# BC-SMART Low Carbon Fuels Consortium

Decarbonising Long-Distance Transport

Newsletter Issue No. 15, March 2025

***BC-SMART Workshop: "How do we decarbonise refineries and produce low-CI jet / biojet / SAF?"***

## *From the BC-SMART Secretariat*

We are all "living-in-interesting-times" and although the "tariff" word was hardly ever used at the recent BC-SMART annual workshop held at UBC on 19 February 2025, the participants were all very aware of how current global/US "uncertainty" might influence our collective decarbonization efforts. Regardless, refineries will play a key role (Figure 1). As covered in more detail within this newsletter, the workshop was initiated by a global perspective provided by the International Energy Agency (IEA). (Please refer to the Appendix, which describes the program and speakers within the workshop.) As mentioned before, policies such as BC's Low Carbon Fuels Standard (LCFS), carbon tax, hydroelectricity, etc., and the evolving Canadian federal Clean Fuels Regulations (CFR) make BC and Canada a good place to be in developing ways to decarbonize long-distance transport. The workshop profiled many of the refineries that are currently walking-the-talk, both in BC, Canada and other parts of the world. Several companies profiled their decarbonizing efforts, both within the refineries and the fuels they produce. Overviews were also provided by C-SAF, the US ASCENT collective (Center of Excellence for Alternative Jet Fuels and Environment) and ICF, while lipid feedstock providers (e.g., West Coast Reduction, Canola Council of Canada) indicated how much lipid feedstock is now used to make biofuels. In addition to having provincial representatives summarise BC's goals and the policies that will be used to decarbonize transport, Vancouver Airport (YVR) also described its decarbonization plans. To try and capture, as much as possible, of what was discussed within the workshop, the final presentations also described the complexities in determining the carbon intensity (CI) of fuels such as biojet/sustainable aviation fuel (SAF) and what could be done to bridge the current price gap between fossil jet and biojet/SAF. Despite the current turmoil that, at times, seems to overshadow our collective decarbonization efforts, as summarised in this issue of the BC-SMART newsletter, all components of the drop-in, low-CI fuel supply chain remain fully engaged. As shown by LA fires, Valencia floods, etc., climate change affects us all. The hard-to "green" electrify long-distance transport sector needs to decarbonize. The workshop participants showed how we can do this.

Thank you for reading this newsletter and participating in the BC-SMART network!

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## *Lowering the carbon intensity (CI) of the global economy and the key role of refineries*

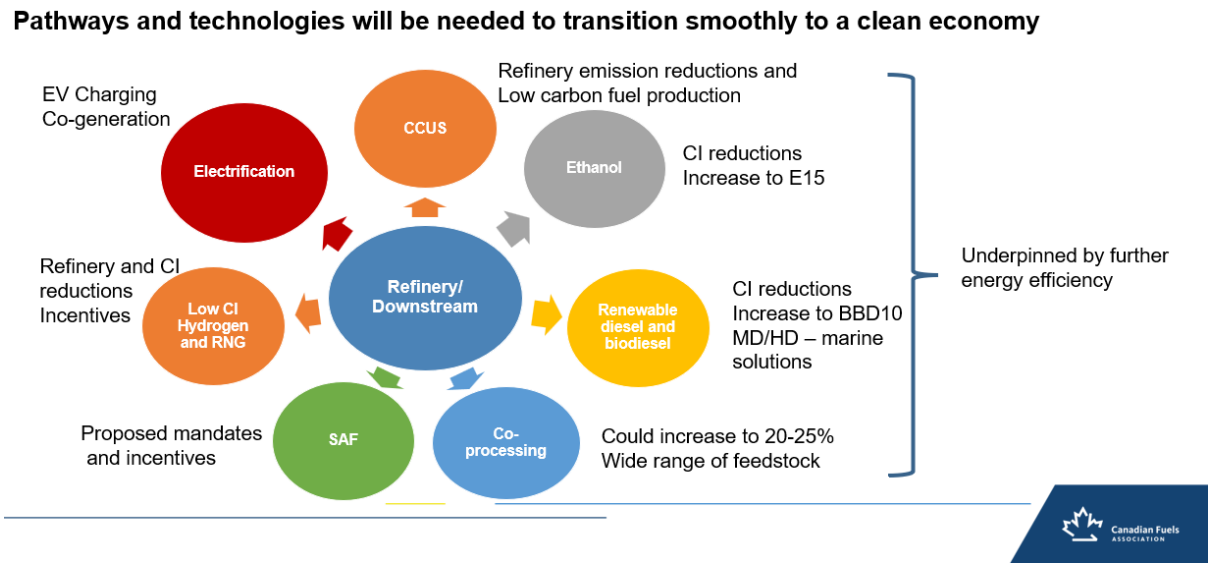


**Figure 1.** Several ways in which refineries can contribute to lowering the carbon intensity (CI) of the global economy *(source: Canadian Fuels Association)*

As covered in the workshop, Jeremy Moorhouse from the International Energy Agency (IEA) and Alastair Blanshard from ICF described some of the global developments currently underway that are focussed on decarbonizing long-distance transport. For example, the IEA predicts that there is enough sustainable biomass to allow us to collectively achieve our bioenergy goals without an overall increase in cropland. Although eSAF might play a role, it will require 2% of the world's electricity by 2035. However, if the aviation sector is to achieve net zero by 2030 it will require almost 40 billion litres (BL) of biojet to be produced. Consequently, every biojet/SAF project that has been announced must reach a final investment decision (FID) if this goal is to be achieved. It was apparent that current biojet production falls well short of most published biojet/SAF production-and-use targets. Jeremy also described how reducing the carbon intensity of refining could help, as would methane reductions, carbon capture technologies, etc., with each of these strategies contributing to the overall decarbonization of transportation.

