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PROPOSAL EXAMPLE

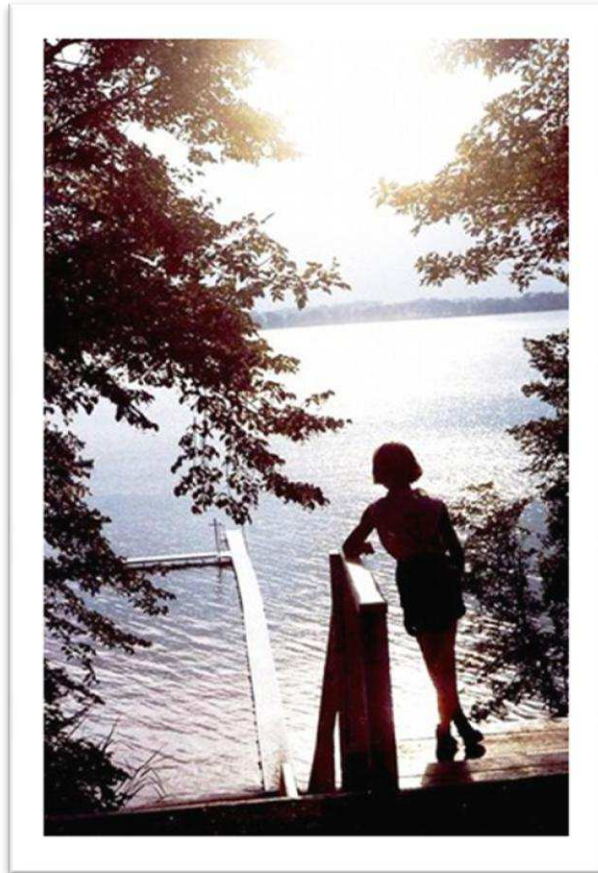
Grant from the State of Minnesota

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MARCH 2011

Admin
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Ojiketa Park Solar Project

Solar Energy and conservation lighting



***Bringing back the Sun
remembered from
our youth***

- Learning
- Understanding
- Appreciating
- Teaching others

Highlights

- 1.6 KW dual-axis tracking PV array providing 73% of the park's lighting power needs
- Wireless interactive PV monitoring terminal for the Park's Interpretive Center
- Energy conservation reducing the lighting kWh demand 71% park-wide
- LED safety lighting for parking and buildings with an annual cost of less than \$100



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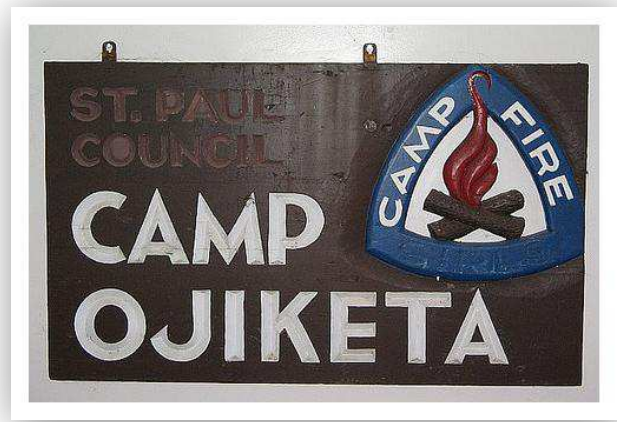
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Background



- A girls camp formed in 1926 (cabins and lodges)
- A women's business club builds Zonta Lodge in 1955
- In 1967 the huge Strom Dining hall was completed
- 1970 Camp expanded to 70 acres and 20 cabins
- In 2006, Minnesota Council of Camp Fire USA voted to reduce from 4 camps to 3, putting Camp Ojiketa up for sale
- The Trust for Public Land buys rights to buy the camp for \$3.8M
- In February 2008, the Ojiketa Preservation Society forms to help raise funds to have the camp sold to the city
- In May 2008 Chisago city commits \$1.5M towards the effort
- In October 2008 the Minnesota DNR awards \$500K to Chisago City to preserve the park
- In November 2008 local donations raised remaining funds.
- In December 2008 Chisago City buys the camp and names it a ***“Ojiketa Regional Park.”***

The park is open, but is in a restoration phase. We hope to bring it back to the family-oriented educational park it once was.

