



STAFF REPORT ACTION REQUIRED

Ashbridges Bay Treatment Plant Biogas Cogeneration Proposal from Toronto Hydro Energy Services

Date:	May 20, 2009
To:	Public Works and Infrastructure Committee
From:	General Manager, Toronto Water
Wards:	All
Reference Number:	P:\2009\Cluster B\TW\pw09020

SUMMARY

The purpose of this report is to obtain City Council authority to finalize negotiations with Toronto Hydro Energy Services Inc. ("THESI") and enter into an Energy Services Agreement between the City and THESI on terms and conditions based on the commercial principles outlined in Attachment 1 for the implementation of an 8.2 megawatt ("MW") Cogeneration Facility, capable of being increased to 10 MW, utilizing biogas generated at the Ashbridges Bay Treatment Plant (the "Cogeneration Facility").

THESI proposes to design, construct, own and operate the Cogeneration Facility which would generate electricity and thermal energy to be located within the City's Transportation Services yard at 7 Leslie Street. It is proposed that the City and THESI enter into an Energy Services Agreement pursuant to which THESI would purchase from the City, and the Cogeneration Facility would use, as a fuel source, biogas produced at the Ashbridges Bay Treatment Plant (the "ABTP") and the City would purchase thermal energy produced by the Cogeneration Facility and receive the benefit of standby electricity generation capacity for the operation of the ABTP. The Cogeneration Facility is expected to provide green energy, emergency power for the ABTP and reduce CO₂ emissions.

City staff have previously been authorized by City Council, subject to a report back to Committee, to negotiate with THESI, on a sole source basis, the development of this Cogeneration Facility at the ABTP in accordance with conditions directed by Council at its meeting on March 3, 4 and 5 of 2008 and, specifically, THESI agreeing to, among other things, City ownership of any resultant emissions credits not required to be provided to the Ontario Power Authority (the "OPA").

RECOMMENDATIONS

The General Manager, Toronto Water recommends that:

1. The General Manager, Toronto Water be authorized to finalize negotiations, enter into and execute an Energy Services Agreement with Toronto Hydro Energy Services Inc., on terms and conditions based on the commercial principles outlined in Attachment 1, and otherwise on terms and conditions satisfactory to the General Manager, Toronto Water and in a form satisfactory to the City Solicitor.
2. Subject to the adoption of Recommendation 1, the General Manager be authorized to negotiate, enter into and execute any other related agreement(s) as may be necessary to give effect to Recommendation 1 on terms and conditions satisfactory to the General Manager, Toronto Water and in a form satisfactory to the City Solicitor.

Implementation Points

Toronto Water staff are currently working with THESI to develop an Energy Services Agreement based upon the negotiated commercial principles contained in Attachment 1. The proposed Energy Services Agreement will govern the financial and operating terms related to the sale of the ABTP biogas to THESI as fuel for the proposed Cogeneration Facility and the purchase by the City of thermal energy and electricity from THESI for use within the ABTP.

In addition to this staff report, Facilities and Real Estate staff have prepared a staff report to Government Management Committee seeking authority to enter into a lease agreement with THESI, subject to the execution of the Energy Services Agreement, for the use of a portion of the City's Transportation Services yard at 7 Leslie Street, the proposed site, for the Cogeneration Facility.

Toronto Water staff will continue to work with THESI on the proposed interconnection to the ABTP with the objective of minimizing any operational impacts and risks to the ABTP.

In the event Council adopts the Recommendations in this report, the City Solicitor will retain, on a sole source basis, the services of external legal counsel to assist in the final negotiations and preparation of the Energy Services Agreement and any other necessary related agreements, within the financial limits of her delegated authority.

