

Interim Report

July 30, 2008

ALBERTA renewable **DIESEL** DEMONSTRATION



Managed by:



Climate Change Central
Albertans taking action

Proudly supported by:

Alberta



Canada

Disclaimer

The views and opinions expressed in this report are based on observations gained through the Alberta Renewable Diesel Demonstration and do not represent technical, policy or procedural guidelines set out by Climate Change Central, its funders or its project partners. All of the information contained herein is provided to share observations from using renewable diesel blends and is correct according to our best understanding at time of print. No warranty for the accuracy of the information or its subsequent use is represented or implied by Climate Change Central or its partners.

Table of Contents

Disclaimer	ii
Table of Contents	iii
Executive Summary	1
Acknowledgements	2
Sponsors	2
Participants.....	2
Glossary of Terms	3
Common Terms and Abbreviations.....	3
1.0 Background	4
1.1 Context	4
1.2 Purpose	5
2.0 Introduction	6
2.1 Objectives.....	6
2.2 Timeframe	7
2.3 Location.....	8
2.4 Project Participation and Governance.....	11
3.0 Fuel Overview	13
3.1 Blending Facility.....	13
3.2 Blending Techniques	16
3.3 Fuel Properties	17
3.4 Fuel Handling	17
4.0 Fuel Testing	18
4.1 Monitoring Protocol.....	18
4.2 Quality Testing.....	19
4.3 Volume of Fuel	19
4.4 Testing Results	19
5.0 Vehicle Monitoring	21
5.1 Fleet Composition.....	21
5.2 Monitoring Protocol.....	22
Monitoring Results	22
6.0 Operability Evaluation	26
6.1 Scope of Evaluation.....	26
6.2 Observations	26

Executive Summary

This report is an update on the observations of the Alberta Renewable Diesel Demonstration (ARDD) over the winter period of operation. It provides a general account of the project scope, methods and observations. This report provides early input to stakeholders in regards to the integration of renewable diesel into Canada's on-road fuel market by determining operational feasibility of renewable diesel blends in response to the Government of Canada's Notice of Intent (NOI) to regulate a Renewable Fuel Standard (RFS).

Over the course of the winter of 2007-2008, the ARDD completed construction and commissioning of a commercial blending facility at Shell Canada's Sherwood Marketing Terminal in Edmonton, Alberta. The facility was designed to allow rack loading of B2 and B5 blends (2% and 5% respectively) of two different types of renewable diesel fuel: fatty acid methyl ester (FAME) and hydrogenation derived renewable diesel (HDRD). Fuel was blended using a continuous flow blending system to optimize homogeneity. During the winter period, B2 blends were used exclusively and were retailed from participating commercial cardlocks across Alberta. Fleets of at least 25 vehicles were recruited to run on each test fuel. A control group was monitored using normal ultra-low sulphur diesel (ULSD), making up a total fleet of over 70 vehicles. The fleet spanned Class 8 transport trucks with and without new exhaust after-treatment technologies (pre- and post 2007 model year units), school buses, a variety of delivery trucks and a group of heavy-duty oilfield services vehicles.

All fuels dispensed in the ARDD met Canadian specifications for quality and cold weather performance. Thus far in the demonstration there have been no reports of filter problems, fuel gelling, troubles starting or other operational difficulties among end users. Temperatures in the study area dipped to as low as -44°C. Moreover, the ARDD has generated some observations about fuel storage, handling and blend formulation that may be noteworthy in preparation for implementing a national Renewable Fuel Standard.

Acknowledgements

Sponsors

- Advancing Canadian Agriculture and Agri-Food Program, Agriculture and Agri-Food Canada
- Alberta Energy – Biodiesel Commercialization and Market Program
- Alberta Energy – Biodiesel Infrastructure Development Program
- Canadian Petroleum Products Institute
- Canadian Renewable Fuels Association
- Canola Council of Canada
- Milligan Bio-Tech
- Natural Resources Canada
- Neste Oil
- Shell Canada Limited

Participants

- CF Managing Movement Ltd.
- First Bus Canada Ltd.
- Gibson Energy Ltd.
- Hi-Way 9 Express Ltd.
- Rosenau Transport Ltd.



Glossary of Terms

Common Terms and Abbreviations

ARDD – Alberta Renewable Diesel Demonstration

CAN/CGSB – A CGSB standard recognized by the Government of Canada as an official national standard

CGSB – Canadian General Standards Board

CME – Canola Methyl Ester

FAME – Fatty Acid Methyl Ester

HDRD – Hydrogenation Derived Renewable Diesel

Renewable Diesel – An umbrella term referring to any sort of diesel fuel from a renewable source

SME – Soy Methyl Ester

TME – Tallow Methyl Ester

1.0 Background

1.1 Context

In December 2006 the Government of Canada published its Notice of Intent (NOI) to regulate a Renewable Fuel Standard (RFS) mandating the use of renewable fuels across Canada. The RFS will put into place a pool average of renewable fuel content equivalent to 5% of the gasoline pool by 2010 (a broad suite of liquid renewable fuels such as ethanol and renewable diesels are expected to count towards compliance), and an additional 2% renewable fuel content in the middle distillate pool (diesel fuel, home heating oil etc) by no later than 2012¹.

The RFS would have a dramatic impact on the Canadian middle distillate market, increasing the annual consumption of renewable diesel in Canada by a large margin. However, the NOI stipulates that implementation of the RFS is contingent on the successful demonstration of renewable diesel use under a range of Canadian conditions.

To meet this need for a national-scale demonstration, a group of diverse stakeholders announced its intention in late 2006 to embark on a renewable diesel demonstration project in Alberta. Designed as a two-phased approach, the Alberta Renewable Diesel Demonstration (ARDD) involved laboratory testing followed by on-road fleet use of commercial vehicles running on renewable diesel blends meeting Canadian General Standards Board CAN/CGSB 3.520 specification, including 2007 and 2008 models with current emissions after-treatment technologies. This document is a progress report of the 2007-2008 winter's experience using 2% renewable diesel blends (B2) in Alberta.

