Natural Resources Canada: Financial and Market Analysis

Hydrogenation-Derived Renewable Diesel Canadian Business Case Analysis

June 20, 2013

Overview, Methodology and Key Findings

Overview

Engagement overview and purpose

Deloitte LLP (“Deloitte”) has been requested to assist Natural Resource Canada’s (“NRCan”) Financial and Market Analysis group to commission a study on the economics of Hydrogenation-Derived Renewable Diesel (“HDRD”) production in Canada. More specifically, Deloitte has been asked to estimate the capital and operating costs of such plants in Canada based on Bloomberg’s renewable diesel research note dated March 28, 2013 (“Research Note”) and available market research.

Profitability analysis – adapting Bloomberg’s research note

We reviewed the Research Note and other market research to adapt the capital and operating costs to the Canadian market. The profitability analysis (per litre) uses the Research Note as a starting point. The analysis looks at the profitability per liter at a specific point in time for HDRD production.

The analysis was adapted for two plants in Canada. We determined the plant characteristics (size, feedstock and city) based on the availability of feedstock and the proximity to large refining operations (Exxon and Suncor) which generate hydrogen in their powerformer units that is used in hydrofining operations. The plants included in our analysis are the following:

- 50 million litre plant located in proximity to Sarnia using yellow grease / tallow (“Tallow Plant”)
- 250 million litre plan located in proximity to Edmonton using canola oil (“Canola Plant”)

Sensitivities on key risk factors

Based on the available market research and our analysis, we identified the key risk factors associated with our profitability analysis. We then ran sensitivities on these to demonstrate the impact on overall profitability (per litre).

Restrictions on use and distribution

Although a view of the possible future financial prospects of HDRD plants is provided, we offer no guarantee whatsoever that such prospects will be achieved, as the actual results will be affected by various factors outside the scope of the analysis and beyond reasonable foresight, including but not limited to changing market conditions and management decisions. Accordingly the actual results will differ from the analysis included in the report.

This report is intended solely for the information and confidential internal use of NRCan. Our Report should not be disclosed to any other party, quoted from or used by any other party without our prior written consent. No other party is entitled to rely on our Report for any purpose whatsoever.

NRCan provided us with a copy of the Research Note for the purpose of this analysis and we will not use it for any other purpose.

Overview – HDRD Production

Overview of HDRD [1 2]

- HDRD is also known as green diesel or second-generation biodiesel.
- Current production of HDRD in the world is driven by blending mandates and subsidies.
- HDRD can be produced from a wide variety of renewable feedstock, mainly fats and vegetable oils (both virgin and waste)
  - In Europe, production of HDRD is primarily from palm oil, rapeseed oil, tallow, yellow grease, jatropha oil and camelina oils.
  - Asian plants exclusively use palm oil given the significant supply of this feedstock and lower prices.
  - In the United States, all operational plants are using tallow, but there is a plant currently under construction that could use camelina oil. Soy is also a possible alternative given its high supply in the country.
- It is our understanding that production yields for the various feedstock types doesn't vary significantly, however, pre-processing costs may be different depending on the quality of the feedstock.
- HDRD production has greenhouse gas emissions benefits when compared to fossil diesel production, similar or better than biodiesel production. Comparative greenhouse gas emissions benefits of HDRD is dependent on the feedstock used.
- According to Bloomberg, HDRD sells at a higher price than biodiesel given it's better properties (lower cloud point than biodiesel and diesel). Cloud point issues are of particular concern for the Canadian marketplace, making HDRD of interest in Northern regions.
- Some forms of HDRD can be replacements for kerosene.
- HDRD plants don't require complex technologies as it uses hydrotreatment technology currently used in conventional refineries. Refiners could decide to co-produce HDRD at their current facilities given the existing infrastructure.

[1] Research Note

[2] Study of Hydrogenation Derived Renewable Diesel as a Renewable Fuel Option in North America, Eco Ressources Consultants, 2012 ("Eco Ressources Study ")

Methodology

Profitability analysis

In order to complete the profitability analysis for the Tallow and Canola Plants, we used the Research Note as a starting point, adjusted certain assumptions based on our analysis and research and estimated capital costs.

1) Review of the Research Note

- Reviewed the Research Note to understand the various components that were included in the analysis and how each was calculated.
- Highlighted the key pricing and production yield (noted in the Research Note or implied based on noted pricing assumptions) assumptions:
  - Plant characteristics (size, throughput and efficiency);
  - Renewable biodiesel revenue (biodiesel pricing, premium and by-products);
  - Feedstock costs (feedstock pricing and implied production yield);
  - Variable costs (hydrogen and pre-processing costs); and
  - Fixed and capital costs
- Replicated the Research Note analysis and structure.

2) Analysis and research

- Researched and enhanced understanding of the HDRD as well as understand the current HDRD plants around the world.
- Researched market pricing for key biodiesel prices, feedstock prices, hydrogen production costs and naphtha prices.
- Reviewed current and historical biofuel revenues and feedstock costs for Proponents currently in NRCan’s ecoEnergy for Biofuels Program (“ecoEnergy Program”).

3) Capital costs analysis

- Reviewed existing documentation to understand capital project assumptions and context.
- Conducted industry-specific research on the technology and associated constraints or considerations.
- Identified location-specific capital project cost trends (multipliers or construction indices).
- Identified complexities, risks, and other considerations that may drive capital costs.
- Proposed costing ranges according to location and potentially plant size.

Methodology (continued)

Sensitivities on key risk factors

1) Identified key risk factors

- Based on the preliminary profitability analysis, our market pricing research and pricing analysis for the Proponents currently in the ecoEnergy Program, we identified the key risk areas for the analysis.

