1. Title Page

Canary Biofuels Inc.
(formerly Invigor Bioenergy Corporation)
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Calgary, Alberta, Canada, T2R 0C5

Project ID: B0160850
Project Title: Canary Biofuels - Technology Upgrade

Project Leader: Brian Sorenson, VP Finance & Accounting at Canary Biofuels Inc.
ERA Project Advisor: Mehr Nikoo, Senior Manager, Clean Technology at Alberta Innovates
Start Date of Project: March 1, 2021
Completion Date of Project: March 31, 2022
TRL at Project Initiation: TRL 8
TRL at Project Completion: TRL 9
Total actual ERA funds received (including holdback): $4.7 million

Total Actual Project Costs

Actual	Total Project	Total Eligible
Labour	$2,550,889	$2,550,889
Equipment	$11,338,204	$11,338,204
Materials & Supply	$5,630,635	$5,630,635
Overhead	$2,589,273	$1,608,571
Total	**$22,109,000**	**$21,128,298**

Final Outcomes Report Submission Date: May 31, 2022

Project Description

Canary Biofuels Inc. ("Canary") modified a fully permitted biodiesel facility in Lethbridge, Alberta to enable it to convert local waste feedstock (tallow, used cooking oil) from its previous operating design of food grade feedstock (canola oil, soybean oil) through a unique and innovative process placing it as a "first of its kind" in Canada and among the most technically advanced biodiesel facilities in North America.

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5. Executive Summary

Canary has re-commissioned an existing biodiesel plant (formerly the Kyoto Fuels facility) in Lethbridge Alberta to convert waste oils into low-carbon biodiesel.

The ERA project, as defined, demonstrated the commercial feasibility of the Canary facility configuration proving out the reliability of the plant as designed.

There is no other complete technology slate currently available that has similar results to Canary's and is as effective as distillation, producing high-purity ASTM quality biodiesel. Dry-stripping of the biodiesel followed by a reactive forecolumn to react and remove excess glycerin is the most reasonable approach for biodiesel finishing prior to distillation, in that it removes the requirement to wash the biodiesel and dispose of the wash water. Finally, the glycerin wash innovation is a superior advancement in feed oil pre-treatment – it saves a large amount of needless distillation energy and is better at removing and destroying contaminants that are detrimental to the downstream conversion process. Elements of this technology slate in the US were used by: BioVantage, Blue Sun, Viesel, GreenHunter, and Lakeview Biodiesel representing around 10% of the biodiesel plants in the US. There are no other biodiesel plants in Canada that incorporate this complete slate of technologies like the Canary facility.

Canary's technology slate:

- Combined Methyl Ester Distillation/ Fore Column
- Glycerin Wash

The emission reduction by the Canary facility stem from two key mechanisms:

1. Consumption GHG reduction: The displacement of conventional fossil diesel with use of Canary's biodiesel (making up ~95% of the GHG reduction)
2. Operations GHG Reduction: The diversion of waste canola oil (making up ~5% of overall GHG impact)

Waste canola: A sample is taken from the canola seed bin. If it does not meet the below grading, it is considered offspec and is discarded in a landfill

- No. 1: 5% damaged canola seed (0.1% heated seed)
- No . 2: 12% damaged seed (0.5% heated seed)
- No. 3: 25% damaged seed (2% heated seed)

An average of 2.3% of each years' canola crop is classified as 'feed, waste or dockage' by Statistics Canada, representing an average of 460,000 tonnes per year of off-spec seed

The canola seed is crushed into meal and oil. Canary uses the oil for producing biodiesel, therefore diverting the canola seed from the landfill. While a few cold-press crushers exist to salvage off-spec/spoiled canola for meal, this capacity is not enough to service Canary's feedstock requirements, nor enough to salvage all of the offspec oilseed.

The facility produces a water white biodiesel product in addition to a co-product, glycerin. Biodiesel is the only alternative fuel to voluntarily undergo the United States EPA Tier I and Tier II testing to quantify emission characteristics and health effects. That study found that B20 (20% biodiesel blended with 80% conventional diesel fuel) reduced total hydrocarbons by up to 30%, carbon monoxide up to 20%, and total particulate matter up to 15%. Research also documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50% less than that of petroleum fuel. Pure biodiesel does not contain sulfur and therefore reduces sulfur dioxide exhaust from diesel engines to virtually zero.

