A CITIZEN'S GUIDE TO THE

Clean Fuel Standard

CANADAWEST FOUNDATION
NATURAL RESOURCES CENTRE

DECEMBER 2020

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CANADA WEST FOUNDATION

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This work was enabled through the generous support of the Alberta Real Estate Foundation.

The preparation of reports at the Canada West Foundation is a team effort. Sincere thanks to all the staff for their research, editing and communications prowess, and other contributions which enriched the quality of the report and brought the text to life on the page.

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ISBN 978-1-989323-74-8

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UPDATE

On December 11, 2020, the federal government published its *Healthy Environment, Healthy Economy* climate plan. As part of the plan, it was announced that the Clean Fuel Standard will only include liquid, and not gaseous or solid fossil fuels.

This change alters some of the conclusions presented in this report. The Canada West Foundation will continue to analyze the Clean Fuel Standard as it evolves and will publish additional briefing materials to help Canadians understand what the policy means for them.

EXECUTIVE SUMMARY

In 2022, the Clean Fuel Standard (CFS) will come into force – a major piece of the federal government's climate policy framework. The CFS is being promoted by the federal government as an effective way to help Canada reach its goal of a 30% reduction in GHG emissions by 2030. The CFS is intended to drive emissions reductions across all facets of society, in areas as varied as households, universities, hospitals, small manufacturing, retail businesses, food processing plants, shopping malls and government operations.

The rationale for the policy is sound. There is no question that reducing global GHG emissions is critical, and Canada must do its part.

But there are also risks. The policy needs to be designed and implemented in a way that actually results in lower emissions and doesn't accidentally put Canada out of business.

These risks are especially high given that some aspects of the policy are new and untried. Canada will be the first jurisdiction in the world to extend this type of policy to fuels used outside of transportation, including fuels used for industrial purposes or for residential or commercial heating.

This report is intended to help answer the many questions Canadians have about how – and whether – the Clean Fuel Standard will work:

- Is the policy capable of meeting its GHG reduction objectives?
- What will it cost?
- How will it work?
- Who could come out ahead?
- What are the impacts on different sectors?

Before coming into force there are outstanding issues to be addressed:

- **Show your work.** The government has yet to publicly produce a cost-benefit analysis, economic analysis or regulatory analysis for the CFS. Given provincial and federal regulations established in the last four years that also drive emissions reductions, it is incumbent on the federal government – before it introduces additional regulation – to demonstrate that the policy will be able to achieve its reduction targets at a cost that is proportionate to the emissions reductions derived.
- **Be prepared to adapt.** The federal government should be prepared to listen to legitimate concerns from different stakeholders and to make real change, where needed – both before the policy comes in and in the years after.

> **For the Clean Fuel Standard to be both effective and fair, it must concentrate on driving down emissions and not just moving money around to ensure compliance. Otherwise, the result will be both extremely expensive and inefficient.**

- **Plan for how to get supporting infrastructure built quickly.** It will take time to plan and construct biofuel production facilities, pipelines to transport renewable natural gas and hydrogen, and transmission lines and grid capacity to support electrification. The federal government must provide leadership on several fronts to get this done in a predictable and realistic timeframe.
- **Provide protections for the EITE sector.** Without sufficient protections in place, the CFS risks damaging the "energy-intensive, trade-exposed" (EITE) sector's competitiveness, burdening these industries with duplicated costs, and creating an uneven playing field. The federal government must find ways to build competitiveness protections into the policy – or risk sending business out of the country.
- **Build in flexibility to ensure that the CFS actually results in fuel decarbonization, not just payments and penalties.** Until new technologies such as renewable natural gas are ready and supply can be delivered, many fuel suppliers will have few options for decarbonizing, and credit availability may be limited. The policy provisions to bridge this timing gap will likely not be sufficient. The government needs to keep an eye on the technology lifecycle and make changes as needed so that fuel suppliers are able to comply.

For the CFS to be both effective and fair, it must concentrate on driving down emissions and not just moving money around to ensure compliance. Otherwise, the result will be both extremely expensive and inefficient. It's not too late for the federal government to get it right – if done properly, the CFS can be an effective tool.

INTRODUCTION

In 2022, the Clean Fuel Standard (CFS) will come into force – a major piece of the federal government's climate policy framework. The CFS is being promoted by the federal government as an effective way to help Canada reach its goal of a 30% reduction in GHG emissions by 2030.

Though it's certainly not the first legislation put forward to reduce GHG emissions in the country (see our report, *A Compendium of GHG Reduction Legislation & Regulations Across Canada)*, it will be unique in both its breadth and its ambition. Covering the fuels that Canadians rely on to heat their homes, power their vehicles and operate businesses, the CFS attempts a new way to gradually green all sectors of society.

It is also wading into uncharted territory: Canada will be the first place in the world to extend this type of policy to fuels used outside of transportation, including fuels used for industrial purposes or for residential or commercial heating.

There is no question that reducing global GHG emissions is critical, and Canada must do its part. The intentions of the CFS are appropriate – meaningfully reducing emissions anywhere fossil fuels are used and encouraging new and innovative clean energy opportunities. However, the federal government has struggled to get Canadians on board with other environmental legislation, such as the carbon tax and Bill C-69, the *Impact Assessment Act*. Clearly, good intentions don't necessarily translate to success in implementation.

Although the government has provided some information about its proposed regulatory approach, there remain many unanswered questions:

- Will the CFS be able to achieve meaningful emissions reductions?
- What will it cost? And will costs be reasonable in proportion to the benefit?
- How will it interact with provincial regulations that are also intended to reduce emissions?
- How will it affect the competitiveness of Canadian export industries?
- Is it likely to create new opportunities for clean-tech industries?
- Is it likely to work outside of transportation fuels, where there is no precedent?

This report is intended to help answer the many questions Canadians have about how – and whether – the Clean Fuel Standard will work. Canadians deserve these answers.

WHAT IS THE CLEAN FUEL STANDARD?

The Clean Fuel Standard (CFS) is a regulation under the *Canadian Environmental Protection Act*. The regulation has twin objectives: to reduce Canada's GHG emissions, and to stimulate investment in lower-emitting technologies. This section provides a very brief overview of the policy. The mechanisms are examined in more depth in Section 5 of this report.

The policy is intended to have an effect on GHG emissions across all segments and sectors of society: any place fuel is used, such as households, commercial buildings, farms, vehicles and industrial processes. This is different than most federal or provincial GHG emissions legislation, which generally applies only to a specific sector: most often transportation, heavy industry or electricity generation. (The notable exception is the carbon tax, which applies to all fuel users.)

While the federal government is still drafting the final regulations for the CFS, it has released some details about its proposed regulatory approach.[1] Here are some of the key features announced to date:

Application

The CFS will apply to all fossil fuels sold in Canada – whether in **liquid, solid or gaseous** form:

- Liquids include gasoline, diesel, kerosene and light and heavy fuel oils
- Gases include natural gas and propane
- Solids include coal and petroleum coke

There are some **exemptions**: the CFS will not apply to fuels that are exported, in transit through Canada, or used for international marine or air travel. It also will not apply to fossil fuels that aren't combusted – such as those used as industrial feedstocks. And it won't apply to any coal-fired power plants that come under the federal coal-fired electricity greenhouse gas emission regulations.

The CFS will be implemented via a **phased approach**: liquid fuels will be the first to be regulated in 2022, followed by gaseous and solid fuels in 2023.

Regulatory Approach

- All fossil fuels will be required to have a gradually decreasing **carbon intensity**. Carbon intensity (CI) refers to the amount of greenhouse gas (GHG) emissions that are released along the full lifecycle – from production to consumption – of a given volume of fuel. The CFS will have a **reduction target** of about 10 to 12% of CI compared to the average intensity of each fuel type, as compared to the 'baseline' year of 2016. CI reduction targets will start out relatively low and increase each year until 2030.
- The responsible party to meet the standard is the **fuel supplier** – any party that produces, imports or distributes fossil fuels in Canada.
- Fuel suppliers will have **flexibility** to choose how they achieve their emissions reductions. This could include investing in energy efficiency improvements, swapping out fossil fuels for lower-intensity fuels (such as biofuels or natural gas) or turning to non-emitting sources such as electricity or hydrogen. However, supplementation with biofuels will remain a requirement for gasoline and diesel.
- The policy also includes a **credit trading scheme.** Credits are generated when fuels are produced with a CI below the limit. They can be generated by fossil fuel suppliers, by producers or importers of biofuels, hydrogen, and renewable natural gas, or by some fuel end-users, like manufacturers of electric vehicles or industrial facilities. Credits are purchased by fuel suppliers who do not to meet the full CI reduction requirements.

A lot is still unknown about how the CFS will actually work. While the federal government has provided details on some policy elements, these have not yet officially been locked in. The implementation of many other important policy features have not been described yet.

How COVID-19 has affected roll-out of the CFS

The extraordinary circumstances of the COVID-19 pandemic have caused the federal government to slow down implementation of the CFS. In April 2020, the federal government announced the following changes to the rollout:

- Publication of the proposed regulations for the liquid stream, originally expected in summer 2020, have been pushed back by some months. However, the liquid stream regulations are still on track to come into force in 2022.
- The CI reduction targets will be relaxed for the first three years of implementation in the liquid stream – about one-third lower than originally planned – although they will eventually hit the reduction targets originally set for 2030.

Is it capable of meeting its GHG reduction objectives?

In this section, we review the alignment of the CFS with the objectives it is trying to achieve. What is the precedent for this kind of policy? Is there evidence that it has worked elsewhere? How much does the government claim the CFS will reduce emissions? And are those claims plausible?

What happened in other places where a low carbon standard was introduced?

Similar policies to the CFS have been in place for over 10 years in California, B.C. and the European Union. In all cases, carbon intensity has decreased, although to different degrees. While this kind of policy has had a beneficial effect on emissions from transportation, it isn't necessarily the case that the outcome will be similar when applied outside of transportation.

The CFS is not the first CI reduction policy to be introduced – at least for transportation fuels. California, B.C. and the European Union have had similar policies (referred to as a Low Carbon Fuel Standard or LCFS) in place for over a decade.

