

SUBMITTED ONLINE

March 29, 2019

Comments & Recommendations – Advanced Biofuels Canada

Made-in-Ontario Environment Plan – Addressing Climate Change

Advanced Biofuels Canada (ABFC) appreciates the opportunity to comment on proposals to amend O. Reg. 535/05 (Ethanol in Gasoline) under the Environmental Protection Act, R.S.O. 1990, c. E.19.

Our comments and recommendations are intended to support Ontario’s residents and industries in their actions to reduce greenhouse gas emissions, while maintaining household affordability and a healthy economy. They address rising costs of living and will assist business competitiveness and encourage needed innovation in transportation fuels while driving job growth in important sectors of our economy.

EXECUTIVE SUMMARY

ABFC supports the recommendations to move to 15 percent renewable content in gasoline by 2025, and to continue to modernize Ontario’s renewable fuel regulations.

The proposal will send a signal to innovate in the fossil fuel (gasoline, diesel) and renewable fuel sectors. Other jurisdictions’ successful experience with increasingly stringent fuels regulations support a decision by the province to move from periodic step-change regulatory events to a continuous, predictable, pragmatic requirement to reduce the carbon content in fuels and tap market-based mechanisms to accelerate the change and mitigate impacts on fuel costs. This is a modern, flexible approach.

Diesel emissions will increasingly come under scrutiny, with a number of factors pointing to the need for action. While the simple rack-price basis for action may not be so obvious for renewable diesel fuels, their relatively low mitigation cost and very low carbon potential (in a sector that is tough to decarbonize) support increasing the renewable content target under Reg. 97/14 (Greener Diesel) regulation.

Further, carbon pricing can significantly improve the price competitiveness of low carbon fuels, particularly for higher-level blends. The role of taxation is increasingly evident in helping – or hindering – the transition to lower carbon fuels. When fuels are taxed volumetrically, users of lower-density fuels (such as ethanol) pay more tax per kilometer driven than users of higher density fossil fuels. Smart policy should incent adoption of lower carbon fuels; adopting an energetic excise tax basis would be fair to all fuels. We also note that biofuels are the only alternative fuels to pay fuel excise taxes; tax reforms are needed to fairly treat all fuels.

Recommendations Summary

1. Phase in renewable content in gasoline to 15% by 2025, and GHG reduction requirement within the Greener Gasoline regulation.

	Renewable content	GHG reduction
2020	10% (current regulation)	45%
2021	11%	45%
2022	12%	46%
2023	13%	46%
2024	14%	47%
2025	15%	47%

2. Exempt biofuels from Ontario fuel excise taxes on a targeted and limited basis:
 - a) Exempt the ethanol content in select blends (e.g. E25, E85)
 - b) Exempt the biodiesel content in select blends (e.g. B20, B50)
3. Increase the Greener Diesel regulation renewable content requirements in diesel to 5% in 2020, and incrementally increase to 10% by 2030.
4. Align aspects of the Greener Diesel and Greener Gasoline regulations, clarify the eligibility of other renewable fuels, and consider expanding both regulations' scopes to include emerging non-biogenic low carbon fuels (e.g. direct air capture of carbon or industrial emission fermentation).
5. Provide the market with useful, frequent data on performance and market activity.

We believe these recommendations will result in larger economic benefits for the province. Benefits from increasing renewable content in all fuels will be realized from biofuels production, fuel distribution, and upstream supply sectors (farming, forestry, biomass processing, and waste management).

COMMENTARY & RECOMMENDATIONS

Compliance Approaches and Feasibility - proposed regulation amendments

Fuel suppliers can meet a 15% by 2025 renewable content in regular gasoline by:

1. Blending ethanol into gasoline at 15%
2. Co-processing fats, oils, and biocrude oils in existing Ontario refineries
3. Substituting fossil-based hydrogen with renewable hydrogen