Financial Impact

Toronto Water staff have worked with THESI to develop a financial model and to quantify the financial impact to the City over the life of the proposed Energy Services Agreement. The financial model is highly sensitive to variations in key variables such as natural gas prices, reliability (uptime) of the Cogeneration Facility and future volumes of available biogas. The financial model projects that the THESI proposal is superior to the "do nothing" option and potentially equivalent, depending on the burner tip price of

natural gas, to a baseline operating scenario in which Toronto Water uses all the available biogas to displace its purchase of natural gas. The volatility of the variables is such that the City may, under certain circumstances, share part of the financial risk. The magnitude of the cost impact, if any, is difficult to estimate but is mitigated by a reduction in Electrical Transmission and Distribution charges, avoided capital costs to realize full in-plant usage of biogas, financial penalties to THESI if uptime targets are not met, and by Toronto Water's ability to switch back to Biogas when it is not being consumed by THESI.

The annual cost to Toronto Water will increase as the natural gas price increases in future years and if Toronto Hydro is unable to maintain a consistently high facility uptime. The Comment Section further addresses the financial implications to the City.

Although cost increases are not projected at this time, additional funds to cover Toronto Water operational cost increases may be required once the Cogeneration Facility is put into operation. Any added funds required in 2009 will be accommodated from the existing 2009 Toronto Water operating budget in Cost Centre WW100 (Wastewater Treatment). Funds to cover the added cost in future years will be included in future Toronto Water Operating Budgets under this same cost centre.

THESI will fund all capital and operating expenses associated with the cogeneration facility, including costs associated with interconnection to the ABTP. Toronto Water will be required to fund certain in-plant improvements through its 2010 and 2011 capital budgets. The capital improvements are currently estimated at \$2,475,000.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

At its May 17, 18 and 19, 2005 meeting, City Council adopted the recommendation from the Policy and Finance Committee authorizing staff to negotiate agreements with THESI to undertake cogeneration projects at Dufferin Transfer Station, Ashbridges Bay Treatment Plant, Thackeray Road Landfill and Highland Creek Treatment Plant. The decision document can be found at:

<http://www.toronto.ca/legdocs/2005/agendas/council/cc050517/cofa.pdf>

At its March 3, 4 and 5, 2008 meeting, Council approved Motion M17.8 which re-affirmed the original motion but substituted the Thackeray Landfill with the Green Lane Landfill. This motion also refers to THESI agreeing to compensate the City by sharing any revenues, payments or other subsidies to be generated through the development and operation of projects of this nature. Any funds to be received through the development and operation of the cogeneration project are to be first applied to ensuring that there is no increase in City divisional Operating or Capital costs and second, towards other Council-approved initiatives that would reduce air pollution and greenhouse gas emissions. The decision document can be found at:

<http://www.toronto.ca/legdocs/mmis/2008/cc/decisions/2008-03-03-cc17-dd.pdf>

ISSUE BACKGROUND

THESI and Toronto Water have been in discussions for more than two years regarding the potential to use biogas produced in the digesters at the ABTP to fuel a cogeneration facility. Negotiations have centered primarily on the development of a financial model to assess the net financial cost and benefits to the City as well as the development of commercial principles that could form the basis of an eventual Energy Services Agreement. Development costs to date including preliminary engineering and biogas analysis have been funded by THESI.

The negotiations between the parties have resulted in the preparation of the commercial principles detailed in Attachment 1 to this report. It is upon these commercial principles that City staff recommend negotiations with THESI be finalized, the appropriate agreement terms and conditions be developed and the Energy Services Agreement be executed.

COMMENTS

The wastewater treatment process at the ABTP includes a series of digesters used to process and reduce the volume of biosolids generated at the ABTP. The by-products of the digestion process are biosolids intended for beneficial use and biogas which is methane rich digester gas that is scrubbed, dehumidified and used, in lieu of natural gas, to generate process and building heat within the ABTP. Biogas use displaces the purchase of natural gas and thereby reduces the cost of operating the ABTP. Excess biogas, if not utilized, is at this time flared.

Current Situation (or “Do Nothing” Scenario)

In 2008, Toronto Water spent approximately \$1.3M on natural gas at the ABTP, some of which was directed to the intermittent operation of the Pelletizer Facility located at the ABTP. In addition to the use of natural gas, biogas was used to fuel boilers for building and process heat and the excess biogas that could not be utilized was flared. Under the existing operating conditions and current unit price for natural gas, the cost of natural gas will increase to approximately \$3.5M in the next few years as the Pelletizer Facility becomes fully operational and begins consuming a continuous supply of natural gas.

