine River-Backus School District)

**Sourcewell as another champion.** We added Sourcewell early on because I, as the agent for R5DC, needed an attorney. I did not know what the agreements were. The languages was a language I had never spoken. Although I had my trusted partners in RREAL, I needed an attorney. I was going to be signing 25 year agreements on behalf of the commission. I also needed help with legal fees. Dr. Chad Coauette arranged for a retainer from Sourcewell. Dan Listug, Government Relations Associate, Sourcewell, served then as our attorney. He was at every meeting. He went to Duluth with us so many times. He was on so many calls. **He understood what my priorities were for this project and worked to make sure they were honored. He was indispensable.** There was a small army of lawyers throughout this project. The Attorney General, for MinnState/CLC, the schools had their attorneys, RREAL had their attorney, Dan served as the R5DC attorney, and NEE had their attorneys. (Cheryal Hills, R5DC)

**All of the players deserve kudos for good old fashioned perseverance and sticking to it and not letting curve ball after curve ball get in the way.** The last curve ball we got was the severe winter. They shoveled more snow off our roof this year than I think we did in the parking lot. Just to make the project go – so kudos to everyone for gutting it out and making this project work. (Chris Lindholm, Pequot Lakes School District.)

The idea that really intrigued the advisory group, who selected the project, was that the project **was serving an underserved population.** The fact that Region Five included in the proposal **a component to evaluate and assess the effectiveness of the project was also an element that intrigued the advisory group.** There were in the past a lot of proposals that would come in and they would say that the project would make these great improvements or have these great benefits but didn't have an evaluation component. Region Five also had in the proposal assessment objectives they were going to undertake. (Mark Ritter, Former RDF Grant Administrator)

Coming late to the party meant that we had a learning curve. Just the information sharing and knowing about the goals and assumptions. We checked the assumptions and they made sense. **I think the openness and sharing among, not just Region Five, but among the partners really helped in the success of this project.** (Greg Ewig, MinnState)

**The communication and keeping everyone on the same page was important. I know that is not always easy in a large project. I felt like the overall consensus – in that everyone is very excited about this project. The very positive attitudes with everyone I talked with made a big difference as well.** (Allison Uselman, Todd Wadena Electric Cooperative)

**The grant was a critical piece of funding and enable them to do the project. Schools that don't generally have capital to spend on this kind of investment and can't take advantage of tax credits; therefore, the fact that there was an RDF grant was critical to the projects' success.** (Paul Helstrom, MN Power)

**Our board members were great supporters and insisted that we continue on with this project and see it come to full fruition, which it has. At one point I thought they were going to [pull out]. But they never did. They kept looking at me and saying, "We want to keep going with this project because it is important for our district."** (Dave Endicott, Superintendent, Pine River-Backus School District)

**First, having the RDF grant money available. Then the collaborative spirit between Region Five, the school districts involved, RREAL, and NEE – that collaborative spirit enabled us to work through all the hoops. You don't realize how much legal work has to be done to in order to protect your district, to protect the investor, to protect all those involved. There was considerable amount of time and money spent just on getting the legal pieces together. I have to give kudos to Cheryal and her team at Region Five and Jason at RREAL for persevering through all of those things because it can be a frustrating and time-consuming process. Yet no one gave up on that and we ended up with language that was favorable for all. It also protected – in our case – our tax payers from having to face some undue burden because of solar project. We are risk free and cost free because of the work of the collaboration.** (Dave Endicott, Superintendent, Pine River-Backus School District)

**We have a really great crew who pay close attention to detail, which is something you want in your contractor. They do really great work. Also, we have been working on this project a long time. We have a long history working with Region Five. Therefore we have these great partnerships with trusted partners in place. Our local partners, the schools, they have been really great to work with.** (BJ Allen, RREAL)

**The company that was doing the engineering on it, which is RREAL, they had a very good reputation for doing these kinds of projects.** (Tom Lillehei, R5DC Commissioner)

**The Partners. I think the partnership Region Five had with RREAL, RREAL's business culture and commitment to the region and to building local capacity was important. I do think too that Minnesota Power was very responsive. This wasn't necessarily something that they were tee'd up and all ready and set up to do. But they worked with us. They understood that their rate payers wanted to see this happen and so they were responsive.** (Krause, M. Kandiyu Consulting)

## WHAT FACTORS/ELEMENTS LIMITED PROJECT SUCCESS?

### Perspectives Included in the Summary Report.

**One of the factors that I have already mentioned was that the Region Five proposal was on the reserved project list. We learned in prior cycles that some projects don't move forward so it was important to have a reserved project list. It was almost two years between when Region Five received notice that they had been approved for a grant and funds became available. That is a long time. Yet the Region Five board of directors still felt it was an important project. They were able to overcome the challenges of actually implementing the project much later than when the proposed costs and key elements were developed. Another challenge with this project is working with a regulated entity such as Xcel Energy. There were a lot more steps and processes that had to go through regulatory review with the [Public Utilities] Commission that would not be typical from a non-regulated funder.** (Mark Ritter, Former RDF Grant Administrator)