¹ For official Gazette text see: <http://canadagazette.gc.ca/part1/2006/20061230/html/notice-e.html#i3>

1.2 Purpose

The ARDD is a specially-tailored demonstration project aimed at providing information and operating experience to stakeholders in the diesel fuel industry. The demonstration takes renewable diesel from the lab to the road, providing hands-on experience at 2% and 5% blends (B2 in winter and B5 in shoulder and summer seasons). The ARDD fleet consists of over 50 vehicles running on two types of renewable diesel: methyl esters and hydrogenation derived renewable diesel.

Through real-world operating conditions and third-party lab testing, the ARDD provides key information about the cold weather performance of neat renewable fuels, blends with petroleum diesel, blending and handling in the fuel distribution system, and operational performance. The results of this demonstration will contribute to a body of knowledge upon which stakeholders will evaluate the implementation of a Renewable Fuel Standard in Canada.

2.0 Introduction

2.1 Objectives

The ARDD is designed to provide real-world experience for fuel distributors and users. The demonstration marks Canada's broadest study into the performance of renewable diesel in cold weather throughout the fuel supply chain to the end user. Alberta was selected primarily because it represents some of the harsher climates in which renewable diesel would be used, (Edmonton has the same cloud point targets as areas north of Winnipeg, MB and Kapuskasing, ON). By working with producers, distributors and trucking companies to test the viability of renewable diesel use in the winter, the demonstration is ultimately engaging both fuel producers and commercial end users in a real-world deployment scenario.

The primary objective of this demonstration is to evaluate renewable diesel performance in long-haul trucking fleets, and thus assess the overall suitability of renewable diesel among the consumer group for on-road diesel fuel. Of particular interest is the evaluation of cold weather operability of B2 and B5 blends in the range of conditions in the Canadian/Alberta market. We aim to confirm general acceptability of low-level ULSD/renewable diesel blends in regards to vehicle performance (e.g. fuel economy, power, general operability, maintenance requirements and operator perceptions) among Alberta long-haul trucking fleet operators. Over 70 vehicles are participating in the demonstration: over 25 running on methyl ester blends (FAME), over 30 on blends of HDRD, and 20 control vehicles running on ultra-low sulphur diesel (ULSD), making up roughly equal monthly volumes of FAME and HT fuel usage across the fleet. The test fleet includes a range of long-haul and industrial carriers with a focus on Class 8 tractors.

The secondary objective of this demonstration is to build knowledge about blending infrastructure and fuel delivery to demonstrate operational compatibility with commercial cardlocks and fuel distribution infrastructure.

Commercial carrier fleets traveling across the province were targeted for participation in the demonstration. Three Shell – Flying J cardlock stations retailed the fuel for participating fleets in a ‘business as usual’ model, meaning that they received, dispensed and sold blended fuel in a typical commercial setting. One fleet used an in-yard tank and dispensing system (capacity of 65,000 litres) to demonstrate the fuel’s application in above-ground facilities in addition to the below-ground storage of the commercial cardlock model.

2.2 Timeframe

Planning and partnership-building activities for this project began in early 2006, leading to the participation of sponsors and supporters in late 2006. Construction of the blending facility and preparation of cardlocks began in late 2007 with first renewable diesel deliveries occurring in December 2007. The official project launch was held in Edmonton, Alberta on January 23, 2008, while the on-road portion of the demonstration will stretch from December, 2007 through to September, 2008, providing key information from the coldest months as well as some shoulder and summer season operation.

2.3 Location

2.3.1 Study Area

The ARDD study area comprises southern, central and northern regions of Alberta, spanning some of the coldest zones in Canada as defined in the CAN/CGSB 3.520 fuel specification. Participating vehicles fueled in Edmonton, Calgary and Lloydminster, where fuel was dispensed to meet local cloud point targets (i.e. -37°C and -33°C in Edmonton/Lloydminster and Calgary, respectively). Some units ran as far afield as Fort McMurray and Grande Prairie, others ran to the Cold Lake/Bonnyville area (north of Lloydminster), while the balance was dedicated to regional routes in the Edmonton-Calgary corridor.