Biodiesel is currently being shipped to Minnesota, USA, as this market has the highest price for biodiesel.

There have been challenges with the rollout of the Clean Fuel Standard (CFS). Numerous delays in the rollout of the standard has the target publication of final CFS regulation in Spring 2022. Until the CFS is rolled out, the most economic market will be the United States. For Canadian producers to sell biodiesel or renewable diesel into Canada, the carbon generation and pricing needs to be competitive with the United States. We eagerly await the CFS publication.

At full production output, depending on biofuel volume consumed in Alberta, Canary is expected to reduce Alberta's GHG emissions in the range of 232,000 – 488,000 tonnes CO2eq annually by 2024 and for at least 10 years thereafter.

6. Project Description

Introduction

Canary acquired a fully permitted biodiesel facility in Lethbridge, Alberta (formerly Kyoto Fuels facility) that was a Generation 1 idled biodiesel plant. The technology of a Generation 1 facility converts food grade oils. The Project upgraded this technology to convert waste oils thus classifying it as a Generation 2 biodiesel facility.

Background

All biodiesel is made from the chemical reaction that converts a vegetable oil or animal fat into biodiesel. Generation 1 biodiesel production utilizes transesterification processing. Transesterification requires a free fatty acid ("FFA") of 0.5% or less, otherwise, the catalyst is consumed due to the formation of soaps. This base method is not suitable for feedstocks with high FFA content such as some non-edible vegetable oils, waste cooking vegetable oils, or animal fats. Given this drawback, these plants can only use food grade feedstocks (low FFA) and are classified as Generation 1 biodiesel plants.

Environment & Economic Limitations of Generation 1

- Food Diversion: Uses food grade oils as feedstock (canola oil, soybean oil) – using edible oils can increase the cost of food for consumers
- Higher Feedstock Prices: Food grade oils are higher in price due to competitive buyers for food use
- Lower Selling Price: Converting Food-to-fuel results in higher carbon intensity ("CI"), which generates fewer carbon credits and therefore receives a lower selling price

The Project: Technology Upgrade

Technologies that can convert waste oils (High FFA) to biodiesel are essential for economic viability. These plants are classified as Generation 2 biodiesel plants. Canary used a combination of a Methyl Ester Distillation Unit that incorporates a unique and innovate Reactive Forecolumn as well as a Glycerin Wash Process which converted it from the previous operating design of a Generation 1 facility to an advanced Generation 2 facility.

Environment & Economic Benefits of Generation 2

- Lower Feedstock Prices: Waste feedstocks with higher FFA are priced lower
- Waste Diversion: Creates new markets for farmers/ranchers as a result of feedstock consumption that might otherwise be discarded
- Lower Environmental Impact: Waste feedstocks have a lower CI as waste is diverted from landfill, etc.
- Higher Selling Price: Lower CI results in generating greater carbon credits converting to a higher selling price

Technology Slate Expected Results

- Higher finished biodiesel quality that exceeds ASTM D6751 specifications
    - Reduction of impurities in finished product
    - High initial quality product creates consistency with meeting specifications given variety of feedstocks
- Reduction in water use and disposal
    - Dry stripping and residual glycerin conversion rather than water washing
    - Rejection of excess heat via a dry fin-fan cooler rather than evaporative cooling water
    - Conversion of existing methanol rectifying column to higher efficiency with fin-fan
- Optimization of energy usage
    - Using transesterification glycerin to clean oil rather than evaporating methanol/water
    - Able to use less-exotic metals in the design
    - Lower chemical costs by reducing catalyst usage
- Ability to take ~15% FFA feedstocks
    - Lower cost of feedstock as these are considered waste oils
    - Additional options of feedstocks that wouldn't exist without ability for higher free fatty acids
    - Optimize feedstock slate allows the plant to continually operate (not dependent on few feedstock sources)
    - Latent ability to reduce sulfur in final product if desired

