

Low Carbon Fuel Standard: Aviation Fuel Regulation Intentions Paper

April 6, 2023

Table of Contents

- 1 Introduction 2
- 2 Background..... 3
- 3 Aviation fuel regulation..... 3
 - 3.1 Fuel Types..... 3
 - 3.2 Renewable fuel requirements 4
 - 3.3 Standard for Low Carbon Jet Fuel 5
 - 3.4 Low Carbon Fuel Requirements 5
 - 3.4.1 Calculating Compliance Units 6
 - 3.5 Supplier Eligibility 9
 - 3.5.1 Domestic vs. International Aviation 9
 - 3.5.2 Exclusion from the Jet Fuel Category 9
 - 3.5.3 Exemption Threshold 9
 - 3.6 Penalty rates..... 10
 - 3.6.1 Renewable Fuel Target Penalty 10
 - 3.6.2 Low Carbon Fuel Target Penalty 11
- 4 Treatment of Compliance Units..... 11
- 5 Review of Targets 11

List of Tables

- Table 1: Renewable fuel requirements for 2024 and beyond 5
- Table 2: Base carbon intensity 6
- Table 3: Default carbon intensities 7
- Table 4: Energy Content 7
- Table 5: Energy Effectiveness Ratio 7
- Table 6: Carbon intensity reduction targets and values for 2024 and beyond..... 8
- Table 7: Exemption threshold for 2024 and beyond..... 10

1 Introduction

The [Greenhouse Gas Reduction \(Renewable and Low Carbon Fuel Requirements\) Act](#) (Current Act) and the [Renewable and Low Carbon Fuel Requirements Regulation](#) (Current Regulation) are known collectively as the B.C. Low Carbon Fuel Standard (LCFS). The Ministry of Energy, Mines and Low Carbon Innovation (Ministry) intends to include aviation fuel in the LCFS starting in 2024.

In Spring 2022, the Ministry passed Bill 15, the [Low Carbon Fuels Act](#) (New Act), to replace the Current Act. The New Act is intended to enable more greenhouse gas reductions, broaden the scope of the LCFS and make the LCFS easier to understand, administer, and enforce.

The New Act allows the LCFS to apply to the aviation sector by defining a jet fuel category and introducing “fossil-derived jet fuel” as a base fuel. The New Act also enables the creation of regulations regarding the use of jet fuel and its characteristics.

The Ministry is developing regulations (New Regulations) that are intended to bring the New Act into force on January 1, 2024. The purpose of this paper is to discuss the aspects of the New Act and New Regulations regarding aviation fuel that are expected to come into force on January 1, 2024.

This paper will present the types of aviation fuels to be covered by the LCFS, renewable and low carbon fuel requirements and targets, fuel characteristic values, supplier eligibility criteria, and penalty rates.

The Ministry is accepting feedback on these changes. Responses must be in writing and must be submitted by email or mail before 7 a.m. on May 15, 2023, to one of the following addresses:

Email: lcfs@gov.bc.ca

Mail: Low Carbon Fuels Branch
B.C. Ministry of Energy, Mines, and Low Carbon Innovation
P.O. Box 9314 Stn Prov Govt
Victoria, B.C. V8W 9N1

This intentions paper has been posted online on the Ministry's website for comment at: <https://gov.bc.ca/lowcarbonfuels>.

2 Background

Under the LCFS, fuel suppliers must meet annual renewable fuel content requirements and low carbon fuel requirements.

Under the renewable fuel content requirements, a fuel supplier must ensure that the volume of diesel class fuel it supplies in a compliance period contains at least 4% renewable fuel content by volume, and that the volume of gasoline class fuel it supplies in a compliance period contains at least 5% renewable fuel content by volume.

Under the low carbon fuel requirements, a fuel supplier must progressively decrease the average carbon intensity of the gasoline and diesel class fuels it supplies to achieve a 30% reduction in 2030.

A [Technical Requirements Intentions Paper](#) was published on the Renewable and Low Carbon Fuel Requirements website on December 20, 2022. Technical aspects of the New Act and New Regulations are presented therein.

