Intent to Develop Alberta Offset System

Quantification Protocol:

Protocol for quantifying direct reductions in greenhouse gas emissions arising from fuel switching

General Description of the Proposed Protocol

Intent

The protocol will quantify greenhouse gas emission offsets arising from a change in fuel type from diesel (Baseline Condition) to compressed gas or biodiesel (Project Condition). The protocol is intended for use where the volume and location of fuel used is sufficient to make fuel switching economical when offsets are included. Though intended for the forest industry this protocol will be applicable to any industry or company that uses large volumes of fuel and has the ability to provide fuelling infrastructure.

The Protocol will quantify direct reductions in greenhouse gas emissions arising from a change to lower greenhouse gas emission fuel. Lower emission fuel may include biodiesel, compressed natural gas (CNG) or other compressed gasses with lower emission profiles (e.g., compressed syngas from bio-char production). The change from diesel to compressed gas or renewable biodiesel results in significant green house gas reductions per unit consumed. This protocol will apply to all equipment currently using non-renewable diesel including construction, harvesting and transportation operations. Because fuel switching results in direct reductions, the change in fuel type provides assurance of the additionality of any reduction in total GHG emissions.

Baseline

The baseline condition consists of the use of diesel fuel in construction, harvesting, and transportation equipment. Each litre of diesel fuel consumed in a heavy-duty diesel vehicle (HDDV) releases 2663.27 g/L of CO_2 equivalent green house gas emissions (includes CH_4 and N_2O)[1]. Because virtually all greenhouse gas emissions are associated with diesel fuel consumption, significant reductions can be

[1] National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada.

realised by switching to lower emitting fuels. Quantification of baseline emission can be made using historical measures on a per unit of production basis, or based on fuel energy content (calorimetric) to compare directly with measured project fuel use.

The protocol will calculate direct emissions for both the Baseline and Project Conditions. The protocol will use a comparison-based baseline as this is the most accurate, dynamic, and appropriate approach to use. The comparison-based approach will be dynamic because improvements in engine fuel efficiency, and or changes in fuel quality, that may occur will be applied equally to the Baseline and Project Conditions. This dynamic approach is possible because all emissions to be quantified are based on energy consumption, and will be calculated using volume of fuel combusted. Functional equivalence will be achieved by use of equivalent energy content or use of energy per unit of harvest or per tonne values.

The change in fuel type from diesel to compressed gas or bio-diesel is not a regulatory requirement. The desire for a switch in fuel is an entirely self-initiated and voluntary by the protocol developer, and is made possible by use of offsets to recover capital costs associated with the infrastructure required for fuel switching. The use of lower emitting fuel such as CNG, or biodiesel from renewable biomass, results in direct reductions in greenhouse gas emissions, thus the change provides assurance of the additionality of any reduction accruing to the Project Condition.

In Alberta approximately 7,780,000 t CO_2 e is emitted by heavy duty diesel vehicles for transport and related activities (2010 NIR report). This represents the potential pool available for fuel switching. Table 1 shows the potential emission reduction from fuel switching. However, the need to provide fuelling infrastructure, including compression for gas, will limit the adoption of this protocol to industries where the volume of fuel used is sufficient to allow for a recovery of the initial capital expenditure. Additional constraints on the potential uptake of this protocol include location of fuel use (i.e., distance from fuelling stations, rate of fuel consumption, transportation of fuel to temporary fuelling stations). To provide the required level of assurance a robust monitoring system must also be included with the infrastructure. The monitoring will likely include metered readings on production, quantity dispensed, and location of use.

Table1. Potential emission reductions from fuel switching by heavy duty diesel vehicles used for transportation and related activities in Alberta.

	Percent of fuel switching						
kilotonnes CO_2 e	0%	100%	50%	40%	20%	10%	5%
Diesel to CNG	**7780**	**61**	**30**	**24**	**12**	**6**	**3**
Diesel to BIO Diesel	**7780**	**76**	**38**	**31**	**15**	**8**	**4**

Switching to lower emitting fuel is not business as usual. Currently, no large emitter in Alberta has switched entirely to lower greenhouse gas emitting fuel. Development of this protocol is being lead by the forest sector in Alberta. Combined the forest sector Heavy duty diesel emissions are approximately 10% of transportation related emission. Based on published[2] fuel use intensity numbers, Table 2 shows the potential reductions from fuel switching for the forest sector in Alberta. Actual uptake of this protocol is expected to be moderate due to logistical and capital expenditure constraints.