Alastair Blanshard described the potential global supply of SAF based on the collective production by 267 facilities (Figure 2). Although, in the "high" scenario, almost 30 million metric tonnes (MMT) (37.5 BL) could be produced by 2030, this will only happen if all announced facilities are built and operated. When ICF applied provisos such as risk rating and estimated failure rate, this projected volume decreases to about 15 MMT. However, biojet/SAF supply could exceed regulatory demand through 2030 (Figures 2 and 3).

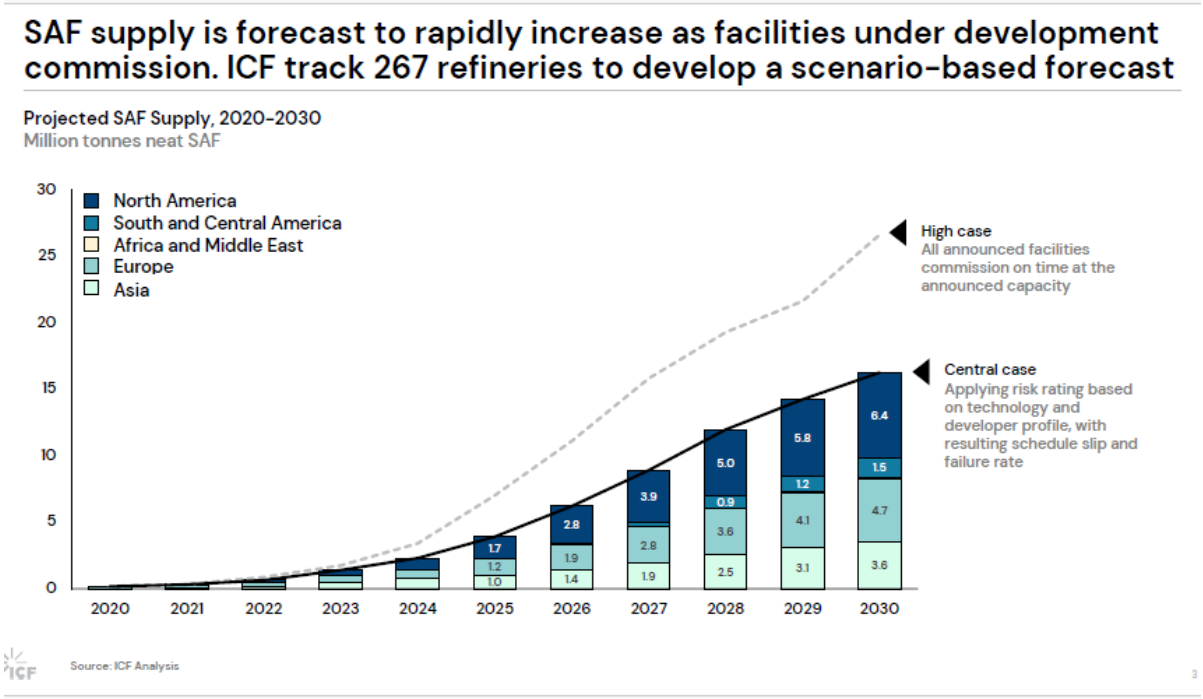


**Figure 2.** Projected SAF Supply Growth (2020-2030) Under Scenario-Based Forecasting *(source: ICF)*

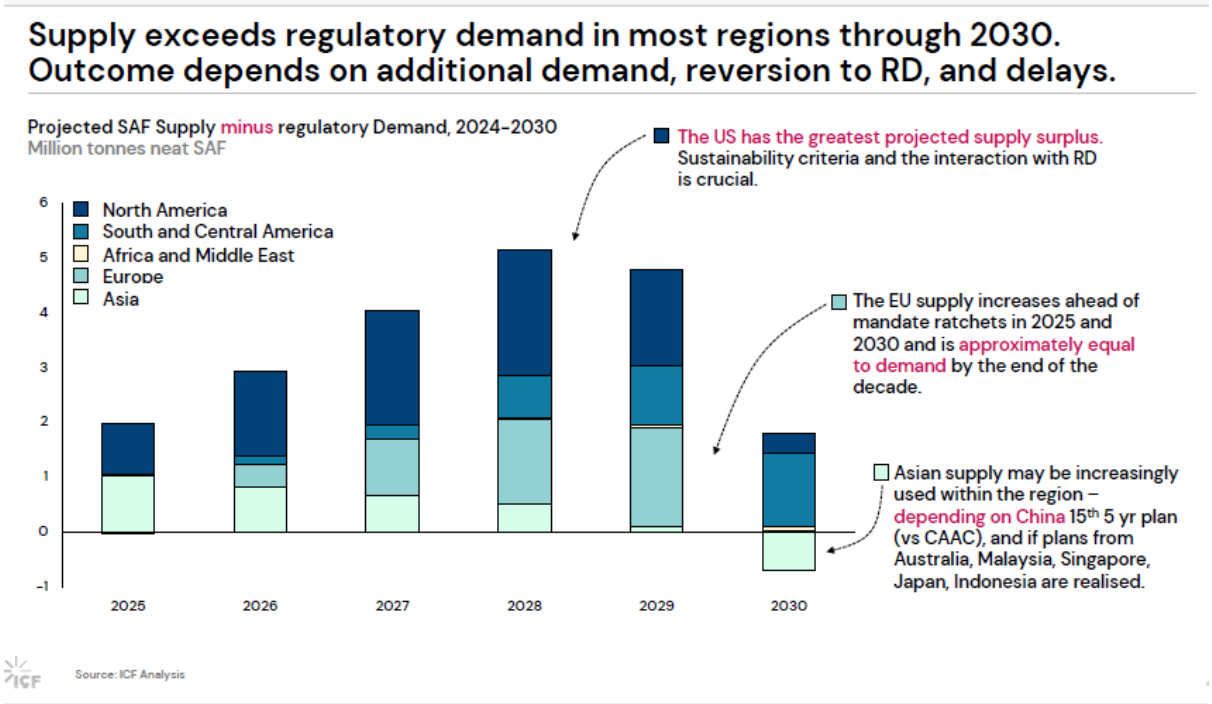


**Figure 3.** Projected SAF Supply Surplus Relative to Regulatory Demand (2024-2030) *(source: ICF)*

Alastair also showed how SAF production in Asia is expected to increase, with Asia soon becoming the region with the largest SAF production. This will have a global impact, as the Used Cooking Oil (UCO) currently exported from China to places like the EU would likely be directed towards domestic production. As was discussed extensively, the HEFA/lipid pathway to biojet fuel is currently the only fully commercial SAF pathway and is expected to supply the bulk of SAF by 2030.

