
Wastewater Treatment Plant – Cogeneration System Project

Recommendation

That the Standing Policy Committee on Environment, Utilities and Corporate Services recommend to City Council:

1. That Capital Project #1247 – WWT – Energy Recovery and Capital Project #2211 – WWT – Electrical Redundancy be cancelled at this time; and
2. That the remaining previous approvals of \$9.745 million from Capital Project #1247 – WWT – Energy Recovery and Capital Project #2211 – WWT – Electrical Redundancy be transferred to Capital Project #2579 – WWT – Digester Tank 4.

Topic and Purpose

The purpose of this report is to receive City Council approval to cancel the proposed design and construction of a full cogeneration system at the Wastewater Treatment Plant (WWTP) and transfer the remaining previous approvals to Capital Project #2579 – WWT – Digester Tank 4.

Report Highlights

1. In 2013, a consultant was engaged to provide engineering design services. Their pre-design work concluded that full cogeneration and electrical redundancy was not feasible at that time.
2. The scope-of-work for the Digester Tank 4 project has been expanded to include partial energy recovery and biogas conditioning, which will be fully utilized when full cogeneration is feasible in the future.

Strategic Goals

This report supports the Strategic Goals of Environmental Leadership, and Asset and Financial Sustainability by including a partial energy recovery heating component and adding the basic building blocks for electrical generation, in combination with the construction of the fourth digester at the WWTP. Currently, all of the biogas production from the digesters is flared. An up-to-date process heating system, complete with biogas conditioning, will supply heating requirements at the WWTP and provide the foundation for electrical generation.

Background

Studies investigating the viability of energy recovery at the WWTP were completed by third party reviewers in 2007, 2008, and 2010. Each report concluded the potential for cogeneration to offset electricity and natural gas demands was attainable with the 2010 Stantec Consulting Ltd. report City of Saskatoon Wastewater Treatment Plant Energy Recovery Study detailing the financial analysis of implementation. Capital funding was commenced to implement cogeneration as part of electrical redundancy and energy recovery at the plant, with the additional environmental benefit of utilizing biogas and reducing electrical demand at the plant.

Based on the Stantec Consulting Ltd. Study, two capital projects were approved at \$10.431 million for cogeneration. Capital Project #1247 – WWT – Energy Recovery was approved for \$4.630 million in the 2012 Capital Budget and Capital Project #2211 – WWT – Electrical Redundancy was approved for \$5.801 million in the 2013 Capital Budget. A total of \$17.180 million was estimated to complete the project, of which, \$10.431 million has been approved to date.

At its meeting held on January 7, 2013, City Council approved a proposal from AECOM Canada Ltd. (AECOM) to design a cogeneration system at the WWTP. The approved proposal was for AECOM's engineering services at a net cost to the City of \$1,317,535.

Report

Work Completed to Date

AECOM completed the preliminary design for the cogeneration project in 17 months and produced 8 technical memorandums, including a financial analysis. The preliminary cost estimate of construction was \$20.6 million, not including incorporating the existing standby generation into the cogeneration building. This estimate significantly exceeded prior approvals for this work.

The detailed analysis, as presented, indicated the investment did not have a payback over the useful life of the asset. Following a review of the preliminary design and financial analysis, the Administration cancelled the contract with AECOM. AECOM was formally notified that the City was cancelling the engineering services contract on June 3, 2015, and was paid \$243,986 for their services.

Expenditures to date on this project total \$912,000 and include the payment of the design work completed by AECOM, in house engineering costs, and costs that were incurred in anticipation of the project proceeding, including the relocation of utilities, the construction of a tunnel under a roadway, and the purchase and installation of generators. The design work by AECOM will provide valuable technical information for future design. The infrastructure upgrades were necessary in conjunction with other capital projects and currently benefit the operations of the utility.

Moving Forward

The Administration continues to implement upgrades according to the WWTP's Long Term Capital Development & Expansion Plan, including the installation of a new digester. Capital Project #2579 – WWT – Digester Tank 4 involves the design and construction of a fourth digester at the WWTP to handle increased solids loading in the sewage stream from an increasing population. Due to the cancellation of the Cogeneration System Project, the scope-of-work of the new digester project has been expanded to include partial cogeneration to increase heat requirement and biogas production. At its meeting held on June 26, 2017, City Council accepted a proposal for consulting engineering services from CH2M HILL Canada Limited (CH2M HILL) for the design and construction of the Digester Tank 4, which is currently in the design stage.

Each digester tank has a volume of approximately 7,500 cubic metres and operate at 35 degrees Celsius. The heating requirements are significant, especially during the winter season. In the past, the WWTP has been forced to direct all heating production to the digesters, resulting in heating deficiency in other building areas.

Currently, the plant uses gas fuelled boilers to provide process and building heating. Previously, biogas was used to partially fuel the boilers; however, the corrosive nature of biogas resulted in constant maintenance of the boilers at a significant cost and increased risk of failure of the treatment process. As a result, a substantial quantity of natural gas is used, while the biogas is wasted by flaring.

As part of the design, CH2M HILL is to include a partial energy recovery and electrical redundancy component in the fourth digester project. Energy recovery will incorporate biogas collection and conditioning with new boilers to provide a reliable and consistent amount of heat for the process and buildings. The electrical redundancy element will enable gas conditioning to reciprocating engine standards and provide the infrastructure for future cogeneration. The value of the biogas that is now flared will be captured and used to fuel boilers.

The fourth digester will be commissioned in 2020 with the intent that the basic infrastructure for biogas recovery and conditioning will be in place and utilized to provide reliable heating for process and building use. This infrastructure and other previously listed upgrades will be fully utilized when full cogeneration is feasible, ensuring there will be no throw-away costs. The introduction of carbon credits may have an impact on the viability of cogeneration. Phasing out coal power production in Saskatchewan might also provide a better rate of return on capital funds used for cogeneration, due to rising electrical rates.

Communication Plan

The City is an environmental leader and continues to look for innovative ways to improve efficiencies and reduce its carbon footprint. This project will be highlighted as an achievement in the annual Services, Savings and Sustainability report and introduced to citizens upon completion with a News Release and through other digital channels, when completed in 2020.

Financial Implications

Capital Project #2579 – WWT – Digester Tank 4 has been approved at \$8.0 million in the 2017 Capital Budget and it has been proposed that a further \$15.0 million be approved in the 2018 Capital Budget. With the components of partial energy recovery and electrical redundancy being included in the project, and the benefit of applying the infrastructure for potential future cogeneration, the Administration proposes utilizing the remaining down payment of \$326,000 and the borrowing provision of \$9.419 million from Capital Projects #1247 – WWT – Energy Recovery and Capital Project #2211 – WWT – Electrical Redundancy for Capital Project #2579 – WWT – Digester Tank 4.

Environmental Implications

Reusing the biogas in the boilers, rather than flaring it, will decrease the amount of natural gas the WWTP uses. The overall impact of greenhouse gas emissions are unknown at this time.

Other Considerations/Implications

There are no options, public and/or stakeholder involvement, policy, privacy, or CPTED implications or considerations.

Due Date for Follow-up and/or Project Completion

Project will be completed in 2020.

Public Notice

Public Notice pursuant to Section 3 of Policy No. C01-021, Public Notice Policy, is not required.

Report Approval

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