

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

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Introduction

- Saskatchewan's greenhouse gas (GHG) emissions per capita was 216% above the national average, while motor gasoline demand per capita was 82% 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].

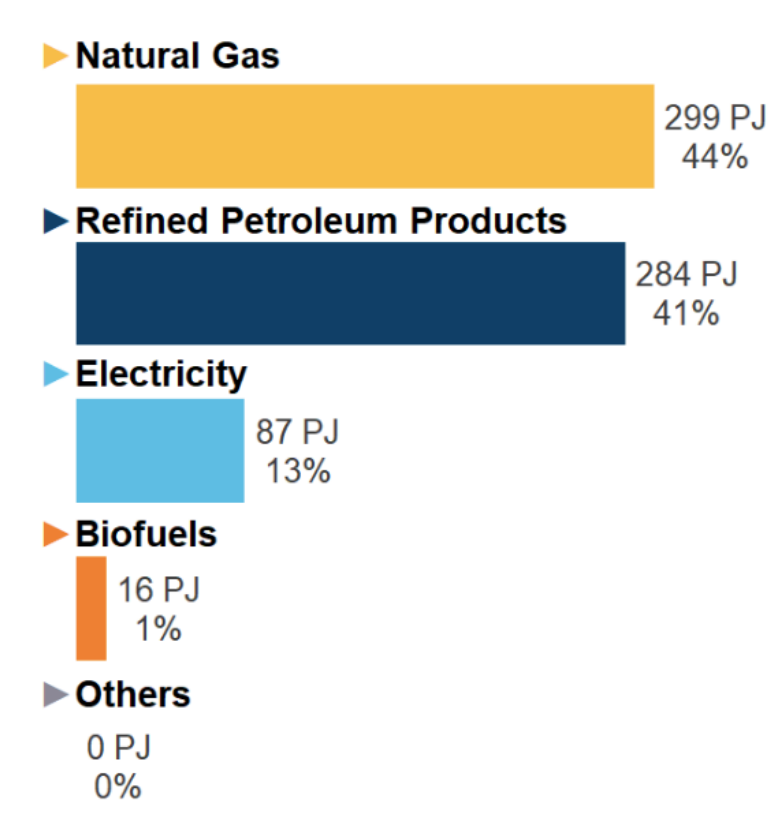


Figure 1: Saskatchewan end-use demand by fuel (2019)

