Discussion Paper

Developing a modern renewable fuel standard for gasoline in Ontario

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Climate Change Action Plan | Ontario

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Introduction

Ontario is leading the fight against climate change through the release of the Climate Change Action Plan. The action plan lays out the specific commitments Ontario is making to meet its 15 per cent overall greenhouse gas emissions reduction target by 2020. The Climate Change Action Plan also establishes the framework necessary to meet its targets in 2030 and 2050. These goals are legislated in the new Climate Change Mitigation and Low-carbon Economy Act.

Achieving the targets and delivering on Ontario's low-carbon vision will require transforming how we use energy to get around and move our goods. Ontario's Climate Change Action Plan outlines several important policies and programs to support this transformation, including a commitment to develop a modern renewable fuel standard (RFS) to reduce greenhouse gas emissions from gasoline by five per cent by 2020. A modern RFS will focus on reducing greenhouse gas emissions from gasoline only, since Ontario already introduced a modern Greener Diesel regulation in 2014. This paper aims to facilitate discussion on key design elements for a modern RFS for gasoline. For clarity, Ontario will not lower the level of existing renewable content required under its Ethanol in Gasoline regulation and existing requirements under its Greener Diesel regulation will remain unchanged and in effect.

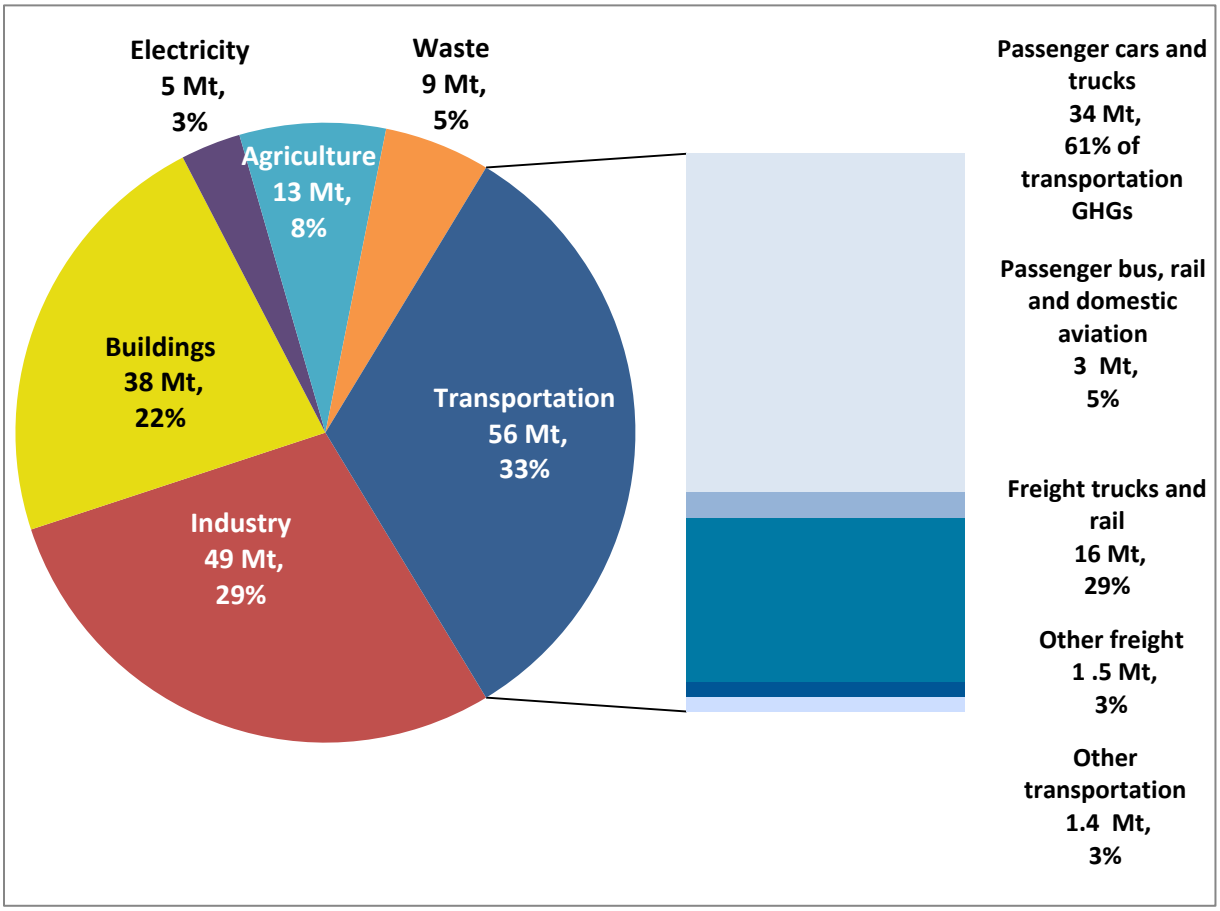
Transportation and Ontario's climate change challenge

