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E-BRIEF

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ENERGY AND NATURAL RESOURCES

Speed Bump Ahead: Ottawa Should Drive Slowly on Clean Fuel Standards

by
Benjamin Dachis

- Clean fuel standards are an evolution in the government-imposed renewable fuel mandates that are common across Canada. Unlike current programs that promote, for example, the use of ethanol or biofuels, a clean fuel standard is a broader policy tool that tracks the overall lifecycle of emissions – from production site to refining and transportation to end combustion.
- Following the lead of British Columbia, the federal government announced plans to have a CFS in place by 2019. Refiners and importers of fuels would be required to ensure that the mix of fuel they sell is below a mandated maximum carbon intensity. However, the federal government has not made an explicit case for a CFS as opposed to other means of reducing emissions. A CFS only makes sense if it is not politically feasible to impose a carbon price that is high enough to result in emissions reductions.
- Ottawa's plan will interact with existing federal and provincial renewable fuel standards, carbon prices, and climate change regulations. Instead of committing to such a policy before all the costs and complications are known, Ottawa should undertake a comprehensive cost/benefit analysis and feasible compliance modelling for a CFS.

In 2016, the federal government announced plans to have a clean fuel standard (CFS) in place by 2019. Sometimes also called a low-carbon fuel standard,[1] the program likely would require fuel suppliers to reduce the lifecycle greenhouse gas (GHG) carbon intensity of fuel – that is, the emissions per amount of fuel measured in grams of CO_2-equivalent per megajoule (CO_2e/MJ) – they sell. Refiners and importers of fuels would be required to ensure that the mix of fuel they sell is below a mandated maximum carbon intensity. Their emissions content would be based on all

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1 This E-Brief draws on Dachis (2009), which applies to a previous version of this policy referred to as a low-carbon fuel standard.

emissions from resource extraction, refining, transportation to market and combustion. The maximum allowable emissions intensity would fall over time to encourage producers to reduce the GHG intensity of fuels they sell, thus resulting in fuels with lower emissions replacing those with higher ones in the market. Suppliers that reduce their average emissions intensity below the standard would receive credits that they could sell to other suppliers unable to produce and sell fuel at or below the standard.

Ottawa is not the first government with such a plan. California established a CFS in January 2007 for transportation fuels sold in that state (California 2007). In British Columbia, a CFS came into effect in January 2010, while the European Union also has a similar policy, a fuel quality directive, in place. The federal plan, however, is more ambitious than earlier ones. One major difference is that the proposed CFS would apply to all fuels – not only liquid transportation fuels, but also gaseous and solid fuels used by industry and buildings. Further, Ottawa is proposing to make the CFS responsible for the second-largest amount of Canada's planned emissions reductions, short only of carbon pricing.

The economic evidence shows that the lowest economic cost approach is for a CFS to play, at most, a complementary role in emissions reduction (Rivers and Wigle 2018). A case can be made for a CFS in parts of the economy that would not be responsive to a politically acceptable emissions price – meaning that the resulting loss of economic value of the activity would be greater than the social cost of pollution. Accordingly, although the federal government should use carbon pricing as the main tool to drive deep emissions reductions, using a CFS to drive such reductions across a wide swath of the economy could have a high economic cost. Instead of committing to such a policy before all the costs are known, Ottawa should undertake a comprehensive cost/benefit analysis and feasible compliance modelling for a CFS, along with an economic costing of the plan in addition to a carbon price, both for businesses and for households, relative to a simple price on emissions.[2] In addition, the plan should contemplate the sector-specific economic costs of a CFS (especially for energy-intensive, trade-exposed industries) and examine the interaction of a CFS with existing federal and provincial renewable fuel standards and climate change regulations. Ottawa should proceed with a CFS only after a clear case remains for such a program as a complement to carbon pricing. Unless it takes these steps, the CFS is a policy tool in search of a rationale.

GHG Intensity and Renewable Fuel Standards

A CFS would be an evolution of renewable fuel mandates that Ottawa, Ontario, and the Western provinces have had in place for many years. Under existing federal mandates, fuel sold in Canada must have, on average, between 2.0 percent and 8.5 percent renewable content by volume, depending on the province and fuel type (Table 1). Quebec does not have a specific renewable fuel content mandate, but does exempt biodiesel from fuel taxes. Other provincial governments, and Ottawa, have eliminated such tax exemptions.

