



Low Carbon Fuel Requirements in Canada

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October 16, 2013



- LCA analysis in Canada uses GHGenius
- Ontario is considering options for including LCA as part of a renewable standard
- Alberta's Emissions Eligibility Standard
- B.C.'s Low Carbon Fuel Requirement
- Lessons, concerns, limitations

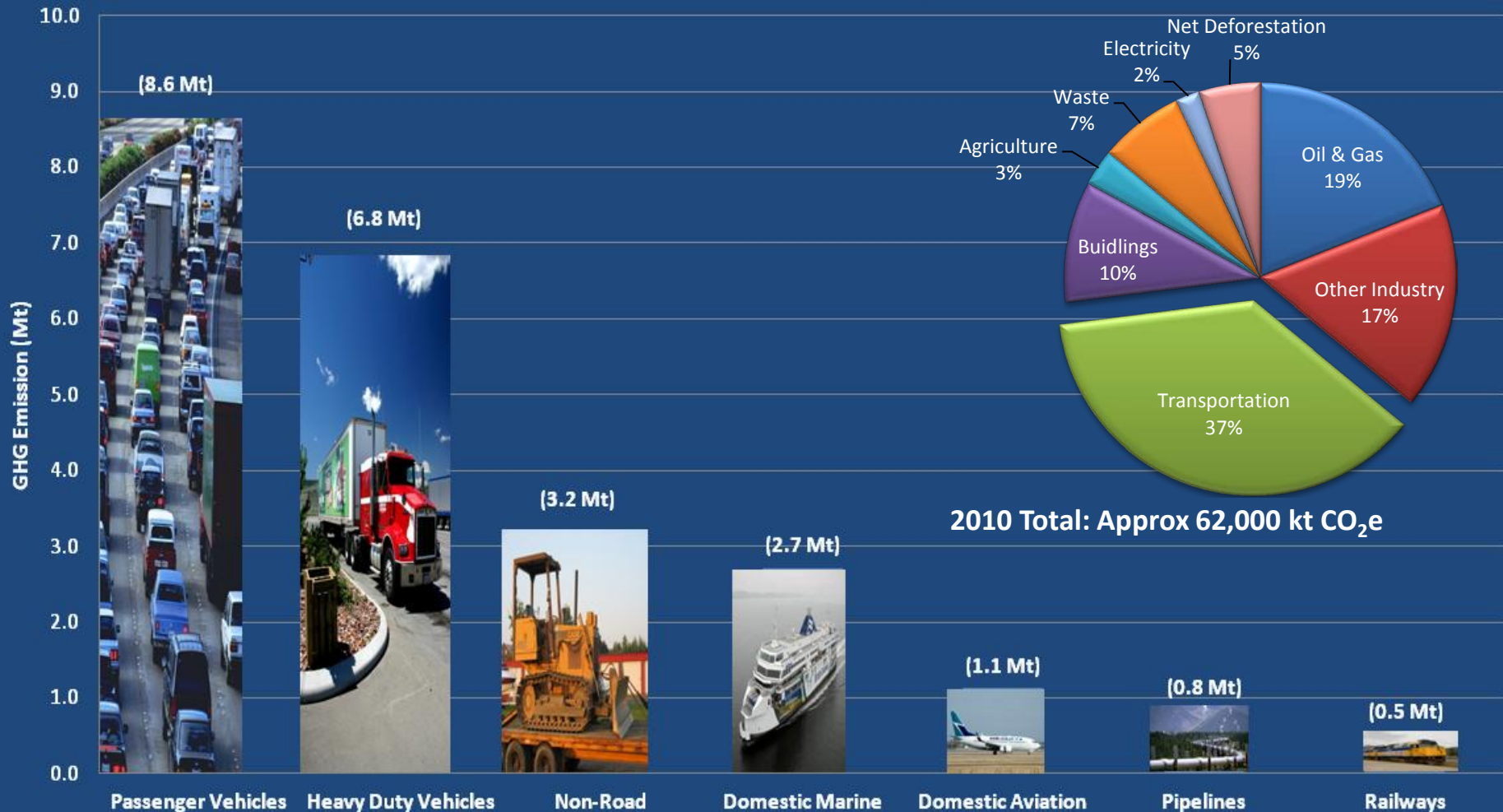


- Alberta's Renewable Fuels Greenhouse Gas Emissions Eligibility Standard
- Must demonstrate 25% fewer GHG emissions than the equivalent petroleum fuel
- GHGenius version 3.19

