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TO:	CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON MONDAY, JULY 18, 2016
FROM:	JOHN LUCAS, P.ENG. DIRECTOR WATER AND WASTEWATER
SUBJECT:	ADVANCING A 760 kW RENEWABLE ENERGY PROJECT AT THE GREENWAY WASTEWATER TREATMENT PLANT

RECOMMENDATION

That, on the recommendation of the Director-Water and Wastewater, the following actions **BE TAKEN** with the respect to renewable energy generation at the Greenway Wastewater Treatment Plant:

- a) The Civic Administration **BE DIRECTED** to prepare a business case and report back to the Municipal Council;
- b) Approval hereby **BE GIVEN** to investigate current and near term funding incentives for this project including the Independent Electricity System Operator (IESO) Process and System Upgrades and any other applicable funding program; and,
- c) Approval hereby **BE GIVEN** to apply to the Federation of Canadian Municipalities (FCM) Green Fund.

PREVIOUS REPORTS PERTINENT TO THIS MATTER
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CWC report of 2016-02-02, Item 5, Electricity Generation from Waste Heat at the Greenway Wastewater Treatment Plant-Update

CWC Report of 2013-09-09, Item 11, Biosolids Disposal Assessment

CWC Report of 2013-02-25, Item 3, Timeline for major Environmental and Engineering Reports

CWC Report of 2012-05-14, Item 14, Renewable Energy Production from the Greenway Fluidized Bed Incinerator

2015-19 STRATEGIC PLAN

This project supports the Strategic Plan with respect to Building a Sustainable City-Robust Infrastructure, through investments in the Wastewater Business Plan on renewable energy production.

Community Energy Action Plan - Renewable Energy Projects

The reuse of waste heat and bioenergy production are priorities identified in London's 2014-2018 Community Energy Action Plan. In addition, the primary goal of the City's Corporate Energy Conservation and Demand Management (CDM) Plan is to reduce the corporation's annual energy use by 10% or 30 million equivalent kilowatt-hours (ekWh) per year from 2014 levels by 2020. The Greenway ORC is identified as a renewable energy project in the CDM Plan and will contribute 20% (5.5 million ekWh/year) of the CDM Plan's energy savings.

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BACKGROUND

Purpose

This report identifies the proposed approach to advance a 760 kilowatt (kW) renewable energy generation project at the Greenway Wastewater Treatment Plant.

Background

The City of London incinerates 17,000 dry tonnes of biosolids annually at the Greenway plant. The Incinerator Environmental Compliance Approval (ECA) currently contains limits for Mercury, Dioxins/Furans and Total Hydrocarbon emissions. The most recent stack testing program showed levels at 27%, 1.4% and 1.6% of the ECA limits respectively for these elements. The process produces a low grade waste heat that has not been utilized for purposes other than plant heating due to the lack of a suitable heat recovery technology. London’s biosolids disposal system already compares favourably to other Canadian Cities and the recovery of energy from the waste heat will further improve the system’s efficiency.

Previous reports to Municipal Council have outlined the regulatory road blocks preventing the installation of an Organic Rankine Cycle (ORC) energy generation system at the Greenway Plant. These roadblocks have been removed as the Technical Safety Standards Authority (TSSA) has determined it does not have jurisdiction over ORC installations in Ontario. Following this decision the City has updated a 2012 draft preliminary feasibility study to incorporate the new Greenway dewatering system and the current market rates for electricity. These factors plus the efficiency gains of the ORC power units have increased the system output to 760 kilowatts, with an anticipated payback of approximately 10 years on a total estimated system cost of \$10M.

This report outlines various components of the system and strategies to advance them. It also highlights funding opportunities and how to take advantage of these. Advancing both of these are critical to finalizing a business plan and business case.

DISCUSSION

Incentives, including grants and financing are available for these types of initiatives through organizations such as the Independent Electricity System Operator (IESO) and the Federation of Canadian Municipalities (FCM). It may also qualify for existing and/or new Infrastructure programs, which are being investigated now.

