

Partners for Climate Protection

Greenhouse Gas Reduction Initiative of the Month

Markham's Solar Photovoltaic System



Municipal Profiles

Population: 301,709

PCP Members since 2007

Background

In 2010, the City of Markham began developing a project to install a 250-kW grid-tied solar photovoltaic (PV) system to the rooftop of a warehouse on Warden Avenue. The project stemmed from *Greenprint*, the City of Markham's community sustainability plan, adopted by Council in June 2011. The warehouse contains storage and work space for the City's Water Works department and a private data centre tenant, which receives efficient cooling and back-up power from Markham District Energy, the City's district energy utility.

"We were actively developing *Greenprint*, including priority areas of energy and climate, when the Ontario Feed-In-Tariff (FIT) for renewable energy projects opened," said Markham Mayor Frank Scarpitti.

FIT covers projects that produce more than 10 kW of electricity; microFIT covers projects that produce less than 10 kW. A feed-in tariff is a way to contract for renewable energy generation by providing standardized rules, prices and contracts. The FIT program, which combined lessons learned from similar programs in Germany, Spain, Denmark and other jurisdictions with similar characteristics as Ontario's electricity system, encourages investment in generation, transmission and distribution, to maximize the renewable energy sources that can be incorporated into Ontario's electricity system.

Implementation and Approach

Graham Seaman, Senior Manager, Sustainability Office says that Markham spent quite a bit of time developing a comprehensive request for proposal (RFP) for the design/build of the system. "We received a number of good bids, but in the end Carmanah Technologies Corp. won based on their competitive pricing and depth of experience," he says.

The 250-kW solar PV system (*pictured at right; photo courtesy of Carmanah Technologies Corp.*) began producing energy in late 2010. It includes nearly 1,300 solar panels on a 50,000 square foot roof top. "It was important to ensure that the roof could take the additional weight load," says Seaman. "You want a good roof under your solar assets since the FIT contract is for 20 years and most of the equipment has a 25-year warranty. We replaced the roof in the summer of 2010."



Extensive electrical work also needed to be done. "We needed a whole new parallel electrical service including a meter to measure the production, an inverter to change the electricity from direct current to alternating current to supply the grid, heavy duty cables, conduits, combiner boxes and sensors," Seaman explains.

Installation of the solar array began in the fall of 2010. The City achieved its Commercial Operation Date (the date a municipality begins receiving money for the electricity generated) in late December 2010, making this project the first functioning municipally-owned FIT project in Ontario.

"Once the project was installed, ongoing operations were pretty easy," says Seaman. "It's a very passive structure but we have a good monitoring system installed that alerts us if there is an issue," he says.

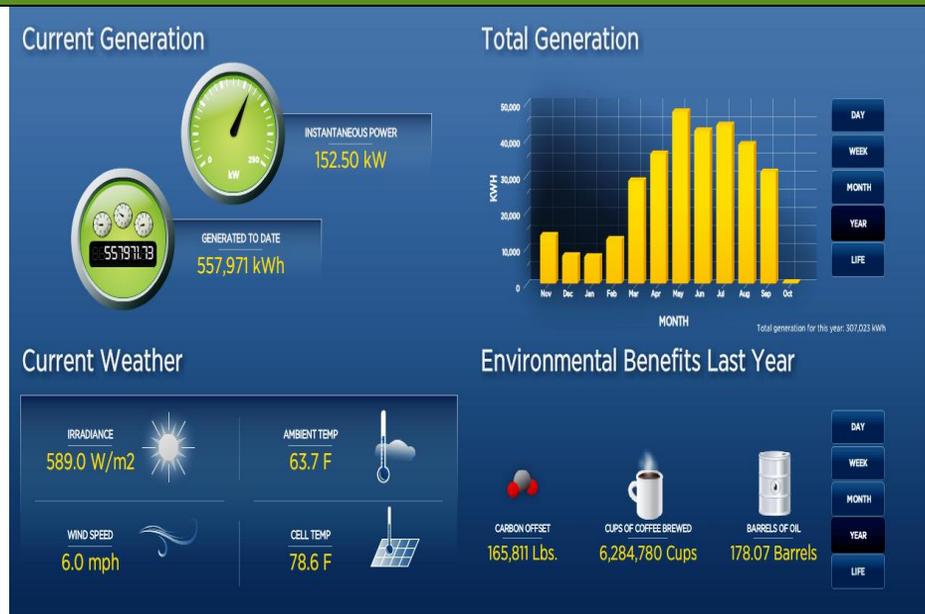
Total project costs were \$1.67 million. The City used \$1 million of the \$3 million they received in federal/provincial infrastructure stimulus funding, and funded the remaining \$670,000 through the City's capital reserve. "We expect the return on the whole investment to be about 10 years with the FIT rate of \$.713/kWh, and the return on Markham's reserve to be just under four years," says Seaman. "All revenues flow to the reserve until it's paid back, leaving the remaining 16 years of the FIT contract to have annual positive cash flows of about \$180,000."