Transportation Emissions



British Columbia Transportation Sector Greenhouse Gas Emissions (2010)





Renewable and Low Carbon Fuel Requirements Regulation

5% percent provincial annual average renewable content in gasoline

4% percent provincial annual average renewable content in diesel

10 % reduction in carbon intensity by 2020

- Renewable requirements in force since January 1, 2010
- Carbon intensity reductions required since July 1, 2013
- GHGenius 4.01
- An alternate compliance mechanism has been introduced in the form of Part 3 Agreements



$$\text{Credit or Debit} = (CI \text{ class} \times EER \text{ fuel} - CI \text{ fuel}) \times EC \text{ fuel} / 1\,000\,000$$

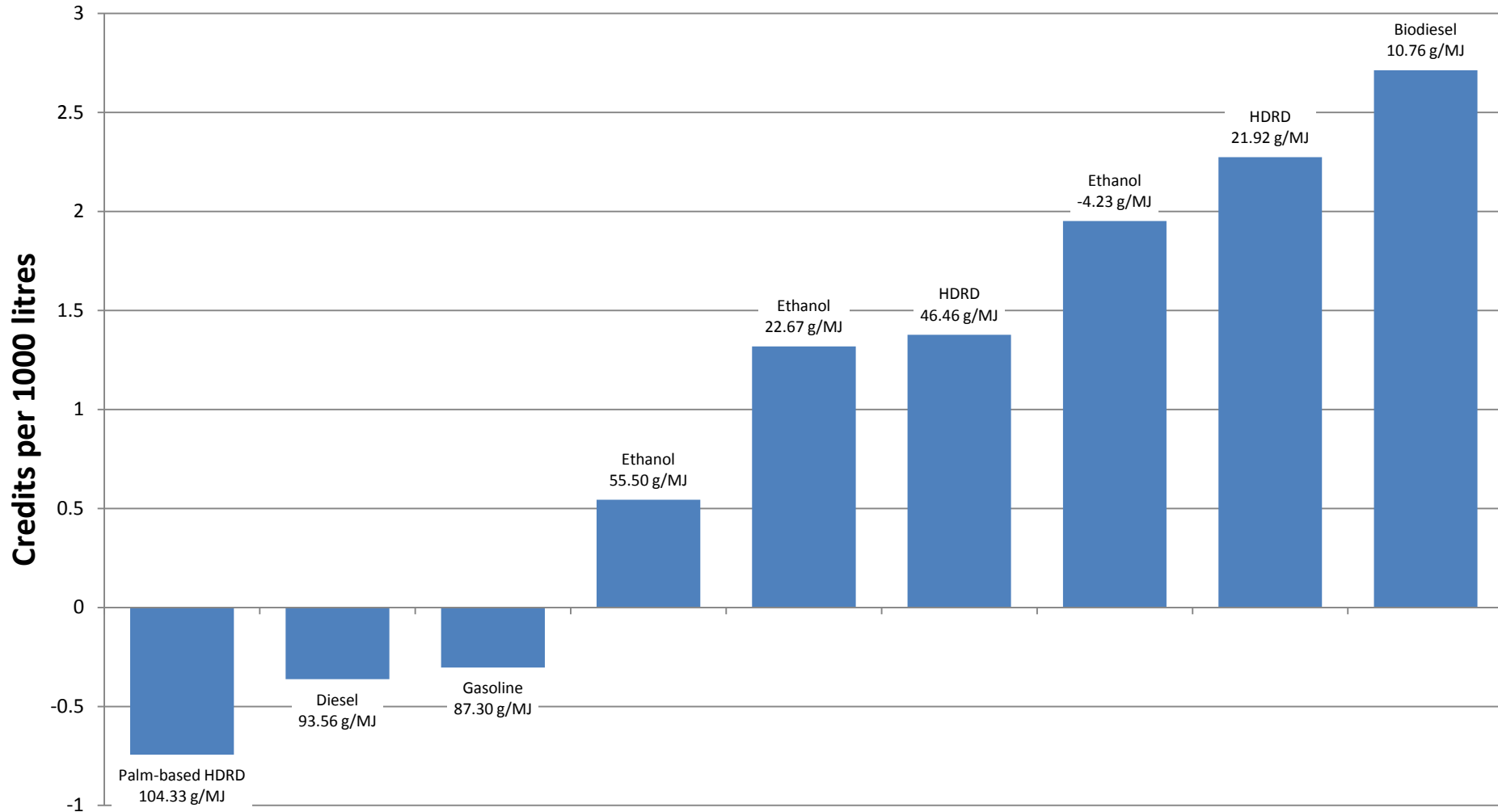
Where

- Credit or Debit = the number of credits generated, if the number is positive, or the number of debits incurred, if the number is negative, for the compliance period;
- CI class = the prescribed carbon intensity limit for the compliance period for the class of fuel of which the fuel is a part;
- EER fuel = the prescribed energy effectiveness ratio for that fuel in that class of fuel;
- CI fuel = the carbon intensity of the fuel;
- EC fuel = the energy content of the fuel calculated in accordance with the regulations.