2) Estimated assumption variability

- Completed trending analysis for key assumptions for the last two years for the following:
  - Biodiesel pricing;
  - Naphtha pricing;
  - Tallow and Canola pricing; and
  - Other vegetable oil pricing (soybean oil and corn oil)
- Identified potential range for these key assumptions.

3) Calculated the impact on profitability

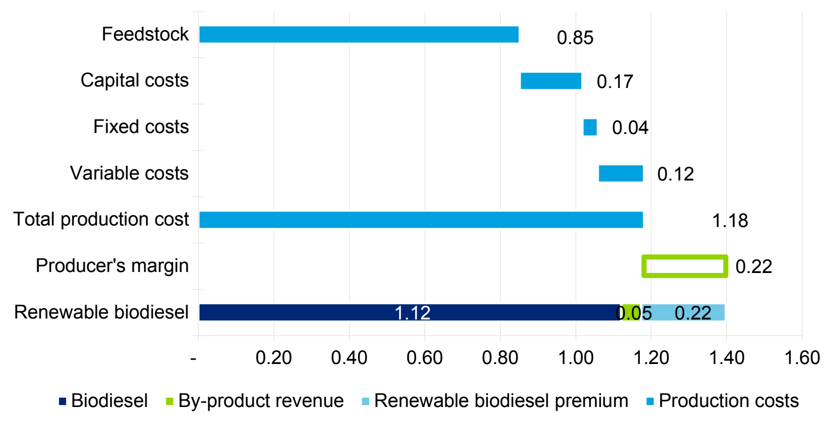
- Ran sensitivities for each risk factor to demonstrate the impact on overall profitability (per litre) using the range of assumptions

Key Findings

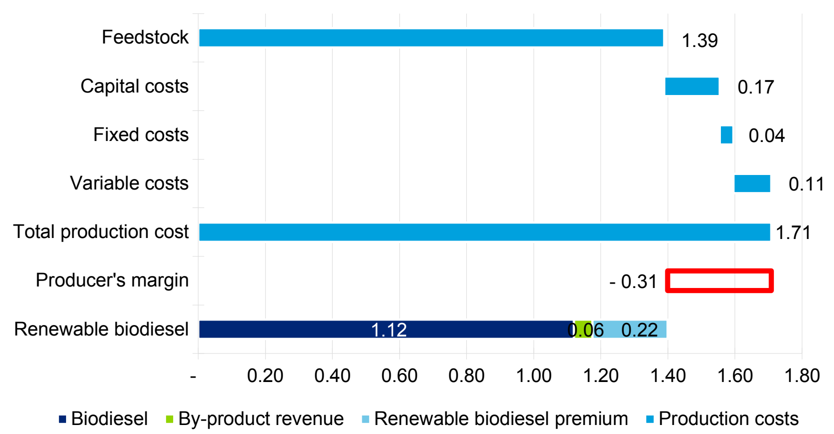
HDRD Financial Assessment

- Based on our analysis, it appears that a Tallow Plant may be economically viable in Canada. However, given the current high price of canola, a Canola Plant may not be economically viable.
- Based on the Research Note and our research, we've estimated that a producer's could generate a profit of be approximately $0.22 / litre for the Tallow Plant and a loss of approximately $0.31 / litre for the Canola Plant.
- The significant profitability difference between both plants may explain the types of plants that are currently commissioned or under construction in the U.S. – five plants use tallow and/or yellow and only one using camelina oil as its feedstock (source: Research Note).
- Key risk areas which may have a material impact (+/- $0.20 / litre) on profitability include:
  - The variability and uncertainty of feedstock prices, more specifically the availability of yellow grease / tallow in specific plant locations and the ability to source canola oil or other vegetable oil at a price that would make the Canola Plant economically viable appears to be difficult; and
  - The uncertainty of renewable biodiesel price and the ability to charge a premium.
- Although capital costs are a critical component of a capital project investment decision, proximity to a steady and on-going supply of feedstock is a more important cost and operation consideration for an HDRD plant.

Tallow Plant



Canola Plant



Profitability Analysis

Assumptions – Adapting the Research Note

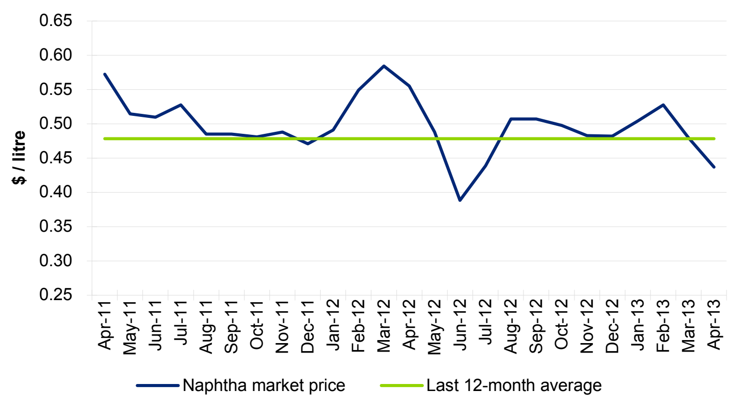
The following table provides the various revenue and cost components from the Research Note as well as the changes made for the Tallow Plant and Canola Plant estimates.

