THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

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January 19, 2018

RE: International Council on Clean Transportation comments on the Clean Fuel Standard Regulatory Framework

These comments are submitted by the International Council on Clean Transportation (ICCT). The ICCT is an independent nonprofit organization founded to provide unbiased research and technical analysis to environmental regulators. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change. We promote best practices and comprehensive solutions to increase vehicle efficiency, increase the sustainability of alternative fuels, reduce pollution from the in-use fleet, and curtail emissions of local air pollutants and greenhouse gases (GHG) from international goods movement.

The ICCT welcomes the opportunity to provide comments on Environment and Climate Change Canada's (ECCC) Regulatory Framework. We commend ECCC for its continuing efforts to promote a cleaner, lower-carbon transportation sector that uses less petroleum-based fuels. This proposed program builds upon the impressive steps ECCC has undertaken to promote low-carbon fuels. The comments below offer a number of technical observations and recommendations for ECCC to consider in its efforts to build this program and maximize the program's benefits in mitigating the risks of climate change and reducing petroleum use.

We would be glad to clarify or elaborate on any points made in the below comments. If there are any questions, ECCC staff can feel free to contact Dr. Stephanie Searle (stephanie@theicct.org).

Fanta Kamakaté

Chief Program Officer

International Council on Clean Transportation

Summary of comments

ICCT supports the ambitious greenhouse gas (GHG) reduction goal of the Clean Fuel Standard and its approach to calculate GHG savings on the basis of lifecycle analysis. However, the omission of indirect land use change (ILUC) accounting will significantly undermine the GHG savings of the program. ILUC occurs whenever biofuel is produced from any crop grown on existing agricultural land, and the available evidence does not support an argument that Canadian biofuels are free from ILUC. Land use change emissions are also very high when stemwood or whole trees are used for bioenergy or biofuels. If ILUC is not addressed, Canada could support biofuels and bioenergy that worsen climate change compared to fossil fuels. In addition, the benefit of differentiating pathways in a GHG standard would be erased if ILUC accounting is not implemented because high-ILUC feedstocks could receive greater policy support than feedstocks with higher direct emissions but a better overall climate performance.

We recommend that Canada implement either ILUC accounting or a non-food based fuel policy, similar to leading jurisdictions in the US and EU. If these measures are not possible, we recommend that Canada implement a combination of support measures for advanced alternative fuels produced from very low carbon feedstocks to reduce the ILUC impacts of the Clean Fuel Standard.

We recommend that Canada set GHG performance targets and baseline GHG intensities by sector instead of by fuel type. Setting standards by fuel type may create an unintended incentive to switch fuel types within a sector and would over-incentivize solid and liquid fuel substitutes compared to renewable gaseous fuels. Especially if land use change impacts are not accounted for, setting standards by fuel type could perversely incentivize switching from natural gas to biofuel and biomass feedstocks with very high lifecycle emissions.

Indirect emissions of fuel production

ICCT supports the ambitious greenhouse gas (GHG) reduction goal of the Clean Fuel Standard and its approach to calculate GHG savings on the basis of lifecycle analysis. However, the omission of indirect land use change (ILUC) accounting will significantly undermine the GHG savings of the program.

Canada has likely experienced ILUC as a result of its biofuel policies

The summary of comments on the Clean Fuel Standard Discussion Paper included a viewpoint that “Canadian practices demonstrates very little iLUC impact but are not reflected in iLUC models” (IISD, 2017). Here, we argue that this is unlikely to be true.

ILUC occurs as a result of any policy that promotes the use of commodities produced on existing agricultural land. Because this effect is indirect, most land use change likely does not take place in the vicinity of where the biofuel feedstock is grown, or for the most part even in the same country. When agricultural commodities grown on existing cropland are used for biofuel, this raises the overall demand of those commodities. Because agricultural commodities are traded on a global market, an increase in demand in one country raises the price of that commodity worldwide. Total production of that crop is expected to increase as a result of the higher price, and that cropland expansion could occur in any and all countries that produce the commodity.

Canada has experienced a gradual increase in total harvested crop area over the past several decades, and that increase has continued as biofuel production has increased. Figure 1 compares the increase in both crop area and biofuel production from 2010 to 2016, the period over which our biofuel production data is available (FAOSTAT; USDA, 2016). We can see this effect more clearly if we focus on canola oil, as we have the data available to track the full ramp up of this type of biofuel (Figure 2). Although there are some differences in the time trend, total canola harvested area has increased over roughly the same time period that the amount of canola oil used in biodiesel has ramped up. Biofuel demand is not likely the only factor affecting total canola harvested area; canola demand may also be increasing due to population growth or dietary changes. However, the data suggest the possibility that canola biodiesel demand has contributed to increasing canola acreage in Canada over the past several years.