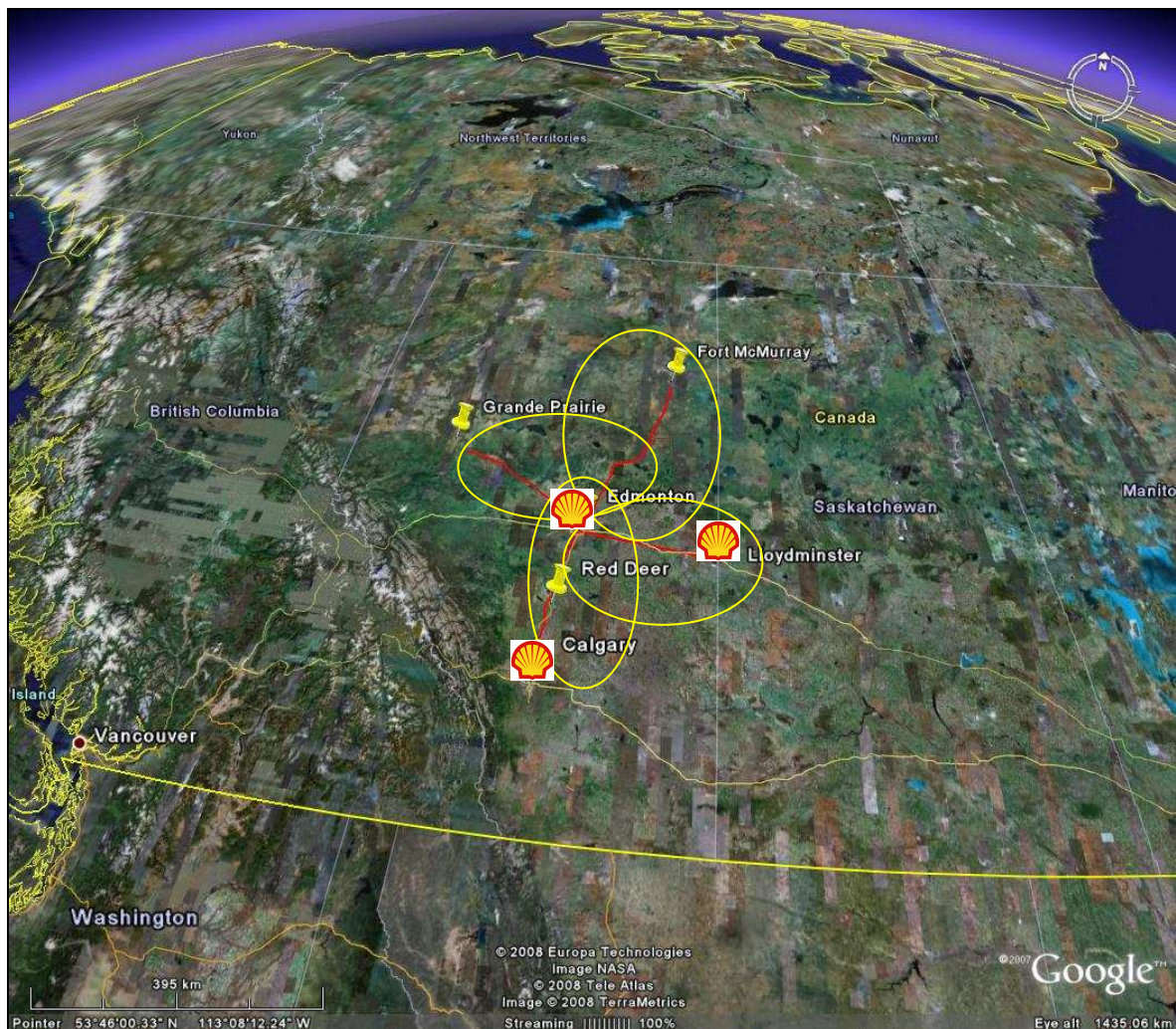


Photo courtesy: Google Earth

2.3.2 Fuel Retail Locations

Designated Fuelling Cardlock Location #1 – HDRD Blended Fuel

Edmonton South - 1820 76th Avenue

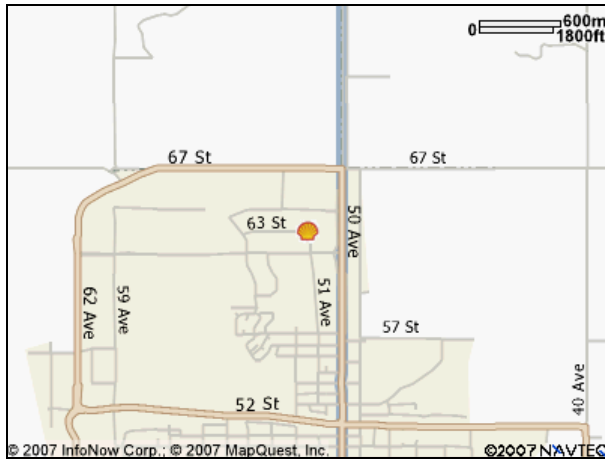


Designated Fuelling Cardlock Location #2 – FAME Blended Fuel

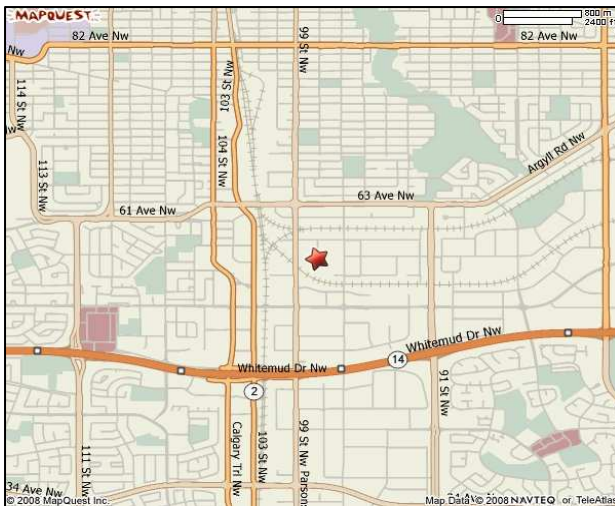
Calgary - 2525-23rd Street NE



Designated Fuelling Cardlock Location # 3 – HDRD Blended Fuel
Lloydminster - 5109 63rd Avenue



Designated Fuelling Location # 4 – Rosenau Transport Yard Tank – FAME Blended Fuel
Edmonton - 5805 98 Street



All Shell – Flying J cardlocks were fitted with dispensing pump filters as an additional project precaution. The Rosenau yard tank dispensing system was commissioned with a strainer only and did not have any supplementary filtration installed.

2.4 Project Participation and Governance

The ARDD was managed and coordinated by Climate Change Central with funding from federal and provincial programs, as well as significant cash and in-kind contributions provided by industry partners. Shell Canada Ltd, being the major industry partner, coordinated construction and managed the blending facility. Core project management was done by consensus through a Steering Committee. Support was provided as needed from a Technical Committee and a supplementary Communications Committee for key project material and events. A broader Advisory Committee was struck to solicit input from a wide variety of stakeholders, including OEMs (engine manufacturers), trucking associations and vehicle manufacturers. An illustration of the Steering Committee, Technical Committee, Advisory Committee and fleet participants is provided below. Where more than one organization is presented per line, one committee member represented both organizations.

