



**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: 2      Report Date: 10.12.2009

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Congressional District (RDF Awardee): Fourth

Congressional District (PV Installations): TBD

**Project funding provided by customers of Xcel Energy through a grant from the Renewable Development Fund.**

## **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 development of an assessment process and tool for site selection of photovoltaic installations. The site selection process and tool evaluate and weigh the following 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
- Site Electricity Use: Provides opportunity to offset cost and carbon emissions
- Site Demand Charges: Provides opportunity to offset large monthly costs of high usage rates
- Site 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.
- Site Interpretive Space: Space near the renewable energy equipment that can be used for interpretive displays

Evaluation criteria metrics have been documented to promote consistent evaluation across sites and evaluators. The completed selection tool spreadsheet will show a quantitative ranking for each park/site location to facilitate choosing the locations for the 99 KW of total renewable energy installations. A screen print from the Selection Tool is attached below.

Additional Milestones: None.

Project Status: The project is on schedule and within budget.

Name	Park Level	Annual Visitors	Overnight Stays	Focal Point	Other	Park Score	CY08 KWH	Demand Charges	Site Description	Solar Access	Display Space	Site Score	Total Score						
R3 HQ	N/A	1	0	1	0	1	Entry lobby or reception area	1	Possible micro-hydro.	4	368,009	5	8,415	5	Roof: Structurally sound and will be reroofed this year. Good site for SP 7.	5	2	24	27
																		17	21
																		17	21
Fort Snelling	4	4	644,889	5	0	1	YR Visitor Center	5	Historic site nearby.	18	173,646	3	2,823	2				8	26
																		8	26
																		8	26
William O'Brien	4	4	221,614	2	35,822	5	YR Visitor Center	5		19	99,559	2	1,638	1				5	24
																		5	24
																		5	24
Lac Qui Parle	2	2	71,396	1	6,497	1		3	Park Office has electric heat.	9	80,030	2	-	1				3	12
																		3	12
																		3	12
Crystal Springs Hatchery	N/A	1	0	1	0	1	Small existing space	2		5	71,537	1	1,640	1				5	10
																		5	10
																		5	10
Wild River	4	4	182,545	2	29,687	5	YR Visitor Center	5	300 seat amphitheater.	19	65,582	1	481	1				3	22
																		3	22
																		3	22
Alton	3	3	148,909	2	7,014	2	Seasonal Visitor Center	3		13	61,472	1	-	1				2	15
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Interstate	3	3	372,780	3	14,508	3	Seasonal Visitor Center	3		15	59,310	1	-	1				2	17
																		2	17
																		2	17
Lake Shetek	3	3	120,000	1	14,738	3	Seasonal Visitor Center	3	Possible wind site. New camp ground	12	56,276	1	1,672	2				6	18
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																		6	18
Glenwood Fisheries	N/A	1	0	1	0	1		2		4	54,979	1	-	1				2	7
																		2	7
																		2	7
Nerstrand Big Woods	2	2	75,594	1	11,560	2		3		10	50,623	1	-	1				2	12
																		2	12
																		2	12

  

Solution Packages:	Selection Factor	Weight	% of Max	Score	Focal Point	Score	Solar Access	Score
1: Roof mounted PV system 2 - 4 KW	Park Level	48.1%	80%	5	Year Round Visitor Center	5	No shading now and none in future	5
2: Pole mounted PV system 3.7 KW	Annual Visitors	21.0%	60%	4		4	No shading now but trimming req. in 5+ years	4
3: Picnic Shelter with PV array 2 - 4 KW	Overnight Stays	21.0%	40%	3	Seasonal Visitor Center	3	Small tree and shrub trimming required	3
4: Solar Patio with PV array 2-4 KW	Focal Point	9.8%	20%	2		2	Single large tree removal required	2
5: Parking Canopy with EV plug-ins 4 KW	Electricity Consumption	21.0%	0%	1	No Visitor Center	1	Several large tree removals required	1
6: Large ground mounted PV array 15+ KW	Demand Charges	48.1%						
7: Large flat roof mounted PV array 15+ KW	Solar Access	21.0%						
	Interpretive Space	9.8%						

  

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

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