ECO RESSOURCES CONSULTANTS

An Update on Renewable Diesel Infrastructure in Canada

Final Report

Natural Resources Canada

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Executive Summary

The Government of Canada has a four-pronged biofuels strategy in order to: reduce the greenhouse gas (GHG) emissions resulting from fuel use; encourage greater production of biofuels; accelerate the commercialization of new biofuel technologies, and provide new market opportunities for agricultural producers and rural communities. One component of this strategy is to increase the retail availability of renewable fuels through regulation. On July 1, 2011, the requirement for 2% renewable content in diesel fuel and heating distillate oil under the federal *Renewable Fuels Regulations* came into force.

Natural Resources Canada commissioned this study to survey the state of existing and planned renewable alternative to diesel blending infrastructure, and understand the types and sources of fuels that will be used to meet both federal and provincial renewable mandates. More specifically, the objectives of the study are: to assess the physical blending, storage and distribution infrastructure for renewable content in diesel and heating oil in place on July 1st 2011; where and what infrastructure remains to be installed for regulated parties to comply with the Regulations; the types of renewable alternatives to diesel refiners intend to use to meet the federal requirements in the short- medium, and long-term; preferences regarding renewable fuel production technologies and/or the key fuel parameters (e.g. cloud point, cost, etc.) and rationale for preferences; key criteria used by refiners to select suppliers of renewable alternatives to diesel and typical supply arrangements; and refiner experiences with biodiesel, hydrogenation derived renewable diesel (HDRD), and other emerging fuels technologies.

The results of these tasks were obtained by carrying out a literature review and also through extensive consultation with industry proponents. We provided fuel producers and importers with a questionnaire to complete and obtained clarifications when necessary. The majority of large petroleum producers agreed to participate in this study, with the understanding that any sensitive commercial information be protected. Eleven large, medium and small diesel and heating oil producers and importers were surveyed and provided responses: Imperial Oil, Shell, Suncor, Ultramar, Chevron, Husky, Consumer's Cooperative Refineries (Coop), Norcan, Transmontaigne, Parkland and Irving.

In order to preserve the confidentiality of the commercially sensitive information provided by the petroleum producers, for the purposes of this report we will be presenting results aggregated by region. The region defined as "West" includes British Columbia, Alberta, Saskatchewan and Manitoba. The region defined as "East" includes Ontario, Quebec and the Atlantic provinces (excluding Newfoundland and Labrador that is permanently exempt from the Regulations).

Refineries

As at July 1st 2011, investments had been made at five refineries in the West only in order to meet provincial regulations; four in order to accommodate the blending of biodiesel and one to accommodate HDRD. Survey respondents have indicated that additional infrastructure additions and modifications have been and/or will be necessary at five refineries since the entering into force of the federal *Renewable Fuels Regulations*, two for biodiesel and three for HDRD. Three of these refineries are in the West and two are in the East. The modifications in the West are additions to refineries that had already received upgrades prior to July 1st 2011 and are relatively minor in comparison with the work already

carried out at these locations. In the East, modifications at both refineries in question will be related to the import and blending of HDRD, including marine tank receipt management, storage tank and line realignments and installation of meters.

Terminals

As at July 1st 2011, 10 terminals had received modifications or upgrades to accommodate biodiesel and three had received modifications for HDRD. Ten out of the 13 are located in the West and are operated by Imperial Oil, Shell, Suncor, Chevron and Coop. These investments were made in order to meet provincial regulations in Manitoba, Alberta and British Columbia. Three of the 13 upgraded terminals are located in the East, are operated by Norcan and Olco (under the ownership of Transmontaigne) in Montreal and Québec City, and are not due to any federal or provincial regulations.

Additional investments are anticipated at a total of nine terminals in Canada, three of which involved investments for HDRD. Three of the terminals to be upgraded are in the West and six are in the East. It should be noted that all of the proposed new projects in the West are predominantly in order to meet provincial regulations.

The types of investments that have been made or that remain to be made at refineries and terminals in order to accommodate renewable content are primarily related to offloading facilities for biodiesel and HDRD, purchase or cleaning of tanks for biodiesel and HDRD, installation of insulation and heating systems for tanks and lines and installation of blending equipment (batch, in-line or on the rack) for biodiesel.

Preferences for renewable diesel types and renewable diesel producers/suppliers

Table I summarizes the survey respondents' views on the advantages and disadvantages of different types of renewable alternatives to diesel.

Most refiners/blenders surveyed for this project indicated that they would ideally choose HDRD due to its favourable physical properties, the reliability and good reputation of existing suppliers, as well as the fact that most HDRD production plants built are relatively large-scale and hence are able to reliably provide the required volumes.

Some respondents have already decided to only use HDRD. Some plan to increase their use of HDRD, but current prices and availability prevent them from doing so. Others plan to minimize their use of HDRD because the cost premium is considered still too high. However, most respondents indicated that if the construction of new plants in North America (as well as Europe and Asia) caused a sufficient increase in supply and reduction in the cost premium, they would likely source most if not all of their renewable diesel requirements from HDRD producers.

The three key criteria that all respondents cited as deciding factors for their choice of suppliers are: quality of product, stability of supply and cost. However, the order of importance of these three factors varies depending on the respondent.

TABLE I – SUMMARY OF SURVEY RESPONDENT VIEWS ON THE ADVANTAGES AND DISADVANTAGES OF VARIOUS RENEWABLE ALTERNATIVES TO DIESEL

	Advantages	Disadvantages
Soy/canola biodiesel	Currently lower cost relative to HDRD. Lower cloud point relative to animal fat or yellow grease biodiesel. Increased lubricity – less of a need for additives.	Still need to blend with significant amounts (up to 50%, depending on the required cloud point) of ultra low sulphur kerosene (ULSK) to meet industry seasonal cloud point schedules for diesel fuels. Not many "large" producers of biodiesel – producers who can meet refiner requirements for stability of supply and quality assurance.
Animal fat/yellow grease biodiesel	Currently the least expensive renewable alternative to diesel. Increased lubricity – less of a need for additives. Food vs. fuel not a concern.	High cloud point. Can only be blended in mid-summer, or very high volumes of ULSK are required (up to 90%, depending on the required cloud point) Not many "large" producers of biodiesel – producers who can meet refiner requirements for stability of supply and quality assurance.
HDRD	Can be blended seamlessly with ultra low sulphur diesel (ULSD) – possible to blend at higher percentages than biodiesel. Cloud points for HDRD can go as low as -25ºC, depending on the product. Less infrastructure and monitoring required when blending with ULSD. No need to label final blend for the Renewable Fuels Regulations or for customers.	Cost relative to other renewable diesel alternatives. Currently one major supplier has virtual monopoly on the market.

