Technology
Monitoring
Best Practices

SolarCity Partnership

Exhibition Place

100 kW Photovoltaic System

BACKGROUND

In 2005, Exhibition Place initiated a solar photovoltaic (PV) feasibility study and field test as part of the organization's 2010 energy self-sufficiency plan. At the time of installation, the 100 kW system was the largest urban PV array in Canada. Since the enactment of the Green Energy and Green Economy Act, 2009, hundreds of rooftop solar energy systems have sprung up across Southern Ontario. While several larger rooftop PV projects have been implemented, the Horse Palace's four arrays, specially configured for research and evaluation, continue to yield important insights into the performance of photovoltaic systems in real world settings. They also continue to meet a portion of Exhibition Place's electricity demand, helping to advance the organization's goal of becoming energy self-sufficient.

The four Horse Palace arrays include two types of panels (Sharp and Evergreen models) installed at angles between 0 and 20 degrees, each with a differ inverter (Xantrex and SMA, respectively).

MONITORING

Data acquisition and monitoring has been carried out under contract for five years. The monitoring system includes voltage and current meters on both the AC and DC sides of the inverters; a pyranometer to measure solar irradiance; ambient air temperature and module temperature sensors; data loggers and communication equipment.

FINANCIAL

The project was funded through a $600,000 loan and $500,000 in grants. The system will pay for itself in approximately 15.7 years and continue generating clean electricity for years after.

STATUS

The project has successfully transitioned to the FIT program and is performing as estimated by RETScreen.

Project Overview

Owner: Exhibition Place
Address: Horse Palace Building - Exhibition Place
15 Nova Scotia Ave. Toronto M6K 3C3
Building type and use: Horse Stable
System type: Grid connected PV
System power rating: 100 kW
Installation date: August, 2006
Installer: Carmanah

System Configuration

See Table 1

Annual Performance

Actual (average)*: 1,008 kWh/kW/yr (See Table 2)
* Data collected from November 1, 2006 to December 31, 2010.

Financial

System Cost (including tax): $1,103,273
Grants: $500,000
Annual Income: $70,441
Cost per kW: $68,964*
Simple Payback: 15.7 years

Environmental Benefits

Estimated emission reduction: 18.8 tonnes CO_2e /yr**

*based on FIT rate of 71.3 ¢/kWh
**based on 0.187 kg CO_2e/kWh

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Table 1: Installed PV Arrays

Array #	#1	#2	#3	#4
Manufacturer	Sharp	Sharp	Evergreen Solar	Evergreen Solar
Panel Model	ND-200U1, 200 watt panels	ND-200U1, 200 watt panels	EV-115, 115 watt panels	EV-115, 115 watt panels
PV Module Type	Solar Crystalline Silicon	Solar Crystalline Silicon	Thin Ribbon Silicon	Thin Ribbon Silicon
# of Panels	216	216	40	40
Array Size	45,600 W	45, 600 W	4,600 W	4,600 W
Slope	10 degree	20 degree	0 degree	20 degree
Azimuth	20 degrees east	20 degrees east	20 degrees east	20 degrees east
Inverter Name	Xantrex PV-45 Grid Tie	Xantrex PV-45 Grid Tie	SMA 5200 Watt Grid Tie	SMA 5200 Watt Grid Tie
Inverter Model	P45	P45	SB6000U	SB6000U

Table 2: Horse Palace PV Arrays: 2007-2010 electricity generation and array performance

Array #	#1	#2	#3	#4	System Total
Panel Manufacturer	Sharp	Sharp	Evergreen	Evergreen	-
Inverter Manufacturer	Xantrex	Xantrex	SMA	SMA	-
Slope of Array Installation	10 degree	20 degree	0 degree	20 degree	-
kW installed	45.6	45.6	4.6	4.6	100.4
Electricity production (kWh/yr)					
2007	42,409	44,746	4,491	4,835	96,481
2008	43,272	44,575	4,442	4,436	96,724
2009	45,427	45,825	4,605	5,479	101,336
2010	44,589	46,161	4,633	5,257	100,639
2007 - 2010 average	43,924	45,327	4,543	5,002	98,795
Electricity production standardized per unit of capacity (kWh/kW/yr)					
2007	930	981	976	1,051	985
2008	949	978	966	964	963
2009	996	1005	1,001	1,191	1,048
2010	978	1,012	1,007	1,143	1,035
2007-2010 average	963	994	988	1087	1008

* The data for November-December 2008 is from Toronto Hydro, because the Fat Spaniel monitoring system was down from November 6 to December 15. Values have been prorated for each array based on the array size/total system size.