

Solar Energy Partnership Initiative (SEPI)

Rosebud Sioux Tribe

DOE Grant DE-IE0000045

Final Report

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April 28, 2019

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Solar Energy Partnership Initiative
The Rosebud Sioux Tribe
Executive Summary

The present day members of the Rosebud Sioux Tribe of approx. 33,000 are the descendants of the Sicangu Oyate (Brule or Burnt Thigh Nation). The Sicangu are a part of the Tetonwan Lakota Oyate (Dwellers of the Plains), more commonly known to history as the Great Sioux Nation. The People of the Sioux Nation, from West to East, refer to themselves as Lakota, Nakota or Dakota, which means friend or ally. The expansive, rolling prairies, the shallow winding creeks and rivers, and the ever present winds are all integral parts of the continuing history, culture and remaining economic base upon which the Lakota people who call Rosebud home depend. Many of the Rosebud Sioux Tribe reside on the one-million-acre reservation, the nation's 6th largest, in South Central South Dakota.

Since 1999 the Rosebud Sioux Tribe has been exploring green energy through efforts to show primarily our wind potential to the outside world. In March of 2003, we commissioned a 750 Neg Micon turbine, named Akicita Cikala, "Little Soldier" and sold the power to the local utility, Cherry-Todd electric. Then in 2003, through a grant with DOE, the RST begin the pre-development study of a 30 MW wind farm named Owl Feather War Bonnet Wind Farm. In 2006, we had a draft PPA with Nebraska Public Power District, but it expired before the Bureau of Indian Affairs could approve the lease agreement. That wind farm stands idle to many issues from the lack of an ensuing economic PPA to ineptness of the lead agency BIA which stalled the approval process for more than 18 months since the tribe approved the agreement with the developer DISGEN Inc. of Lakewood Colorado in Dec of 2006.

In 2007, we entered into an agreement with Citizens Wind, a subsidiary of Citizen Energy Corporation of Boston Mass., to develop an overall 190 MW wind farm called the North Antelope Highlands Project. After receiving a 1.5-million-dollar DOE grant in 2009, Citizens Wind and the tribe continued the pre-development studies required by NEPA regulations and the project was stalled on several occasions and then in 2017 Citizens Wind decided to end the project and the interconnection agreement expired in August of 2017 due to the lack of a promising PPA. The tribe is committed to activating these large Utility Grade projects, but focus has turned to community scale and residential projects using solar photovoltaics to lower the cost of energy for our tribal members. We have engaged two groups Genpro Energy Systems of Piedmont, South Dakota, a for profit company and GRID alternatives of Oakland, Calif. a non-profit company to install photovoltaics on tribal lands and results have shown that this resource is a great resource to develop for both residential and community scale use.

In 2014-15, the tribe developed the RST Strategic Energy plan and the primary focus moving forward was photovoltaic installation on residential units as it is the least cost and has minimum maintenance requirements. Since 2015, the Tribe and GRID Alternatives have successfully installed 13 residential solar PV installations, the Rosebud Sioux Homeless Shelter, and the Okreek Community Center. The majority of the cost savings of these projects are being realized by the SWA Corporation which can then be deployed for other vital services on the reservation. The Solar Energy Partnership Initiative is a proud participant in this venture.

Since 2009, due to the rise in wholesale electrical rates from Basin Electric, the local utility Cherry-Todd Electric, the major provider of electricity has raised its rates to the majority of the reservation by 55% which has put a burden on most of the tribal members of the reservation due to the extreme unemployment rates we have on the reservation. Unemployment runs between 45% in the summer to a high of 80% in the winter, and in any given month during winter in the Cherry-Todd service area, 400 households will have their electricity shut off. Of these 400 households at least 80% of them are tribal members. Once the power is off, these homeowners scramble to get their power turned back on and sometimes it takes 2 or 3 days for them to have the power back on and with that a rather substantial cost to the tenant or homeowners as late charges have doubled up to the time of shut off in the vicinity of at least \$50.00 and to have it turned back on another charge of \$45.00 plus the total arrears bill. Average electric bills are around \$230.00 a month. During that time the weather conditions can change dramatically here on the upper plains with temperatures dropping to subzero causing water pipes to freeze and break. Compounding the issues, the local housing authority has in their lease agreement that the tenant is subject to loss of the rental unit if electricity is turned off to the unit. In the last 5 years, this has led to grass root organizations within the tribe to fight the local utility and gather support to elect tribal members to become members of the Cherry-Todd Board and we have gathered that support to put tribal members onto the Board and today we have 4 tribal members on the board of 8. The Cherry-Todd Board can make changes in policy to a degree, but the utility is bound by contract with Basin Electric called the All Requirements Contract until 2070, in which Cherry-Todd has to buy all electricity for its consumers from Basin at the rate Basin commands, and this is the basis of the problem. Basin has raised its wholesale rates by 107% since 2003. The retail rates have risen to the point of unbearable for some and once spring and summer come to our region and the electricity is shut off, some just leave it off until they can save up enough to pay off the electric bill right before winter onset. Many of the tribal members have made the call for the tribe to build their own utility within the tribe providing electricity through renewable energy sources. This effort has led to the experiment to understand this potential and the Tribal Utility Commission has made inroads to pilot projects such as SEPI and have engaged institutions within the tribe to assist in building these projects, such as SWA Corporation. *See Attachment A. Electrical rate changes over 16 years*