For this “do nothing” scenario, Table 1 summarizes the Net Cash Flow (“NCF”) over twenty (20) years for different natural gas burner tip values. At this time, the natural gas burner tip price is \$10.50/GJ.

Table 1 – Net Twenty Year Cash Flow for “Do Nothing” Scenario

	Natural Gas Burner Tip Price (\$/GJ) – Base Price Changes Not Including Inflation			
	\$10.00	\$10.50 (current)	\$12.00	\$14.00
NCF (20 yrs)	(\$66.9M)	(\$70.2M)	(\$80.3M)	(\$93.7M)

Alternatives

Plant staff have assessed the option of maximizing the use of biogas through a variety of measures including the conversion of the existing Pelletizer Facility from natural gas to biogas. It is estimated that a capital investment of approximately \$5,975,000 would be necessary to maximize the on-site use of biogas and this would reduce the cost of natural gas purchases to approximately \$357,000 per year. Over several years, as the volume of biogas produced increases through process improvements and efficiency measures, it is estimated that Toronto Water can virtually eliminate its reliance on natural gas and become self sufficient within five years. From this point on, natural gas costs would be reduced to zero. Table 2 summarizes the Net Cash Flow of this alternative under a range of possible natural gas burner-tip prices.

Table 2 – Net Twenty Year Cash Flow for Toronto Water Full Use of Biogas

	Natural Gas Burner Tip Price (\$/GJ) – Base Price Changes Not Including Inflation (shown as Baseline scenario on Chart 1)			
	\$10.00	\$10.50 (current)	\$12.00	\$14.00
NCF (20 yrs)	(\$6.95M)	(\$7.0M)	(\$7.15M)	(\$7.35M)

The proposed THESI Cogeneration Facility provides an alternate approach to maximizing the use of biogas. The Cogeneration Facility and related infrastructure is to be designed, constructed, operated and funded by THESI. However a \$2,470,000 capital expenditure by Toronto Water to upgrade some existing ABTP equipment would be necessary and would need to be included in the 2010/11 Capital budget.

Toronto Water has compared the THESI cogeneration proposal against the option of maximizing biogas utilization in existing boilers and converting the Pelletizer Facility.

Under the THESI proposal, Toronto Water will sell the biogas to THESI, purchase and rely on thermal energy (heat) from the Cogeneration Facility, and meet its remaining needs through the purchase of additional natural gas. The financial impact to the City for this alternative, assuming the Cogeneration Facility is highly reliable, is generally equivalent to Toronto Water utilizing the biogas solely for its needs. The added benefit is that Toronto Water avoids design, construction and operational risks associated with converting the Pelletizer Facility to biogas. In addition, the THESI proposal provides the ABTP with 8.2 MW of standby power at no additional cost to the City and thereby mitigates the risk of future ABTP service disruptions resulting from electricity outages.