It is recommended that you review the [Technical Requirements Intentions Paper](#) for context prior to reading this Aviation Fuel Regulation Intentions Paper. Many aspects of the New Act and Regulation are explained in detail in the Technical Requirements Intentions Paper, and will provide the proper background for understanding the aviation specific topics presented in this paper.

Feedback received on the aviation aspects presented in the Technical Requirements Intentions Paper has been incorporated into the intentions published in this paper. In cases where there is conflicting information between the Technical Requirements Intentions paper and this paper, this paper should be considered as the most up to date information.

3 Aviation fuel regulation

3.1 Fuel Types

The most common types of aviation fuels used in B.C. are jet fuel and aviation gasoline.

Jet fuel is the predominant aviation fuel in B.C. and is used to power turbine engine aircraft that compose the majority of civil aviation. Aviation gasoline is used to power piston engine airplanes, commonly private or recreational aircraft.

In 2019, total demand for aviation fuel in B.C. was 2,074 million litres.¹ Of the total demand, 2,065 million litres were jet fuel, and 9 million litres were aviation gasoline.

Currently aviation gasoline is not being considered for regulation in LCFS.

The New Act has created a “jet fuel category” that includes fossil-derived jet fuel and alternatives to jet fuel. There are emerging alternatives to jet fuel that have a very low carbon intensity such as electricity, hydrogen and low carbon jet fuel produced from non-fossil feedstocks.²

The Ministry intends for the jet fuel category to be subject to carbon intensity reduction requirements starting January 1, 2024, and renewable fuel content requirements starting January 1, 2028.

3.2 Renewable fuel requirements

In the regulations for the New Act, the Ministry intends to add a renewable fuel content requirement for suppliers of fuel in the jet fuel category. Suppliers of fuel in the jet fuel category will be required to ensure that the volume of jet fuel they supply in a compliance period contains at least 1% renewable fuel content by volume starting in 2028, 2% renewable fuel content by volume in 2029, and 3% renewable fuel content by volume in 2030 and subsequent compliance periods.

The renewable fuel content requirements for the jet fuel category must be met with non-fossil-derived alternatives to jet fuel, as prescribed in the Regulation, and may not be met by over-compliance with the renewable fuel content requirements in the gasoline or diesel fuel categories.

¹ Statistics Canada, May 2022, Report on Energy Supply and Demand in Canada 2019 Revision: <https://www150.statcan.gc.ca/n1/pub/57-003-x/57-003-x2022001-eng.htm>

² See Section 5 of the Low Carbon Fuels Act for full definition of alternatives to base fuels: <https://www.leg.bc.ca/parliamentary-business/legislation-debates-proceedings/42nd-parliament/3rd-session/bills/third-reading/gov15-3>

Table 1: Renewable fuel requirements for 2024 and beyond

Compliance Period	Renewable fuel target for fuel in jet fuel category
2024	N/A
2025	N/A
2026	N/A
2027	N/A
2028	1%
2029	2%
2030 and subsequent compliance periods	3%

3.3 Standard for Low Carbon Jet Fuel

The Ministry intends to accept as *low carbon jet fuel*, fuel produced from renewable feedstocks in a stand-alone facility or co-processed from renewable feedstocks in a conventional petroleum refinery, so long as the fuel meets equivalent standards to fossil-derived jet fuel for use in a jet engine.

Low carbon jet fuel may be used to fulfill the renewable fuel content requirement and generate credits relative to its carbon intensity in fulfilment of the low carbon fuel requirements that follow.

3.4 Low Carbon Fuel Requirements

The Ministry intends to apply a low carbon fuel requirement to the jet fuel category starting on January 1, 2024. This will require suppliers of jet fuel category fuel to meet increasingly stringent annual carbon intensity reduction targets.

Technical aspects of the low carbon fuel requirements are presented in the following subsections.

3.4.1 Calculating Compliance Units

The [Technical Requirements Intentions Paper](#) outlines how compliance units (currently called “credits” and “debits”) are intended to be calculated under the New Regulations. The formulas are not presented or discussed in this paper, however the key technical values pertaining to the jet fuel category are presented in the following sections.