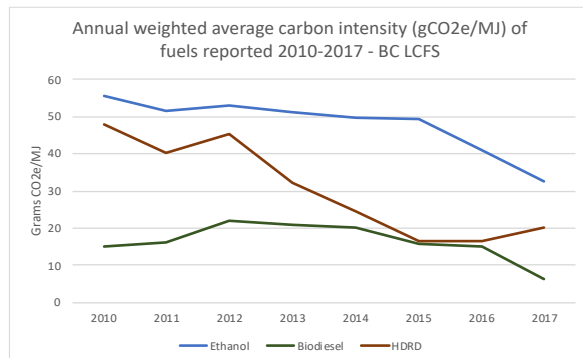
In addition to the options cited above, compliance can be met from:

- Ethanol blending at higher E25, E85 levels
- Inclusion of renewable fuels (including ethanol) below the 45% GHG reduction requirement to reduce the effective volumetric blending rate
- New pathways utilizing wastes and residues

ABFC detailed modelling shows that 15% renewable content is feasible under a range of compliance approaches for fuel suppliers. A number of these allow refiners to utilize existing refining assets. Kern Oil, for instance, has been co-processing petroleum and renewable feedstocks in its California refinery since 2008.

Results (2010-2017) in British Columbia's LCFS¹ demonstrates how the market has responded to an increasingly stringent, performance-based regulation.

The carbon intensity of ethanol has decreased 41% from 2010 to 2017 in response to tighter regulatory stringency. The weighted average CI of ethanol supplied to BC in 2017 was 32.58 grams CO₂e/MJ. This is ~60% below the CI of gasoline in Ontario.



Under a gradual increase in blending rates (2020-2025), the scenarios show that refiners and infrastructure operators have sufficient lead time to plan and implement a range of viable, proven compliance solutions.

GHG Minimum Reduction Requirement and Phase-in schedule

The practice of setting mandate levels on a step-change schedule—static until the next regulatory change process—is outdated and retards innovation in clean fuels.

Ontario can modernize its approach to GHG reductions in fuels by:

- Staging in the increase in renewable content to allow industry to plan and adapt efficiently
- Gradually increasing the GHG reduction requirement to allow low carbon fuel providers to innovate in feedstocks and production processes

¹ [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/transportation/renewable-low-carbon-fuels/rlcf007 - 2017_summary_2010-17v2.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/transportation/renewable-low-carbon-fuels/rlcf007_-_2017_summary_2010-17v2.pdf)

Recommendation

We recommend the following schedule for increase in renewable content and increases in carbon intensity reduction requirements for the period 2020 to 2025:

	Renewable content	GHG reduction
2020	10%	45%
2021	11%	45%
2022	12%	46%
2023	13%	46%
2024	14%	47%
2025	15%	47%

Viability of E15 Blends in Current Light-duty Vehicle fleet

Canada (ECCC) and the US (EPA) have aligned their light-duty vehicle and engine emissions standards since 2001, first under an MOU with automobile manufacturers that committed them to aligned US/Canada standards for 2001MY-2003MY, then by way of Environment Canada's 'On-Road Vehicle and Engine Emission Regulations'² promulgated under CEPA, effective January 1, 2004, that aligned Canadian vehicle and engine certification requirements with those of the US Environmental Protection Agency (EPA). In this regard, Canadian vehicle and engine certifications are by federal law fully aligned with EPA requirements.

The regulation clarifies that evidence of conformity for US EPA-certified vehicles and engines shall be taken as evidence of conformity with the Canadian regulation. Stakeholder comments in consultations support this approach.

In June 2011, the US EPA formally approved the use of E15 in model year 2001 and newer automobiles. The EPA approval was based on extensive engine testing conducted by the US Department of Energy.³ EPA regulations are directly applicable to Canadian light-duty vehicles. Hence, the DOE testing to affirm compatibility with post-2001 US vehicles is directly relevant to Ontario's fleet under Canada/US harmonized regulations.