ARDD Management Committees, Stakeholders and Participants:

Steering Committee Members:

Climate Change Central
Shell Canada Limited / Canadian Petroleum Products Institute
Canadian Renewable Fuels Association / BBI Biofuels
Canadian Bioenergy / Alberta Biodiesel Association
Canola Council of Canada
Alberta Motor Transport Association
Agriculture and Agri-Food Canada
Natural Resources Canada
Environment Canada
Government of Alberta

Technical Committee Members:

Climate Change Central
Shell Canada / Canadian Petroleum Products Institute
Canadian Renewable Fuels Association / BBI Biofuels
Agriculture and Agri-Food Canada
Natural Resources Canada
Environment Canada
Government of Alberta
Original Engine Manufacturers
Renewable Diesel Producers
Alberta Research Council (3rd Party Lab)

Participating Fleets:

Rosenau Transport Ltd.
Gibson Energy Ltd.
First Bus Canada Ltd. (Cardinal Coachlines)
Hi-Way 9 Express Ltd.
CF Managing Movement (TransForce)

Advisory Committee Members:

Government of Canada
Government of Alberta
Caterpillar
Cummins
Detroit Diesel
Navistar
Canadian Vehicle Manufacturers' Association
Association of International Automobile Manufacturers of Canada
Engine Manufacturers' Association
BC Trucking Association
Canadian Trucking Alliance
Neste Oil
Milligan BioTech Inc.

The blending facility consisted of two renewable diesel double-wall storage tanks with spill containment, recirculating pumps, filters, interstitial space heaters and immersion heaters, and piping to the loading rack that was heat-traced and insulated to ensure the product operated above its cloud point. Loads of pure renewable diesel product were unloaded as per usual through standard four inch hose at the unloading station and pumped into the appropriate storage tank. The FAME product was intended to be stored at approximately 15°C above its cloud point, while the HDRD product was intended to be stored at approximately 5°C above its cloud point. These temperature values were chosen as ‘best guesses’ for successful performance in the Canadian market (to ensure 100% liquid phase renewable diesel in storage) and do not reflect or represent any official standards for the renewable diesel industry.

Storage Tanks for Neat Renewable diesels



The neat renewable diesel offloading rack was also heat traced and insulated to provide protection from the elements along the entire path of the B100 handling system. Likewise, because the blending facility incorporated tanks with only enough heating capacity to maintain their contents at a constant temperature (i.e., not able to quickly raise the temperature of fuel in storage), neat renewable diesels were delivered at approximately the same temperature ranges. The requirement to deliver neat renewable diesel fuels at specified temperatures required carriers to have insulation and/or heating capability such as steam coils or heat exchangers. Immersion heaters were specified for the B100 tanks but not operated in some cases due to logistical constraints.

Filters on Neat Renewable Diesel Tanks



Heated storage or delivery were not required of blended fuels, as their cloud points were formulated to -37°C during the coldest periods (meeting the same cloud point targets as petroleum diesel for the same region and season).

Insulated and Heat-Traced Offloading Station



3.2 Blending Techniques

Neat renewable diesels were blended by a precisely-controlled in-line blending system to provide uniform, consistent blends. This approach avoided the potential for uneven blending that could occur with a simple splash blending approach.

Close-Up of Micro-Blender for FAME and HT Fuels



3.3 Fuel Properties

During the winter months, a 2% blend was used (B2), while a 5% blend (B5) will be used in the shoulder and summer periods of 2008. All blends of renewable diesel were blended with seasonal diesel and CAN/CGSB 3.517 Type A fuel (similar to kerosene or number 1 diesel in the US) to produce fuels whose cloud points meet or exceeded CAN/CGSB 3.520 standards. Fuel suppliers were solicited to supply fuel samples of renewable diesel by an invitation process and selected through consensus of the ARDD Steering Committee based on quality and cold weather performance criteria. A suite of fuel testing work was carried out as a precursor to the ARDD in a sister study known as the Renewable Diesel Characterization Study (RDCS). Results of the RDCS are available via www.climatechangecentral.com or www.renewablediesel.ca.

3.4 Fuel Handling

Throughout the project a strict set of handling guidelines was followed in order to maintain the quality of the fuel. For each load of fuel, whether neat renewable diesels or blended fuels, the prior load in the truck was required to be diesel or jet fuel. In case of question, a certificate of cleanliness or wash certificate was required to prove that the hold was clean. Trusted carriers were used in all cases to haul fuel, predominantly haulers with experience hauling jet fuel or biodiesel, or that had acceptable fuel handling procedures in place to protect against moisture, contamination from diesel residue or contamination from incompatible prior load.

Flying J: Fuel Hauling



4.0 Fuel Testing

4.1 Monitoring Protocol

Recognizing that maintaining fuel quality throughout the chain of custody was a primary objective of this demonstration, a monitoring protocol was created to sample and test all fuels for quality and cold weather characteristics throughout the demonstration.

Each incoming neat renewable diesel delivery was tested for quality and cold performance attributes. All neat renewable diesel deliveries were stipulated to come accompanied by valid Certificates of Analysis showing they met ASTM D6751 and CAN/CGSB 3.517 specifications (FAME and HDRD respectively). Third party analysis was conducted to verify the vendors' Certificates of Analysis, with all project testing carried out by Alberta Research Council in Edmonton, where retains were also stored for each incoming and outgoing delivery. FAME deliveries were stipulated to report cloud point and cold soak filtration time, with all winter renewable diesels required to meet or exceed 200 seconds. HDRD deliveries were also required to report cloud point.

Since the renewable fuels were not additized for stability, cold flow or any other parameter, a project goal was set to use the FAME product within three months of receipt (about half of the typical shelf life) in order to maintain fuel quality and guard against signs of fuel degradation (e.g. acid number, oxidation stability, etc). All deliveries were made with trucks conforming to project protocols for acceptable prior loads or were required to show valid wash certificates to prove that no unwanted contamination might spoil the neat or blended fuel deliveries. For deliveries of neat renewable fuels, truck tankers or ISO containers were hired that were insulated and had steam coils to facilitate warming of product, recognizing that outdoor storage or transportation could render the neat biofuel product below its cloud point.