In addition to reviewing this global outlook, the workshop attendees also heard from Max Jallad (Neste) and Mark Wilson (Montana Renewables). Neste is currently the world's largest producer of SAF and renewable diesel (3.3 MT per year) and has the capacity to produce 1.5 MT of SAF each year. Max described how Neste plans to increase its SAF production to 2.2 MT by 2026, and more than 3 MT by 2030.

In North America, Montana Renewables is the largest SAF producer, and the company plans to increase current production of 30 million gallons (recently demonstrated 45 million gallons)(170 million litres (ML)) to 150 million gallons (560 ML) within two years. This will be followed by a further expansion to 300 million gallons (1.2 BL) of SAF within 3-4 years. Their location has advantages accessing to lipid feedstocks (Figures 4 and 5). Montana Renewables' future plans also include the production of "green" hydrogen. A key takeaway from Wilson's presentation was that SAF production will be restricted unless it is priced higher than renewable diesel. (It costs more to make!) He also highlightedinvestors need a return on the capital, the need for stable regulatory policy, and the importance of improvements in the downstream supply chain.

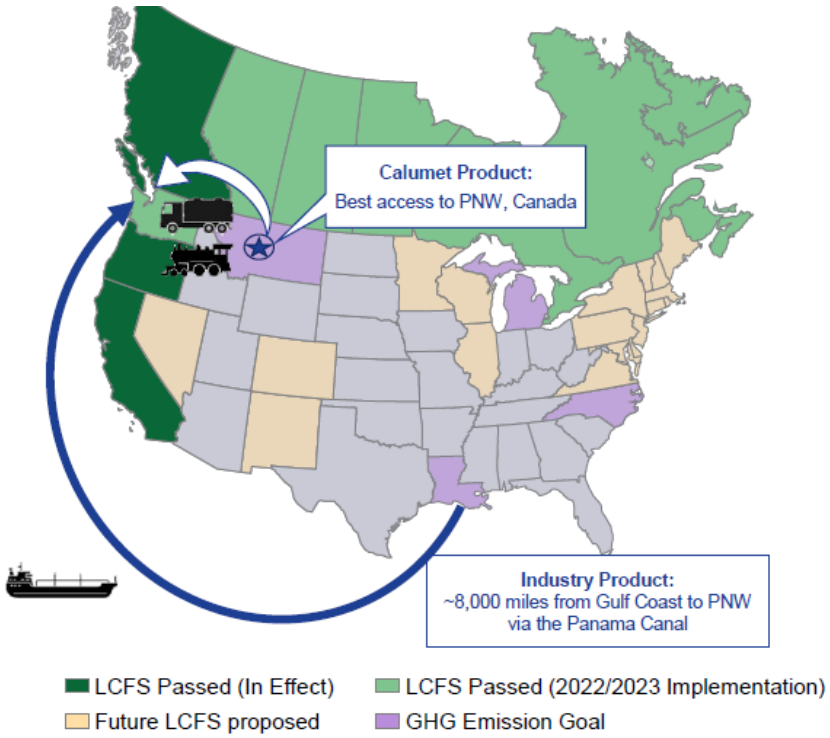


**Figure 4.** Biofuel producers can benefit from "local" policies that encourage the use of Low Carbon Intensive (CI) fuels *(source: Montana Renewables)*