Transportation represents one of the largest challenges Ontario faces in achieving its emission reduction targets.

With nearly 56 million tonnes of greenhouse gas emissions in 2014, the transportation sector accounted for approximately one third of all greenhouse gas emissions in Ontario – the largest share of any sector. While Ontario's emissions as a whole fell by approximately six per cent between 1990 and 2014, emissions from the transportation sector grew by 27 per cent.[1]

[1] Environment and Climate Change Canada (2016), National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada, based on IPCC categorizations.

Figure 1: Ontario's greenhouse gas emissions in 2014[2]



Source: Environment and Climate Change Canada, National Inventory Report 2016, economic sector categorization. With rounding, figures may not sum to 100 percent.

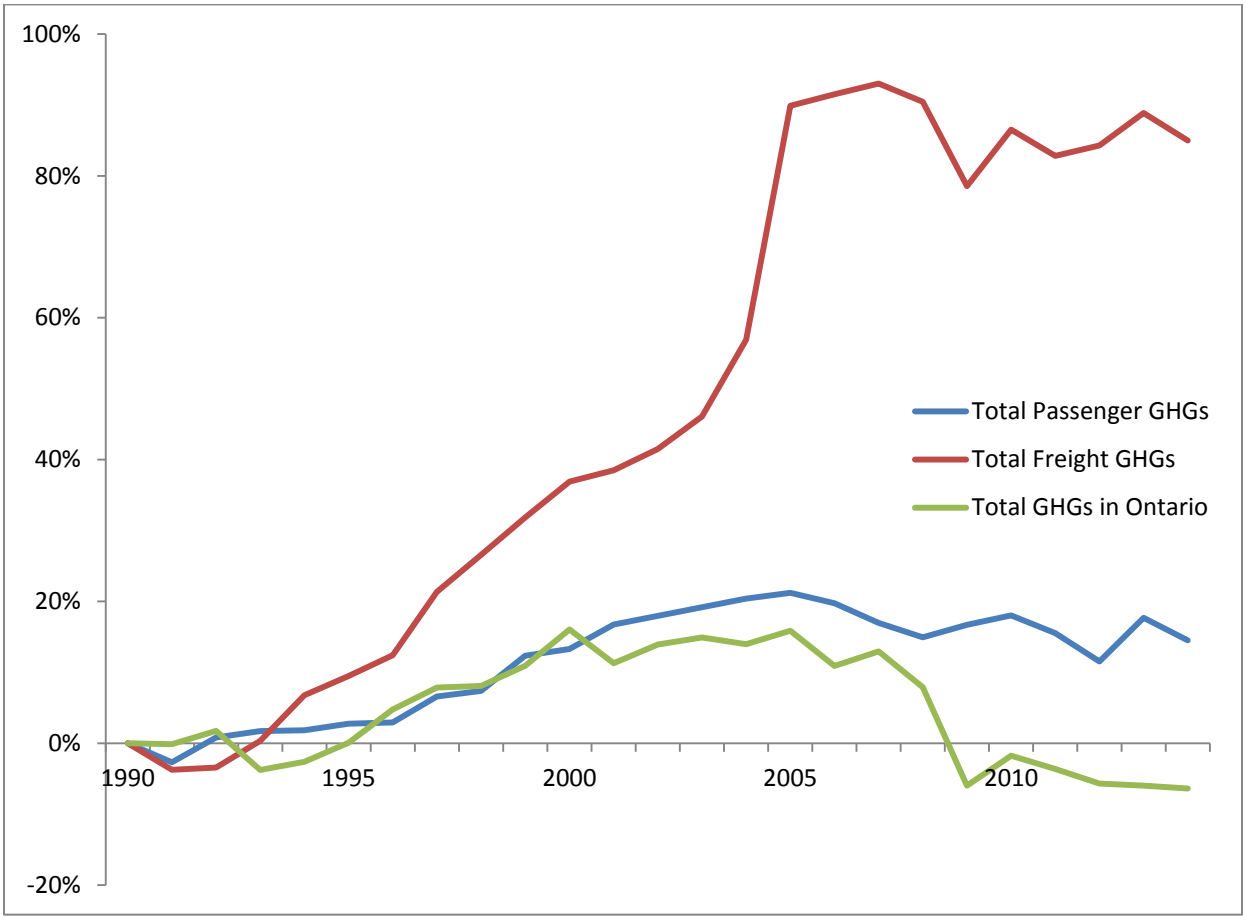
Emissions from total passenger transportation (cars, trucks, bus, rail and domestic aviation) have grown almost 15 per cent since 1990, to 36 million tonnes of CO_2e, approximately 66 per cent of Ontario's 2014 transportation emissions. This growth was driven by an increase in vehicle-kilometres travelled as well as a shift in the composition of the fleet from cars to sport-utility vehicles, pick-ups and minivans.