4.2 Quality Testing

From the point of blending at the Terminal and subsequent loading at the diesel fuel rack, quality was monitored through a series of retained samples for additional analysis (single determinations of cloud point and density). At the point of loading at Sherwood Terminal, a sample was retained from each load of fuel leaving by truck tanker. These samples were sent to ARC for blend analysis, cloud point, density and in some cases lubricity testing. Results from each load were tracked and charted against CAN/CGSB 3.520 / CAN/CGSB 3.517 targets for cloud point for blended fuels (due to their chemistry, FAME blends up to B5 are covered by CAN/CGSB 3.520 while HDRD is covered by CAN/CGSB 3.517 specifications). Additional results are outstanding and will be included in the final report.

4.3 Volume of Fuel

During the winter phase of the demonstration (December, 2007 to mid-April, 2008), the ARDD dispensed nearly 650,000 litres of B2 blended fuel, comprising approximately 250,000 litres of FAME B2 and 400,000 litres of B2 HDRD.

Table 1: Fuel Volumes Dispensed in Winter Phase of ARDD

Total Fuel Lifted	B2 FAME	B2 HDRD
Lloydminster		177,117.47
Calgary Barlow	100,439.50	
Edmonton South		226,161.06
Rosenau Yard	145,132.30	
Total	245,571.80	403,278.53

4.4 Testing Results

Table 2: FAME Cardlock Retain Analysis

Parameter	Jan 22 '08	Feb 12 '08	Feb 26 '08	Mar 06 '08	Mar 10 '08
Cloud Point (°C)	-38.3	-33.5	-30.3	-30.4	-30.8
Density (kg/m3)	833.2	839.2	839.2	834.3	844.5

Table 3: HDRD Cardlock Retain Analysis – Part 1

Parameter	Dec 19 '07 Edm	Jan 15 '08 Lloyd	Jan 10 '08 Lloyd	Jan 22 '08 Lloyd	Jan 16 '08 Edm	Jan 10 '08 Edm	Jan 22 '08 Lloyd	Jan 4 '08 Lloyd
Cloud Point (°C)	-39.4	-37.7	-38	-37.9	-36.1°C	-37.2	-39.1	-40.4
Density (kg/m3)	833	834.5	835.5	828.1	832.8	834.3	832.7	832.2

Table 4: HDRD Cardlock Retain Analysis – Part 2

Parameter	Feb 13 '08 Edm	Feb 16 '08 Lloyd	Feb 21 '08 Edm	Feb 25 '08 Lloyd	Feb 28 '08 Edm	Mar 03 '08 Lloyd	Mar 04 '08 Edm	Mar 12 '08 Lloyd
Cloud Point (°C)	-36.5	-36.5	-34.1	-31.8	-31.1	-32	-34	-31.3
Density (kg/m3)	837.3	838.4	836.9	840.3	837.9	834.7	833.1	842.2

Still more samples were taken at various times from the dispensing nozzles of cardlocks, bulk tanks and/or from fleets' onboard fuel tanks to provide confirmation of fuel quality at the end of the custody chain where it counts: quality fuel for the end user. Additional testing of engine oil, mechanical wear or suspect filters was to be conducted only as required (triggered by any negative feedback or suspicion of the offending parts). No such testing was required during this period.

5.0 Vehicle Monitoring

5.1 Fleet Composition

The ARDD fleet consisted of over 50 participating trucks running on blended fuel. The Class 8 units comprised both long-haul and oilfield service applications, and at least 8 post-2007 model year units with current emissions reduction systems. The remainder of the fleet was made up of a range of engine and vehicle types and applications, from body job delivery service trucks to school buses. Participating trucks included the following:

Manufacturer (Make)	Model	Year	Engine
Ford	F350 Cutaway	2002	
Freightliner	Bus	2003	CAT 3126
Freightliner	Columbia	2003	CAT
Freightliner	Columbia	2005	Detroit
Freightliner	Safetyliner	2006	Mercedes MB 900
Freightliner		2002	
Freightliner	Columbia	2005	MB/450 hp
Freightliner	Columbia	2006	MB/450 hp
Freightliner	Columbia	2007	MB/450 hp
Freightliner	Cascadia	2008	
Freightliner	FL 112	2004	
Freightliner	CL 120 Bunk	2007	
International	9200	2002	
International	9200	2007	ISX/475 hp
International	9200	2007	ISX/475 hp
International	9200	2007	ISX/475 hp
International	9200	2008	ISX/485 hp
International	CE 300	2008	Maxxforce 7
Kenworth	T600	2008	Cummins
Kenworth	T800	2007	CAT
Kenworth	W900	2005	C13 CAT
Kenworth	W900	2006	C15 CAT
Kenworth	W900	2007	CAT
Peterbilt		2006	CAT
Volvo	Conv	2006	Volvo

5.2 Monitoring Protocol

The ARDD collected data on fuel use, distance traveled, operating hours (when available), oil change and fuel filter change intervals and maintenance/operational observations. All data were gathered in aggregate monthly tallies from participating fleets. As such, the demonstration also asked for qualitative feedback from drivers relating to perceptions of cold weather operability and general fuel performance. These results will be included in the final report.