A wide variety of contract types are observed from the replies of the respondents. For some, long-term contracts are preferred for stability whilst for others short-term contracts are preferred for flexibility. Some contracts set a price on a term basis while others follow spot prices (both arrangements can be beneficial depending on market conditions). Some smaller refiners/blenders have expressed a desire for longer-term contracts in order to guarantee supply, but they are not always easy to obtain.

Forecasted use of renewable alternatives to diesel

Table II below presents a breakdown of the forecasted renewable diesel types that will be used to meet the federal and provincial regulations. These proportions were calculated based on the volumes provided by the eleven respondents only. However, these eleven respondents account for the majority of diesel and heating oil produced or imported in Canada.

TABLE II – BREAKDOWN OF TYPES RENEWABLE ALTERNATIVES TO DIESEL USED TO MEET FEDERAL AND PROVINCIAL REGULATIONS[1]

	West			East			Canada		
	Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term
From Canada									
Soy biodiesel	1.5%	1.2%	1.2%	0.0%	0.0%	0.0%	1.3%	0.9%	0.8%
Canola biodiesel	7.8%	11.0%	9.8%	0.0%	0.0%	2.7%	6.7%	8.1%	7.9%
Animal fat biodiesel	0.0%	0.0%	0.0%	0.0%	1.1%	2.6%	0.0%	0.3%	0.7%
Yellow grease biodiesel	0.0%	0.0%	0.0%	0.0%	1.1%	2.1%	0.0%	0.3%	0.6%
Total from Canada (%)	**9.3%**	**12.3%**	**11.0%**	**0.0%**	**2.2%**	**7.4%**	**8.0%**	**9.6%**	**10.0%**
From USA									
Soy biodiesel	6.1%	6.9%	9.3%	0.0%	6.6%	6.0%	5.2%	6.9%	8.4%
Canola biodiesel	41.5%	35.9%	33.6%	0.0%	0.0%	5.4%	35.5%	26.4%	25.9%
Animal fat biodiesel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hydrotreated products (e.g. HVO)	5.0%	1.2%	9.3%	0.0%	46.8%	43.0%	4.3%	13.3%	18.5%
Total from USA (%)	**52.6%**	**44.1%**	**52.2%**	**0.0%**	**53.4%**	**54.4%**	**45.0%**	**46.5%**	**52.8%**
From overseas									
Hydrotreated products (e.g. HVO)	36.0%	43.6%	35.0%	87.7%	44.4%	38.2%	43.6%	43.9%	35.9%
Total from overseas	**36.0%**	**43.6%**	**35.0%**	**87.7%**	**44.4%**	**38.2%**	**43.6%**	**43.9%**	**35.9%**
Other	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
Credits	2.0%	0.0%	0.0%	12.3%	0.0%	0.0%	3.5%	0.0%	0.0%
GRAND TOTAL (%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

[1]Short-term = July 2011 – December 2012 (first distillate compliance period); Medium-term = 2013; Long-term = 2014 and beyond.

As can be seen in Table II, in the short-, medium- and long-term, in both the West and the East, it is expected that only up to 12% of the volume requirements for provincial and federal mandates will be met using renewable diesel alternatives from Canada. It is expected that 44% - 54% will come from the United States (except in the East in the short-term), mostly as biodiesel but also as HDRD. 36% - 44% will be HDRD from overseas (except in the East in the short-term where it will be 88%). It should be noted that the estimates for HDRD volumes in the long-term are conservative, as most respondents indicated that if prices of HDRD go down, they will purchase more of it.

It should also be noted that the medium-term and long-term estimates shown in Table II do not take into account the 265 million litre ADM biodiesel plant that is currently under construction in Alberta with a predicted start date at the end of 2013. If the project does follow through, the fuel quality is acceptable and consistent and the prices are competitive, product from this plant could be used to meet the federal requirements.

It can also be seen in the table that of the different forms of biodiesel available, refiners prefer canola biodiesel. This is due to its better cold flow properties relative to biodiesel from other feedstocks and the greater availability of supply.

Table III below shows that a significant proportion of the renewable content to be blended (particularly in the East) will be HDRD and overall less than half of the total federal requirement will be met with biodiesel.

TABLE III –PROPORTIONS OF RENEWABLE ALTERNATIVES TO DIESEL BLENDED BY REGION AND FUEL TYPE

	West			East			Canada		
	Short-term	**Medium-term**	**Long-term**	**Short-term**	**Medium-term**	**Long-term**	**Short-term**	**Medium-term**	**Long-term**
Biodiesel	57%	55%	54%	0%	9%	19%	49%	43%	44%
Hydrotreated products (e.g. HVO)	41%	45%	44%	88%	91%	81%	48%	57%	54%
Credits/other	2%	0%	2%	12%	0%	0%	3%	0%	1%
TOTAL (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table IV below shows where biodiesel and HDRD will be blended. As can be seen in the table, the majority of biodiesel will be blended in the West due to existing biodiesel blending infrastructure that was put in place for the provincial renewable fuels mandates. In the short-term the majority of HDRD use will be in the West but in the medium- and long-term, approximately equal proportions of HDRD will be blended in the West and the East. It should be noted that diesel and heating oil sold in Quebec and the Atlantic Provinces are temporarily exempt from the *Renewable Fuels Regulations* until December 31, 2012.

TABLE IV –LOCATION OF BLENDING BY FUEL TYPE

	Short-Term			Medium Term			Long-Term		
	West	**East**	**Total**	**West**	**East**	**Total**	**West**	**East**	**Total**
Biodiesel	100%	0%	100%	95%	5%	100%	88%	12%	100%
HDRD	73%	27%	100%	58%	42%	100%	59%	41%	100%

Table V below illustrates where refiners/blenders will be blending renewable alternatives to diesel to meet the federal and provincial requirements. Volumes were obtained by multiplying the percentages by estimated volume requirements for the federal Regulations based on predicted diesel and heating oil demand (see Table 4 in (ÉcoRessources, 2010b)). Note that demand for Quebec and Atlantic Provinces was removed from the estimate in the short-term since they are exempt from the Regulations until end 2012.