Many of the elements of the CFS are similar to the approach taken in these jurisdictions: a CI target was established that started low and increased over time; CI reductions could be made anywhere in the fuel's lifecycle; and a credit trading mechanism was established. In all three jurisdictions, there were at least some gains made in reducing carbon intensity and emissions, although the experience (and the data available) is slightly different for each:

- Since it came into effect in 2011, California's LCFS has been more successful than anticipated. The carbon intensity of transportation fuels has decreased, and fuel suppliers have generated more CI reduction credits than deficits.
- In B.C., the government reports that the LCFS resulted in the avoidance of 7.73 million tonnes of GHG emissions between 2010 and 2017.
- The EU used a very different approach, which allowed a high degree of flexibility for its member states. The downside of this flexibility is that only five of 22 reporting member states are on track to meeting their reduction targets.

Appendix 1 presents additional information on each of the three jurisdictions. Table 1 highlights some of the similarities and differences in approach and compares them with the approach proposed under the CFS.

Yet, while the LCFS has helped California and B.C. to avoid GHG emissions, the two jurisdictions are still struggling to reach the goal of reducing absolute emissions. California's GHG emissions rose overall by more than 5.5% between 2011 and 2017, stemming from increased miles travelled, and B.C. also saw an overall increase in GHG emissions from the transportation sector. This paradox – a policy that is effective in avoiding emissions, but unsuccessful in reducing absolute emissions – has been a key challenge of fuel decarbonization policies.

Table 1: Comparing low carbon fuel standards across different jurisdictions

	CALIFORNIA	B.C.	EUROPEAN UNION	CANADA
Name	Low carbon fuel standard	Low carbon fuel standard	Fuel Quality Directive	Clean Fuel Standard
Year enacted	2007	2010	2009	2019/20
First compliance year	2011	2013	2009	2022 for liquid stream 2023 for gaseous and solid stream
APPROACH				
Fuel coverage	Transportation fuels	Transportation fuels	Transportation fuels	All fossil fuels
Carbon intensity reduction target	10% below 2010 levels by 2020	10% below 2010 levels by 2020	A minimum of 6% below 2010 levels by 2020	10% reduction by 2030 from carbon intensity baseline (baseline not yet set)
Technology approach	Flexible and technology neutral; CI reduction can occur anywhere in full fuel lifecycle	Same	Same	Same
Mandates a minimum biofuel content	No, but there is a federal renewable fuel standard that applies in California	Yes	Yes – established with complementary renewable fuel legislation	Yes
Credit trading and price caps	Credit trading system with a cap on credit prices	Credit trading system with no cap on credit prices	Credit trading system with no cap on credit prices	Credit trading system with a cap on credit prices
OUTCOME				
Success in reducing CI and avoiding emissions	Appears to be meeting its CI reduction targets	Appears to be meeting its CI reduction targets	Flexible implementation produced varying results; some member states are meeting their targets, most aren't	To be determined
Cost to consumers	Less than 1.75 cents per litre of gasoline and diesel	2-3 cents per litre of gasoline	Not available	To be determined

The experience of these jurisdictions suggests that a low carbon fuel standard – at least applied to transportation fuels – can be implemented in a way that effectively decreases carbon intensity, doesn't cost consumers too much, and doesn't frustrate business.

But an important caveat to remember here is that the LCFS policies in California, B.C. and the EU have been limited to transportation fuels only: not for other fuel uses, as proposed for the CFS. It cannot be assumed that similar outcomes can be realized when the policy is applied to fuels used for residential, commercial or industrial uses.

What are avoided emissions?

Avoided emissions are emissions that would have occurred if the policy had not been in place. This is not the same as absolute emissions reductions, where emissions are reduced from baseline levels.

An increase in fuel use (for example, through more cars on the road) can cause absolute emissions to increase, even though emissions would have been even higher without the policy in place.

How much will the CFS reduce emissions?

Initial estimates were that the CFS could reduce Canada's GHG emissions by 30 megatonnes. However, many new federal and provincial emissions policies have been established since the CFS was first proposed. Given these new policies, it may be that the CFS will add only as little as a seven megatonne reduction.

The objective of the Clean Fuel Standard is to achieve 30 million tonnes of annual reductions in greenhouse gas emissions by 2030[2] – or nearly 15% of the government's 219 megatonne reduction target.

Is this likely to happen? It's hard to say.

The federal government has not yet released any modelling showing how they arrived at the figure of a 30 megatonne reduction; what data and assumptions were used to develop the projection; and whether this will represent an absolute reduction or only emissions avoided. Importantly, the government's estimate has not been revised to reflect 21 additional federal and provincial regulations on GHG emissions that have been introduced since 2017[3] when the government's model was first developed.*

In the absence of this information, other organizations have developed their own models and estimates. Their results differ depending on which other emissions reductions policies are included in the model.

Modelling done in 2017 by Navius Research[4] predicted that the CFS with a 10% CI reduction target will result in something close to a 30 megatonne reduction in 2030. Their model included some other federal and provincial GHG reduction policies that were known at the time, including a carbon price and methane reduction initiatives for upstream oil and gas. However, it did not take into account all GHG reduction policies, nor those introduced after 2017.

* For a complete list of all regulations on GHG emissions, please see Canada West Foundation's report A Compendium of GHG Reduction Legislation & Regulations Across Canada.

> **The extent to which the CFS will be able to induce emissions reductions *above and beyond* those that are already likely to occur due to existing policies or regulations — many of which were not in place when the CFS was designed — is still uncertain.**

Modelling published in 2019 by the Canadian Energy Research Institute (CERI)[5] found that a CFS with a 10% CI reduction target would result in avoided emissions in the year 2030 of 47 megatonnes compared to the "business as usual" scenario.* Most of the decrease was generated equally by the transportation and industrial sectors, with a relatively small amount contributed by buildings.

CERI's modelling accounted for anticipated improvements in fuel economy and changes in vehicle types for transportation; but did not take into account the large number of regulations in place to reduce industrial emissions over the next few decades such as the carbon tax, the Output-Based Pricing System, or provincial regulations such as Alberta's Technology Innovation and Emissions Reduction (TIER) regulation, Manitoba's Industrial Greenhouse Gas Emissions Control and Reporting Act or the New Brunswick Regulatory Approach for Large Industrial Emitters. This omission means that CERI's modelling overestimates the potential impact of the CFS itself, especially for the industrial sector.

The most recent modelling was undertaken in 2020, again by Navius.[6] The conclusions of this work are strikingly different. It estimated that the CFS would produce at most seven megatonnes of reductions, because the CFS will interact with other federal and provincial policies "that are different in name and mechanism but target the same emission reductions." Navius also concluded that over "three-quarters of the emission reductions the CFS aims to achieve will already be achieved without it."

The extent to which the CFS will be able to induce emissions reductions *above and beyond* those that are already likely to occur due to existing policies or regulations — many of which were not in place when the CFS was designed — is still uncertain. Without the federal government releasing its modelling (and its assumptions) Canadians cannot confidently gauge the projected costs against the anticipated benefit.

* This does not translate to an absolute reduction in emissions – only the avoidance of omissions, as the economy and overall GHG emissions are expected to continue growing.

What will it cost?

Another key question is around the policy's cost.
Is it a hidden second carbon tax? What will it cost? Who will be hardest hit:
households, businesses, large industry or fuel suppliers?

Is the CFS essentially another carbon tax?

The CFS will increase costs for fuel suppliers and in some cases those costs will be passed on to consumers, but it is not a tax. It may also be able to cause some GHG reductions in a way that a carbon tax can't.

Some people have called the CFS another carbon tax[7,8] because both are intended to chip away at Canada's overall emissions levels and both are government actions that increase fuel costs for consumers. But they are not the same.

The carbon tax is designed to change consumer behaviour. By making fuel more expensive, the government hopes that consumers will purchase less fuel or will switch to lower carbon options. The CFS, on the other hand, makes the fuel that is used less carbon intensive. The CFS achieves reductions directly, without the need for consumers to change their behaviour.

> **"It's like a litre of gas is a piece of pizza, and the country is on a diet. The carbon tax makes the pizza more expensive so we will buy less of it. The CFS turns it into a low-fat pizza, so that even if we eat the same amount, we have consumed fewer calories.**

Achieving behavioral change is hard. Some consumers will not respond to price signals until they are high enough to inflict serious harm. At that point consumers may inflict serious political harm on any government proposing carbon taxes high enough to change behaviour sufficiently to achieve GHG reduction goals.[9]

The CFS is also better suited to reduce emissions where users are not responsive to a carbon tax. Commercial transportation is a good example as an industry that can't simply reduce the number of kilometres travelled and where there are currently few viable alternatives to petroleum-based fuels.

An additional difference between the CFS and the carbon tax in most jurisdictions is that no revenue from the CFS goes into the pocket of the government. And importantly, the fuel suppliers and their supply chain are the ones making the choices about whether and how to invest in CI reduction. Government is not picking technology winners and losers (except for the biofuel content restrictions).

How much will the CFS cost fuel suppliers and end users?

The CFS will present additional costs to consumers – although these costs will be less visible than the carbon tax. Widely different cost estimates have been prepared by different organizations. The federal government has not yet produced any modelling showing its projections.

The key question of what the CFS will cost is much more difficult to answer than for carbon tax, where the price is clear and is borne by the end consumer.

Under the CFS, compliance costs are borne by the fuel supplier. These costs will depend on the approach that the supplier uses to implement a CI reduction. In some cases, costs may be passed on to the end consumer, but there are some sectors – particularly the trade-exposed sectors – where costs cannot be passed on and have to be absorbed by the industry that uses the fuels.

Ultimately, the cost of the CFS will be less visible to consumers than the carbon tax – and therefore perhaps more politically acceptable – but costs will be present nevertheless.

The federal government has not yet provided an estimate of the costs of the policy, although a cost-benefit analysis for the liquid fuel class is supposed to be published along with the regulations in the *Canada Gazette* near the end of 2020. To fill this information gap, other organizations have developed their own projections of what the policy is likely to cost consumers and industry. These estimates vary widely – and unfortunately are not always directly comparable (see Table 2).