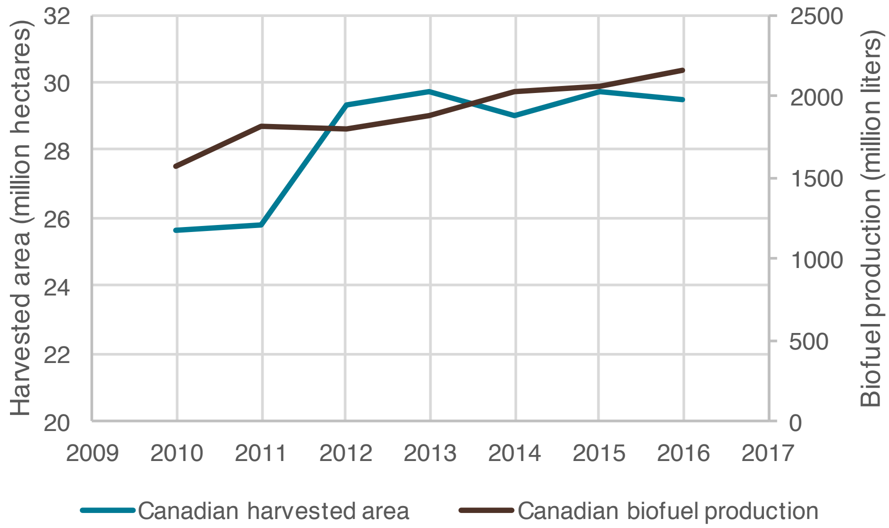

Figure 1: Total harvested agricultural area and biofuel production in Canada over the period 2010 to 2016. Data from FAOSTAT and USDA (2016)

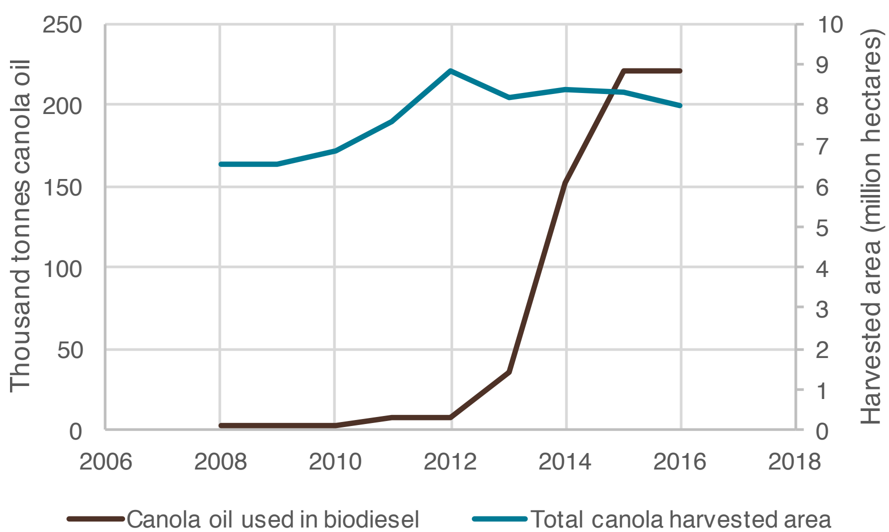

Figure 2: Canola oil used in biodiesel and total canola harvested area in Canada over the period 2010 to 2016. Data from FAOSTAT and USDA (2016)

We still would not expect to see most of the effect of Canadian biofuel demand on crop area in Canada itself. Since increasing demand for canola in Canada would raise canola prices worldwide, we would expect much of the total resulting increase in crop area to occur in other countries. Moreover, vegetable oils, including canola oil, are substitutable for one another, and we would actually expect to see the canola price increase transmitted to other vegetable oils such as palm oil. In fact, our research has shown that increases in canola oil price in Europe (where most biodiesel is produced from canola) result in increases in palm oil imports from Indonesia and Malaysia. Similarly, we found that increases in soy oil price in the US drive increases in palm oil imports (Searle, 2017; Santeramo, 2017). The net effect of increasing canola oil demand in Canada is very likely felt in other countries, and also in other crops. This effect may be particularly pronounced in developing countries, where land governance tends to be weaker. Unfortunately, these countries are often also in tropical or subtropical areas with high carbon stocks such as Indonesia (Petrenko et al., 2016). We do in fact see rapidly increasing harvested area in the world's Least Developed Countries, according to the UN classification (Figure 3). Most of the harvested area increase in Least Developed Countries is likely from population growth and dietary changes. However, it does seem likely that much of land use change occurring as a result of Canada's biofuel policy is occurring in other countries.

