Minnesota Department of Natural Resources
500 Lafayette Road, St Paul, MN 55155

Project Title: ***Development of Renewable Energy Strategies***

Contract Number: EP3-13 Milestone Number: 3 Report Date: 12.11.2009

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Congressional District (RDF Awardee): Fourth

Congressional District (PV Installations): TBD

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MILESTONE REPORT

Executive Summary: The Department of Natural Resources (DNR) will be installing small-scale solar photovoltaic systems into several of their facilities and develop a renewable energy interpretive program. This is in preparation for large-scale implementation of renewable energy resources into new and existing DNR facilities. DNR is interested in doing renewable energy in a way that is not only in keeping with its mission and the Governor's Executive Order 05-16, but in a way that will inform and encourage other renewable energy applications. Installations included in this Project are rooftop solar photovoltaic systems connected to the grid and freestanding photovoltaic systems at locations where a building is well shaded but open sunlight is close; these systems will be installed at selected area offices, interpretive centers, visitor centers, and hatcheries. The Project will form the framework for establishing renewable energy design and specification standards for future photovoltaic installations at the DNR.

This project will provide DNR with a process and the tools for determining the feasibility of various renewable energy systems, the development of standard designs and specifications for photovoltaic systems, a number of grid-connected and customer-sited installations, a monitoring process, and a renewable energy interpretive program. The DNR has over 2,500 buildings ranging from vault toilets to visitor centers at 182 sites throughout the state. Within these facilities opportunities exist for solar photovoltaic systems. The DNR will use flat plate photovoltaic arrays mounted on sloped roofs at State Park sites, flat plate photovoltaic arrays mounted in series on flat roofs at larger buildings such as Regional offices, and flat plate photovoltaic arrays mounted on the ground at historic sites. All systems are anticipated to be fixed and will be connected to the grid.

The goals of this project are to develop a series of renewable solar energy strategies, prototypes, and specifications that will become part of all future new and renovated DNR facilities and to install at least 99kW of photovoltaic systems, both grid-connected and customer-sited. Specific objectives include:

- The development of assessment tools for building site selection, both to select sites for this project as well as for use by DNR to assess sites for future renewable energy installations
- Assessment and selection of sites serviced by Xcel electricity for inclusion in this project

- Design, construction documents, and construction administration for a minimum of 99kW of solar array collection systems for electricity generation at approximately 6 DNR state parks, regional and area offices
- The development of an interpretive program about the solar energy installations at the above referenced sites.

Technical Progress: This milestone involved the piloting of an assessment process and tool for selection of photovoltaic installations. The selection process and tool evaluated and weighed the following criteria:

- Overall Site Criteria
  - Park Level: Good overall proxy for park attractiveness, amenities, prominence, etc.
  - Park Annual Visitors: More visitors means more opportunities for interpretation
  - Park Overnight Stays: Overnight visitors will be more likely to take time during their visit for interpretive activities
  - Park Focal Point: A natural point of congregation like a Visitor Center, amphitheater, park store, etc. provides a good venue for interpretive activity
- Location-specific Criteria
  - Location Electricity Use: Provides opportunity to offset cost and carbon emissions
  - Location Demand Charges: Provides opportunity to offset large monthly costs of high usage rates
  - Location Solar Access: This will be the result of a site assessment exercise, and will include all related factors like roof slope/orientation/condition, shading, etc.
  - Location Interpretive Space: Space near the renewable energy equipment that can be used for interpretive displays

Evaluation criteria scoring metrics were defined and used to enable consistent evaluation across sites and evaluators. The criteria were weighted by a panel of experts representing DNR Parks, Regions and the Central Office. The completed selection tool spreadsheet provided a quantitative ranking for each potential location to help guide decision making.

