CAPITAL PROFILE REPORT

PROFILE NAME:	**LANDFILL GAS TO RENEWABLE NATURAL GAS (RNG)**		**FUNDED**
PROFILE NUMBER:	**22-81-2053**	PROFILE STAGE:	**Approved**
DEPARTMENT:	**Utilities**	PROFILE TYPE:	**Standalone**
LEAD BRANCH:	**Waste Services**	LEAD MANAGER:	**Michael Labrecque**
PROGRAM NAME:		PARTNER MANAGER:	
PARTNER:		ESTIMATED START:	**January, 2021**
BUDGET CYCLE:	**2023-2026**	ESTIMATED COMPLETION:	**December, 2023**

Service Category: **Utilities** **Major Initiative:**

GROWTH	RENEWAL
100	

PREVIOUSLY APPROVED:	**13,368**
BUDGET REQUEST:	**-**
TOTAL PROFILE BUDGET:	**13,368**

PROFILE DESCRIPTION

The Landfill Gas to Renewable Natural Gas Project (Project) was developed to look for environmentally sustainable and financially attractive solutions for post-2024 LFG management. The proposed initiative focuses on LFG to RNG upgrade. Fulfillment of this initiative will require the construction of RNG upgrading infrastructure for generation and interjection of RNG into the natural gas network. This project will be the first-of-its-kind project in Alberta to upgrade the LFG to RNG and sell the RNG as a commodity to the local, provincial and/or national market.

While there are several market-ready technologies available for the upgrading of LFG to RNG, this project will use the pressure swing adsorption method for the following reasons:

-It is proven, mature and reliable;
-It demonstrates high conversion yield (up to 98% of methane is conserved during LFG to RNG conversion);
-It is well suited for the quality of LFG found in Clover Bar Landfill;
-It has a lower life cycle cost when compared to other existing upgrading technologies; and
-It generates low residual waste by-products which are mostly inert in nature (spent adsorbing media).

Collected LFG is directed to a gas conditioning system where major impurities such as water, siloxane, ammonia, and H2S are removed from the stream. Conditioned gas is then fed into a pressure swing adsorption (PSA) upgrading unit consisting of a series of vertical towers where one-half of the towers operate at high pressure and the other half operate at low pressure. These vessels are connected by a complex network of piping and valves to switch the gas flow between the towers. Each tower is filled with an adsorption medium through which the gas permeates. As the gas flows from one vessel to another one, it swings from a high to a low- pressure environment. When in a high-pressure environment the CO2 and the other impurities are adsorbed and then released to the ambient at low pressure. The exit gas stream is at least 95% clean methane in its composition that is suitable for use as RNG. Gaseous impurities such as ammonia and H2S are adsorbed on adsorption media. Condensate is collected and disposed of at the Wastewater Treatment Plant, or equivalent licensed facility. Adsorption media when enriched is replaced with the old media being regenerated or disposed of at a licensed facility (typically class 2 landfill).

The entire LFG to RNG upgrading system comes pre-fabricated. A footprint of a typical LFG to RNG upgrading facility is approximately 3,600 m2. Within this footprint, there are both (i) LFG conditioning and removal of impurities module (ii) a module for LFG upgrading to produce RNG of pipeline quality, (iii) a flare, and (iv) injection station. Appropriate land meeting these requirements has been identified at the Edmonton Waste Management Centre (EWMC) along with adequate utility supplies.

PROFILE BACKGROUND

A landfill gas collection system has been in place since 1992, and is currently owned and managed by Capital Power under a collaboration contract, until 2024. To prepare for the City to take back control of the LFG obligation and management as soon as the existing contract expires, WS completed a condition assessment, which confirmed that the system requires complete upgrades in order to meet the minimum environmental obligations under the Environmental Protection and Enhancement Act. This means the City will need to invest $7.3 million to upgrade the landfill gas collection as well as the flare system, by 2024. This work has been captured in the Clover Bar Landfill Liability, through an increase to the landfill liability in 2019.

Under the current operational conditions, the landfill gas collection system also generates greenhouse gas (GHG) offset compliance credits. The GHG offset credit agreement with CP (different from the collaboration agreement) is valid until August 2023. GHG offset compliance credits are those that have been generated and quantified by voluntary project developer under Technology Innovation and Emissions Reduction (TIER) regulation.