- **Transportation fuels:** As described above, in both B.C. and California, the cost of the policy on transportation fuels has been about two to four cents per litre. CERI and Navius both project that the CFS will cost about five to seven cents per litre. And some individuals and organizations have put out alarming estimates of 22 cents per litre,[10] or a 10% to 20% increase above 2016 prices.[11]
- **Household heating and cooking:** The type and amount of fuel used for household heating and cooking – as well as the cost associated with that use – vary enormously across individual households and regions, based on everything from house size to weather to type of furnace and cooktop (natural gas, electric, etc.). Averaging across these factors, CERI projected an increase of $42 per household per year, as of 2030, and Navius projected $55 to $60 per household. In both cases, it should be noted that there is no such thing as an average household, and costs will vary depending on whether or not the household uses natural gas (costs will be higher) and what power source is used for electricity (natural gas-powered electricity will see increased costs; hydro, nuclear, solar and wind will not). LFX Associates presented their estimate as a 3.1% to 4.2% increase compared to 2016 prices for those households that use natural gas.
- **Natural gas:** In addition to being used by households for heating and cooking, natural gas is also used by industry for various purposes, and so its cost is of broad interest. Under the CFS, the cost of natural gas is expected to rise quite dramatically. CERI projects an increase of 94 cents per gigajoule – an increase of 58% over 2017 prices. Navius's projection is slightly less, at 80 cents per gigajoule, and the Chemistry Industry of Canada estimates a 20-40% increase in natural gas prices in Ontario and a 45-95% increase in natural gas prices in Alberta. The extent to which these large percentage increases actually impact an organization's bottom line obviously depends on how much natural gas is used and whether they can pass these cost increases along to their customers.
- **Industry:** Canada's industrial sector will bear the brunt of the CFS costs because of its heavy use of fossil fuels. CERI has estimated that industry, including manufacturing, agriculture, cement, steel, chemicals, and oil and gas, can expect to pay upwards of $3.3 billion in total additional costs under the CFS over the next 10 years.

  They project that the oil and gas sector will incur $1 billion in additional costs by 2030, with the electricity sector at $868 million and agriculture at $389 million. On a facility-level basis, for each facility that emits 100,000 tonnes of CO_2e per year or more, costs could amount to between $1.8 million to $3.7 million per year. And for facilities that emit around 10,000 tonnes of CO_2e per year, costs could amount to between $180,000 to $370,000 per year. Again, the extent of these costs will depend on the cost of the approach that the supplier uses to implement the CI reduction and the cost of credits to comply with the reduction targets.
- **Credit price:** One cost measure that has been the subject of extensive discussion is the credit price – that is, the cost to purchase a credit to offset one tonne of GHG emissions. The reason this has been under such scrutiny is that the credit price has an enormous effect on what the projected costs of the policy will be – and particularly on the estimated costs to industry. As an example of the difference the credit price can make, CERI developed projections of the increased cost of gasoline under a $50 credit price and a $200 credit price. The associated increase in fuel cost was .01 cents and six cents respectively.

  Credit prices will start out low and gradually increase each year. Different observers have made predictions of what cost they will eventually reach by 2030, ranging from $163[12] to an improbable $350[13] per tonne of emissions by 2030. The actual cost will depend on demand.

  The federal government has stated that there will be a cap placed on credit prices under the CFS so that they don't become unmanageably high; however, what that cap will be has not yet been specified. Many organizations have assumed that the credit price will settle around $200, which is congruent with credit prices in B.C. and California.

Table 2: **Estimated costs of the CFS to end-users**

Source	CERI	Navius Research	LFX Associates	Chemistry Association of Canada
Transportation fuel	5 to 6 cents per litre for gasoline and diesel	5 cents per litre for gasoline 7 cents per litre for diesel	Increase of 10.1% to 19.4% compared to 2016 (price varies by province)	
Household energy costs	2% increase in household energy costs. Equals $42 per household per year in 2030, on average	$55 to 60 per household per year	3.1% to 4.2% increase in cost of natural gas to households	
Natural gas	$0.94 per GJ (58% increase over 2017)	$0.80 per GJ	3.1% to 4.2% increase in cost	20 to 40% increase in price in Ontario 45 to 95% increase in Alberta
Industry	10% increase in fuel costs for agriculture 8% increase for oil and gas industry 0.8 cents per kWh for electricity Total cost to industry: $3.3 billion			$1.8 million to $3.7 million for facilities that emit >100,000t of CO_2e per year $180 to $370K for facilities that emit >10,000t of CO_2e per year
Offset Credit Price	$163 to $200 per tonne of emissions	$182 (transportation); $38 (stationary sources)	$288	

Sources: Canadian Energy Research Institute[14], Navius Research[15], LFX Associates[16] and the Chemistry Association of Canada.

How will it work?

The fundamental goal of the CFS is to reduce the carbon intensity of fossil fuels. But the success of the policy will rest on the details of how it is implemented. This section examines some of these key considerations and highlights the approach being taken by the federal government.

How do carbon intensity and reduction targets work?

CI reduction targets start off low and gradually increase over time, hitting their maximum level in 2030. The targets for the first three years have been scaled back to help companies cope with the effects of the COVID-19 pandemic.

Carbon intensity (CI) refers to the estimated amount of carbon dioxide (or CO_2) produced from a unit of fuel and is measured over its lifecycle – from extraction to end combustion (also known as "well-to-wheels"). Setting appropriate targets for CI reduction is a critical determinant of the success of a clean fuel standard. Policymakers must strike the right balance between setting the targets low enough that fuel suppliers can realistically achieve them, yet high enough that suppliers and their supply chains are incentivized to invest in future emissions reductions.

Most jurisdictions (see Appendix) have addressed this by implementing a back-loaded approach, in which CI reduction targets start out low (about 10%) and gradually increase to reach a maximum target (about 30%). This strategy gives predictable, long-term results by giving fuel suppliers time to adapt and make investments.

This is also the approach being taken for the CFS, as shown in Figure 1. CI reduction was planned to start at 3.6 grams of CO_2/megajoule in 2022 for the liquid fuel stream, and increase to a target of 10 grams by 2030. However, due to difficulties associated with the COVID-19 pandemic and lockdown, the federal government has relaxed the CI reduction targets for the first three years of implementation, with a new target of 2.4 grams of CO_2/megajoule for 2022 – about a third less than originally planned – but at the same time has increased the final target to 12 grams.[17] It remains to be seen if the CI targets for the solid and gaseous stream will follow suit.

How flexible is the CFS with respect to technology?

The CFS is mostly technology neutral (except for biofuel requirements for gas and diesel): CI reductions can be achieved in any way and at any point in the fuel's lifecycle. However, in practice, biofuels and credit purchasing may account for the vast majority of CI reductions.

To be maximally effective, a clean fuel standard should be technology-neutral, and not prescribe specific solutions. This allows fuel suppliers to identify and employ whatever processes and technologies are both cost-effective and a good match for their specific situation. It also enables new technologies to be adopted when their price and effectiveness are suitable, even if they are not viable at the time the regulations are written.

The CFS regulations mostly support this flexibility. Fuel suppliers can choose how to reduce emissions along the well-to-wheels pathway. This includes, for example, electrifying processes, finding efficiencies so that less energy is used, switching to lower-carbon or non-fossil fuel sources, or employing other

innovative technologies. And the CI reductions can be realized at any point in the fuel's lifecycle, from production to consumption.

Where this flexibility ends is around biofuel supplementation. As described on page 18, renewable fuel requirements – which require supplementing gasoline and diesel with a minimum percentage of biofuel – will remain part of the CFS.

Cost considerations and technical feasibility will be the main drivers of technology choice. Not all options are equally feasible in all situations; for example, electrification doesn't currently provide sufficient heat for some industrial processes, and the cost of implementing process changes isn't the same in all geographies and contexts.

A number of industry commentators have predicted that at least in the short term, the vast majority of CI reductions will come from two sources: additional supplementation with biofuels for transportation fuels and purchase of offset credits for other sectors. This is consistent with what has been seen in both California and B.C. (see Appendix) where the vast majority of credits in the early stages came from biofuel supplementation, with electrification and novel processes such as hydrogen starting years later, and still representing a minority of how credits are generated.

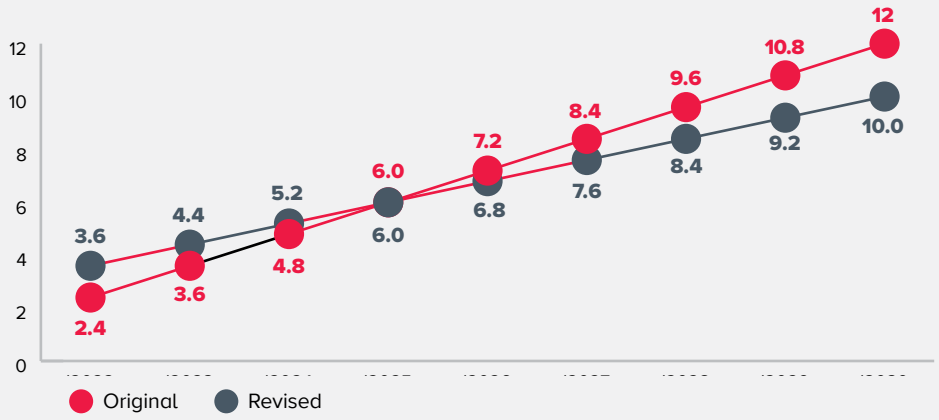
How will credit trading and price caps work?

Credits are a market-based trading mechanism. They allow companies that exceed reduction targets to sell the value of that carbon offset to a company that can't or doesn't meet its reduction targets. To protect against excessive costs, the government will place a cap on the credit price – although it hasn't yet announced what that cap will be.

Most low carbon fuel standards – including those in B.C., California and other U.S. states – include some sort of market-based credit trading mechanism. Fuel suppliers are able to generate credits by supplying a fuel with a carbon intensity below the limit; and the credit can either be banked for future use or sold on the market. Alternatively, if a supplier is unable to comply with the targets, they must purchase new credits or use their banked credits to offset their emissions.

The use of credits is seen as a way to add flexibility to the program, and also to incentivize fuel suppliers to go above and beyond the minimum requirements – which may produce GHG emission reductions that surpass the initial targets.

Figure 1: CI reduction targets for the liquid fuel stream, by year (in grams of CO_2/megajoule)



The credits are a market mechanism. Credits are generated through investments in the reduction of emissions and become a revenue generator for the company making the investment. This contrasts with carbon taxes which are collected as revenue for the government (regardless of how the tax is re-distributed).

Under the CFS, fuel suppliers can generate credits by supplying a fuel with a carbon intensity below the limit. In addition to fossil fuel suppliers, other categories of low carbon fuel suppliers will be able to generate credits, including producers or importers of biofuels, hydrogen and renewable natural gas. Carbon capture and storage is also eligible. Finally, credits can be generated by non-regulated facilities such as manufacturers of electric vehicles or industrial facilities that switch machinery to non-fossil fuel sources of power.