Site visits were made to 13 candidate Sites. Sites were considered to be candidates if they had significant Xcel electricity usage (> 20,000 KWh per year) and the potential to provide good opportunities for interpretive signage and interactive displays for Site visitors. Each location (an area within a Site) assessed had a score that combined an evaluation of the Site and the particular location within the Site. Each site visit started with a discussion between the site manager and the evaluation team about the site's history, character and unique attributes. Two to three potential locations within the site were jointly identified for closer examination. Each location was visited to measure the solar window using the Solar Pathfinder tool, discuss potential interpretation methods, potential security concerns, viewscape/environmental impacts and take digital pictures documenting the area. After the site visit the photographs were edited with Adobe Photoshop to create a depiction of the solar array at the location. We expanded the tool to show how the PV system would look installed at the actual location and a clickable navigation feature that allowed easier viewing and an ability to review the tool findings and recommendations with groups of DNR decision makers.

There were 16 acceptable locations found across the 13 Sites visited. Two Sites, Interstate State Park and Sakatah Lake State Park, had no acceptable locations because of their dense tree canopy. The total scores

ranged from 17 to 35 across the 16 locations and were consistent with the opinions of the assessment team - reinforcing our confidence with the Tool.

As we began to think about implementation it became apparent that the Tool needed to be enhanced to allow for the evaluation of multiple implementation scenarios. These scenarios would have to be evaluated on additional factors like implementation cost and generation capacity so that we could determine how they met our commitment to implement 99 KW for the $800,000 of the RDF grant we have earmarked for the actual purchase and installation of PV systems. We found that we needed to implement 1 – 2 large PV systems with a lower cost per watt to drive down the average cost per watt across the 99 KW of capacity. We also considered adding a time element to the tool to factor in changing PV prices over the next few years. Several consultations with established PV installers convinced us that PV prices would be relatively stable over the next few years and we chose not to add this to the tool.

The implementation recommendation was reviewed with DNR management and the tool proved to be very useful in evaluating alternative scenarios based on their feedback. The final recommendation calls for roof or ground mounted systems to be installed in 2010 at five DNR sites. These systems range in size from 12.0 KW to 39.4 KW and should produce a total of over 132,000 KWh each year, reducing the DNR's yearly carbon emissions by 110 metric tons. The selected sites are shown below in bold font.

Name	Site Score	Location Description	Loc. Score	Total Score	Solar Cap: KW	Annual KWh Est.	Cost Estimate	*$ per Watt*	Install Timing
R3 HQ	**4**	**Loc. 1: Roof mount. Roof is structurally sound and will be reroofed this**	**23**	**26**	**23.0**	**30,000**	**$210,000**	***$ 9.13***	**May-2010**
Fort Snelling	**18**	Loc. 1: Pole mount in grass median strip by CC	**16**	**35**					
William O'Brien	**18**	**Loc. 1: Large ground mount behind CC**	**14**	**32**	**39.4**	**50,000**	**$315,000**	***$ 7.99***	***Jul-2010***
		Loc. 2: Solar picnic shelter by ball diamond, long run to meter, no internet	**15**	**34**					
		Loc. 3: Visitor Center roof mount, older shingles, great display space	**16**	**34**					
Lac Qui Parle	**10**	**Loc. 1: Large ground mount south of VC**	**15**	**25**	**13.1**	**16,700**	**$110,000**	***$ 8.40***	***Jul-2010***
Crystal Springs Hatchery	**5**	Loc. 1: Pole mount by fence gate	**11**	**17**					
Wild River	**16**	Loc. 1: Contact Center median strip pole mount	**11**	**27**					
Afton	**13**	**Loc. 1: Large ground mount by Contact Ctr**	**16**	**29**	**13.1**	**16,700**	**$110,000**	***$ 8.40***	***Jul-2010***
		Loc. 2: Pole mount by VC, small display area, no internet	**13**	**26**					
Interstate	**15**	No acceptable locations found, too many trees							
Lake Shetek	**11**	Loc. 1: Pole mount in new campground	**16**	**28**					
		Loc. 2: Roofs of picnic shelters in new campground	**16**	**28**	**12.0**	**19,000**	**$ 96,000**	***$ 8.00***	**Aug-2010**
Glenwood Fisheries	**4**	Loc. 1: Roof of garage, warped rafters, outside signage only	**13**	**17**					
Nerstrand Big Woods	**11**	Loc. 1: Clearing close to VC pole mount, use kiosk signage and touchscreen	**16**	**27**					
		Loc. 2: San Building north side pole mount, signage only	**10**	**21**					
Frontenac	**12**	Loc. 1: Ground Mount behind Contact Center	**13**	**24**					
Sakatah Lake	**8**	No acceptable locations found, too many trees							
				Totals:	**100.6**	**132,400**	**$841,000**	***$ 8.36***	
				Metric Ton of CO_{2e} avoided each year:			**110.0**		

The complete Selection Tool output is attached as a PDF file.