TABLE V – LOCATION OF RENEWABLE ALTERNATIVE TO DIESEL BLENDING

	Percentage			Volume (ML)*		
	West	**East**	**Total**	**West**	**East**	**Total**
Short-term	85.5%	14.5%	100%	342	58	400
Medium-term	73.5%	26.5%	100%	441	159	600
Long-term	72.7%	27.3%	100%	472	178	650

*Volumes were calculated by multiplying percentages by estimated demand for renewable alternatives to diesel due to the federal Regulations based on predicted diesel and heating oil demand (see Table 4 in (ÉcoRessources, 2010b)).

As can be seen in the table, the majority of blending in order to meet the federal and provincial requirements will take place in the West. This is due to the existence of provincial regulations that were put in place prior to the entering into force of the federal Regulations. As such, the infrastructure required for blending with renewable diesel was already put in place for the provincial regulations. National refiners with activities in the West will therefore concentrate their blending activities in this region in order to take advantage of existing infrastructure investments. Nevertheless, one can see an increase in the proposed proportion of renewable diesel being blended in the East over time.

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1. Introduction

1.1 Background

In 2006, the federal government proposed developing regulations under the *Canadian Environmental Protection Act, 1999* to require average renewable fuels content in Canadian conventional fuels. The key elements of the approach as indicated in the Notice of Intent, published December 30, 2006, were (Canada Gazette, 2006):

- The requirement for an average of five percent renewable content based on the volume of gasoline that a company produces or imports for use in Canada commencing in September 2010;
- The requirement for an average of two percent renewable content in the diesel and heating oil pool by 2012[1] upon successful demonstration of renewable diesel fuel use under a range of Canadian conditions;
- A credit and trading system such that a company would have an option of obtaining credits from others rather than actually having renewable content in its fuel.

In order to assess the technical feasibility of renewable fuel use in diverse applications under typical Candian conditions, as was required for the development of the Regulations, Natural Resources Canada initiated the National Renewable Diesel Demonstration Initiative (NRDDI). This multi-faceted initiative provided partial funding for renewable diesel demonstration projects, mostly related to end-user operability but also with regards to blending operations under a range of temperature conditions. As a part of the NRDDI, ÉcoRessources Consultants was retained to conduct a study (*National Renewable Diesel Demonstration Initiative Infrastructure Project*. ÉcoRessources, 2010) that sought to assess the existing infrastructure for the storage, blending and distribution of renewable diesel in Canada, the additional infrastructure that would be required in order to meet the Regulations, the costs of this additional infrastructure and the lead times required to put it in place. The study also evaluated the additional kerosene requirements due to low-temperature blending of fatty-acid methyl ester (FAME) biodiesel. The information required for the study was obtained principally through direct consultations with diesel fuel and heating oil producers and blenders.

This study found that while infrastructure investments had already been made in order to meet existing provincial regulations, significant additional investments would be necessary in order to meet the federal requirements. The cost of this additional infrastructure was estimated to be of the order of $180 million, with lead times of 6-30 months (most of the work being completed within 24 months).

[1] This was subsequently changed to 2011.

When the study was carried out in 2010, the respondents consulted predicted that only about 10% of the renewable diesel requirements for the federal regulations would be met using hydrogenation-derived renewable diesel (HDRD) from Europe and Singapore and that the rest would be met with FAME biodiesel from Canada and the United States[2].

On June 29, 2011, the government of Canada registered regulations amending the *Renewable Fuels Regulations* which were then published on July 20, 2011 (Canada Gazette, 2011). These amendments stated that the coming into force of the 2% requirement of renewable content in diesel and heating oil would be effective as of July 1st, 2011.

At time of writing, the regulated parties are currently about a third into the first distillate compliance period of the Regulations (which is from July 1st 2011 to December 31st, 2012). Natural Resources Canada would like to understand the state of existing and planned renewable alternative to diesel blending infrastructure, and understand the types and sources of fuels that will be used to meet both federal and provincial renewable mandates. The objectives of the current study are to assess:

- The physical blending, storage and distribution infrastructure for renewable content in diesel and heating oil in place on July 1st 2011;
- Where and what infrastructure remains to be installed for regulated parties to comply with the regulations;
- The types of renewable alternatives to diesel refiners intend to use to meet the federal requirements in the short- medium, and long-term and why;
- Preferences regarding renewable fuel production technologies and/or the key fuel parameters (e.g. cloud point, cost, etc.) and rationale for preferences;
- Key criteria used by refiners to select suppliers of renewable alternatives to diesel and typical supply arrangements;
- Refiner experiences with (1) biodiesel, (2) hydrogenation derived renewable diesel (HDRD), and (3) other emerging fuels technologies (e.g. Fischer-Tropsch).

The results of these Tasks were obtained by carrying out a literature review and also through extensive consultation with industry proponents. ÉcoRessources Consultants provided fuel producers and importers with a questionnaire to complete (included in Appendix A) and obtained clarifications when necessary. The majority of large petroleum producers have agreed to participate in this study, with the understanding that any sensitive commercial information be protected. Eleven large, medium and small

[2] For the purposes of this study, biodiesel is defined as a diesel alternative composed primarily of fatty acid methyl esters produced from renewable feedstocks, while HDRD is composed of paraffinic hydrocarbons produced via hydrotreatment of renewable feedstocks.

diesel and heating oil producers and importers were surveyed and provided responses: Imperial Oil, Shell, Suncor, Ultramar, Chevron, Husky, Consumer's Cooperative Refineries (Coop), Norcan, Transmontaigne, Parkland and Irving.

In order to preserve the confidentiality of the commercially sensitive information provided by the petroleum producers, for the purposes of this report we will be presenting results aggregated by region. The region defined as "West" includes British Columbia, Alberta, Saskatchewan and Manitoba. The region defined as "East" includes Ontario, Quebec and the Atlantic provinces (excluding Newfoundland and Labrador that is permanently exempt from the Regulations).

2. Existing and Planned or Proposed Infrastructure

Prior to the entering into force of the federal Regulations, some infrastructure for handling and blending biodiesel already existed across the country for a number of reasons. In the Western region, provincial regulations were in effect in British Columbia (4%) and Manitoba (2%). Alberta's 2% mandate came into force in April 2011 (only slightly prior to the federal Regulations) and Saskatchewan has indicated that it will also introduce renewable fuel requirements in 2012 (although it has not yet been formally mandated).

In Ontario and Quebec, some biodiesel was being blended in the absence of provincial or federal regulations. This was due to some demonstration initiatives taking place with public transportation and government service vehicles in a number of jurisdictions. In Quebec in particular, this has allowed Norcan and Olco, who are already in the business of providing boutique products, to get into the business of selling biodiesel blends. There have also been some initiatives in Quebec to incent agricultural producers to use biodiesel blends for their equipment, given that using these fuels supports their industry. Relative to the volumes being blended in the West for provincial regulations, however, the volumes blended in Ontario and the East prior to the implementation of the Regulation have remained small.