The Management Team

- George Wadsworth, CEO - 25+ year energy leader, entrepreneur, founder and executive of private and public companies
- Rob Skilnick,CFO – 20+ year energy finance and accounting executive, private and public companies
- Lorne Petersen, VP Business Development – 25+ year energy, agriculture and renewable energy entrepreneur
- James Graham, VP Operations Engineering – 25+ year energy executive, engineering, operations and commercial development
- Kavanagh Mannas, VP Corporate Development – 15+ year energy and renewable energy executive, engineering and commercial development
- Brian Sorenson, VP Finance & Accounting: 12 + years experience in finance, audit and accounting

Board of Directors

- Kent Brown, Board Chair – 25 year renewable energy executive
- Jennifer Carscallen, Director – 20 year ESG focused entrepreneur
- Cody Church, Director – 25 year private equity investor and director
- Ryan Ellson, Director – 20 year energy executive and CFO
- Tony Lorie, Director – 25 year investment banker

Project Objectives

Overall objective was to modify the existing biodiesel plant using a unique first of its kind in Canada technology slate. This technology slate enabled locally generated waste fats and oils to be converted into 69 million liters of low carbon intensity biodiesel annually. There were no evolution or revisions from the original objective

There were no changes to the Project scope during the lifecycle of the project nor any change to the corporate structure. As Canary was the holding company and owned 100% of Invigor Bioenergy Corp, for simplicity Invigor

Bioenergy Corp and Canary Biofuels Inc. amalgamated to continue as one single entity, Canary Biofuels Inc. on December 31, 2021.

Technology Risks

- Risk: Lack of Technology Specific Know-How
- Mitigation: Cultivate relationships with biodiesel experts. Involve early in the project as required. Build local and internal capability over time.
- Findings: Management relied on Canary's VP Operations Engineering – 25+ year energy executive, engineering, operations and commercial development as well as the Plant Manager who ran the facility previously when it was Kyoto. The Company faced challenges bringing in industry experts as they resided in the United States during the pandemic. Virtual meetings were held which had less of an impact than physically at the plant.

- Risk: Technology slate fails to produce ASTM quality biodiesel
- Mitigation: Select commercially proven technology. Retain engineering firm with proven experience integrating similar technology upgrades. Insure process integration. Hire staff several months in advance of production to train such that they are familiar with the plant to minimize commissioning challenges.
- Findings: Commercially proven technology was selected. Applying new facility process was challenging given the lack of local Alberta labour with experience in operating a generation 2 biodiesel facility and understanding when to and how to effectively manage changing input feedstocks. Therefore, the plant has produced some batches of off-spec biodiesel due to these challenges. These off-spec batches of biodiesel can generally be re-run and the local plant operators have gained significant experience which will help achieve the near and long-term project goals.

- Risk: Technology slate fails to perform with Mass Energy Balance projections
- Mitigation: Select commercially proven technology. Retain engineering contractor with proven experience integrating similar technology upgrades. Insure overall process performance. Develop and maintain effective relationships with other plant operators, and industry to share learnings and best practices.
- Findings: It has taken longer than anticipated to achieve Mass Energy Balance projections on a consistent basis primarily as a result of practical experience limitations of the local labour force, previously mentioned. However, we have already seen significant improvements and have had many learnings, in particular as we utilize 3rd party industry experts to assist in training our professional bio and chemistry staff responsible for testing and ensuring product ASTM specifications are achieved. Furthermore, by ensuring we had available 3rd party industry experts, technology selection and plant capabilities have been further endorsed.

- Risk: Plant design process is not being followed caused by human error
- Mitigation: BSI (the designer) provided a process narrative describing how the plant should be operated. Canary to establish quality control and management systems – such as analyzing samples throughout the process to determine efficiency and process implementation was working.
- Findings: Acid Esterification chemistry requires monitoring more frequently. More strict FFA frequency of testing was needed to ensure product quality. We cannot re-run partially converted products through the plant at any significant rate. Real time measurements and strict process monitoring is essential for producing on-spec biodiesel product. Currently, real time measurements and process monitoring/ following correct processes is more critical than automation.