LIHEAP, which assists our low income people here on the reservation has become a burden on our tribal programs to such a large degree that the tribe as a whole has also been trying to find solutions to this problem. In the 2003-2004 LIHEAP assisted our people with energy bills which tallied the bills for electricity, propane and wood at approx. \$665,525.00. In 2015-2016, the total bills for this burden came to \$3,200,000.00 of which the federal assistance was only around \$960,000.00. The rest of this cost was borne by entities within the tribe with SWA Corporation bearing at least \$450,000.00 per year. The majority of these bills are the cost of electricity and this has been a great impetus to this project. *See Attachment B. LIHEAP program costs since 2004*

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Project Overview

In the summer of 2015, Grid Alternatives and Tribal Utilities Commissioner Ken Haukaas, approached Sicangu Wicote Awanyanke Corporation on the prospect of developing a residential roof top solar installation project that could save them approx. \$8,500.00 annually on electricity for 10, 3 bedroom units in the Wicozani Subdivision in the community of Ring Thunder, approx. \$850.00 a unit. They gave us permission to view the annual electrical consumption of these units combined and using the formula of PV watts, we calculated the sun exposure of the area along with the cost of electricity and this was the basis of our estimate of \$8,500.00. I had recently found out that through their agreement with USDA, who provided the money to build these units in 2007, that SWA was to insure that the electric bill was paid by SWA every month. These units are provided for low income people and rent is based on their income and some only pay \$50.00 as most have almost no income. The one thing that also sparked our interest to us was the fact that their heating and cooling system are Ground Source Heat Pumps and considered the most efficient of all heating systems known. I felt it would be good combination to incorporate with photo voltaic systems and we could show the tribe what this could do for the future of energy use within the tribe because of these particular systems. SWA agreed to the project with a cost share of \$51,350 in cash and Grid Alternatives would cost share \$80,623.00 in equipment and training matching the DOE grant of \$129,766.00 to build the project.

See Attachment C. PV Watts on calculation on project.

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Objectives

The primary objective of the project was to find a way to save monies on the electric bills for the ten units at the Wicozani Subdivision for SWA Corporation. During this build was also the objective to train SWA employees and Sinte Gleska University Voc-Ed department students to familiarize what the process of the installation entails. The promotion of safety on the job site was also an objective during the whole process as roof top work has extreme risks involved. Building capacity and understanding was an important ingredient in the whole project both on the job and within the administration of SWA Corporation along with the administration of the Rosebud Sioux Tribe. The learning curve of all involved, including the education of our administrative personnel with our elected officials has brought us all within the tribe a more enlightened view of the economic potential of Solar Photo-Voltaics for our people.

Within these objectives was an action item that required an assessment of the actual size of the system required to lessen the daily electrical need from the grid by at least 40%.

1. Collect and analyze one year of electrical on data on all ten units affected and find the average use per unit.

It was determined by the size of the roof and by the average use of electricity of these units that a 5.8 kW system would be the best size for these units.

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Description of Activities Performed

Initially at the onset of the project, a class was held at the Sicangu Nation Employment and Training Partnership offices to teach basic safety issues that would be done on the job site and description of modules and tracks that will be attached and devices used in mounting of the solar modules.

At the job site volunteers were taught repetitive tasks that would be used in the attaching of tracks on to the roofs and eventually the modules to the tracks. Some volunteers were used on the roofs and were taught the important aspects of safety harnesses and the attaching of these harnesses to safety lines.

Grid Alternative personnel were both on the roof and on the ground mentoring volunteers on the work involved in attaching these solar modules to the roof tracks and how micro inverters were attached to each other as the process of laying these solar modules on the tracks. Building of electrical conduit and the running of electrical lines through the conduits along with the sizing of electrical used. All of this was discussed and shared among the volunteers by Grid personnel.

When the actual presence of live electricity was involved as new breakers were installed in the breaker boxes, only qualified Grid Personnel with appropriate safety gear were present for such activities and volunteers were not allowed to participate in such activities, although explanations of the activities were given on all the subjects so all would have an understanding of these activities.

This work interested a SWA worker, a Rosebud Sioux Tribal member, so much that she left SWA and took on a year of internship with Grid Alternatives and is now a full time worker for Grid Alternatives.