1.0 Executive Summary

Ojiketa Regional Park in Chisago City is a treasure. As a former youth camp dating back to 1926, generations of families continue to enjoy it's rich nature which includes 70 acres of oak forest, 3100 feet of shoreline, and wonderful facilities. These including 20 cabins, 3 conference halls, a dining hall, walkways, bike trails, and a large playing field. Numerous updates to the park are underway to provide a beach area, tent and RV camping.

In planning for the future of the park, **energy education and energy conservation are key cornerstones.**

With the help of this grant, we can introduce and educate our visitors to the benefits of solar energy through the use of a highly interactive 1.6KW dual-axis photo-voltaic (PV) system. This system will be unique in the area and we expect it to be a significant attraction to individuals, groups, and even local companies interested in learning about the benefits of solar energy. We sized the PV to satisfy 70% of the park's needs to power lights.

We believe this type system is far more educational than a static set of PV panels which can be seen in a number of parks already.

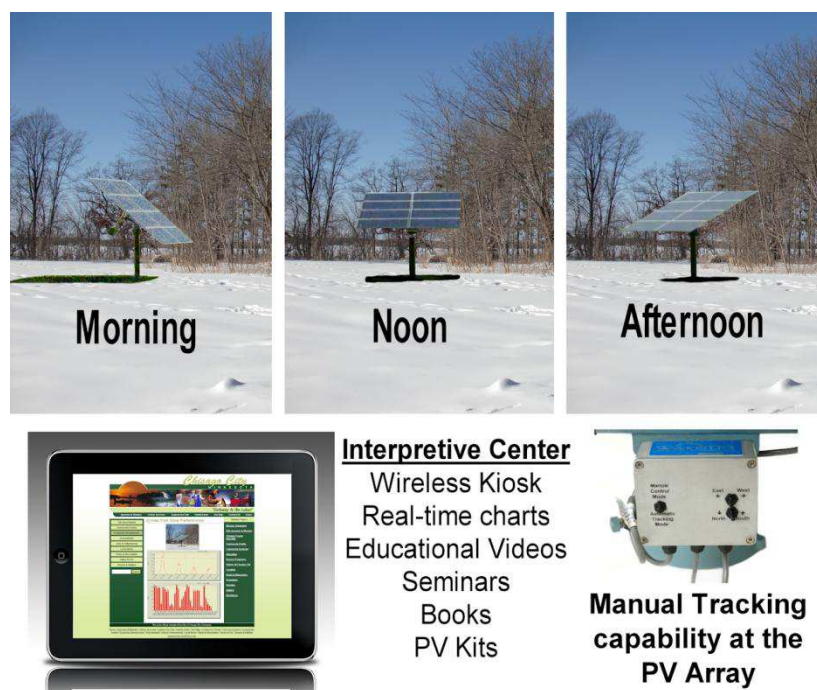


Figure 1: The Ojiketa Regional Park Solar Energy project (artist depiction at location)

Conservation We have forecasted our 2012+ energy needs for lighting to be approximately 11, 600 kWh/yr, costing \$1400 annually. With the help of this grant, we plan to apply LED lighting in the most heavily used applications, and compact fluorescent lights in medium use cases. Table 1 illustrates the expected savings. This effort will reduce costs by AT LEAST \$1000 every year beginning in 2012. This is significant and a true example of conservation that will be showcased to our park visitors in the Interpretation Center and through signage.

	kWh/year	Cost/year (\$0.12/kWh)
Forecast lighting demand	11621	\$1395
LED for high use areas	- 3340	- 401
CFL for medium use areas	- 4892	- 598
New Forecast	3399	\$396
Reduction in use and cost	-72%	-72%

Table 1: Conservation savings through use of more efficient lighting in targeted areas



Figure 2: The Ojiketa Regional Park Solar Energy project map view

Figure 2 illustrates the primary aspects and locations of the components for the proposed system. The PV array will be located in the best location the park has to offer, which is west of the parking area in the north end of the meadow. This is a central location and all park visitors will be exposed to this attraction.

