

TO:	CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON MAY 14, 2019
FROM:	KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR, ENVIRONMENTAL AND ENGINEERING SERVICES AND CITY ENGINEER
SUBJECT:	GREENWAY WASTEWATER TREATMENT PLANT ORGANIC RANKINE CYCLE EQUIPMENT INSTALLATION BUDGET ALLOCATION

RECOMMENDATION

That on the recommendation of the Managing Director of Environmental and Engineering Services and City Engineer, the following actions **BE TAKEN** with respect to the installation of an Organic Rankine Cycle system (ORC) at Greenway Wastewater Treatment Plant:

- a) A capital project **BE APPROVED** to undertake contract administration and construction of the Organic Rankine Cycle system at Greenway Wastewater Treatment Plant in the total amount of \$11,000,000;
- b) the value of the total engineering consulting fees for GHD Limited **BE INCREASED** by \$900,000.00, excluding HST, to \$1,707,515.50 including contingency, to cover contract administration services for the installation of the Organic Rankine Cycle system at Greenway Wastewater Treatment Plant; and
- c) the financing for the project **BE APPROVED** in accordance with the “Sources of Financing Report” attached hereto as Appendix “A”.

PREVIOUS REPORTS PERTINENT TO THIS MATTER
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Civic Works Committee, July 17, 2018, Item 2.6 – Clean Water and Wastewater Fund Project Budget Adjustments.

Civic Works Committee, June 7, 2017, Item 11 – Clean Water and Wastewater Fund – Purchase of Major Organic Rankine Cycle System Components for Power Generations at the Greenway Wastewater Treatment Plant.

Civic Works Committee, November 29, 2016, Item 11 – Appointment of Consultants – Clean Water and Wastewater Fund Projects.

Civic Works Committee, October 4, 2016, Item 8 – Infrastructure Canada Phase 1 Project Requests – Clean Water and Wastewater Fund Projects.

Civic Works Committee, July 18, 2016, Item 5 – Electricity Generation from Waste Heat at the Greenway Wastewater Treatment Plant-Update.

Civic Works Committee, September 9, 2013, Item 11 – Biosolids Disposal Assessment.

Civic Works Committee, February 25, 2013 – Timeline for major Environmental and Engineering Reports.

Civic Works Committee, May 14, 2012 – Renewable Energy Production from the Greenway Fluidized Bed Incinerator.

2019-2023 STRATEGIC PLAN

Strategic Plan

This project supports the Strategic Plan with respect to Building a Sustainable City - Conserve energy and increase actions to respond to climate change.

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 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 Organic Rankine Cycle initiative is identified as a renewable energy project in the Corporate Energy Conservation and Demand Management Plan and will contribute 12.5% (3.75 million ekWh/year) of the Plan's target energy savings.

BACKGROUND

Purpose

The purpose of this report is to seek approval for the financing to install the Organic Rankine Cycle power generation equipment previously purchased under the Clean Water and Wastewater Fund.

Context

Previous reports to Council have requested and received approval to purchase technology that can convert waste heat at the Greenway Incinerator into electrical energy. This purchase was made under the Clean Water and Wastewater Fund (CWWF), whereby the City received funding from the federal and provincial governments in the amount of 75% of the purchase price. Delivery is expected in spring 2019. One of the key requirements for this funding was that the project was "incremental" meaning that the work was in addition to projects currently approved in the capital budget.

CWWF formed part of a federal infrastructure funding program, originally planned with multiple phases. Phase 1, from 2016 - 18 with Phase 2, starting in 2018. The intention was make an application to install the Organic Rankine Cycle system under Phase 2 of the program. Phase 2 has since been deferred, and any timelines for future versions of the fund are unclear.

The City has also pursued other funding sources, and incentive funding from the Independent Electricity System Operator (IESO) in the amount of \$730,000. This funding is only available for a limited time. In order to receive this funding the Organic Rankine Cycle system must have been fully operational for over a month by the end of 2020, meaning the installation tender would need to close by the end of June 2019.

DISCUSSION

Project History

The City of London incinerates 17,000 dry tonnes of biosolids annually at the Greenway plant. The process produces heat that is currently used to heat the Greenway plant but could also be used to produce electricity. In June 2017 Council approved purchase and engineering efforts to convert this waste heat into electricity. Through the CWWF program the City received 75% funding from the federal and provincial governments for total expenditures of \$5,899,000, amounting to an estimated \$4,424,250 in funding.

Business Case

Based on the final production estimates, the Organic Rankine Cycle system is projected produce 475 kW and is now projected to save the City \$600,000 per year in electricity costs and contribute to 12.5% of the City's goals under the Corporate Energy Conservation and Demand Management Plan. Considering all City costs related to the Organic Rankine Cycle package and associated heat exchanger, including engineering consulting services, and with Independent Electricity System Operator funding of \$730,000, the payback for the project is 19.6 years. The minimum expected life of the equipment portion of the Organic Rankine Cycle system is 20 years with the life of the structural and facility works (which represent a quarter of the costs) with an expected life of 50 years or more.

Working with Finance staff, an opportunity has been identified to access \$4.5 million of Federal Gas Tax. This funding source was not previously identified but aligns with the Organic Rankine Cycle project through the improved overall energy efficiency of Greenway's solids handling operations. This funding would reduce the projected payback period to 12.1 years on the ratepayer-funded contribution to the project.

Environmental Benefits

In addition to any financial justifications for this project, there are significant potential environmental benefits that will contribute to the City's goals under the Community Energy Action Plan. Operating the Organic Rankine Cycle system is expected to displace 3.75 GWh of electrical consumption from Ontario's power grid and meet 12.5% of the City's overall goal for energy consumption reduction. To provide an idea of the impact of this project, 3.75 GWh of annual electrical consumption is roughly equivalent to the annual demand of 475 residential homes in London, or the entire Kensal Park neighbourhood adjacent to Greenway Wastewater Treatment Plant.