**One factor is just the nature of the costs. Solar has become more cost effective. But without the ability to monetize the existing federal tax credits through the investment tax credit that the US Congress passed through the use of a private sector financier such as NEE – without that 30% the financing costs are still is extremely challenging for public school districts. That added another layer of complexity to bring in that private sector ability to monetize those tax**

credits. Because these are school districts; they are public entities; they don't pay taxes. Therefore in order to get that advantage it added a number of layers of complexity [to the project]. (Dan Listug, Sourcewell)

**One of the big factors here you had a grant from one utility in other utility territories.** So there was a degree of trying to understand, "What is this?" **and a questioning of why is Xcel Energy money being spent in another utility service territory?** That led to more explaining that needed to be done to help the utilities understand how this works. The requirements regarding where **the renewable energy credits (RECs) go**, who they belong to, was another factor that influenced the project. You also have these technical factors as well. **You have all these bodies of approvers.** You have to have approval from a myriad of groups – from school boards, to financiers, to utilities, etc., while trying to meet the requirements of this grant program. Also you have the unknowns going into it. **You do not know if the building is going to support it. I know they ran into some of those things where they had to relocate some of the arrays. So there were a number of technical factors as well that extended the timelines.** (Paul Helstrom, MN Power)

You triggered my memory into one of the bigger hurdles, and it is something, quite frankly that the **RDF needs to see in this report. Their standard grant contract is a rigid document.** They tried to have a one-size-fits all contract that they could execute with any grant recipient. One of the significant issues that has been worked around with the PUC and RDF process now – they initially did not want third party ownership of these systems. The original goal was to have public entities applying for these grant dollars. They public entities would then use the grant dollars to purchase their solar arrays and reduce their energy costs. I alluded to the investment tax credit earlier, that lack ability to have third party ownership significantly limited the ability to monetize those tax credits for public entities. This worked out in the end. This worked out in this project because Xcel and RDF and the PUC have done this several times where they have added special conditions to the agreement. To make sure that their concerns are met, that the public entities are really the ones who are taking advantage of these grant dollars, not an investor. They did that through the addition of several special conditions to the standard grant contract. As we look at economies and things to learn, the intent was true in having one standard agreement to make it plug and play for different entities. The reality is that that probably caused more problems than it solved. It needs to be looked at that they consider a more flexible contract process, a more flexible grant process in the future. [Was it specifically around **third party ownership** or was there some other aspect of that contract that needs to be addressed?] That was the primary impact. It doesn't necessarily exclude third party ownership. But the way the contract was structured it only presumed that the public entity would be the one contracting directly with a solar manufacture and solar entity. It didn't contemplate factoring in that solar investment tax credit option – which is a 30% value to the investors. That is a significant amount of money that they can bring to the table to deliver further savings to the public entity. Dan Listug, Sourcewell)

**Polar Vortex!** I cannot believe what our installation team had to work through! I am so grateful for their ability to work through those conditions. They shoveled gazillions and trillions of pounds of snow in order to make this project happen. I have to call out the polar vortex because it was a historic winter! (Jason Edens, RREAL)

[Interviewer and BJ talked about the **anti-island testing.**] It turned out that it was on the utility end. It wasn't anything on the inverter side. The project has been under a lot of change for so many different reasons. **One of our challenges too is that solar is such a political hot button topic.** We just heard from suppliers today that the tariffs are starting to drive up prices on our inverters. So the inverters that we installed at Pine River-Backus are going to go up 15% by quarter three. **It is very hard to deal with the constant changes in the solar industry.** (BJ Allen, RREAL)

In terms of our technical project success we passed all our performance tests on the first try. The financier stated, "We never have people passing performance on the first try." It is all, technically, has been really positive. (BJ Allen, RREAL)

Several – I wish I would have kept a list, but there were too many. I think there were a number of times when we had to have an internal discussion – is this feasible anymore? Does this still make sense? **Certainly the panel manufacturing going out of business** was a significant hurdle. Also, when we identified **NEE as our preferred finance partner we entered into a letter of intent with them. That had a term on it. That term came and went. We were still viewing each other as viable partners after that term expired.** When it finally looked like we had a solid enough information to **submit the grant documents with RDF that started another clock.** And then there were some **significant issues in terms of executing the EPC contract** and the way we had to structure that contract as a back to back agreement. In NEE hiring Region Five and Region Five hiring RREAL to make it work. That was a challenge as well. **Then you got to the realities of meeting NEE calendar year obligations in regard to certain tax credits and that having significant cost impact if they were able to deliver more kilowatts before the end of the last calendar year then they would have received a better tax benefit and could have passed the savings onto the schools. We had to make sure that the contractor RREAL was able to absorb the consequences, and everybody had to agree that it made**

financial sense for them to meet the current construction schedules. So there are numerous examples, those are the big ones. (Dan Listug, Sourcewell)