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

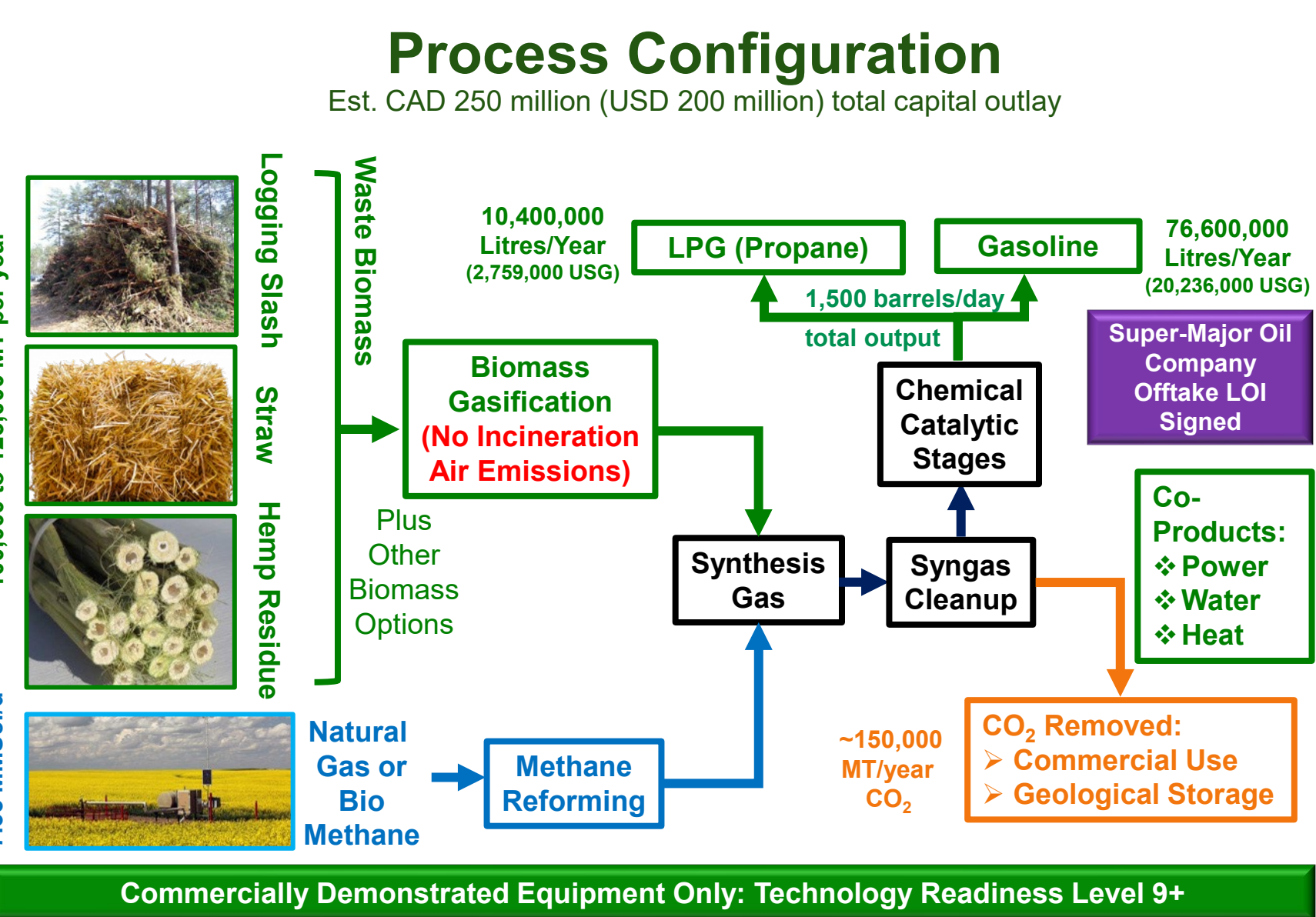


Figure 2: Project process configuration^[3]

Facts and Figures

- Proposed Location:** Treaty Lands owned by the George Gordon First Nation east of Punnichy, Saskatchewan
- Site Area:** 10 acres
- Capex:** CAD 250 million
- Economic Life:** 20 years

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



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ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

8 DECENT WORK AND ECONOMIC GROWTH
PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL

11 SUSTAINABLE CITIES AND COMMUNITIES
MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

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.

