Winnebago Tribe Solar Project

DE-EE0006479 Final Report

2/26/2016

Winnebago Tribe of Nebraska
Autumn Nieman

Acknowledgement

I would like to express my abundant gratitude to the Department of Energy for the award of the Winnebago Tribe's Solar Project. As the tribes first photovoltaic energy project the Department of Energy's support was resourceful in all aspects for present and future objectives. This opportunity has provided our community with a diverse outlook on anticipated renewable energy production.

I would also like to state my great appreciation to Mr. Michael Shonka Solar Heat and Electric of Omaha, NE and his colleague for the composition and efforts put forth on the behalf of the Solar Project. I would also like to pay recognition to the tribal employees and community members that were able to have the chance to participate in the construction of the solar panels.

Executive Summary

The Winnebago Tribe of Nebraska is a small federally recognized tribe organized pursuant to Section 16 of the Act of June 18, 1934 (48 Stat.984), (25 USC 476) as amended by the Act of June 15, 1935 (49 Stat. 378). The reservation is located primarily in northeast Nebraska, with approximately one-half of nearly 5000 members living within the reservation boundaries. The Winnebago Tribe's Solar Project is focused on renewable energy production and energy cost savings which follows through with the Winnebago Tribes commitment to reduce energy usage and consumption.

The Tribe has taken small steps to become more energy efficient yet the Solar Project was the first photovoltaic renewable energy project for the Winnebago Tribe. Although the tribe's economic arm, Ho-Chunk Inc., uses personal wind units and stationary solar panels on some structures. I feel this implementation of solar panels on the Winnebago Police and Fire Station is the foundation for creating the community awareness and inspiration of long term renewable energy goals. My impression is that the attentiveness of the capability to establish renewable energy community wide is the resolution to the tribe's commitment.

The strategy of the Solar Project was to reduce fuel use within two years by a roof mounted photovoltaic system. As the Project Manager, with assistance from the Tribal Engineer the project was completed within the time frame, alongside eleven months of energy usage data collection. The savings verification and projected estimate met the expectations.

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I. PROJECT OVERVIEW

The Solar Project will provide both economic and environmental benefits to the Tribe with the reduction of energy cost which are replaced with renewable energy generated power for the Police/Fire building. By focusing on solar generated power we will be able to address our tribal goal and commitment to reduce energy usage and consumption. The Solar Project serves as a continued demonstration on the importance of decision making and how to continually look for ways to conserve energy with a focus on renewable alternatives such as solar.

Installation of photovoltaic solar power generation will reduce the amount of energy purchased for the building and provide a source of energy for our police and fire departments for continued operations, should the grid power be unavailable. Powering this essential building at all times is essential to ensure the safety and well-being of our tribal members and residents of the entire reservation. We anticipate with the assistance awarded that it will take a 7 year period for the Solar Project to pay back the tribal investment in energy savings.

Our project site is located in the village of Winnebago on the Winnebago Indian Reservation in northeast Nebraska. Our nine member tribal council serves one to three year terms, providing a stable government operation, which officers are selected on an annual basis by tribal council members. Approximately one-half of nearly 5000 members live within the 128 square mile reservation boundaries.

II. OBJECTIVES

The Objective of this project is to reduce fuel use of the Winnebago Police and Fire building by 30% within two years through the installation of a 23kW solar photovoltaic system. The Solar Project will assist the Winnebago Tribe with a single yet crucial building within the community – the Police/Fire building. This 8,000 square foot masonry block/steel joist police/fire building was built in 1978.

The police/fire building is completely powered by electricity. The renewable energy system we have selected has a power capacity of 23kW and the ability to export 44.3 MWh. We anticipate 32.55% kWh energy savings, an excess of the required 30% reduction, in the building's total fuel use based on the most current 12 months of data (2012).

The rationale for selecting this photovoltaic solar for our site was:

1. Solar electric production will simply and effectively displace total energy use,
2. Roof top installed photovoltaic will keep panels safe and secure,
3. Properly installed photovoltaic solar panels require no maintenance
4. Photovoltaic solar is far more cost effective than any other decentralized renewable energy system and is the most plentiful resource available at this site, and
5. The photovoltaic solar system can be upgraded with Sunny Island system to ensure continuous power to the police/fire building.

III. DESCRIPTION OF ACTIVITIES

The Solar project staff includes the Tribe's Solar Project manager, the Tribal Engineer, and Physical Resource's Director. Procurement and contract management policies and procedures have been adopted by the Winnebago Tribe that will be followed by all parties related to the project.

a. Tasks Performed

1. NEPA and the Addressing of Special Conditions.

Upon the release of funds the project the Project Manager prepared a presentation of the project and delivered the presentation at the Annual Tribal Energy Program Review held March 2014 in Denver, CO. The presentation was updated with the project progress and delivered at the annual event held in May 2015.