The only thing I haven't remarked about – I think it wasn't really a limitation but it has been a challenge – is the business structure that the **energy company financing has used for this project. That has been a challenge because they changed their LLC structure a few times.** This may be standard practice; however, generally when we enter into an agreement, we enter into an agreement with a specific party. So changing the company structure, from a public sector viewpoint, was a little bit disconcerting at times. That is one of the things we had a little bit of a challenge with and I don't know if the school districts share that. Generally the other party [NEE] have been very willing to negotiate with issues that we have raised. (Greg Ewig, MinnState)

In Minnesota, obviously, you always have the weather to contend with. The contract discussions took us a little late into the building season which then meant that we had to pause on some of the pieces during the deepest part of the winter. So that is always a bit of a schedule game in Northern Minnesota. (John Langhus, NEE)

### **Additional Perspectives.**

Yes, obviously things like the financing **trying to find an investor** that was willing to invest in the project. We had a couple **investors who were ready to sign on and then they backed out at the last minute.** We had the **solar panel manufacturer who backed out, and I want to say it was at the 11th hour, and we were a month away from getting started with construction.** That was a huge setback. Then we had to go in and find a new supplier. **That new solar array was more expensive so we had to go back in and redo all the numbers and get our investors back online again.** This all took a lot of negotiations and time to get it all done. (Tom Lillehei, R5DC Commissioner)

Another challenge with this project is **working with a regulated entity such as Xcel Energy. There were a lot more steps and processes that had to go through regulatory review with the [Public Utilities] Commission that would not be typical from a non-regulated funder.** (Mark Ritter, Former RDF Grant Administrator)

It is an **incredibly complex transaction** to put it all together when you factor in the grant compliance requirements, you factor in the Power Purchase Agreements, you factor in the leases, you factor in the Joint Powers Agreement – it is just an **incredibly complex project. It is also an industry, solar, that changes all the time.** One of the significant hiccups along the way was that our preferred panel manufacturer went out of business. So we had to scramble and find a new product, [which resulted in needed to] redo the models, re-engineer the project, reposition arrays to meet the project requirements. **There is always the political risk when dealing with public entities;** you could have had new school board come in at any point in time and scuttle the deal. If one key player dropped out that could torpedo the whole deal. All sorts of challenges to work through. (Dan Listug, Sourcewell)

There were a few hiccups along the way. I was not here when the first application was turned in. Then the project stalled for quite a while. I heard first from Cheryal last August. **There were a few things once our engineers looked at the application that needed to be tweaked. That is not unusual. That is very normal for a diagram to come in and our engineers to want few tweaks. I would say that that was fixed immediately.** After that it was pretty quiet until the construction was completed. The utility isn't really that involved until it comes to interconnection. At the end, the anti-islanding test went fabulously for the Ag Campus and the West Campus. **However, the Main Campus there were some issues in getting the third inverter to shut down. The electrician, the project manager from RREAL worked with the Todd Wadena Electric Cooperative meter technician and were just fabulous. They were collaborating and thinking through ideas together. They found a solution within a matter of days.** And then retested and the system passed. Therefore there were very few things but they were resolved right away. (Allison Uselman, Todd Wadena Electric Cooperative)

So we had **some bumps along the road figuring out the contract language.** You had several different entities. We tried to keep those contracts as similar as possible. **There was some misunderstanding that came up during the contracting process about a couple of the key provisions between us and the schools and RREAL as the local developer. That took some time to work through but I think we got to a place where everyone was happy with it.** The schools are getting a very healthy discount on their solar electricity. By far it was the biggest project that RREAL has done so that is great for them. We have a new spot in the state where we have some familiar faces now. (John Langhus, NEE)

**There was a significant limiting factor. Region Five had paid for all the design work, for all the engineering and then the solar manufacturer went out of business.** Region Five had to go back through and do the redesign and the re-engineering. At the time this happened, the project was almost ready to sign the contract to initiate this project. The manufacturer came up and met with us and one month later folded up. However, because of my background – I am very thankful, for the sake of Region Five and our schools, we didn't go ahead and use the other brand. I have heard of various failures in the original proposed equipment. **Therefore, from that standpoint, of ending up with the modules and inverters from Heliene, from what I am seeing in the field, it is a very proven product. Therefore there was a significant step back when all the designing and engineering had been done with one product and then it was no longer available. But in the long term – it was a blessing. The other factor was convincing the various school boards of the advantage of installing solar. One school was going to be engaged and then they backed out.** (Sheldon Monson, R5DC Commissioner)

The biggest one for me is that this **project involved a lot of layers.** It was a lot of government layers. So you have an Xcel Energy grant and then you are working with Minnesota Power and you are working with Region Five and you are working with an investor. **You end up working with a lot of layers that are cumbersome to work through.** When, in a sense, you end up with a government project you end up with all those hoops you have to jump through to make it happen. There is a beauty with the collaboration and bring all those entities together and it doesn't happen without that but there is also the bogging down because of all the layers. (Dave Endicott, Superintendent, Pine River-Backus School District)