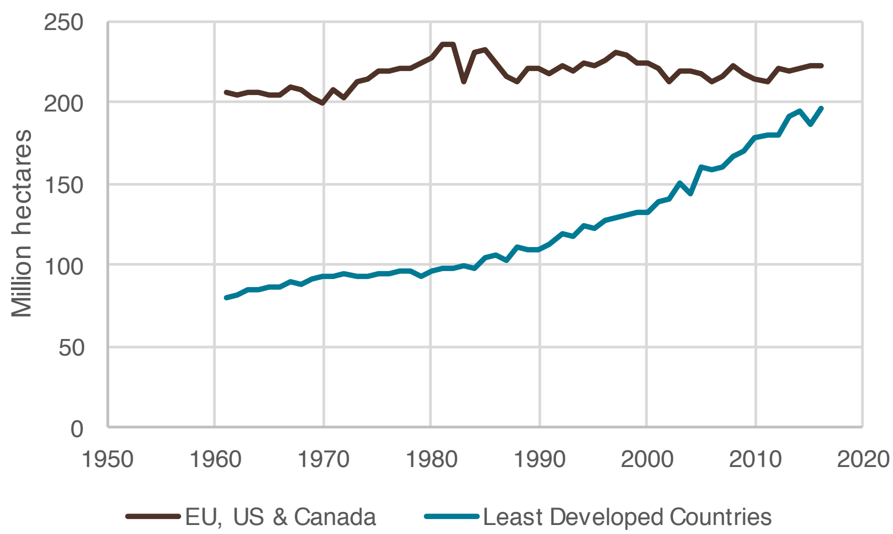

Figure 3: Total harvested agricultural area over time in the EU, US & Canada compared with Least Developed Countries. Data from FAOSTAT

Biofuel proponents might argue that harvested area increases in Canada are not the result of biofuel demand because the total amount of feedstock used for biofuel in Canada is less than the amount of additional feedstock produced from increasing yields. It is true that canola yields in Canada have increased, and that the additional amount of canola oil produced from yield increases since 2008 exceed the amount used for biodiesel. However, this argument incorrectly attributes the canola yield increases in Canada to biofuel policy. It is important to understand that canola yields in Canada have been increasing for decades, and would have continued to increase over the period 2008-2016 in the absence of biofuel policy ("baseline" yield increases). In fact, we see that rate of yield increase has not changed from the period 2000-2011 (before significant amounts of canola oil were used in biodiesel) to the period 2012-2016 (when significantly higher amounts of canola oil were used in biodiesel) (Figure 4). This suggests that canola yields have been increasing simply as a result of the same technological improvements that have driven yield increases for decades. Our previous research has shown that it is very unlikely that biofuel demand has resulted in above-baseline yield increases (Berry and Schlenker, 2011; Malins et al., 2014).

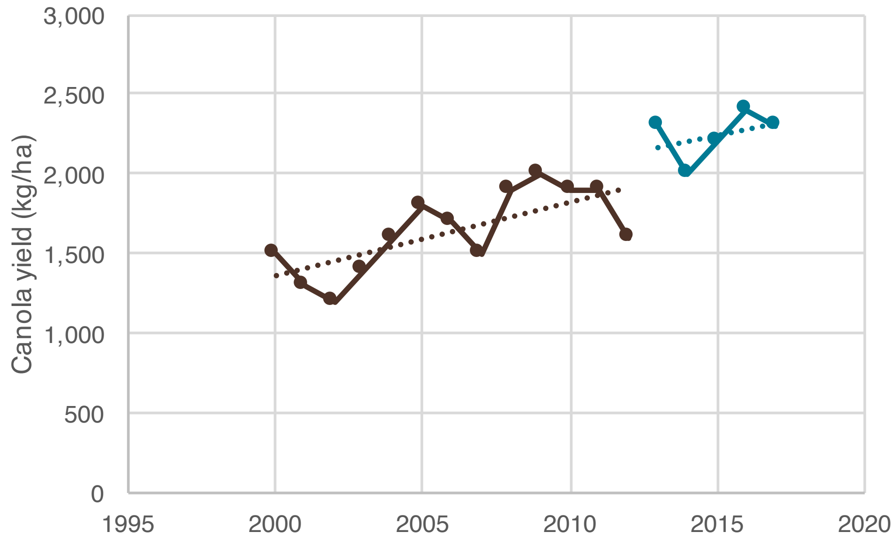

Figure 4: Canola yield in Canada over the periods 2000-2011 and 2012-2016. Data from Statistics Canada

Whether or not yield increases are due to biofuel demand is important in understanding whether biofuel demand causes ILUC. The available evidence suggests that, in the absence of biofuel demand, canola yields in Canada would have grown by the same amount that we see in Figure 4. If Canada never had a biofuel policy, the additional canola resulting from increased yields would have been available for food and other uses. We might thus expect total canola harvested area in Canada to be lower than what we have actually seen (allowing room for other crops to increase production without expanding onto new land in Canada). Figure 5 shows a theoretical scenario where all of the canola oil that has been used for biofuel would have contributed to a reduction in total canola area in Canada in a “no biofuel” scenario. In reality, we would also expect international cropland area to have expanded less in a “no Canadian biofuel” scenario. In a “no Canadian biofuel” scenario, we would likely have experienced overall less land use change in Canada and internationally than we actually have, and total resulting GHG emissions from land use change would be lower.