Monitoring Results

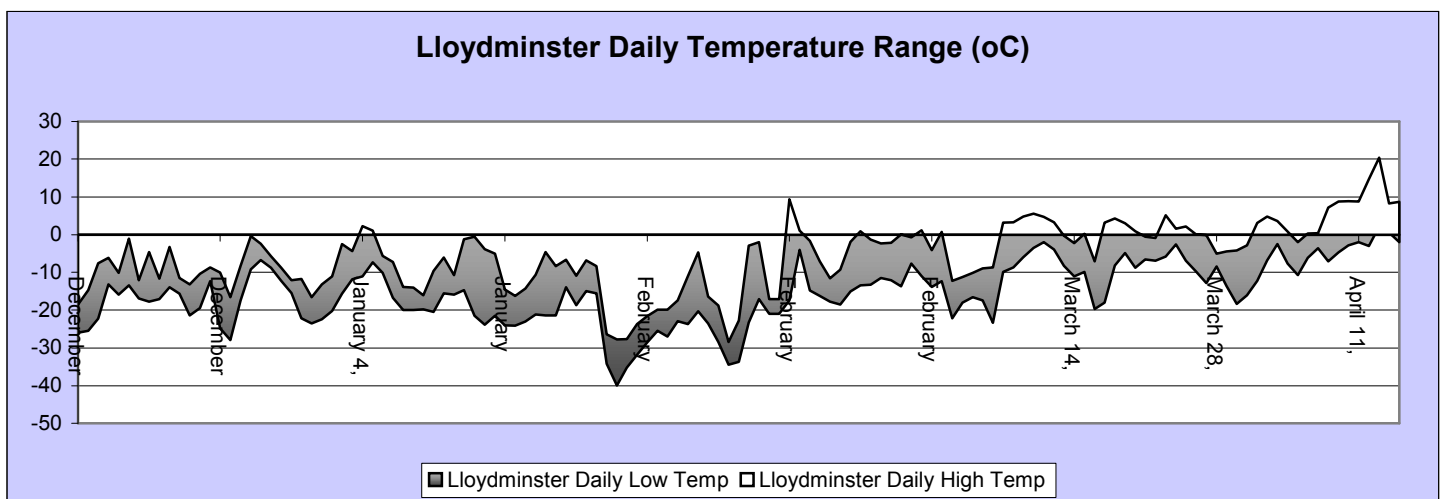
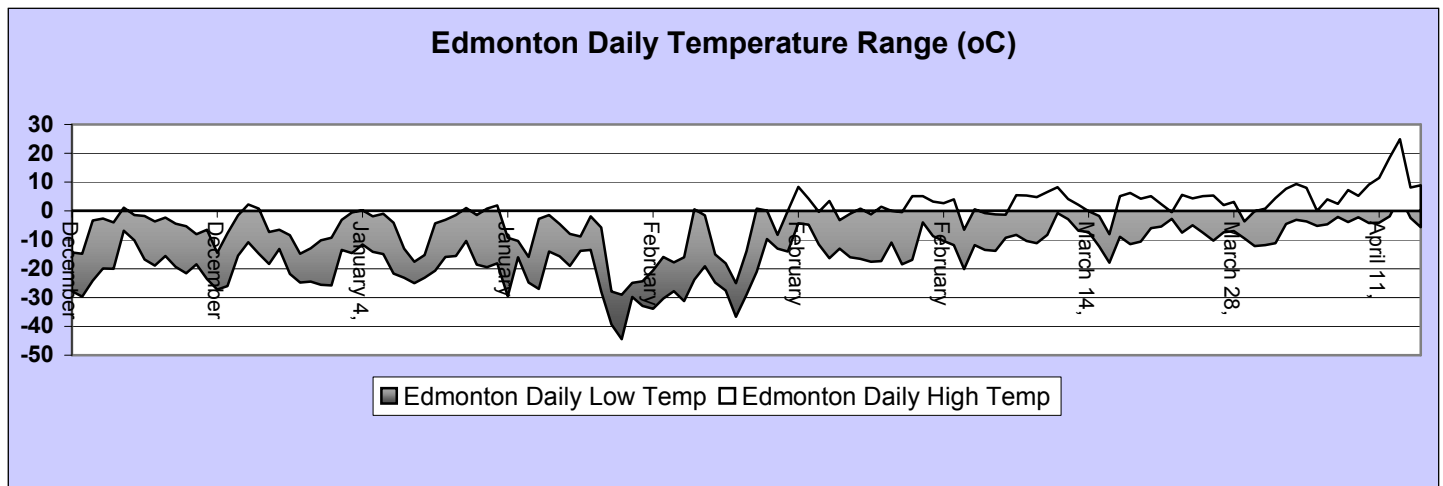
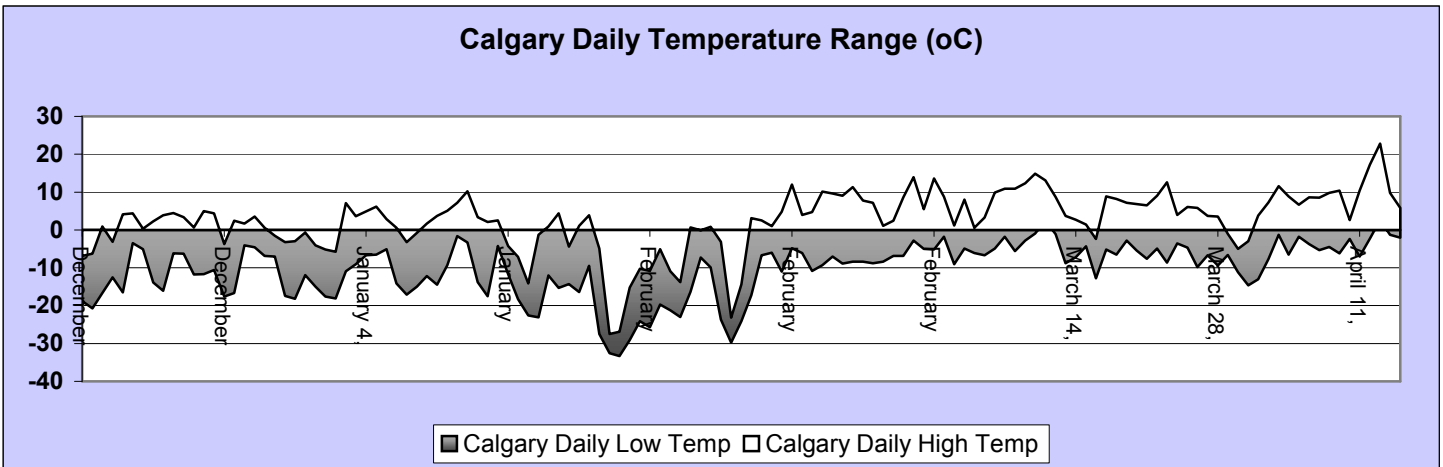
Participating Trucks and Buses:

Participating vehicles were launched in a staggered fashion, allowing the fleets to fuel at their next natural opportunity after notification of renewable diesel availability at the designated cardlock. Fleets were asked to change the engine oil and oil filter, as well as fuel filter prior to taking on test fuel, but otherwise were asked to follow business as usual.