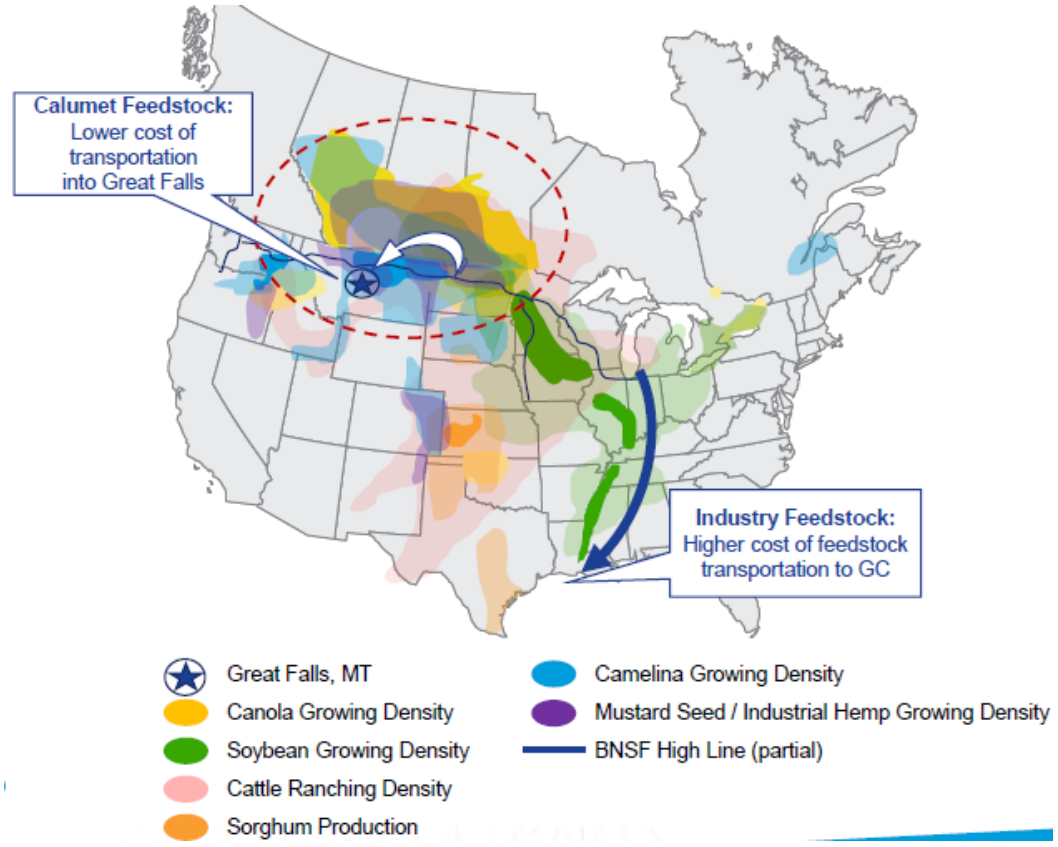


**Figure 5.** Geographical advantages of Montana Renewables *(source: Montana Renewables)*

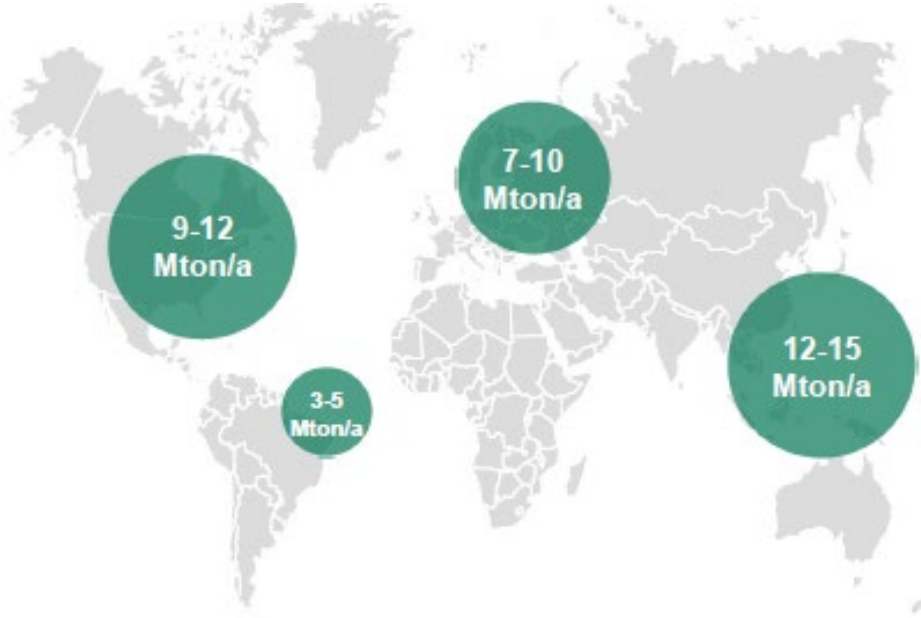


**Figure 6.** Availability of waste and residue oils and fats by region *(source: Neste)*

## *Biofuel Feedstocks*

Although time did not allow for a presentation or discussion on British Columbia's established wood pellet sector, biomass-to-biofuels processes will be needed if we are to meet the targets set by groups such as the IEA and ICAO. Currently, virtually all of the world's bio/renewable diesel and SAF is made from lipid feedstock, with BC's West Coast Reduction one of the leaders in collecting and distributing low-CI lipid feedstock such as animal fats. As presented by Chris Vervaet (Canola Council of Canada), biofuels are an increasing market for vegetable oil producers, with the sector substantially investing in crushing facilities and an ongoing focus on ways to reduce the carbon intensity of lipids production. However, some jurisdictions, such as the EU, will only use "waste lipids" which are the only feedstocks permitted under the RefuelEU aviation mandate. In related discussions, it was suggested that fraudulent UCO feedstocks have been entering the EU market, with efforts currently underway to differentiate "spiked" virgin oils from legitimate waste lipids such as animal fats.