Table 2- Potential forestry sector offsets in Alberta from switching to compressed natural gas (CNG) or bio diesel. Tonnes of potential CO_2 equivalent emission reductions calculated using 7.1 L of fuel per m^3 harvested.*

[2] FERRIC: Sambo S.M. 2002. Advantage 3: 29. Weighted average of 7.1 L/m3 of diesel fuel for all harvest systems examined. Includes harvest, transport and handling, preharvest, camp, and silviculture. http://www.feric.ca/en

	Harvest		Diesel to CNG		Diesel to BIO Diesel	
	m^3	m^3	tonnes CO_2 e		tonnes CO_2 e	
Operation	2006	2007	2006	2007	2006	2007
Ainsworth	666000	766000	12616	14510	12590	14481
Alberta Plywood	247000	260000	4679	4925	4669	4915
ALPAC	2714000	2725000	51411	51620	51307	51515
ANC Timber	660000	700000	12502	13260	12477	13233
Blue Ridge	814000	1053000	15420	19947	15388	19906
Boucher Brothers	202000	173000	3826	3277	3819	3270
Canadian forest products	867000	712000	16424	13487	16390	13460
DMI	1516000	1795000	28718	34003	28659	33934
Evergreen	45000	20000	852	379	851	378
Foothills Forest Products	257000	362000	4868	6857	4858	6843
Footner Forest products	1022000	688000	19360	13033	19320	13006
Gordon Buchanan Ent.	390000	405000	7388	7672	7373	7656
La Crete	231000	184000	4376	3486	4367	3478
Manning	394000	326000	7464	6175	7448	6163
Millar Western (total)	2368000	2435000	44857	46126	44766	46032
Northlands	232000	252000	4395	4774	4386	4764
Other (smaller mills) Total	574000	455000	10873	8619	10851	8602
Precision	102000	47000	1932	890	1928	889
Rocky Wood Preservers		102000	0	1932	0	1928
Slave Lake Pulp	621000	541000	11764	10248	11740	10227
Spray Lake Sawmills	508000	460000	9623	8714	9603	8696
Spruceland Millworks	179000	116000	3391	2197	3384	2193
Sundance	539000	676000	10210	12805	10190	12779
Sundre Forest Products (total)	1378000	1174000	26103	22239	26050	22194
Tolko (total)	2221000	1571000	42072	29759	41987	29699
Vanderwell Contractors	725000	345000	13734	6535	13706	6522
West Fraser (total)	1819000	1240000	34457	23489	34387	23442
Weyerhaeuser (total)	3604000	3569000	68270	67607	68132	67470
Grand Totals	24895000	23152000	471585	438567	470627	437676

*Harvest volumes from "Economic Impact of the Alberta Forest Industry 2008. AFPA Pub No. I/308. ISBN No. 978-0-7785-7045-5 (Online Edition)"

Project Condition

The proposed protocol is conceptually very simple. Fuel use would be measured directly, or estimated from annual harvest volumes or tonnes, then compared to an equivalent amount of diesel fuel that would have been consumed under baseline conditions. Figure 1 provides the likely sources and sinks that will be considered for both the baseline and project conditions.