Among the many problems with renewable mandates, however, fuel standards often have no connection to actual emissions reductions (for a list of concerns, see Auld 2008). Indeed, some types of renewable fuels, such as traditional ethanol made from corn or wheat, can create more emissions than gasoline over their whole lifecycle in certain circumstances. A CFS instead mandates that the overall lifecycle of emissions – from production site to refining and transportation to end combustion – be at a set, and declining, threshold of

2 Below I show evidence of the cost of California's CFS policy, which is sufficiently different from the federal proposal to warrant a new analysis.

Table 1: Renewable Fuel Standards, Canada

Jurisdiction	Renewable Fuel-Content Mandate	Fuel-Tax Exemption
British Columbia	5% for ethanol, 4% for biodiesel in 2010	Phased out in 2010
Alberta	5% for ethanol, 2% for biodiesel since 2011	Phased out in 2007
Saskatchewan	7.5% for ethanol since 2007, 2% for biodiesel since 2012	Phased out in 2007
Manitoba	8.5% for ethanol since 2008, 2% for biodiesel since 2009	N/A
Ontario	4% for biodiesel since 2017,* 5% for ethanol since 2007	Phased out in 2005
Quebec	N/A	Biodiesel exempt
Federal	5% for ethanol in 2010, 2% for biodiesel in 2011	Phased out in 2008

*Also requires a minimum 70% GHG reduction relative to diesel.

Source: Canada 2017.

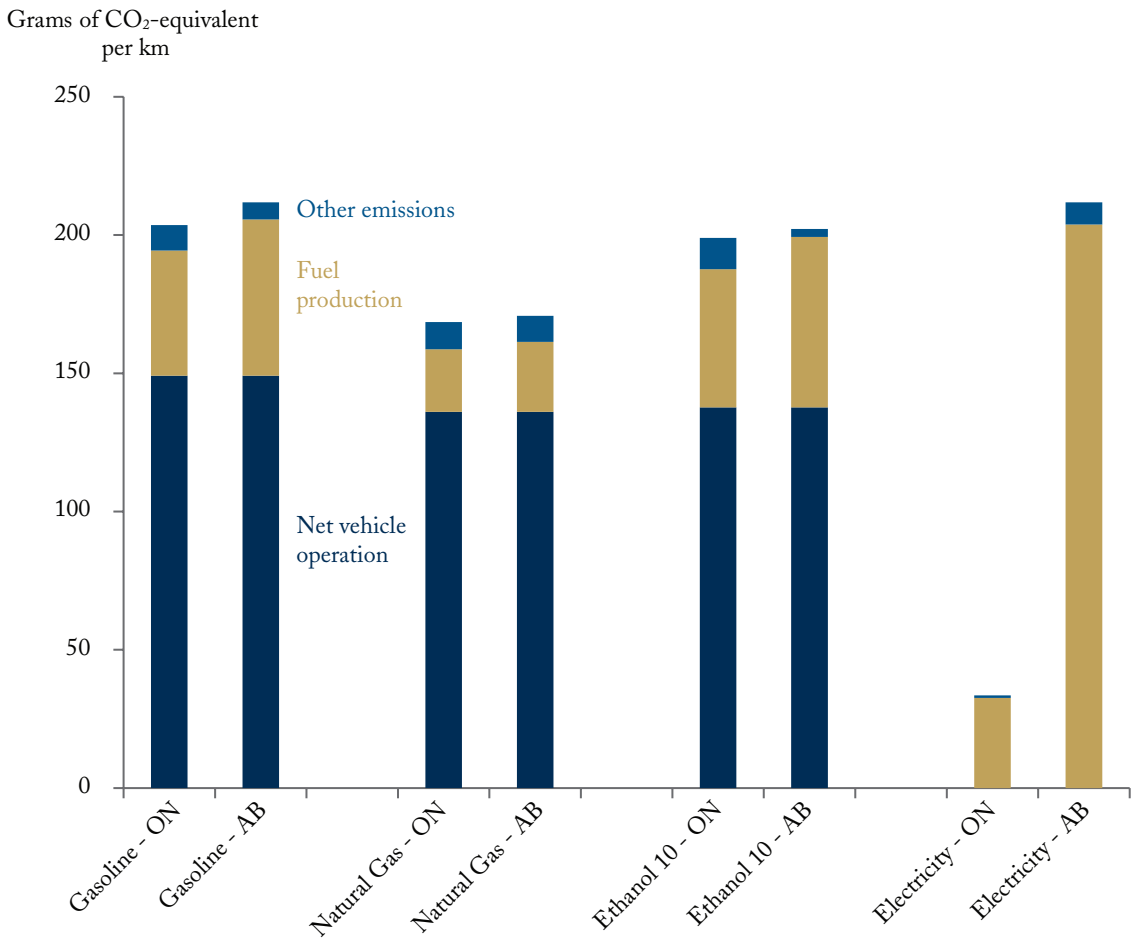
emissions per unit that fuel distributors sell. In this sense, a CFS is akin to a cap-and-trade program: fuel distributors that sell fuel with emissions below the standard get either credits to sell to those that cannot meet the threshold or bank credits for future compliance. British Columbia's CFS, for example, requires a 10 percent reduction in GHG intensity in 2020 relative to 2010 levels.[3] Thus, a CFS would create a larger mandated demand for fuels below a given GHG intensity, while increasing the relative cost of fuels with GHG content above the threshold. A major difference between a cap-and-trade program and a CFS, however, is that a CFS is a tradable performance standard with no cap on overall emissions.