As described by Chris, North American canola production continues to grow, with the significantly increased amounts of canola oil produced by 2030. However, there are at least two ongoing risks for canola producers. First, California introduced a cap on fuels made from vegetable oils, coming into effect on January 2028, which will likely result in a decreased demand for lipid feedstocks such as canola. Second, canola-based fuels do not qualify for tax credits under the Inflation Reduction Act, Section 45Z, a producer tax credit in place from 1 January 2025 until the end of 2027. Although not discussed at length, further uncertainty is also created by the impending tariffs that the US plans to impose on goods exported from Canada. As the majority of Canadian canola oil is currently exported to the US for biofuel production, tariffs will have a significant impact on the Canadian canola sector.

## *The key role that refineries will play in decarbonizing long-distance transport*

Both BC's refineries have made progress in decarbonizing their operations and the fuels they produce. Representatives from the Parkland refinery outlined their decarbonization journey, which started in 2017 (Figure 7). Currently, Parkland co-processes tallow, tall oil, and canola in its fluid catalytic cracker (FCC), and it has achieved insertion ratios as high as 25%. In related work, lower CI jet fuel has been produced when processing lipids at the refinery's diesel hydrotreater. Despite the higher costs of the lipid feedstocks, BC-LCFS has encouraged Parkland to grow these activities, with the current co-processing amounts of 4000 barrels per day likely to grow to 7500 barrels per day by 2028.

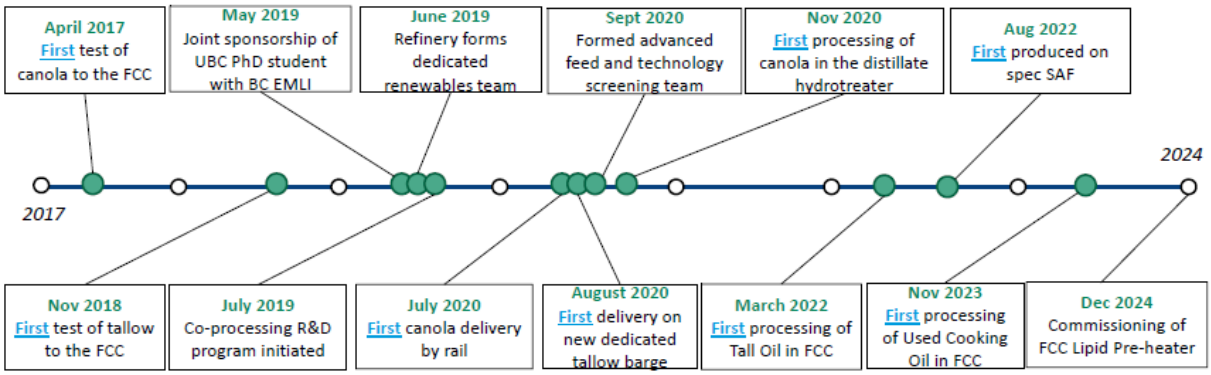


**Figure 7.** Parkland's co-processing timeline from 2017 to 2024

Tidewater started lipid co-processing at its hydrotreater in 2021 and at the FCC in 2022. These initial successes were followed by the construction of a "stand-alone" renewable diesel (RD) facility, the first such production plant in Canada, which started operation in November 2023. The plant has its own "pretreatment" unit which allows flexibility in the lipid feedstocks that are used. Hydrogen is produced from gases generated during the processing of the lipid feedstocks. Tidewater can produce 170 ML of renewable diesel per year, and this fuel has a carbon intensity reduction of about 80% compared to fossil-derived diesel. The company is currently in the middle of a FEED engineering assessment and Class III cost estimates to assess the attractiveness of making biojet/SAF. Once a final investment decision is made, construction could start in 2026. Although BC's low carbon fuel regulations and Part 3 agreements have helped Tidewater make investment decisions, the ability of US producers to "stack" policies/credits has made it difficult for Tidewater to compete with US producers. However, since the workshop was held (a few weeks ago), the BC government has indicated that "effective April 1, 2025", the renewable-fuel requirements must be met by using low-CI fuels produced in Canada, while the renewable fuel requirement will immediately be increased from 4% to 8%. This policy aims to increase BC's production of renewable fuels.

Canada's biggest renewable diesel facility will soon be completed at Imperial's Strathcona facility near Edmonton. Jason MacDonald described how the plant will soon be completed and have a capacity to produce about 20,000 barrels per day (2.5 MT) of renewable diesel. Canadian-derived canola oil will be the primary lipid feedstock. Although, at this time, no biojet/SAF will be produced at this facility, Imperial is also assessing co-processing as a means of decarbonizing their operations and the fuels they produce. Jason also emphasized the importance of provincial and federal policies that will be needed to ensure domestic production of low-CI, drop-in biofuels in Canada.

The workshop participants also benefited from an excellent presentation from Olov Öhrman, who described Preem's ongoing efforts to decarbonize their refinery operations in Sweden. Preem has been co-processing for more than fifteen years, with "waste" lipids, such as pulp-mill-derived-tall oil, used as one of their feedstocks. Preem is a co-investor in the SunPine facility, which "pretreats" tall oil to be subsequently co-processed at Preem's refineries. Preem

is also an investor in the Pyrocell facility, which produces pyrolysis-derived "biocrudes" from sawdust, with the goal of co-processing this low-CI feedstock at the refinery's Fluid Catalytic Cracker (FCC). The company uses a dedicated nozzle that allows more effective insertion of the biocrude at the FCC. However, Olov highlighted some of the other problems they encountered when trying to co-process biocrudes while indicating that "inserting raw biocrude directly into a refinery is very challenging". As summarised below (Figure 8), although Preem has made considerable decarbonization progress, some form of "pretreatment" will be required if biocrudes are to be effectively co-processed.

