

# TORONTO TRANSIT COMMISSION REPORT NO.

**MEETING DATE:** August 27, 2008

**SUBJECT:** ENERGY CONSERVATION, EFFICIENCY AND DEMAND  
RESPONSE MEASURES

## **ACTION ITEM**

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### **RECOMMENDATION**

It is recommended that the Commission:

1. amend the 2009 base Capital Budget to include an amount of \$2,100,000 for energy management projects in accordance with TTC Environmental Plan. These projects include Toronto Hydro Energy Services Inc. (THESI) recommended energy conservation and efficiency measures of \$1,579,000, associated TTC work of \$421,000 and LED lighting pilots of \$100,000;
2. authorize staff to obtain sole source approval to issue a Purchase Order with an upset limit of \$1,579,000 to THESI to carry out the identified energy management work at Birchmount Garage, Greenwood Shop, Keele Subway Station and to install power factor correction capacitors at 44 TTC facilities;
3. authorize staff to sign a Letter of Intent with THESI to explore opportunities within various TTC facilities for reducing electrical load through the city's Demand Response Program;
4. forward this report to the City of Toronto for confirmation of funding.

### **FUNDING**

A budget request has been included below the line under the project Energy Conservation, Efficiency and Demand Management as outlined on pages 1609-1611 in the 2009-2013 Capital Program. No funding has yet been identified by the City for this project, which supports the City of Toronto's Climate Change, Clean Air and Sustainable Energy Action Plan. Staff will bring forward in subsequent Operating and Capital Budget any LED lighting project that is found to be technically, financially and safety acceptable.

**BACKGROUND**

On December 6, 2007, the Commission endorsed and approved the TTC Environmental Plan supporting the City of Toronto’s Climate Change, Clean Air and Sustainable Energy Action Plan. In the Plan, staff was asked to:

1. work with THESI to study and implement the use of alternate energy sources, and further electrical energy conservation, efficiency and demand strategies through Capital and Operating projects;
2. continue the Lighting Replacement Program and continue the study of LED technology for possible use by the TTC.

In addition, the Ontario Power Authority’s 20-year Integrated Power System Plan places a priority on energy conservation and demand management in order to meet Ontario’s need for a reliable and sustainable electricity system.

This report details the identified TTC’s energy management measures for 2009 in order to support the above referenced TTC Environmental Plan.

**DISCUSSION**

**Energy Conservation and Efficiency**

In July 2007, TTC awarded THESI with a contract to commence detailed energy reviews of our facilities and to develop the related energy management action plan. Birchmount Garage, Greenwood Shop, Keele Subway Station, McBrien Building, Russell Carhouse and Birchmount Emergency Service Building were selected as the first 6 locations for the study. These 6 locations are a good representative portfolio of TTC facilities. THESI carried out the energy review in late 2007 and early 2008. The results of the energy review confirm that there are energy conservation and efficiency opportunities at the chosen facilities.

The following table summarizes THESI proposed energy management action plan results from the above energy review. McBrien Building and Russell Carhouse related energy conservation and efficiency measures have been removed from the table pending a decision about the continuing use of these two facilities.

	<b>Annual</b>		<b>Estimated</b>	<b>Simple Payback</b>	<b>GHG</b>
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<b>Measure Type</b>	<b>Savings (\$)</b>	<b>Total Cost (\$)</b>	<b>Incentives (\$)</b>	<b>with Incentives (yrs)</b>	<b>Reduction (tones)</b>
Energy Conservation & Efficiency	\$239,616	\$846,727	\$88,400	3.2	911
Power Factor	\$145,700	\$651,575	\$0	4.5	0
PML Electric Meter Connection to WAN	\$0	\$80,000	\$0	0	0
Boiler Replacement (Russell)	\$18,500	\$302,893	\$4,625	16.1	88
Birchmount Garage - Photovoltaic	\$38,640	\$811,520	\$0	21.0	24
Greenwood Shop - VertAxis Wind Turbine	\$3,740	\$228,393	\$0	61.1	31
<b>Total</b>	<b>\$446,196</b>	<b>\$2,921,108</b>	<b>\$93,025</b>	<b>6.3</b>	<b>1054</b>

**Action Plan**

**Implement Energy Conservation, Efficiency and LED Lighting Measures:**

Following a detailed review of the above THESI proposed energy management action plan, based on both technical and financial considerations staff recommends THESI to implement the Energy Conservation and Efficiency, and Power Factor measures. Staff also accepts THESI proposal to carry out the Power Measurement Limited (PML) Electric Meter Connection to WAN measure due to its real time capability to remotely monitor, verify and analyze energy consumption and charges in details. The budget cost for these three measures is \$1,579,000 which includes THESI supply, installation and other fees related to engineering, project management and commissioning. An additional \$421,000 will be required to assist THESI to complete the work: \$150,000 for TTC engineering, \$250,000 for TTC labour and \$21,000 for materials. This results to a total project cost of \$2,000,000. The project is expected to be completed within a year and a half following the award of the design and build contract to THESI.