Evidence from other jurisdictions suggests that credits are normally relatively inexpensive during the early stages when targets are low, but can increase considerably as the targets become more difficult to meet and fewer credits are generated. As a result, governments may choose to establish a price cap on credits to protect suppliers (and consumers) against extreme market volatility or high costs. In the case of the CFS, the government has announced it will place a cap on the maximum allowable credit price, although it hasn't yet stated what the cap price will be.

Who is the regulated party?

Although the government often describes the CFS in terms of transportation, industry and building fuels, the legislation itself is framed around liquid, solid and gaseous fuel streams. There are key differences in who is the regulated party under each stream.

Separate regulations are being developed for liquid, solid and gaseous fuel types. The government is furthest along in defining regulations for the liquid fuel stream, which will be rolled out first, in 2022. Fewer details are available about implementation around solid and gaseous fuels, the regulations for which are still in development.

The government has indicated who will be the regulated party for each of the streams. There are some key differences that will have implications for different sectors.

Liquid fuels

Liquid fossil fuels are gasoline, diesel, kerosene and light and heavy fuel oils: all products that are derived from petroleum. As shown in Table 3, the regulated parties for liquid fuels are its producers and importers – the refineries that produce these finished products. In some cases, this is the same as the oil producer. For example, Suncor, Imperial, Shell and Husky all own refineries as well as producing oil. In other cases, the refiner works with oil that has been purchased domestically or imported from abroad – such as Irving Oil or Valero Energy. Because oil from different sources inherently has a different carbon intensity, the difficulty in meeting CI targets will vary from refinery to refinery.

Solid fuels

For solid fuels, the regulated party is those who produce or import solid fuels. For the most part, this means companies that mine coal. The mining sector in Canada hasn't had the same pressure to decarbonize as the oil and gas sector, and its current plans appear less ambitious.[18] The CFS is likely to accelerate movement, at least for coal producers.

However, under the proposed rules, some solid fuel end-users will also be considered regulated parties.*

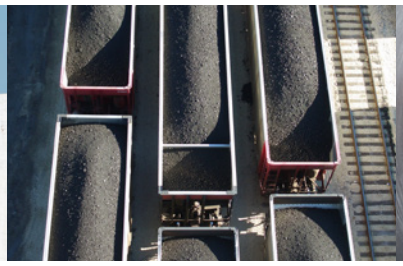
Some cement companies (mostly in Central and Eastern Canada) import the majority of their fuel from outside the country. Under the CFS, they will be considered primary fuel suppliers, and be responsible for reducing the CI of that coal.

Steel manufacturing also gets caught – but under the gaseous stream. Some steel manufacturing facilities recycle the waste gases from burning coal to make electricity that they then use. This is an environmental positive, as the gases are not released, and less fossil fuel is needed. However, this co-generation means that these steel makers will be regulated as primary fuel suppliers under the CFS, and will be responsible for decarbonizing those gases, or purchasing credits to make up for it.

* The CFS will have essentially no effect on coal-fired electricity producers, which is the largest user of coal in Canada. Of the 33 facilities across the country that are powered by coal, 30 are either exempt from the CFS or are slated for retirement or conversion before the regulations take effect in 2023. The remaining three plants are scheduled for retirement by 2029 at the latest.

Table 3: Regulated parties for each fuel stream

	Liquid	Solid	Gaseous
Specific fuels	Gasoline, diesel, kerosene and light and heavy fuel oils	Coal, petroleum coke and coke	Natural gas and propane
Implementation date	2022	2023	2023
Regulated party	Those who produce or import liquid fossil fuels	Those who produce or import solid fossil fuels	Those who: • process or import natural gas • deliver pipeline quality natural gas to end-users • produce or import propane
Exemptions (not a complete list)	• Used for non-combustion purposes (e.g., as solvents or industrial feedstocks) • Exported from Canada • In transit through Canada • Jet fuel for international flights and aviation gasoline	Coal combusted at electricity plants covered by the federal coal-fired electricity regulations	
Main uses	• Transportation • Heating (residential and commercial buildings) • Powering stationary appliances (engines)	• Electricity generation • Steel and iron making • Cement manufacturing	• Electricity generation • Heating and cooking (residential and commercial buildings) • Power for industrial processes • Powering stationary appliances (engines)


Gaseous fuels

The approach taken for gaseous fuels differs from liquid or solid fuels. Instead of just focusing on producers and importers, the gaseous fuel stream regulations apply to those entities that distribute and deliver natural gas to consumers, as well as to those who process it. This includes large companies like Enbridge and smaller companies like Summit Energy Québec. It also includes gas processing plants and companies that produce natural gas liquids like propane. This chain of responsibility is more diffuse – and a little more confusing – than for liquid or solid fuels, and will require concerted effort across a longer supply chain.

What are the sustainability criteria for biofuels?

Not all biofuels are better for the environment than fossil fuels. To ensure that the CFS delivers a net positive result, the policy includes sustainability criteria for biofuels, both those grown in Canada and those imported from abroad.

One of the most common ways to reduce the carbon intensity of transportation fuels is to supplement them with biofuels. Biofuels include ethanol, which is derived mostly from sugar- and starch-rich plants including corn, sugar cane or palm oil; and biodiesel, which is derived primarily from plant oils (including canola) or animal fats. But the problem is that not all biofuels are better for the environment; in fact, certain biofuels can generate greater GHG emissions over their lifecycle than some fossil fuels.

Some of these GHG emissions arise from the energy-intensive process of producing the crops; some from nitrogen-based fertilizers that have a large GHG impact; and some from land-use changes when forests, wetlands or peatlands are converted into farmland to produce biofuel crops, releasing the previously-stored carbon from the ground into the atmosphere.

The way in which a fuel policy accounts for emissions across the biofuel lifecycle is therefore an important element in understanding whether the policy will result in meaningful GHG decreases.

The CFS includes sustainability criteria for biofuels to reduce this problem. The 2019 proposed regulatory approach disallows the use of biofuels from areas where a high degree of land use change has taken place, where there is high biodiversity or carbon content, and from protected areas. These restrictions apply not just to biofuels produced in Canada, but also to those imported from abroad.

In addition, more recent documentation by the government indicates that the CFS will also make ineligible any biofuels that have already been grown in fields beside waterways, in areas that were previously wetlands, forests or grasslands, or that will require any land to be cleared, will be ineligible under the CFS. This last provision could cause a problem for Canada's biofuel producers – more about that in Section 6.

What will happen to the renewable fuel standard?

Renewable fuel standards are straightforward and clear. Increasing biofuel content and stringency through an enhanced RFR would be an easy alternative to the CFS, but wouldn't allow the same flexibility or create incentives for alternative technologies.

The CFS will replace the federal Renewable Fuel Regulations (RFR), which Canada has used as the primary mechanism to reduce GHG emissions from the transportation sector since 2010.

The RFR is very straightforward – it requires that gasoline and diesel fuel have a minimum percentage of biofuel. As shown in Table 4, in addition to federal standards, several provinces have their own RFRs, with higher or more stringent blending requirements than the federal version.

Under the CFS, the requirements for the percentage of biofuel in diesel and gas will be maintained. However, the mandated minimums of 5% biofuel in gasoline and 2% biofuel in diesel may not be sufficient to achieve the CI reductions required for those fuels. Some observers have predicted that the ethanol content of gasoline (actual, not minimum mandated) will rise from 5% to 15%, and the biodiesel component of diesel fuel will rise from 2% to 11%.[19]

A simpler approach than the CFS – and one for which the costs would be easier to anticipate – would be to keep the RFR intact and just increase the percentage and stringency* of biofuel supplementation required. This alone could substantially reduce emissions from transportation. Similarly, requirements could be established to supplement natural gas for buildings and industry with either hydrogen or renewable natural gas (RNG – natural gas made from the decomposition of organic matter).

But this would not necessarily be a better approach. The CFS offers fuel suppliers greater flexibility in deciding how to reduce CI in a cost-effective manner, as well as rewarding them for overperforming on their targets – both things that an RFR can't do. While supplementing with biofuels may be the most efficient way for some fuel suppliers to meet their targets, it runs the risk of discouraging investments in alternative technologies that could produce better outcomes.

Table 4: Renewable fuel requirements across Canada (as a percent of fuel)

	Gasoline	Diesel
Federal (under existing RFR)	5%	2%
Federal (under proposed CFS)	5%	2%
B.C.	5%	4%
Alberta	5%	2%
Saskatchewan	7.5%	2%
Manitoba	8.5%	2%
Ontario	5%	4%
Quebec (proposed)	10% by 2021, rising to 15% by 2025	2% by 2021, rising to 4% by 2025

How will the CFS interact with provincial regulations?

Provincial governments have their own regulations governing GHG emissions – over 65 of them. The CFS needs to complement rather than conflict with these policies, but it is not clear that it will do so.

The CFS is just one of many pieces of legislation that governments are using to reduce emissions in transportation, industry and buildings. Across the country there are over 80 existing regulations at the federal, provincial or territorial level that govern GHG emissions from different sectors (see the Canada West Foundation report *A Compendium of GHG Reduction Legislation and Regulations Across Canada*).

Provincial regulations on transportation emissions for the most part comprise either carbon taxes or renewable fuels regulations. For industrial emissions, however, the story is more complex. B.C., Alberta, Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia and Newfoundland (every province except Ontario and P.E.I.) have legislation that places reduction requirements or costs on at least some industrial GHG emissions. Many of these also involve a cap-and-trade or credit trading system (see Table 5).

Attaining policy congruency, so that these different federal and provincial policies complement rather than conflict with one another, will be critical.

The federal government has not been particularly clear about how the CFS will interact with provincial legislation. This is problematic. After all, a lack of clarity around jurisdiction for managing GHG emissions led several provinces to take the government to the Supreme Court over the constitutionality of the carbon tax. The parties involved are likely eager to avoid needing to repeat the process.

The following represents our best understanding of how the CFS will interact with provincial regulations:

* By stringency, we mean requirements to ensure that the biofuels used have low GHG emissions profiles and a minimal negative environmental footprint.

> **Competing sets of regulations send mixed signals to industry about what is an appropriate and cost-effective pathway towards decarbonization. What may seem like an optimal way of reducing emissions under one system may turn out to be something that results in non-compliance with the rules of the other system.**

Action that generates compliance
Action that generates compliance with either federal or provincial regulation can count in either or both programs.

