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ERM 19-40

REPORT TO PARKS & ENVIRONMENT COMMITTEE
MEETING OF WEDNESDAY, JUNE 26, 2019

SUBJECT **Landfill Gas Utilization – Additional Information**

ISSUE

To provide the lifecycle greenhouse gas (GHG) impacts of the two landfill gas utilization alternatives.

BACKGROUND

Landfill gas (LFG), which is approximately 50% methane, is produced through decomposition of organic material in landfills. This gas is a form of potential energy, and can be beneficially used to add capacity to the electrical or natural gas systems. Hartland Landfill gas is currently combusted to generate power, which is sold to BC Hydro. The volume of gas collected at the landfill has exceeded the capacity of the current power generation equipment and, as a result, two enhanced utilization alternatives have been evaluated:

- Green Power: expand the existing power generation equipment and sell more electricity to BC Hydro.
- Renewable Natural Gas (RNG): upgrade the landfill gas to RNG and sell the upgraded gas onto the FortisBC gas pipeline.

On March 6, 2019, the results of the enhanced LFG utilization evaluation were presented to the Parks & Environment Committee. Before making a final utilization decision, the committee requested more information and, on March 13, 2019, the Capital Regional District (CRD) Board passed a motion that included:

1. directing staff to pursue negotiations with FortisBC and determine rates, in order to further flesh out the return on investment for a potential Hartland Renewable Natural Gas (RNG) Project
2. directing staff to report back to Committee once initial conversations with FortisBC have taken place and with the potential of green power revenues as soon as possible after the Comprehensive Review of BC Hydro has been completed; and
3. including an estimate of the GHG impacts of the expanded electrical power generation option and RNG conversion.

In response to Item 3, the CRD has retained Stantec Inc. to complete a lifecycle GHG assessment of the two LFG utilization alternatives, which is presented below.

To retain the CRD's negotiating position with either BC Hydro or FortisBC, staff have prepared a closed report that addresses items 1 and 2. The decision on the preferred LFG utilization technology will be made with consideration of the financial analysis presented during the closed session of the meeting, and will be made public through the rise and report process.

ENVIRONMENTAL/CLIMATE LENS IMPLICATIONS

The CRD retained Stantec Inc. to complete a lifecycle GHG assessment of the two Hartland LFG utilization alternatives being evaluated: upgrading to RNG (including FortisBC installing a 7.4 km pipeline to connect the project to the main gas distribution network), or expanding Hartland green power production. The lifecycle GHG assessment considered GHG emissions related to construction, operation, and major rehabilitative maintenance, along with the GHG emissions that would be displaced by adding Hartland LFG to the BC energy grid.

This review examined green power and RNG scenarios, assuming 200,000 GJ of LFG available for processing, and found that in both utilization options, LFG (50% methane) will be fully combusted to produce energy. Under the green power scenario, the combustion of LFG occurs at the Hartland power plant, with an average electrical generation efficiency of 34.8%, where the remaining energy is lost to heat and friction. Under the RNG scenario, combustion would occur at the end-use site (homes or businesses) in natural gas stationary combustion equipment, which is typically more efficient at 80-90%. In terms of energy produced by the two projects, after accounting for production and efficiency losses, the RNG project would add around 192,000 GJ of clean energy to the gas distribution network, whereas expanding electricity production would add around 67,000 GJ of clean energy to the electricity distribution network.

A summary of the lifecycle GHG impacts is presented in Table 1. Over a 25-year lifecycle, the RNG initiative would result in a reduction of approximately 264,000 tonnes CO_2e, a nearly 95-fold improvement over the Green Power scenario (2,800 tonne reduction). This difference between the two scenarios is twofold: first, the BC electrical grid has a low GHG emissions intensity per unit of energy produced, when compared to natural gas. Consequently, displacing natural gas with biogas (RNG) from Hartland Landfill results in greater GHG emissions savings than displacing BC Hydro electricity with Hartland green power. Second, natural gas stationary combustion equipment has more than twice the efficiency (~85%) of the genset (power production) efficiency (~35%), which means that the RNG scenario produces more than twice as much energy available to displace conventional energy sources. If more gas were available for upgrade, or if the project life were extended, in both green power and RNG scenarios, the emissions benefits of the project would increase.

Table 1: Lifecycle Greenhouse Gas Impacts of Renewable Natural Gas vs. Green Power

Stage	RNG Scenario (tCO_2e)	Green Power Scenario (tCO_2e)
Facility Construction	730	632
Energy Distribution Infrastructure Construction	550	-*
Operation	9,936	1,589
Maintenance	-	1
Avoided Energy GHG Emissions	-275,039	-5,011
Total GHG Emissions (tCO_2)	**-263,822**	**-2,789**

*Notes to Table: * No additional transmission and distribution lines are required under this scenario; however, if equivalent length of transmission to the pipeline were constructed, it is estimated that the construction activities would add an additional 313 tCO_2e, reducing the net benefit to (1,792) tCO_2e.*

To accommodate the volume of RNG from the proposed project, FortisBC would need to expand the capacity of natural gas distribution infrastructure over a 7.4 km stretch, which would result in 550 tonnes of GHG emissions generated. There is already a residential supply of natural gas in the area, so the residential natural gas demand is not expected to change significantly.

Overall, the Stantec lifecycle GHG emissions analysis found that GHG emissions associated with construction, energy distribution infrastructure construction and operations are higher in the RNG scenario than electricity production. However, when considered over the project lifecycle in BC where power is already clean, the highest GHG reduction potential is to use captured LFG to produce RNG and displace natural gas, which has nearly a 95-fold GHG improvement over the green power scenario. The full Stantec report is presented as Appendix A.

ECONOMIC IMPLICATIONS

Economic implications of the two alternatives are presented in the Landfill Gas Utilization-Alternatives Report that went to the CRD Board, March 13, 2019 (attached in Appendix B), and additionally in a report prepared in closed, to protect CRD's negotiating position with either BC Hydro or FortisBC.

INTERGOVERNMENTAL IMPLICATIONS

Intergovernmental implications were presented in the Landfill Gas Utilization-Alternatives Report that went to the CRD Board on March 13, 2019 (attached in Appendix B). They have not changed substantively since that report.

SOCIAL IMPLICATIONS

Social implications were presented in the Landfill Gas Utilization-Alternatives Report to the CRD Board on March 13, 2019 (attached in Appendix B). They have not changed substantively since that report.

CONCLUSION

This report summarizes and presents the lifecycle greenhouse gas impacts of the two landfill gas utilization alternatives being considered. In BC, where power is already clean, after factoring in GHG emissions from construction, operations and maintenance, the highest GHG reduction potential is to use captured LFG to produce RNG and displace natural gas. Over a 25-year lifecycle, producing RNG from LFG would result in a reduction of approximately 264,000 tonnes CO_2e, nearly a 95-fold improvement over the Green Power scenario (2,800 tonne reduction).

RECOMMENDATION

That the Parks & Environment Committee recommend to the Capital Regional District Board:

That this report be received for information.

Submitted by:	Russ Smith, Senior Manager, Environmental Resource Management
Concurrence:	Larisa Hutcheson, P.Eng., General Manager, Parks & Environmental Services
Concurrence:	Robert Lapham, MCIP, RPP, Chief Administrative Officer

RS/LF:ac

Attachments: Appendix A – Life Cycle Greenhouse Gas Analysis of Landfill Gas Utilization Scenarios at the Hartland Landfill (Stantec – June 10, 2019)
Appendix B – Landfill Gas Utilization – Alternatives – Staff Report (March 13, 2019)