In Environment Canada consultations (circa 1999) to align with US emissions standards,⁴ Canadian automobile manufacturers stated that, "CVMA/AIAMC request Environment Canada to continue the practice of aligning Canada's vehicle emission standards to those of the U.S. EPA." Further, AIAMC/CVMA stated: "There is no added value for the Department to undertake in-use testing on vehicles with an EPA certificate of conformity as mentioned above since these are already conducted in the U.S." Also, "Ford recognizes EC's desire to know and understand the overall compliance performance of vehicles in the Canadian marketplace. This testing, however, in large part duplicates

² <https://laws-lois.justice.gc.ca/eng/regulations/sor-2003-2/index.html>

³ <https://www.energy.gov/articles/getting-it-right-accurate-testing-and-assessments-critical-deploying-next-generation-auto>

⁴ <http://www2.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=36FD6CB3-1&offset=2&toc=show>

testing already conducted in the U.S. At the same time, any in-use emissions test results must also be viewed as fuel quality impact test results as well."

Long term success of E15 blends has been proven in the US markets:

- Over 6 years and almost 10 billion kilometers of consumer use of E15 in the US, there have been no documented cases of damage from misfuelling or use of E15^{5,6}
- Numerous statements about 'potential issues' related to E15 use were issued by fossil fuels or automotive organizations in the 12-24 months after the June 2011 EPA approval
 - The two most prominent critics of the EPA E15 ruling were the American Automobile Association (AAA) and the American Petroleum Institute (API)
 - A recent AAA website search for E15 engine damage citations has neither any links to material more recent than 2013 – and those references were all speculative – nor any claim or citations of evidence of E15 damage to engines or fuel systems⁷
 - A recent API website search likewise shows multiple claims of 'potential issues' with no citations with evidence of damage⁸

A February 2018 report on the E15 market by the Fuels Institute cites no case of engine damage in its assessment of consumer acceptance.⁹ The Fuels Institute's members includes automobile manufacturers, consumer organizations, fuel retailers, fuel producers and refiners, alternative and renewable fuel producers, and government entities.

Driving Innovation in Ontario Businesses

Both Greener Gasoline and Greener Diesel regulations define 'renewable' to be bio-based. However, there are fuels that reduce GHGs that are not bio-based. Examples include: alcohols fermented from industrial flue gases to produce jet fuel; direct air capture of CO₂ to produce a fossil refinery feedstock or a diesel fuel blendstock; and, and recurring waste streams (e.g. municipal solid wastes) that can be processed into renewable fuels.

These fuels all displace petroleum fuels, can be very low carbon, and have co-benefits such as improved waste utilization, or supporting the economic viability of co-located heavy industries (e.g. steel).

Recommendation

1. Expand the definition of eligible fuels to include approved waste streams and other non-biogenic feedstocks and processes. Fossil feedstocks (e.g. natural gas) should not qualify as renewable.

New fuels also bring more competition to a fuels market that is supplied chiefly by three petroleum refineries. In the more mature US market, ethanol sells for less than gasoline on both a volumetric and energetic basis.

⁵ <https://www.greencarcongress.com/2018/11/20181109-e15.html>

⁶ Correspondence with Growth Energy and Renewable Fuels Association

⁷ <https://newsroom.aaa.com/tag/e15-gasoline/>

⁸ <https://www.api.org/searchresults?search=E15&page=1>

⁹ <https://www.fuelsinstitute.org/Research/The-Case-of-E15>

Alignment of Greener Diesel/Greener Gasoline and General Regulation Clarification

The Greener Diesel regulation and Greener Gasoline regulations can be aligned in several places.

Recommendations

- Provide the Greener Diesel regulation with the Greener Gasoline's clause (3.1(1)3) which allows the Director to provide a methodology for calculating the GHG intensity for a fuel not listed in GHGenius
- Enable a peer/public review process for new pathways (per CARB)
- Align definition of bio-based and provide additional clarification of eligible/ineligible feedstocks
- Provide more specificity as to eligible fuels

Labelling

See section on E15 compatibility.

Canada's vehicle and engine certifications are by federal law fully aligned with EPA requirements; it is fully rational, therefore, to largely follow EPA labelling requirements.

Recommendation

Adopt EPA labelling requirements for ethanol in gasoline:

'Up to 15% ethanol. Use only in 2001 and newer passenger vehicles and Flex fuel vehicles.'

Appropriate cautions for gasoline-ethanol blends for off-road use, marine engines, and gasoline-powered equipment are warranted.