2.1 Refineries

There are currently 19 refineries under the operation of 11 refining-marketing companies in Canada. Imperial Oil, Shell and Suncor market nationally and each operate more than one refinery. North Atlantic Refining, Irving Oil and Ultramar in eastern Canada and Consumers' Co-op Refineries Limited (Co-op), Husky and Chevron in western Canada operate one refinery each and generally supply local markets only

As at July 1st 2011, investments had been made at five refineries in the West only in order to meet provincial regulations; four in order to accommodate the blending of biodiesel and one to accommodate hydrogenation derived renewable diesel (HDRD). Some of these investments include: truck offloading facilities for B100 (including particulate filters), tanks for storage of B100 and blends, insulation and heating systems for tanks and lines, blending facilities (at the rack, batch (i.e. directly into a tank) or in-line), metering and control systems (FAME and HDRD).

Survey respondents have indicated that additional infrastructure additions and modifications have been and/or will be necessary at five refineries since the entering into force of the federal *Renewable Fuels Regulations*, two for biodiesel and three for HDRD. Three of these refineries are in the West and two are in the East. The modifications in the West are additions to refineries that had already received upgrades prior to July 1st 2011 and are relatively minor in comparison with the work already carried out at these locations. In the East, modifications at both refineries in question will be related to the import and blending of HDRD, including marine tank receipt management, storage tank and line realignments and installation of meters.

2.2 Terminals

In addition to some refineries, a large proportion of the storage and blending of biodiesel, as well as the storage of biodiesel blends, takes place at the terminals. As at July 1st 2011, 10 terminals had received modifications or upgrades to accommodate biodiesel and three had received modifications for HDRD. Ten out of the 13 are located in the West and are operated by Imperial Oil, Shell, Suncor, Chevron and Coop. These investments were made in order to meet provincial regulations in Manitoba, Alberta and British Columbia. Three of the 13 upgraded terminals are located in the East, are operated by Norcan and Olco (under the ownership of Transmontaigne) in Montreal and Québec City, and are not due to any federal or provincial regulations.

The types of investments that have been made at terminals in order to accommodate renewable content, as of July 1st 2011, are listed below:

- Truck offload facilities for B100 and/or BXX including new filters;
- Rail offload facilities for B100 and/or BXX;
- Marine offload facilities for HDRD and tank receipt management;
- Insulation and heat tracing of tanks and lines for FAME and blends;
- Installation of new tanks and/or modification of existing tanks (cleaning, treating and installation of floor liner and/or filters) for the dedicated storage of B100 and/or BXX;
- Procedural changes in tank inventory management for B100, BXX or HVO;
- Installation of temperature control equipment for tanks containing B100 or BXX: heating coils/elements, nitrogen blankets, etc.;
- Installation of in-line blending equipment;
- Installation of blending equipment on the rack;
- Upgrade of electrical substation to accommodate heating of stored FAME;
- Re-programming of rack ordering software for BXX.
- Customer education.

Additional investments are anticipated at a total of nine terminals in Canada, three of which involved investments for HDRD. Three of the terminals to be upgraded are in the West and six are in the East. The types of additional investments to be made are of a similar nature to those already carried out and listed previously. The most common investments are for new tanks, tank cleaning, heating and insulation, FAME or HDRD offloading (marine, rail or truck) and blending equipment.

All of the proposed new projects in the West are predominantly in order to meet provincial regulations. However, certain respondents have indicated that although the projects were put in place for provincial regulations, some projects would have been put in place anyway even in the absence of provincial regulations (or at least the nature of the investments would not have changed much), in order to meet the federal Regulations. Not surprisingly, most of the infrastructure additions are being made at the refinery and/or terminal sites serving large markets (i.e. near large urban centres) and capable of handling high volumes.

National refiner/marketers have the greatest flexibility in meeting the federal Regulations, as they can make investments strategically in large markets and/or in markets where provincial regulations already exist, in order to meet their annual national average of 2% renewable content. However, the impact of the federal Regulations in terms of cost per litre sold is likely to be higher for regional producers/blenders because they don't all have access to larger markets and they don't have the flexibility of being able to choose strategically in which market they will blend, yet the absolute cost of their investments per terminal or refinery is about the same as for the national operators. This results in the average cost impact per litre for a regional producer/blender being higher for a regional producer/importer than for a national refiner/marketer. Of course, this impact will mostly affect the regional producers/blenders in the East, where provincial mandates do not already exist[3]. Regional producers/blenders in the West have already made their investments in order to meet the provincial regulations; therefore the relative impact of the federal Regulations on their operations is lower.

All cardlocks that will be receiving biodiesel blends must undergo preventative tank cleaning.

Table 1 provides a summary of the infrastructure additions carried out as at July 1st, 2011, and the additions/modifications to be made as of that date.

[3] It should be noted that transitional flexibilities have been provided within the Regulations by temporarily exempting renewable content in diesel fuel and heating oil sold in Quebec and the Maritimes until December 31, 2012.

TABLE 1 – INFRASTRUCTURE MODIFICATIONS AT REFINERIES AND TERMINALS

		Biodiesel	HDRD
As at July 1st 2011	**Refineries**	Truck offloading facilities for B100 (including particulate filters) Tanks for storage of B100 and blends Insulation and heating systems for tanks and lines Blending facilities (at the rack, batch or in-line) Metering and control systems	Metering and control systems
	Terminals	Truck offload facilities for B100 and/or BXX including new filters Rail offload facilities for B100 and/or BXX Insulation and heat tracing of tanks and lines for FAME and blends Installation of new tanks and/or modification of existing tanks (cleaning, treating and installation of floor liner and/or filters) for the dedicated storage of B100 and/or BXX Procedural changes in tank inventory management Installation of temperature control equipment for tanks containing B100 or BXX: heating coils/elements, nitrogen blankets, etc. Installation of in-line blending equipment Installation of blending equipment on the rack Upgrade of electrical substation to accommodate heating of stored FAME Re-programming of rack ordering software for BXX Customer education	Marine offload facilities for HDRD and tank receipt management Procedural changes in tank inventory management
After July 1st 2011	**Refineries**	Small modifications further to those already carried out (additional tank, changes in production operations (distillation cutpoint, catalysts, etc.) to accommodate higher cloud point biodiesel.	Marine tank receipt management Offload rack for HDRD Piping changes and tank realignments to accommodate blending Installation of meters
	Terminals	Truck offload receipt facilities (including filters) New tanks Tank cleaning Tank liners and filters Electrical upgrade to accommodate tank and line heating Heating of tanks and lines Blending facilities (batch, in-line and at the rack)	Truck and marine offload receipt facilities Tank receipt management

2.3 Retail sites

As at July 1st, 2011, approximately 1300 retail sites had been upgraded in the West in order to accommodate the sale of renewable diesel blends (this also includes bulk plants). These upgrades include regular maintenance such as tank cleaning and installation/replacement of filters, as well as inventory software modifications. All of these retail site upgrades were put in place due to the provincial regulations.

