

BEMIDJI CITY COUNCIL

Work Session Agenda

Monday, July 26, 2010

**City Hall
Conference Room
5:30 P.M.**



1. CALL TO ORDER / ROLL CALL

2. SOLAR ENERGY PRESENTATION - BONESTROO
 - CONSIDER A RESOLUTION APPROVING AN APPLICATION TO THE MINNESOTA DEPARTMENT OF COMMERCE OFFICE OF ENERGY SECURITY (OES) FOR THE LOCAL GOVERNMENT RENEWABLE ENERGY GRANT PROGRAM FUNDED BY THE AMERICAN REINVESTMENT AND RECOVERY ACT OF 2009 (ARRA) AND LAWS OF MINNESOTA 2009 CHAPTER 138 FOR A GRANT TO PURCHASE AND INSTALL A PHOTOVOLTAIC SYSTEM ON THE BEMIDJI REGIONAL EVENT CENTER (BREC)

3. CGMC UPDATE

4. ADJOURNMENT



Memorandum

DATE: July 23, 2010

TO: Bemidji City Council

FROM: Phil Carlson, AICP, Bonestroo

RE: Bemidji Regional Events Center Solar Feasibility Study

Introduction

The City has retained Bonestroo to conduct a feasibility study analyzing the potential for a solar photovoltaic (PV) system on the Bemidji Regional Events Center (BREC) to generate electricity from the sun to offset some of the electrical use by the geothermal heating and cooling system in the building. The information and conclusions from our study will be submitted in a grant application to the State of Minnesota to secure funding for a portion of the actual design and installation cost of such a system.

We have been working with the City's Sustainability Committee and City staff to ascertain available grants for the PV system and to work through the basic analysis. A grant source was identified that appears to be a good fit for the BREC system – a federal grant administered by the Minnesota Department of Commerce Office of Energy Security. This is ARRA or “stimulus” money being directed at local governments to spur development of renewable energy projects. There may be other grants or contributions available that can offset the remaining cost of the PV system.

Recommendation

The Sustainability Committee recommends a ground-mounted PV system in the front parking lot of the BREC, consisting of 104 250-Watt panels designed as a canopy over a section of 10-12 parking spaces. This option would be relatively easy to construct, would be visible as an educational tool for the community and would be functional, providing shade for cars in the summertime. The grant application does not commit the City to this location and design – it can be modified or redesigned after we get the grant, if need be.

Request

The timeline for submitting the grant is very tight – it is due August 4, 2010. We have made some basic conclusions about the feasibility of the system but have not prepared all the information needed for the grant as of this writing. In order to meet the deadline we are asking the City Council to authorize the Mayor and City staff to prepare the grant application on your behalf in advance of getting all this information gathered. We will share the final grant application materials with you at your August 2, 2010 meeting but we want to have the City Council's resolution in support of the project as we go forward from this point. Our request at this City Council meeting is to adopt the attached resolution so we can continue to work on the grant application.

The resolution and grant application do not commit the City to any funding obligations. The grant will match 40% of the total project cost, up to \$100,000, but the City does not need to identify at this time what the source of the remaining 60% is. There may be City contributions, outside contributions, or other grants that will make up the difference. That does not need to be decided at this meeting.

Summary of Analysis

System Design:

- The City analyzed the energy needs of the BREC and asked us to design and analyze a 25 kilowatt (1,000 Watts, or 1 kW) PV system.
- PV solar panels come in various sizes and designs. A typical panel (or module) that we used for our analysis is rated at 240 Watts. To achieve 25 kW we therefore need 104 such panels.
- The panels measure 39' by 65" each, so that the entire array of solar PV panels would be about 1,825 square feet in area.
- The panels are typically assembled in arrays of several to several dozen panels per array. To maximize exposure to the sun they need to be spaced apart about 2.0 to 2.5 times the panel height, if placed back-to-back. Therefore the total area needed for the PV panel array is about 4,000 square feet of ground area or roof area.

Location:

- The Committee looked at several locations on and around the BREC, both ground and roof mounted.
- The higher and middle roofs of the BREC were ruled out – the higher roof is not designed for any additional load; the middle roof is compromised both structurally and by shadows from upper portions of the building.
- The lower roof in the far southeast corner of the building would work well from a solar exposure standpoint, but in order to support the PV system a separate structure would need to be built to suspend the PV array off the roof, connecting to columns in the structure underneath. The additional cost of this structure is estimated at \$50,000 to \$100,000. The Committee did not feel this added cost was justified.