2. Selection of Vendor for Solar Equipment Procurement and Installation

The Project Manager in cooperation with the Tribal Engineer and Physical Resources Director procured the solar equipment and installation vendor by requesting qualifications published in two local newspapers. With three RFQ submitted a panel board was formed to score vendors by previous engagements close to what the project needed. This panel board consisted of three tribal council members and the tribal engineer. The vendor, Solar Heat and Electric of Omaha scored the highest and was selected in September 2014

3. Vendor Selection and Application Submittal to Nebraska Public Power District

Upon selection, the Customer Generation Connection Application (K-450) was completed and submitted for acceptance by the Nebraska Public Power District. After acceptance of the application, the vendor was provided the notice to proceed by the Project Manager in October 2014.

4. Installation of Energy System

Installation started in the beginning of November 2014, everything was set in place except for the electrical, which got held up over the holiday season. We chose to have a local electrician do the work in case future repairs were needed. The electrical system was connected at the end of January 2015. (Due to breakers that were tripped and

after contractor and electrician was called and repairs were made to upgrade the electrical system, and approval of the K450 application from Nebraska Public Power District the solar project was complete as of April 2015.)

5. Energy Usage Data Collection

Energy usage data was collected monthly from billing statements, and is complemented with the meter reading collected from the inverters. There is a graph on page 9 of the final report, this shows we are at 15% savings for a year. In November 2015 a web page was constructed to view daily, monthly and yearly data.

6. Fuel Use and Savings Verification

The CO2 offset was recorded monthly and is also included on the usage savings graph on page 10 of the final report.

7. Quarterly Project Progress Reviews

Monthly project progress was reviewed to assess achievement of project benchmarks and completion of project in a timely manner and reported quarterly.

b. Panel Information

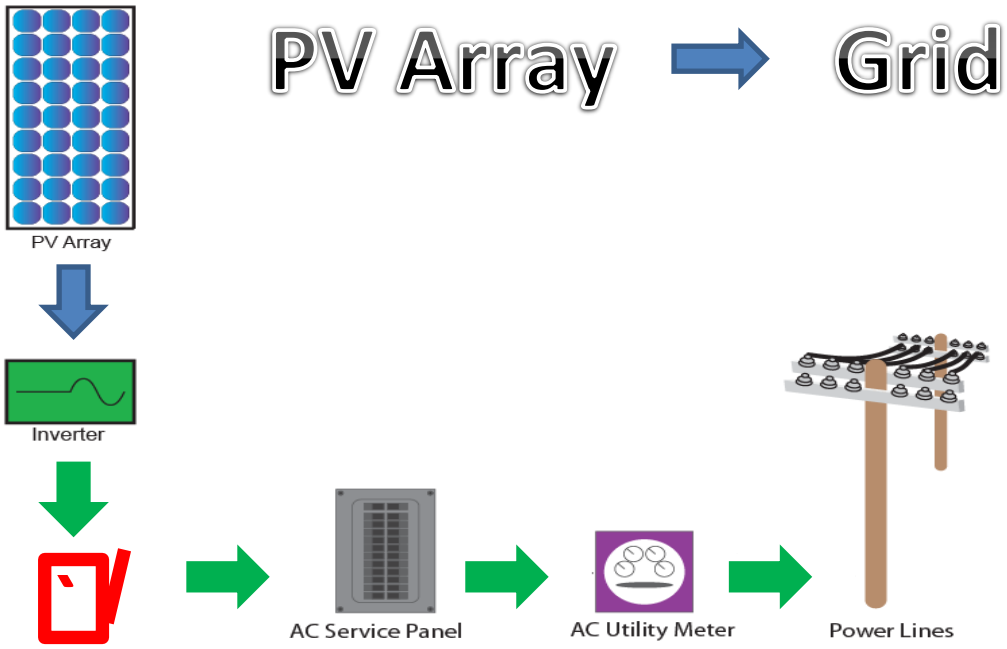
The solar electric system is a grid-tie, ballast mounted on a flat roof over the police/fire station. The solar electric system includes 280 Watt modules for a nominal total of 22.80 kW. Approximately 84 modules are ballast mounted to the flat roof facing south. The conduit runs from the solar rack to the inverters, then to the outside disconnect and finally to the main electrical service panel. The two inverters are installed inside the facility for security and to protect from weather. The outside AC disconnect is installed along the outside west wall near the meter/service entrance. All wiring follows NEC 2011 guidelines.