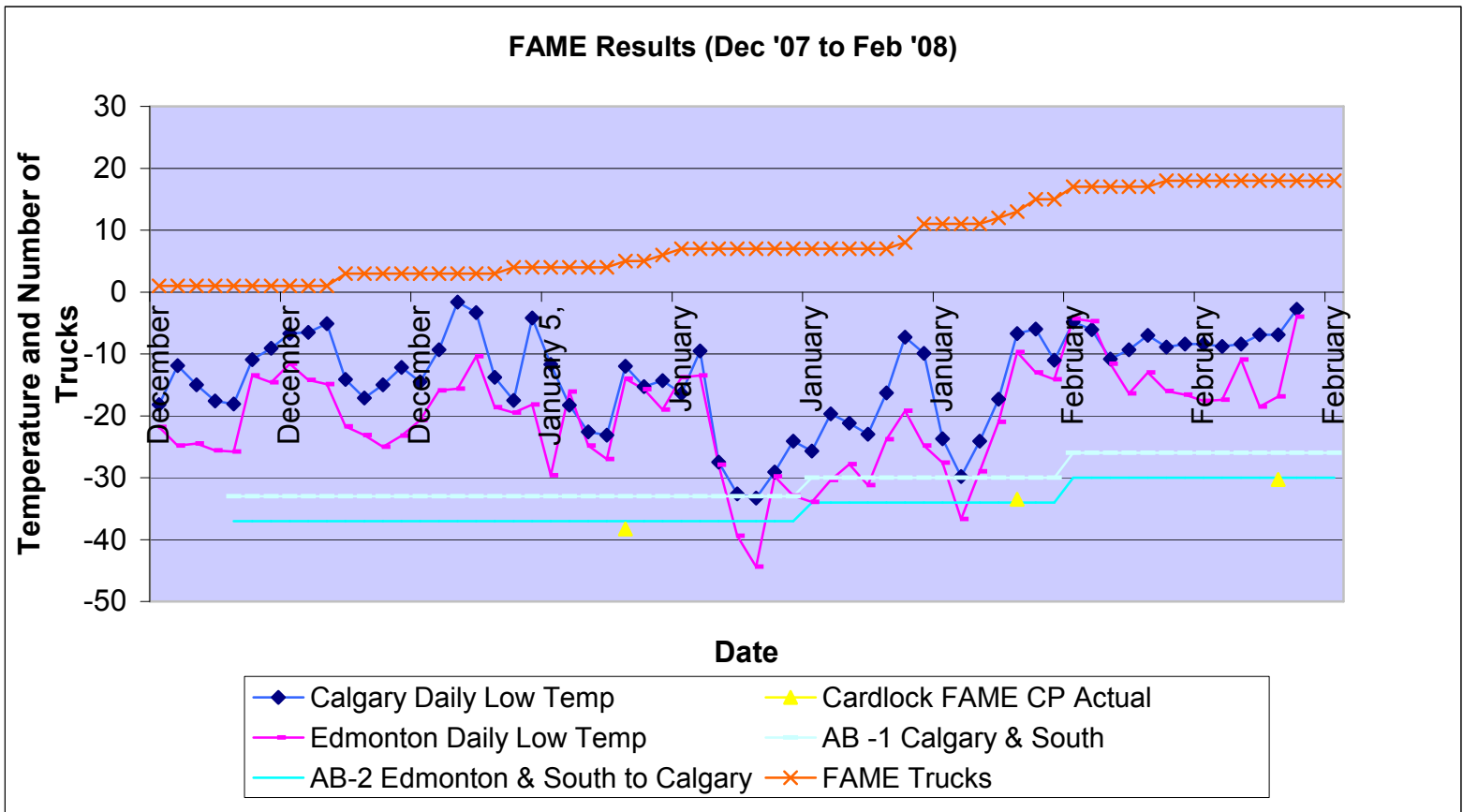
As of February 29, 2008, the ARDD fleet consisted of 19 trucks on FAME blends and 30 units on HDRD blended fuel. More units were launched after February 29, bringing the total number of trucks to approximately 30 on FAME blends and 30 on HDRD blends, with another 20 trucks as control vehicles, operating on normal petroleum-based ULSD fuel.

In Edmonton, for two consecutive nights overnight low temperatures fell below -44°C . During the same period temperatures fell across the province, reaching below -30°C in Calgary and to -40°C in Lloydminster. No fleets reported any fuel-related behaviour out of the ordinary while continuing to operate under 'business as usual'. Likewise, there were no fleet reports of fuel-related problems from the control units running on ULSD fuel (petroleum diesel).

Environment Canada daily temperature ranges are provided in graphical form below.