3.4.1.1 Base carbon intensity

Table 2 below shows the base carbon intensity for the jet fuel category. It is the carbon intensity intended to be prescribed by the New Regulations for fossil-derived jet fuel. The base carbon intensity will function as the baseline from which the annual carbon intensity targets will be calculated, and against which the alternatives in the jet fuel category will be compared.

Table 2: Base carbon intensity

Fuel Category	Carbon intensity (gCO ₂ e/MJ)
Jet fuel category	88.83

The carbon intensity value was calculated for fossil-derived jet fuel produced in 2010 using the lifecycle assessment model, GHGenius 5.02.

2010 was chosen as the base year for modelling to be consistent with the gasoline and diesel fuel regulations. This approach is consistent with feedback received from interested parties.

For more information on how base carbon intensities were determined, see the [Technical Requirements Intentions Paper](#).

3.4.1.2 Recorded carbon intensity and default carbon intensity

For fossil-derived base fuels, such as diesel, gasoline, and jet fuel, the recorded carbon intensity will be equal to the base carbon intensity for that category (see Table 2 above).

To determine the recorded carbon intensity of an alternative fuel which displaces the use of a fossil-derived base fuel, it is recommended that the producer of the fuel apply for a carbon intensity that represents their unique fuel production process. This is presented in greater detail in the [Technical Requirements Intentions Paper](#).

If a published carbon intensity for a fuel is unavailable, fuel suppliers may use the default carbon intensity for the fuel type prescribed in the New Regulations. The default value for alternative fuel in the jet fuel category is presented in Table 3. The default

carbon intensity for non-fossil-derived jet fuel is set to be the same carbon intensity as fossil-derived jet fuel, to be a precautionarily conservative yet realistic value.

Table 3: Default carbon intensities

Fuel Category	Carbon intensity (gCO_{2e}/MJ)
Non-fossil jet fuel	88.83

3.4.1.3 Energy content

Table 4 below shows the energy content of jet fuel and alternatives to jet fuel. The values below were taken directly from GHGenius 5.02 and are comparable to the values used in GHGenius 4.03.

Table 4: Energy Content

Fuel	Energy Content (MJ/L)
Jet fuel - fossil derived	37.40
Jet fuel - other	36.00

3.4.1.4 Energy Effectiveness Ratio

The Energy Effectiveness Ratio (EER) is a measurement of efficiency which compares the useful work output of an engine running on a low carbon fuel (e.g., electricity) to the engine output of the base fuel (e.g., fossil-derived jet fuel) it is displacing.

Table 5: Energy Effectiveness Ratio

Fuel	Jet fuel category energy effectiveness ratio
Electricity	2.5

Where no EER is provided for a fuel, the EER is assumed to be 1.0. No EER is published for low carbon jet fuel, as it is assumed to have the same energy efficiency as conventional jet fuel. Additional EERs may be added for emerging alternatives to jet fuel at a later time.

See Appendix D in the [Technical Requirements Intentions Paper](#) for more detail on how the electricity EER was calculated for the jet fuel category.

3.4.1.5 Carbon intensity reduction targets

The Ministry intends to require suppliers of fuel in the jet fuel category to meet annual carbon intensity reduction targets that progress linearly towards a 10% carbon intensity reduction in 2030, beginning January 1, 2024.

Table 6 below shows the percent reduction from a 2010 baseline and the associated target carbon intensity for the jet fuel category in each year from 2024 to 2030 and subsequent compliance periods.

The target carbon intensities shown in Table 6 are presented for illustrative purposes only and will not be prescribed in the New Regulations; only the percent reduction values, and baseline carbon intensity will be prescribed.

Table 6: Carbon intensity reduction targets and values for 2024 and beyond

Compliance Period	Percent Reduction for fuel in jet fuel category	Target carbon intensity for jet fuel category (gCO₂e/MJ)
2024	0%	88.83
2025	1.67%	87.35
2026	3.33%	85.87
2027	5.00%	84.39
2028	6.67%	82.91
2029	8.33%	81.43
2030 and subsequent compliance periods	10.00%	79.95

In 2024, the carbon intensity reduction requirement for jet fuel is intended to be set to 0%. In 2024, suppliers of fossil-derived jet fuel must report their supply of jet fuel to the Ministry in a compliance report but will not incur debits. From January 1, 2024, onward, suppliers of low carbon alternatives to jet fuel may generate credits for their supply of low carbon fuel in the jet fuel category.