"We are proud that our solar project was the first municipal project to participate in the Ontario Power Authority's FIT program," said Mayor Scarpitti. "Installing a solar photovoltaic system on our facilities, supported by FIT, helps fulfill on the *Greenprint* plan and it's a great investment."

Results

Markham had previous experience with solar energy, notably the 9.6kW microFIT solar array atop the City's Civic Centre. "That experience, and this one, has helped to normalize solar for businesses and residents, and we're now seeing significant solar development in Markham," says Seaman.

In the first year of operation, the Warden Avenue system generated \$189,000 in revenue, surpassing the City's expected target of \$178,000. Annual avoided GHG emissions are in the range of 75 tonnes, the equivalent of about 178 barrels of oil.



The image above (courtesy of Carmanagh Technologies Corp.) shows the data captured from the system in early October 2012; live data can be accessed at:

<http://datareadings.com/client/moduleSystem/Kiosk/site/bin/kiosk.cfm?k=2E2gJ-A3>.

As a result of this project, Markham now specifies that all municipal buildings be solar ready or include solar, and has four more leased roof tops to develop with PowerStream Solar, a new division of the local distribution company that Markham jointly owns with the cities of Vaughan and Barrie. "Solar ready means that we make sure the orientation is mostly south, the roof structure can handle the additional panel load, and the electrical infrastructure is in place so we can essentially plug and play a solar array when we're ready," says Seaman.

Markham has also invested in PowerStream Solar. "To support that investment we signed leases for six of our largest buildings for a total solar capacity of 1.2 MW," he says. "Two of those solar arrays have been completed, so we have 1170 kW of solar deployed and expect to have a total of about 2 MW in the next year or two."

Mayor Scarpitti says that, "With our growing experience in solar, both on our own and in partnership with PowerStream Solar, our programs are exceeding our expectations. We feel confident about continued investment in renewable energy."

Lessons Learned

Seaman says that the project went smoothly due to the collaborative nature and expertise of the team. "We hired a great third-party engineer [Enviro-Energy Technologies of Markham]. They had lots of solar experience to help us develop the RFPs and to oversee and review the system design and construction on our behalf. Caramanah was an excellent partner as well and our Asset Management team did a great job," he says. "When we did have any issues, as all projects do, everyone got together to solve them quickly and effectively."

Markham was an early adopter of the FIT program and learned many lessons navigating the FIT contract with OPA. "We experienced significant rule changes with respect to the domestic content report, but these have now settled down," he says. "One thing I would recommend is to start the domestic content report tracking as soon as possible; we could have saved a lot of time if that had started sooner." According to FIT contract requirements, wind projects greater than 10 kilowatts (kW) and all solar PV projects need to include a minimum amount of goods and services that come from Ontario. The domestic content report demonstrates how this criterion is met.

"We're seeing great economic and environmental returns for this project and look forward to adding more renewables to our facilities in the future," he says. "I would recommend that if a community is considering making investments in energy conservation or renewable energy that they start with conservation. It's always cheaper to save a kilowatt-hour than it is to generate one."

Future Direction

Seaman reports that Carmanah provided excellent post-project support and that the City is considering a service contract with them now that the initial warranty period is up. "We'll continue seeking operational energy savings, while making strategic investments to make our buildings more efficient," says Seaman.

Mayor Scarpitti added, "Our expectation is to continue making investments in our district energy company in dense development areas as well. I am pleased that we're making good progress on our *Greenprint's* energy and climate objective of net zero energy, waste, water and emissions by 2050, and also our goal to become one of the most sustainable communities in North America."

Further Information

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Learn more about OPA's FIT program at: <http://fit.powerauthority.on.ca/>.

The Partners for Climate Protection (PCP) program is a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. PCP is the Canadian component of ICLEI's Cities for Climate Protection (CCP) network, which involves more than 1200 communities worldwide. PCP is a partnership between the Federation of Canadian Municipalities (FCM) and ICLEI – Local Governments for Sustainability. PCP receives financial support from FCM's Green Municipal Fund.



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