Most respondents indicated that they did not yet know how many additional retail sites would need upgrading due to the federal Regulations (as well as provincial regulations). However, it is to be expected that a significant number of retail sites in the East will require upgrades as mentioned above in order to accommodate the sale of renewable diesel blends to meet the federal Regulations.

The blends offered at retail sites are most commonly B5 and B2 blends. In some cases, B20 blends are offered to customers that are educated in its proper use at the same price as B5 and B2 blends.

2.4 Additional practices and procedures

In addition to the physical infrastructure required at the refineries, terminals, cardlocks, bulk plants and retail sites, there are also other significant procedural expenses that must be incurred in order to comply with the federal and provincial regulations. The respondents indicated the following procedural expenses have been or will be incurred:

- Additional manpower (0-3 additional staff members per regulated party) for handling compliance accounting, monitoring and data gathering. Some parties created a new administrative department to handle these tasks;

- Hiring auditors to audit FAME producers/suppliers every two years or so;

- Development of new receiving and storage procedures for FAME and HDRD, in order to prevent contamination of products;

- Purchases of ULSK for blending with FAME and high cloud HDRD in order to meet cloud point requirements;

- Requirement to export additional ULSD that is replaced by ULSK, imported to blend with biodiesel to meet cloud point requirements;

- Fuel quality monitoring (as per CGSB standards for biodiesel and biodiesel blends);

- Increased energy costs for heating of tanks and lines;

- Modifications to inventory software;

- Review and re-write of inter-refiner exchange agreements to take into account the changing dynamics in partnerships due to the requirement to source and blend renewable content;

- Research on potential FAME and HDRD suppliers;

- Increased monitoring of competitive landscape due to the added dimension of infrastructure investments, different renewable fuel costs and supplier relationships.

3. Assessment of Renewable Alternatives to Diesel

3.1 Preferences for renewable diesel types

Biodiesel

Biodiesel (from soy, canola, animal fat and yellow grease) has been in the past and is currently the most widely used renewable alternative to diesel in Canada. In most cases it is the most accessible, as biodiesel production plants can be found in many regions across North America. Biodiesel from animal fat is the least expensive, while biodiesel from soy and canola is somewhat more expensive.

The difference in price is due to both the feedstock and the cloud point of the final product. Animal fats and waste greases used to make biodiesel are a by-product of the meat rendering, food processing and restaurant industries and tend to be cheaper than virgin vegetable oils such as soybean and canola. In addition, the cloud point of the final biodiesel product is significantly higher for biodiesel made from animal fat and waste greases, thus typically sells at a discount to lower cloud-point biodiesel.

The cloud points of biodiesels made from canola, soy and animal fat are -3, +2 and +15 degrees Celsius, respectively (see Table 2). Therefore, in order to meet CGSB specifications for diesel and heating oil in the colder months, it is necessary to add ultra-low-sulfur kerosene (ULSK) in the proportions required to obtain the desired cloud point for the month and region in question, increasing the costs of producing the final blended product. These proportions can vary widely, going up to 90% ULSK to produce a -20C cloud point B2 blend made with biodiesel from animal fat. Although in principal it should be possible for most refiners to meet the 2% requirement by blending entirely during the warmer months in order to minimize ULSK requirements, this is dependent on factors such as the availability of biodiesel and HDRD.

Depending on the required cloud point and the biodiesel type used, in some cases the required ULSK volumes can be quite significant and given the cost premium of ULSK, this can result in significant additional costs (especially for biodiesel from animal fat). However, the increased lubricity of biodiesel reduces the need for lubricant additives to ULSD.

There are significant concerns regarding contamination of other fuels with biodiesel. B100 biodiesel and biodiesel blends cannot be transported by pipelines that are also used for any other product due to contamination risks. This is a particular concern with regards to jet fuel, which has the strictest fuel standards. Therefore, it is not possible to blend biodiesel at central (hub) refinery locations with subsequent shipping by pipeline. As a result, biodiesel is typically blended at terminals for local shipments where offloading, blending, storage and loading facilities must be dedicated to biodiesel and biodiesel blends. Care must be taken to avoid trail-back contamination through lines (i.e. biodiesel tracing back through lines and contaminating high-spec fuels such as jet fuel).

TABLE 2 – CLOUD POINT SPECIFICATIONS OF DIFFERENT BIODIESEL TYPES

Biodiesel type	Cloud Point (degrees Celsius)
CME (canola)	-3
SME (soy)	+2
TME (tallow)	+15
HDRD	0 to -25

Source: Suncor Energy, personal communications, 2010.
Note: actual cloud points can vary depending on the quality of the feedstock and of the production process.

Respondents have indicated that they have experienced some issues with the use of biodiesel in the past. The most common issue has been the clogging of filters for a variety of reasons. In some cases this was due to B100 de-gumming delivery tanks previously used for other products (properly cleaned tanks or dedicated tankers for B100 transportation could improve this issue), or due to sub-standard product quality that results in solidification or high content of particulate matter. There have also been some issues experienced with customers using B20 improperly, so better customer education has been introduced.

Some respondents indicated that biodiesel from animal fat/yellow grease does not meet their specifications and therefore they use exclusively canola- or soy-based biodiesel. Other respondents have not reported any issues using biodiesel from animal fat/yellow grease and that their customers appreciate that the biodiesel used does not contribute to the food vs. fuel debate.

In general, respondents have indicated that biodiesel is favourable due to its price, but there are still concerns that remain with regards to product quality, cloud point and producer/supplier stability and reliability (see the next Section).

HDRD

HDRD is a relatively new product that refiners and blenders have only started using in the last two years. Its chemical properties allow it to be blended seamlessly with ULSD and it can be transported via pipeline without any issues (Keyriläinen, 2011). Its density is lower than that of ULSD, so the density of the final blend must be monitored in order to ensure that it meets industry specifications. It can be produced with a range of cloud points (from 0 even to -25 degrees Celsius) and the cost of the product increases as the product cloud point decreases.