Milestones: #1: Selection of an engineering firm; completed on June 11, 2009.
#2: Process and tool to assess buildings for renewable energy; completed on October 6, 2009.
#3: Site selection; completed on December 11, 2009.

Project Status: Project is on schedule with implementation of 99 KW planned by the end of 2010 instead of by the end of 2012. This accelerated timeline will allow us to reduce our carbon emissions earlier and provide a more timely interpretive experience for park visitors. The modular design of the 13 KW ground mounted array will also support a faster implementation.

DNR Site Selection Tool

Front Page

Facility Name (click on name to link to Site page)	Weighted Site Score	Weighted Location Score (best site)	Total Weighted Score	Solar Capacity (kW) (best site)
Region 3 Headquarters	4	23	26	23.0
Fort Snelling	18	16	35	3.7
William O'Brien	18	14	32	39.4
Lac Qui Parle	10	15	25	13.1
Crystal Springs Hatchery	5	11	17	3.7
Wild River	16	11	27	3.7
Afton	13	16	29	13.1
Interstate	15	0	0	0
Lake Shetek	11	16	28	3.7
Glenwood Fisheries	4	13	17	10.0
Nerstrand Big Woods	11	16	27	3.7
Frontenac	12	13	24	3.7
Sakatah Lake	8	0	0	0

Solution Packages (click on name to link to images)	Output	Approx. Cost
SP1: Roof Mount	2-4kW	$30,000
SP2: Pole Mount	3.7kW	$37,000
SP3: Picnic Shelter	2-4kW	$40,000
SP4: Solar Patio	2-4kW	$40,000
SP5: Car Park w/ EV plugins	4 kW	$40,000
SP6: Large Ground Mount	13 kW	$110,000
SP7: Large Flat Roof Mount	12 kW	$105,000

