Feasibility Study of a Biomass-Methane Clean Fuel Project in Punnichy, Saskatchewan

Leyton Heikan Zhou, Master of Science in Sustainable Energy Development, University of Calgary
Supervised by Mr. Jeff Arsenych of Rainforest Energy Corp. and Dr. Poomnia Jayasinghe of University of Calgary

Introduction

- Saskatchewan’s greenhouse gas (GHG) emissions per capita was 216% above the national average, while motor gasoline demand per capita was 92% above the national average in 2019[1].
- As illustrated in Figure 1, natural gas and refined petroleum products remained the largest fuel types consumed in Saskatchewan in 2019, while biofuels and others only contributed to an insignificant portion[1].

Figure 1: Saskatchewan end-use demand by fuel (2019)

- Considering the high potential to explore the energy sector in Saskatchewan, Rainforest Energy Corp. (RFEC) is partnering with Touchwood Agency Tribal Council (consortium of four First Nation Communities) to work on their first clean fuel project in Punnichy, Saskatchewan.

Research Question and Its Importance

Research Question
- Is the project economically feasible throughout its economic life under various assumptions?

Importance
- Concerns from investors and company management on project profitability, economic sustainability, and potential for future commercialization.
- Industry benchmarking and future policies adjustment.
- Contribution to Canada’s energy transition and net-zero GHG emissions in the long run.

Interdisciplinary Aspects
- Energy: Energy output vs. provincial and national gasoline demand
- Environment: GHG emissions level and carbon intensity score
- Economics: Financial performance indicators and sensitivity analysis

Methodology

Data Collection
- Publicly available sources
- External consultant reports
- Internal corporate data

Data Analysis
- Estimation of project energy output and carbon intensity score.
- Projection of both cash basis and accrual basis statement of operations.
- Analysis of major financial performance indicators and ratios.

Project Energy Output
- Annual production capacity of the project is 87 million litres of low-carbon gasoline and liquefied petroleum gas (propane substitute) combined[3], fulfilling around 3.2% of Saskatchewan’s annual motor gasoline demand.

Strategic Comparison with Different Renewable Energy Sources
- Carbon intensity score of the project: - 19.07 g CO2e/MJ.

Findings and Analysis

Sensitivity Analysis
- Breakeven Points for Maintaining a 10% Earnings Before Interest, Tax, Depreciation, Amortization (EBITDA) Return on Investment
- Project Investment Ratio @ 5% Discounted Cash Flow 3.01 4.95
- Internal Rate of Return (%) 25.0% 34.4%
- Net Present Value Before Tax @ 10% Discounted Cash Flow (CAD millions) $358 $646
- Payback Period (Years) 3.7 2.7
- Net Income (CAD millions) $1,025 $1,656
- Earnings Before Interest, Tax, Depreciation, Amortization (CAD millions) $1,726 $2,551

Conclusion and Recommendation

- At a strategic level, the project appears to be the most favourable investment option as compared with other alternative renewable energy projects when it manages to achieve both positive investment return and negative carbon footprint.
- Compared with other financial inputs, the project’s investment return is more sensitive to decrease in product output price.
- Investors and managers should closely monitor product market price and feedstock cost throughout the project’s economic life and mitigate risks through price hedging and other structural measures.

Limitation and Future Research

- Financial projection involves assumptions made and management position taken. Any material changes may result in different estimated results.
- Certain stakeholders may be concerned about the possible shrinking for the fuel-powered cars and gasoline market following the Government of Canada’s proposal of setting a mandatory target for all new light-duty car and passenger truck sales to be zero-emissions by 2035, yet such risk could be mitigated by the project’s flexibility to be reconfigured for blue hydrogen production. Future research may add value by analyzing such technology’s environmental impact and economic viability.

References

Figure 2: Project process configuration[14]