What **promoted success was that Region Five and the other folks involved in this process didn't give up on this.** Every time a barrier was placed **they found a way to overcome that barrier.** Another piece was that we had different school districts involved from the very beginning and we had some districts come and go out of this project until we landed on the two school districts and Central Lakes College. **You create a plan for these districts and then all of the sudden one district doesn't go forward. So then you need to bring someone new in. If I had been in Cheryal's shoes or Region Five's shoes that had to be difficult.** I think probably the amazing thing is that all these different things got thrown at us throughout the three- and four-year process and we always found a way to overcome those barriers and make sure the project move forward. (Dave Endicott, Superintendent Pine River-Backus School District)

I didn't personally re-engineer the project that many times because I wasn't involved with this project until the deal was signed. However, people on our team certainly did. We don't have any licensed engineers on our staff so anything that required a PE stamp had to go out to licensed engineers. Therefore, we subcontracted a lot of that work out to WSN in Brainerd. **For one of the schools that dropped out we invested a significant amount of money in the analyses done at their site. Therefore not only mechanical but the electrical as well were designed multiple times.** (BJ Allen, RREAL)

In addition, because of some of the delays and then because of some of the individual pricing considerations – as far as how you compared [the new solar array] against the running utility – for a couple of the schools, **the schools no longer thought it was as good of a deal for them anymore. So those schools then backed out.** (Tom Lillehei, R5DC Commissioner)

**I do think the 40 kilowatt cap on solar projects has become limiting.** It was probably an appropriate limit to have 3 or 4 years ago. But these systems are growing. The solar equipment is becoming more powerful in terms of what it could do. The utility benefits from the system and the grid—so I think the 40 kilowatts is too limiting. It should be sized to the specifics of a given location. (Krause, M. Kandiyo Consulting)

[Did the tax equity financing model play into the difficulty in terms of getting the schools to participate in this project] Yes, because this was definitely outside the wheelhouse of the typical school board. **This is a very nuanced finance instrument.** If you are not in the solar industry and you are not familiar with these types of transactions it can quickly make a school board member's head spin. **There are a lot of legal documents associated with this.** And although it is a tried and tested instrument it is not something that most people are familiar with. (Jason Edens, RREAL)

We ran into a buzz saw of anti-solar agitators in Little Falls. (Krause, M. Kandiyo Consulting)

Cheryal and RREAL are very community oriented. Very service oriented. Very collaborative. Of course we both recognize and embrace the mantra of no margin, no mission. Do good while doing well. However, some of the other entities we had to work with are much more focused on the bottom-line. Whereas Region Five and RREAL are very focused on the triple bottom line. **I think there was culture clash in the negotiations that probably didn't help speed**

**the project up ...** So we definitely ran into some culture issues in that regard. Beyond that that was the only thing that really limited success. (Jason Edens, RREAL)

**We did not end up with the three public entities that we started with.** Two of us were in the project for the long haul, Pequot Lakes and Pine River-Backus. At one point Brainerd schools was on board and at another point Little Falls was on board. Ultimately they ended up not engaging in the project. (Chris Lindholm, Pequot Lakes School District.)

**It took quite a bit of time before we chose NEE as the best fit for the project.** (Dan Listug, Sourcewell)

**The fact that it took years to come together is a risk because of leadership turnover. For example, Brainerd leadership turned over in that time.** There were board elections during that time frame. So when a project spans over four or five or six years in the making, you run the risk of turnover at the board level, or at staff level, or at a Superintendent level. So timing wise, when we lost the initial investor that slowed everything down. When things slow down and you have a school board convinced that this is the right thing to do – then they start to ask questions and they get gun shy. They are risk adverse, as they should be. Therefore timing was a challenge. But we were able to hang on. It almost lost Pine River-Backus, their board started to lose faith and trust. So timing and relationships are very important. (Chris Lindholm, Pequot Lakes School District.)

My secondary understanding of the industry is that NEE is primarily a short-term financier. They are able to put up the up-front-cost and take the short term tax benefits, through the depreciation period which is five or six years. Eventually they will assign or sell that project or that asset to a long-term holder. In order to facilitate that we needed to have more specific numbers in terms of production. **They needed some tweaks to the agreements. That caused quite a bit of a hiccup and took a couple of months to iron that out.** Eventually, whether it was timing, whether the project better fit their portfolio, or whether the long-term purchaser didn't have any interest any more – for whatever reason NEE decided to keep this project in their portfolio. (Dan Listug, Sourcewell)

IF YOU WERE RESPONSIBLE FOR TEACHING OTHERS HOW TO CREATE AND OPERATE A SUCCESSFUL SOLAR PROJECT, WHAT WOULD YOU TEACH THEM? (MAKE SURE AND DO A, B, C! WATCH OUT FOR X, Y, Z)