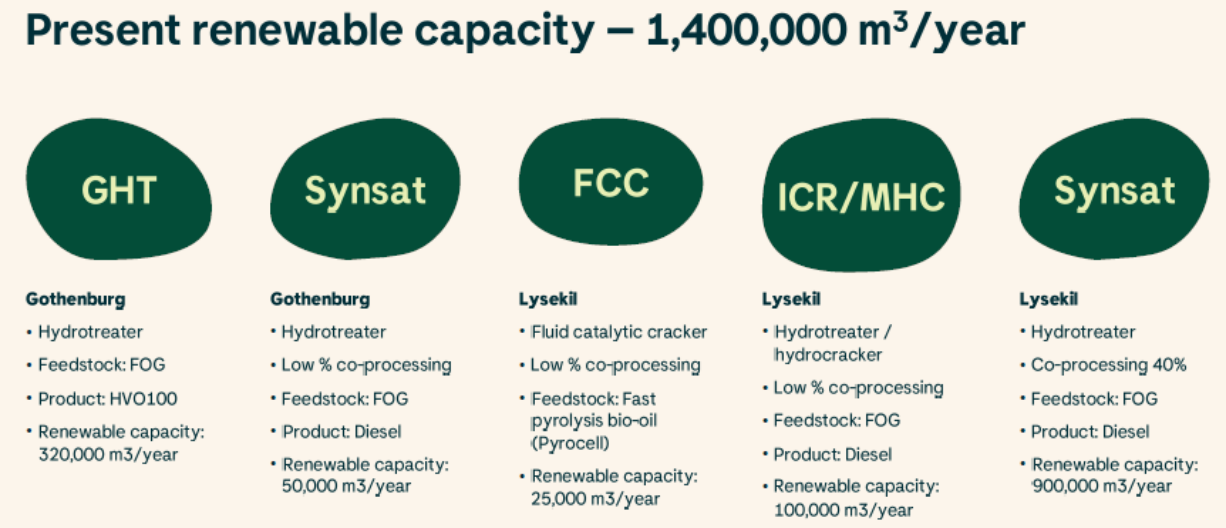


**Figure 8.** Preem's Renewable Fuel "evolution"

## *The critical role that "enabling" policies will play in decarbonizing transport*

Sean LeRoy, Executive Director of the Low Carbon Fuels Branch of the BC Ministry of Energy and Carbon Solutions (MECS), gave an overview of the BC-LCFS and the important role policy has played in decarbonizing the BC transport sector. As covered previously by both of BC's refineries (Parkland and Tidewater), BC's policies were pivotal in both refineries' decision to invest in a low-CI approach, helping create market certainty and encouraging ongoing investment in making low-CI transportation fuels.

As summarised in Figure 9, BC has made substantial progress in meeting its decarbonization targets. Similarly, the automobile and truck sectors have decarbonized significantly (Figure 10), with the dramatic rise in renewable diesel use over the last few years playing a key role in the decisions made by BC's refineries. However, the influx of US renewable diesel shows how even successful policies need to be refined to support local biofuel production.

Through the Ministry's initiative agreements program, the province also provided funding to Vancouver airport (YVR), to develop supply chains for low-CI jet fuels to be used by airlines

at YVR. Through this program, airlines will be eligible to receive aid to help them bridge the price gap between conventional jet fuel and biojet/SAF. The cash incentive is estimated to be $0.75/L for SAF with a carbon intensity greater than 10 gCO2e/MJ, and $1.12/L for SAF with a carbon intensity lower or equal to 10 gCO2e/MJ.

Vancouver Airport is currently developing a *SAF Opportunity Study* to promote the use of SAF at YVR.

The Canadian Council for Sustainable Aviation Fuels (C-SAF) is Canada's "umbrella" organization that has already developed a road map which details how Canada might decarbonize its aviation sector. Geoff Tauvette described how the overall ecosystem for low-CI jet fuel supply could be optimized and how biojet/SAF might be promoted in Canada. Geoff also described what C-SAF thinks are the key policy considerations for SAF development in Canada. They include:

- Industry and Government working closely together.
- Implementation of a long-term (10-year) biojet/SAF program. For example:
    - reducing the cost of biojet/SAF
    - help to make biojet/SAF production competitive
    - support the use of more sustainable production processes and feedstocks
- Support R, D&D investment for biojet/SAF production
- Support lipid feedstock carbon intensity reduction strategies
- Harmonize with other markets (i.e., no distortion or monopolies)