Staff recommends deferring the energy conservation and efficiency measures proposed for McBrien Building and Russell Carhouse due to the uncertainty of their continuing use. Russell Carhouse boiler replacement is also not recommended because of its long payback. Renewable energy measures including Birchmount Garage 66 kW roof-top photovoltaic and Greenwood Shop 31.5 kW vertical axis wind turbine installation are not currently financially attractive due to the long payback. However, staff will continue monitoring the renewable energy technologies and will bring forward any recommendation when they are financially and technically justified.

To support the city’s commitment to the LED City initiatives, staff has been studying the potential of LED lighting at various TTC facilities. LED lighting is able to reduce energy use, cut down maintenance costs, lower greenhouse gas emissions and to eliminate mercury found in fluorescent lamps. Staff plans to carry out LED lighting pilot tests at St. Andrew

Subway Station platform and at other TTC locations such as offices, streetcar loops, bus loops, etc. These tests would enable staff to evaluate brightness, reliability, safety and energy performance on LED lighting.

A preliminary engineering investigation has concluded the use of LED for platform lighting at St Andrew Subway Station is technically and financially feasible. A pilot test of 39 LED lights will be installed in approximate 1/7 of the station platform by September 2008 which is included in the current 2008 Operating Budget. If successful, all remaining platform lights will be replaced with LED in conjunction with the Subway Station Finishes Renewal Project. An estimated incremental cost of \$25,000 will be needed to replace all existing platform fluorescent lights with LED instead of replacing with similar linear fluorescent lights. The payback of this investment is 5.2 years. The short payback is due to the lower LED related electricity and re-lamping costs.

It is recommended an amount of \$100,000 be approved to complete the above LED lighting project at St. Andrew Subway Station and other pilot tests at various locations. Staff will bring forward in subsequent Operating and Capital Budgets any LED lighting project that is found to be technically, financially and safety acceptable.

**Award THESI Energy Management Contract:**

Staff recommends issuing a purchase order to THESI as a sole source with an upset amount of \$1,579,000 to carry out the previously identified Energy Conservation and Efficiency, Power Factor and PML Electric Meter Connection to WAN measures. THESI has a solid track record of delivering sustainable energy savings through energy conservation and efficiency projects to both industrial and private sectors, and collectively their staff have over 250 years experience in energy management. In addition, THESI offers the following benefits in carrying out the work for TTC:

- performed the detailed energy review of the six subject TTC facilities and currently working to complete all facility preliminary energy reviews by summer of 2009;
- familiar with TTC operating standards and requirements;
- currently provide the city and TTC with electricity consolidated billing;
- readily able to access TTC detailed electrical and gas load profiles;
- attained exclusive source status with the city for the implementation of all Demand Response (DR) projects within City and its Agencies, Boards and Commissions (ABC's) owned facilities;
- acquired sole source status through City Council resolution for 40% of energy retrofit work within City facilities;
- carried out similar energy management work for city hall, 14 city civic centres, Exhibition Place, over 50 community centres, dozens of other commercial and private sector clients as well as several projects within their facilities including photovoltaic at 500 Commissioners Street and wind turbine at Exhibition Place;

- currently work with the city for the development of the City of Toronto Integrated Energy Strategy;
- currently work with Toronto Water and the Toronto Zoo to develop several large green generation projects across the city;
- provide annual dividend to the city.

**Sign Demand Response Letter of Intent with THESI:**

Demand response is a measure to save electricity costs, improve electrical system reliability and realize environmental benefits by shifting or reducing electrical load during periods of system constraints. Any resulting demand reduction will be rewarded through program incentives.

The city has partnered with THESI and the Ontario Power Authority to offer an exclusive demand response program to all city's ABC's. In April 2007, the City Council adopted the motion requesting TTC to identify and implement potential demand response opportunities in cooperation with THESI to achieve the City's goal of 90 MW of demand reduction. Staff recommends TTC enter into an agreement with THESI to further explore demand response opportunities in areas including generation, building controls, lighting and others.

**JUSTIFICATION**

The Toronto Transit Commission has committed to reduce the environmental impacts from its facilities and to comply with all legal and applicable requirements through different energy conservation, efficiency and demand response measures.

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August 11, 2008  
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