7. Project Work Scope

Scope
To modify the existing Kyoto facility

Highlights
- Removed existing AE and replaced it with larger reactors
- Installed two distillation towers and a heating/cooling system

Result
To change the biodiesel production process from Generation 1 (food to fuel) to Generation 2 (waste to fuel)

Commissioning Description:
- Entire facility was broken down into 5 separate work areas
- Each work area was addressed sequentially at a different point in the commissioning system:
    1. Pump motors were bumped;
    2. Instrumentation was signal verified and calibrated;
    3. All control systems were updated or written;
    4. All lines and vessels were wet commissioned to test for leaks or pressure where required;
    5. Utility system was brought online proving the cooling water, steam boilers, and water treatment systems

Once all the requirements were met, the commissioning was developed in 3 stages:
1. Super degummed canola was run through the TE system and then to the Distillation system to commission the TE process and distillation system.
2. Glycerin system was commissioned with crude glycerin produced through the TE system to produce glycerin and recover methanol
3. AE was commissioned with DCO and soya that ran through the whole system

Results/Achievements
- The TE and distillation column ran as expected and produced on spec ASTM biodiesel
- ASTM quality biodiesel was sold FOB Raymond Alberta, effectively reducing emissions via displaced petroleum diesel
- The AE process is the more challenging of the processes. It is critical that the AE process brings the FFA level down through two acid-esterification processes, generally targeting below 1% levels to prevent problems downstream in the production process. We continue to refine this process and our lab staff and testing processes have advanced significantly ensuring our AE processes contribute to ASTM biodiesel production allowing us to maximize.
- No lost time safety incidents

8. Commercialization

As commissioning created ASTM specification biodiesel product, Canary was in commercial deployment at the end of the project and continues to be.

Update of Achievement of Performance/ Success metrics outline in Contribution Agreement

Table 1 – Success Metrics

Success Metric	Commercialization Target	Project Target	Actual Result	Explanation
Litres biodiesl produced	> 85.5% Utilization (140mm litres)	85.5%	25%	Slower than anticipated ramp up in production during commissioning
Opex	<$0.5/gallon	<$0.45/gallon	$0.65/gallon	Slower ramp resulted in higher fixed costs
GHG	• Operations GHG Reduction: 12,000 – 48,000 tonnes CO2e/year • Consumption GHG Reduction: 220,000 - 440,000 tonnes CO2e/year	Annualized 79,000 tonnes CO2e/year	Annualized 20,000 tonnes CO2e/year	Based on a lower production that is annualized. Would be in line if production was higher

Technological Readiness Level Advancement over the course of the Project

The project Technology Readiness Level ("TRL") started as TRL 8 which is defined as "Actual technology completed and qualified through tests and demonstrations." Canary's technology slate is a combination of Methyl Ester Distillation/ Fore Column & Glycerin Wash. Elements of this technology slate in the US were used by: BioVantage, Blue Sun, Viesel, GreenHunter, and Lakeview Biodiesel representing around 10% of the biodiesel plants in the US. These technologies are commercial and considered TRL 9 but the combination is a first of its kind, therefore, at start of the project, the project is TRL 8.

At the end of the project, the plant was commissioned and on spec biodiesel spec was produced and sold commercially, therefore, the completion of project is considered TRL 9 "Actual technology proven through successful deployment in an operating setting."

9. Lessons Learned

Challenges

- Reduced Production Rate: Reduced production rate within the stated project time period due to the soaps.
- Scheduling Delay: We faced delays in engaging the process engineering company (BSI Engineering) as they were scheduled on other projects.
- Quality of Work: Initially, given the slow down in the oil patch, we had the better team booked for our project. However, given some upfront delays due to COVID-19 supply chain challenges, and resurgence of oilfield activity, construction firms provided less experienced teams.
- Covid Impacting Delivery: Global supply chain disruption impacted delivery times of long lead items.
- Weather Impacting Commissioning: Decided to defer commissioning start-up given it would be easier to commission during a warmer weather period.
- Canadian Code: Some American equipment needed adjustments to be brought up to Canadian codes.
- Leaks During Commissioning: Leaks from certain of the legacy facility pipelines were found at the plant during commissioning that needed to be addressed before full commercial operations.