#### **Perspectives Included in the Summary Report.**

**Being a novice in the space of renewables was sometimes a detriment to the bottom line, in other times it was an asset.** Because I didn't know what was possible and what wasn't. So I kept saying, "Can we do this?" and "Can we do that?" and "Can we go through this window?" "Can we go through that door?" "Can we travel that road for a while?" People would laugh at me and say, "We never thought of that!" But I didn't know that it hadn't been done before. So I think the being a novice that I stated earlier about being a factor that limited our ability to be cost effective – it also allowed us to think differently because it was a voice that had never been at the table. So to that degree that was fun. And it made the ride fun because we got to be innovative. (Cheryal Hills, R5DC)

**I will stick to my subject area expertise which is in the legal area.** It is always best to **set expectations ahead of time in terms of what obligations the organization may have.** Obviously you want to have the vision and you want to be able to work toward promoting solar energy if you can put more money into the classrooms that is great. **But you also have to recognize that there might be some investment on the front end and you need to realize how the structure of this market works. A little basic level of telling you that you might be looking at a 20 to 30 year lease.** You might be looking at a 20 to 30 year Power Purchase Agreement. Just to get that initial shock out of the way. Because that is a long term agreement and that is not the type of agreement that school districts and school boards routinely [deal with]. Therefore, managing expectations and having clients know what the potential risk are at the outset is helpful. You always want to balance that against the potential benefits of the project; but, I would focus on that. Make sure that that is a small piece when you are pitching what the vision is – to know that there is a little bit of work and a little bit of challenge to be addressed. That helps identify solid partners in the beginning. (Dan Listug, Sourcewell)

It is counter intuitive, in that from a business perspective you want was as few pieces as possible. One stop where one person or one organization gets to make all the decisions. The conversations are streamlined and simplified. But that, realistically, doesn't happen much in almost all the projects we have. This project was a little bit more than usual but only in scale rather than in type. **We had lots of stakeholders; therefore, recognizing that different stakeholders have different priorities and different needs. I think if you can keep that in the back of your mind then you can have an open discussions that ultimately are successful. If you lose sight of that and you try to make every project like**

**every other project – then those either tend to fail or be very slow or people are not very happy with them at the end.** (John Langhus, NEE)

**Patience.** *I would teach them a little bit about how electricity is charged and costed. That was a big learning curve for me and it is a key reason why Little Falls dropped out. The threshold of savings for them was so small that when it was calculated on projections they were not going to save any money and in fact might be charged more. So I would teach them about how that works and how to project that out over time so that the decision makers are making a safe bet when moving forward.* (Chris Lindholm, Pequot Lakes School District.)

#### Additional Perspectives.

*I have five things. The first one is: **Anticipate and expect some political opposition.** Build the kind of credible champions you need to push back on that. Little Falls is the poster child for that. We ran into a buzz saw of anti-solar activists. The second thing is to **be realistic about timelines.** It is always going to take longer than you think it will. I think the team would agree with me on that. So just be realistic about timelines. The third one is to **start early in the process and be willing to get creative about putting the financing together.** So don't work with just the usual suspects for financing – but continuously try to reach out to the local banks and regional banks. Cheryal and I had a meeting with a local bank in St. Cloud and did a presentation on the project to try to get them involved in the financing. They ultimately decided not to. So start early and be open to some creative solutions for financing. Fourth one is – **you have to be able to continually test the market for equipment and services to make sure you are getting the best deal.** There is so much change and volatility in those markets now that you just cannot lock into a system and a year later place the order, necessarily. The last one, would be to **engage the utilities you are working with early.** This is Cheryal's call and she was right about it. To just sit down with them and say, "Here is what we are trying to do. Here is what we are trying to accomplish. Let us know how we can make this process work and how we can be a partner with you to get it done." (Krause, M. Kandiyo Consulting)*

**[Interviewer, What did NEE Learn from this project?] No matter how much you pray that it won't snow it is going to snow! We had a heck of a tough winter this year. I think it set a few records in January and February. This did not surprise us, but it did remind us of the potential challenges of solar construction. The impact of that was felt throughout the installation timing as well as trying to keep folks safe on the roof tops and ground mounts in order to make sure that we have a safe and successful installation. That is something that we already know but we need to keep reminding ourselves of – never to underestimate the weather and the impact that it can have on the installation timing and delays. So overall, we had some speed bumps along the way. We managed the installation as we would any other installation and we are very happy with the results.** (Matthew Hankey, President/CEO, NEE)

*For example, I didn't know that a regional development commission had never entered into a joint powers agreement with MinnState system. Because I didn't know that no one had ever done it I didn't think it wasn't possible. I just thought it was possible. So when we were having conversations with MinnState Attorneys and they were saying, "Well no, we can't do this," and "No, we can't do that" I would say, "Well why?" And that led us to some really creative solutions – Like the Joint Powers Agreement between R5DC and MinnState. It also led to some other conversations with partners because they would say, "well you have to do this" and I would say "Why?" and they would say, "Because that is how we have always done it." And I would then ask, "What are we legally bound by? What do we have to do?" So that changed the conversation. So being a novice, sometimes came in handy and it made the project fun! Because we were problem solving as we would building the plane. That created a lot of innovation and inspired my partners to think innovatively about projects like this as well. (Cheryal Hills, R5DC)*