DNR Site Selection Tool

Scoring Page

Name	Site Score	CY08 KWH		Demand Charges		Location Description	Solar Access	Display Space	Loc. Score	Total Score	Inc ?	Solar Cap: KW	Annual KWh Est.	Cost Estimate	*$ per Watt*	Install Timing
R3 HQ	**4**	368,009	**5**	8,415	**5**	Loc. 1: Roof mount. Roof is structurally sound and will be reroofed this year.	**5**	**2**	**23**	**26**	1	23.0	30,000	$ 210,000	*$ 9.13*	May-2010
Fort Snelling	**18**	173,646	**3**	2,823	**2**	Loc. 1: Pole mount in grass median strip by CC	**4**	**3**	**16**	**35**	0	3.7	4,400	$ 37,000	*$ 10.00*	
William O'Brien	**18**	99,559	**2**	1,638	**1**	Loc. 1: Large ground mount behind CC	**4**	**3**	**14**	**32**	1	39.4	50,000	$ 315,000	*$ 7.99*	*Jul-2010*
						Loc. 2: Solar picnic shelter by ball diamond, long run to meter, no internet	**5**	**2**	**15**	**34**	0	3.0	2,100	$ 40,000	*$ 13.33*	
						Loc. 3: Visitor Center roof mount, older shingles, great display space	**4**	**5**	**16**	**34**	0	8.0	9,000	$ 75,000	*$ 9.38*	
Lac Qui Parle	**10**	80,030	**2**	-	**1**	Loc. 1: Large ground mount south of VC	**4**	**5**	**15**	**25**	1	13.1	16,700	$ 110,000	*$ 8.40*	*Jul-2010*
Crystal Springs Hatchery	**5**	71,537	**1**	1,640	**1**	Loc. 1: Pole mount by fence gate	**3**	**3**	**11**	**17**	0	3.7	4,400	$ 37,000	*$ 10.00*	
Wild River	**16**	65,582	**1**	481	**1**	Loc. 1: Contact Center median strip pole mount	**3**	**3**	**11**	**27**	0	3.7	4,400	$ 37,000	*$ 10.00*	
Afton	**13**	61,472	**1**	-	**1**	Loc. 1: Large ground mount by Contact Ctr	**5**	**4**	**16**	**29**	1	13.1	16,700	$ 110,000	*$ 8.40*	*Jul-2010*
						Loc. 2: Pole mount by VC, small display area, no internet	**4**	**3**	**13**	**26**	0	3.7	4,400	$ 37,000	*$ 10.00*	
Interstate	**15**	59,310	**1**	-	**1**	No acceptable locations found, too many trees										
Lake Shetek	**11**	56,276	**1**	1,672	**2**	Loc. 1: Pole mount in new campground	**5**	**3**	**16**	**28**	0	3.7	4,400	$ 37,000	*$ 10.00*	
						Loc. 2: Roofs of picnic shelters in new campground	**5**	**3**	**16**	**28**	1	12.0	19,000	$ 96,000	*$ 8.00*	Aug-2010
Glenwood Fisheries	**4**	54,979	**1**	-	**1**	Loc. 1: Roof of garage, warped rafters, outside signage only	**5**	**1**	**13**	**17**	0	10.0	12,000	$ 80,000	*$ 8.00*	
Nerstrand Big Woods	**11**	50,623	**1**	-	**1**	Loc. 1: Clearing close to VC pole mount, use kiosk signage and touchscreen	**5**	**5**	**16**	**27**	0	3.7	4,400	$ 37,000	*$ 10.00*	
						Loc. 2: San Building north side pole mount, signage only	**3**	**3**	**10**	**21**	0	3.7	4,400	$ 37,000	*$ 10.00*	
Frontenac	**12**	39,291	**1**	-	**1**	Loc. 1: Ground Mount behind Contact Center	**4**	**4**	**13**	**24**	0	3.7	4,400	$ 30,000	*$ 8.11*	
Sakatah Lake	**8**	23,118	**1**	-	**1**	No acceptable locations found, too many trees										
											Totals:	5	100.6	132,400	$ 841,000	*$ 8.36*	
											Remaining:		-1.6		$ (41,000)	

Solution Pac
1: Roof mour
2: Pole mour
3: Picnic She
4: Solar Patic
5: Parking C
6: Large grou
7: Large flat

% of Max	Score
80%	5
60%	4
40%	3
20%	2
0%	1

Focal Point	Score
Year Round Visitor Center	5
	4
Seasonal Visitor Center	3
	2
No Visitor Center	1

Solar Access	Score
No shading now and none in future	5
No shading now but trimming req. in 5+ years	4
Small tree and shrub trimming required	3
Single large tree removal required	2
Several large tree removals required	1

Display Space	Score
Close, high-traffic display space available	5
Good display space available close to PV array	4
Display space available in vicinity of PV array	3
Can add display space in vicinity of PV array	2
No display space available in vicinity of PV array	1