In other words, if a fuel supplier in Alberta electrifies some processes and thereby reduces its GHG emissions, this action would help them comply with their obligations under the province's TIER regulation, and would also lower the CI content of the fuel under the CFS.

Credit generation
Credit generation is another story. Credits are a market mechanism: something that can be bought and sold. As described on page 15, credits can be generated by fuel producers who provide a fuel under the CI limit (whether oil, hydrogen or biofuel), or by end-users who replace fossil fuels with other power sources.

To ensure that the same credit isn't generated once and sold twice, the CFS has some limitations in place.

An activity that is undertaken to be in compliance with provincial (or territorial) regulations can generate credits under the CFS, but only if the provincial regulation is part of a carbon pollution pricing system. If the activity is legally required by provincial regulations that are not carbon pollution pricing-related, the project cannot generate credits under the CFS. However, activities undertaken under B.C.'s low carbon fuel standard are also eligible for creating CFS credits.

The intention of this approach is to ensure additionality – that the CI decreases generated under the CFS credit system are real and incremental to what would have happened in absence of the policy. However, the approach raises a number of problems.

First, it rewards the GHG emissions reduction efforts of some provinces while penalizing others, depending on whether the province's approach is pricing-related (as in Manitoba) or not (as in New Brunswick).

Second, it may increase the compliance burden for regulated parties when there are both federal and provincial regulations that apply.

Most importantly, however, competing sets of regulations send mixed signals to industry about what is an appropriate and cost-effective pathway towards decarbonization. What may seem like an optimal way of reducing emissions under one system may turn out to be something that results in non-compliance with the rules of the other system.

As stated above, attaining policy congruency across provincial, territorial and federal legislation will be critical. There is currently little indication, however, of the federal government working closely with the provinces to address inconsistencies and develop harmonized solutions.

Table 5: Major provincial legislation on industrial emissions with which the CFS will interact

B.C.	Greenhouse Gas Reduction (Renewable and Low Fuel Requirements) Act (2008/2009) Carbon	Requires that fuel suppliers reduce the carbon intensity of fuels
Alberta	Technology Innovation and Emissions Reduction (TIER) Regulation (2020)	Requires facilities that emitted 100,000 tonnes of CO_2e or more per year to reduce emissions by 10% in 2020, and an additional 1% each year after
	Oil Sands Emissions Limit Act (2016)	Establishes an annual limit of 100 megatonnes of GHG emissions for all oilsands activities
Saskatchewan	The Management and Reduction of Greenhouse Gases Act (2018)	Imposes reporting requirements on all facilities emitting more than 10,000 tonnes of CO_2e annually, establishes facility level GHG performance standards for facilities emitting more than 25,000 tonnes of CO_2e annually, and imposes emissions thresholds for electricity generation
Manitoba	Industrial Greenhouse Gas Emissions Control and Reporting Act (not yet in force)	Establishes an output-based pricing system for large industrial emitters (> 50,000 tonnes of GHGs per year)
Quebec	Regulation respecting a cap-and-trade system for greenhouse gas emission allowances (2011)	Establishes a provincial-wide cap-and-trade system for industrial facilities and electricity providers that emit more than 25,000 tonnes of GHG emissions annually, as well as distributors of fossil fuels
New Brunswick	Made-in-New-Brunswick Regulatory Approach for Large Industrial Emitters (2019)	Establishes GHG emission performance standards for large industrial facilities that produce over 50,000 tonnes of CO_2e annually, with a credit trading system
Nova Scotia	Cap-and-Trade Program Regulations (2018)	Establishes a provincial-wide cap-and-trade system on all facilities that produce > 50,000 tonnes of CO_2e annually, petroleum suppliers, natural gas distributors, and electricity providers
Newfoundland and Labrador	Management of Greenhouse Gas Act (2016)	Establishes GHG emission reporting requirements and reduction targets for large industrial facilities and large-scale electricity generations that emit more than 25,000 tonnes of GHG emissions annually

Who could come out ahead?

By incentivizing the uptake of technologies – new and old – for emissions reduction, the CFS will create lucrative opportunities for the suppliers of those technologies. Who is most able to capitalize on those opportunities, what is the size of the prize and what pitfalls are there to watch out for?

Will the policy encourage new technologies?

The CFS is intended to incentivize the uptake of low-emissions technologies such as hydrogen, zero-emission vehicles, renewable natural gas and carbon capture, utilization and storage. The credit trading system provides an additional revenue stream to boost these technologies. However, the government's ambition may run into problems if supportive infrastructure can't be built quickly.

One of the goals of the CFS is to incentivize uptake of low carbon technologies that are not currently as widely deployed as they could be – such as zero-emission vehicles or hydrogen. The mechanism that will create this push is the credit trading system.

Currently, Canada does not have a mechanism to provide financial returns to low carbon products, other than through the sale of the products themselves. Under the CFS, low carbon fuel suppliers will be able to generate an additional revenue stream through credits. This includes fossil fuel producers who are able to produce fuel that is below the CI threshold; but also producers or importers of biofuels, hydrogen and renewable natural gas; some CCUS (carbon capture, utilization and storage) applications; and some fuel users who switch to a lower CI fuel (such as a cement manufacturer that switches from coal to landfill waste).

Under this system, the financial viability of these low-emissions technologies will be enhanced because a revenue stream can be generated from the sale of credits created, as well as from the sale of the product.

An example of how these financial incentives work can be seen with Carbon Engineering, a direct air capture (DAC)* company founded in Calgary that built a well-known DAC prototype in Squamish, B.C. The company's first operational facility is being built not in Canada, however, but in Texas. The Texas facility is eligible to generate credits under California's Low Carbon Fuel Standard, which makes the economics viable south of the border, but not currently in Canada.** The CFS would provide financial incentives for this type of low-emissions technology leadership.

Giving these industries a boost can help increase their viability as part of a lower-emissions future. (Although some have argued that subsidizing these sectors masks their inherent non-viability on an open market.) However, in order to realize the ambition of the CFS policy, alternative fuel sources – electricity, hydrogen, renewable natural gas, etc. – will need to be ramped up substantially. And here is where the ambitions of the policy hit the wall of reality.

* Direct air capture takes CO_2 out of the ambient air and uses it to generate a concentrated stream that can be sequestered or used for purposes such as producing synthetic fuel.
**The economics are further enhanced through the 45Q regulation in the US that provides a $50/tonne tax credit for captured CO_2.

There have been immense difficulties in getting infrastructure built in a timely manner in Canada, especially when infrastructure crosses provincial boundaries, crosses the traditional territories of multiple Indigenous groups, and falls under a lengthy federal regulatory approval process. Will it be possible to build the infrastructure that is needed to transport these alternative fuel sources – many of which will need to travel via pipelines or transmission lines – in a way that fits the CFS timeline? If the government wants to see the CFS succeed, it will need to turn attention to facilitating the rapid build-out of the supportive infrastructure that will be needed for lower-emissions energy alternatives.

Will it help the domestic biofuels industry?

The sector that stands to benefit the most from the CFS is biofuels. However, the extent to which the industry will benefit hinges on the industry's ability to keep up with growing demand, and on CFS regulations about what biofuels are eligible.

Demand for biofuels in Canada is high. Federal and provincial regulations require all gasoline and diesel fuel to contain between 2% to 7% ethanol and biodiesel, depending on the province (see Table 4). As a result, biofuel consumption has almost doubled since the regulations were enacted a decade ago.

But while biofuel production in Canada has also grown steadily over the past ten years, Canada consumes more biofuels than it can produce – a lot more. In fact, since 2011, Canada has gone from being a net exporter of biodiesel to being a net importer. In 2019, Canada imported about 50% of its ethanol and biodiesel – with the vast majority (98%) coming from the U.S.[20]

Under the CFS, the demand for biofuels is likely to grow even more, with the increase in ethanol and biodiesel demand up to nine times Canada's current production.[21] At the same time, the CFS could also stimulate demand for solid biofuels (e.g., wood waste) for applications such as electricity generation and industrial heating applications (i.e. cement kilns).

This is good news for the Canadian biofuels industry, although there are also challenges.

First, Canada must find a way to scale up its biofuel production, and quickly. This won't happen overnight; it takes anywhere from two to three years to build a new facility. Fortunately, Canada has abundant access to biofuel feedstocks and the necessary skills and infrastructure to either retrofit existing facilities to accommodate biofuels or build new ones. And as the CI targets begin low and slowly increase over the first few years, this should give producers enough time to get the infrastructure in place. But attracting the private investment needed to build this new infrastructure requires that the government set out a coordinated, predictable and stable vision that endures over successive governments. Funding support – as has been provided in the U.S. – is obviously always welcome.

Second, the CFS will introduce criteria and restrictions for how and where eligible biofuel feedstocks can be grown. Specifically, it is proposed that biofuels will be ineligible under the CFS if they have been grown within 30 metres of waterways, in areas that expand into wetlands, forests or grasslands (where the expansion occurred after January 2020), or that will require any land to be cleared.

The rationale for this makes sense. In order for biofuels to make a net positive contribution to both GHG emissions and the environment, they must be produced in a way that doesn't undermine those goals. However, some have voiced concern that these regulations will result in less farmland qualifying for growing biofuel crops. This means that many farmers may come to find that large swaths of their land are suddenly less profitable.

There is also the question of whether equivalent criteria will be applied to feedstocks grown in the U.S. If it is, there is potential for it to result in trade retaliations, as it will disadvantage agricultural producers in U.S. jurisdictions that are subject to lesser restrictions. If not, it could create an uneven playing field between the two countries, with Canadian producers subject to more stringent criteria than their U.S. competitors.

The CFS sends a strong policy signal for growth and investment in the biofuel sector. If the Canadian biofuels industry is able to successfully navigate these challenges, the CFS creates an enormous growth opportunity. If, however, the sector gets bogged down in uncertainty and uncompetitive restrictions, the real winners will be biofuel producers in the U.S.

What are the impacts on other sectors?

The CFS has been described by government as a way to drive emissions reductions across industry, transportation and buildings. But concerns have been raised about each of these sectors, the unique challenges they face, and whether the policy can achieve its targets without undue compliance or cost burden.

Will it harm EITE industry competitiveness?