Additionally, emissions from total freight transportation (trucks, rail and other) have increased more drastically over the period, rising 85 per cent since 1990, to almost 18 million tonnes of CO_2e (approximately one third of Ontario's current transportation emissions). This was driven by a significant increase in the use of diesel-fuelled heavy-duty trucks, with additional kilometres travelled offsetting improvements in efficiency.[3]

[2] Note: under Environment and Climate Change Canada's economic sector categorization, most off-road transportation emissions are allocated to their host economic sectors and consequently are not included under transportation in Figure 1. For example, emissions from diesel combustion in farm equipment are categorized under Agriculture.

[3] Environment and Climate Change Canada (2016), National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada.

Figure 2: Change in greenhouse gas emissions in Ontario since 1990[4]



Source: Calculated based on Environment and Climate Change Canada, National Inventory Report 2016, (economic sector categorization)

The transition to a low carbon transportation sector in Ontario will require a holistic approach that lowers greenhouse gas (GHG) emissions across the sector, while providing compliance flexibility and encouraging the use of green technology.

[4] Note: under Environment and Climate Change Canada's economic sector categorization, most off-road transportation emissions are allocated to their host economic sectors and consequently are not included under transportation in Figure 2. For example, emissions from diesel combustion in farm equipment are categorized under Agriculture.

What is a low-carbon fuel?

A low-carbon fuel is a source of energy with lower lifecycle greenhouse gas emissions than conventional fossil fuels like gasoline and diesel. Examples include: ethanol and cellulosic ethanol, biodiesel, renewable diesel, natural gas, renewable natural gas, hydrogen and electricity.

In addition to greenhouse gas reductions, increased use of low-carbon fuels can bring substantial co-benefits, including cleaner air, increased fuel diversity and consumer choice, and economic benefits from reducing reliance on fossil fuels.

Transforming transportation: the critical role of fuels

Meeting Ontario's ambitious emissions targets and transitioning to a low carbon transportation sector will require significant reductions in the future.