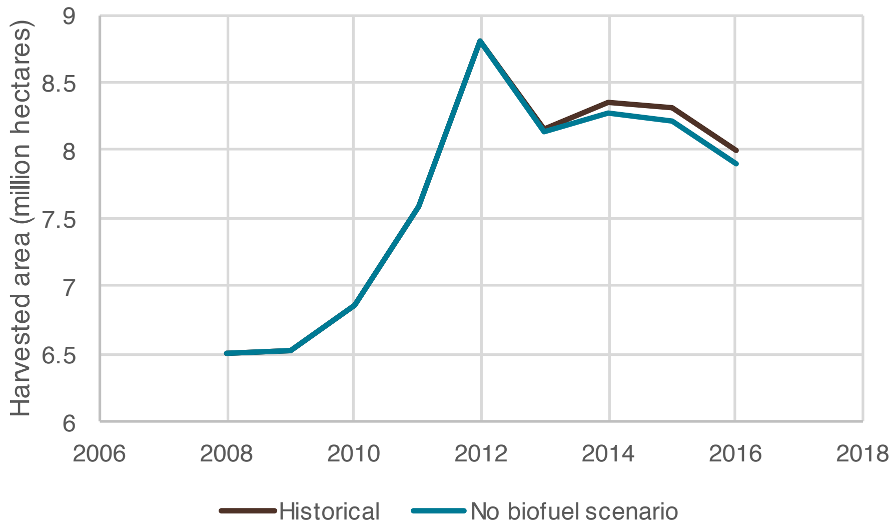

Figure 5: Historical canola harvested area in Canada and theoretical harvested canola area in a scenario with no biofuel demand. Historical data from Statistics Canada

It is difficult to see the effects of ILUC from Canadian biofuel policy in part because the effect has been small because Canadian biofuel production has remained relatively low. It is likely that the Clean Fuel Standard will incentivize substantially higher volumes of biofuel to 2030 than we have seen at present, and the consequential land use change impacts may become more apparent.

Importance of ILUC accounting

It is difficult to observe iLUC because it's impossible to see what the world would have looked like in a counterfactual scenario with no biofuel policy. As explained regarding Canadian canola harvested area above, it is impossible to separate out the many disparate drivers of agricultural changes when looking at historical data. Therefore, economic modeling is necessary to evaluate the aggregate impacts of biofuel policies on agricultural markets. Looking forward, to isolate the impact of biofuel policy specifically, it is necessary to use economic models to simulate global scenarios with and without biofuel policy. Use of these models has been the accepted scientific standard in major low carbon fuel policies in the US, California, and EU (EPA, 2010; ARB, 2015a; Laborde, 2011; Valin et al., 2015).

If Canada does not account for or otherwise address ILUC, the actual GHG reductions achieved by the Clean Fuel Standard will be substantially lower than reported. In the EU, the Renewable Energy Directive (European Union (EU), 2009) mandates 10% use of renewable energy in transport in 2020 but does not account for ILUC. As a result, the policy is expected to be met almost entirely with food-based biofuels that generate substantial ILUC emissions. In fact, the mix of food feedstocks used for biofuel in the EU is estimated to have ILUC emissions high enough to reverse the previously perceived climate benefits of the biofuel policy. With the most up-to-date ILUC science, we now understand that the EU's biofuel policy will result in net GHG emissions compared to petroleum (Figure 6). **Because of a failure to account for ILUC, the EU has perversely supported biofuels that are worse for climate than fossil fuels.**