The CFS presents both a risk and an opportunity for EITE industries. Because they compete globally on prices, they can't pass along higher costs to the consumer – it just comes out of their bottom line. On the other hand, some EITE companies may be able to generate credits – a nice income stream. And because jurisdictions like the EU and the U.S. are starting to consider carbon border tax adjustments, the CFS may eventually enable Canadian companies to sell into those markets without carbon tariffs being added to their products.

EITE stands for "energy-intensive, trade-exposed"* and describes those industries that create goods for export and have high energy use. This includes mining, forestry, chemicals, cement, steel, pulp and paper, fertilizer, manufacturing and oil and gas, among others. This is a large part of Canada's economy: nearly half of our economy relies on exporting our goods and materials abroad.

Because these industries compete with producers internationally, their prices are determined by global supply and demand, rather than the cost of production. In other words, any additional costs from conforming with the CFS (or any other policy or condition) is not something that can be passed along to the purchaser, but has to be absorbed by the business. This is different than the transportation sector, for example, where higher fuel costs can be passed onto end-users.

For this reason, a number of EITE industry organizations and other business groups such as the Canadian Chamber of Commerce, the Business Council of B.C., the Cement Industry Association, the Canadian Steel Producers Association, the Chemistry Industry Association of Canada, Canadian Manufacturers & Exporters and others, have been vocal in their concerns about the erosion of competitiveness.

The "competitiveness problem" has a number of different elements:

- Costs of the CFS are difficult to predict – and as described earlier in this report, the government has not yet provided a cost-benefit, economic or regulatory analysis.
- The costs are difficult to prevent or manage. They arise not only from the industry's use of fuel, but also from increased costs along their entire supply chain, which also may experience higher fuel costs.
- It is difficult for some industries to decarbonize in response to rising costs. The chemistry industry, for example, switched to what they consider their least carbon-intensive option – natural gas – years ago, and electrification is not a feasible option.

* Sometimes called "emissions-intensive, trade-exposed"

- Alternative fuels such as hydrogen and renewable natural gas are not yet available at scale. It is likely to take a number of years for these lower-carbon fuel sources to become available in a way that can truly decarbonize the natural gas stream. In the meantime, the only alternative appears to be carrying higher costs through the purchase of credits and compliance mechanism fees.
- Unlike the carbon tax and the Output-Based Pricing System (OBPS), the CFS (so far) does not contain any competitiveness protective measures for EITE sectors.

A related concern is regulatory 'pancaking' and the duplication of cost and regulatory compliance burden. A wide range of regulations apply to industrial fuel use and GHG emissions. These include federal and provincial carbon taxes that raise the cost of fuel use and incentivize fuel reduction; but also regulations like the federal greenhouse gas reporting program and the Output-Based Pricing System for large emitters. It also includes provincial regulation, such as (but not limited to) the regulations shown in Table 5, which establish emissions caps, performance standards, and/or emissions reduction requirements. EITE industry commentators have stated that the compound result is multiple layers of cost and regulation on the same set of emissions, which they don't see as fair.

Balancing these risks – but less discussed in the documents produced by these organizations – are some opportunities that the CFS may provide to EITE industries.

First, the credit trading system will allow some EITE industry companies to generate credits – which they can then use themselves or sell – through end-use fuel switching. This isn't equally viable for all companies – limited fuel alternatives, lack of infrastructure for transporting or using those alternatives and regulatory constraints will influence the ability for individual companies to switch fuel types. However, for those EITE companies that are able to generate credits through this mechanism, it would provide a direct financial boost.

Second, the CFS – in combination with other carbon policies – may enable preferential access of EITE industries to certain markets. Across a number of jurisdictions, there appears to be increasing consideration of "carbon border tax adjustment" – tariffs that are applied to goods produced in countries with less stringent emissions policies, in order to minimize carbon leakage.*

Carbon border tax adjustments have already been proposed by the European Commission as part of the "European Green Deal." Having Canada's own carbon policies robust enough to avoid the tariff would be beneficial to Canadian EITE industries that sell to Europe. In practice, however, this is not a huge market. Although the EU is Canada's second-biggest trading partner, it accounts for only about 8% of our global goods exports.

More relevant is what will happen over the next few years in the U.S., our largest trading partner and competitor. A Congressional action plan for a clean energy economy was published in June 2020.[22] The 547-page report outlines the approach that will probably be taken under a Biden administration. In addition to establishing stricter regulation of industrial emissions, including a federal credit trading system, the document recommends the development of "Border Adjustment Mechanisms for Emissions-Intensive Goods" – a carbon border tax. (The idea is also explicit in Biden's platform.) This would help level the playing field between Canada and the U.S. for many EITE goods. It would also provide a very strong justification for establishing legislation in Canada that would enable Canadian goods to be exported to the U.S. without a carbon tariff being applied.

The success of a policy lies in the details of its implementation and the extent to which it takes into account the specific circumstances of those parties regulated by or affected by that policy. In the case of the EITE sector, there are both risks and opportunities. In the case of the federal government, it would seem there is still work needed to bridge the gap between the objectives of the CFS and the "on-the-ground" reality of how it will be experienced by sectors critical to Canada's prosperity.

* Carbon leakage occurs when the environmental policies of one jurisdiction cause businesses to transfer their production to another jurisdiction with less stringent environmental measures, resulting in a shift (and potential increase) of GHG emissions from one jurisdiction to another.

Is it the nail in the coffin of the oil industry?

The CFS is unlikely to be the straw that breaks the back of the oil and gas industry, as most companies are already moving in the direction of reducing emissions. However, the details of how the policy is implemented will have an effect on how easy, costly or burdensome it will be for oil and gas companies to comply with the regulations.

Although the oil and gas industry is an EITE sector and subject to the same market constraints described above, it has a distinct interest with respect to the CFS. Fossil fuel primary suppliers can be regulated parties under the policy – meaning they are the ones responsible for demonstrating compliance (see page 16).

The oil and gas sector in Canada has been experiencing extreme pressure to reduce its GHG footprint; and this pressure has been coming from all sides. Investors, banks and insurers are increasingly applying criteria to test emissions levels before they will hand over money. Provincial and federal governments have increasingly been enacting legislation that sets emission caps, performance standards or reduction requirements on the industry – such as Alberta's Technology Innovation and Emissions Reduction (TIER) regulation that requires large emitters to reduce their emissions by 10% in 2020, and an additional 1% each subsequent year. Carbon taxes have been established as a market mechanism to encourage energy efficiency and fuel switching. And pressure from the public, ENGOs and other civil society organizations has been mounting.

Individual oil and gas companies have responded in different ways, but most of them appear to be moving in the direction they are being pushed. Increasingly, Canada's largest oil and gas companies are making net zero pledges – some of which extend not only to their own operations, but to consumption of their products as well.[23]

All these forces are pulling in the same direction, which means that actions undertaken to comply with the CFS are also likely to result in those companies drawing closer to their other legal obligations and non-legal commitments. As a result, the CFS itself is not likely to be so onerous that it hamstrings the industry. And for those companies that are able to create a product that comes in under the CI threshold, there is the potential to generate revenue.

However, the CFS does create friction, which arises from the gap between the policy's objectives and the rules around its implementation. The Proposed Regulatory Approach document contains hundreds of pages of detail on what is or is not an allowable credit generation activity; cut-off dates for qualifying activities; lifecycle quantification methodologies; rules around additionality; portioning across streams; and much more. Each of these details has a material effect on how easy or difficult it will be to comply with the regulation, and also shapes decisions around the actions that will be taken under the policy. Not all the details have been worked out yet, and public documents indicate that there is still quite a lot of work to be done.

It should also be noted that the experience of individual oil and gas companies will differ widely. Companies with greater vertical integration – like Suncor, Imperial or Husky (those that also refine and create downstream products rather than just shipping out unrefined product) will likely engage at more points with the CFS. At the same time, they also have more opportunities to engage in CI reductions along the full lifecycle of the fuel, and may find more efficient ways to achieve compliance.

Finally, there is the problem of aligning investment in producing lower carbon fossil fuels with dwindling demand. It is easier to build emissions-lowering technology into new projects than it is to retrofit existing projects. However, few new projects are currently planned, due to both the investment and regulatory climate. In addition, recent announcements by both Quebec and B.C. banning gas-powered vehicles (by 2035 and 2040 respectively) make it challenging for oil refiners to ensure that the investments they make under the CFS are resilient for the future.

Will it help reduce emissions from transportation?

The CFS has precedent in the area of transportation fuels. In California and B.C., where fuel standards have been in place for over 20 years, similar policies have managed to reduce CI at relatively low cost. There is reason to think that the CFS – applied specifically to transportation fuels – may deliver similar positive outcomes.

Transportation represents one of the largest sources of greenhouse gas emissions worldwide – accounting for nearly 25% of emissions in Canada and 15% globally. But it also represents one of the most difficult areas in which to bring down those emissions. Policymakers have employed a number of approaches to tackle this problem, including imposing taxes on gasoline, requiring the use of renewable fuel content, setting fuel economy standards and subsidizing electric vehicle sales. (See Box).

Precedent for the CFS exists for transportation fuel. As described in Section 3, similar legislation, called a Low Carbon Fuel Standard, or LCFS, was enacted over 10 years ago in California, B.C. and the EU. The LCFS took a very similar approach to the CFS: a CI target was established that started low and increased over time; CI reductions could be made anywhere in the fuel's lifecycle; and a credit trading mechanism was established.

The LCFS policies were generally successful. In both B.C. and California, the CI of transportation fuel was reduced. In California, fuel suppliers – in their rush to create and sell credits – overshot their early targets. The cost to consumers was relatively low: under three cents per litre. Over time, the mechanisms have been adjusted to enhance success and reduce problems. (See the Appendix for more detail on the approaches those jurisdictions took, the outcome in each instance, and the lessons that can be drawn.) As a result, nine other U.S. states are currently implementing or considering similar policies. There is evidence to think that the CFS – applied specifically to transportation fuels for which precedent exists – may deliver similar positive outcomes.

How do governments reduce GHG emissions from transportation fuels?

While an LCFS is one way to target GHG emissions from the transport sector, it is certainly not the only approach. Other ways that governments have tried to reduce GHG emissions from transportation fuels are:

Gasoline taxes: Gas taxes increase the price consumers pay at the pump. While research has shown that gas taxes can be effective at reducing the amount of fuel consumed, the downside is that they're politically unpopular and can be particularly damaging to lower-income households.