PROFILE JUSTIFICATION

The technology to convert LFG to renewable natural gas (RNG) is mature as evidenced by many successful projects fully operational globally (please see USEPA RNG Project Map) . The government commitment to greenhouse gas emission reduction has created a high demand on the “green” energy market. The demand has been further enhanced by more and more responsible energy consumers who voluntarily purchase green energy. To fully leverage City owned LFG resource and invest in a capital project that generates revenue creates a unique investment opportunity that also fits well with the City’s strategic direction.

The expiration of the existing contractual agreements in 2024, along with the expiry of the GHG compliance offset credit agreement in 2023, results in an opportunity to improve the beneficial use of the landfill gas post 2024 while continuing to manage the environmental liability associated with the approval to operate CBLF. In the spring of 2020, Waste Services secured a $10 million grant from Emissions Reductions Alberta (ERA) to upgrade the LFG to renewable natural gas. A key stipulation of the $10 million grant is for the City to partner with the current LFG collection system operator, Capital Power.

RNG is a form of non-fossil carbon-neutral energy that is interchangeable with conventional natural gas, can be injected into the natural gas distribution system, and reduces the amount of conventional natural gas by replacing it with gas from a renewable source. From a recent engineering study by Jacobs (2018) on the quantity and flow rate of available LFG, it is estimated that the CBLF could produce an average of 245,000 GJ per year of RNG, for at least another 20 years. Based on expectations of the RNG market, this opportunity will add annual revenue to the Utility of $3 million. An overview of the RNG market can be found in section 5, Context Analysis.

Over the next three years, there will be major activities around CBLF with a direct influence on this Project. The first is the final closure of the landfill and its transition into post-closure monitoring and management. The construction of closure activities is slated for the second quarter of 2021. Concurrent construction of collection system upgrades is planned as it will result in reduced cost of this undertaking by eliminating repetitive ground disturbance works as well as double payment for mobilization and demobilization activities.

Furthermore, the $10 million grant provided by Emissions Reduction Alberta requires the grant holder to implement the project before September 2023, which is three years from the date of the grant award. Any extension to this schedule may jeopardize the receipt of the grant which is a significant offset to overall project costs.

Finally, the existing LFG management arrangement with Capital Power will last until August 2024 after which the control over LFG will be transferred to Waste Services. Although WS has the first right of refusal to purchase the existing LFG management infrastructure, it is not known what the fair price of that infrastructure would be. Also, the feasibility of purchasing this infrastructure is questionable given its condition and required minimum time horizon for its post-closure liability service.

Starting the planning, design and upgrading of the landfill gas collection system, and a flare station are mandatory activities in order to meet the minimum regulatory requirement. Also to embrace the opportunity to convert the collected landfill gas to renewable natural gas and sell it on the market as a commodity will give the project significant financial benefits.

The total capital cost is estimated to be $16.7 million. Although the total capital cost of the project is $16.7 million, the City will fund $2.7 million. The remaining $14 million will be funded externally, with $10 million coming from the Emissions Reductions Alberta grant and $4 million from Capital Power.

STRATEGIC ALIGNMENT

The City Plan has two goals that are addressed by the project. By investing in technology focuses on renewable energy generation, Edmonton will be a healthy city, progress towards a low carbon future and continue toward its path of Climate Resilience.

The Community Energy Transition Strategy is Edmonton’s plan to address and mitigate climate change through the reduction of GHG emissions, increasing efficiency and promoting renewable energy systems. Investing in the Project will result in a reduction of the overall GHG emissions from the CBLF added benefit of producing renewable energy.

ALTERNATIVES CONSIDERED

There are three alternatives presented in the Business Case. It is worth noting that Waste Services has engaged a consultant for a more comprehensive review for all possible options in developing a LFG to RNG facility. This included 30 different scenarios which ultimately was narrowed down into 3 alternatives that is presented here.

Alternative 1 (Status Quo) - this alternative foregoes building a LFG-to-RNG facility. The facility is not mandatory for WS to meet its environmental liabilities associated with CBLF. As such, this alternative provides analysis on what the O&M cost and NPV are compared to building a LFG-to-RNG facility.

Alternative 2 - includes a shared ownership model for the LFG to RNG initiative. The ownership of the upgrader would be split between Capital Power and the City. This is the preferred alternative.

Alternative 3 - involves full capital investment by the City to maintain maximum strategic independence, operational control, and business flexibility.