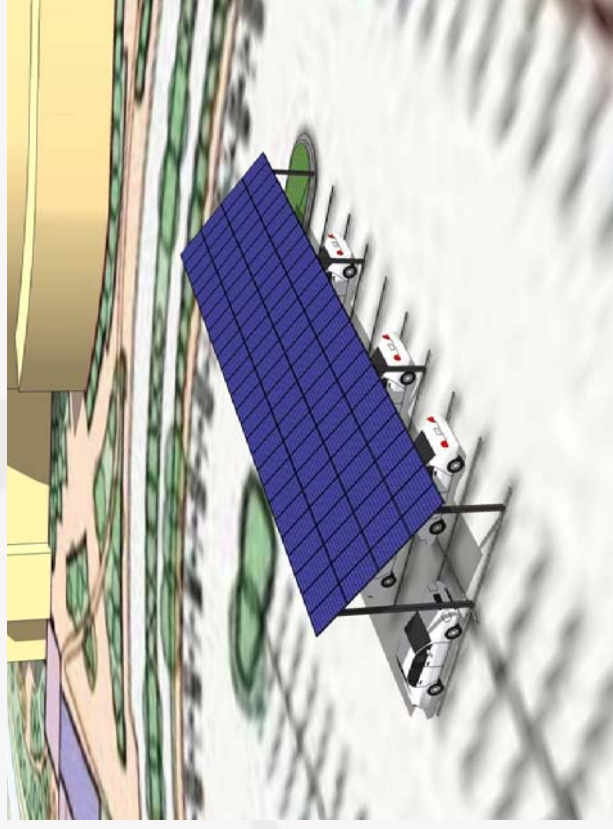
- Ground locations were considered at the northeast corner of the rear parking lot near the MnDOT trail, at the southeast corner of the building fronting on the wetlands, and in the front parking lot, as a parking canopy.
- The Sustainability Committee recommended by consensus the front parking canopy option:
 - It would be visible as an educational tool
 - It would cost less than the roof-mounted option
 - It would be easier to expand if the City wanted to add capacity to the system
 - It provides shade for cars in that location in the summertime.
 - It is the preferred ground location as far as security and vandalism are concerned.

Cost:

- The preferred front parking lot canopy option is estimated to cost about \$270,000:
 - The basic PV system of 25 kW - 104 panels and electrical equipment – is estimated to cost about \$10,000 per kW or \$250,000
 - The additional cost extending the electrical connection underground to a front parking lot location is estimated at about \$25,000
 - More detailed costs will be forthcoming for the grant application
- A roof-mounted system on the lower roof in the southeast corner would cost an estimated \$300,000 to \$350,000, due to the additional structure needed to support it.
- The grant will cover 40% of the total project cost, up to \$100,000
- The 25 kW system is estimated to generate about 27,500 kW hours (KWH) per year, which translates to about \$10 per KWH hour. Local Otter Tail Power Company cost is about \$0.07 per KWH. This is typical of the cost comparison for solar PV systems at this point.

Sustainability Committee Recommendations

- Preferred PV system location: front parking lot canopy
- Highly visible as educational tool
- Easier to expand system in the future
- Relatively easy to avoid shading obstacles (trees)
- Best ground location for security/vandalism issues
- Provides cool shaded area for cars in the summer



Location Considerations

High Roof Middle Roof Low Roof

Ground mount



240 Watt Panel

ELECTRICAL CHARACTERISTICS	
Maximum Power (Pmax)*	240 W
Tolerance of Pmax	+10%/-5%
Type of Cell	Monocrystalline silicon
Cell Configuration	60 in series
Open Circuit Voltage (Voc)	37.4 V
Maximum Power Voltage (Vpm)	30.1 V
Short Circuit Current (Isc)	8.65 A
Maximum Power Current (Ipm)	7.98 A
Module Efficiency (%)	14.7%
Maximum System (DC) Voltage	600 V
Series Fuse Rating	15 A
NOCT	47.5°C
Temperature Coefficient (Pmax)	-0.485%/°C
Temperature Coefficient (Voc)	-0.351%/°C
Temperature Coefficient (Isc)	0.053%/°C