Fuel economy standards: These are minimum performance standards for fuel efficiency – that is, how many kilometers per litre a certain class of vehicle must achieve. The car manufacturer is responsible for achieving these targets. Both Canada and the U.S. have fuel economy standards and have been increasing their stringency over time.

Renewable fuel regulations: Renewable fuel regulations mandate a minimum content of ethanol or biodiesel in gasoline and diesel fuel. Renewable fuel regulations are effective in displacing fossil fuels used for transportation but have a number of shortcomings in terms of cost and environmental performance.[24]

Subsidies for electric vehicles and encouraging mode shifting: Encouraging more people to buy electric vehicles, walk, cycle or take public transit can also achieve similar objectives, but do not place any restrictions or requirements on the fuel itself.

How will the CFS affect buildings and houses?

Buildings – residential, commercial and institutional – will contribute a relatively small but meaningful six megatonne reduction in GHG emissions under the CFS. Across Canada, homes will experience about a 2% increase in annual energy expenditures, with the greatest cost for households and businesses that use natural gas.

Buildings use fossil fuels in two main ways. The first is indirectly via the materials used to construct the building, such as cement, steel, glass and wood. To the extent that the CFS reduces the carbon intensity of these products, it will also reduce the CI of the buildings themselves. The flip side is cost. To the extent that the CFS increases the cost of these materials, it will increase the cost of constructing buildings.

The second way buildings use fossil fuels is for energy: for space and water heating (which together consume over 80% of domestic energy consumption) and to power appliances and lighting.

The energy sources used for heat and for power differ by region, but are dominated by electricity and natural gas. Across the country, electricity accounts for around 40% of residential and 42% of commercial/institutional energy consumption; and natural gas accounts for around 44% of residential and 52% of commercial/institutional energy use. The GHG emissions from natural gas combustion occur at the location of the building. The GHG emissions from electricity occur at the electric power generating facility and differ depending on whether the power plant is run by coal, hydro, nuclear, natural gas, wind or solar.

Building energy use has increased over time, growing over 17% between 1990 and 2015. However, GHG emissions from the building sector decreased over the same period and reached its lowest point since the 1980s in 2016.[25] This is due both to reduced emissions from electricity generation, and from improved energy efficiency within buildings themselves. According to analysis by the Canadian Energy Research Institute (CERI), building emissions are projected to remain at 2016 levels by 2030 even without the CFS. At the same time, buildings still account for about 13% of Canada's total GHG emissions[26] and the size of the sector continues to grow each year.

How big an effect will the CFS have?

The only modelling that has been published that breaks out the effect of the policy on buildings comes from CERI. Under a 10% CI reduction target (which is about the level expected under the CFS), CERI projects that building emissions will fall six megatonnes by 2030 – a decrease of a little less than 9% compared to 2016 emissions.[27] If this is the case, this would be a relatively small but still meaningful contribution towards the federal government's objective of inducing a 30 megatonne reduction via the CFS.

No estimates have been developed for what the costs to the building sector overall will be. However, CERI's study projected that on average, homes will experience about a 2% increase in annual energy expenditures. The greatest cost implications will be experienced by buildings that rely primarily on natural gas, with little to no increase for buildings that use exclusively electricity from non-emitting sources like hydro. An assessment by Canadians for Affordable Energy estimated that home heating prices for natural gas could increase as much as 60%.[28]

The decreases driven by the CFS are likely to be complemented by other planned future policy actions by the federal government to target building emissions for commercial and residential buildings. These include adopting a Canada-wide "net-zero energy ready" building code by 2030, strengthening existing building codes by 2022, establishing new standards for heating equipment and other building technologies, and subsidies to retrofit existing buildings to improve energy efficiency, as well as additional provincial actions. According to some analyses,[29] deeper decarbonization in this sector will mainly be achieved through increased electrification of heating – moving from natural gas to electricity – which will require a greater supply of low carbon electricity and efficient electric heating to keep costs down.

These other policy actions will also have costs associated with them; and some in the real estate industry have expressed concern about adverse cost impacts for home buyers and sellers.[30]

CONCLUSION AND RECOMMENDATIONS

The intention of the CFS is to support a critical objective: reducing global GHG emissions. But the policy also needs to represent the best mechanism for getting there.

While plenty of emissions reduction regulation exists, there is little that applies across the board. Most regulation – both federal and provincial – focuses on specific high-emissions sectors, such as oil and gas production, electricity, waste management and transportation. That is the right place to start – it's the low-hanging fruit. But the CFS is intended to drive emissions reductions across all facets of society: households, universities, hospitals, small manufacturing, retail businesses, food processing plants, shopping malls, government operations, etc. These other sectors represent 25% to 30% of Canada's total GHG emissions, and currently the only regulatory instrument that applies to these sectors broadly is the carbon tax.

But unlike the carbon tax, the CFS doesn't have to incent a change in behaviour in consumers to make a difference. The difference will be made on their behalf by fuel suppliers – who may or may not pass on any extra costs.

On the other hand, the approach taken by the CFS is not necessarily the best solution for all sectors. Requiring that fuels be less carbon intensive makes sense for the transportation sector, where biofuel supplementation is already common practice and existing vehicle infrastructure can support it. But that is not always the case for other sectors. For instance, in some industries, accommodating lower-carbon fuels will require substantive retrofits or complete overhauls of their existing infrastructure. Others want to fuel-switch away from higher-emitting fossil fuels such as coal, yet face other regulatory barriers preventing them from doing so. If different industries are to achieve meaningful emissions reductions, identifying and incentivizing the most effective pathways to decarbonization for each – whether fuel switching, technology investments, or other things – is the best way to achieve that goal.

The CFS will necessarily interact and overlap with other federal and provincial policies that target emissions reductions in different sectors. Some of these existing regulations, such as the RFRs, may discourage some fuel suppliers from pursuing the most cost-effective manner for reducing fuel CI; while the others may combine with the CFS to present some sectors with more costs, including administrative burdens, than warranted by the benefits.

There are still important improvements that need to be made – and many analysts and working groups are continuing to look at and comment on the technical details. Here are our high-level recommendations for the federal government as it moves towards implementation:

- **Show your work.** The government has yet to publicly produce a cost-benefit analysis, economic analysis or regulatory analysis for the CFS – and it is getting very late in the day to do so. These pieces of work are critical. The objective of the CFS is excellent, but the support of many organizations – including the Canada West Foundation – rests on clearly demonstrating that the policy will be able to achieve its reduction targets, especially in the context of the additional provincial and federal regulations that have been established in the last four years to drive emissions reductions. Also the costs – both the overall economic burden and the cost to individual industries – must be proportionate to the emissions gains derived in each.
- **Be prepared to adapt**. The ability for the federal government to adapt the CFS to changing circumstances and new information will be critical to the success of the policy. Other jurisdictions have had to make numerous adjustments along the way. Similarly, the federal government will need to be prepared to listen to legitimate concerns from different stakeholders and to make real change, where needed.
- **Plan for how to get supporting infrastructure built quickly.** No matter the industry, supplying and transitioning to lower-carbon fuels will not happen at the flip of a switch. Significant time will be needed for planning and construction of supporting infrastructure like biofuel production facilities, pipelines to transport RNG and hydrogen, transmission lines and grid capacity to support increased electrification. With the full implementation of the CFS only a few years away, this needs to happen now (or even better: yesterday). Yet, the combination of a sluggish regulatory process, the lack of a harmonized approach across provinces and the federal government, and the financial setbacks from the COVID-19 pandemic together make the prospect of quickly building the needed infrastructure seem remote. Time is of the essence – and the federal government must provide leadership on several fronts to get this done in a predictable and realistic timeframe.
- **Provide protections for the EITE sector.** Canada's EITE sectors face unique challenges when it comes to the CFS. Without sufficient protections in place, the federal government risks damaging the sector's competitiveness, burdening these industries with duplicated costs, and creating an uneven playing field. For the sake of these industries and the many jobs that depend on their survival and prosperity, the federal government must acknowledge and address how the CFS may impact these industries and take steps to mitigate it – or risk sending their business across the border.
- **Build in additional flexibility to ensure that the CFS actually results in fuel decarbonization, not just payments and penalties.** Implementation of the CFS will act as the starting gun for increased investment in certain decarbonization technologies such as renewable natural gas. However, it will take time for these investments to result in facilities and transmission mechanisms being built and supply being delivered. The government has included a number of provisions to bridge this timing gap – such as deficit carry-forward and cross-class use of credits. However, two problems remain: a) until these technologies are ready, there may not be enough credits available for use; and b) these provisions may not be enough to keep up with the realities of the technology lifecycle. To overcome this problem, the government needs to keep a close eye on the development of decarbonization technologies and ensure that additional flexibility is added to the CFS as needed after it is implemented. Having fuel suppliers throw money at the problem won't necessarily result in fuel decarbonization – the primary goal of the CFS.

The CFS needs to work – not just for transportation, but for every sector. For this to happen, it must concentrate on driving down emissions and not just moving money around to ensure compliance. Otherwise, the result will be both extremely expensive and inefficient. It's not too late for the federal government to get it right – if done properly, the CFS can be an effective tool.

APPENDIX

LCFS policies in California, B.C. and the European Union

The Clean Fuel Standard (CFS) is not the first time that a carbon intensity (CI) reduction policy has been introduced for transportation fuels. B.C., California and the European Union have had similar policies (referred to as a Low Carbon Fuel Standard or LCFS) in place for over a decade.

The experience of these jurisdictions suggests that a low carbon fuel standard – at least applied to transportation fuels – can be implemented in a way that effectively decreases carbon intensity, doesn't cost consumers too much, and doesn't frustrate business.

The experience of the LCFS in these three jurisdictions is presented below. Table 1 highlights some of the similarities and differences in approach and compares them with the approach proposed under the CFS.

However, it is important to note that these LCFS policies have been limited to transportation fuels only. The CFS is much broader and it cannot be assumed that similar outcomes can be realized when the policy is applied to fuels used for residential, commercial or industrial uses.

California

Approach

In 2007, California became the first jurisdiction in the world to introduce an LCFS. The policy requires transportation fuel suppliers (gasoline, diesel and conventional jet fuel) to reduce the lifecycle carbon intensity of their products by 10% by 2020 and 20% from 2010 levels by 2030.[31] The responsibility to meet the carbon intensity targets falls upon the primary fuel suppliers in the state, meaning fuel producers and importers – and as with the CFS, the reductions can take place anywhere along the fuel's lifecycle.