A solar PV site survey has already been performed and the shading analysis report is provided as Attachment F. We estimate it will produce 2795 kWh per year (grid tied). This will provide **73%** of the power for the park's lighting needs if the other measures as proposed here are accomplished. The system is expandable to meet over 100% of the park's lighting needs for power.

Conservation through replacement lighting – The park has over 30 buildings, all with very outdated lighting. A lighting audit has been performed, and the types and locations of replacement bulbs have been identified. The annual savings will be substantial, reducing the lighting kWh used by over 72% compared to what the usage would be without a replacement lighting effort.

Safety Lighting - Since the park has virtually no outdoor safety lighting currently, especially in the parking areas and critical pathways, some will be added as part of this project. These will be highly efficient LED lighting which will save the park money in the long run as well as be a fantastic example of the use of this technology for energy conservation.

Although these will be the most used lights in the park, we estimate that they will only account for 16% of the overall lighting electrical costs on an annual basis. This is another great aspect to showcase to park visitors.

The Interactive Learning Environment

The proposed modestly-sized dual-axis tracking PV array provides a wonderful tool to teach about the power of the sun and the progression the sun takes through the sky throughout the year.

The PV array will be on automatic tracking most of the time, but a manual “joystick” control will be provided to help in demonstrations and seminars. This will give visitors a real feel for what how the system works, how the sun is tracked, and how much more power can be produced. We estimate at this location that 36.9% more power will be produced by using this tracking system versus a fixed array. It clearly opens up discussions of cost benefit analysis, which every potential PV owner should go through. This system aids greatly in this type of education and understanding.

The Interpretive Center – One of the cabins, Red Oak, is being converted into an Interpretive Center. Here many aspect of the park will be showcased including the PV, lighting, and conservation topic areas.

Park staff will be trained to discuss the PV system and related areas, and literature will be made available.



Figure 3: The Ojiketa Regional Park Interpretive Center

The wireless internet “Ojiketa Park Hot Spot” - Through this project an interactive website will be built that will chart the Real-time performance of the PV system as well as provide access to historical data. Visitors can view the system information at various points in the park as well as on their own wireless devices. We expect to reach many 1000s through this method.

SUMMARY

This project will be a vitamin shot for this old park. The solar energy and conservation aspects will be a wonderful attraction as well as will allow the park to operate at lower annual costs.

We have the support of the Camp Ojiketa Preservation Society members, the Green Lake Association, and Chisago city. Funding for the 25% match has been secured, budgeted and funded. Green Energy Alternatives Inc of Forest Lake, home of the only Solar Store in Minnesota, has been selected as the prime contractor. They are supported by members of the Minnesota Renewable Energy Association (MREA) and local renewable energy contractors and educators.

2.0 Technical Description

The goals of the Ojiketa Solar project are to provide long term energy cost savings for the park and to educate the park visitors about the benefits of conservation and the use of solar energy. Various steps were taken to define the problem and to develop an affordable “Best fit.” solution.

Below were the steps taken. First we quantified the expected demand. Secondly we estimated the demand reduction through light bulb replacement efforts (conservation). Thirdly we sized and defined a PV system that met a good percent of the future lighting energy demand needs as well as made an effective interactive teaching system for the education goal. And lastly, adding high efficient safety lighting and its impact of energy demand was determined.

STEP 1: What is the projected lighting usage for the park in 2012 and beyond w/o replacing lighting?