Metric Ton of CO_{2e} avoided each year: 110.0

Region 3 Headquarters

Link Back to Front Page

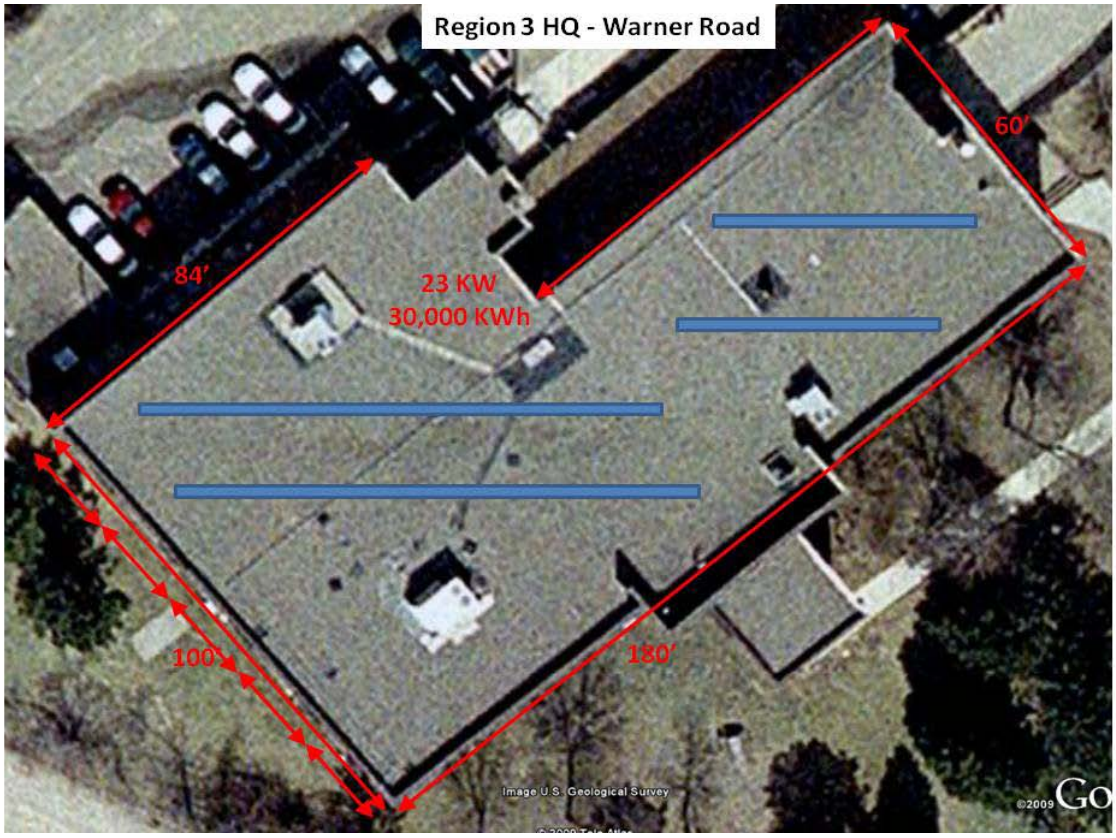
Criteria	Value	Score
Park Level	N/A	1
Annual Visitors	0	1
Overnight Stays	0	1
Focal Point	Entry lobby or reception area	1
	Weighted Site Score	4

Location 1: Roof

Criteria	Value	Score
Energy Use (CY08, kWh)	368,009	5
Demand Charges	$8,415	5
Solar Access Score	No shading now and none in future	5
Display Space Score	Can add display space in vicinity of PV array	2
	Weighted Location Score	23
	Total Weighted Score	26

Location 1 Economics

Solar Capacity (kW)	23.0	
Annual Estimated Production (kWh)	30,000	8.2%
Cost Estimate	$210,000	
Dollars per Watt	$9.13	



Fort Snelling

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Criteria	Value	Score
Park Level	4	4
Annual Visitors	644,889	5
Overnight Stays	0	1
Focal Point	Contact Center, small retail space	4
	Weighted Site Score	18

Location 1: Pole mount in grass median strip by CC

Criteria	Value	Score
Energy Use (CY08, kWh)	173,646	3
Demand Charges	$2,823	2
Solar Access Score	No shading now but trimming req. in 5+ years	4
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	16
	Total Weighted Score	35

Location 1 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	12.3%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

Fort Snelling SP – Contact Center

William O'Brien

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Criteria	Value	Score
Park Level	4	4
Annual Visitors	221,614	2
Overnight Stays	35,822	5
Focal Point	Excellent YR Visitor Center(5), Contact Center(3)	5
	Weighted Site Score	18

Location 1: Large ground mount behind CC

Criteria	Value	Score
Energy Use (CY08, kWh)	99,559	2
Demand Charges	$1,638	1
Solar Access Score	No shading now but trimming req. in 5+ years	4
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	14
	Total Weighted Score	32