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Conclusions and Recommendations

Major conclusion directly on this install is that SWA Corporation is highly satisfied with the great amount of electrical cost savings that this system has produced for this group of houses in the housing authority. My recommendation to the tribe would be to provide some sort of financial assistance for tribal homeowners to be able to purchase these solar systems for use at their own homes.

In the first winter after installation, the savings was around \$8,100.00, although significant we fell short of our estimate of \$8,597.00 and I felt that we could have done better. Upon further investigation into the electrical data on each of these units, electrical use was higher in some houses than in other houses. Originally I assumed that it was the size of the household members that caused this anomaly in electrical use, but on further investigation some filters were not being changed out on a regular basis and this was causing the heating system to automatically switch to its secondary heating capability, (straight electrical, 100% efficiency) as it was over heating the compressor in the ground source heat pump mode (300% efficiency) and shutting down. The responsibility to change out these filters are upon Maintenance Department of SWA Corporation and at the time for whatever reason, that was being done on a hit and miss situation. So indirectly through this project it showed SWA Corporation, that the lack of maintenance on these units was a contributing factor on electrical consumption of these units and steps need to be incorporated to insure maintenance to all units that have forced air to heat the units. *See Attachment D. Actual 1st years savings and electrical production*

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Social and Economic Profile

The project area is located in Todd County, South Dakota, which lies wholly within the exterior boundaries of the Rosebud Sioux Tribal Reservation. In 2017, Todd County, SD had a population of ~ 10,000 people with a median age of 24.4 and a median household income of \$26,285, as compared to South Dakota with a median income of \$54,126.00. Between 2016 and 2017 the population of Todd County, SD declined from 10,019 to 10,016, a -0.0299% decrease and its median household income declined from \$30,800 to \$26,285, a -147%.

The population of Todd County, SD is 77.2% American Indian & Alaska Native alone. 8.51% two or more races and 8.49% White alone.

The Wicozani Subdivision is located in the District/Community of Ring Thunder located approx. in the center of Todd County within the exterior boundaries of the Rosebud Sioux Tribal Reservation.

Rosebud Sioux Tribal Reservation or Todd County is predominately an agricultural based economy with no industry or manufacturing occurring in the area.

In recent years, there has been a push by grass roots organizations and programs within the tribe to establish our own electrical utility and produce energy on a community scale or residential level through renewable resources. SEPI is an attempt to see what production could be made and what savings could be found by doing this work. In 2014, the tribe, through RST Tribal Utilities Commission, developed its own Strategic Energy Plan to move forward with that intent and develop these resources on the reservation. Today, the RST Tribal Utilities Commission has developed a charter to be organized as a tribal utility named Rosebud Energy Services Company (RESCo) and is awaiting action required by Governmental Affairs to review, and after two readings, establish the charter through Council approval. It is desired that the knowledge brought forward through this project will promote this effort and establish RESCo, and with that jobs and knowledge in renewable energy production here on the Rosebud Indian Reservation. *See Attachment E. Map of project area.*

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Attachment A.

Electrical rate changes over 16 years

Year	Power Costs to CTE	% increase	Consumer Rate Increases
2003	\$3,100,487.00		
2004	\$3,301,285.00	6.48%	
2005	\$3,375,773.00	2.26%	
2006	\$3,767,277.00	11.60%	
2007	\$3,907,134.00	3.71%	
2008	\$4,489,925.00	14.92%	
2009	\$4,969,624.00	10.68%	22.0%
2010	\$5,929,792.88	19.32%	8.4%
2011	\$6,678,890.00	12.63%	8.1%
2012	\$7,813,674.54	16.99%	9.0%
2013	\$8,157,205.51	4.40%	
2014	\$7,820,287.00	<4.13%>	
2015	\$7,094,184.00	<9.28%>	2.7%
2016	\$7,717,184.00	8.08%	2.0%
2017	\$8,488,902.40	10.00%	4.4%
Percent change		107.66%	56.6%

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Attachment B

LIHEAP program costs since 2004

LIHEAP Program Costs

- 2003/04.....\$ 665,525.00
- 2006/07.....\$ 954,997.00
- 2013/14.....\$2,713,645.50
- 2014/15.....\$2,578,311.68
- 2015/16.....\$3,200,000.00
- 2016/17.....\$2,900,000.00
- Federal LIHEAP assistance, annually is ~\$963,000.00
and may not be funded at this level in the future.
- Remaining monies supplied internally



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Attachment C

PV Watts Calculation on Project

COMPUTATION BASIS

- According to pv watts, 5.0 Peak sun hours per day
- $5.0 \text{ hours} \times 5.83 \text{ kW} = 29.15 \text{ kWhr per day per house}$
- $29.15 \text{ kWhr} \times 365 \text{ days} \times 80\% \text{ Real Solar Conditions} = 8511.8 \text{ kWhr per year/per house}$
- $8,511.8 \text{ kWhr} \times 10 \text{ houses} = 85,118 \text{ kWhr}$ Amount produced by 10 Houses
- $85,118 \text{ kWhr} \times \$.101 = \$8,597$ Cumulative savings for 10 Houses in fall 2016

