

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 different 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.

Exhibition Place

100 kW Photovoltaic System



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

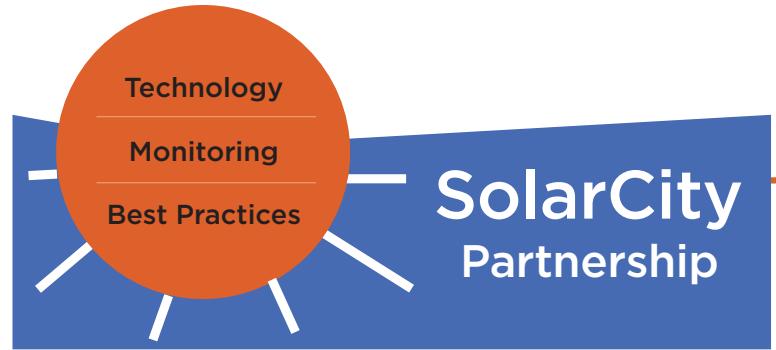
Estimated emission reduction: 18.8 tonnes CO₂e /yr**

*based on FIT rate of 71.3 ¢/kWh

**based on 0.187 kg CO₂e/kWh

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Exhibition Place

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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 | 1,005 | 1,001 | 1,191 | 1,048 |
| 2010 | 978 | 1,012 | 1,007 | 1,143 | 1,035 |
| 2007-2010 average | 963 | 994 | 988 | 1,087 | 1,008 |

* 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.