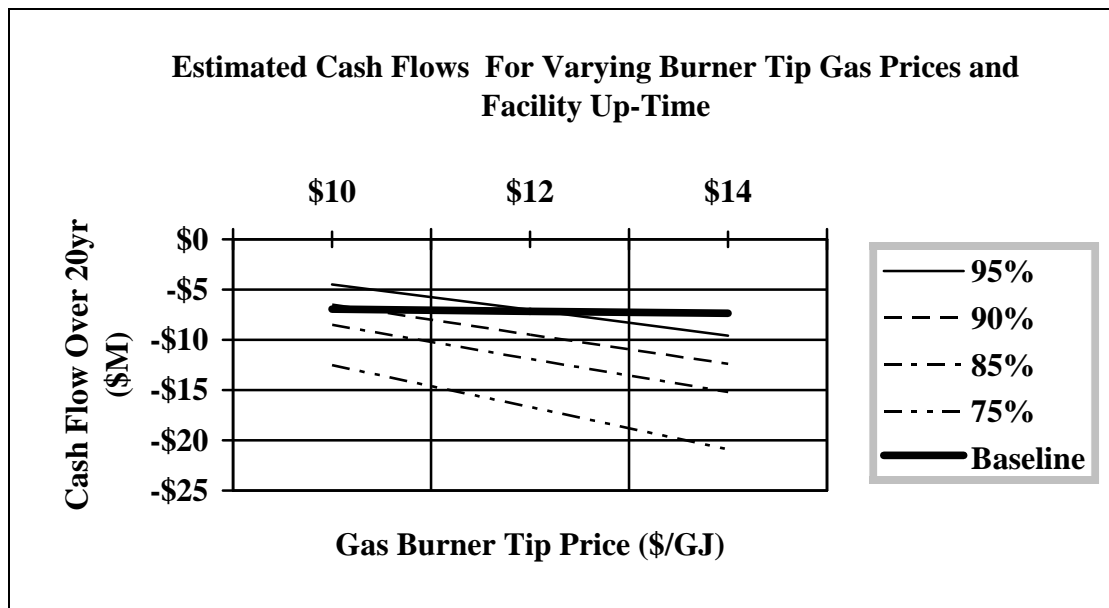
Based on the financial model used to assess the costs to the City, two of the key variables are the burner-tip price of natural gas and the Cogeneration Facility uptime. In addition, the model is highly sensitive to the increased Toronto Water revenue when THESI expands the facility from 8.2MW to 10MW. The viability of the expansion depends in large part on the increased production of gas in the ABTP digesters as improvements and efficiencies are implemented by Toronto Water over time.

Since THESI have not committed to a date to expand to 10MW, the Toronto Water model assumes that the expansion is not made until the tenth year – middle of the 20 year term. Based on 8.2 MW output for the first 10 years and then 10MW for the remaining 10 years, Table 3 and Chart 1 demonstrate the sensitivity of the two key variables noted above on the Net Cash Flows (“NCF”) to Toronto Water:

Table 3 – Net Twenty Year Cash Flow for THESI Cogeneration Proposal

	Natural Gas Burner Tip Price (\$/GJ) – Base Price not Including Inflation			
NCF (20yrs) for Varying Average Cogen Facility Uptimes	\$10.00	\$10.35 (current)	\$12.00	\$14.00
95%	(\$4.5M)	(\$5.1M)	(\$7.0M)	(\$9.6M)
90%	(\$6.5M)	(\$7.3M)	(\$9.5M)	(\$12.4M)
85%	(\$8.5M)	(\$9.4M)	(\$11.9M)	(\$15.2M)
75%	(\$12.5M)	(\$13.6M)	(\$16.7M)	(\$20.9M)

Chart 1 – Sensitivity Analysis of THESI Cogeneration Proposal



The analysis therefore concludes that:

- THESI’s proposal is financially superior to the “do nothing” alternative;
- For high levels of Cogeneration Facility reliability (95% uptime) the THESI proposal, depending on the Burner Tip price of natural gas, is generally equivalent to Toronto Water’s full utilization of the biogas;

- As the Cogeneration Facility reliability deteriorates and as the Burner Tip price of natural gas increases, the financial impact on Toronto Water increases; and
- If and when THESI opts to expand the Cogeneration Facility to 10 MW sooner than the ten years assumed in the model, the THESI proposal becomes more financially attractive to the City. The extent to which all Toronto Water added costs are mitigated depends heavily on when the expansion is implemented

Financial Risk Mitigation

Financial risk to Toronto Water resulting from lower facility uptime is partially mitigated in the Toronto Water model through provisions that require compensation to Toronto Water in the event that the Cogeneration Facility is unable to produce 95% of the required electricity output or 95% of the required thermal output. In both cases, the Energy Services Agreement will include payments from THESI to Toronto Water to offset the cost of purchasing additional natural gas and the cost of lost Electrical Transmission and Distribution credits.