Starting in 2025, suppliers of fossil-derived jet fuel will incur debits calculated according to the quantity of fossil-derived jet fuel supplied and its carbon intensity relative to the annual target carbon intensity.

3.5 Supplier Eligibility

3.5.1 Domestic vs. International Aviation

The Ministry intends for the New Act to apply to all fuel in the jet fuel category that is imported or manufactured in B.C. and used for aviation regardless of the destination of the flight. The Ministry does not intend to distinguish between international and domestic aviation. If a jet fuel category fuel is supplied in B.C. it is intended to be subject to the LCFS starting on January 1, 2024.

3.5.2 Exclusion from the Jet Fuel Category

The New Regulations intend to exclude jet fuel supplied to the Department of National Defence (Canada) if the fuel supplier reasonably expects that the fuel will be used in military aircraft or equipment for military operations. A military operation means an operation undertaken to protect national security, support humanitarian relief efforts, participate in multilateral military or peace-keeping activities under the auspices of international organizations or defend a member of the North Atlantic Treaty Organization.

Jet fuel is also intended to be excluded if supplied to military aircraft or equipment of a foreign country.

3.5.3 Exemption Threshold

The Current Regulation allows individuals who supply 200,000 litres of fuel or less to apply for exemption from the renewable or low carbon fuel requirements. This volume includes the total supply of fuel in the gasoline and diesel fuel categories.

Under the New Regulations, the Ministry intends to allow an individual to apply for exemption from the renewable and low carbon fuel requirements for jet fuel if their annual supply does not exceed 10 million litres in the jet fuel category until 2029. In 2030 and subsequent compliance periods, the limit will be reduced to 4 million litres.

Table 7: Exemption threshold for 2024 and beyond

Compliance Period	Jet fuel supply volume (L)
2024	10,000,000
2025	10,000,000
2026	10,000,000
2027	10,000,000
2028	10,000,000
2029	10,000,000
2030 and subsequent compliance periods	4,000,000

The Ministry intends for an individual to be able to apply for exemption from the New Regulations for jet fuel, even if they are not exempt from the Regulations for gasoline and diesel class fuels. Individuals who do not apply for exemption by the reporting deadline are subject to the renewable and low carbon fuel requirements regardless of the volume of fuel supplied.

A supplier of low carbon jet fuel who intends to generate credits from the supply of the fuel can not be exempt from the New Regulations. However, if not applying for exemption, this supplier will also incur debits for any supply of fossil-derived jet fuel in the compliance period.

3.6 Penalty rates

3.6.1 Renewable Fuel Target Penalty

The Current Regulation sets the penalty rate for non-compliance with the renewable fuel content requirement at the following:

- \$0.30/litre deficit for gasoline class fuel
- \$0.45/litre deficit for diesel class fuel

The Ministry intends to set the penalty rate for non-compliance with the renewable fuel content requirement in the jet fuel category as the following:

- \$0.50/litre deficit for the jet fuel category

3.6.2 Low Carbon Fuel Target Penalty

The Current Regulation was recently amended to increase the low carbon fuel penalty from \$200 per tonne to \$600 per tonne starting with the 2023 compliance period. As compliance units are indistinguishable between fuel categories, the same low carbon fuel penalty rate will apply to the jet fuel category.

4 Treatment of Compliance Units

There will be no distinction between compliance units (“credits” and “debits” in the Current Act and Regulation) created in different fuel classes. For example, a fuel supplier who incurs negative compliance units from the supply of fossil-derived jet fuel may generate or otherwise acquire positive compliance units created from the supply of low carbon gasoline or diesel fuels to fulfil their low carbon fuel compliance obligations. Similarly, positive compliance units from the supply of low carbon jet fuel may be used to fulfil low carbon fuel compliance obligations from the supply of fossil gasoline or diesel fuels.

5 Review of Targets

The Ministry intends to conduct ongoing review and analysis of the aviation sector and Regulations. The renewable fuel targets, low carbon fuel targets and exemption thresholds presented in this paper are considered to be conservative and will be revisited in 2026 after a reassessment of the sector.