- **ANSWER:** An energy audit was done and a future power estimate determined:

Lighting demand	Qty	Per UNIT			TOTAL
		kWh/D	Days/yr	kWh/yr	kWh/yr
Electric Cabins	15	1.6	200	320	4800
Zonta Lodge	1	11.42	200	2284	2284
Strom Lodge	1	15.81	200	3162	3162
Chapel Lodge	1	5	75	375	375
Interpretive Center	1	5	200	1000	1000

11621

STEP 2: What is the projected lighting usage for the park in 2012 and beyond if LED and CFL lighting is introduced in a smart way, such as CFL for medium use areas and LED for heavy use areas?

- **ANSWER:** An energy audit was done and a future power estimate determined:

Lighting demand	Qty	Per UNIT			TOTAL kWh/yr	LED SAVED kWh/yr	CFL SAVED kWh/yr	
		kWh/D	Days/yr	kWh/yr				
Electric Cabins	15	1.6	200	320	4800		3744	
Zonta Lodge	1	11.42	200	2284	2284	1404	137	
Strom Lodge	1	15.81	200	3162	3162	1936	28	
Chapel Lodge	1	5	75	375	375		293	2012
Interpretive Center	1	5	200	1000	1000		780	DEMAND
					11621	3340	4982	3299

STEP 3: What size PV system would be needed to meet ~75% of the future lighting demand as well as make an attractive system for Interactive learning?

- **ANSWER:** 75% need is 2475 kWh/yr. This could be met with a 2KW fixed array (10 panels) or a 1.6KW single-axis or dual-axis tracking array.

The tracking array was more attractive than a fixed array for interpretive learning. The next decision was single-axis tracking or dual-axis tracking. The incremental cost for the dual-axis tracking, approximately \$500 was judged to be worthwhile for the teaching aspects of tracking the sun even though the incremental increase in kWh/yr was only modest versus the single-axis system.

2.1 PV System

To minimize the impact to the park and to keep construction costs low, a pole mount PV system was chosen. The 8-panel system will use a single 6-inch ID pipe in a rebar reinforced concrete base, to manufacturing and permit requirements.

Panels - The panels proposed are rated at a minimum of 210 watts each. We currently plan to use panels from Kyocera.

Grid Tie Inverter System - A 3.3kw grid tie inverter (GTI) was selected in order to allow expansion. The system proposed is from Solar Edge. Unlike central GTIs or A/C based micro inverters, the Solar Edge system uses DC/DC power units for each panel and a 400 VDC bus back to the main inverter. This approach has proven to maximize power generation, reduce installation constraints, reduce installation time, minimize maintenance costs, provide superior safety, and can provide theft protection.

This new approach is becoming standard in Europe and likely will become standard in the USA in a few years. It was felt that for a new installation such as at Ojiketa Park, that making this migration to the newest technology is smart to do now rather than have to do it a few years down the road. The cost is essentially the same but provides benefits that other GTIs systems don't.

Dual-axis Tracking mount – The mount proposed is from Wattsun. Wattsun has been in the solar panel tracking array business for over 20 years and has products that cover a wide range. The 8-panel unit proposed here is one of their smallest units and it has a good reputation in the field.

Once set-up, it automatically tracks the sun. It will be installed with a manual control capability to allow interactive demonstrations.