Lessons Learned

- Important to consult with Industry Members: Producing biodiesel is a sensitive process and there are many variables, therefore, it is difficult to pin down the issue. It is crucial to learn from how other biodiesel plant operators solved these issues opposed to going through the exact same challenges.
- Feedstock Quality Testing and Management is Critical: It is important to test at numerous process locations including at the feedstock level in order to understand the chemical dosing and how it impacts the biodiesel specifications. The variability of feedstock impacts chemical dosing, therefore, understanding feedstock variables and their interactions with chemicals is important to ensure product quality is on spec.
- Feedstock Sourcing & CI: The distance of feedstock impacts the carbon intensity score (CI score). All sourcing of feedstock distance is tracked and the calculation of the CI score uses the average of all soured feedstock distances.
- Balancing the Recycling of Co-products: It is critical to understand the recycling of co-products (water, methanol, etc.) at each process stage and managed appropriately. If it isn't, it can impact output and product quality.
- Understanding Chemical Processing: Keeping water out of the Acid Esterification process is critical. The harder the glycerin is boiled, the more water will flow with the recycled methanol. It is better, for now, to have high methanal in the glycerin than to produce wet recycled methanol.
- Nature of Business Creates Logistical Challenges: Feedstock is either on a truck or a railcar and there are many factors such as strike, availability, transloading, etc. that can delay the delivery time.

10. Environmental Benefits

10.1 Emissions Reduction Impact

Why Alberta?

Canary is ideally situated to support renewable fuel in Alberta today, and into the decades to come. As with most ambitious undertakings, initial carbon markets and pricing were very local, governed by specific countries, states and provinces. Given the global nature of carbon dioxide pollution, these fragmented efforts are beginning to converge towards a more collaborative and organized framework. This convergence allows for market participants, specifically renewable fuel producers, to continue building a local supply chain from feedstock to end-user which satisfies the growing demand for low-carbon solutions.

Given Alberta's strong energy infrastructure is the product of over a century of petroleum development, it is logical for renewable fuel producers in this province to access this system to provide market solutions without the need for completely reinventing or rebuilding the pipelines and distribution hubs. Biodiesel provides a solution tailor-made for displacement of higher carbon-intensity fuels such as petroleum diesel. In fact, many large-engine manufacturers for rail and heavy equipment have suggested biodiesel provides an upgrade due to the increased lubricity, cost effectiveness and environmental performance. This growing uptake will likely be strongest in areas where equipment substitution is difficult or prohibitive, such as the oilsands. In fact, for every 1% biodiesel incorporated, the oilsands could reduce emissions 0.5% using the difference between average biodiesel CI versus petroleum diesel CI. Large emitters have already announced efforts for reducing GHG emissions. Recently, Cenovus Energy, Suncor Energy, Canadian Natural Resources, Imperial, and MEG Energy that operate ~90% of Canada's oil sands production formally announced the Oil Sands Pathways to Net Zero initiative to achieve net zero GHG emissions by 2050. Fuel switching will play an important role at achieving these ambitious goals. Several engine manufacturers are currently supportive

of biodiesel blends up to 20%, which will have a massive impact on the overall carbon-intensity of oilsands-derived crude oil.

The other industry which is prime for increased uptake is the agricultural sector. From growers to transporters to processors to end-users there are many opportunities for biodiesel to displace conventional fuels. Envision an economy where a grower is using biodiesel to power their operation, and then providing waste-products back to biodiesel producers such as Canary for conversion back into biodiesel. Circularizing the supply-chain will require local production if climate change performance improvement is to be achieved.

When Sales to Alberta Market?

As discussed above, one key consideration is related to timing of certain carbon market developments. As witnessed on the West Coast (British Columbia, California, Oregon), implementing a Low-Carbon-Fuel Standard (LCFS) is a targeted method to attract and incorporate fuels with the lowest carbon-intensity. As the Clean Fuel Regulation (CFR) is incorporated in Canada in 2023, for the first-time producers in Alberta will have a more market-competitive product without having to ship fuel across the continent. As the target carbon reduction and the backstop price under the CFR begin to increase, the local market will certainly become the market of choice for Albertan producers. Initially, as the program is first incorporated, the targets and prices will not offset more established markets which is a critical drawback of the program. However, through 2024-2030 Canary expects the increased demand for biodiesel will drive a higher product price and cause the shift in sales markets. With an average CI from Canary's facility expected to be less than 10 grams CO2 per Megajoule (g/MJ), this will amount to over 200,000 tonnes of carbon dioxide removed from Alberta's diesel emissions annually. As the price of carbon begins to synchronize between jurisdictions, the Alberta Advantage will continue to grow. The other advantage of a local market will be reduced freight costs as the provincial market does not require transporting finished goods the long distances as the current higher value markets require. This reduced freight will reduce the corresponding transport emissions for Canary's finished biodiesel, reducing the carbon intensity even further and allowing Canary to benefit through producing an estimated 1% to 2% more carbon credits. Again, as the Alberta market becomes competitive, Canary will reduce Alberta-based emissions more throughout the next decade.