Reductions

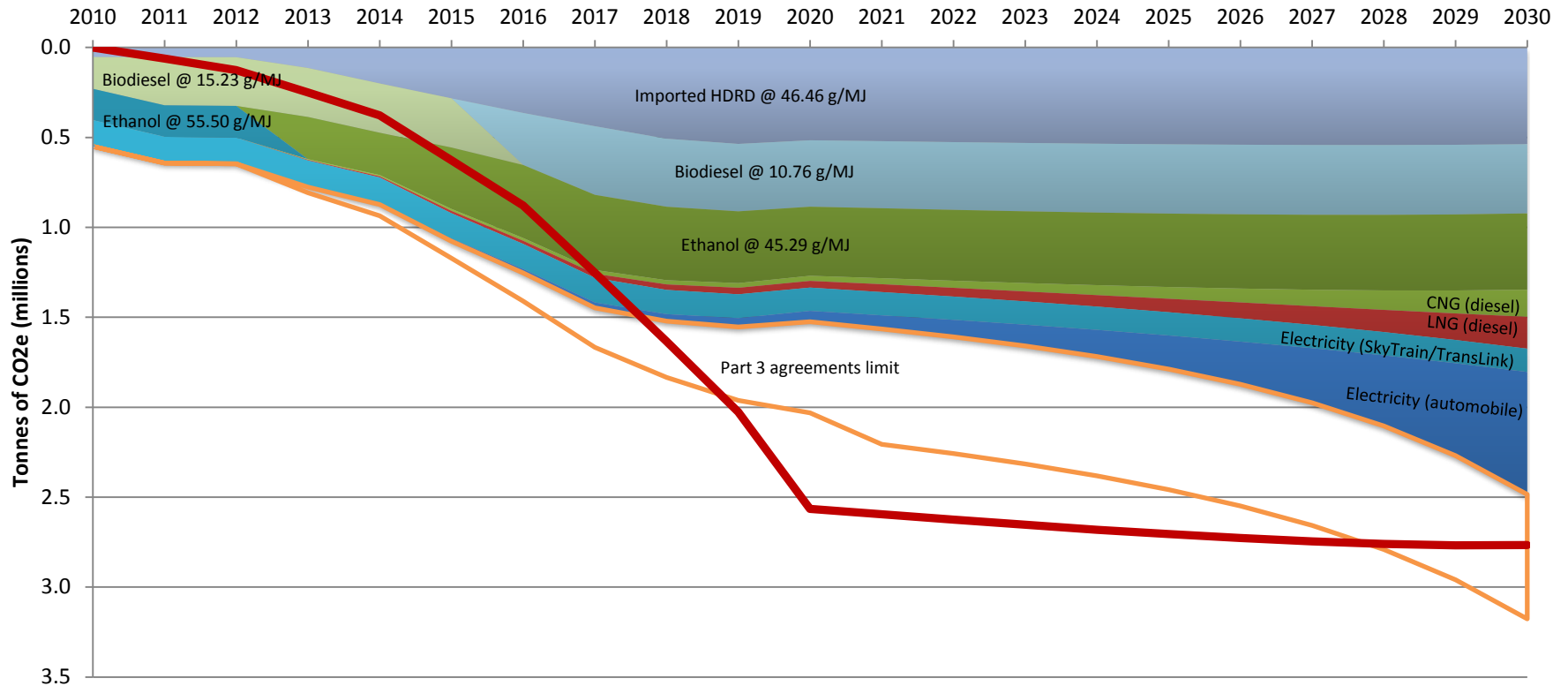


Credits (Debits) from the sale of 1000 litres of fuel in 2020

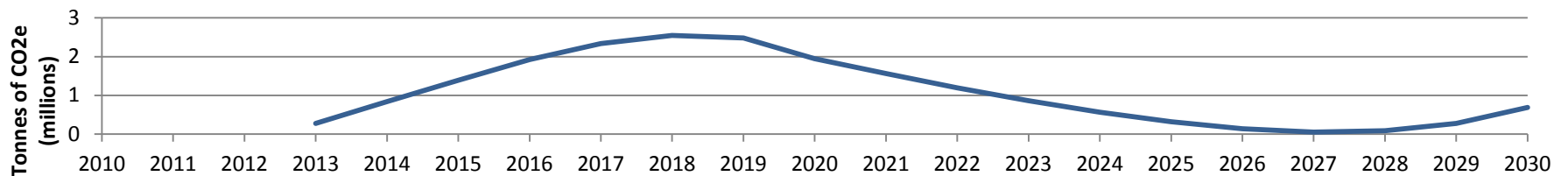


Compliance scenario

Reductions in Tonnes of CO₂e



Credit balance



State of the market (liquid fuels)



- Ethanol and biodiesel are now relatively common.
 - The maximum possible carbon intensity reduction with the best of today's renewable fuels is limited by:
 - 10% ethanol and 5% biodiesel warranty limits
 - Cold weather performance of fuels
- Producers need to respond in various ways:
 - Growing Power has integrated their ethanol production with a feed lot and other alternative energy production, leading to a carbon intensity of -4.23g/MJ
 - Hydrogenation-derived renewable diesel that meets the conventional diesel standard.
 - There is an unknown demand for flex fuel and higher level blends of biodiesel.

State of the market (alternate fuels)



- Natural gas has the potential to reduce carbon intensity by up to 30% immediately, and by significantly greater amounts if renewable natural gas becomes available
- Electricity in B.C. has a very low carbon intensity, so electric for transportation makes sense
- Hydrogen can be captured as a by-product of industrial chemical production or manufactured from wind power can be very low carbon
- All of the above are only just entering the market, and are dealing with issues such as:
 - Lack of infrastructure
 - Market acceptance
 - High cost

Lessons Learned



- Each fuel is valued according to its carbon intensity, and every fuel has a different carbon intensity. For gasoline and diesel, market share determines compliance if both fuels are ranked together. Separating the pools allows the market to evolve to accommodate fuels with significantly different carbon intensities.
- The large suppliers see too much competitive risk to be the first movers on anything that could increase the cost of fuel.
- Petroleum manufacturers are used to relatively high profit margins. Renewable fuels may not offer the same level of profitability.
- Fuel shuffling will always be an issue that decreases the effect of low carbon requirements. In British Columbia, we have fixed the carbon intensity of gasoline and diesel to avoid shuffling. Any producer of any fuel could “shuffle” fuels if they have a diverse market.



- Understanding of LCA is evolving rapidly, and suppliers are not able to respond quickly enough to comply using the “most recent” version of any model.
- The B.C. RLCFRR “smoothes out” GHGenius updates by:
 - Fixing the carbon intensity of fuels for up to 3 years through the Director’s approvals
 - Requiring the Director to approve the version of GHGenius to be used when calculating carbon intensity.
- This leads to a lag in response if an LCA value increases significantly.

What LCFS doesn't do



A low carbon fuel standard reduces emissions from the use of transportation fuel, but it does not directly address issues such as:

- Total fuel use
- Vehicle efficiency
- Not all factors that influence fuel choice are within the control of the fuel suppliers
- Market acceptance and consumer choice
- Preference for a particular fuel or technology
- Preference for the domestic production of fuels
- Social justice



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Thank You!



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