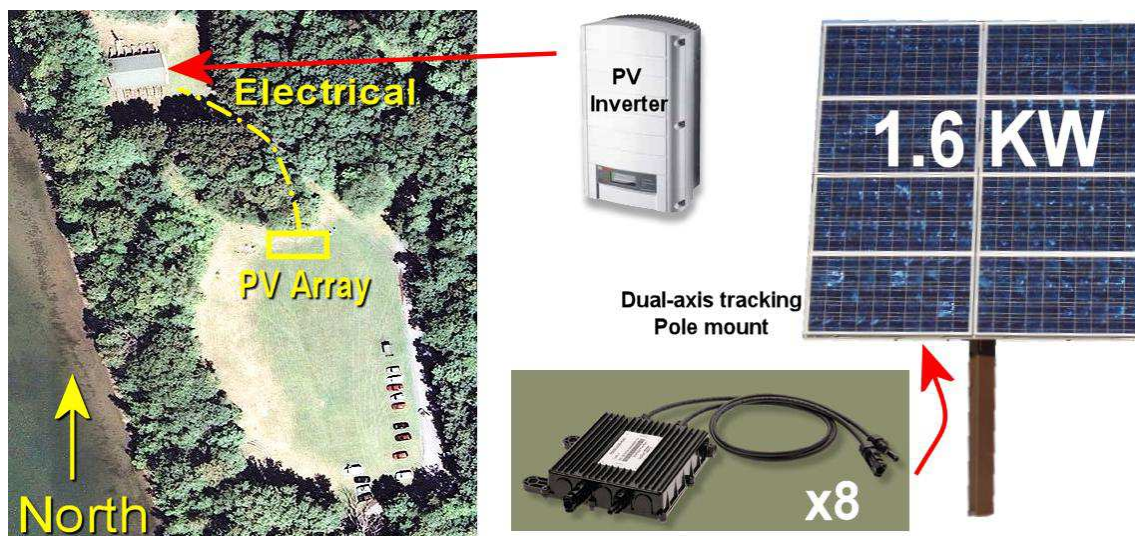


Figure 4: Proposed Ojiketa Park PV array

The electrical service at the Ojiketa Park chapel building will be used to tie into the power grid.

The installation will be performed using the appropriate permitting, adherence to building codes, and the use of licensed installers.

2.1.1 Solar performance modeling

The park is mostly forested; however a suitable location was selected at the north end of a large play area that also acts as a parking lot. A 3-point pathfinder site assessment was performed and it did indicate some shading in the early morning and late evening hours due to trees on the east and west sides of this open space.

During the core of the day there is no shading and solar production will be very good. The shading aspect will be **turned into a positive message** to visitors, emphasizing the factors involved in optimizing a solar installation, and using tracking.

We propose to share the methods used in selecting and sizing the PV system at the given the location, using a series of short online-videos as part of the interpretation program. These will cover the pathfinder assessment, the calculations resulting from it, and the choices for tilt angle, components, and connections will all be presented. We feel these real-life issues will be very valuable as part of the learning and understanding environment we plan to have surrounding this project.

The site shading analysis is provided as Attachment F.

2.2 Conservation through replacement lighting

Table 1 identifies the expected savings in annual kWh and dollars from a baseline forecast for usage for 2012 prior to performing any replacement lighting. We estimate a savings of over 70%.

Though average numbers were used for each cabin, the 2 large lodges, Zonta and Strom were studied in more depth. These facilities are large and use a lot of outdated internal lighting currently.

Figure 6 illustrates the savings plan for Zonta and Figure 7 illustrated the savings plan for Strom. Both indicate a savings of over 60% can be achieved. Note that many existing fluorescent lights remain. Only where it made sense was a bulb proposed to be replaced.