The above discussion only centers on Canary's existing footprint, but as with most facilities there is also the room to expand. A strong CFR will certainly help underpin Canary's expansion of doubling its plant generating over 400,000 tonnes per year of CO2 mitigation. This expanded volume is analogous to removing almost 100,000 vehicles from the roads every year. Currently, Alberta only has one biodiesel plant that intermittently produces between 100 million L and 250 million L's of biodiesel per year, all from higher carbon intensity food- based Canola. As a result, Alberta currently imports biodiesel to meet the provinces 2% blend mandate. With the rollout of the CFS, on average 90% of all biodiesel production over the next 20 years is expected to be consumed in Alberta creating almost 8 million tonnes CO2e GHG emissions reduction for the province as shown in the table below.

Figure 1 – Alberta Emissions Reduction

	Unit of Measure	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032-2041	Total	Reference
Plant Operations														
Consumption GHG Reduction (plant production of biodiesel)	000 tonnes CO2e	100	220	220	320	440	440	440	440	440	440	4,400	7,900	
Operations GHG Reduction (offspec canola purchases)	000 tonnes CO2e	6	12	12	18	48	48	48	48	48	48	480	816	
Total GHG Reduction	**000 tonnes CO2e**	**106**	**232**	**232**	**338**	**488**	**488**	**488**	**488**	**488**	**488**	**4880**	**8,716**	
Alberta Market														
Canary Biodiesel Sold in Alberta Markets	%	0%	15%	25%	40%	70%	100%	100%	100%	100%	100%	100%		
Alberta GHG Reduction	**000 tonnes CO2e**	**6**	**45**	**67**	**146**	**356**	**488**	**488**	**488**	**488**	**488**	**4880**	**7,940**	
Clean Fuel Standards														
Clean Fuel Regulations minimum price	CAD/Tonne CO2e		$65	$80	$95	$110	$125	$140	$155	$170	$170			
Clean Fuel Regulations target diesel intensity	g/MJ		92.4	91.2	90	88.8	87.6	86.4	85.2	84	84			Canada Gazette, Part 1, Volume 154, Number 51:
Clean Fuel Regulation Fuels Supplied	PJ	23.8	23.8	23.8	23.8	35.6	35.6	35.6	35.6	35.6	35.6			Canada Gazette, Part 1, Volume 154, Number 51:

Table estimating carbon reductions in Alberta if the Clean Fuel Regulation provide the expected market-competitive incentive to sell biodiesel in Alberta

The emission reduction by the Canary facility stem from tow key mechanisms:

1. Consumption GHG reduction: The displacement of conventional fossil diesel with use of Canary's biodiesel (making up ~95% of the GHG reduction)
2. Operations GHG Reduction: The diversion of waste canola oil (making up ~5% of overall GHG impact). The Offspec Canola Seed Project captures this margin.

Offspec Canola Seed Project

43,000 farmers across Western Canada grow 20,000,000 tonnes of Canola annually; of this, 90% is exported. A portion of each years' crop spoils in storage and is currently bought at a significant discount or dumped. Operationally, Canola oil is the most preferred feedstock as the ability to blend helps broaden the plate of higher waste feedstocks. An average of 2.3% of each years' canola crop is classified as "feed, waste or dockage" by Statistics Canada, representing an average of 460,000 tonnes per year of off-spec seed. Canary has ordered long-lead items and are finalizing engineering and design plans to build a cold-press crush facility and expected to be in operations November 2022.

Using the Waste Diversion Model created from the Quantification Protocol for Biofuel Production and Usage, version 2.0 (October 2014) and the Carbon Offset Emission Factors Handbook, version 2.0 (November 2019), GHG emission reduction at full expansion will offset 48,000 tonnes CO2e annually.