Assumption	Research Note	Tallow and Canola Plants	Comment
Plant			
• Size	400M litres	Tallow: 50M litres Canola: 250M litres	• Adjusted to reflect market conditions in Canada and availability of feedstock
• Target throughput	80%	80%	• Same as Research Note
• Pathway efficiency	80%	80%	• Same as Research Note
Revenue			
• Biodiesel market price	EU: $ 0.97 / litre US: $ 1.19 / litre	$ 1.12 / litre	• Based on the last 12-month average of the Biofuel B100 Index (Chicago), adjusted for conditions specific to the Canadian market.
• Assumed premium	20%	20%	• Same as Research Note. This premium could be a combination of premium paid for the better quality as well as incentives.
• Naphtha by-product revenue	100 litres / tonne of feedstock $ 0.50 / litre	100 litres / tonne of feedstock $ 0.48 / litre	• Yield implied based on naphtha market price used in Research Note. • Adjusted market price based on the last 12-month average. Naphtha pricing has declined in recent months

Biodiesel prices - ecoEnergy for Biofuels

Source: Special Purposes Reports – ecoEnergy Program

Naphtha Market Prices

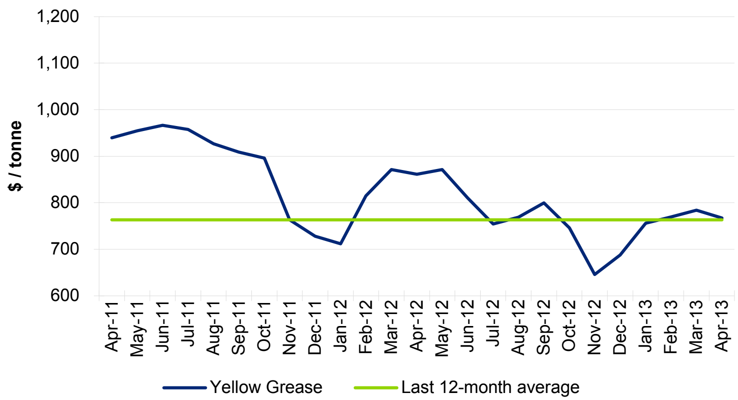


Source: Platts Naphtha Index

Assumptions – Adapting the Research Note (continued)

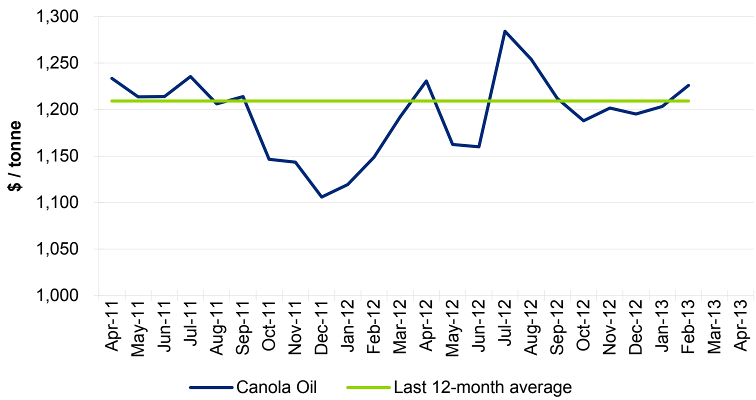
Assumption	Research Note	Tallow and Canola Plants	Comment
Feedstock			
• Production yield (litres per tonne of feedstock)	Yellow Grease: 1,120 Palm oil: 1,088	Tallow: 1,120 Canola: 1,088	• Implied based on market price used and feedstock cost per liter produced from Research Note. • Same as Research Note
• Feedstock market price ($/tonne)	Yellow Grease: $860 Palm oil: $723	Tallow: $763 Canola: $1,209	• Adjusted market price based on the last 12-month average of yellow grease from the United States Department of Agriculture and canola oil prices from Canola Council of Canada (Vancouver) prices.
Capital Cost: calculated assuming an annuity payment for the estimated capital costs, life and weighted average cost of capital			
• Total capital costs (present value)	US: $0.75 / litre EU: $0.80 / litre	Sarnia: $0.83 / litre Edmonton: $0.86 / litre	• Adjusted to reflect market conditions in specific cities – see RS factors included in capital costs section.
• Plant life	20 years	20 years	• Same as Research Note
• Weighted average cost of capital	15%	15%	• Same as Research Note

Yellow Grease



Source: United States Department of Agriculture

Canola Oil



Source: Canola Council of Canada (Vancouver) prices

Assumptions – Adapting the Research Note (continued)

Assumption	Research Note	Tallow and Canola Plants	Comment
Fixed costs			
• Fixed costs (labour costs and royalty fees)	$12.8M ($0.04 / litre)	Tallow: $1.6M Canola: $8.2M	• Increased to reflect higher wages in Canada vs. US (source: Wages for manufacturing sector Globe and Mail)
Variable costs			
• Hydrogen price	$2.50 / kg	From refiner: $2.50 / kg On-site : $4.50 / kg	• Implied based on hydrogen use per litre stated in Research Note. Same as Research Note • On-site production costs based on research prepared by U.S. Department of Energy (Hydrogen Production Multi-Year Research, Development and Demonstration Plan)
• Hydrogen requirement	0.025 kg / litre	0.025 kg / litre	• Same as Research Note
• Pre-processing costs ($/litre)	Yellow Grease: $0.06 Palm oil: $0.05	Tallow: $0.06 Canola: $0.05	• Same as Research Note

Hydrogen cost component	$/kg 2011 estimates
Production unit	0.60
Feedstock cost	1.10
Fixed operating and maintenance costs	0.20
Other variable costs	0.10
Compression, storage and dispensing costs	2.50
Total	**$4.50 / kg**

Source: U.S. Department of Energy

Note:

This costing assumes that hydrogen is produced using distributed steam methane reforming technologies. The U.S. Department of Energy is currently funding research for renewable hydrogen production technologies which they estimate should be able to produce “green” for the same cost.