Like the proposed CFS, the California LCFS framework builds in a technology-neutral approach, a credit trading system with a cap on credit prices, and increases the stringency of CI reduction targets over time.

Outcome

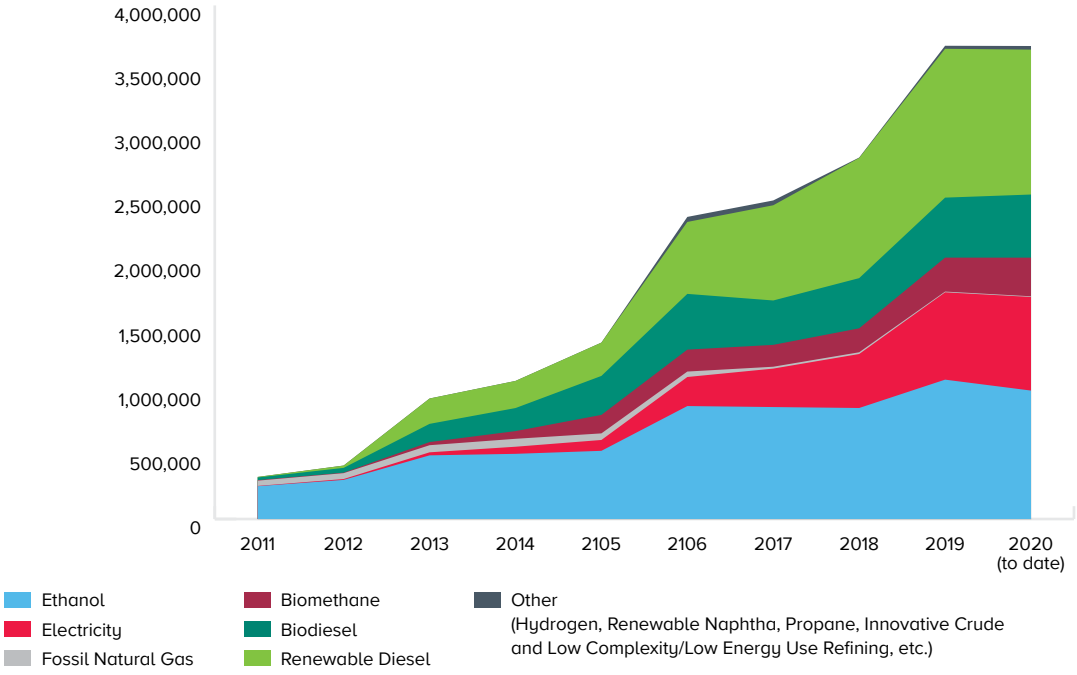
Since it first came into effect in 2011, California's LCFS has been even more successful than anticipated. For instance, by 2014, fuel suppliers had generated 67% more credits than deficits, and by 2017, the average carbon intensity of transport fuels was 3.5% lower than 2010 levels.[32,33] *

In addition, the cost to consumers has been relatively low. One study estimates that the LCFS contributed less than a five cent (U.S.) increase per gallon (around 1.75 Canadian cents per litre) to gasoline and diesel prices between 2011 and 2017.

End-use fuel switching with ethanol has been the primary way in which fuel suppliers have achieved compliance, though the program has witnessed increases in credits generated by renewable diesel, electricity and biodiesel in recent years (Figure 2). The contribution of innovative technology approaches was almost negligible.

* While the LCFS has helped California to avoid GHG emissions, the state is still struggling to make meaningful progress towards its target of reducing emissions 40% below 1990 levels by 2030. As described under the topic of "avoided vs. absolute emissions" paradox on page 07, California's GHG emissions rose overall by more than 5.5% between 2011 and 2017, stemming from an increase of 8.5% in vehicles miles travelled over that same period.

Figure 2: How CI reductions were achieved in California since the implementation of the LCFS policy (MT)



Source: California Air Resource Board. California LCFS Quarterly Summary Excel file

A key reason for the success of the policy – despite initial strong opposition from both politicians and the oil industry – was that it created benefits for a wide range of industries from the credit trading scheme. As a result, industries as varied as oil and gas companies and electric vehicle automakers have shown broad support for the policy.[34]

The implementation of the LCFS was a learning experience for the Government of California. Significant amendments were introduced in 2011, 2015, and 2018 to improve the flexibility of the program. For instance, in 2018 the government expanded the LCFS to include more opportunities for regulated entities to earn credits – including a protocol for carbon capture and storage (CCS) projects to earn credits, which provides industries greater long-term incentives to invest in reducing their emissions; as well as allowing utilities to earn credits through the development of electric charging and hydrogen refueling infrastructure.

British Columbia

Approach

In 2009, B.C. introduced the LCFS as one of several measures designed to help the province reach its commitments under the *Climate Change Accountability Act.* B.C.'s LCFS requires transportation fuel suppliers to achieve a 10% CI reduction by 2020 and a 20% reduction by 2030. It also builds on the federal Renewable Fuel Regulation to require a minimum biofuel content of 5% for gasoline and 4% for diesel.

The B.C. LCFS is largely modelled after California's policy and shares many similarities, including the technology neutrality, a lifecycle "well-to-wheels" emissions approach and a credit trading system.

Outcome

The Government of B.C. reports that the LCFS resulted in the avoidance of 7.73 million tonnes of GHG emissions between 2010 and 2017.*

In terms of compliance, B.C.'s LCFS, as with California, has mostly been achieved through biofuel blending. By 2016, the average renewable fuel content of gasoline was 7.4%, and 5.1% for diesel – surpassing the legislated targets of 5% and 4%, respectively.[35] While the B.C. government has stated that carbon intensity has decreased, which makes sense given the inclusion of biofuels, no information has been made available on the overall CI reduction achieved, or the extent to which reductions can be attributed to different approaches to reducing emissions across the fuel lifecycle.

The cost of the policy to consumers in B.C. has been low, adding only between two and three cents per litre to the cost of gasoline.[36]

What's more, the policy has existed for over a decade with little public objection or notice. According to one study, the LCFS was mentioned only 21 times by the province's most popular newspapers between 2007 and 2014, compared to 1,714 mentions of the carbon tax.[37]

European Union

While Canada's CFS is more similar to the approach taken by B.C. and California, the EU provides a valuable lesson in what can happen when a low carbon fuel standard is implemented across jurisdictions with very different laws, institutions, economies and political contexts.

Approach

In 2008, the EU introduced two major pieces of legislation that targeted GHG emissions from the transportation sector – the Fuel Quality Directive (FQD) and the Renewable Energy Directive (RED).

The FQD introduced a CI reduction target of 6% by the year 2020 compared to a 2010 baseline, while the RED established a target of having a minimum of 10% of each member state's transport fuel come from renewable sources by 2020.[38]

The EU implemented the FQD and RED across 28 countries as varied as Sweden, Malta and France – and they did it by building a great deal of flexibility into the implementation of the policy in order to be sensitive to different regional contexts. For instance, member states could exempt or distinguish between different fuel suppliers; choose the most appropriate method of renewable fuel support (i.e. volume mandates, energy mandates or GHG emissions saving targets); and set various criteria for biofuels.[39]

Outcome

This flexibility had both an upside and a downside. The upside was that the policy was supported by the EU's members. The downside was that members' progress in achieving the targets varied greatly. In 2017, it was estimated that only five of 22 reporting member states were on track to meet their 2020 reduction targets.

Lessons for Canada

If implemented smartly, there is reason to believe that Canada's CFS could also be successful with respect to transportation fuels. But there are also some lessons to be learned from the experiences of California, B.C. and the EU:

- Two key factors that underpinned success were flexibility and harnessing market forces (i.e. credit trading).
- Support was contingent on the extent to which the policy created opportunities and benefits for different industries as well as compliance costs for them.
- Other jurisdictions have had to make numerous adjustments to improve the policy after initial mistakes. The CFS will need to include a mechanism that allows for subsequent adjustment, and the government will need to be prepared to listen to and respond to legitimate concerns from stakeholders.
- The CFS will extend beyond transportation to include building and industry fuels. This is uncharted territory, and it is important to remember that the lessons of success for transportation fuels may not apply.

* Similar to California, B.C.'s policy has only managed to avoid GHG emissions rather than reduce them; over this time period there was an overall increase in GHG emissions avoided vs. absolute emissions from the transportation sector.

Table 6: Comparing low carbon fuel standards across different jurisdictions

	CALIFORNIA	B.C.	EUROPEAN UNION	CANADA
Name	Low carbon fuel standard	Low carbon fuel standard	Fuel Quality Directive	Clean Fuel Standard
Year enacted	2007	2010	2009	2019/20
First compliance year	2011	2013	2009	2022 for liquid stream, and 2023 for gaseous and solid stream
APPROACH				
Fuel coverage	Transportation fuels	Transportation fuels	Transportation fuels	All fossil fuels
Carbon intensity reduction target	10% below 2010 levels by 2020	10% below 2010 levels by 2020	A minimum of 6% below 2010 levels by 2020	10% reduction by 2030 from carbon intensity baseline (baseline not yet set)
Technology approach	Flexible and technology neutral; reduction can occur anywhere in full fuel lifecycle	Flexible and technology neutral; CI reduction can occur anywhere in full fuel lifecycle	Flexible and technology neutral; reduction can occur anywhere in full fuel lifecycle	Flexible and technology neutral; reduction can occur anywhere in full fuel lifecycle
Mandates a minimum biofuel content	No, but there is a federal renewable fuel standard that applies in California	Yes	Yes – established with complementary renewable fuel legislation	Yes
Credit trading and price caps	Credit trading system with a cap on credit prices	Credit trading system with no cap on credit prices	Credit trading system with no cap on credit prices	Credit trading system with a cap on credit prices
Mechanism for measuring lifecycle emissions	GHGenius	GHGenius	Its own model	Building its own model
Emissions from biofuels	Considers the full lifecycle emissions analysis of biofuels	Does not consider the full lifecycle emissions analysis of biofuels	Includes a sustainability criterion for biofuels	Includes a sustainability criterion for biofuels
OUTCOME				
Success in reducing CI and avoiding emissions	Appears to be meeting its CI reduction targets	Appears to be meeting its CI reduction targets	Flexible implementation produced varying results; some member states are meeting their targets, most aren't	To be determined
Cost to consumers	Less than 1.75 cents per litre of gasoline and diesel	2-3 cents per litre of gasoline	Not available	To be determined

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