Location 1 Economics

Solar Capacity (kW)	39.4	
Annual Estimated Production (kWh)	50,000	428.1%
Cost Estimate	$315,000	
Dollars per Watt	$7.99	

Location 2: Solar picnic shelter next to Ball Diamond

Criteria	Value	Score
Energy Use (CY08, kWh)	99,559	2
Demand Charges	$1,638	1
Solar Access Score	No shading now and none in future	5
Display Space Score	Can add display space in vicinity of PV array	2
	Weighted Location Score	15
	Total Weighted Score	34

Location 2 Economics

Solar Capacity (kW)	3.0	
Annual Estimated Production (kWh)	2,100	11.3%
Cost Estimate	$40,000	
Dollars per Watt	$13.33	

Location 3: Visitor Center Roof roof mount

Criteria	Value	Score
Energy Use (CY08, kWh)	99,559	2
Demand Charges	$1,638	1
Solar Access Score	No shading now and none in future	4
Display Space Score	Close, high-traffic display space available	5
	Weighted Location Score	16
	Total Weighted Score	34

Location 3 Economics

Solar Capacity (kW)	8.0	
Annual Estimated Production (kWh)	9,000	45.0%
Cost Estimate	$75,000	
Dollars per Watt	$9.38	

Lac qui Parle

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Criteria	Value	Score
Park Level	2	2
Annual Visitors	71,396	1
Overnight Stays	6,497	1
Focal Point	YR Visitor Center, large	5
	Weighted Site Score	10

Location 1: Large ground mount south of VC

Criteria	Value	Score
Energy Use (CY08, kWh)	80,030	2
Demand Charges	$0	1
Solar Access Score	No shading now but trimming req. in 5+ years	4
Display Space Score	Close, high-traffic display space available	5
	Weighted Location Score	15
	Total Weighted Score	25

Location 1 Economics

Solar Capacity (kW)	13.1	
Annual Estimated Production (kWh)	16,700	58.4%
Cost Estimate	$110,000	
Dollars per Watt	$8.40	

Lac qui Parle SP – WMA HQ

Crystal Springs Hatchery

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Criteria	Value	Score
Park Level	N/A	1
Annual Visitors	0	1
Overnight Stays	0	1
Focal Point	Small existing VC, unheated, spartan	2
	Weighted Site Score	5

Location 1: Pole mount by fence gate

Criteria	Value	Score
Energy Use (CY08, kWh)	71,537	1
Demand Charges	$1,640	1
Solar Access Score	Small tree and shrub trimming required	3
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	11
	Total Weighted Score	17

Location 1 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	6.2%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

Crystal Springs Hatchery

Wild River

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Criteria	Value	Score
Park Level	4	4
Annual Visitors	182,545	2
Overnight Stays	29,687	5
Focal Point	Contact Center, small retail space	3
	Weighted Site Score	16

Location 1: Pole mount in median strip of CC

Criteria	Value	Score
Energy Use (CY08, kWh)	65,582	1
Demand Charges	$481	1
Solar Access Score	Small tree and shrub trimming required	3
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	11
	Total Weighted Score	27

Location 1 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	26.2%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

Wild River State Park – Contact Center

Afton

Link Back to Front Page

Criteria	Value	Score
Park Level	3	3
Annual Visitors	148,909	2
Overnight Stays	7,014	2
Focal Point	YR Visitor Center	4
	Weighted Site Score	13

Location 1: Large ground mount by CC

Criteria	Value	Score
Energy Use (CY08, kWh)	61,472	1
Demand Charges	$0	1
Solar Access Score	No shading now and none in future	5
Display Space Score	Good display space available close to PV array	4
	Weighted Location Score	16
	Total Weighted Score	29

Location 1 Economics

Solar Capacity (kW)	13.1	
Annual Estimated Production (kWh)	16,700	111.3%
Cost Estimate	$110,000	
Dollars per Watt	$8.40	

Afton SP – Contact Center

Location 2: Pole Mount by Visitor Center

Criteria	Value	Score
Energy Use (CY08, kWh)	61,472	1
Demand Charges	$0	1
Solar Access Score	Small tree and shrub trimming required	4
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	13
	Total Weighted Score	26