Profitability Analysis – Tallow Plant

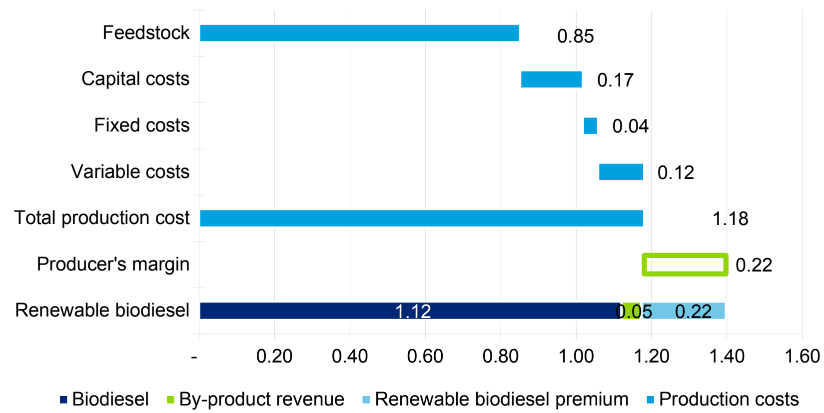
Profitability analysis – good margins may be achieved

- Based on our analysis, it appears that a Tallow Plant may be economically viable in Canada.
- We've estimated that the producer's profit could be approximately $0.22 / litre for the Tallow Plant based on the previously listed assumptions.
- In the event that a hydrogen production facility would be required on-site, we've estimated that the variable costs would increase by $0.05 / litre and result in a producer's profit of approximately $0.17 / litre.

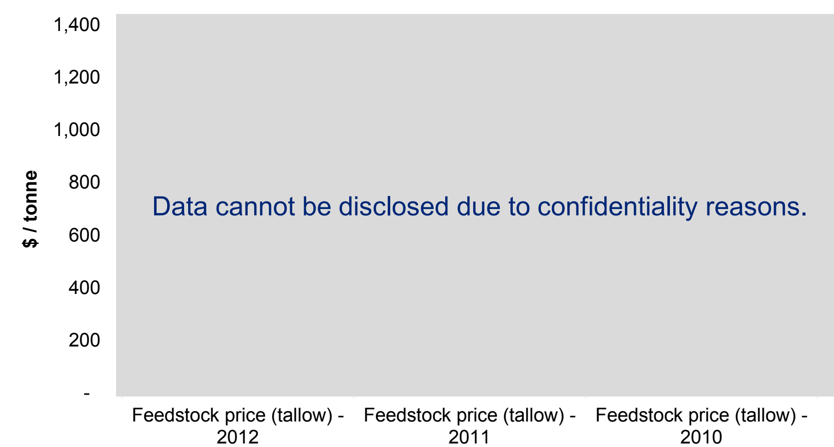
Risk around availability and pricing of yellow grease / tallow

- The main risk with the Tallow plant is the ability to source sufficient feedstock at a reasonable price. The supply of yellow grease and tallow is limited and will greatly depend on the city or region of the plant. This is supported by the significant range paid by the Proponents currently in the ecoEnergy Program over the last three years. Proponents have paid between [redacted] tonne for yellow grease / tallow. Our analysis assumes $763 / tonne based on the 12-month average of yellow grease from the United States Department of Agriculture.
- This risk will be further assessed and the potential impacts on profitability will be calculated in the sensitivity analysis section.
- We have not conducted a detailed analysis on availability of yellow grease and tallow close to Sarnia.

Tallow Plant



Tallow / yellow grease prices - ecoEnergy for Biofuels



Source: Special Purposes Reports – ecoEnergy Program

Profitability Analysis – Canola Plant

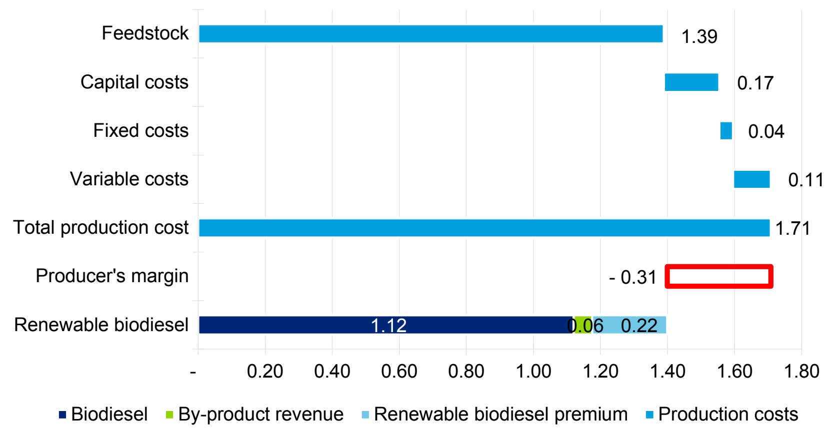
Profitability analysis – does not appear to be viable

- Based on our analysis, it appears that a Canola Plant may not be economically viable in Canada.
- We've estimated that the producer's loss could be approximately $0.31 / litre for the Canola Plant based on the previously listed assumptions.
- The potential significant losses for a Canola plant may explain the types of plants that are currently commissioned or under construction in the U.S. – five plants use tallow and/or yellow grease and only one using camelina oil as its feedstock. This plant is however potentially suspended (source: Research Note).
- In the event that a hydrogen production facility would be required on-site, we've estimated that the variable costs would increase by $0.05 / litre and result in a producer's loss of approximately $0.36 / litre.