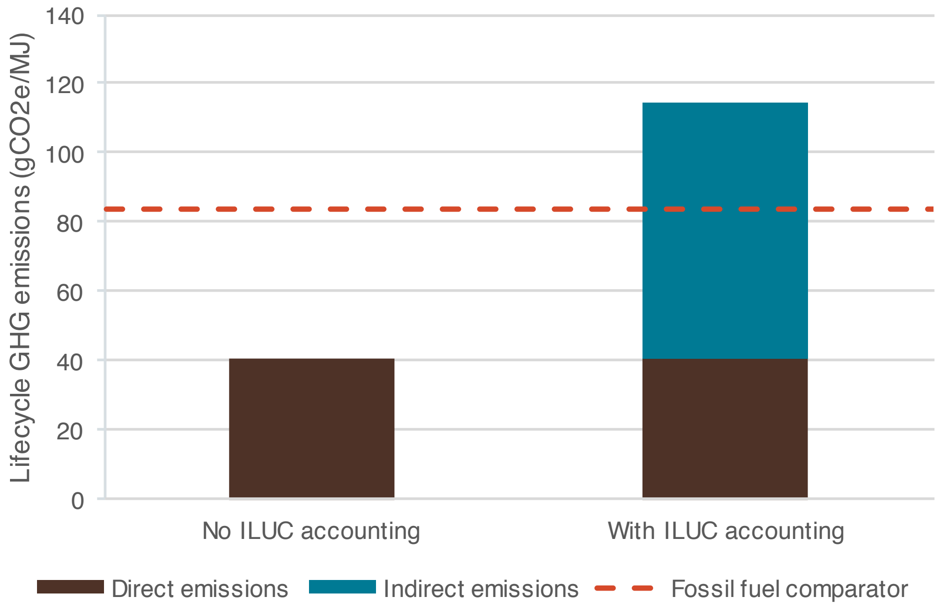

Figure 6: Lifecycle GHG emissions from EU biofuel policy with and without ILUC accounting. Source: Valin et al. (2015) and European Union (2009)

The perverse impacts of failing to account for ILUC will be even worse in Canada's Clean Fuel Standard, because Canada's policy aims to incentivize biofuels on the basis of their GHG reduction. ILUC accounting yields a completely different understanding of which biofuel feedstocks deliver the greatest benefits as compared with an approach that considers direct emissions alone (Figure 7). For example, palm biodiesel appears to be one of the lower-carbon feedstocks shown in Figure 7 on the basis of direct emissions alone. However, when we include indirect emissions, it is clear than palm biodiesel has the worst climate impact of these feedstocks, and has an even greater carbon intensity than the petroleum baseline. At the same time, landfill gas appears to be a relatively poor-performing feedstock on the basis of direct emissions, but in fact offers much greater GHG benefits compared to most of the other feedstocks in Figure 7 when accounting for ILUC. In this figure, we use ILUC emission estimates performed for California's Low Carbon Fuel Standard (ARB, 2015a), and median direct emission values for approved pathways of each feedstock category in the Low Carbon Fuel Standard (ARB, n.d.), except for palm biodiesel, for which we take the direct emission estimate from EPA (2012).

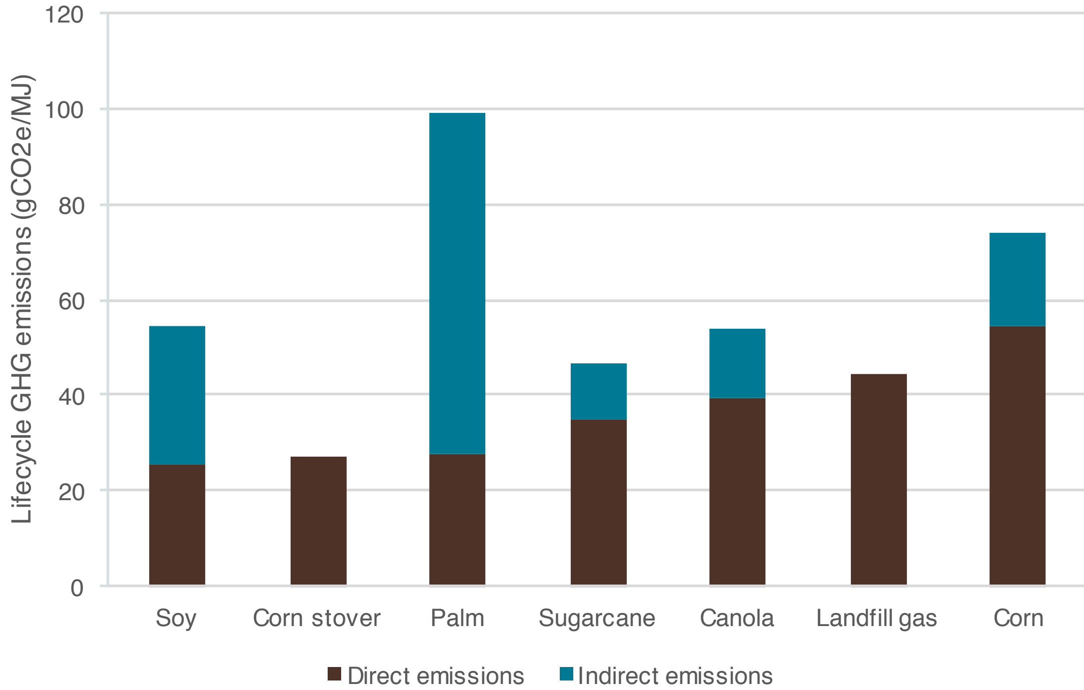

Figure 7: Lifecycle GHG emissions of common biofuel feedstocks with direct and indirect emissions. Source: ARB (2015a) and EPA (2012)