The advantages of HDRD are that it can be blended seamlessly with ULSD and depending on the cloud point of the product purchased, little or no ULSK may be required in order to meet seasonal specifications. Risks of cross-product contamination is less of an issue and HDRD with the correct cloud point does not need to be heated, so the infrastructure requirements at refineries and terminals to accommodate the receipt, storage and blending of HDRD are less significant.

Currently, HDRD is sold at a premium of approximately 40 cents per litre relative to biodiesel. For some respondents, the avoided costs of infrastructure from the use of HDRD instead of biodiesel are significant

enough to justify purchasing HDRD at such a high premium. For other respondents, the costs of purchasing HDRD are still too high and therefore the use of HDRD will be minimized where possible. The difference between these two points of view is somewhat related to the degree to which biodiesel blending infrastructure has already been put in place by the respondent in order to meet provincial regulations. For those that have already made significant investments, it makes sense to maximise these investments to their full capacity. For refineries and terminals that have already been adapted for the receipt, storage and blending of biodiesel, adding an additional tank or a rack to increase blending capacity is more favorable than purchasing HDRD at a high premium. For respondents that have not yet made significant investments for the use of biodiesel, it may make more sense to pay the extra price for HDRD and avoid the costs of additional infrastructure required for blending with biodiesel.

TABLE 3 – SUMMARY OF SURVEY RESPONDENT VIEWS ON THE ADVANTAGES AND DISADVANTAGES OF VARIOUS RENEWABLE ALTERNATIVES TO DIESEL

	Advantages	**Disadvantages**
Soy/canola biodiesel	Currently lower cost relative to HDRD. Lower cloud point relative to animal fat or yellow grease biodiesel. Increased lubricity – less of a need for additives.	Still need to blend with significant amounts (up to 50%, depending on the required cloud point) of ultra low sulphur kerosene (ULSK) to meet industry seasonal cloud point schedules for diesel fuels. Not many "large" producers of biodiesel – producers who can meet refiner requirements for stability of supply and quality assurance.
Animal fat/yellow grease biodiesel	Currently the least expensive renewable alternative to diesel. Increased lubricity – less of a need for additives. Food vs. fuel not a concern.	High cloud point. Can only be blended in mid-summer, or very high volumes of ULSK are required (up to 90%, depending on the required cloud point) Not many "large" producers of biodiesel – producers who can meet refiner requirements for stability of supply and quality assurance.
HDRD	Can be blended seamlessly with ultra low sulphur diesel (ULSD) – possible to blend at higher percentages than biodiesel. Cloud points for HDRD can go as low as -25ºC, depending on the product. Less infrastructure and monitoring required when blending with ULSD. No need to label final blend for the Renewable Fuels Regulations or for customers.	Cost relative to other renewable diesel alternatives. Currently one major supplier has virtual monopoly on the market.

3.2 Preferences for renewable diesel suppliers

The three key criteria that all respondents cited as deciding factors for their choice of suppliers are: quality of product, stability of supply and cost. However, the order of importance of these three factors varies depending on the respondent.

A number of respondents indicated that despite the abundance of biodiesel producers in North America, few are able to meet their own requirements of product quality and stability of supply. This is particularly a problem for small biodiesel producers. A number of respondents have indicated that following on-site audits of potential biodiesel producers, out of dozens of potential suppliers, only two or three would meet their requirements.

A wide variety of contract types are observed from the replies of the respondents. For some, long-term contracts are preferred for stability whilst for others short-term contracts are preferred for flexibility. Some contracts set a price on a term basis while others follow spot prices (both arrangements can be beneficial depending on market conditions). Some smaller refiners/blenders have expressed a desire for longer-term contracts in order to guarantee supply, but they are not always easy to obtain.

Most respondents indicated that they have a preference for large-scale producers as they typically have the testing and quality control procedures in place that ensure product quality. Small-scale producers don't always have a good understanding of refining standards and quality norms in the petroleum industry. Respondents indicated the importance of the product consistently and reliably meeting the ASTM D-6751 standard[4]. Larger producers are also less likely to default on deliveries and there is less risk of bankruptcy. Nevertheless, diversity of suppliers is also important, as demonstrated by recent biodiesel shortages due to flooding in the Midwestern United States causing feedstock shortages and issues with truck deliveries.

3.3 Summary of preferences for renewable diesel fuel types and suppliers

Most refiners/blenders surveyed for this project indicated that they would ideally choose to blend with HDRD due to its favourable physical properties and due to the reliability and good reputation of existing suppliers, as well as the fact that most HDRD production plants built are relatively large-scale.

Some respondents have already decided to use HDRD exclusively to meet the federal requirements. Some plan to increase their use of HDRD, but current prices and availability prevent them from doing so. Others still plan to minimize their use of HDRD because the cost premium is considered too high. However, most respondents indicated that if the construction of new plants in North America (as well as Europe and Asia) caused a sufficient increase in supply and reduction in the cost premium, they would likely source most if not all of their renewable diesel requirements from HDRD producers.

[4] Note that CGSB standards for B1-B5 blends, B6-B20 blends and B100 were published in December 2011 after the survey was conducted for this study.

4. Forecasted use of renewable alternatives to diesel

Table 4 below presents a breakdown of the forecasted renewable diesel types that will be used to meet the federal and provincial regulations. These proportions were calculated based on the volumes provided by the eleven respondents only. However, these eleven respondents account for the majority of diesel and heating oil produced or imported in Canada.

TABLE 4 – BREAKDOWN OF TYPES RENEWABLE ALTERNATIVES TO DIESEL USED TO MEET FEDERAL AND PROVINCIAL REGULATIONS[1]