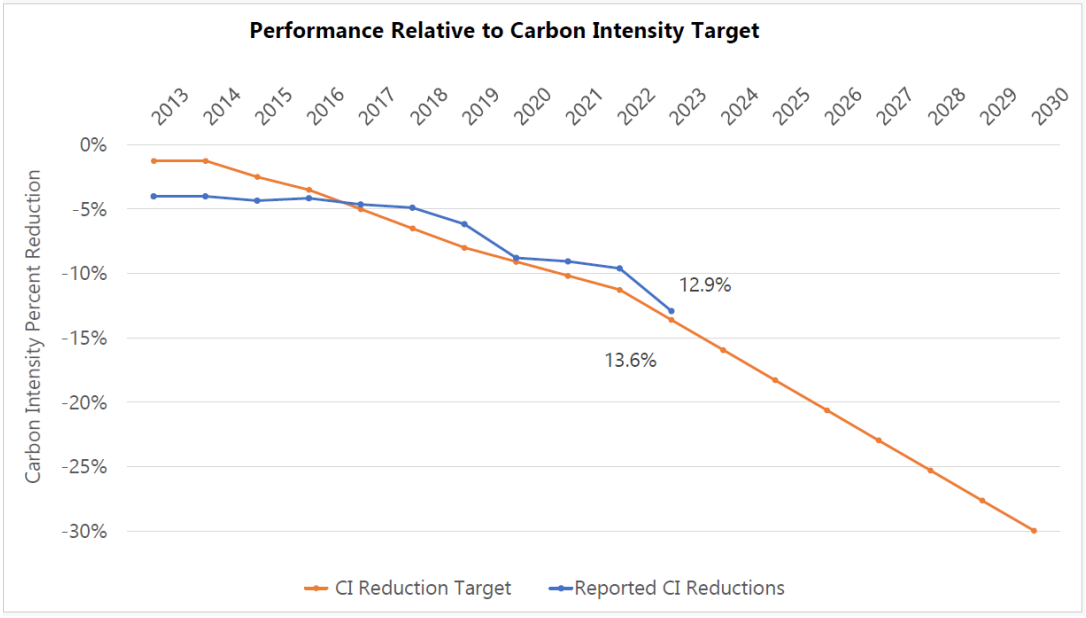


**Figure 9.** BC's Performance Comparison of Reported vs. Targeted CI Reductions (2013-2030)
*(source: BC Ministry of Energy and Climate Solutions)*

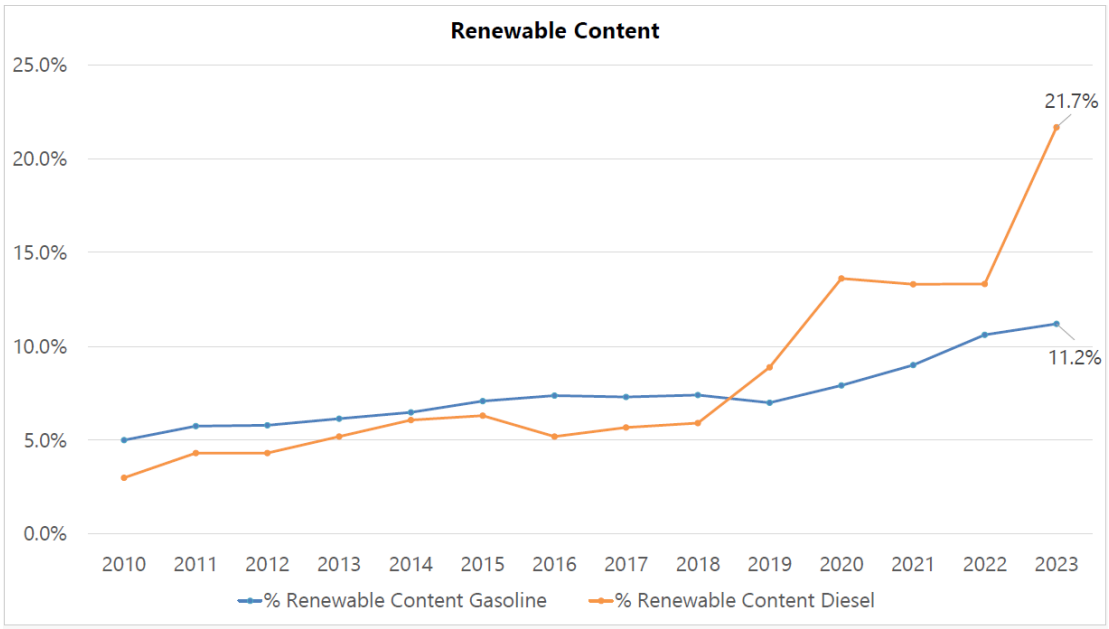


**Figure 10.** BC's Trends in Renewable Content of Gasoline and Diesel (2010-2023) *(source: BC Ministry of Energy and Climate Solutions)*

## *The importance of international cooperation and the work carried out by the US Center of Excellence for Alternative Jet Fuels and Environment (ASCENT)*

As covered elsewhere, Climate Change is an international "problem" with Canada and the US's inter-dependent economies joined-at-the-hip, (notwithstanding the current situation!) and a lot of *long-distance transport* occurring between the two countries!

Michael Wolcott and Kristin Brandt, from Washington State University (WSU), presented on behalf of the FAA-supported ASCENT program, highlighting the biojet/SAF feedstock supply chains that could be developed in North America. Kristin described the work that has and will be carried out using the Volpe freight and fuel optimization tool (FTOT) to assess feedstock availability (e.g., lipids, sugars/starch, ethanol and biomass), current-and-future infrastructure (e.g., renewable fuel facilities, blending terminals, existing pipelines, oilseed crushers, slaughter facilities, etc.), fuel demand by major airports (e.g., PDX, SEA, YVR), and other components of a biojet/SAF supply chain.

As well as assessing aspects such as feedstock availability, maturity of conversion pathways, etc., the project will also assess the impact of various policies, such as California, Washington and BC's LCFS, on the production and use of biojet/SAF.

The commonality of policies in the "Cascadia Regions" (e.g., California, Oregon, Washington and BC), such as the LCFS, makes this an interesting geographical region in which to assess how a robust biojet/SAF supply chain might be established.