Once a CFS is in place, the federal government intends to remove its renewable fuel standards, although there is no word on whether provincial standards would stay. One benefit of a CFS over renewable fuel standards is that, unlike the latter, which prescribe the type of fuel producers must use, a CFS would be agnostic and flexible about the choice of fuel that producers may use to meet emissions-reduction targets. A number of alternative fuels can reduce lifecycle emissions relative to traditional gasoline or diesel. The most common of these is ethanol, produced from corn, wheat, sugar cane or other organic material. Another major source of alternative fuels is biodiesel, which can be produced from various sources, such as canola oil, animal fats and even algae. Both ethanol and biodiesel must be blended with gasoline or diesel, however, up to the limits usable by vehicle engines. Natural gas, which comes in either compressed or liquefied form, also provides lower emissions than do traditional gasoline or diesel, and increasingly is being delivered in renewable forms from sources such as methane extracted from landfills. Other vehicle power options, such as electricity or hydrogen, would also be under a CFS.

Each type of fuel has a different full lifecycle emissions intensity. California, which has the longest history of a CFS, produces lifecycle GHG intensity benchmarks relative to traditional fossil fuel-based gasoline. In the

3 As of 2018, British Columbia's *Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act* sets the carbon intensity standard at 82.41 grams of CO2e/MJ of gasoline, declining to 79.33 in 2020 and beyond. The federal government has not yet set an intensity standard for its proposed CFS.

Figure 1: CO_2-Equivalent Intensity of Vehicle Fuels, Alberta and Ontario, 2018



Note: Emissions are from 2018 model assumptions for a light-duty vehicle; ethanol in this model is a wheat-based 10 percent blend with gasoline.
Source: GHGenius 4.03.

California system, traditional gasoline had an initial benchmark GHG intensity of 95.6 grams of CO_2e/MJ, with the intensity standard declining over time. Within each category of fuel, there is a range of GHG intensities based on the exact method of production. Looking at assumptions about the emissions lifecycle of fuels used in Canada, the majority of emissions from both traditional gasoline and a gasoline mix with 10 percent ethanol come from the operation of vehicles (Figure 1), while natural gas as a fuel source for vehicles can have a lower emissions intensity than either type. For electric vehicles, the majority of emissions come from the source of electricity production, not from end users, while the emissions produced by an electric vehicle travelling one kilometre vary depending on the location, being higher than regular gasoline in Alberta, given its current electricity mix, and lower in Ontario.