*Measured at (STC) Standard Test Conditions: 25°C, 1 kW/m² insolation

MECHANICAL CHARACTERISTICS	
Dimensions (A x B x C below)	39.1" x 64.6" x 1.8"/994 x 1643 x 46 mm
Cable Length (l)	43.3"/1100 mm
Output Interconnect Cable**	12 AWG with MC4 Locking
Weight	44.1 lbs / 20.0 kg
Max Load	50 psf (2400 Pascal)
Operating Temperature (cell)	-40 to 194°F / -40 to 90°C



SHARP®

solar electricity

240 WATT

MULTI-PURPOSE MODULE
NEC 2008 Compliant



NU-U240F1

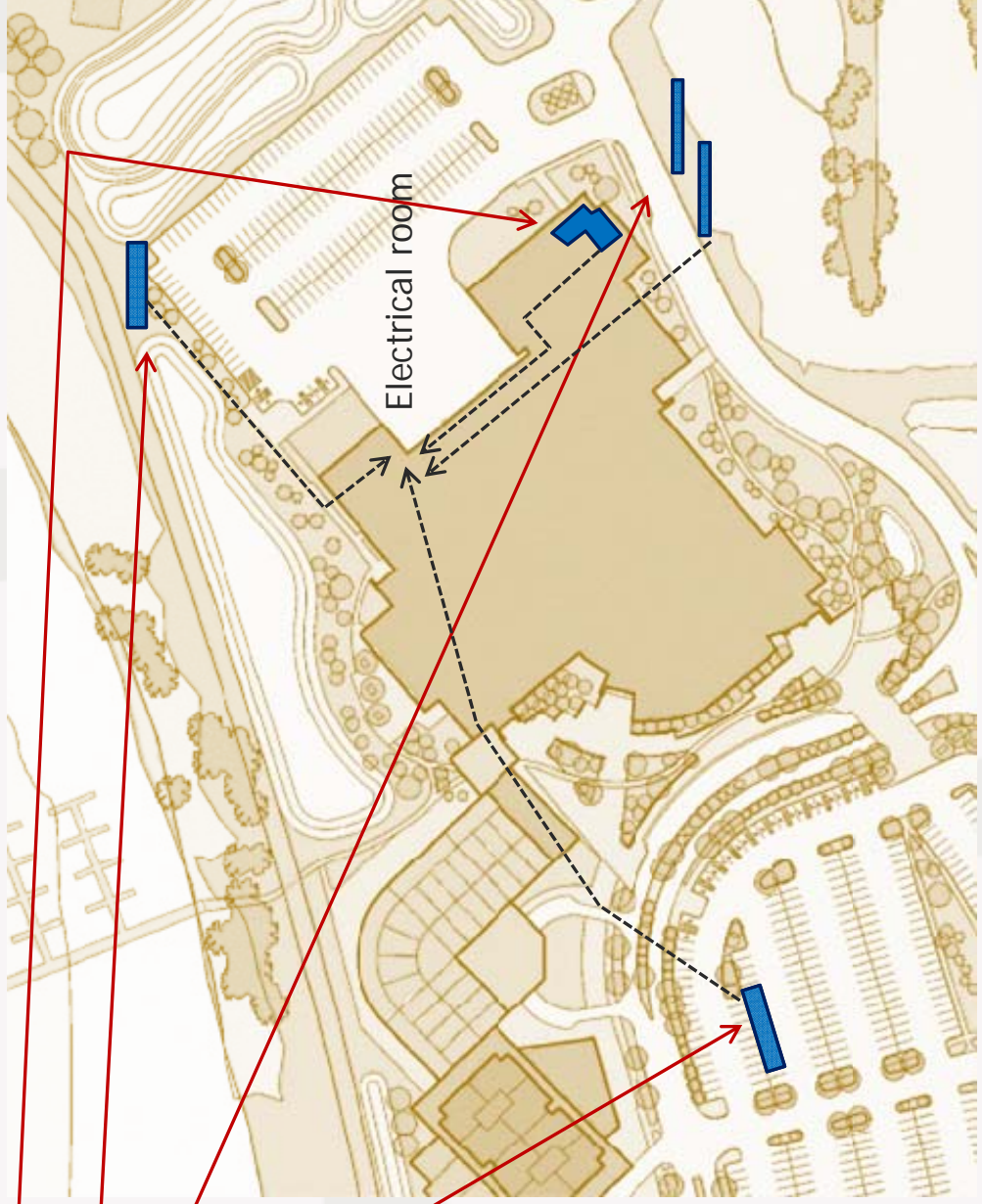
39"