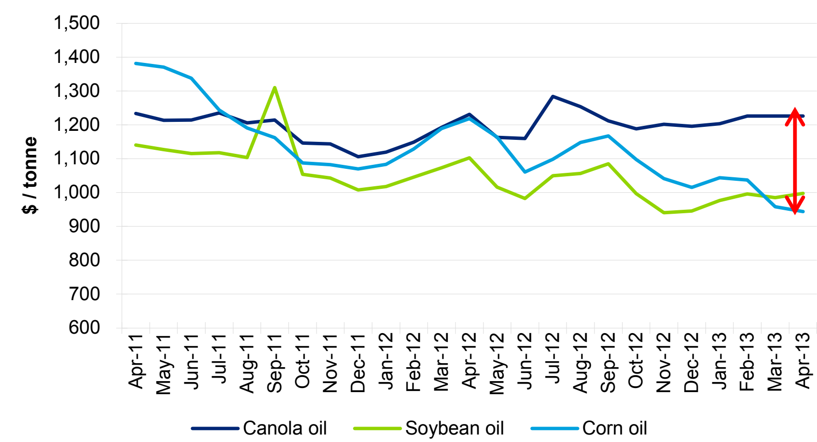
High canola oil prices have significant impact on profitability

- The main reason for the estimated loss is due to the high canola oil prices. The feedstock cost of $1.39 / litre is almost equal to total revenues (including premium and by-products) of $1.40 / litre.
- We understand that the type of vegetable oil used for the production of HDRD is relatively flexible without affecting the production yield. As such, a plant using corn oil and/or soybean oil may be more economically viable than one using canola oil as demonstrated in historical market prices. The market price of both corn oil and soybean oils is currently around $1,000 / tonne which is more than $200 / tonne less than canola oil.
- The impacts on profitability of lower feedstock prices will be calculated in the sensitivity analysis section.
- We have not conducted a detailed sourcing analysis for canola oil, corn oil and soybean oil available in western Canada. However, we understand that the current supply of corn oil and soybean oil is significantly less than canola oil.

Canola Plant



Canola, soybean and corn oil



Source: United States Department of Agriculture

Basis for Capital Costs

HDRD Plant Cost Considerations

Technology considerations

- With several HDRD plants already operational, the risk of immature technology is reduced, for example compared to other technologies not proven at higher volumes such as pyrolysis and Fischer-Tropsch processes.
- Co-processing with conventional crude requires only inventory management and minimal operational scheduling impacts, compared with decontamination and cleaning and dedicated storage and transport for biodiesel.
- Caution is advisable using US plants as comparables due to differences in tax laws (eg. biodiesel blenders credit), which, in some cases, influence plant engineering design, and subsidies.

On hydrogen production

- Hydroprocessing of renewable diesel offers opportunity to produce a sustainable drop in transportation fuel compatible with existing fuel infrastructure and engine technology. In that regard, proximity to hydrogen production offers cost synergies.
- Inclusion of Hydrogen production capacity in development or partnering with existing facility is a factor in capital cost.

Regarding Feedstock

- In contrast to biodiesel, HDRD can make use of a wider range of feedstock including Lignocellulosic biomass, e.g. for wood pulp and paper operations.
- Defining feedstock (eg. rapeseed, crude oil, waste/animal fat) may drive plant design and equipment, and ultimately capital costs. The extent to which processing is feedstock-specific or dependent is not clear.
- Existing hydrotreatment plants have experienced significant idleness due to a lack of sufficient feedstock.
- Operating plants have shown little profitability, which is impacted by several external factors (eg. feedstock prices, market prices, and government subsidies).

Capital Cost Ranges

The Eco Ressources Study and the Research Note both identified cost and capacity metrics for operational plants.

- Early small to medium scale plants were based on retrofit of existing plants, thereby biasing estimates of costs lower than would otherwise be incurred.
- Eco Ressources Study included two hypothetical plants, for which estimates could not be verified and which had a price inconsistent with the capital cost as a function of production capacity.
- Neste has built and operated more HDRD plants than any other organization, starting with two small retrofitted plants before building two similar, large capacity plants. Its organizational learning should have significant capital cost reduction benefits.
- Geographical factors play a substantial role in capital costs, e.g. Neste's two similar plants in Rotterdam and Singapore differed in price by 15-38%, depending on the source of the cost information.

Plant costing ranges are dependent on location and plant size.

- Three plants of < 5000bpd (barrels per day) have been completed in the past 6 years for a price below $150M.
  - Two of those were retro-fit plants
  - The third plant is the subject of a patent infringement action
- A US plant completed in 2010 with a capacity of 9000bpd had a price of $330-410M.
- Two large plants of 16,000bpd have been completed in 2010/2011 for prices of $725M - $1B.
- Co-processing with conventional diesel in an existing refinery has the potential of significant capital savings as hydrotreatment is already used to de-sulfurize fractional distillates.
- At least one study suggests there is no capital cost benefit to building plants with capacity >5000bpd

Location Impact on Plant Capital Costs

Although capital costs are a critical component of a capital project investment decision, decisions on the location of a long life plant or facility should be determined by operating costs. In this case, proximity to a steady and on-going supply of feedstock is a more important cost and operation consideration for an HDRD plant.

- When considering multiple geographical locations for a new plant, construction cost indices can be a useful indicator of cost differentials.
- Input considerations of construction cost indices include labour costs, available supply of skilled workers, economic and market conditions, influence of regional unions, material costs, etc.
- Construction cost indices are based on a wide range of assumptions which are invalid when certain parameters change, such as access to specific technologies, opportunity costs, tax laws, government subsidies, material discounts, easements, site access and remote locations, among other factors.