Such figures abstract, however, from how energy gets from wells to wheels. Several problems are inherent in the implementation of a CFS. One is how to determine conclusively the total amount of emissions created during

the production of the fuel, which cannot be done simply by burning the fuel in a test facility, for example. Each approach that a fuel producer or distributor wished to take to reduce the emissions intensity of the fuel produced would need to undergo a regulatory approval that would make it costly for them to undertake a full lifecycle assessment of the fuel. Another problem is that, in determining the relative GHG intensity of ethanol and gasoline, scientifically defensible differences in modelling assumptions of the effect of land-use change and emissions reductions credited to co-products can yield sizable differences in emissions estimates at each stage of the full fuel cycle (Dachis 2009). Indeed, Ottawa has decided not to include land-use effects in its calculation of lifecycle emissions standards in its proposed CFS, meaning that the policy ignores a major unintended consequence that could negate emissions reductions from many fuels.

The Economic Cost of a Clean Fuel Standard

Policymakers can lean on economic theory, evidence and the results of clean fuel standard programs already in place to determine whether a CFS is likely to be effective and what its economic costs would be.

A CFS might have a role if it makes an emissions price more effective (Ragan 2017). An emissions price would solve the economic problem of an externality, in the sense that drivers or other emitters do not take into account the effect of pollution from their activities on climate change. They might decide, because of the higher cost of fuel, to drive less or buy a more fuel-efficient vehicle. There are, however, other potential market failures that emissions pricing does not address and that a government should assess before deciding that regulation is a better way than pricing to reduce emissions (Ecofiscal Commission 2017). For example, households might not be able to afford to buy an expensive vehicle with low emissions or high fuel economy, but continue to use their old gas-guzzler, making an emissions price a blunt way to change personal vehicle emissions. In contrast, businesses might be quick to adopt more efficient vehicles if they realize a cost advantage by using new technology in response to a price on emissions (Tertzakian 2017).[4] If the problem with the emissions price a CFS is intended to solve is not economy-wide and if certain kinds of fuels are more responsive to carbon pricing, a CFS should not be adopted economy-wide and for all fuels.

As well, there would be an economic cost to applying a CFS in cases where a price on emissions is a more cost-effective way to reduce emissions, since a CFS would make some socially beneficial activities, even if they create some pollution, overly expensive. For example, for industrial users that need a particular kind of fuel, switching to a fuel with lower emissions might involve major retooling and capital for their industrial process. For such users, a CFS would need to reach a high cost to induce emissions reductions.

Pre-implementation regulatory impact studies of the California (n.d.) program predicted negligible effects on employment and aggregate economic growth, but they did expect reductions in output in the local petroleum products sector of around 1 percent per year by 2020. Canada's proposed CFS, however, likely would have a larger competitiveness cost because it would apply to all fuel combustion, including industrial production, unlike California's policy, which applies only to transportation fuels, affecting mostly domestic households. Thus, the application of Ottawa's proposal to energy-intensive trade-exposed sectors would have a greater likelihood than California's CFS, which applies mostly to transportation activities inherently inside the state, of leading Canadian companies to perhaps relocate elsewhere to avoid the higher cost of emissions.

4 An alternative view of the effect of a clean fuel standard is Lepitzki and Axsen (2018) who show in a model that personal vehicle operators will have a larger response than freight vehicle operators to a clean fuel standard.

In contrast, a set price on emissions would deter only activities in which the economic value is low relative to the price. A number of studies have estimated the theoretical economic cost of a CFS relative to a price on emissions. Holland et al. (2015a) find that, for the same amount of emissions reductions, the average economic cost of reducing one tonne of emissions due to a CFS would be more than twice the cost of doing so with an emissions price. Anderson, Fischer, and Egorenkov (2016) find that a CFS would be more economically costly than other policies, such as vehicle fuel economy standards.

Another economic problem with a CFS or renewable fuel standard is that it would not address a core reason for pollution: the amount of driving. A CFS would promote lower-emissions intensity in fuels sold, but because it would amount to a subsidy for using these fuels, people would drive more. Since there would be no cap on total emissions from fuels under a CFS, on its own a CFS would have ambiguous effects on GHG emissions (Holland et al. 2015b). Thus, to understand the net effect of a CFS, it needs to be examined in the context of carbon pricing. In addition, the diversion of cropland from food production to fuel production also might end up increasing food prices, making the global economy worse off (Chen et al. 2014).