Transitioning to a low carbon transportation sector involves:

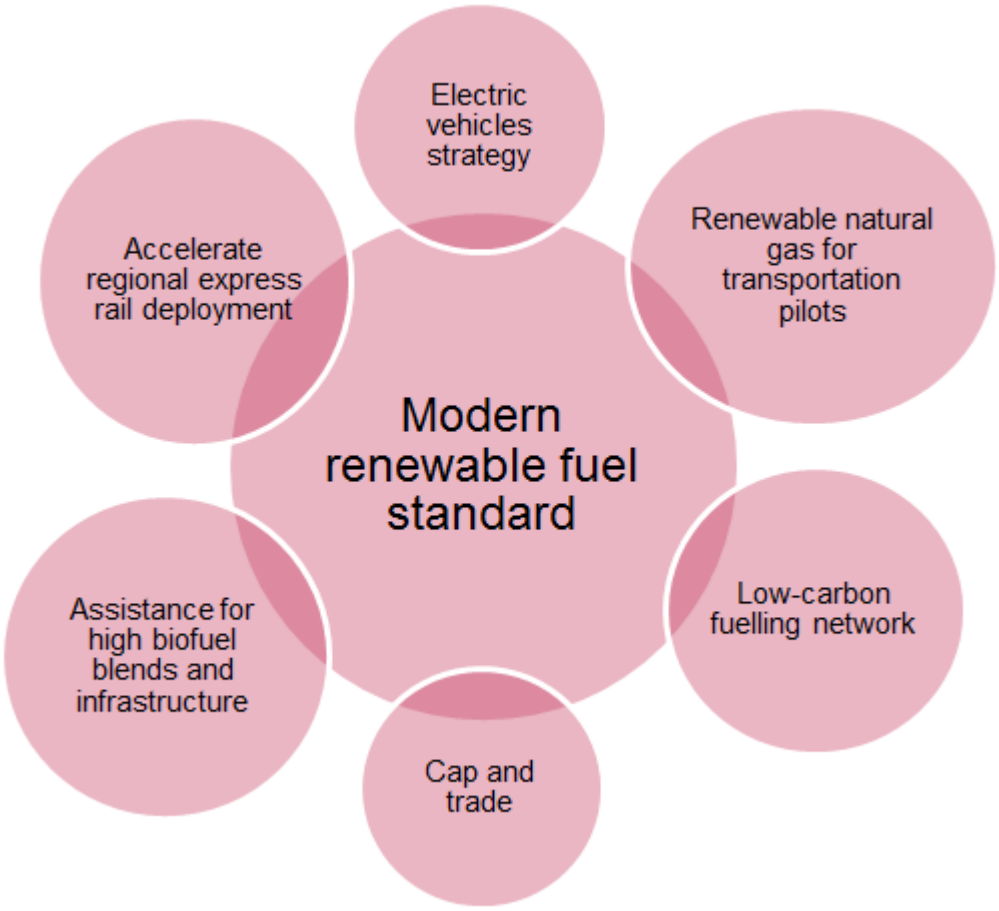
- Increasing access to more low-carbon fuels, like electricity and biofuels;
- Expanding consumer choice by providing multiple transportation options, like cycling, walking, transit and carpooling; and
- Accelerating the shift to more energy efficient vehicles.

In recognition of their essential role in reducing emissions from transportation, the International Energy Agency (IEA) now includes low-carbon fuels as a distinct category, projected to deliver one third of necessary reductions in transportation emissions across Organization for Economic Co-operation and Development (OECD) countries.[5]

Ontario's modern renewable fuel standard will be designed to build on and complement measures such as the federal vehicle efficiency regulations, existing renewable fuels policies, the Regional Transportation Plan and the electric vehicle program. And it will work together with measures in Ontario's Climate Change Action Plan – including actions to increase the number of zero-emission vehicles on the road, deploy cleaner trucks and increase the availability of high biofuel blends – to deliver clear and consistent signals to support low-carbon fuels (see Appendix).

[5] IEA (2016), Energy Technology Perspectives 2016, p. 49.