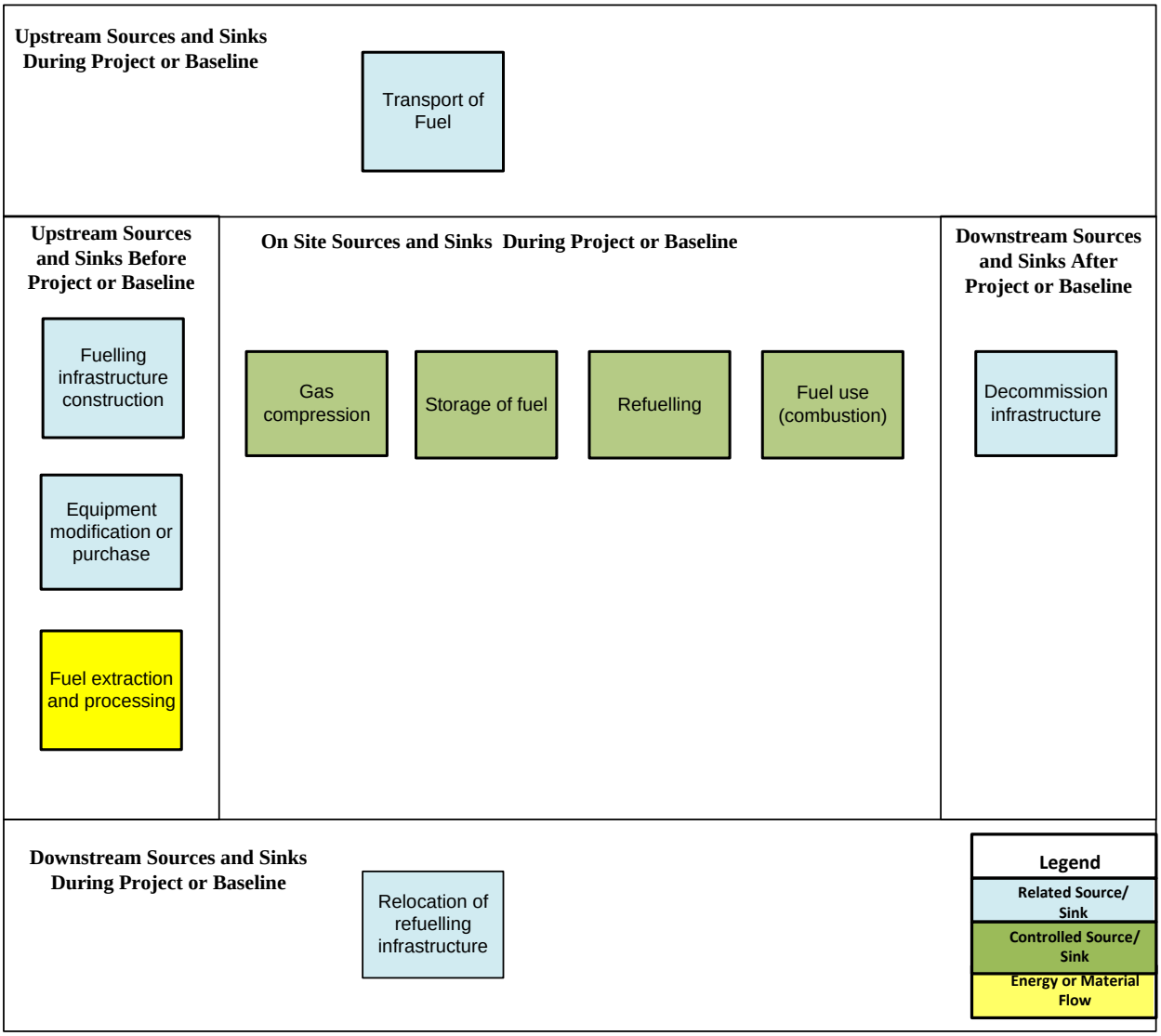

Figure 1. Likely greenhouse gas sources and sinks to be considered in protocol development.

The general approach taken to quantification will use energy consumption to estimate GHG emissions associated with both the Baseline Condition and the Project Condition. Energy consumption in both cases is primarily heavy-duty diesel engines. The preferred method for quantification is to use litres of

fuel and GHG emission factors for Heavy-duty Diesel Vehicles (HDDVs)[3] as follows: (1) Determine total fuel use; (2) Determine HDDVs GHG emissions for the project from lower emission fuels; (3) compare to an equivalent amount of diesel fuel. Equivalency can be achieved by correcting for variations in energy content between fuel types.

Applicability

This protocol will be applicable to any company implementing fuel switching within their sphere of operations. In addition, the quantification methods are applicable to any company implementing a switch in fuel type to achieve reduced greenhouse gas emissions.

Regulatory Requirements

The proposed protocol quantifies a direct reduction in GHG gas emissions due to fuel switching. The change is not a regulatory requirement.

Additionality

The concept of additionality is central to protocol credibility. There is no GHG capture or sequestration associated with the proposed protocol – instead it quantifies a ***direct reduction*** in GHG emissions – thereby obviating the need to address ***permanence*** or ***reversibility*** of any GHG emission offsets arising from it. The proposed protocol also addresses a location specific change in fuel use and focuses entirely on changes at that location. Since the proposed protocol will effectively be site-specific and will not result in changes in production (i.e., harvesting is independent of fuel used in equipment), ***leakage*** will not be a concern.

[3] National Inventory Report: Greenhouse Gas Sources and Sinks in Canada.

Barriers

Barriers to implementation of this protocol include capital expenditures for:

- Procurement or modification of equipment to use the alternative fuel,
- Gas or fuel collection infrastructure,
- Gas compression facility,
- Fuelling stations including portable and fixed locations

The significant GHG reduction potential of fuel switching is critical for implementation by project developers to offset the initial capital costs.

No other barriers are anticipated at this time.

Permanence

There is no GHG capture or sequestration associated with the proposed protocol – instead it quantifies a ***direct reduction*** in GHG emissions – thereby obviating the need to address ***permanence*** or ***reversibility*** of any GHG emission offsets arising from it.

Leakage

There is no GHG capture or sequestration associated with the proposed protocol – instead it quantifies a ***direct reduction*** in GHG emissions. The proposed protocol also addresses a location specific change in emissions and focuses entirely on changes at that location. Since the proposed protocol will effectively be site-specific and will not result in changes in production (i.e., harvesting is independent of fuel used in equipment), ***leakage*** will not be a concern.

Conservativeness

The proposed protocol uses a dynamic baseline approach. General technological improvements and efficiencies will be applied equally to the project and baseline conditions.