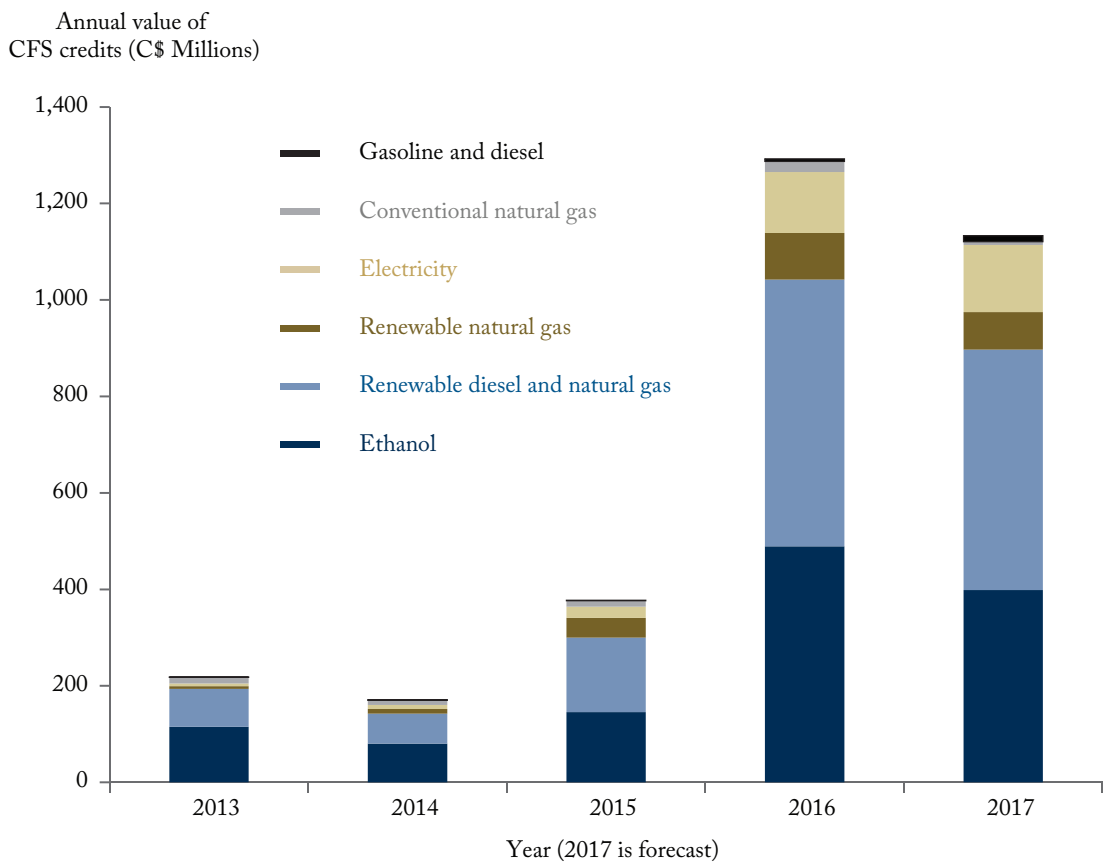
Rivers and Wigle (2018) show that a CFS would have a higher economic cost than would an emissions price at current carbon price levels. However, a very limited and small-scale CFS would have the benefit of being a low-cost option if emissions prices in the rest of the economy increased substantially. That is, a CFS could be a low-cost policy if policymakers used the easiest-to-obtain emissions reductions such a policy might deliver after exhausting the low-cost options that emerge from carbon pricing. Rivers and Wigle (2018) find that the economic costs of a CFS limited to reducing transportation emissions from liquid fuels would rapidly increase if the policy sought to reduce emissions by more than 10 megatonnes (MT) per year. For comparison, the federal CFS plan would reduce emissions by 30 MT a year from all fuels in the Canadian economy for both transportation and other sources of emissions.

The Cost of a CFS versus Emissions Prices: The Evidence

By 2020, California's CFS aims to achieve 25 MT of emissions reductions from transportation fuels, out of a projected total reduction of around 180 MT (California Air Resources Board 2017a). Canada's existing policies are set to reduce emissions by 232 MT by 2030, with a CFS expected to represent 30 MT of that, albeit for all fuels, not just transportation fuels (Canada 2018a). California's CFS has mostly resulted in ethanol and biodiesel receiving credits for offsetting fossil fuels. In 2016 and 2017, producers of these fuels received most of the more than $1 billion (all dollar amounts are in 2017 Canadian currency) per year in CFS credits (Figure 2). Although other vehicle fuel types are eligible, ethanol and biodiesel – the kinds of products already supported by renewable fuel standards – are the dominant source of existing CFS programs.