Costs

Wholesale ethanol (Chicago basis) has historically been less expensive than wholesale straight gasoline, with a growing delta between the two:

2018	Average price difference (gasoline-ethanol) = \$0.245/L (33% discount to gasoline)
2017 - 2018	Average price difference (gasoline-ethanol) = \$0.172/L (25% discount to gasoline)
2013 - 2018	Average price difference (gasoline-ethanol) = \$0.102/L (15% discount to gasoline)

See Appendix 1 for comparative cost charts.

Note that ethanol provides octane content needed to bring sub-octane gasoline blendstock up to finished gasoline octane requirements. Ethanol is widely regarded as the most cost-effective octane source; this is supported by the fact that, for years, refiners have blended ethanol considerably above

mandated levels in ON. Ethanol's octane value in 2016 in Ontario is calculated to have saved Ontario motorists \$720M;¹⁰ this value is not included in the price data cited here.

Looking forward, ethanol costs can be expected to stay in the current price band, based on USDA 2019 long term projections.¹¹ Corn yields are expected to rise from current 180 bu/ac to 188 bu/ac by 2025/2026, contributing to this stability and to continued modest carbon intensity improvements.

Impact on Retail Fuels Distribution

With more ethanol blending understood to be a significant compliance option, one consideration in assessing the feasibility of the 2025 target is the capacity of retail infrastructure to sell higher blends. The following questions should be considered:

- What sites are compatible with E15 and higher blends?
- What parties will need to undertake upgrades (obligated refiners vs independent retailers)?

Almost all underground storage tanks manufactured in the last 29 years are compatible with up to 100% ethanol.¹² Above-ground infrastructure varies in compatibility, with necessary upgrades ranging from a new hose to new dispensers/meters/piping. Newer retail site equipment will be more fully compliant with higher biofuel blends.

Of note, ABFC scenarios show that E15 blends will fulfil most of the compliance required, with modest to no reliance on E25 or E85. This is significant because E15 upgrades are substantially lower cost than those for higher blends.

Ontario has approximately 3,000 retail fuel sites, and another 285 'big box' retail locations selling gasoline. In 2017, one third of the retail sites were under the control of 'integrated refiner marketers';¹³ these parties will be obligated under the regulation and have a business case (i.e. compliance) to invest in infrastructure. Small retail operators who do not produce, import, blend or wholesale fuel will not be obligated parties. Under the majority of compliance scenarios modelled by ABFC, almost all the retail throughput of ethanol blends above 10% could be accommodated by integrated refiner-marketers. These companies have considerable resources to undertake any retail (and wholesale/rack) upgrades. Big box retailers also can play a role even if they are not obligated; credits generated from voluntary blending of E15 can be sold to obligated parties for their compliance and be a revenue stream for big box retailers.

We also note that in the US market, wholesale racks are increasingly offering E15,¹⁴ lessening the requirement for onsite blending at retail sites.

¹⁰ Navius, 2018, *Biofuels in Canada* <https://www.naviusresearch.com/publications/2018-biofuels-in-canada/>

¹¹ <https://www.usda.gov/oce/commodity/projections/> Table 5-8.xls

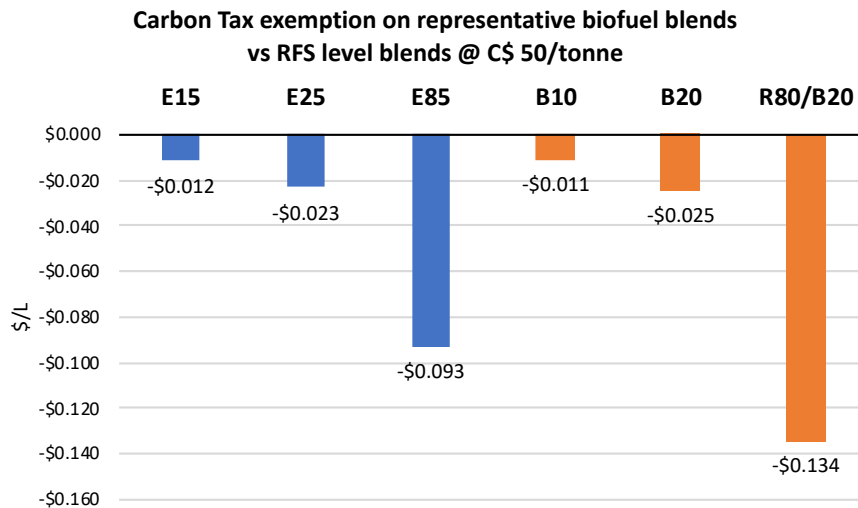
¹² https://afdc.energy.gov/files/u/publication/e15_infrastructure.pdf