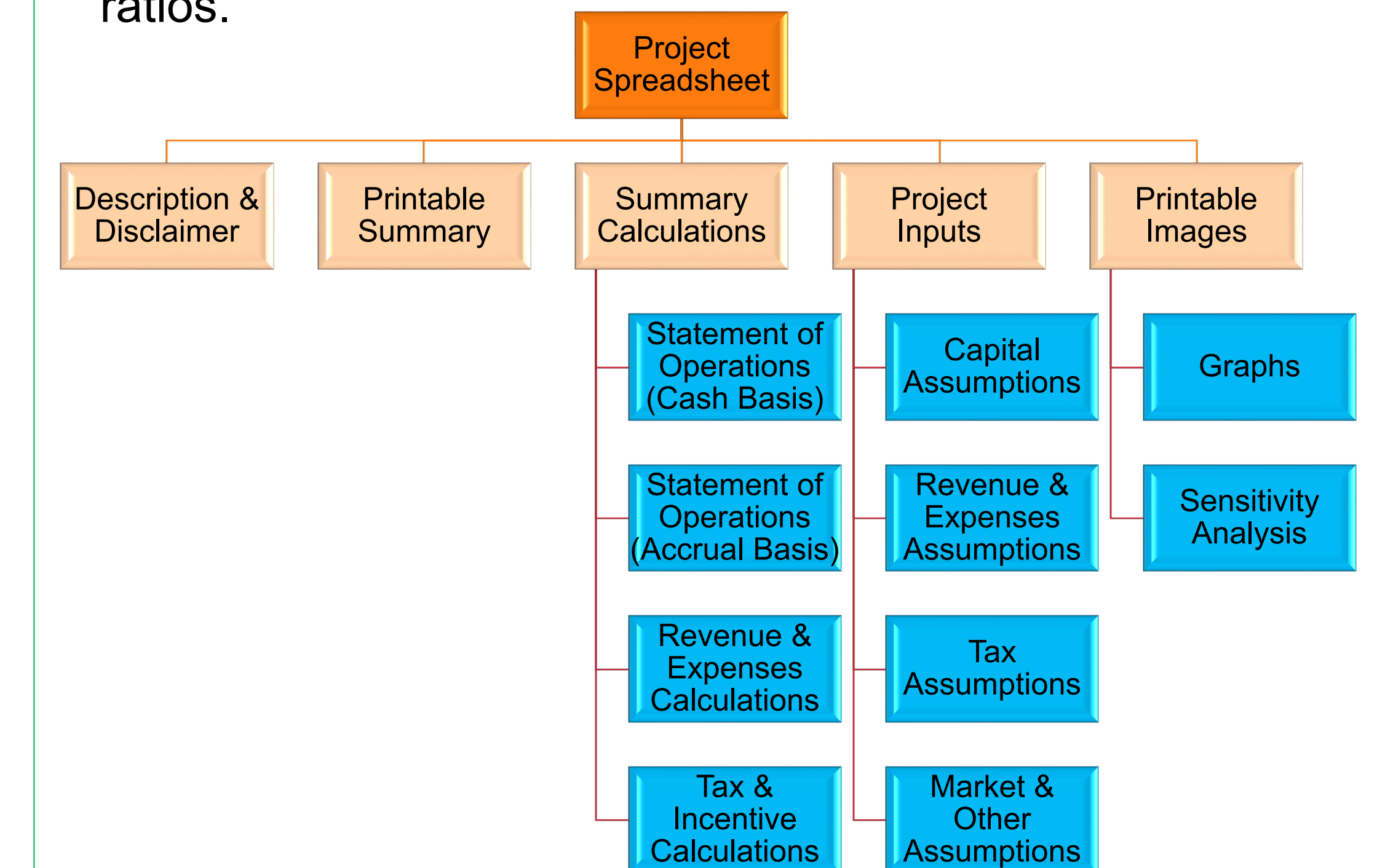


Figure 3: Project spreadsheet layout and major components

Findings and Analysis

Project Energy Output

- Annual production capacity of the project is 87 million litres of low-carbon gasoline and liquefied petroleum gas (propane substitute) combined^[2], 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.