Figure 3: Climate Change Action Plan policies that support low-carbon fuels

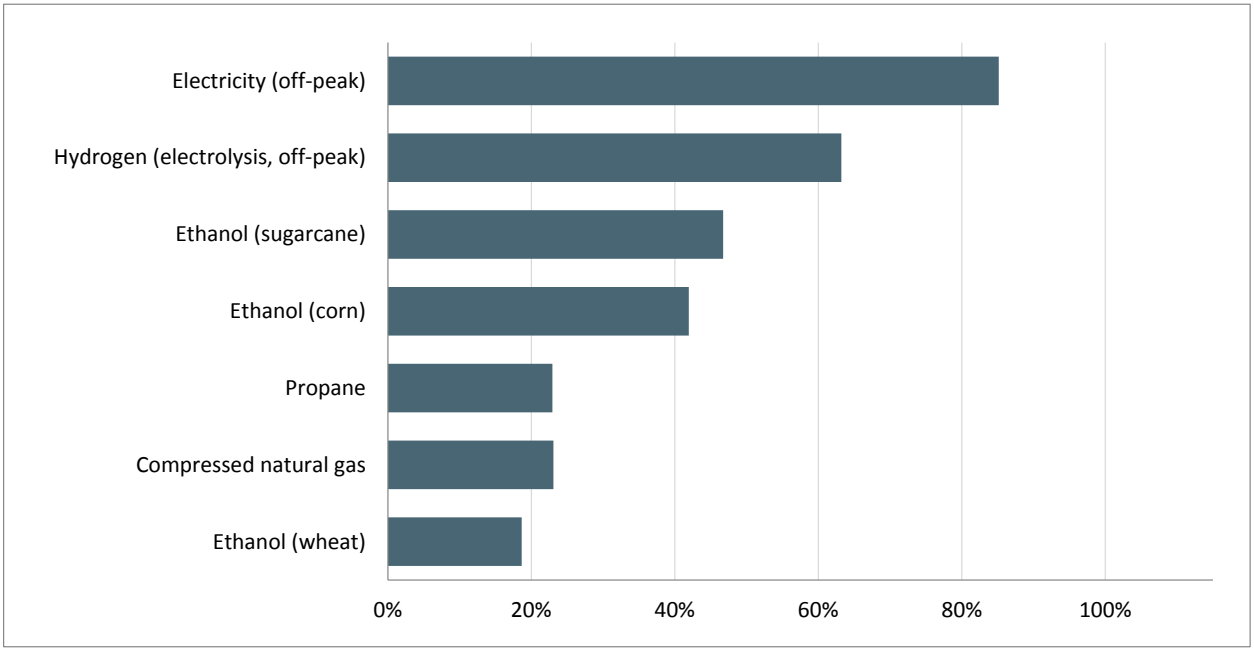


What is the advantage of a renewable fuel standard for gasoline in Ontario?

The RFS serves as an important tool, providing more certainty to support technology investment, commercialization and deployment in the transportation sector. This, in turn, supports greener fuel options to help reduce GHGs, increase air quality co-benefits, and reduce the longer-term costs of climate action. The RFS can also help reduce the share of transportation energy supplied by fossil fuels.

Illustrative examples of lower-carbon fuels that can substitute for gasoline are shown in Figure 4. Note that the greenhouse gas emission reductions shown are average values; the reduction from each fuel will depend on the specific feedstock and production process used.

Figure 4: Lifecycle GHG emission reductions from select alternative fuels relative to gasoline



Source: Ontario 2016 values from GHGenius 4.03a lifecycle assessment model, not accounting for differences in drivetrain efficiency