**One of the lessons learned for me was with the utility companies were flat out amazing to work with –** Our project was not in Xcel territory, yet they were phenomenal to work with. Their guidance and mentorship was professional and so very helpful, I can't praise them enough. MN Power, Brainerd Public Utilities, and Todd Wadena Electric Coop are TOP NOCH utility providers. Early on we met with utility companies who were not like our project utility partners, rather they were flat out **resistant!** I had one cooperative tell me that if we were to proceed with this project that Region Five would have to become a utility company and comply with all the utility company laws of the land. Which was not true according to state statute. But their approach was to bring in that fear to kill the project early on so it would not impact their infrastructure. (Cheryal Hills, R5DC)

*Also, long term – what the long term expectation is. We did spend some time on the end of life for the end of the lease term. What we don't want to have happen is that, "Hey, the technology has moved on and we have these old solar panels that are sitting on our campus and we have to get rid of them." **If I would say, make sure and do X, Y and Z – I***

**would say – don't forget the Z – at the end of the life, what is your plan.** Are you expecting them to continue to run them until they no longer generate electricity? And as the owner you are taking them over for disposal? Or do you make that an obligation of your tenant to remove it and bring the site back to its original state. Or maybe there is a phase II and we enhance the solar system. So we did talk about the end of life for the equipment in our agreement. Don't overlook those types of things. If I had it to do over again, I would want to deepen the discussion regarding the opportunities for the phase II and the technology improvements that will be coming during the term of this arrangement. (Greg Ewig, MinnState)

My advice to anyone who wants to create a solar project is to **really understand the technology.** That seems to be where the hiccups come into play. That can include how the systems will be interconnected, the system design, how they are running, and what testing needs to be done. In general, I think having processes in place makes a big difference. Thinking through things before you are at the moment when they need to be done. **Making sure that everyone is on the same page because people don't know what they don't know. There is nothing worse in a project than realizing later that you didn't do something right and you have to redesign half your system.** [Interviewer: Are there any things you would say, "Watch out for?"] Not really. The good thing about these solar companies is nine times out of ten they are very knowledgeable. I often spot check what they are telling members and usually the information is accurate. They know all the technical steps. **All I would say is do the research on the company you are hiring because they will make a difference in the entire project.** (Allison Uselman, Todd Wadena Electric Cooperative)

If I were to approach a project like this, I might try to break it down into more pieces. I would also try to streamline that process. As far as finding willing partners. It might be beneficial to stay within one utility service territory. Therefore, it might be clearer and easier to work with a number of projects with the same utility provider. They struggled a bit with once they had the people on board to find a financier. Maybe that should have been a first step – to find a willing financier before moving forward. (Paul Helstrom, MN Power)

[Interviewer: For Minnesota Power is there something you learned from the project that might be helpful for your utility in the future?] **There are a number of good lessons learned from this project.** This is a new experience and you learn from new experiences. For example **how we aggregated meters at Pine River and that interconnection process for these systems.** Also, on our technical side, as we are doing the **commissioning we are learning from those aspects as well.** From a broader perspective **I think we are always interested in working with our schools.** We have a long history of working with our schools on energy efficiency and conservation. We remain interested in working with schools. **We have been watching very closely the state legislature that had a bill that might fund school systems. In that case, there was an effort to define where that money may be coming from and who gets in RECS.** So in that state legislation they are addressing the RECs issue. Also for Xcel there is a pool of money that they can use for their service area and there would then be a separate pool that could be used by other energy utilities. That is a good and important thing to happen because it helps with motivations on both sides. For the R5DC project, we really worked hard to try to figure out what could we do to help promote that project. **We have compliance goals. An important part of the project was the renewable energy credits – without the ability to take advantage of those RECs we did not have a path forward – from a regulated perspective – to use our rate payer money because we could not use the project to meet compliance goals.** So that put us in the category where, yes, we are the electric service provider so we are here to help get the interconnection through and make sure that it is interconnected correctly. But, because of who owned the RECs, it left us out of being a more active partner. (Paul Helstrom, MN Power)

**Go find people who have the experience and expertise in this area.** The folks at Region Five and the folks at RREAL – they were the people who spearheaded and made this project successful. Partnering with people who know what they are doing. People who are going to go to bat for you and who are going to persevere through any of the challenges that present themselves. **All around our state there are some really strong resources to help you accomplish your goals. Therefore it is reaching out and being willing to have those conversations.** Don't be scared of the conversation. You can always say this doesn't fit right now, but start the conversation. (Dave Endicott, Pine River-Backus School District)