(RS Means) Construction Cost Index

Year	Edmonton	Sarnia
2013	114.8	109.1
2011	114.9	111.4

The current difference in construction costs between Edmonton, Alberta and Sarnia, Ontario, is in the order of 4-5% based on RS means. Note that actual costs can vary significantly dependent on number and timing of local projects, among other factors.

See Appendix for additional information on RS Means

Critical Decisions Impacting Capital Costs

Several critical decisions must be made to define the parameters and success criteria that justify capital project investments. The following are a list of considerations and critical questions that should be considered before an HDRD facility investment is made.

- What are the objectives of the investment?
  - Commercial capability? Proof of concept?
  - Initiating technology development for long-term capability?
- What legislative support does the Government of Canada expect to offer?
- What is the existing Canadian technology heritage? Is there a technical advantage or license/patent leverage that can be exploited?
- What is the expected industrial permitting strategy?
- What is the pay-back period?
  - How is “success” defined?
  - What is the time horizon for “success”?
- What are tolerance limits to feedstock risk/ uncertainty, with respect to availability and price?
  - How flexible must design be?
  - Is there willingness to reinvest as supply–side matures?
  - Is there a business case for investing in supply-side, the current known major bottleneck in the renewable diesel supply chain?
- Has investment option been considered for processes other than hydrotreatment?
- How would absence of a hydrogen production partner impact the investment decision?

Sensitivity Analysis

Sensitivity Assumptions and Rationale

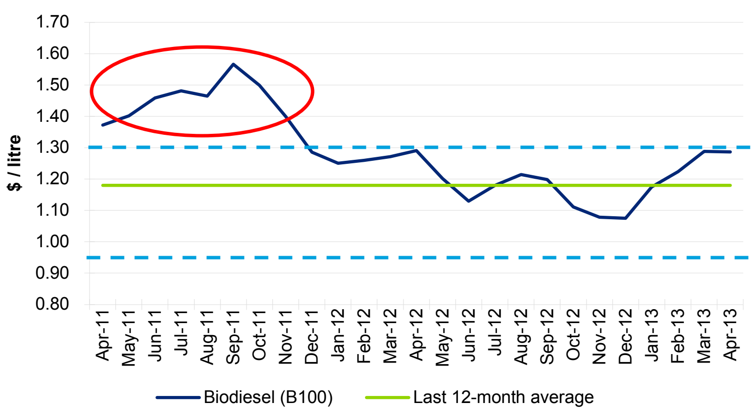
The following table provides the identified key risk factors as well as the assumptions used for our sensitivity analysis for the Tallow Plant and Canola Plant.

Key Risk Area	Base Case	Worst Case	Best Case	Rationale
Plant				
• Target throughput	80%	60%	90%	• Based on Research Note. This range is similar to the range of throughput achieved by the larger producers currently in the ecoEnergy Program.
• Pathway efficiency	80%	70%	85%	• Based on Research Note
Revenue				
• Biodiesel market price	$ 1.12 / litre	$ 0.95 / litre	$ 1.30 / litre	• Based on lowest and highest prices received from Proponents in the ecoEnergy Program in the last two years. • **Worst Case:** The worst case assumption is approximately $0.10 / litre lower than the lowest level of the B100 Index (Nov – Dec 2012). • **Best Case:** The Biodiesel Index (B100) was even higher than our best case assumption being over $1.30 / litre for most of 2011.
• Assumed premium	20%	5%	25%	• **Worst Case:** Minimal premium paid and no incentives provided to support renewable biodiesel production. • **Best Case:** Incentive of approximately $0.28 / litre paid which is similar to the incentive offered by the ecoEnergy Program ($0.26 / litre in first year of program).

Biodiesel prices - ecoEnergy for Biofuels

Source:: Special Purposes Reports – ecoEnergy Program

Biodiesel Index (B100) - Chicago

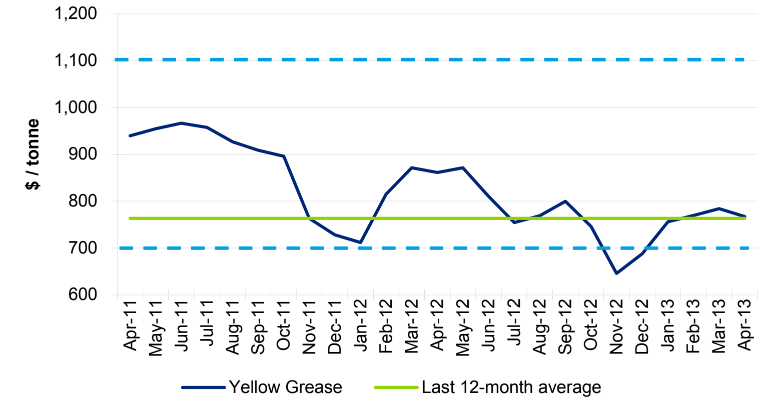


Source: Oil Price Information Service

Sensitivity Assumptions and Rationale (continued)

Key Risk Area	Base Case	Worst Case	Best Case	Rationale
Feedstock price ($ / tonne)				
• Yellow grease / Tallow	$763	$1,100	$700	• **Worst Case:** Based on yellow price index (lowest price in last 2 years) • **Best Case**: Based on highest price within the range of feedstock prices paid by proponents in the ecoEnergy Program.
• Canola Oil	$1,209	$1,250	$950	• **Worst Case:** Based on recent prices for soybean oil and corn oil • **Best Case**: Based on canola oil price index (highest price in last 2 years). The normalized average for the few Proponents in the ecoEnergy Program using canola oil was [redacted].
Capital Cost ($ / litre)				
• Tallow	$0.83	-20%	+50%	• **Worst Case**: increased construction efficiencies and potential a plant retrofit • **Best Case**: estimated based on risk factors and unknowns listed in capital costs section
• Canola	$0.86	-20%	+50%	