The cost of emissions reductions from CFS programs in California and British Columbia is now many times that of emissions permit prices in the broader market (Figure 3). The market-clearing price for permits – in either a cap-and-trade program or a CFS – is equal to the marginal cost of the most expensive actual emissions reductions that businesses are willing to take on. The cost of emissions reductions under British Columbia's CFS was $164 per tonne in 2017, compared with the $30 per tonne carbon tax that has prevailed since 2013. Similarly in California, after initially low prices for CFS permits, the cost of permits peaked at $160 per tonne of emissions reductions, much higher than the average California economy-wide emissions cap-and-trade price of around $18 per tonne. The narrower base of the CFS – which applies only to transportation fuels, not to economy-wide emissions – results in a higher cost of emissions reduction. California's CFS was forecast to reduce emissions by 6 MT by 2016, and British Columbia's by 1.1 MT that year (see British Columbia 2017;

Figure 2: Low-Carbon Fuel Standard Credit Values by Fuel Type, California, 2013-17



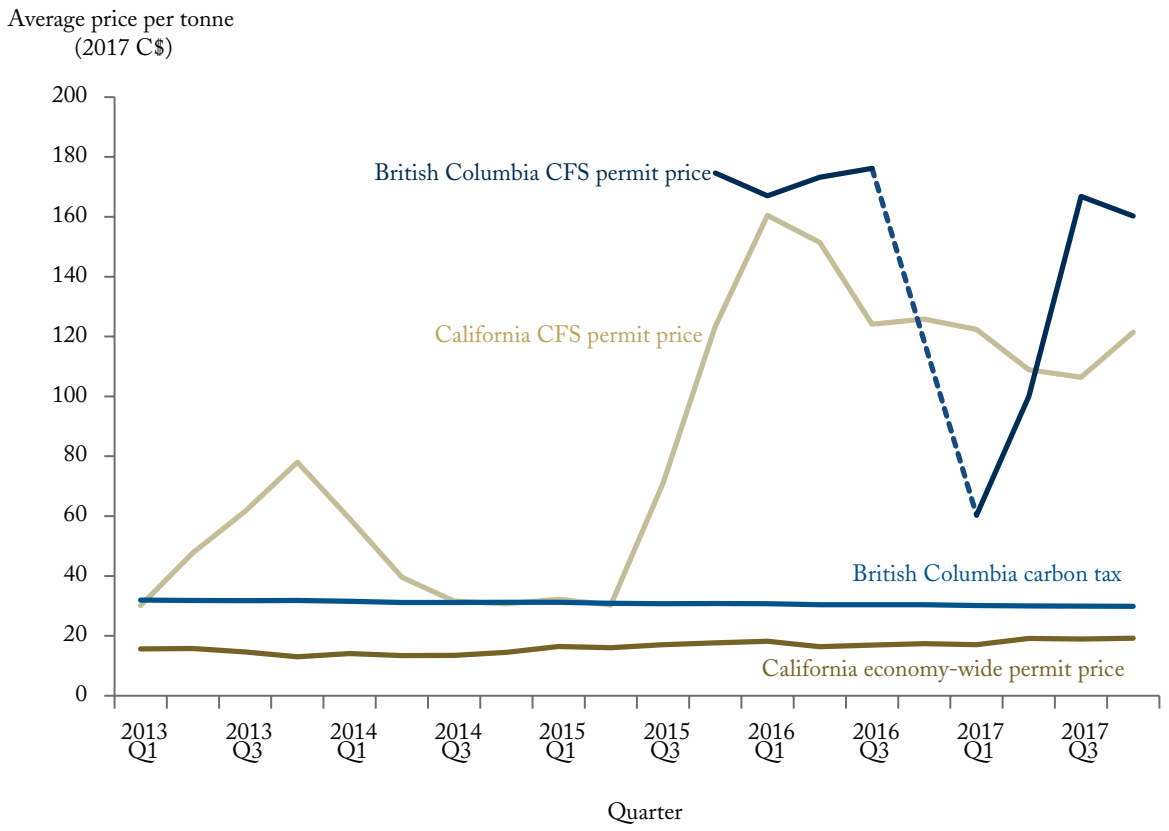
Source: Author's calculations from California Air Resources Board.