COST BENEFITS

The Project produces two key, revenue-generating outputs:
- RNG, to be injected and blended into the local natural gas system
- GHG emissions offsets, to be quantified, reported and verified annually thus producing offsets eligible under Alberta’s existing Carbon Competitiveness Incentive Regulation (CCIR) and the new Technology Innovation and Emissions Reductions Regulation (TIER), or a voluntary offset program.

KEY RISKS & MITIGATING STRATEGY

Key risks & mitigation strategy:
Fluctuating LFG quality & quantity
-Measure LFG quality & quantity on at least a monthly basis to assess fluctuation & degradation in flow
-Additional LFG sampling efforts required in order to minimize risk to the City
-Ensure RNG upgrader has built in capacity to turn down LFG flows
Failure to meet RNG injection specifications (due to high nitrogen, oxygen or CO2)
-Implement a robust biogas upgrading technology capable of exceeding RNG injection specification requirements
-Enhance operational planning
-Improve collection efficiency
Revenue fluctuation
-Secure long-term contracts for a guaranteed RNG Price
-Consider the worst case scenario for all cost benefit analyses
-Start discussions with off-takers earlier in the project

RESOURCES

CoE will provide overall direction, guidance, and approval for the lifecycle of the project. Waste Services will lead the project team as well as full budgetary control on this project and be the official recipient of the ERA grant. Contract management will be led by Waste Services staff.

CONCLUSIONS AND RECOMMENDATIONS

To deliver this project for the construction of the Landfill Gas to Renewable Natural Gas facilities, a total capital investment of $16.7 million is required. By entering a partnership with CP, the true required capital funding for the City of Edmonton is $2.7 million. Accomplishing this project will further translate in the following for the WS:

-Significant reduction in environmental risks due to LFG management system failure;
-Net positive cash flow to business area over project's lifespan;

It is recommended that this Business Case is approved and authorized following Alternative 2 for Capital Expenditure (Funding Approval) of $2.7 million within the 2019-2022 budget. The approval of this Business Case will enter the project to the Delivery Phase in 2021-2023.

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PROFILE NAME: **Landfill Gas to Renewable Natural Gas (RNG)** **FUNDED**

PROFILE NUMBER: **22-81-2053** PROFILE TYPE: **Standalone**

BRANCH: **Waste Services**

CAPITAL BUDGET AND FUNDING SOURCES (000's)

		Prior Years	2022	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030	Total
APPROVED BUDGET	Approved Budget												
	Original Budget Approved	-	-	-	-	-	-	-	-	-	-	-	-
	2021 Cap Capital Budget Adj (one-off)	670	10,800	5,200	-	-	-	-	-	-	-	-	16,670
	2021 Cap Carry Forward	-670	670	-	-	-	-	-	-	-	-	-	-
	2022 Cap Budget Request for Next Cycle	-	-	-5,300	1,998	-	-	-	-	-	-	-	-3,302
	Current Approved Budget	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368
	Approved Funding Sources												
	Partnership Funding	-	3,000	-3,000	-	-	-	-	-	-	-	-	-
	Provincial Grant	-	7,000	-	-	-	-	-	-	-	-	-	7,000
	Self-Liquidating Debentures	-	-	1,700	1,998	-	-	-	-	-	-	-	3,698
	Waste Mgt Retained Earnings	-	1,470	1,200	-	-	-	-	-	-	-	-	2,670
	Current Approved Funding Sources	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368
BUDGET REQUEST	Budget Request	-	-	-	-	-	-	-	-	-	-	-	-
REVISED BUDGET (IF APPROVED)	Revised Budget (if Approved)	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368
	Requested Funding Source												
	Partnership Funding	-	3,000	-3,000	-	-	-	-	-	-	-	-	-
	Provincial Grant	-	7,000	-	-	-	-	-	-	-	-	-	7,000
	Self-Liquidating Debentures	-	-	1,700	1,998	-	-	-	-	-	-	-	3,698
	Waste Mgt Retained Earnings	-	1,470	1,200	-	-	-	-	-	-	-	-	2,670
	Requested Funding Source	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368

CAPITAL BUDGET BY ACTIVITY TYPE (000's)

REVISED BUDGET (IF APPROVED)	Activity Type	Prior Years	2022	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030	Total
	Other Costs	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368
	Total	-	11,470	-100	1,998	-	-	-	-	-	-	-	13,368

OPERATING IMPACT OF CAPITAL

Type of Impact:

Branch:	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE	Rev	Exp	Net	FTE
Total Operating Impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-