If the Clean Fuel Standard incentivizes different types of biofuels on the basis of GHG performance (presumably through tradable credits), it would award greater credit values per liter to the wrong biofuels in the absence of proper ILUC accounting. Figure 8 compares the credit value that would be awarded on the basis of direct emissions alone to the actual GHG impacts when ILUC is accounted for. Palm biodiesel would perversely be awarded high credit value while actually worsening climate change, and very low-carbon pathways such as corn stover and landfill gas would be under-incentivized. **The benefit of differentiating pathways in a GHG standard would be erased if ILUC accounting is not implemented.**

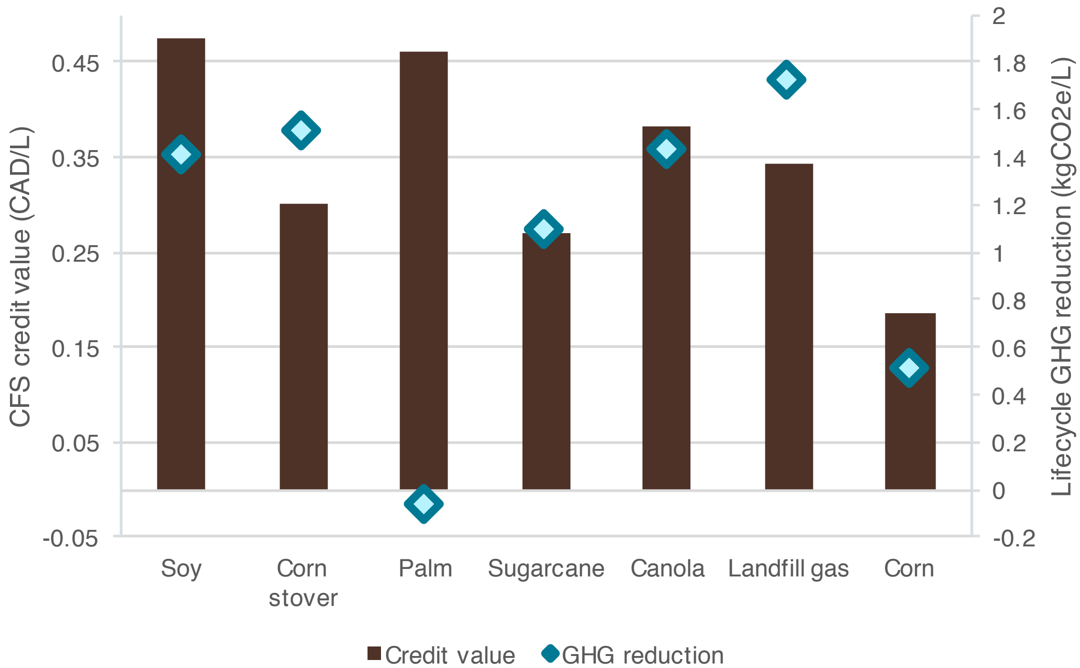

Figure 8: Estimated policy value of the Clean Fuel Standard for common biofuels compared to lifecycle GHG reduction per liter. Source: ARB (2015a) and EPA (2012)

**Note: Assuming CFS credit value of 200 CAD/tCO_2e reduction. Landfill gas is shown on the basis of gasoline-equivalent liters.*

Land use change emissions are not only a problem for food-based biofuels. Because the Clean Fuel Standard includes solid fuels, it is likely to incentivize the replacement of coal with biomass, as well as possibly the production of cellulosic biofuel from biomass. While using forestry residues and short-rotation woody crops on unused land with low carbon stocks can provide high GHG benefits (Valin et al., 2015), using stemwood for bioenergy results in a significant carbon debt. Forest stands store a substantial amount of carbon in biomass (IPCC, 2006). When that biomass is harvested for bioenergy, it takes many years to regrow. During that time, there is less standing biomass on the land and a greater total amount of CO_2 in the atmosphere. Eventually, the trees will regrow and be harvested again for energy, and after a period of time the climate benefit from displacing fossil fuels will exceed the carbon debt as well as the emissions from harvesting, transporting, and processing the biomass; this is called the payback period. The payback time represents the moment at which the total emissions from harvesting trees exactly matches the avoided emissions of displacing fossil fuels; GHG reductions are only achieved **after** the payback time. Most studies estimate payback times for stemwood or whole trees to be very long. The European Commission's Joint Research Center performed a comprehensive review on estimated payback periods of stemwood and whole trees (JRC, 2014). The median payback time in this review was 38 years. The only Canadian-specific study included in this review reported a payback time also of of 38 years for stemwood displacing coal when used for electricity and over 100 years when stemwood is used for biofuel production in Ontario (McKechnie, 2011).

