

Cover Sheet

Applicant/Implementer: Tonto Apache Tribe
#30 Tonto Apache Reservation
Payson, AZ 85541

Project Title: Solar Assist for Governmental and Community Facilities

Descriptions of Affected Buildings: Tribal Administration Building and Community Gym/Pool

Project Location: Tonto Apache Reservation, Gila County, north-central Arizona

Fuel use targeted in project: Solar Photovoltaic Cells reduce electricity use in both buildings

Funding Opportunity: Community Scale Clean Energy Projects in Indian Country,
DE-FOA-0000852

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Executive Summary

Tonto Apache Tribe applied to the Department of Energy's "Tribal Energy Program" for the "Community Scale Clean Energy Projects" in Indian Country in 2013 to implement a solar project to reduce energy use in two tribal buildings. Total estimated project cost was \$804,140, with the Department and Tribe each providing 50% of the project costs.

Photovoltaic systems totaling 75 kW on the Administration Building and 192 kW on the Gymnasium were installed. We used roof tops and installed canopies in adjacent parking areas for mounting the systems. The installed systems were designed to offset 65% of the facilities electric load.

Background: The Tribe's interest in renewable energy began with the knowledge that renewable energy could save significant tribal resources, that the use of renewable energy fit into the Tribe's overall view of development, and that we are situated in an area that is one of the best locations for use of solar energy in the entire nation. Constraints to developing renewable energy included very little land space, financing, and little potential for other renewable energy sources because of the nature of the Reservation. A project would have to be affordable, demonstrate significant savings within the project life, fit into available spaces, be financially understandable, and be manageable once implemented. Working with our contractor, Tonto Apache was able propose a system that met all of the Tribe's concerns and addressed the constraints/challenges.

Key Objectives of the Project:

- Integrate renewable energy on community buildings
- Becomes less reliant on energy generated by nonrenewable sources
- Reduce carbon footprint
- Become a leader in self-sustainability
- Create needed jobs for tribal members

Scope: The project was composed of the two major energy using tribal facilities, was designed to not require land or space not already used in conjunction with the two buildings, and financing available from the Dept and from the Tribe was adequate. It was proposed and carried out as a one year project.

Approach: Tonto Apache contracted for a turn-key project. Contractor was responsible to design, provide cost estimates, plan, order and install equipment, acquire required agreements for interconnection, provide reporting and usage systems. The Tribe coordinated with contractor using an advisory group that met with contractor regarding project progress, problems, dates, etc.

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Project Overview:

The Tonto Apache Tribe gained federal recognition in 1972, and the enabling legislation provided 85 acres of reservation (trust) lands adjacent to the Town of Payson, Arizona. Tonto Apache has a tribal population of 158 members, and most of the members live on the reservation. Employment is available within tribal governmental operations, tribal economic development, and in the local area. Jobs are still needed, however, for many members.

Since recognition, the Tribe has striven to provide services to its members. Within the 40 years since recognition, an entire community has been developed. Housing, infrastructure, community facilities are among the physical developments that occurred to meet the needs of the community members.

Concurrent to physical development, governmental systems and community services were also identified and developed. The Tribe has developed governmental structures and offices, and among services developed are law enforcement, judicial systems, elder services, preventive health programs, alcohol and substance abuse programs, community water & sewer, and maintenance for tribal facilities.

In the past two decades, the tribe has also been able to develop successful economic programs, such as gaming, lodging, a gas station and the community gymnasium. Proceeds from these ventures fund the majority of the tribe's health care needs, allow for other community investments, and provide the ability to consider needed and expected growth in further opportunities for tribal members.

All of the work accomplished in the past has allowed the tribe to consider projects, such as the solar development project, to meet tribal and community goals. Leadership looked for ways assess alternative energy projects, and in 2013, identified the Dept of Energy, EERE program as ideal to try to implement energy savings for the Tribe.

Objectives:

Integrate renewable energy on community buildings: in the year long project, we met this objective with the installation of 267 kW photovoltaic cells on the tribal administrative building and gymnasium. We also installed canopies in parking lots which allowed us to reach the targeted installed capacity while providing shaded parking for gymnasium visitors and staff.

