Best Power Int'l, LLC

ST. JOHN'S ABBEY SOLAR FARM EXPANSION

RDF BOARD PRESENTATION MARCH, 2015

EP4-6 RDF GRANT CONTRACT

Partial project funding by customers of Xcel Energy through a grant from the Renewable Development Fund.

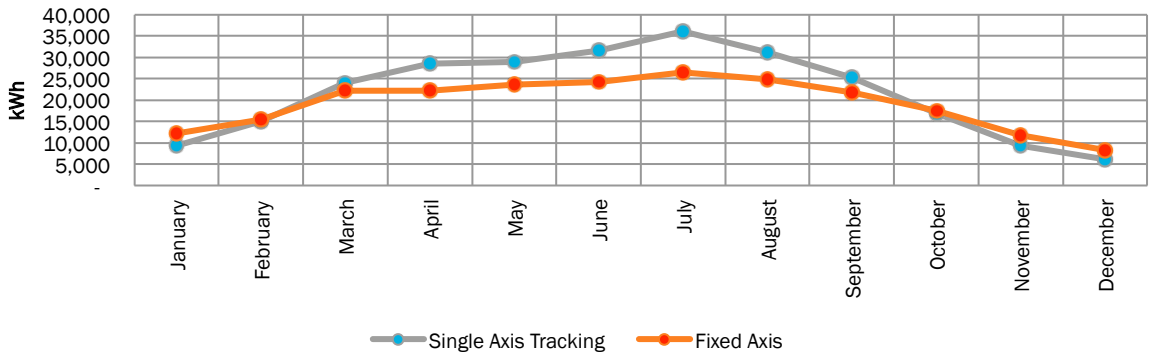
PROJECT SCOPE

St. Johns Solar Addition is a 182 kWDC expansion of the existing 400 kWDC St. John's Solar Farm in Collegeville, MN that was commissioned in 2009. It incorporates an on-site side-by-side comparison of competing solar technologies in the Midwest; linear axis tracker technology currently in place and fixed tilt technology of the new array.

PROJECT GOALS

- Increase the market penetration of renewable energy in Minnesota
- Compare the direct energy production differences between technologies
- Complete upgrades to the monitoring system
- Monitor weather impacts and compare differences between technologies
- Provide a comparison of costs and financial aspects between the two systems
- Provide knowledge and benefits now and into the future for Xcel Energy ratepayers and others

Figure 1 - Monthly Energy Comparison



WHAT WE DID

- All goals for the project were realized
- By completing the project within budget, the project provided one of the best values in total resource costs in this round of RDF funding.
- By having this comparative facility available, researchers, solar developers, and facility owners will have the opportunity to evaluate the differences in technologies to make better decisions about solar resources in the future.

WHAT WE FOUND

Modeling of the two technologies using generic but identical data at the same location has shown that there are significant differences between the two technologies depending on the goals of the energy provider or consumer.

The following is a summary of the modeling outcomes:

- Assuming a flat, open site with identical energy rates, a fixed system produces a slightly better economic return than a tracking system of the same power rating of 1MW$_{DC}$ due to lower construction costs.

- Under challenging topographic issues such as slopes and shade, a fixed system is more economical than a tracking system due to the flexibility in the design of the components.

- A tracking facility produces 13.9% more energy per kilowatt installed on an annual basis than a fixed system of the same power rating. The Direct Current (DC) capacity factor (electricity produced relative to the maximum it could produce at continuous full power operation) for a tracker is 16.45% while a fixed system is 14.44%.

WHAT WE FOUND – CONT.

- A tracker produces more energy earlier in the morning and later in the afternoon than a fixed system during the summer months.
- A tracker produces 22% more energy than a fixed system during the Xcel Energy peak period of 9:00am to 9:00pm during a sunny, late July day.
- A fixed system produces 8% more energy in the winter months from October through February than a tracker.
- The tracking system produces 69% of its energy in the summer months (April through September) while the fixed system produces just 62%.
- Reductions in generation differences due to snow and ice impacts are complicated and not conclusive at this time.

PROJECT BENEFITS

- Local construction jobs were created
- Taxable Income will be generated based on fees paid to contractors in the amount of approximately $100,000.
- Taxable income in the amount of approximately $587,000 from electricity generated (15 years)
- The purchase of $173,000 of materials and services were purchased from Minnesota suppliers and contractors.
- Information from this project can be utilized to lower the cost of solar energy in the future.
- The project has provided hands on demonstration on what is involved when adding on to an existing solar facility.
- The project provides a comparison of string inverters to a central inverter at the same facility.
- The project will provide additional educational benefits that will be administered by St. Johns University.
- Press coverage in print, radio, and television helps to educate people in the St. Cloud area about solar energy.

PROJECT BENEFITS - CONTINUED

- By adding this knowledge, better decisions about design and construction of future facilities will lower the cost of future projects.
- Data from the project has concluded that there are significant differences in technologies .
- A camera was added to the facility that will help better understand the impacts of weather.
- 3,290 MWh's of renewable energy, all of which will count towards Xcel Energy's RPS.
- The project will produce the following annual environmental benefits during its first year
  - The equivalent of 349,646 pounds of carbon dioxide (CO2) not released
  - The equivalent of 2,990 pounds of sulfur dioxide (SOx) not released
  - The equivalent of 1,380 pounds of Nitrogen oxides (NOx) not released
  - Approximately 170,350 pounds of coal not used

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QUESTIONS