65"

MULTI-PURPOSE 240 WATT

Location Options

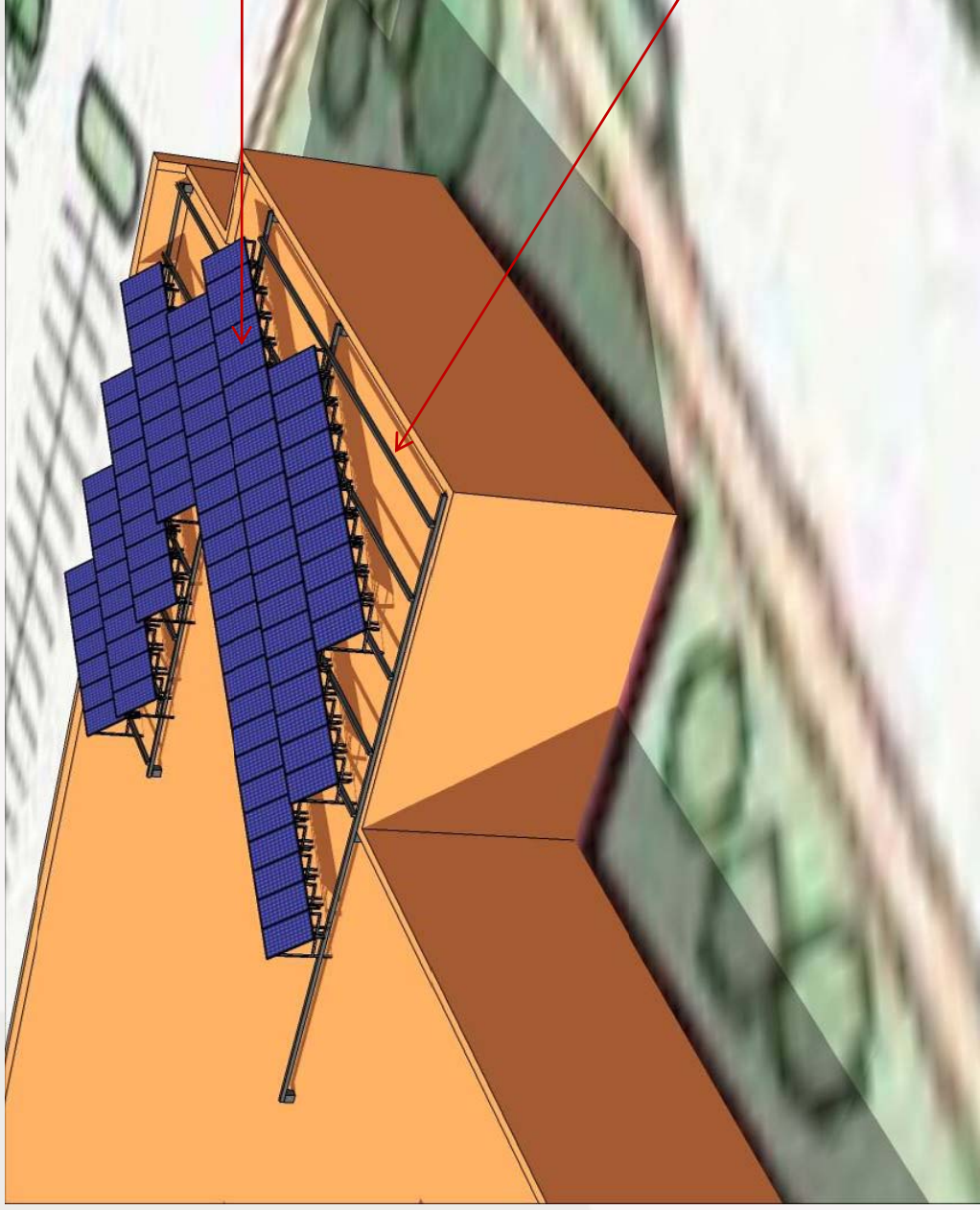
- 1) Lower roof
- 2) NE parking lot/trail
- 3) SE corner wetland
- 4) Front parking lot canopy



Front Parking Lot Location



Roof-Mounted System



Solar PV array
on lower roof
– 104 panels
@ 39" x 65" in
sets of 7 to 25
panels

Structure to
support array
above existing
roof