Become less reliant on energy generated by nonrenewable sources: the solar systems are estimated to reduce non-renewable electric usage by 65%. We have partial operating figures (electricity bills) which indicate that the system are on track to reach project savings and offset.

Reduce Carbon footprint: the system will reduce tribal demand for non-renewable energy at our two buildings by 65% aggregate. Tribal facilities will reduce electric demand from our utility, reducing the 'carbon footprint' significantly over the next 25 years with the modules having a guaranteed production

rating within the Manufacturer's warranty but, the technology can and should work beyond that timetable.

Become a leader in self-sustainability: We have demonstrated that we are capable of planning, financing, and installing a complex renewable energy technology project. The long term results are lower costs, knowledge of how to implement complex projects, and less reliance on non-renewable energy.

Create needed jobs for tribal members: throughout the installation phase of the project, contractor had hired 4 tribal members to work on the project. One employee has become a regular employee of the contractor, and is working on other projects in Arizona as a result of his performance at the Tribe's project.

Description of Activities Performed

Planning:

Planning for the project actually occurred in two stages.

First, we had to put together the specifications of the project which would meet the requirements of the grant opportunity, which called for very specific and detailed information on planned equipment, inputs, outputs, installation plans, cost savings, and renewable production metrics. As the Tribe did not possess the ability or capability to put this information together without assistance, the grant developer was directed towards a contractor with some knowledge of the Tribes electric use and layout. This contractor was brought on board to provide the technical ability to produce a viable grant application. We worked the technical requirements to fit the profile of the project as the tribe envisioned it. Together we melded technical information with tribal direction for the initial description of the project.

Second, we had to plan internally on how to implement the project once funded. The Tribe organized an advisory group to work with the contractor during the process of installation. The group provided local input and knowledge which was very valuable in that they provided information which kept the project from problems which may not have been apparent in maps or building records. In one examples, we had to adjust the placement of one canopy, after the group identified problems with the complex placement of preexisting underground wiring after a private locator was brought into the project. The contractor provided all specs and details of the entire system, the group reviewed, questioned and approved these plans. The group helped keep the project on schedule.

Installing/Implementation:

Although this was what we consider a turn-key project, wherein the contractor was responsible for the entire project development, reviews were done in stages:

The project layout, placement, schedule, and specifications were developed by the contractor and approved by the Advisory Group and Tribal Council.



Erecting canopies in gymnasium parking lot

Detailed specifications and drawings were developed, and once approved, okay was given to order the project equipment. This included all photovoltaic panels, inverters, steel canopies, interconnections, wiring, and all associated equipment. Once ordered, the contractor mobilized and scheduled the equipment delivery and started the installation of the project. Concurrently, work was being done with the local utility for approval and Interconnection on to the existing electrical grid with inspections and review.



Panels installed on Tonto Gymnasium, from the southeast



Canopies, Panels in Gymnasium parking, from the northeast

During work on installation, the local utility provider was contacted to create all the necessary agreements required to interconnect to their system. All required agreements and certifications regarding the system were brought forth as needed, and executed by the Tribe.



Tonto Administrative Building, with new panels, from the southeast

Coordinating

This was ongoing as described, but also included much coordinating with Arizona Public Service, and other agencies. This was the responsibility of the contractor, and review and approval rested with the tribe.

Reporting:

Reporting consisted of both financial and progress reports to the granting agency; reports to the Tribal Council. The reports were essential for purposes of keeping everyone on the same page, and worked well. We also addressed the needs for reporting to funding agency on final outputs, production, and computer controls of the overall system. The contractor provided the technical aspects of reporting, while tribal staff provided narrative on progress, problems, challenges, and changes.

Conclusions and Recommendations

If a tribe is considering alternative energy projects, it would seem that the best direction is a complete planning process that allows for consideration of a wide range of potentials. We didn't have that, but were in a situation where the opportunity aligned with tribe's desire for this type of project and so we were fortunate to be able to acquire support and implement this type of project.

Early development of technical capability would improve the odds of long range success.

Lessons learned

Communication and clear understanding of schedules: We did have had some targeted times that were missed due to circumstances un-foreseen and coordination plans for each particular event required agreement between the contractor, our staff, and other agencies. There are many outside factors and potential pitfalls to a project of this complexity so, when things don't work due to harsh weather for example, the coordination becomes even more critical.