Low carbon fuel policies in the US and California calculate GHG emissions on the basis of 30 years (EPA, 2010; ARB, 2015), while the EU calculates GHG emissions on the basis of 20 years (EU, 2010). If Canada follows this convention, **it is very likely that stemwood or whole trees used for fuel production in the Clean Fuel Standard would increase GHG emissions compared to fossil fuels.**

Indirect effects of petroleum use

The summary of comments on the Discussion Paper include a viewpoint “That iLUC should not discriminate against renewables but, if considered, should extend to fossil fuels, alternative vehicles and other alternatives” (IISD, 2017). In a previous study, we performed a comprehensive review of the indirect emissions associated with petroleum production and found no basis for including them in fuel policy (Malins et al., 2015). Most of the categories of indirect emissions that could apply to petroleum production are both very small and are omitted from assessments of indirect effects of biofuel production. For example, petroleum production induces some amount of land development, including the building of roads and pipelines, as well as the direct land use change occurring at the side of oil production. We found this term to be less than 1 gCO_2e/MJ (compared to total lifecycle emissions of 97-98 gCO_2e/MJ in California’s Low Carbon Fuel Standard, for example (ARB, 2015b)). Morever, induced land development such as road building or the land used at biofuel facility sites is not included in assessments of ILUC for biofuel feedstocks. Similarly, emissions from accidents such as oil spills are estimated to be less than 0.01 gCO_2e/MJ and are also not considered in biofuel assessments. We found one category of indirect emissions that could potentially be significant, but again is not included in biofuel lifecycle assessments used for regulations: indirect fuel use change. This refers to the increase in fuel demand that occurs as a result of increased fuel supply and reduced fuel prices; it is also known as the “rebound effect.” We note that if indirect fuel use change were accounted for in biofuel policy, it would likely substantially increase estimated emissions for all biofuel pathways. **Apart from indirect fuel use change, no indirect effect from petroleum production is likely to change our understanding of the net GHG impacts of policies incentivizing biofuel demand.**

Options for addressing ILUC in the Clean Fuel Standard

Other jurisidictions have adopted one of two strategies for addressing ILUC:

- The US, California, and Oregon include ILUC accounting in estimating the GHG intensities of different biofuel pathways (EPA, 2010; ARB, 2015; DEQ, 2015)
- The European Commission has proposed to exclude food-based biofuels from its 2030 renewable fuel in transport target completely, incentivizing only wastes, residues, and lignocellulosic material, as well as other low carbon fuels such as renewable power-to-liquids and renewable electricity used in vehicles (European Commission, 2016)

ICCT recommends following one of those two approaches.

The Regulatory Framework states that “whether the impacts of indirect land use change should be accounted for” will be reconsidered during a future review of the Clean Fuel Standard. We caution that waiting to assess and address ILUC at a later date will be far more difficult than addressing it at the start of a policy. The EU followed this approach and did not include ILUC accounting in the Renewable Energy Directive, requiring the European Commission to make a proposal for how to address ILUC at a later date. By the time the European Commission released its ILUC assessment, which found that the EU’s biofuel mix had very high ILUC emissions, the food-based biofuel industry had already made significant investment. It was thus politically impossible to remove or meaningfully reduce support for these poor-performing pathways, and the EU still does not account for ILUC and is on track to worsen climate change with its biofuel policy (Figure 6). This debate worsened policy certainty for all biofuel producers, obligated parties, and other stakeholders. The EU has been widely criticized for these actions and as a result the Commission has attempted to move beyond food-based biofuels entirely with its 2030 proposal.

ILUC varies both by feedstock and by country where the biofuel policy takes place. If Canada adopts ILUC accounting, it would be ideal to conduct a Canada-specific ILUC modeling exercise. If there is not sufficient time to complete ILUC modeling before finalizing the Clean Fuel Standard regulation, Canada could consider adopting ILUC values from another jurisdiction, such as those developed for California's Low Carbon Fuel Standard or for the U.S. federal Renewable Fuel Standard, as temporary, provisional values. Canada could then conduct its own ILUC modeling exercise, and the resulting ILUC factors would replace the provisional values once that study is complete. **Adopting provisional ILUC values at the start of the Clean Fuel Standard program would provide far more regulatory certainty than waiting until the future review to address ILUC.** It is very likely that Canada-specific ILUC values as determined by future modeling will be closer to those adopted by other jurisdictions than to zero. Adopting provisional values now would thus send a more accurate value signal to alternative fuel producers and will avoid building up an industry based on policy support that could later be reduced. Importantly, adopting provisional ILUC values at the start of the Clean Fuel Standard program will ensure that real GHG savings are achieved during the early years of the program.