The Region Five Solar Schools project provides a number of learnings regarding the tax equity – third party finance tool. It is a complex tool which requires an extended time to ensure understanding of, addressing and fully vetting of varied and potentially conflicting, needs and values, and negotiating the long-term agreements. **"What is challenging in any of these transactions is that there is not a model. It is not a plug and play. There are nuances and fact patterns that you have to customize to address most of these issues.** (Greg Ewig, MinnState)

**You need to learn a whole new language.** Cheryal calls it the Solar Coaster and that is absolutely right. **It is a topsy-turvy industry. It is becoming more stable; but it is not stable.** (Dan Listug, Sourcewell)

**If you have never done a scattered site, multiple utility companies, multiple school boards, and multiple partners' project then it would be money saved to hire a consultant who has done a project -- hire an industry expert consultant or be prepared to spend the time necessary on the learning curve.** (Cheryal Hills, R5DC)

**Establish realistic schedules and communicating that to all interested parties is also an important factor.** Complex projects like this are successful when all interested parties have a clear understanding on what their role is, how best to accomplish that role, and the latest information. While that may sound simple or obvious it is actually very difficult especially with projects that have many teams coming together for a common goal. (Kevin Corcoran, NEE)

**That is a lesson learned – to be really careful about making sure the roof manufacturer is consulted with and their requirements are set in stone before building on top of the roof.** (Kevin Corcoran, NEE)

**In reviewing proposals from various potential financial partners, make sure that the goals and values of the regional partners are clearly articulated.** Make sure that, as part of the proposal review process, that questions are developed and consideration given to the degree to which the regional partners' goals and values align with the financial partners' goals and values. (Jason Edens).

**Understand your energy mix and how will our project fit into that. The other thing is to be comfortable with the technology** so that if a panel goes out or an inverter needs to be replaced that you have the capacity to make that correction. (Mark Ritter, Former RDF Grant Administrator)

**Obviously – making sure that all start at the same point in time.** Coming up with common objectives that line up with the local jurisdictions. The more that local jurisdictions can come up with the goals and then go to the private sector route for proposals, that gives everyone an opportunity to come back with, hopefully, their best offer in terms of how to meet those objectives. Also being transparent about what your objectives are – so that we can compare apples to apples. Consistency in the entity that you are working with and some clear defined schedules – so it is a clear path when you can expect certain things to happen – from interconnection agreements to first move on the ground to operating the equipment. (Greg Ewig, MinnState)

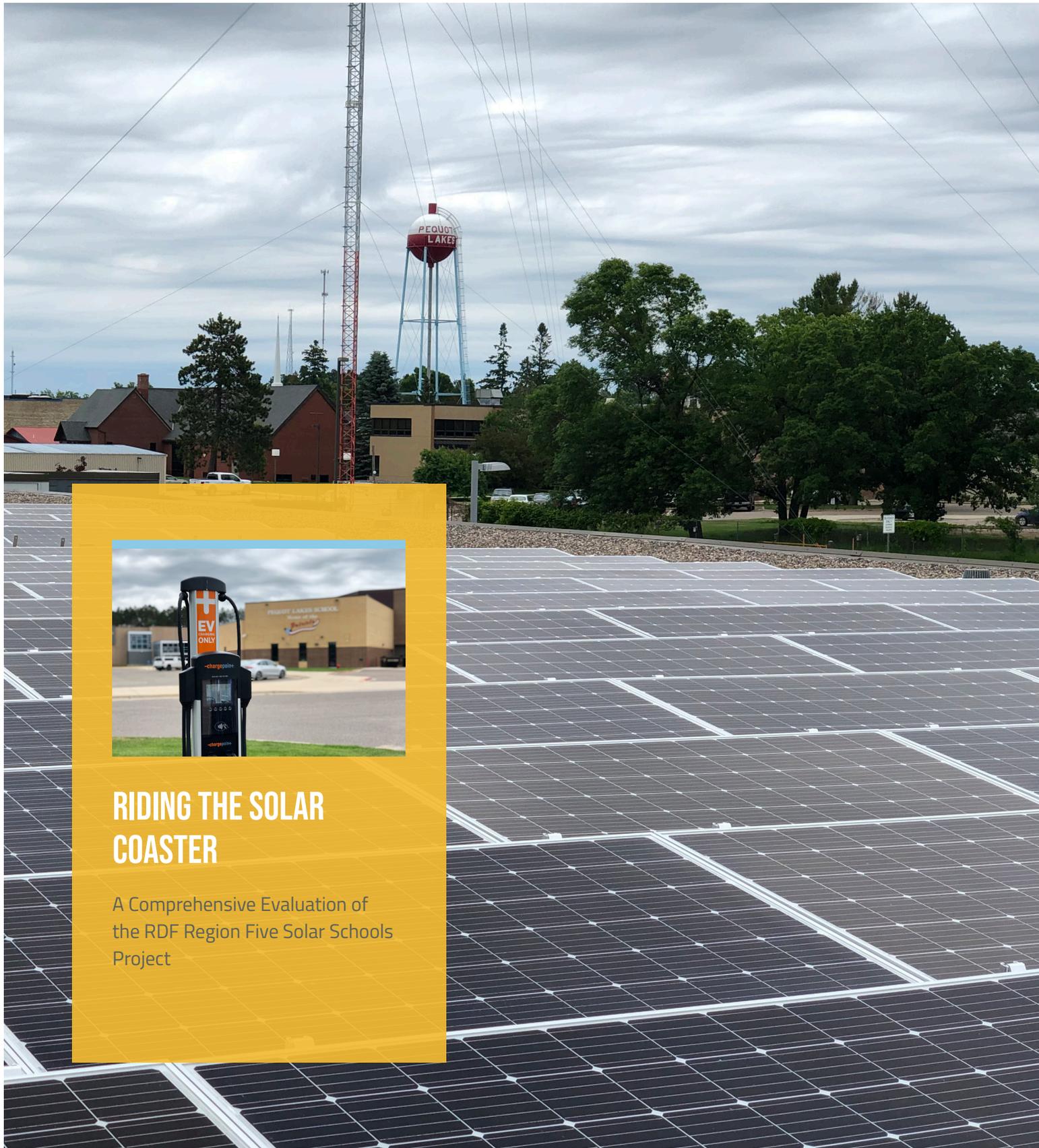
**I would tell them, from my perspective as project manager and an engineer, that every detail, even if it seems very small, is important.** Keeping timelines organized and making sure people are doing the right thing is also extremely important. Safety is always the most important thing. Making sure that safety is a priority even when you are trying to move quickly on a project. Those are the things I would tell someone in my role. (Kevin Corcoran, NEE)