	West			East			Canada		
	Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term
From Canada									
Soy biodiesel	1.5%	1.2%	1.2%	0.0%	0.0%	0.0%	1.3%	0.9%	0.8%
Canola biodiesel	7.8%	11.0%	9.8%	0.0%	0.0%	2.7%	6.7%	8.1%	7.9%
Animal fat biodiesel	0.0%	0.0%	0.0%	0.0%	1.1%	2.6%	0.0%	0.3%	0.7%
Yellow grease biodiesel	0.0%	0.0%	0.0%	0.0%	1.1%	2.1%	0.0%	0.3%	0.6%
Total from Canada (%)	**9.3%**	**12.3%**	**11.0%**	**0.0%**	**2.2%**	**7.4%**	**8.0%**	**9.6%**	**10.0%**
From USA									
Soy biodiesel	6.1%	6.9%	9.3%	0.0%	6.6%	6.0%	5.2%	6.9%	8.4%
Canola biodiesel	41.5%	35.9%	33.6%	0.0%	0.0%	5.4%	35.5%	26.4%	25.9%
Animal fat biodiesel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hydrotreated products (e.g. HVO)	5.0%	1.2%	9.3%	0.0%	46.8%	43.0%	4.3%	13.3%	18.5%
Total from USA (%)	**52.6%**	**44.1%**	**52.2%**	**0.0%**	**53.4%**	**54.4%**	**45.0%**	**46.5%**	**52.8%**
From overseas									
Hydrotreated products (e.g. HVO)	36.0%	43.6%	35.0%	87.7%	44.4%	38.2%	43.6%	43.9%	35.9%
Total from overseas	**36.0%**	**43.6%**	**35.0%**	**87.7%**	**44.4%**	**38.2%**	**43.6%**	**43.9%**	**35.9%**
Other	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
Credits	2.0%	0.0%	0.0%	12.3%	0.0%	0.0%	3.5%	0.0%	0.0%
GRAND TOTAL (%)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

[1]Short-term = July 2011 – December 2012 (first distillate compliance period); Medium-term = 2013; Long-term = 2014 and beyond.

As can be seen in Table 4, in the short-, medium- and long-term, in both the West and the East, it is expected that only up to 12% of the volume requirements for provincial and federal mandates will be met using renewable diesel alternatives from Canada. It is expected that 44% - 54% will come from the United States (except in the East in the short-term), mostly as biodiesel but also as HDRD. 36% - 44% will be HDRD from overseas (except in the East in the short-term where it will be 88%). It should be noted that the estimates for HDRD volumes in the long-term are conservative, as most respondents indicated that if prices of HDRD go down, they will purchase more of it.

It should also be noted that the medium-term and long-term estimates shown in Table 4 do not take into account the 265 million litre ADM biodiesel plant that is currently under construction in Alberta with a predicted start date at the end of 2013. If the project does follow through, the fuel quality is acceptable and consistent and the prices are competitive, product from this plant could be used to meet the federal requirements.

The table also shows that a small amount of credits are expected to be purchased and only in the short- to medium-term. Some respondents indicated that due to the high costs of infrastructure required for biodiesel blending or for HDRD purchases, they may choose instead to simply purchase credits or redirect their sales of diesel and heating oil in Canada to the United States to reduce their renewable diesel requirements.

It can also be seen in the table that of the different forms of biodiesel available, biodiesel from canola is preferred. This is due to its better cold flow properties relative to biodiesel from other feedstocks and the greater availability of supply.

Table 5 below shows that a significant proportion of the renewable content to be blended (particularly in the East) will be HDRD and overall less than half of the total federal requirement will be met with biodiesel.

TABLE 5 –PROPORTIONS OF RENEWABLE ALTERNATIVES TO DIESEL BLENDED BY REGION AND FUEL TYPE

	West			East			Canada		
	Short -term	**Medium-term**	**Long-term**	**Short-term**	**Medium-term**	**Long-term**	**Short-term**	**Medium-term**	**Long-term**
Biodiesel	57%	55%	54%	0%	9%	19%	49%	43%	44%
Hydrotreated products (e.g. HVO)	41%	45%	44%	88%	91%	81%	48%	57%	54%
Credits/other	2%	0%	2%	12%	0%	0%	3%	0%	1%
TOTAL (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 6 below shows where biodiesel and HDRD will be blended. As can be seen in the table, the majority of biodiesel will be blended in the West due to existing biodiesel blending infrastructure that was put in place for the provincial renewable fuels mandates. In the short-term the majority of HDRD use will be in the West but in the medium- and long-term, approximately equal proportions of HDRD will be blended in the West and the East. It should be noted that diesel and heating oil sold in Quebec and the Atlantic Provinces are temporarily exempt from the *Renewable Fuels Regulations* until December 31, 2012.

TABLE 6 –LOCATION OF BLENDING BY FUEL TYPE

	Short-Term			Medium Term			Long-Term		
	West	**East**	**Total**	**West**	**East**	**Total**	**West**	**East**	**Total**
Biodiesel	100%	0%	100%	95%	5%	100%	88%	12%	100%
HDRD	73%	27%	100%	58%	42%	100%	59%	41%	100%

Table 7 below illustrates where refiners/blenders will be blending renewable alternatives to diesel to meet the federal and provincial requirements. Volumes were obtained by multiplying the percentages by estimated volume requirements for the federal Regulations based on predicted diesel and heating oil demand (see Table 4 in (ÉcoRessources, 2010b)). Note that demand for Quebec and Atlantic Provinces was removed from the estimate in the short-term since they are exempt from the Regulations until end 2012.

TABLE 7 – LOCATION OF RENEWABLE ALTERNATIVE TO DIESEL BLENDING

	Percentage			Volume (ML)*		
	West	**East**	**Total**	**West**	**East**	**Total**
Short-term	85.5%	14.5%	100%	342	58	400
Medium-term	73.5%	26.5%	100%	441	159	600
Long-term	72.7%	27.3%	100%	472	178	650

*Volumes were calculated by multiplying percentages by estimated demand for renewable alternatives to diesel due to the federal Regulations based on predicted diesel and heating oil demand (see Table 4 in (ÉcoRessources, 2010b)).

As can be seen in the table, the majority of blending in order to meet the federal and provincial requirements will take place in the West. This is due to the existence of provincial regulations that were put in place prior to the entering into force of the federal Regulations. As such, the infrastructure required for blending with renewable diesel was already put in place for the provincial regulations. National refiners with activities in the West will therefore concentrate their blending activities in this region in order to take advantage of existing infrastructure investments. Nevertheless, one can see an increase in the proposed proportion of renewable diesel being blended in the East over time.