By revising operational practices, it is possible to increase operating temperatures in the incinerator. It is not clear if this will result in a net increase of annual energy production from the Organic Rankine Cycle system, but initial estimates indicate that up to 20,000 tonnes of equivalent carbon dioxide (eCO₂) greenhouse gases will be eliminated from incinerator flue gases per year. Removing 20,000 tonnes of eCO₂ is like taking 4,246 cars off the road.

In an effort to increase the climate change mitigation benefits of the project, Wastewater Treatment Operations staff have also explored options for alternative sources of incinerator feedstock to augment power production. Fats, oils and grease (FOG) have been examined as one potential high-energy fuel source that would result in increased energy production, although significant works would be required to facilitate its implementation. This remains a future opportunity.

Project Status and Next Steps

The Organic Rankine Cycle equipment package has been completed and is in the process of being shipped from Italy to London. The City's consultant, GHD, has completed the detailed design of the installation contract and it is ready for tender (the design assignment was also funded under the Clean Water and Wastewater Fund Phase 1).

The \$11,000,000 requested for approval is intended to fund both the construction contract (estimated at \$9,800,000), engineering services for contract administration (estimated at \$900,000) and engineering services for SCADA integration (\$300,000 under a future separate contract). Upon approval of this capital project, the tender call will be issued and a separate report made to Council for award of the construction contract.

Financing

The significant environmental benefits associated with the installation of the ORC project makes it a great candidate for multiple sources of financing intended for energy conservation projects.

Federal Gas Tax	\$ 4,500,000
Sewage Works Reserve Fund	\$ 5,770,000
Independent Electricity System Operator	\$ 730,000
Total	\$11,000,000

Federal Gas Tax

On March 19, 2019, the Government of Canada released Budget 2019 which included a one-time transfer of \$2.2 billion through the Federal Gas Tax Fund to address short-term priorities in municipalities and First Nation communities. This transfer doubled the Government's commitment to municipalities in 2018–2019 and will provide much needed infrastructure funds for communities of all sizes. In 2018-2019, the City of London's regular annual allocation of Federal Gas Tax is \$23.3 million, meaning the City can expect an additional one-time transfer of \$23.3 million in 2019.

The Federal Gas Tax program provides annual, reliable, sustainable funding to the City of London. The reliability of this funding allows the City to strategically invest in infrastructure projects each year that benefit the citizens of London in many ways. In order to make the best use of Federal Gas Tax funding, it is carefully built into the ten year capital plan to support a wide array of projects such as roads, bridges, solid waste, energy efficiency, bike lanes and pathways, transit, water and wastewater. The one-time infusion of Federal Gas Tax in 2019 provides a unique opportunity to invest in strategic priorities for capital funding for the City that are not currently funded and qualify under Federal Gas Tax criteria.

The Federal Gas Tax program restricts the use of funds to different categories of expenditures. The Community Energy Systems category is intended to increase the efficient use of energy in the community. With the energy savings described elsewhere in this report, the ORC system at the Greenway Pollution Control Centre is an excellent candidate for the application of \$4.5 million of this one-time Federal Gas Tax funding.

Independent Electricity System Operator Grant Funding

The installation of the ORC system has already been approved for \$730,000 of funding through the Independent Electricity System Operator's Process and Systems Upgrade Initiative. In order to qualify for this funding, the City must demonstrate that it has achieved the energy savings expected over the course of a one year reporting period. Therefore the system must be operational and have a minimum of one month of reliable operational data before the end of 2020. To meet this deadline, the installation of the ORC equipment cannot be delayed any further and is therefore being brought forward at this time rather than through the annual budget process.

Sewage Works Reserve Fund

It is recommended that \$5.77 million from the Sewage Works Reserve Fund be contributed to this project to supplement the funding from the other unique sources, bringing the total to the \$11 million that is currently estimated to be required to install the ORC system. In 2018, more than \$1.7 million was returned to the Sewage Works Reserve Fund through the mid-year and year end capital monitoring reports when capital projects with a surplus were closed.

CONCLUSIONS

The Organic Rankine Cycle project at Greenway Wastewater Treatment Plant is the single largest energy use reduction project in the City of London. It will be responsible for displacing over 3.75 GWh per year of electricity consumption, saving an estimated \$600,000 per year and further reducing the City’s carbon footprint. The requested budget allocations will allow for the installation of pre-purchased equipment in time to take advantage of up to \$730,000 in incentive money and \$4.5 million in federal funding. In addition, this project will have a projected payback of just over 12 years and achieve 12.5% of the City’s overall goal for energy consumption reduction.

Acknowledgements

This report was prepared with the assistance of Kirby Oudekerk, P.Eng., Wastewater Treatment Operations Division.

PREPARED BY: 	REVIEWED BY:
GEORDIE GAULD DIVISION MANAGER WASTEWATER TREATMENT OPERATIONS	SCOTT MATHERS, MPA, P.ENG. DIRECTOR WATER, WASTEWATER AND TREATMENT
RECOMMENDED BY: 	
KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR ENVIRONMENTAL AND ENGINEERING SERVICES AND CITY ENGINEER	

Attachment: Appendix “A” Sources of Financing

- cc: Anna Lisa Barbon, Managing Director, Corporate Services and City Treasurer, Chief Financial Officer
- Jason Davies, Manager III, Financial Planning & Policy
- Alan Dunbar, Manager III, Financial Planning & Policy
- John Millson, Senior Financial Business Administrator