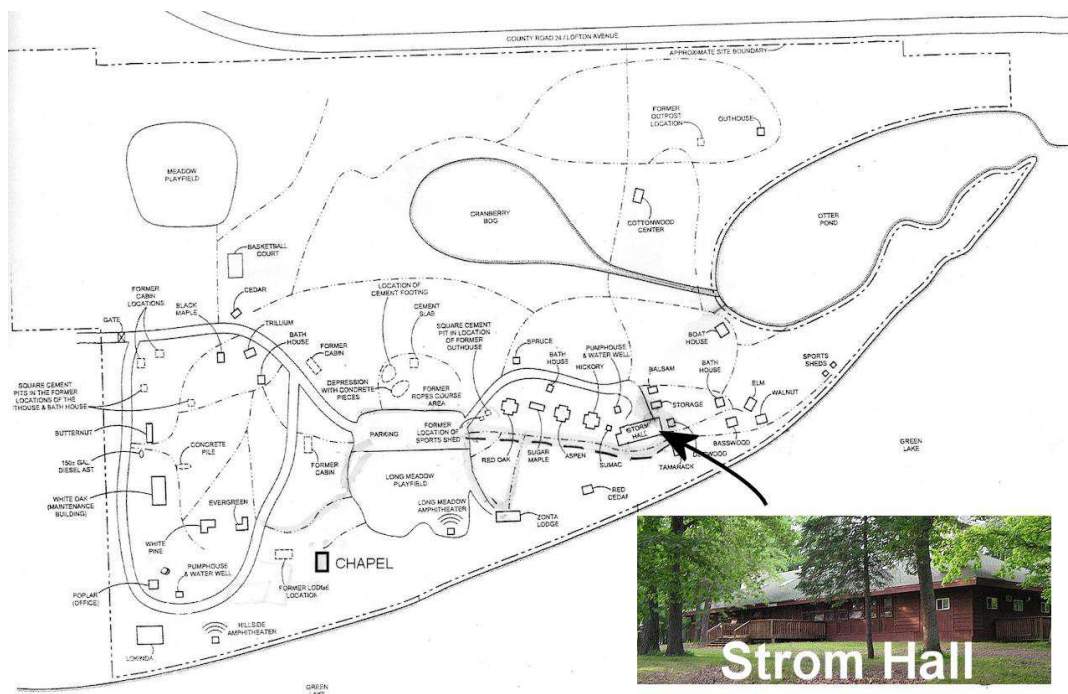


Figure 5: Park facilities map

2.2 Safety Lighting

The main parking area that services the park is shown in Figures 4 and 5. Lighting in this area is very poor and need to be modernized. There is also a lack of lighting for common walkways and roads.

These type of lights tend to stay on from dusk until dawn and can be a major contributor to overall electrical lighting costs. Because of this high usage, we propose to install high efficiency lights as follows:

- 3 large LED spot lights on tall parking lot poles to illuminate the parking lot, play-field and part of the main roadway.
- 6 medium sized LED spot lights to illuminate both the entries to Zonta hall, Strom hall, the Chapel, and the Interpretive center.
- 4 medium sized LED spot lights to illuminate the roadway in the loop west of Strom hall

The anticipated annual electrical use due to the addition of these very efficient safety lights is 528 kWh. At \$0.12/kWh, this is a cost of just \$63 vs. a cost of \$528 using conventional lighting.

There are a number of suppliers of these units and we will make a final selection as part of the overall project execution activity.



Figure 8: Parking lot Safety Lighting/LED technology



Figure 9: Walkway wash lights/Safety Lighting/LED technology

Medium sized “wash” lights are proposed to illuminate broad areas near major building entryways as well as down pathways. This allowed the use of existing electrical service connections on building and on posts along walkways and roads.

2.4 Interpretive Learning

Ojiketa is the largest park in Chisago city and utilization is increasing. We are very excited about adding a solar energy and conservation program at the park to benefit the local citizens. It fits well with our interpretive learning plans.

With the nice central location of the PV array, we expect Ojiketa park to be the place residents and students from as far as 20 miles away to come to learn about solar power, its benefits, and how to apply it in their homes, their schools, and their businesses. Our conservation efforts will also be highlighted as a cornerstone of this program

Because of this expected interest, we plan to offer 24 hour-a-day access to the solar and conservation learning environment. The major aspects of our approach are shown in Table 1.

Interpretive learning	Description	Target Audience
Ojiketa Internet “Hot Spot” and Ojiketa solar webpage	Add a park-wide wireless LAN capability and a webpage on the Chisago City website containing rich information about the Ojiketa system, its real-time performance , and Ojiketa’s ongoing energy conservation efforts. This will include a good number of educational videos.	Everyone; 24 hours a day access
Solar kiosk in the main building using an iPad-type device	Instant access to park information including access to the webpage described above.	Visitors
Signage	Signs at the PV array and in various buildings describing the system and directing visitors to see the webpage.	Visitors
Community Education	City staff and local solar energy volunteers will host seminars at the park on a regular basis. There will be seminars for youth, families, and adults.	Individuals and groups, including schools.