¹³ <https://www.kentgrouppltd.com/analytics/retail-site-census/>

¹⁴ <https://www.greencarcongress.com/2017/09/20170922-e15.html>

Interaction with carbon pricing

The biofuel portion of a blend is exempt from the federal carbon charge when blend levels exceed 5% in diesel and 10% in gasoline. Exemption of the federal carbon price at \$50/t in 2022, shown in the figure below, can provide an incentive for exceeding low-level blends of biofuels. This value can be passed on to the consumer, lowering the cost of mid- and high-level blends, with price differentiation at the pump allowing the consumer to choose the best value fuel.



We note that carbon pricing is intended to influence end-use consumer behaviour, and toward that end the province may wish to monitor the pricing of fuels based on their carbon content. Fuel users should see the price of fuels reflecting the blending of lower carbon fuels.

Fuel Taxation

Biofuels generally have a lower energy density than the fossil fuels they replace. A litre of ethanol contains 32% less energy than a litre of fossil gasoline, while a litre of biodiesel/RHD contains 6-9% less energy than a litre of fossil diesel. Preliminary tax analysis by Navius Research, based on a linear reduction of energy density in biofuels blends, shows that, over 2010-2017, the Province of Ontario collected a 'surplus' (energetic surtax) of over \$1.1 billion in taxes due to the volumetric taxation of ethanol in gasoline blends. See Appendix 2.

From 2010-2013, biodiesel was exempt from the provincial fuel tax of \$0.143/L, this led to a cumulative savings of \$17 million. Since 2014, when biodiesel and RHD were no longer exempt, the Province has collected a surplus of \$21 million in taxes from volumetric taxation of renewable diesel fuels.

To ensure fair treatment of biofuels under provincial tax regulations, we recommend that fuel taxes be applied on an energy basis, rather than volumetrically. This will support fair and equal tax treatment of the biofuels that these regulations are trying to incent.

With respect to the energy content of fuel blends, we note that the lower energy density of blended fuel does not necessarily correlate 1:1 with increased fuel consumption. Some engines and technologies are better suited to handle higher octane blends (from increased ethanol) without significant compromise

to fuel consumption. A 2018 study conducted for Natural Resources Canada¹⁵ stated that, “Theoretically, the fuel consumption when using E20/25 would rise by approximately 8% in an unoptimized engine. The results from the meta-analysis, however, show only an increased consumption of about 3%, which reflects the increased thermodynamic efficiency due to the use of ethanol.” In addition, research cites varying seasonal energy density of gasoline fuels, injection technologies (direct/indirect), vehicle model years, applicability of test fuel to market fuel comparability, and other factors as having bearing on the analysis of fuel efficiency of blended fuels. Any improvement above a liner reduction in energy efficiency of fuel blends would reduce the magnitude of the above noted surtax on biofuels.

LCA Model

Ontario uses GHGenius 4.03a. A newer version 5.0 is available which incorporates more current data, and its adoption would yield a more accurate emissions reductions picture for Ontario.

Regarding alignment between Ontario’s LCA model use and the development of a model by ECCC for the proposed Clean Fuel Standard, we believe that Ontario can practically use only GHGenius until 2022 at the earliest, or until it is clear that the federal model is accurate, usable, and stable. The use of different LCA models across federal/provincial regulations is unlikely to be practical once the federal model is in the market. Ontario can assess the best course of action at a future date; no action appears to be needed in the near term.

Open Data & Reporting

Renewable and low carbon fuel markets require specific market information on an as ‘close-to-real-time’ basis as possible to provide clear market signals to:

- Ensure adequate supply
- Provide the most cost-effective supply
- Plan for near-term as well as mid- to long-term term supply
- Deploy capital to improve carbon intensity of fuels

Fuel suppliers require detailed, accurate, and timely information to plan for capital investments and design fuel supply operations. Fuel supply systems are capital intensive, long-life assets; every attempt should be made to provide clear regulatory signals over the longer-term (at least to 2030) and dynamic fuel market information.