Yellow Grease

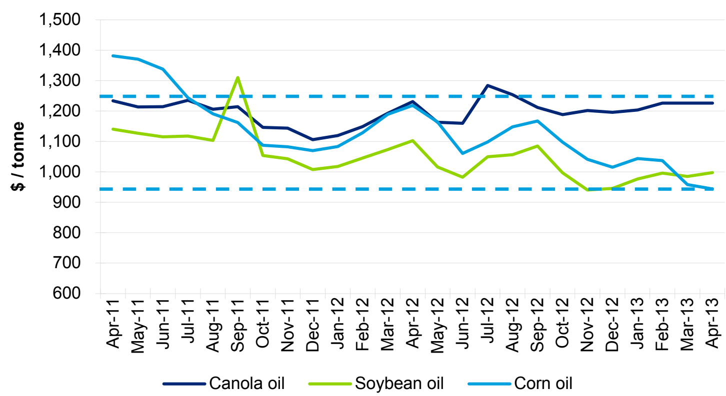


Source: United Stated Department of Agriculture

Tallow / yellow grease prices - ecoEnergy for Biofuels

Source: Special Purposes Reports – ecoEnergy Program

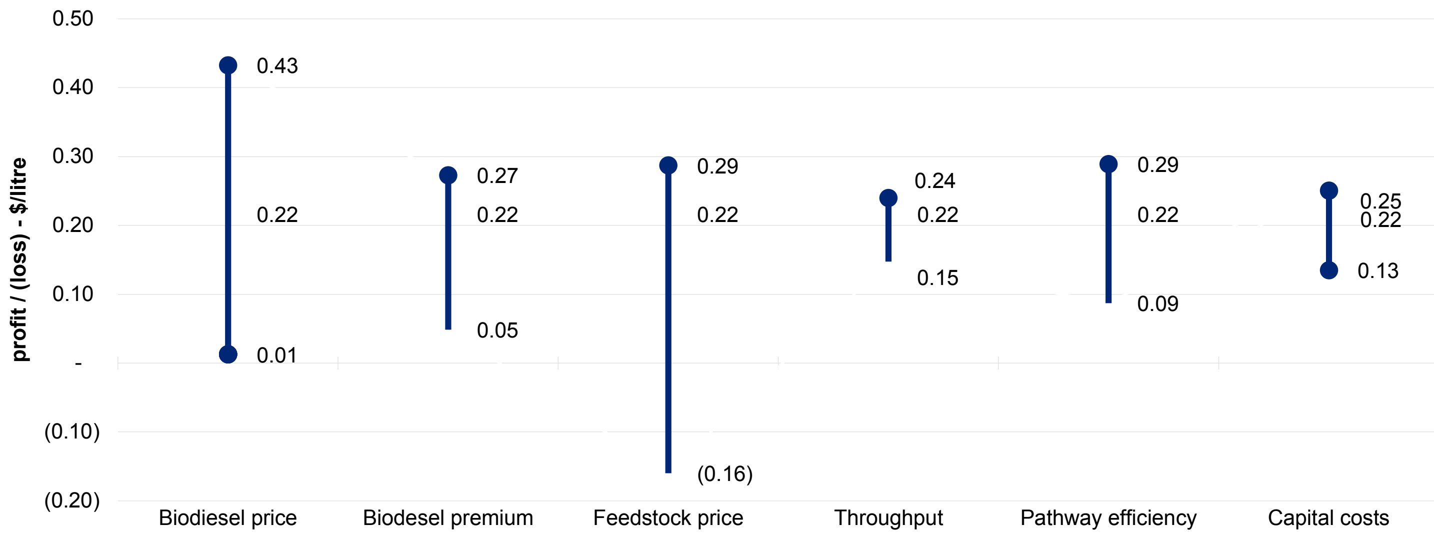
Canola, soybean and corn oil



Source: United States Department of Agriculture

Sensitivity Analysis – Tallow Plant

The following graph show the resulting producer's gross profit for each of the sensitivities for the Tallow Plant:



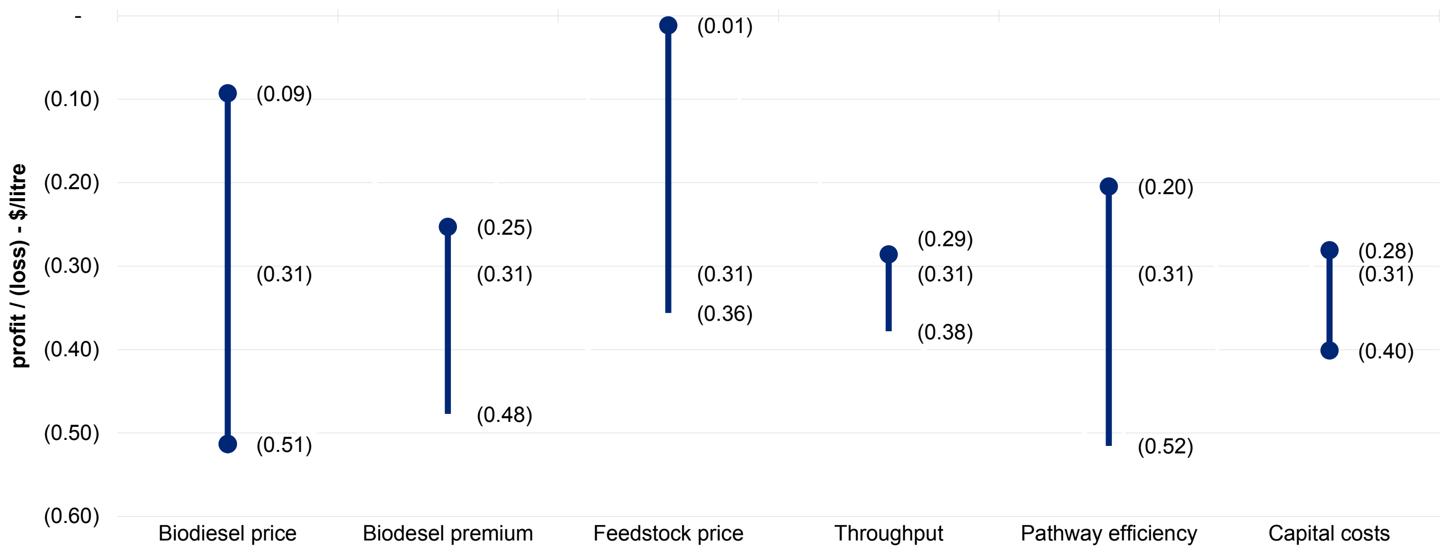
Sensitivity analysis observations:

- Biodiesel price and feedstock price are the risk factors that could have the most significant impact on profitability.
- The change in biodiesel prices results in an increase of $ 0.22 / litre (best case) or decrease of $ 0.20 / litre (worst case).
- The increase feedstock price sensitivity has the most adverse effect on profitability as this would result in a $ 0.38 / litre increase in production costs.
- Only two of the sensitivities (biodiesel price of $ 0.95 / litre and feedstock price of $1,100 / tonne) would result in a loss per litre.
- The pathway efficiency cost sensitivity has a moderate impact on results as it is linked to feedstock costs, while throughput and capital costs sensitivities have a minimal impact on results mainly because of the variable cost structure of HDRD production.

Key Risk Factors	Base Case	Worst Case	Best Case
Biodiesel price	$1.12 / litre	$0.95 / litre	$1.30 / litre
Assumed premium	20%	5%	25%
Yellow grease / tallow	$763 / tonne	$1,100 / tonne	$700 / tonne
Target throughput	80%	60%	90%
Pathway efficiency	80%	70%	85%
Capital costs	$0.83 / litre	$0.66 / litre	$1.24 / litre

Sensitivity Analysis – Canola Plant

The following graph show the resulting producer's gross profit for each of the sensitivities for the Canola Plant:



Sensitivity analysis observations:

- Biodiesel price, feedstock price and pathway efficiency are the risk factors that could have the most significant impact on profitability.
- The change in biodiesel prices results in an increase of $ 0.22 / litre (best case) or decrease of $ 0.20 / litre (worst case).
- A decrease in feedstock price has the most positive effect on profitability as this would result in a $ 0.30 / litre decrease in production costs.
- Only one sensitivity (feedstock price of $950 / tonne) would result in close to break-even per litre. All other sensitivities still result in a loss per litre. This clearly demonstrates that for HDRD to be financial viable in Canada, feedstock prices need to decrease. This could be achieved by improving feedstock crop yields or growing feedstock with higher yields in Canada and North America.
- The throughput and capital costs sensitivities have a minimal impact on results mainly because of the variable cost structure of HDRD production.

Key Risk Factors	Base Case	Worst Case	Best Case
Biodiesel price	$1.12 / litre	$0.95 / litre	$1.30 / litre
Assumed premium	20%	5%	25%
Canola oil	$763 / tonne	$1,250 / tonne	$950 / tonne
Target throughput	80%	60%	90%
Pathway efficiency	80%	70%	85%
Capital costs	$0.86 / litre	$0.69 / litre	$1.29 / litre

Deloitte.

Appendix – Interpreting RS Means, Construction Cost Index

- RS Mean data represents a 30 [Major US] city average construction cost index. It serves as a National Average (i.e. 100% represents the North American average construction cost)
- The 30 cities that make up the sample data are listed below.

Atlanta, GA	Memphis, TN
Baltimore, MD	Milwaukee, WI
Boston, MA	Minneapolis, MN
Buffalo, NY	Nashville, TN
Chicago, IL	New Orleans, LA
Cincinnati, OH	New York, NY
Cleveland, OH	Philadelphia, PA
Columbus, OH	Phoenix, AZ
Dallas, TX	Pittsburgh, PA
Denver, CO	St. Louis, MO
Detroit, MI	San Antonio, TX
Houston, TX	San Diego, CA
Indianapolis, IN	San Francisco, CA
Kansas City, MO	Seattle, WA
Los Angeles, CA	Washington, DC

To apply a location cost adjustment, use the following calculation.

$$\frac{City\ A\ Index}{City\ B\ Index}\, x\ City\ B\ Cost = City\ A\ Cost$$

- The Index does not reflect or consider:
  - Managerial efficiency
  - Competitive conditions
  - Automation or technology
  - Restrictive union practices
  - Unique local requirements
  - Regional variations due to specific building or environmental codes

Sample Locations	2013 RS Mean range
Louisiana, USA	77.6 – 88.4
Missouri, USA	91.2 – 104.0
Texas, USA	72.7 – 86.5
Washington, USA	91.8 – 103.8
Alberta, Canada	104.5 – 114.8
Ontario, Canada	103.2 – 112.3