**I would tell them to hire Cheryal! A multi-site project like this is like eating an elephant.** You do it one bite at a time. As long as you have the big picture as to what you are trying to accomplish you break this up into small projects, like we did here. You work with one school and then onto the next. You don't try to do it all at once, you do this sequentially, for the most part. And you work out the problems as they arise. In some cases, when it came to siting you had to work them all in parallel because we needed to have the total scope as to where all the arrays were going to be in place. So that was something that was done in parallel. When it came down to installation, once everything was finalized, it was one site at a time and it went very smoothly. (Tom Lillehei, R5DC Commissioner)

**The biggest thing to be aware of is – early on – when you are selecting your supplier to make sure that you have your suppliers well vetted.** Can they actually supply what you are asking? Is their product going to be something that will have long-term staying power? There were flags that came up with our first solar vendor. The vendor had a good product, it was a good design. There were other people who were saying this probably not the way to go. But electrically the product was good, in that it was a good design and it was robust and it had self-healing abilities, which others did not have. But the thing that was unforeseen in that was the ability to supply. The sole source for that company was in China; that is what made the product more cost affordable than others – but it also made it more vulnerable to the political environment in terms of sourcing materials from China. That is one thing that I would say that you really need to watch out for when you are starting a project like this. Take it all in and you have to weigh the benefits with the risks. You have to make a decision. Sometimes the decisions are wrong; sometimes you strike a homerun. That is where experience and insight comes in. With all the experience I had I would have selected this vendor as well. The fact that the vendor pulled out at the very last minute, that made me very disappointed. (Tom Lillehei, R5DC Commissioner)

If I were to suppose another question. My job is as an advisor and to advise the client. How would I advise a client in the future in looking at one of these projects? **I would suggest that you need to understand the complexity of the project going in.** I don't know that anyone, even with their best intentions, fathomed how complex this ended up being. At one point I had a count of documents and contracts pushing two dozen. I don't remember what the final number ended up being, but that is a lot of back and forth among [a number] of entities. It had a lot of moving parts. [There were so many needs that needed to be taken into consideration.] The campuses needs, the financier's needs, the external financier's needs, grant complications – just a very very complex project. Hopefully we have ironed out some of those and identified some of those inefficiencies for other projects that might want to consider this model – but from a client expectation perspective I would always want to make sure that the clients have a clear understanding of what they are getting into when they are pitched a project of this nature. (Dan Listug, Sourcewell)

[Interviewer: In terms of lessons learned, do you there are things that a project like this needs to think about in terms of choosing a financier?] ***A familiarity in working with public entities is key. I think there is a little bit of a misconception too about what the investment firms are doing. They are essentially lenders – they are essentially financiers. You need to understand how they make their money. You have to understand that they are either in it for a short-term gain for the long-term benefit of another investor. You need to have more of an understanding about how their industry works. Because they are a conduit to a significant amount of federal money that would otherwise not be available. Therefore, they bring significant value to the project. But there is always, I think, this reluctance of how much are they making. Are they making too much money? How do they re-coop their investment? Things of that nature. Therefore, there needs to be some front-end education as to how their business model works.*** (Dan Listug, Sourcewell)



## RIDING THE SOLAR COASTER

A Comprehensive Evaluation of the RDF Region Five Solar Schools Project