Renewable and low-carbon fuel standards

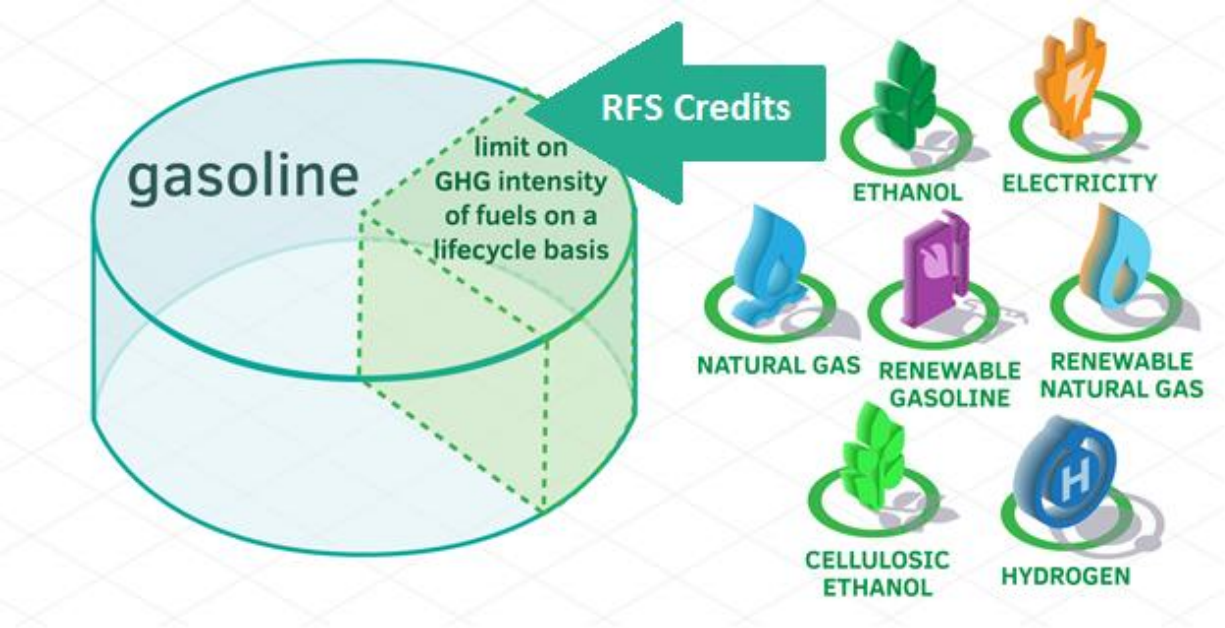
Initial measures to reduce the carbon intensity of fuels in Canada and Ontario tended to support specific alternative fuels, such as ethanol, through volume-based blending mandates or incentive programs. For example, Ontario's Ethanol in Gasoline regulation came into effect in 2007 and requires on average a minimum of five per cent renewable content in gasoline. More recent policies, such as Ontario's Greener Diesel regulation, are designed not only to require renewable alternatives to petroleum, but to assess emissions performance across the fuel's full well-to-wheel lifecycle, from extraction to processing, distribution and end-use combustion. Better-performing fuels are rewarded, while there is little to no incentive for those that do not contribute significantly to emissions reductions. The regulation uses the GHGenius lifecycle assessment model, developed for Natural Resources Canada, to calculate greenhouse gas intensity.

A modern renewable or low-carbon fuel standard works on a similar principle to reduce greenhouse gas emissions from gasoline. Traditional fossil fuel suppliers are required to reduce the lifecycle carbon intensity of the transportation fuels they sell each year. To meet their target they can increase the proportion of sustainable biofuels in the fuels

they sell or purchase credits from others. Depending on program design, credits could be generated by suppliers of other low-carbon fuels that have opted in to the program, such as renewable natural gas, hydrogen, or electricity supplied for transportation.

An RFS is the next step in the ongoing modernization of Ontario's renewable fuel regulations, and will not lower the level of existing renewable content or requirements under the Ethanol in Gasoline and Greener Diesel regulations. A modernized RFS can encourage the blending of more advanced renewable fuels such as cellulosic ethanol, improving environmental outcomes while providing compliance flexibility.

Figure 5: How a modern RFS could work



Source: Adapted from EDF, Lung Association, and TetraTech (2014), Driving California Forward

In this way, the RFS takes a performance-based approach to reducing transportation emissions. It sets an environmental objective and allows participants to meet the objective in the way that makes the most sense for their operations. The credit value of a fuel is proportional to its environmental performance. This will increase demand for lower carbon fuels and reward innovation to reduce their GHG intensity.