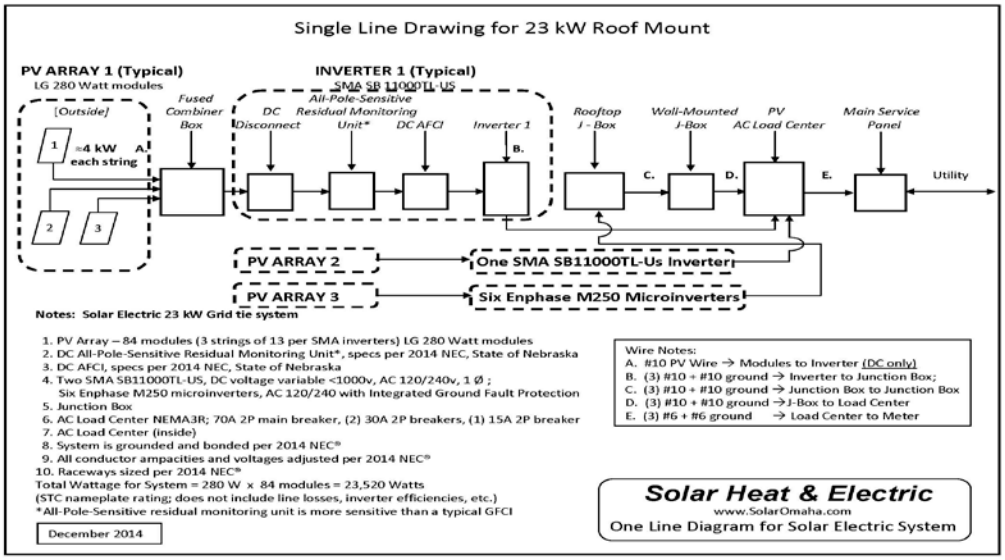
- 280 Watt modules x 84 = 23520 Watts
  - 60 Cell
  - Monocrystalline
- Ballast mount rack
  - 4 rows x 21 column = 84
  - 20 degree tilt
  - 180 degree azimuth
  - Exactly fits to roof
- Inverter
  - 11,000 Watt
  - Transformerless
  - 240v/Single phase
  - 2 Inverters needed