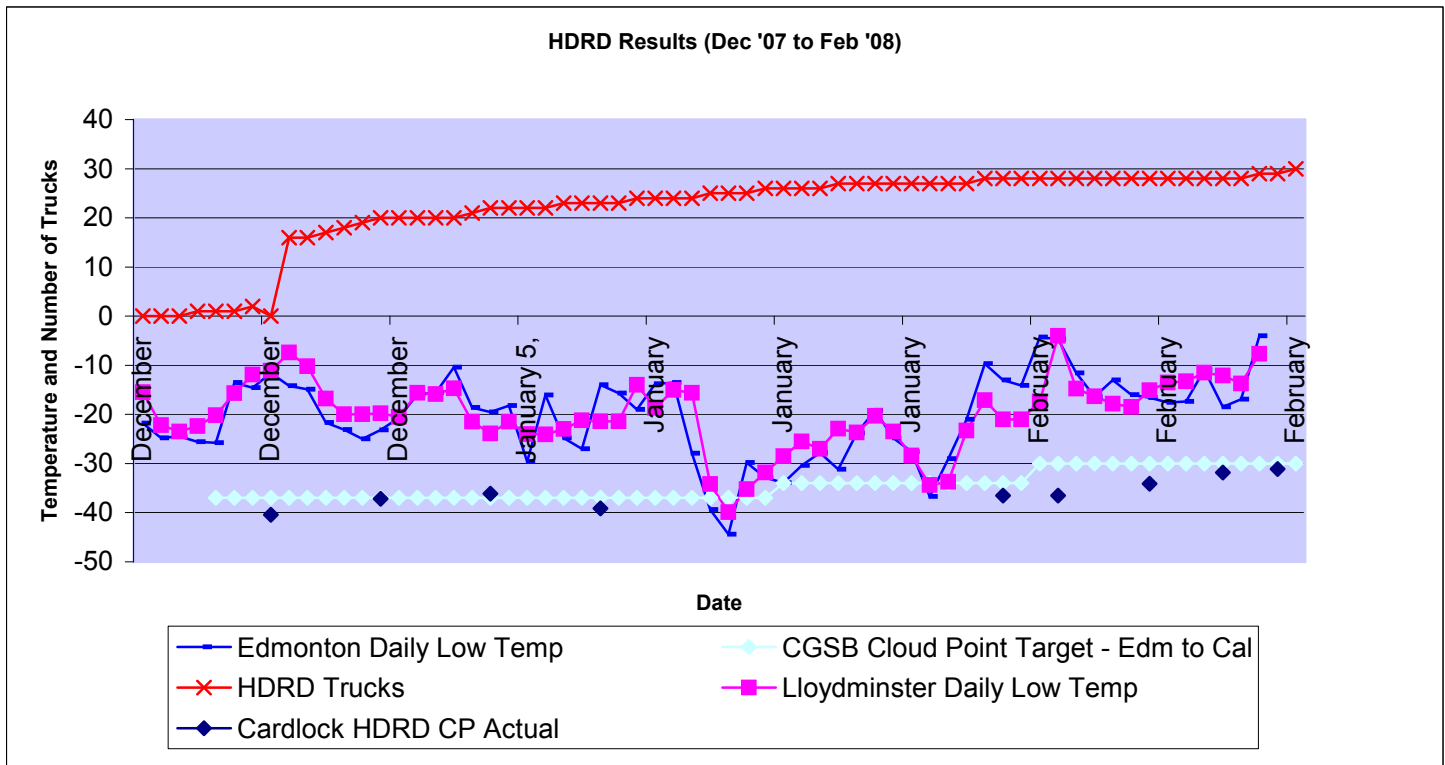
Overview of Fleet Launch for B2 FAME Fuel:



The chart above provides an overview of the launch of trucks running on FAME blends. The red line illustrates the number of trucks running on that test fuel, reflecting the staggered launch mentioned above.

The pink and dark blue lines represent the daily low temperatures for Edmonton and Calgary. The light blue lines represent cloud point specifications for CAN/CGSB 3.520 compliance, which are set to meet the 2.5th percentile low end design temperature for the location and 15-day period (eg temperature target at which ambient temperature does not fall below for more than 9 hours in a 15 day period as calculated over decades of historical climate data). For the Calgary region, this target for the coldest periods is -34°C, while the target for the Edmonton region in the coldest periods is -37°C. The yellow triangles on the chart show the measured cloud point of samples of blended fuel taken from one of the participating cardlocks. Their measured cloud points all met or exceeded the CGSB target (note: some results varied within the repeatability of the test method from the target temperature).

Overview of Fleet Launch for B2 HDRD Fuel:



The chart above provides an overview of the launch of trucks running on HDRD blends. The red line illustrates the number of trucks running on this test fuel, reflecting the staggered launch mentioned above (the majority of trucks launched in the early part of January, 2008). The pink and dark blue lines represent the daily low temperatures for Edmonton and Lloydminster. The light blue line represents cloud point specifications for CAN/CGSB 3.520 compliance. The target for the Edmonton region in the coldest periods is -37°C. The dark blue diamonds on the chart represent the measured cloud point of samples of blended fuel taken from participating cardlocks on the dates shown. Their measured cloud points essentially all met the CGSB target (note: some results varied within the repeatability of the test method from the target temperature).

The demonstration is slated to use some two million litres of blended fuel from launch to the fall of 2008. During the winter of 2007-2008 the ARDD fleet consumed some 246,000 litres of FAME B2 and 403,000 litres of HDRD B2.

6.0 Operability Evaluation

6.1 Scope of Evaluation

Recognizing that all of the Original Engine Manufacturers (OEMs) of vehicles in the demonstration already warrant their equipment for use with low level biodiesel blends up to B5, this demonstration explicitly did not set out to establish wear levels, materials compatibility or longevity. Instead, the demonstration sought to ascertain whether there were any operational challenges from issues such as fuel gelling or clouding, blocked filters, stalled vehicles or non-starts *from an operational perspective*. As such, an *operability breach* was defined as a fleet-identified fuel-related problem that caused verifiable reduced performance or loss of service.

6.2 Observations

To date, with the B2 blends we have not encountered operational difficulty or reduced performance among participating vehicles. All fleets have incorporated the test fuels into their business as usual without any reports of filter clogging, hard starts, non-starts or breakdowns. All fuels used in the demonstration were acquired and maintained to meet quality specifications. No fuel filters in the distribution chain or participating trucks were blocked or identified as impeding operation. A full analysis of project data will be included in the final report scheduled for release in late 2008.