Financial risk to Toronto Water resulting from higher natural gas burner tip prices can be partially mitigated if Toronto Water produces Biogas in excess of the Cogeneration Facility fuel input requirements. In this instance, Toronto Water may reduce natural gas purchases for the heating boilers depending on the excess volumes available. If natural gas purchases for heating boilers are fully eliminated, then Toronto Water may displace thermal purchases from THESI using the surplus biogas. Pelletizer natural gas usage and costs however will remain dependent on the volatility of natural gas prices.

The proposed cogeneration operation will be embedded within the ABTP's electrical distribution and hot water heating systems and therefore THESI's design and construction will need to be closely monitored by Toronto Water. This cost and risk, if any, has not been included in Toronto Water's analysis.

Other Considerations

The City's Clean Air and Sustainable Energy Action Plan (the "Plan") sets out targets for the reduction of greenhouse gas emissions as well as the development a plan to procure electricity from green energy sources. The Plan requires that 25% of the City's corporate electricity be sourced from renewable generation, which is approximately 550,000 MWh annually. The development of this cogeneration project will contribute towards achieving this target.

The Ministry of Energy has recently introduced Bill 150, the Green Energy Act. This Act revises a number of existing Acts and Regulations and provides the Minister with powers to direct the OPA to provide a Feed-In Tariff (FIT) program for renewable energy sources (e.g. wind, photovoltaic, biogas and biomass). The proposed Cogeneration Facility, using ABTP biogas, positions the City as a leader in this new program and a supporter of initiatives that address Climate Change.

This cogeneration project will also generate annual greenhouse gas (GHG) credits, the ownership of which is addressed in the commercial principles outlined in Attachment 1. Specifically, the development and operation of the Cogeneration Facility may give rise to emissions credits in three ways:

- (a) through the displacement of natural gas in the production of electricity;
- (b) through the displacement of natural gas in the production of thermal energy (e.g. steam); and
- (c) through improvements (pursuant to planned investments) in the ABTP that result in more efficient capture and disposal of methane.

It is expected that THESI will enter into a contract with the OPA to sell electricity produced by the Cogeneration Facility under a long-term fixed price arrangement. It is also expected that any contract with the OPA will require THESI to assign to the OPA certain emission credits that arise in relation to the development and operation of the Cogeneration Facility likely limited to those arising under the first category above, i.e. in relation to the production of electricity. If this is the case under the OPA contract, the City will want to ensure that THESI takes all commercially reasonable steps, in entering into any contract with the OPA in respect of the Cogeneration Facility, to preserve its rights to all emissions credits not required by the OPA to be assigned to it. Arrangements with THESI, as contemplated by the commercial principles outlined in Attachment 1 therefore require that any emissions credits retained by THESI in relation to the Cogeneration Facility become the property of and are assigned to the City. This is consistent with the City's Climate Change and Sustainable Energy Strategy, which supports the City's entitlement to emissions credits for projects involving the City's facilities, such as the ABTP and Council's earlier direction that THESI agree to City ownership of any resultant emission credits not required to be provided to the OPA.

The financial costs to Toronto Water are offset by certain non-financial benefits. The following summarizes the key benefits to the City of proceeding with the biogas cogeneration project:

- The biogas resource is fully utilized;
- There will be greenhouse gas reductions of 39,000 tonnes per year, or 44% of ABTP's baseline greenhouse gas (GHG) emissions, principally CO₂;
- Approximately 68,000 MWh per year of renewable electricity will be generated, contributing approximately 12% towards the 550,000 MWh target in the City's Climate Change & Sustainable Energy Plan; and
- Provision of 8.2 MW of standby power capacity for ABTP at no capital cost to Toronto Water.

In summary, although the proposed Cogeneration Facility by THESI has some financial risk to the City by potentially generating some financial costs for Toronto Water as assessed against other alternatives that fully utilize the biogas resource, these are offset

by the provision of standby power and certain other non-financial benefits consistent with overall City policies on greenhouse gases and renewable energy.

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SIGNATURE

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ATTACHMENTS

Attachment 1 – Commercial Principles