Based on Canadian Market Prices on June 8, 2023

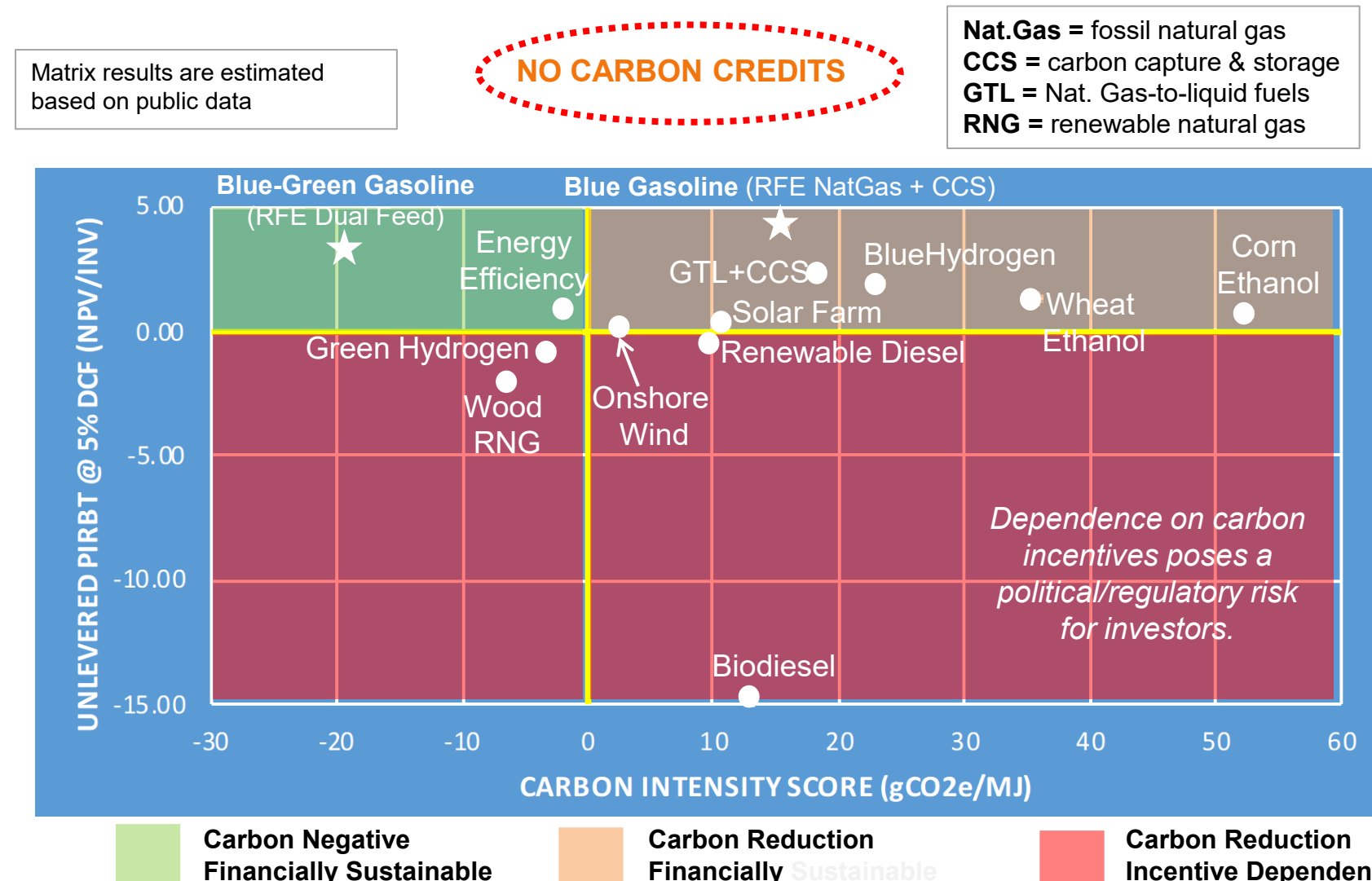


Figure 4: Matrix results of various renewable energy projects^[4]

Summary of Critical Financial Performance Indicators

Key Financial Indicators throughout 20-year Economic Life	Without Carbon Credits	With Carbon Credits
Revenue (CAD millions)	\$2,589	\$3,414
Earnings Before Interest, Tax, Depreciation, Amortization (CAD millions)	\$1,726	\$2,551
Net Income (CAD millions)	\$1,025	\$1,656
Payback Period (Years)	3.7	2.7
Internal Rate of Return (%)	25.0%	34.4%
Net Present Value Before Tax @ 10% Discounted Cash Flow (CAD millions)	\$358	\$646
Project Investment Ratio @ 5% Discounted Cash Flow	3.01	4.95