The most important information for the market:

- Volumes (physical)
- Carbon intensity
- Credit trading – number and value
- Credit positions – credits held by types of market participants

Recommendations

1. ECP should require fuel suppliers to report the above information on a quarterly basis.

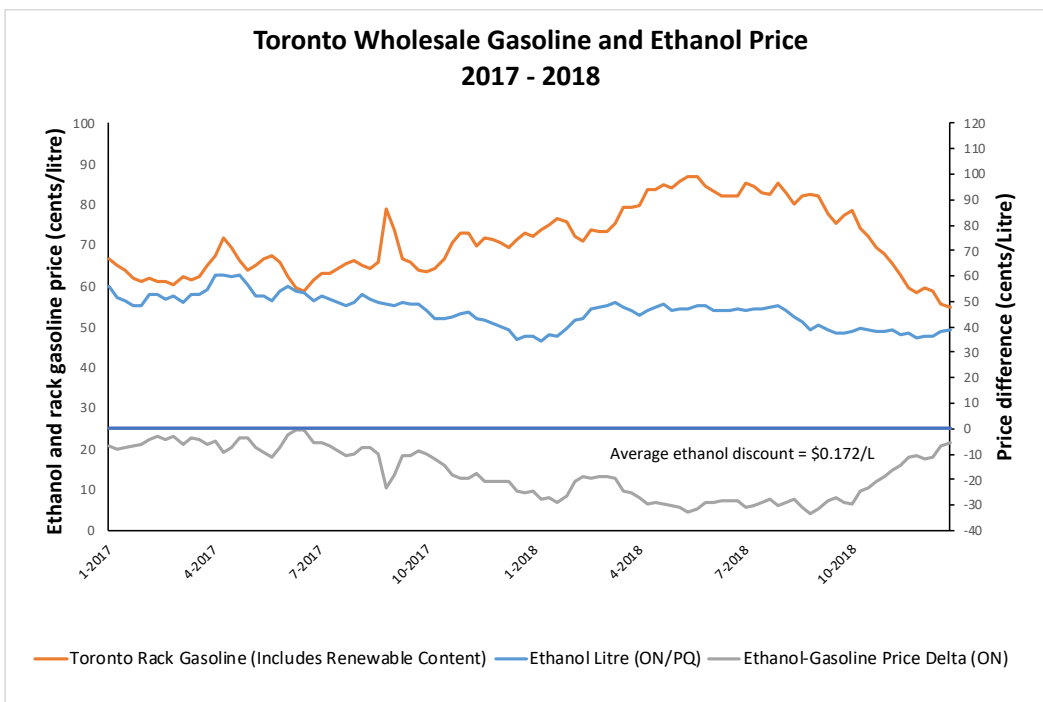
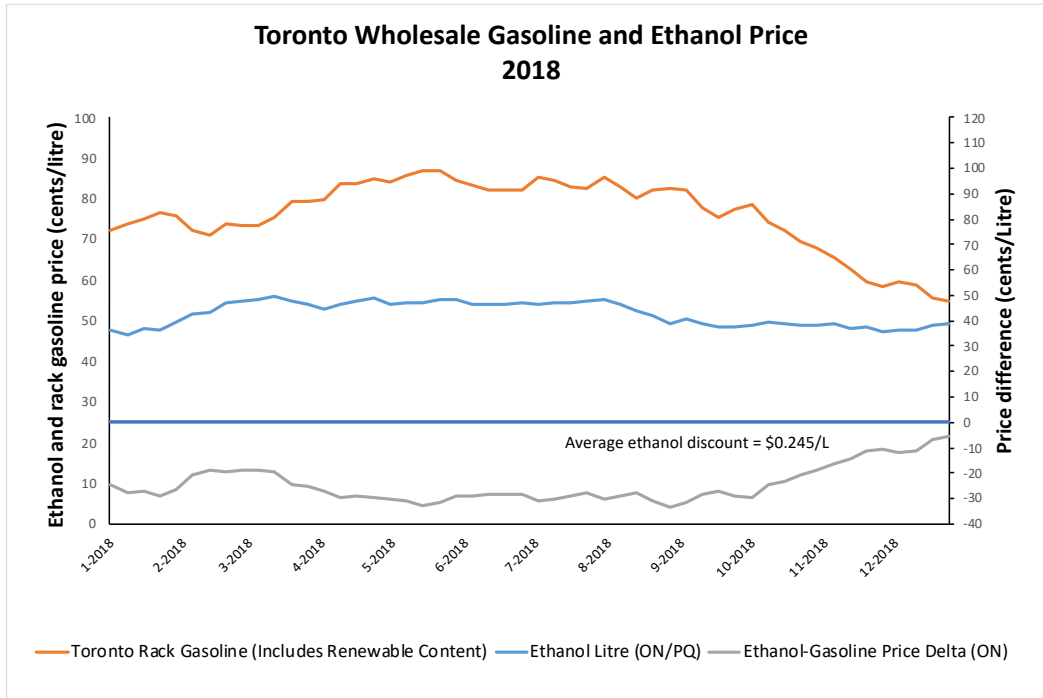
¹⁵ <https://www.nrcan.gc.ca/energy/transportation/alternative-fuels/resources/21268>