Conclusion

For Canary, support is critical to advance its biodiesel production to capture the growing market opportunity. The efforts of past decades led to the establishment of a strong ethanol market in Canada, unfortunately without the corresponding growth in Canadian production. With over 40% of Canada's mandated needs supplied by American facilities, the policy has not generated the same in-Province and in-Country benefits as it should have. By supporting Canary and its biodiesel production platform, Alberta and Canada can ensure the majority of the industry benefits are retained in the community, rather than supplied from abroad. The Clean Fuel Standard can, and should, be fulfilled by Albertan/Canadian production, not through import. We are of the opinion the Standard does create the necessary competitive environment for domestic production, however this will take time. The creation of an LCFS program in

Alberta will alleviate price risk and establish the framework for production of biofuels in this province. Currently, only British Columbia has this framework in Canada. Access to feedstock is the most significant factor when deciding on plant location. Alberta's sizable established agricultural industry makes it the desired province for biofuels. Alberta therefore has an advantage over all other provinces and has the opportunity to become an energy hub with the combination oil & gas and biofuels. We recommend an LCFS program within this province to compete with BC and US states.

At full production output, Canary is expected to reduce Alberta's GHG emissions in the range of 232,000 – 488,000 tonnes CO2eq annually by 2031 and for at least 10 years thereafter. With the rollout of the CFS, on average 90% of all biodiesel production over the next 20 years is expected to be consumed in Alberta creating almost 8 million tonnes CO2e GHG emissions reduction.

10.2 Other Environmental Impacts

- Less emissions from transportation as the biodiesel facility is near rendering plants, farmers, and local sales markets.
- Less off-spec canola seed in the landfill as our facility can use the off-spec oil as feedstock (see below, economic impacts for discussion on off spec canola).
- Less fertilizer and water usage for plants such as camelina that can be grown and used specifically for use as an input feedstock for biodiesel production.

11. Economic and Social Impacts

Economic Impacts

- Agriculture Supply Chain Value Add: On average of 2.3% of each years' canola crop is classified as "feed, waste or dockage" by Statistics Canada (off spec canola), representing an average of 460,000 tonnes per year of off-spec seed. The oil from this off-spec seed can be used as feedstock thus creating a market for the crop that is bought at a significant discount of dumped.
- Proximity to farmers: The facility is close to the Transmark rail yard, rendering plants and farmers allowing to share in the transportation costs. Also, rail shut-downs do not require local rendering plants to shut-in if there is a local offtake for their by-product.
- Full time jobs include:
  - 25 process operators and technicians
  - 5 office personnel
  - 30 full time jobs

August 25, 2021, Imperial announced it's Strathcona project in August 2021 that could produce 20,000 bbls or approximately 3 million litres of renewable diesel per day by 2024. A final investment decision has not been announced yet and the news release indicated a need for government support..

Given California's 2030 goal of all diesels be derived from 80% renewable diesel and 20% biodiesel, we believe that Canada will follow, therefore renewable diesel production needs to be established in order for there to be a blend. This blend will increase the demand for biodiesel which our plant produces.

With this announcement and the possibility of other companies entering the industry, feedstock availability is crucial for the viability of the companies producing renewable fuels thus securing feedstock will have a dramatic impact on margins.

Understanding the current and future requirement of feedstock, Canary has proactively commenced vertically integrating of a portion of its feedstock needs with the crusher project (explained in 14 Next Steps).
Additionally, we are in discussions with possibly partnering with a camelina seed producer to grow this crop specifically for production of biodiesel thus locking in feedstock supply. We believe feedstock competition will drive the camelina market which will benefit our vertical integration.

Social Impacts

- Developing the biofuels industry in Alberta: Our company is the first Generation 2 biodiesel facility in Alberta (and all of the prairie provinces). We are therefore developing a highly skilled workforce within the biofuels industry as well as attracting capital. We believe there is an opportunity for Alberta to be a biofuels hub given the expertise in both agriculture and energy.
- Farmer and rural area impacts: by adding a local offtake and value add process for agricultural products, there is a contribution to stability of farm incomes and therefore rural areas.
- Economic diversification: moving away from oil and gas for energy consumption and towards renewable energy using waste oils will assist in diversifying the economy.