Renewable and low-carbon fuel standards are "essential catalysts for the production of advanced low-carbon biofuels" in the International Energy Agency (IEA)'s low-carbon scenario. They "also broaden the scope of improvement beyond biofuels, favouring the deployment of innovative solutions in fuel production processes, promoting low-carbon electricity and hydrogen energy carriers."[6]

The RFS is a technology-neutral policy. This is important, since there are many possible paths that the transformation of the transportation sector could follow to achieve deep reductions. While electrification is likely to play an important role in light-duty vehicles and advanced bioenergy is likely to be important in long-haul road freight and aviation, technology pathways are inherently unpredictable. A technology-neutral approach lets the alternatives compete on their merits.

Modern renewable fuel standards are currently in place in California, British Columbia, Oregon, and the European Union. North American policies (often called low-carbon fuel standards) are summarized in Table 1.

How does a modern renewable fuel standard support innovation?

By valuing greenhouse gas emissions across the full lifecycle of a fuel – not just at its final combustion – a RFS supports innovation across the whole value chain. It supports the investment in R&D and early demonstration needed to bring new fuels and vehicles to the market. It also encourages improvements in low-carbon fuel production, distribution and marketing.

[6] IEA (2016), Energy Technology Perspectives 2016, p. 251.

Table 1: Renewable / low-carbon fuel standards in North America

	California (CA) Low Carbon Fuel Standard	British Columbia (BC) Renewable and Low Carbon Fuel Requirements	Oregon (OR) Clean Fuels Program
Coverage	Gasoline and Diesel	Gasoline and Diesel	Gasoline and Diesel
Targets	10% below 2010 baseline by 2020 (including interim targets) California is considering a 2030 target of between 18-25% reduction in carbon intensity from a 2010 baseline.	10% below 2010 baseline by 2020 (including interim targets) Commitment to 15% below 2010 baseline by 2030	10% below 2015 baseline by 2025 (including interim targets)
Broader crediting scope	Allows performance credits for refinery improvements and innovative upstream projects (subject to limit)	Allows performance credits for infrastructure investments and broader action to reduce transportation emissions, based on agreements with regulator (subject to limit)	None
GHG intensity model	GHG intensities approved by regulator, calculated using CA-GREET 2.0 model Values for indirect land-use change (iLUC) incorporated for 6 feedstocks	GHG intensities calculated by regulated parties using GHGenius model. Regulator may approve alternative pathways No values for iLUC	GHG intensities approved by regulator, calculated using OR-GREET 2.0 model. GHG intensities approved by California may be used (adapted by OR regulator), as well as default values Values for iLUC incorporated for 6 feedstocks

	California (CA) Low Carbon Fuel Standard	British Columbia (BC) Renewable and Low Carbon Fuel Requirements	Oregon (OR) Clean Fuels Program
Compliance support and information	LCFS credit transfers are recorded in a registry. Regulator publishes monthly report containing information necessary or helpful (e.g. volume transferred, prices and price trends)	Credit transfer information is publicly available and updated monthly, with the intention to develop a registry similar to California	Similar to California
Blending requirements	None	5% renewable content in gasoline 4% renewable content in diesel	None in Clean Fuels Program E10 and B5 reflected in 2015 baseline
Cost containment	Performance compliance credits can be purchased at USD $200/t CO_2e, rising with inflation	CAD $200/t CO_2e penalty for credit shortfall	Under development

Ontario will build on the experiences of these jurisdictions to design an effective program. Key lessons learned include:

- **Streamline approach to determining GHG intensities:** The programs balance allowing new fuel pathways, managing compliance and administrative costs, and ensuring robust lifecycle analysis
- **Explore broad RFS crediting options:** Initial use of broad RFS crediting options can facilitate investments in deployment of low-carbon technologies to support future compliance. For example: developing and providing access to

electric vehicle (EV) charging, using bio-crude oil to manufacture gasoline and diesel, and building low carbon fueling infrastructure.

- **Transparency:** An information registry could help companies develop compliance strategies and increase program efficiency and transparency.