## *Conclusions*

As usual, the most recent BC-SMART workshop greatly benefitted from the excellence of the participants! As oil refineries currently supply the vast majority of transportation fuels used today, the workshop profiled some of the leading refineries, locally and internationally, that are already producing the low-carbon-intensive fuels used by the long-distance transport sector.

In particular, aviation was highlighted. Although "green" electricity and hydrogen might play a future role in helping decarbonize short-to-medium flights, in the short-to-long-term, drop-in biofuels such as biojet/SAF are already, and will continue to be, integrated into the established supply chains for aviation fuels.

However, although the workshop showed how much progress has been made in decarbonizing long-distance transport, it was clear that, for the immediate future, the right policies will still be needed if we are to wean ourselves off our collective dependence on fossil fuels.

Despite the global uncertainty that currently exists, from armed conflicts to impending tariff/trade wars, the most recent workshop highlighted the good progress that has been made by many components of the low-CI, drop-in biofuels supply chain.

The attached agenda should also indicate how much the workshop participants benefited from the presenters. However, it was the associated discussion, which included virtually all of the workshop participants, that infused the meeting with a sense of optimism. Paraphrasing former President Kennedy when planning to send people to the moon. We try to decarbonize long-distance transport, "*not because it will be easy, but because it will be hard. This goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win*."

If you would like to be part of the **"Coalition of the Willing"** and continue to receive our newsletter and occasional updates about BC-SMART consortium, please contact us at:

The BC-SMART secretariat (***www.BC-SMART.ca***)



## *Appendix - BC-SMART Workshop Agenda-19th February 2025*

| **8:00 – 8:30** | **Arrival, coffee + networking** | **Presenter** |
|---|---|---|
| | **Session theme – Introduction/General background/ International endeavors** | **Moderator: Jack Saddler (BC-SMART)** |
| 8:30 – 9:00 | BC-SMART workshop on "How do we decarbonise refineries and how can we produce low-CI jet/biojet /Sustainable Aviation Fuels (SAF)"<br>30 second round table introductions by participants | Jack Saddler |
| 9:00 – 9:20 | IEA's perspective on "Decarbonising refineries and producing low-CI jet/biojet / SAF" | Jeremy Moorhouse (IEA) |
| 9:20 – 9:40 | The US's ASCENT program and predictions of SAF production/use by 2030 | Kristin Brandt (ASCENT/WSU) |
| 9:40 – 10:00 | Driving market transformation: how B.C. policies are advancing low carbon fuel production and supply | Sean LeRoy (BC Ministry of Energy and Climate Solutions) |
| 10:00 – 10:20 | The C-SAF roadmap and how might Canada be using low-CI jet/Biojet/SAF by 2030 | Geoff Tauvette (C-SAF) |
| **10:20 – 10:45** | **Coffee/health break** | |
| | **Session theme – Decarbonisation of refineries and the production of low-CI fuels** | **Moderator: Dave Schick (Canadian Fuels Assoc.)** |
| 10:45 – 11:05 | Tidewater's decarbonisation and production of low-CI fuels | Matt Millard (Tidewater) |
| 11:05 – 11:25 | Parkland's decarbonisation and production of low-CI fuels | Ashish Malhotra/ Rob Pinchuk (Parkland) |
| 11:25 – 11:45 | Neste's decarbonisation, production and distribution of low-CI fuels | Max Jallad (Neste) |
| 11:45 – 12:05 | Montana Renewables decarbonisation, production and distribution of low-CI fuels | Bruce Fleming/ Mark Wilson (Montana Renewables) |
| **12:05 – 13:00** | **Lunch** | |
| | **Session theme – Progress in the production and use of Low-CI biofuels/jet/Biojet/ SAF** | **Moderator: Geoff Tauvette (C-SAF)** |
| 13:00 – 13:20 | Lower Carbon Fuels Production and Aviation Fuels Policy Perspective | Jason Macdonald (Esso/Imperial) |
| 13:40 – 14:00 | Global progress and projections for Low-CI jet/SAF/Biojet use | Susan van Dyk (BC-SMART/UBC) |
| 14:00 – 14:20 | EU and UK Mandates: Impacts and outlook | Alastair Blanshard (ICF) |
| 14:20 – 14:40 | SAF Opportunity Study that ICF is doing for YVR and BC's-Ministry of Energy and Climate Solutions | Wendy Avis (Vancouver Airport) |
| 14:40 – 15:00 | Lipid feedstock supply to oil refineries in Western North America | Jared Girman (West Coast Reduction) |
| **15:00 – 15:20** | **Afternoon coffee break** | |
| | **Session theme- Feedstocks and assessing the decarbonisation of refineries and jet fuel** | **Moderator: Jack Saddler (UBC/BC-SMART)** |
| 15:20 – 15:40 | How do refineries decarbonise and how do we determine the Carbon Intensity (CI) of jet fuel? | Don O'Connor (S&T2) |
| 15:40 – 16:00 | Decarbonisation of PREEM's refineries and their production of low Carbon Intensity (CI) fuels | Olov Öhrman (PREEM) |
| 16:00 – 16:20 | Bridging the price gap | Michael Rensing (Consultant) |
| 16:20 – 16:40 | The potential and challenges of lipid producers | Chris Vervaet (Canola Council of Canada) |
| 16:40 – 17:15 | General DISCUSSION | All, plus panel of Chris Vervaet, Don O'Connor, Mike Wolcott, Dave Schick and Olov Öhrman |
| 17:15 | Close of session, thank you | Jack Saddler |
| **17:15 – 18:30** | **Drinks and networking at Bean Around The World (sponsored by C-SAF)** | |