- Only strings of 13

- Micro Inverter
  - Needed 6 micro inverters to complete

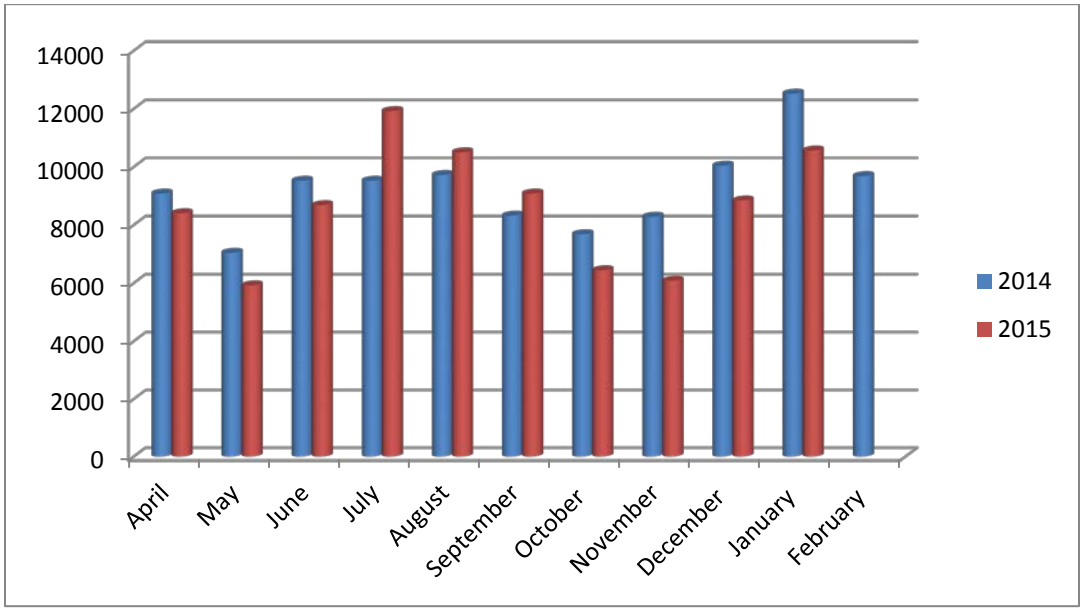
- Online Diagram



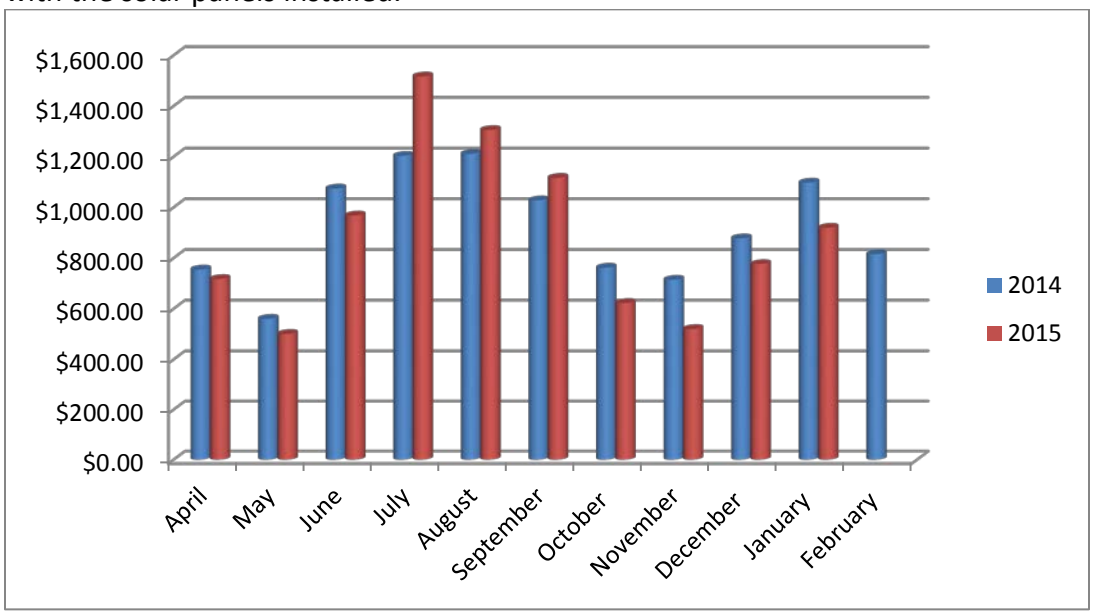


c. Graphs

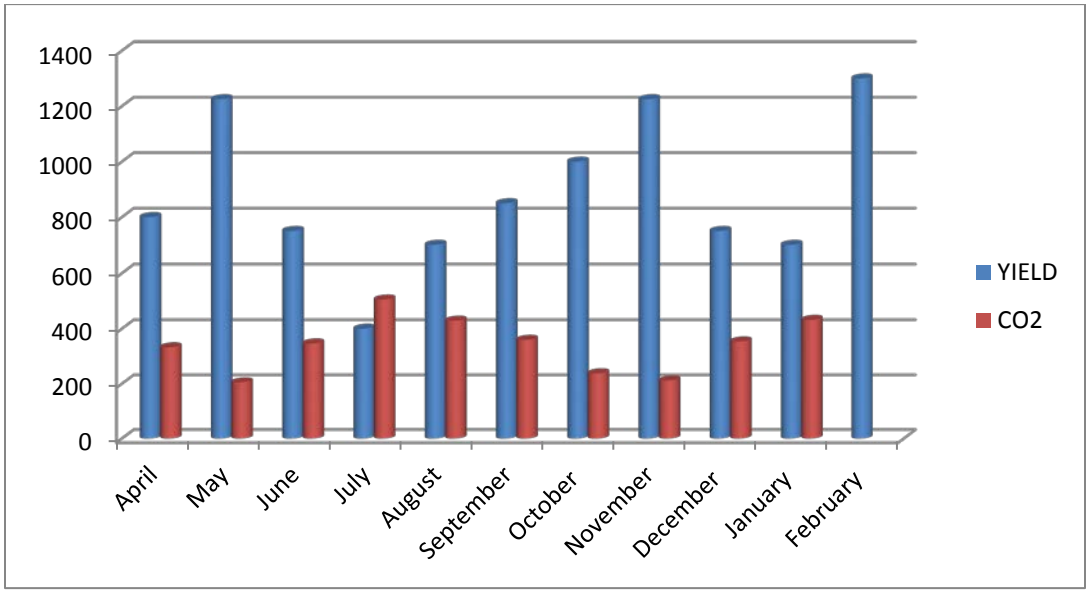
Directly below is the graph for kW usage. 2014 is the usage before the solar panels were put in, 2015 in the usage after the panels were installed. The total kW for 2014 was 101400 kW and total kW for 2015 was 86420, which we saved nearly 15% within the first year.



Below is the cost savings graph. On average we saved nearly $100.00 per month with the solar panels installed.



The graph below represents the kW yielded and the CO2 offset.



d. Photos

IV. CONCLUSIONS AND RECOMMENDATIONS

I feel that all efforts put forth by each and every organization were extremely successful. There is plenty of composition from the beginning of the project all the way to the final paperwork. It took constant communication and vivacities to work towards the completion of the Solar Project. It is my recommendation that keeping steady on the timeframe and awareness of seasonal climates will produce an efficacious project.

V. LESSONS LEARNED

My experience throughout the Solar Project was immensely educational. The significance of the production of the solar panels energy savings is a tremendous effect on a single tribal building, yet opens the door for various opportunities. The Solar Project occupied plenty of time and took precise accounting of documentation.

VI. REPRESENTATIVES

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