Designing a modern and effective RFS for Ontario: key considerations

Ontario's Climate Change Action Plan commits to designing and implementing an RFS for gasoline by 2018. The program would require fuel suppliers to reduce the GHG intensity of gasoline by five per cent by 2020, with the performance standard increasing in future years. A modernized RFS for gasoline could include new features such as consideration of GHG intensity (i.e. full lifecycle analysis of fuels), increased compliance flexibility (e.g. potential trading, banking, and/or crediting options), encouraging the use of the lowest carbon fuels, and streamlining existing requirements.

Ontario is seeking to design this policy with the following considerations in mind:

- **Level playing field**: Evaluates all fuels on their climate impact, regardless of technology or origin
- **Achievability**: Sets ambitious but achievable goals
- **Real reductions**: Supports near and long-term greenhouse gas emissions reductions on a lifecycle basis, including consideration of land-use change (where applicable)
- **Supports consumer choice:** Improves diversity of low-carbon fuel options available to consumers and businesses
- **Supports innovation and investment**: Provides a clear performance standard and necessary certainty to support investments in alternative fuel production, innovation and distribution
- **Manage impacts**: Considers overall impact on fuel suppliers and consumers
- **Compliance flexibility and transparency**: Offers flexible methods for compliance, supported by transparent platforms to assist businesses in making decisions
- **Complements other policies**: Works with Ontario's cap and trade program, Greener Diesel regulation, Long Term Energy Plan (LTEP) and other elements of Ontario's Climate Change Action Plan

- **Canada-wide lens:** The Government of Canada has announced they will develop a national clean fuel standard. Ontario recognizes the important role the federal government will play in setting clean fuel requirements at the national level. Ontario will work collaboratively with the federal government and other jurisdictions to coordinate renewable fuels programs where possible, while ensuring the highest level of environmental protection.

Ontario is seeking comment from stakeholders, in particular on the following key design questions:

1. **Targets and blending requirements:**
    a. Ontario's has existing content requirements for ethanol in gasoline. What minimum level of ethanol blending and GHG performance would help support the objectives of the RFS?
    b. Given Ontario's GHG reduction targets for 2030 and 2050, what factors should be considered in setting RFS targets post-2020?

2. **Flexibility mechanisms:**
    a. Should activities to lower the carbon intensity of other conventional transportation fuels be eligible for compliance purposes?
    b. Should investments in low-carbon transportation projects also be eligible for compliance purposes? If yes, what types of projects?

3. **Assessing lifecycle emissions**
    a. Should an RFS consider impacts from indirect land-use changes (ILUC),[7] even though science in this area continues to evolve? If so, how?

4. **Transparency:**
    a. What measures can be taken to increase transparency and support business decision making under an RFS (e.g. an information registry, bulletins, guidance material)?

5. **Others:**
    a. What other considerations should be included in the discussion?

[7] ILUC GHG factors are a means of representing changes in GHG emissions that may occur as a result of regional or global agricultural market dynamics that displace current crops for the production of fuel feedstocks (thereby inducing land use changes to grow current crops elsewhere).

Next steps

As Ontario works to develop an RFS program, the province is seeking comments from stakeholders on the above questions and other areas of interest relevant to the program. Comments may be submitted through the Environmental Registry, registry number 012-7923.

Appendix: Policies to reduce GHG emissions from transportation

Current policies

- Federal vehicle emissions standards (passenger cars and heavy trucks)
- Regional Transportation Plan
- Provincial land-use plans
- Electric vehicle incentive and charger programs
- Ethanol in Gasoline regulation
- Greener Diesel regulation

Policies in the Climate Change Action Plan

- Cap and trade
- Modern Renewable Fuel Standard
- Support for high biofuel blends and infrastructure
- Renewable natural gas for transportation
- Additional support for electric vehicles and charging infrastructure
- Support for active transportation
- Support for improved land-use planning
- Green commercial vehicles program
- Low-carbon fueling network
- Support for short-line railways
- Accelerate regional express rail
- Global Centre for Low Carbon Mobility
- Support for electric school buses