5. References

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Appendix A – Questionnaire Sent to Refiners/Blenders

QUESTION 1

*Please indicate in the table below the total volume, the types, sources, and proportions of renewable alternatives to diesel that will be used by your company in each region, in order to meet **FEDERAL AND PROVINCIAL** requirements in the **SHORT-, MEDIUM- AND LONG-TERM**.*

SHORT-TERM (JULY 2011 TO END DECEMBER 2012)

	West (BC to MB)		East (ON, QC and ATL)	
	% of total annual purchases or production of renewable alternatives to diesel	**Source (province/state/ country/own production)**	**% of total annual purchases or production of renewable alternatives to diesel**	**Source (province/state/ country/own production)**
Soy biodiesel				
Canola biodiesel				
Animal fat biodiesel				
Yellow grease biodiesel				
Hydrotreated products (HVO, HDRD)				
Other advanced renewable fuels (e.g. Fischer-Tropsch)				
Other (specify):				
TOTAL (%)	100%	n/a	100%	n/a
Total Volume Required (ML)		n/a		n/a

MEDIUM-TERM (JANUARY 2013 TO DECEMBER 2013)

	West (BC to MB)		East (ON, QC and ATL)	
	% of total annual purchases or production of renewable alternatives to diesel	**Source (province/state/ country/own production)**	**% of total annual purchases or production of renewable alternatives to diesel**	**Source (province/state/ country/own production)**
Soy biodiesel				
Canola biodiesel				
Animal fat biodiesel				
Yellow grease biodiesel				
Hydrotreated products (HVO, HDRD)				
Other advanced renewable fuels (e.g. Fischer-Tropsch)				
Other (specify):				
TOTAL (%)	100%	n/a	100%	n/a
Total Volume Required (ML)		n/a		n/a

LONG-TERM (2014 AND BEYOND, ANNUALLY)

	West (BC to MB)		East (ON, QC and ATL)	
	% of total annual purchases or production of renewable alternatives to diesel	**Source (province/state/ country/own production)**	**% of total annual purchases or production of renewable alternatives to diesel**	**Source (province/state/ country/own production)**
Soy biodiesel				
Canola biodiesel				
Animal fat biodiesel				
Yellow grease biodiesel				
Hydrotreated products (HVO, HDRD)				
Other advanced renewable fuels (e.g. Fischer-Tropsch)				
Other (specify):				
TOTAL (%)	100%	n/a	100%	n/a
Total Volume Required Annually (ML)		n/a		n/a

QUESTION 2

*Provide a list of the infrastructure that your company **has already put in place** in order to accommodate the production, distribution and sale of blends of renewable alternatives to diesel for **FEDERAL AND PROVINCIAL** requirements, **as at the coming-into-force date of the federal regulations, July 1st, 2011**. Please indicate if this is new infrastructure or if it is an addition/modification of existing infrastructure.*

Refineries

2.1 Describe in detail the additions and modifications made at each refinery **as at July 1st 2011** for **FEDERAL AND PROVINCIAL** requirements. Please also indicate for which biofuel (such as biodiesel or HVO) the modifications were made.

Refinery name/location	Detailed description of the addition/ modification	Biofuel type for which the addition/ modification was made (biodiesel, HVO)

Terminals/Cardlocks

2.2 Describe in detail (including the number of additional tanks, their capacities, etc.) the additions and modifications made at each terminal and/or cardlock **as at July 1st 2011** for **FEDERAL AND PROVINCIAL** requirements. Please also indicate for which biofuel (such as biodiesel or HVO) the modifications were made.

Terminal/ Cardlock name/location	Detailed description of the addition/ modification	Biofuel type for which the addition/ modification was made (biodiesel, HVO)

Retailers

2.3 Number and location of retail sites already offering biodiesel blends or already upgraded to deal with biodiesel blends **as at July 1st 2011** for **FEDERAL AND PROVINCIAL** requirements:

Location (e.g. Calgary, Metro Toronto, etc.)	Number of Sites	Blends Offered (B2, B5, B10)

2.4 Describe the types of additions/modifications that were made at the retail sites (new tanks, heating equipment, new lines, etc):

QUESTION 3

*Provide a list of the **additional** infrastructure that your company still needs to put in place **in order to meet the federal 2% mandate as well as any provincial mandates**. List only the additional infrastructure needed over and above what has been listed for Question 1. Please indicate if this is new infrastructure or if it is an addition/modification of existing infrastructure.*

Refineries

3.1 Describe in detail the **additional** modifications that would need to be made at each refinery **in order to meet the federal 2% regulation as well as any provincial regulations**. Please also indicate for which biofuel (such as biodiesel or HVO) the modifications will be made.

Refinery name/location	Detailed description of the addition/ modification	Biofuel type for which the addition/ modification was made (biodiesel, HVO)

Terminals/Cardlocks

3.2 Describe in detail (including the number of additional tanks, their capacities, etc.) the **additional** modifications required at each terminal and/or cardlock **in order to meet the federal 2% regulation as well as any provincial regulations.** Please also indicate for which biofuel (such as biodiesel or HVO) the modifications will be made.

Terminal/ Cardlock name/location	Detailed description of the addition/ modification	Biofuel type for which the addition/ modification was made (biodiesel, HVO)

Retailers

3.3 Number of retail sites that would need **additional** upgrades in order to meet federal and provincial requirements:

3.4 Potential locations of retail sites needing upgrading:

QUESTION 4

Aside from the infrastructure modifications and/or additions listed in Questions 1 and 2, what other changes in practices or procedures have been (or will need to be) put in place (fuel accounting, distribution, safety, etc.)?

QUESTION 5 – Preferences for Renewable Fuel Types

5.1 Please describe any preferences your company has for certain renewable fuel types with regards to their production process, fuel properties and characteristics and the rationale for these preferences (i.e. how they can best help your company achieve its federal and provincial requirements).

5.2 Please describe and explain any differences between your company's preferences as described in Question 5.1 and the reality of what your company can use and/or will be using because of cost and/or supply constraints.

QUESTION 6 – Preferences for Renewable Fuel Suppliers

Please explain what are the key criteria that your company has used or will use in selecting renewable diesel suppliers (i.e. availability of product, cost, production capacity, stability of supply, etc.), as well as the types of contracts that characterise these supply arrangements (long-term, short-term, fixed price, volume-tied, other conditions, etc.).

QUESTION 7 – Past Experience with Renewable Fuels

Please describe your past experiences with biodiesel, HVO/HDRD and other emerging fuel technologies (e.g. Fischer-Tropsch). Complete as many as applicable.

Fuel type (biodiesel, HVO, etc.)	Feedstock type (soy, tallow, etc.)	Source (province/ State/ country)	Typical annual volume used (ML)	Market(s) the fuel was used in (e.g. Calgary, Toronto metro, etc.)	Period during which fuel was used (e.g. 2008-2010, 2009-present, etc.)
Impressions:					

Fuel type (biodiesel, HVO, etc.)	Feedstock type (soy, tallow, etc.)	Source (province/ State/ country)	Typical annual volume used (ML)	Market(s) the fuel was used in (e.g. Calgary, Toronto metro, etc.)	Period during which fuel was used (e.g. 2008-2010, 2009-present, etc.)
Impressions:					