Location 2 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	15.5%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

Interstate State Park

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No acceptable sites found - too many trees

Lake Shetek

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Criteria	Value	Score
Park Level	3	3
Annual Visitors	120,000	1
Overnight Stays	14,738	3
Focal Point	New Campground	3
	Weighted Site Score	11

Location 1: Pole mount in new campground

Criteria	Value	Score
Energy Use (CY08, kWh)	56,276	1
Demand Charges	$1,672	2
Solar Access Score	No shading now and none in future	5
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	16
	Total Weighted Score	28

Location 1 Economics

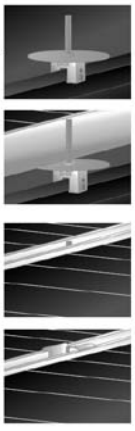
Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	21.1%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

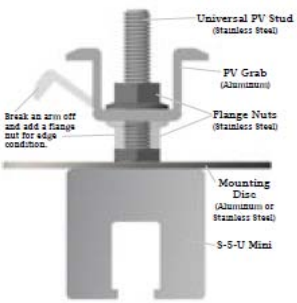
Location 2: Picnic shelter roofs in new campground

Criteria	Value	Score
Energy Use (CY08, kWh)	56,276	1
Demand Charges	$1,672	2
Solar Access Score	No shading now and none in future	5
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	0
	Total Weighted Score	0

Location 2 Economics

Solar Capacity (kW)	12.0	
Annual Estimated Production (kWh)	19,000	90.9%
Cost Estimate	$96,000	
Dollars per Watt	$8.00	





Glenwood Fisheries

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Criteria	Value	Score
Park Level	N/A	1
Annual Visitors	0	1
Overnight Stays	0	1
Focal Point	None	1
	Weighted Site Score	4

Location 1: Roof of garage

Criteria	Value	Score
Energy Use (CY08, kWh)	54,979	1
Demand Charges	$0	1
Solar Access Score	No shading now and none in future	5
Display Space Score	No display space available in vicinity of PV array	1
	Weighted Location Score	13
	Total Weighted Score	17

Location 1 Economics

Solar Capacity (kW)	10.0	
Annual Estimated Production (kWh)	12,000	21.8%
Cost Estimate	$80,000	
Dollars per Watt	$8.00	

Nerstrand Big Woods

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Criteria	Value	Score
Park Level	2	2
Annual Visitors	75,594	1
Overnight Stays	11,560	2
Focal Point	YR Visitor Center, nice kiosk available	5
	Weighted Site Score	11

Location 1: Polemount in clearing by CC

Criteria	Value	Score
Energy Use (CY08, kWh)	50,623	1
Demand Charges	$0	1
Solar Access Score	No shading now and none in future	5
Display Space Score	Close, high-traffic display space available	5
	Weighted Location Score	16
	Total Weighted Score	27

Location 1 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	18.5%
Cost Estimate	$37,000	
Dollars per Watt	$10.00	

Nerstrand Big Woods SP – Contact Center

Location 2: San Building north side pole mount

Criteria	Value	Score
Energy Use (CY08, kWh)	50,623	1
Demand Charges	$0	1
Solar Access Score	Small tree and shrub trimming required	3
Display Space Score	Display space available in vicinity of PV array	3
	Weighted Location Score	10
	Total Weighted Score	21

Location 2 Economics

Solar Capacity (kW)	3.7
Annual Estimated Production (kWh)	4,400
Cost Estimate	$37,000
Dollars per Watt	$10.00

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Criteria	Value	Score
Park Level	3	3
Annual Visitors	97,642	1
Overnight Stays	15,658	3
Focal Point	YR Contact Center	4
	Weighted Site Score	12

Location 1: Ground mount behind CC

Criteria	Value	Score
Energy Use (CY08, kWh)	39,291	1
Demand Charges	$0	1
Solar Access Score	No shading now but trimming req. in 5+ years	4
Display Space Score	Good display space available close to PV array	4
	Weighted Location Score	13
	Total Weighted Score	24

Location 1 Economics

Solar Capacity (kW)	3.7	
Annual Estimated Production (kWh)	4,400	55.0%
Cost Estimate	$30,000	
Dollars per Watt	$8.11	

Sakatah Lake

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No acceptable sites found - too many trees

DNR Site Selection Tool

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Solution Package 1: Sloped roof mount

DNR Site Selection Tool

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Solution Package 2: Pole mount

Sixteen, BP 150 watt modules mounted on a Wattsun AZ-225 Tracker Drive.