All emissions will be quantified based on energy consumption as measured by total fuel consumption. The use of total fuel consumed will also ensure capture of all related activities associated with harvesting, transportation and wood handling. The core assumption that will be included in the protocol

is that all fuel is consumed, and no attempt will be made to separate fuel consumption that may be out of scope or not project related (e.g., outside the FMA, maintenance or downtime emissions).

Aggregation

Aggregation is not required with this protocol.

Verification

The general approach taken to quantification is to use energy consumption to estimate GHG emissions associated with both the Baseline Condition and the Project Condition. Energy consumption in both cases is primarily from diesel engines using diesel fuel or lower emission fuel. The preferred method for quantification is to use litres of fuel and GHG emission factors for Heavy-duty Diesel Vehicles (HDDVs)[4] as follows: (1) Determine total fuel use; (2) Determine HDDVs GHG emissions; (3) compare to an equivalent amount of diesel fuel. Equivalency can be achieved by using energy content of the different fuel types.

Verification will be conducted with total fuel use records including metered readings at fuelling stations. Depending of the fuel type, records will include both production and use records. Additional records will be used to provide the location of the emission reductions to ensure that they occur within Alberta. Additional records may include harvest block location and haul road layouts.

Ownership

The legislation of the Province of Alberta is not prescriptive as to who may own carbon credits. Rather, legal ownership of the reduction must be clearly established in order to qualify for use as a carbon offset credit.

The switch to lower emission fuel equipment including tractors, dozers, loaders, harvesters, and trucks will be a requirement by the protocol developer. It will be a requirement of the proposed protocol that all fuel will be controlled and owned by the project developer. This would include fuelling stations and associated infrastructure. For equipment not owned directly, (e.g., subcontractors) incentives may be provided to ensure transition to use of equipment capable of functioning on lower emission fuel. A formal legal interpretation will be provided and submitted as part of the protocol development process to establish a clear interpretation of ownership.

[4] National Inventory Report: Greenhouse Gas Sources and Sinks in Canada.

Related Protocols and/or Methodologies

Since a direct reduction in GHG emissions is being quantified, the protocol will focus on quantification of GHG sources in the full life cycle of the baseline condition and the Project Condition. Because direct GHG reductions are being quantified, there is no need to quantify capture, sequestration, or duration of storage. In some ways, the proposed protocol parallels the Modal Freight Shift Protocol – in quantifying a change in process. However, it addresses changes across all aspects of a specific operation. Also in Alberta, the Quantification Protocol for Energy Efficiency Projects is conceptually similar to the proposed protocol but would required substantial modification before it could be applied to fuel switching as proposed in this letter of intent.

The Pacific Carbon Trust in BC has recently released a fuel switching protocol for energy generation (Fuel Switching From Fossil Fuel-Fired Energy Generation to Less GHG Intensive Fossil Fuel or Renewable Energy Sources V1.1, January 31st 2011) and have indicated that they are investigating modification so that it would be applicable to fuel switching in vehicles.

Other Benefits

With the implementation of this protocol, the capacity for production and use of lower emitting fuels will be increased in Alberta. Also, experience gained and lessons learned in project development can be used by others in their own projects or in application of other similar projects. The capital expenditures required for implementing fuel switching protocols will also provide employment and use of clean technology in Alberta.

Adverse Effects

Where portable fuelling stations will need to be established a small increase in surface disturbance may occur to allow for construction. The nature of the increased disturbance will be similar to existing surface disturbances associated with forest harvesting and transportation. Therefore existing mitigation methods and reclamation techniques will be sufficient to overcome the anticipated adverse effects.

Other related but uncontrolled effects may arise from the increased demand for lower emission fuel, particularly those fuels produced from biomass. Additional production of lower emission fuel is already occurring, and the moderate uptake of this protocol will not outstrip demand or add considerably to future demands for lower emission fuels.

References

Sambo, S.M. 2002. Fuel consumption for ground-based harvesting systems in western Canada. Advantage Vol. 3 (29), July 2002. Available online from http://www.feric.ca/en

National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada. Available from http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5270.php

Proposed Timing for Submission into the Offset System Review Process

Daishowa Marubeni International Ltd. (the initiating entity) will be submitting an offset protocol titled *Protocol for quantifying direct reductions in greenhouse gas emissions arising from fuel switching from diesel to lower emitting or renewable fuels* for consideration as described in the Specified Gas Emitters Regulation under the Climate Change and Emissions Management Act. The protocol will be submitted in time to meet the October 1st application deadline for the 2011 call for protocols as posted on the Climate Change Central website (http://carbonoffsetsolutions.climatechangecentral.com/offset-protocols/alberta-protocol-development-process/call-protocols).