Sensitivity Analysis

- Breakeven Points for Maintaining a 10% Earnings Before Interest, Tax, Depreciation, Amortization (EBITDA) Return on Investment

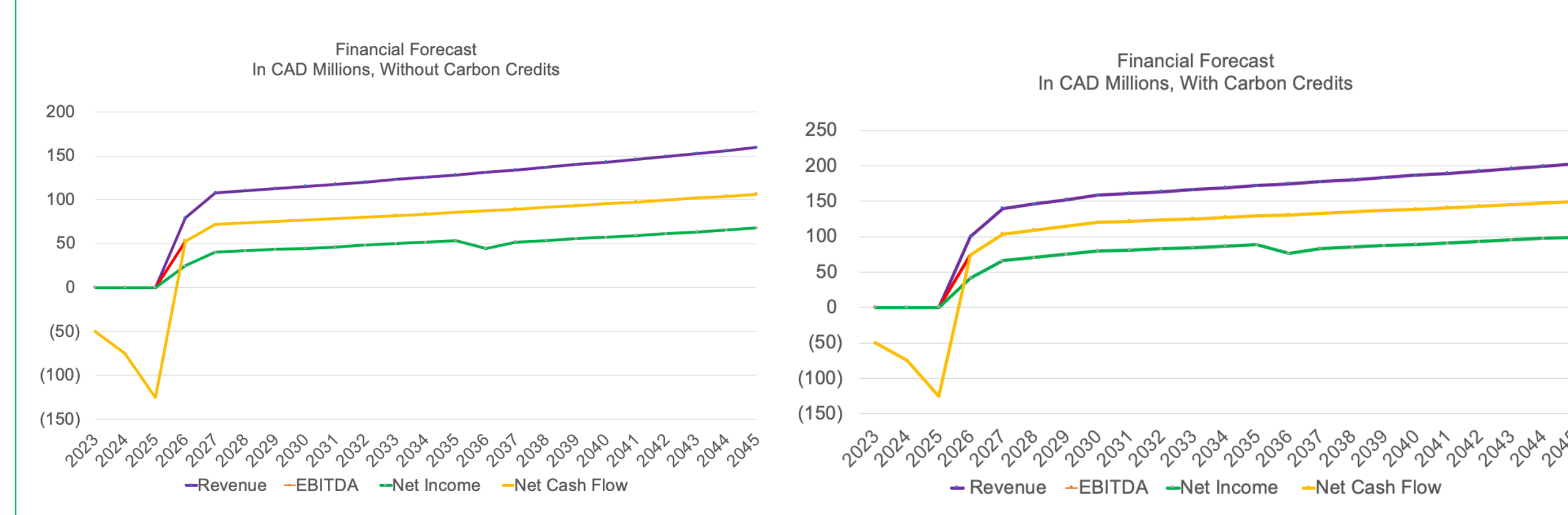
Change of Input	Adjustment (%)	
	Without Carbon Credits	With Carbon Credits
Capital Investment	188%	316%
Output Price	- 43%	- 73%
Biomass Cost	467%	786%
Natural Gas Cost	615%	1,034%
Operation and Maintenance Cost	256%	431%

Most sensitive to price changes, still tolerant

EBITDA Margin Comparison

Company	Principal Business	EBITDA Margin
Rainforest Energy Corp. (Canada)	Low-Carbon Gasoline and Liquefied Petroleum Gas (Propane)	75%
TransAlta Renewables (Canada)	Renewable Power	47%
Brookfield Renewable Partners (Canada)	Renewable Power	43%
Fortis Inc. (Canada)	Electricity, Renewable Natural Gas	40%
Renewable Energy Group, Inc. (USA)	Biodiesel Fuel	9%
Green Plains Inc. (USA)	Ethanol Fuel	- 0.02%

Financial Performance Projection



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

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