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Solution Package 3: Picnic shelter with roof-integrated PV

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Solution Package 4: Solar patio with PV array

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Solution Package 5: Parking Canopy with EV plugins

DNR Site Selection Tool

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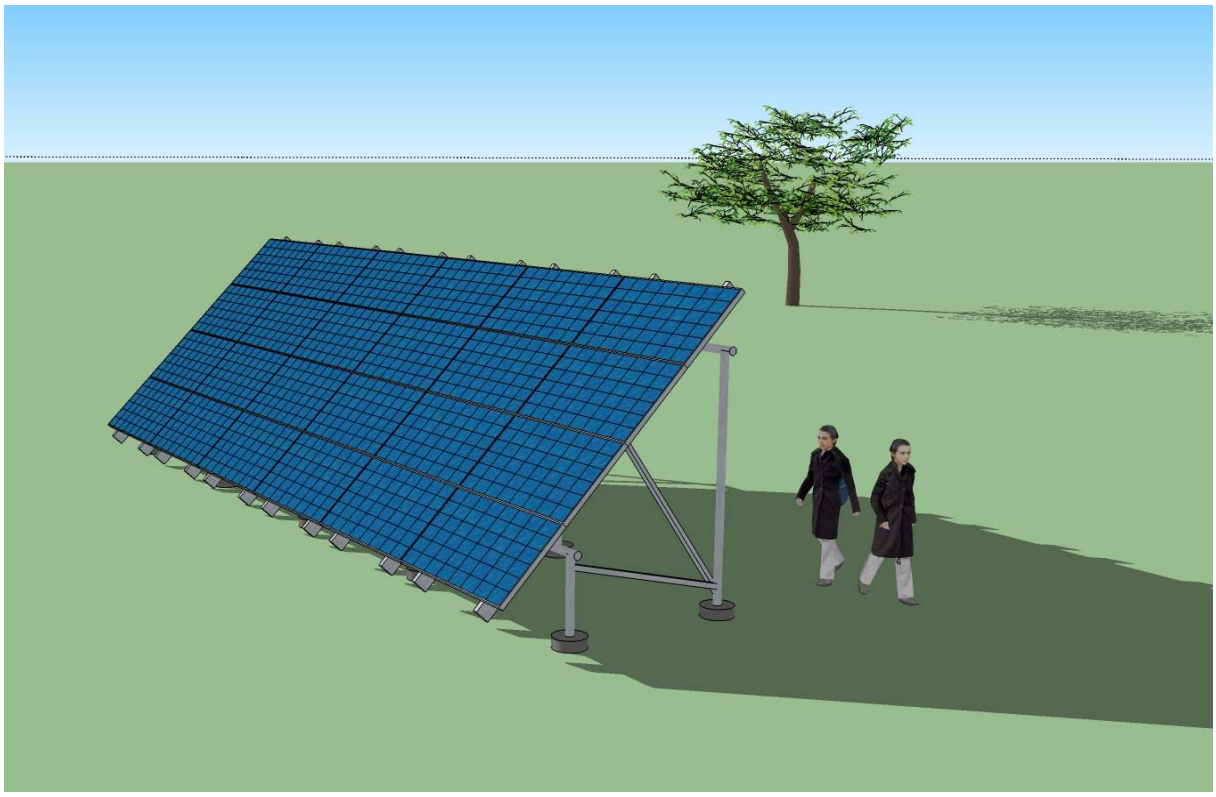
Solution Package 6: Large ground-mounted array



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Solution Package 7: Large flat roof-mounted array