ORC Systems

An ORC system consists of two main pieces of equipment: the heat exchanger, which captures the waste heat from the process stream; and a power unit, which converts this heat into electricity. Both of these units have manufacturing times in excess of 40 weeks.

Power Unit

Given the substantial generation potential and relatively short payback of the ORC system, an Expression of Interest (EOI) for the ORC power unit has been issued to expedite the selection and procurement process. A request for proposal (RFP) will follow for the selected ORC power unit suppliers with the chosen supplier to be submitted to Council for approval.

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Heat Exchanger

The incinerator exhaust gas stream, containing residual ash, enters the ORC heat exchanger at temperatures of 500-600 degrees Celsius, subjecting the heat exchanger to extreme abrasion and temperature ranges. As a result of this harsh environment, heat exchangers have been the main point of failure on the Greenway incinerator since its commissioning in 1988. The recent procurement and installation of a new heat exchanger as a single source supply from a high-quality manufacturer has provided excellent system performance, cost control and downtime improvements to-date. Approval for the purchase of the ORC heat exchanger from the same manufacturer will be considered concurrent with the power unit procurement.

An installation contract will be tendered to coincide with the delivery of the power unit and heat exchanger with consideration given to minimizing the incinerator downtime during installation.

System Design

An economic evaluation for the Greenway ORC system estimates the generation potential at 760 kW worth approximately \$19 million over the next 20 years at the predicted hydro escalation rates. The evaluation also estimates the cost of the ORC system at \$9,248,000 with an accuracy range of -30% to +50%. The consultant has been asked refine this estimate, taking into consideration constructability and by developing a preliminary layout and structural evaluation for the buildings and equipment. The revised total system cost will be included in the business case.

INCENTIVES

A project of this nature is unique in that it qualifies as green, renewable energy and waste heat recovery, all of which are being promoted by the various levels of government, the Federation of Canadian Municipalities and the Independent Electricity System Operators.

The Federation of Canadian Municipalities - Green Municipal Fund (GMF)

The FCM currently funds capital projects considered to support environmentally sustainable municipal planning through the federally backed Green Municipal Fund. The GMF offers low-interest loans, usually in combination with grants, to implement capital projects. Funding is provided for up to 80 per cent of eligible project costs. The loan maximum is \$5 million, and the grant amount is set at 15 per cent of the loan. Applicants with high-ranking projects may be eligible for a loan of up to \$10 million combined with a grant for 15 per cent of the loan amount, to a maximum of \$1.5 million. At the current estimated cost for the project, assuming this project is deemed a high-ranking project by FCM's project evaluators, the GMF could provide a loan up to \$7.36 million combined with a \$1.1 million dollar grant. Applying to this program requires a specific resolution of the Municipal Council which is provided for in recommendation (c)

Independent Electricity System Operators (IESO)

The IESO provides funding for waste energy recovery generation projects based on \$230 per MWh to a maximum of 70% of the eligible project cost. With an annualized output of 6020 MWh the IESO grant for the Greenway project would be \$1.38 million following successful validation of the system. City staff will work with London Hydro on these applications.

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Other Funding Opportunities

Staff will investigate additional funding opportunities offered by the Federal and Provincial Governments with consideration given to their timeliness in relation to completion of this project.

CONCLUSION

The recovery of waste heat from the Greenway biosolids incinerator through the installation of an Organic Rankine Cycle energy generation system can potentially generate 6020 MWh of electricity per year, thereby reducing energy consumption at the plant by \$19 million over the system’s 20 year life expectancy. The estimated cost of the system is \$10 million and can potentially be completed by mid-2018.

Staff will refine system component and installation costs, funding incentives and the implications of the project on the long term sustainability of the wastewater budget as part of a future business case.

Acknowledgements

This report was prepared with assistance from Debbie Gibson, Financial Business Administrator, Business Administration, Kirby Oudekerk P. Eng., Environmental Services Engineer, Wastewater Treatment Operations, and Jamie Skimming P.Eng., Manager of Air Quality, Environmental Programs.

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