Solar Energy Project Initiative

Attachment D

Actual 1st year savings and electrical production

Savings Realized

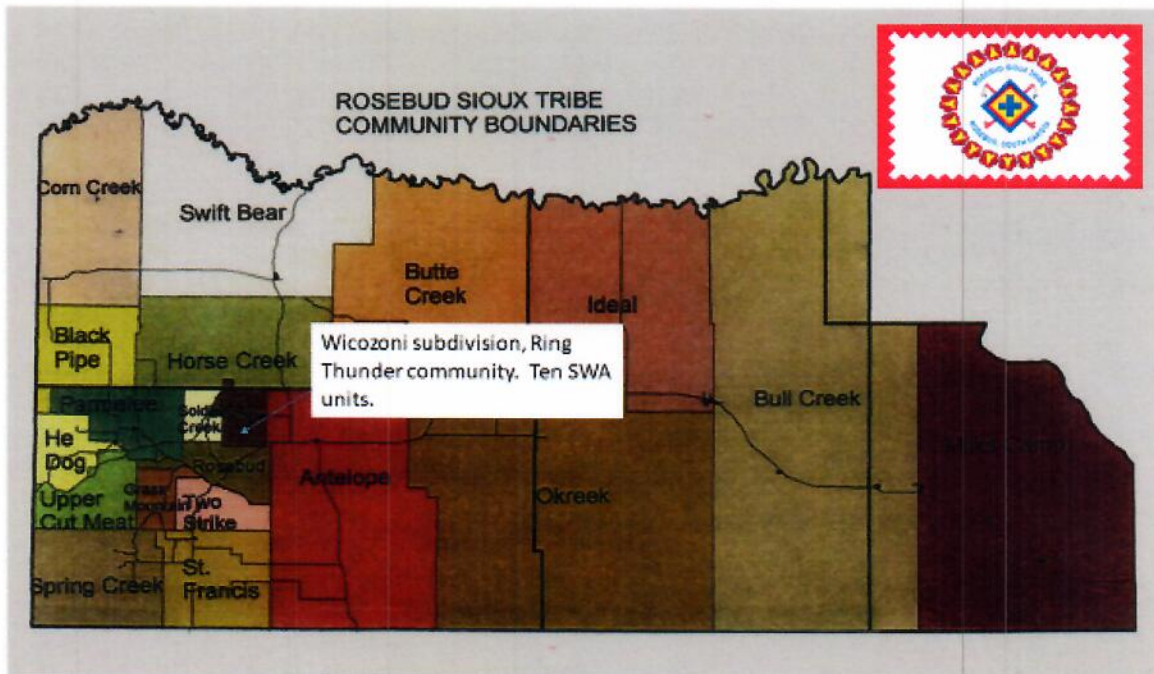
kwh	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	Totals
W/O Solar	19403	29580	17113	25806	30741	14005	19883	20031	19222	23235	219041
Solar Year	10118	29680	16729	20380	25465	13277	19137	13961	10981	15659	175387
Savings	9285	-100	384	5426	5276	728	746	6070	8241	7576	43654

Billing	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	Totals
W/O Solar	\$ 1,946.63	\$ 2,672.59	\$ 1,739.34	\$ 2,471.02	\$ 2,711.36	\$ 1,544.96	\$ 2,024.87	\$ 1,973.72	\$ 1,921.19	\$ 2,318.92	\$ 21,324.70
Solar Year	\$ 748.01	\$ 2,261.46	\$ 1,244.16	\$ 1,634.22	\$ 2,003.10	\$ 964.28	\$ 1,526.41	\$ 950.79	\$ 702.82	\$ 1,167.33	\$ 13,202.56
Savings	\$ 1,198.62	\$ -588.87	\$ -504.82	\$ 836.80	\$ 708.26	\$ 580.68	\$ -499.54	\$ 1,022.93	\$ 1,218.37	\$ 1,151.59	\$ 8,122.12

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Attachment E

Map of project site



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Attachment F

Pictures of Site



Members of Grid Alternatives Crew, Sinte Gleska University Vo-Tech crew and SWA Crew.

RST Chairman, Mr. William “Willie” Kindle on left of Tribal Flag and Ms. Monica Hunger, Acting Director of Sicangu Wicoti Awayankape Corporation

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Attachment F cont.



Last day of install, November 11, 2016. Mr. Tim Willinks in white helmet and dogs of the subdivision who adopted him.

Many more pictures can be viewed at

<https://www.flickr.com/photos/gridalternatives/sets/72157673419740796/with/29505727885/>