The need for strong relationships with the contractor, and knowledge of how the other agencies schedule work is important, as all parties have to be at the right place at the right time. Although we have a relatively straightforward project, work required that tribal agencies be made aware of planned outages; the public hours for the gymnasium required that we give the gym staff adequate notice of planned outages as they had to inform the public of operating hours; Tribal decision makers needed to be informed when schedule changes were to occur.



Elevated view of installed panels, Tonto Administrative Building main entrance

Beginning Usage Reports

The Administration Building:

The PV system was brought on to the grid in January 2014 and the utility companies billing metrics provided the results listed in this graph.

**TAT/SRS 2013/2014 DOE TEP Savings Justification Report: Utility Billings**

Admin Building APS Account # 736604283							
Months	2014 Dollars	2015 Dollars	Savings	2014 kWh's	2015 kWh's	Savings	kWh % offset
January	\$ 1,308.07	\$ 667.64	\$ 640.43	10080	6240	3840	38%
February	\$ 1,359.73	\$ 860.39	\$ 499.34	9600	5440	4160	43%
March	\$ 1,201.40	\$ 596.64	\$ 604.76	9440	6080	3360	36%
April	\$ 1,371.17	\$ 55.58	\$ 1,315.59	9440	4320	5120	54%
May	\$ 1,873.23	\$ 52.65	\$ 1,820.58	10720	3840	6880	64%
June	\$ -	\$ -	\$ -	0	0	0	
July	\$ -	\$ -	\$ -	0	0	0	
August	\$ -	\$ -	\$ -	0	0	0	
September	\$ -	\$ -	\$ -	0	0	0	
Oct	\$ -	\$ -	\$ -	0	0	0	
November	\$ -	\$ -	\$ -	0	0	0	
December	\$ -	\$ -	\$ -	0	0	0	
2015 Total \$ saved YR 1			\$ 4,880.70	2015 Total kWh's saved YR 1		23360	

The above data indicates that we are on a clear path to achieving our goals in renewable energy production, and the savings are becoming apparent month by month. This data is extracted directly from the monthly billing statements and show an upward pattern of production that is only getting better as the months go by and we are also entering the high production months of the summer in Arizona with very long days providing optimal peak production of the PV systems. These monthly daily costs reflected in the bills show the dramatic reduction in our cost for utility provided electricity.

Gymnasium

This PV system was put on the grid in mid-February 2015 so, it has a later start of the year then the Administration building. The Billing information and rate plan are different on the Gymnasium as mandated by the utility company and the usage metrics are listed below. This systems is also able to demonstrate offset of electric usage and savings vs last year.

GYM APS Account # 574594287							
Months	2014 Dollars	2015 Dolars	Savings	2014 kWh's	2015 kWh's	Savings	kWh % offset
January - NO PV			\$ -			0	
Febuary	\$ 4,149.70	\$ 3,584.75	\$ 564.95	38280	28481	9799	26%
March	\$ 3,983.73	\$ 3,521.35	\$ 462.38	37080	27724	9356	25%
April	\$ 3,977.16	\$ 2,799.72	\$ 1,177.44	36840	22228	14612	40%
May	\$ 4,943.88	\$ 3,250.07	\$ 1,693.81	39480	21056	18424	47%
June			\$ -			0	
July			\$ -			0	
August			\$ -			0	
September			\$ -			0	
Oct			\$ -			0	
November			\$ -			0	
December			\$ -			0	
2015 Total \$ saved YR 1			\$ 3,898.58	2015 Total kWh's saved YR 1		52191	
<u>Total Combined Savings 2013/2014 DOE Grant</u>			\$ 8,779.28	<u>Total Combined Projects kWh's</u>		75551	
<u>Project</u>				<u>saved 2013/2014 DOE Project</u>			

The above data indicates that we are on track to achieve our goal in renewable energy production. This spreadsheet shows 2014 vs 2015 actual kWh's and savings results obtained from the billings images.

The aggregate data at the bottom of the above sheets shows both systems indicate acceptable production and offset results as indicated.