All employees and local contractors involved in our project have acquired significant biodiesel production knowledge and as of today, are Alberta's only local industry experts in bio-based diesel production from waste feedstock input products.

We have provided a new job source for bio-talent university graduates, where minimal local opportunities previously existed. We do see some longer-term win-win partnerships with local communities, but we are in the very early stages of developing these opportunities.

While we have not established a formal diversity policy, our initial workforce is diversified from both a skill set and also are from diversified backgrounds.

12. Scientific Achievements

No patents or books

13. Overall Conclusions

Canary successfully completed the Technology Upgrade Project by upgrading the previous Kyoto Generation 1 biodiesel facility into a Generation 2 biodiesel facility that is fully commissioned and commercial.

Although the project itself had minimal GHG reductions as the scope only included building the technology upgrade and commissioning, the benefit to Alberta is at the commercialization stage (currently at) with GHG reductions in the range of 232,000 – 488,000 tonnes CO2eq annually by 2024 and for at least 10 years thereafter.

14. Next Steps

We have ordered long-lead items and are finalizing engineering and design plans to build a cold-press crush facility.

As the biodiesel production facility takes waste as feedstock, there presents a unique opportunity within Canada for Canola seeds that are offspec. The current environment is that any Canola seed that doesn't meet a grade, is considered offspec and generally discarded on farm or taken to a landfill. Canary's plan is to crush the offspec Canola seed and utilize the oil for 1/3 of its feedstock needs and sell the meal locally. We expect this will be operational in Q4.

We have completed preliminary engineering and design work to add refined glycerin to our facility characterized as technical glycerin. Currently, the plant produces crude glycerin as a by-product and while crude glycerin currently sells for US$0.30/lb, there is an option to upgrade to technical glycerin with a selling price of US$1.00/lb. As most commodities, it is priced in USD although sold locally in Canadian markets.
Examples of Crude Glycerin use in Canada:

- Coal wetting and release agents
- Aircraft de-icing fluid
- Dust control

Examples of Technical Glycerin use in Canada:

- Chemical intermediary for oilfield chemicals
- Chemical intermediary in 1500 products including shampoo, hand sanitizer, soap, lotions, livestock feed

We are evaluating doubling the current plant capacity, which would allow for significant follow-on optimization opportunities such as pipe to rail and expanded storage capacity.

As described, there have been significant learnings through the construction and commissioning phase, and their will be additional learnings, but our facility is commercial and we expect continuous improvement to our commercial operations over the coming weeks and months.

No further activities required specific to the project, other than improving our business.

We have no specific partnerships to integrate our technology; however, given our technology is implemented, and at the leading edge of biodiesel facilities, there are several parties looking to partner with our organization from a commercial perspective. Specifically, we have interest in organizations that want to further integrate technologies into our facility which will expand our ability to take waste and increase the overall feedstock market. Additionally, we have been approached by other organizations and have recently acquired an older facility in the United States and will look to implement a similar upgrade process.

15. Communications Plan

We have limited our communication during the project, primarily focusing our activities on commercializing the plant. Limited communications involved:

(1) Investors – current and prospective
(2) Suppliers – Prospective feedstock suppliers who will look to partner with organizations who can utilize the broadest spectrum of feedstocks

Now that we have established a commercial facility, we will focus our efforts on a relatively informal communications strategy, using social media is the primary medium, with some industry conferences, focused on:

(1) Communities / Farmers – We have made preliminary plans for communications to ensure farmers know there is a potential buyer for their off-spec canola
(2) Industry Events - General

(3) Public Education – Work towards helping the general public learn about the biofuel industry
(4) Investors – current and prospective
(5) Suppliers – Prospective feedstock suppliers who will look to partner with organizations who can utilize the broadest spectrum of feedstocks

16. Literature Reviewed

The team performed in FY2021 analysis of 40 different potential feedstocks to gather insights as to their different characteristics before they are used for testing and converted into biodiesel. Through this analysis, 9 different parameters were analyzed (saponification, sulfur/FFA/moisture content, unsap Number, MIU, IV, etc.) to assess whether they could potentially be processed and converted and determine the limits of the current bioconversion process. Numerous literature resources were used to gain an understand of the parameters and various chemical blend impacts.