California Air Resources Board 2015). The total excess cost of the CFS to California drivers over and above the cost of the cap-and-trade price is around $100 per tonne. Divided by the total amount of fuel sold in the state, the total extra cost to drivers ranged between 1.2 and 1.8 cents per litre over the 2016–17 period, assuming the cost was fully passed onto drivers. Future increases in the scope of the CFS in California, which will reduce the carbon intensity of fuel by 18 percent relative to 2010, are forecast to range from 3 to 7 cents per litre by 2030 (California Air Resources Board 2017b).

Fixing Fuel Standards

The current examples of a state- or provincial-level CFS show high costs compared with a carbon tax. So why is Ottawa moving full-steam ahead? The federal government has not disclosed a specific reason for introducing a CFS, but its latest statement on the objective of a CFS is that it would "achieve 30 megatonnes of annual reductions in GHG emissions by 2030, contributing to Canada's overall target of a 30% GHG emission reduction below 2005 levels by 2030" (Canada 2018b). This is not a sufficient case for a specific policy tool. Many policies

Figure 3: Average Low-Carbon Fuel Standards and Economy-Wide Emissions Price per Credit, British Columbia and California, 2013–17



Note: Dotted line indicates period of no permit transactions.

Source: Author's calculations from California Air Resources Board and British Columbia Ministry of Energy, Mines and Petroleum Resources.

can, in theory, reduce GHG emissions. A proper test of the case for a policy tool is whether it is best suited to the specific policy need.

What Should Ottawa Do to Justify a Clean Fuel Standard?

The first step is for the federal government to complete and then release its own estimates of the economic cost of a CFS compared with a price on emissions. Rivers and Wigle (2018), for example, show that a CFS would have a large economic cost, although their study examines a CFS applied only to transportation fuels, not to all fuels, as Ottawa proposes. If the economic cost of the proposed CFS plan would be higher than that of a price on emissions, the federal government should have specific cost/benefit reasons to justify having a CFS in addition to a price on emissions. Other studies (Clean Energy Canada 2017; Jaccard and Vass 2017) report a relatively low cost, but none of these studies exactly models the federal proposal, so we do not know the cost of the proposed

plan. Accordingly, Ottawa should follow California's lead in making available detailed cost estimates of a CFS (California Air Resources Board 2017b).

Second, Ottawa should be careful about applying the same policy to businesses – particularly emissions-intensive, trade-exposed ones – that might be most effective when targeted at households. The federal government recently put in place plans to reduce competitiveness concerns from its broader pricing plan (Canada 2018c). Rather than create two separate regulatory systems – one for GHG pricing and another for fuel distributors – Ottawa should give companies the option to satisfy both policies in a single system.

Third, the evidence so far from California shows that a CFS largely results in traditional biofuels, such as ethanol and biodiesel, providing most of the emissions reductions. Thus, having both a CFS and a patchwork of provincial renewable fuel mandates would be duplicative. Ottawa and the provinces should remove their outdated renewable fuel mandates and state an implementation date, if the federal CFS proposal moves ahead.

Finally, and most important, Ottawa needs to remember that a price on emissions is the lowest-cost way to reduce emissions in the long term. Until it reaches many times its current level, an emission price will remain a more cost-effective way to reduce emissions than would a CFS. Policymakers should promote the importance of using efficient ways of reducing emissions, instead of policies with high economic costs. A CFS would make sense only if a carbon price high enough to result in emissions reductions from sectors targeted by a CFS were not politically feasible.

Driving Fuel Standards in the Right Direction

A clean fuel standard could have a large economic cost relative to pure emissions pricing, especially on energy-intensive, trade-exposed sectors. Such a policy could also be a burdensome regulation and duplicative of existing renewable fuel mandates. The federal government has released neither a clear rationale for the proposal nor an economic costing of it. Before proceeding with the plan, Ottawa should make it clear why Canada needs a CFS in addition to a price on emissions. In the absence of such a clear case, Ottawa should slow down on its CFS plan.

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Benjamin Dachis is Associate Director, Research at the C.D. Howe Institute.

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