Table 2: Interpretive Learning about Solar Energy at Ojiketa



Figure 10: Solar Kiosk at Ojiketa Park Office (shows PV system performance)



Figure 11: Dual-axis tracker Manual Controls

Hands-on PV - The dual-axis tracking array provides a unique environment to teach the principles of solar energy. We expect to host a number of hand-on seminars and tours where the tracking array can be demonstrated in manual mode and the resultant change in performance shown on the kiosk or on people's web-enable smart phones or laptops.

FUNCTION:

Manual Control - Allows the user to bypass automatic tracking and to move the tracker East, West, North, or South.

High Wind protection - The tracker is run to a full North position, the array lays flat in a horizontal stow position.

Shedding Snow - The tracker is run to a full South position; the array elevates up to a 75-degree angle and dumps any snow accumulation on the array.

Switches

Automatic / Manual - Flip Down for Auto Tracking or flip Up to enable Manual Tracking.

East / West - Hold left to track East or hold right to track West.

North / South - Hold up to track South (elevate) or hold down to track North (flatten).

3.0 Project Management

The project will be managed by city staff. They will work with the prime contractor to plan the work around activities at the park so that the installation will go smoothly and not disrupt existing park activities.

The prime contractor will provide monthly costs and status reports. We expect the project to complete within 3 months of receiving the grant.

4.0 Cost

Solar PV system and Interpretive Center design, development, installation, and support; \$39,910.

Conservation and safety lighting hardware, installation, and support; \$11,070.

Project total; \$44,980; (24.6% of total is conservation)

5.0 Compliance

Section	Requirement or Criteria	Comply	Comment
I	Utilize Solar Electric, solar thermal, or solar air	YES	Grid-tied PV
	Provide for public interpretation/education	YES	Kiosk, signage, website, videos, seminars
	Energy efficiency	YES	Offset 50% of lighting cost
	Enhance the quality of outdoor recreation In the parks	YES	Integrated with the park with environmental benefits stated
	Meet Solar Electric Rebate Program eligibility requirements	YES	Using all approved components and methods
	Local government inspiration, planning, and commitment	YES	Part of the city's operational plan to revitalize the park
	Local matching 25% of project cost is needed and can come from energy efficiency improvements.	YES	Planned, budgeted and funded
II	\$10K - \$150K max grant	YES	Grant request of \$30K
	Reimburse up to 75% of actual costs	YES	Cost reports will be provided
	Cannot piggyback grants	YES	No other grant is being pursued or used
	Must complete by June 2012	YES	Budgeted for FY 2011
	Needs a environmental review	YES	Already completed
	20yr maintenance life	YES	All components comply with life requirement
IIIA	TRAILS: Parks of Recreational significance (2 of these criteria - SEE LIST)	YES	CITY RESPONSE HERE
IIIB	PARKS must meet top 2 criteria	YES	CITY RESPONSE HERE
IIIC	PV efficiency not to exceed 25% of project cost.	YES	Estimated at
IIID	List of reimbursement costs	YES	TBD
IV	Solar Energy Requirements		
	A. Energy Audit	YES	Initial estimate by contractor
	B. Site assessment; 90% shade free (PV)	YES	Over 93% measured
	C. Top view diagram	YES	See Figure 2
	D. Grid Tie	YES	Central inverter to be used
	E. Equipment		
	- NEW only	YES	
	- UL/20yr warranty	YES	
	- UL GTI with 2yr warranty and 5yr warranty extension option	YES	
	- code compliant	YES	
	- shade free year round	YES	
	- professional installers	YES	
	- installer provide operation/maintenance information	YES	
V	Funding Priorities		
	A. Efficient and Effective (reduce use)	YES	50% reduction in lighting energy usage
	B. Public interpretation/education	YES	Various. See section 2.4
	C. Reduce Energy use	YES	50% reduction in lighting energy usage

ATTACHMENT F

Solar Shade Analysis Report Ojiketa Regional Park