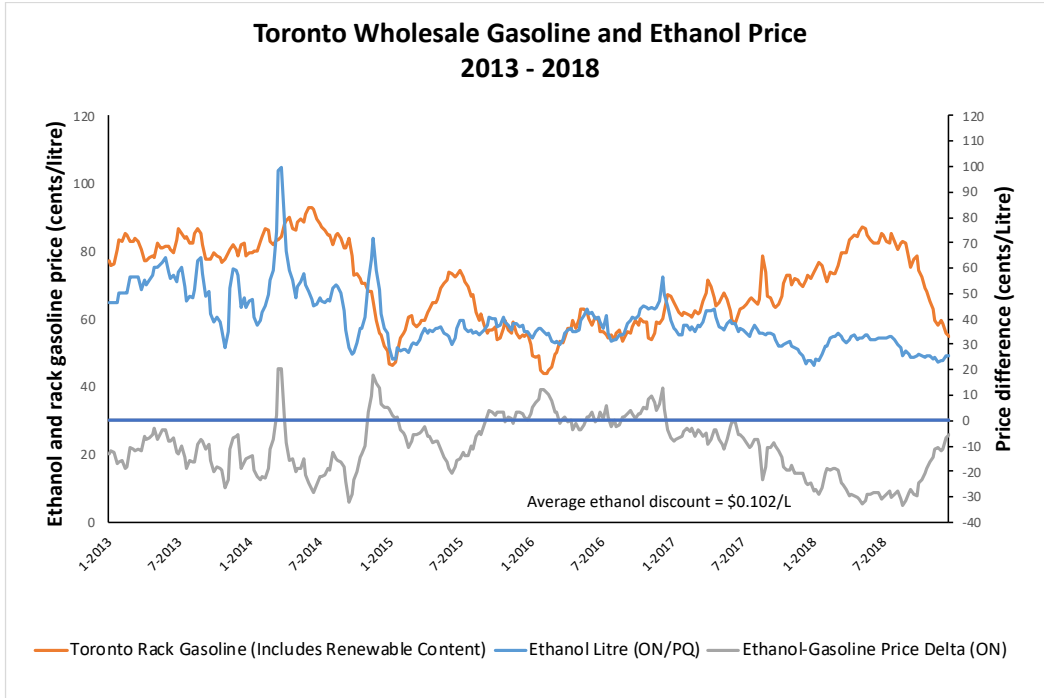
2. ECP should make available on Open Data the above information (in a form that protects confidential data) as soon after the close of the quarter as possible.
3. ECP should also require annual reporting of feedstocks used in compliance volumes to inform both markets and policy.

Appendix 1 – Ethanol Costs¹⁶

Volumetric prices (per litre) for gasoline and ethanol, based on posted market rates, are present below. These prices reflect the wholesale price premium/discount of ethanol, and the potential costs/savings to Ontario consumers, in each period.

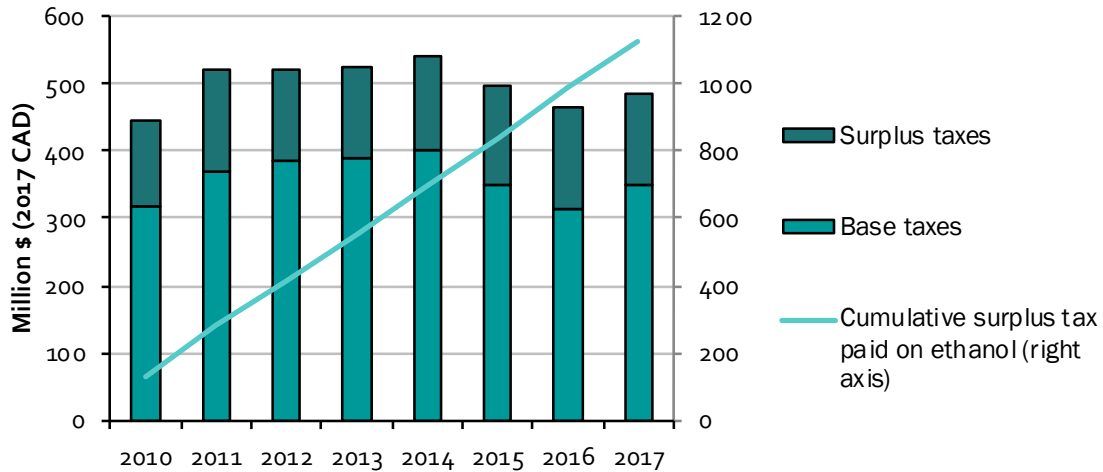


¹⁶ Source: OPIS, NRCAN, Kent Group, ABFC analysis

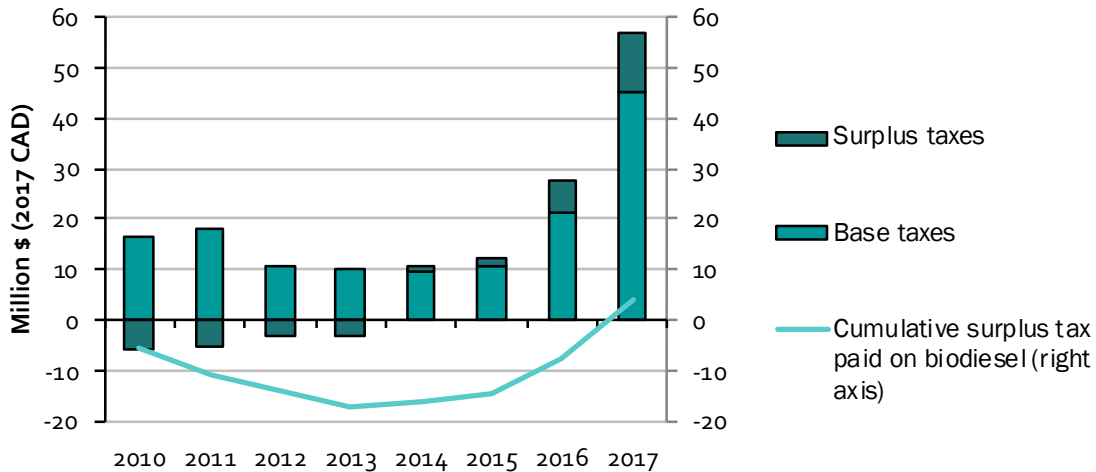


Appendix 2 – Fuel Taxation¹⁷

Ethanol taxation in Ontario 2010-2017. Surplus taxes are due to volumetric taxation on the lower energy density of ethanol compared to gasoline.



Biodiesel and renewable diesel taxation in Ontario 2010-2017. Biodiesel was exempt from the provincial fuel tax 2010-2013. This led to a tax savings (negative bars on the chart) over 2010-2013, that has since turned into a tax surplus in 2014-2017.



¹⁷ Navius Research (2019, preliminary) *Biofuels in Canada*