If it is not politically feasible to include ILUC accounting in the Clean Fuel Standard at all, nor to reserve policy support only for non-food based fuels, Canada could consider other measures to reduce the ILUC impact and improve the GHG performance of its policy:

- A high, binding subtarget for fuels from very low carbon feedstocks
- Multiple counting of fuels from very low carbon feedstocks
- Additional fiscal support for advanced fuel technologies using very low carbon feedstocks
- Do not allow palm biodiesel to participate in the Clean Fuel Standard

Very low carbon feedstocks include wastes with no other uses and sustainably produced cellulosic feedstocks grown on unused, low carbon land. Our research has shown that some byproducts and residues that are sometimes considered "wastes" can have high indirect emissions if displaced from existing uses (Searle et al., 2017). Some types of lignocellulosic feedstocks, namely stemwood, as explained above, does not deliver net GHG savings over a reasonable timeframe. It is thus necessary to exclude these feedstocks from advanced biofuel support to ensure the intended GHG benefits are achieved. Palm biodiesel has been shown to cause higher GHG emissions than petroleum in analyses performed for low carbon fuel policies in other jurisdictions; there is abundant evidence that this feedstock is very unlikely to deliver GHG savings for Canada and thus should be excluded from the Clean Fuel Standard overall.

If Canada chooses to support advanced low carbon fuels through this strategy, it is important that the combination of all four of these measures (subtarget, multiple counting, fiscal support, and palm oil ban) be implemented, rather than a single measure. Each of these policy elements has been adopted in the US or EU, but these efforts have not resulted in significant progress of the advanced low carbon fuel industry (Bitnere, 2017). In particular, one compromise from the EU ILUC debate was to adopt a non-binding 0.5% advanced biofuel target and double counting for non-food feedstocks. The incentive from double counting was effective at promoting the use of first-generation non-food biofuel pathways such as biodiesel produced from used cooking oil, but was not sufficient to support investment in advanced technologies. Because the 0.5% advanced biofuel target was low and non-binding, few specific measures have been put in place to support it. **Policy measures to support advanced biofuels that are not ambitious and strongly implemented will not have a meaningful effect on the overall climate performance of the Clean Fuel Standard.** Lastly, it is important to remember that failure to account for indirect emissions defeats the purposes of a GHG performance-based standard, even if additional incentives are provided for lower carbon fuels.

Partitioning by fuel type

The Regulatory Framework states: “The clean fuel standard will set separate carbon intensity requirements for liquid, gaseous and solid fuel streams.” It appears that one intention of this design is to ensure GHG reductions are achieved in each of the transportation, industrial, and building sectors. However, this design would have the unintended effect of incentivizing the switch from one fuel type to another and could perversely lead to GHG emission increases, especially if land use change emissions from stemwood harvest are not accounted for (i.e. the carbon debt problem described above).

The Regulatory Framework proposes to set baseline emissions for each of liquid, gaseous, and solid fuels. Emission reductions of alternative fuels would then be calculated based on the difference of the carbon intensity of those fuels and the baseline fuels. One key element in this design is that the baseline emissions of each fuel type are likely to be very different. To provide an illustration, the GHG intensity of both petroleum and coal is typically roughly around 90 gCO_2e/MJ, while the GHG intensity of natural gas is half that, roughly around 45 gCO2e/MJ (on a pre-combustion energy basis). There is thus a much greater incentive to displace coal compared to displacing natural gas, even if the natural gas alternative has a lower GHG intensity than that of the coal alternative. We illustrate this problem in Figure 9. The GHG reduction of replacing coal with stemwood is around double that of replacing natural gas with landfill gas, if the carbon debt of stemwood harvest is ignored. If Clean Fuel Standard credit values are equivalent across fuel types, the policy value of using stemwood would also be around double that of using natural gas. This situation would create a perverse incentive for the replacement of natural gas boilers with solid fuel furnaces to combust biomass. If carbon debt is ignored and stemwood is used, this is the worst possible climate outcome. Landfill gas, which has a very low GHG intensity in this example, would not receive a sufficient incentive because it is compared to natural gas, which has a significantly lower GHG intensity than the solid fuel comparator. Setting separate GHG reduction requirements and baseline GHG intensities for different fuel types will create perverse incentives for switching from gaseous to solid fuels. This design will also under-incentivize beneficial fuel switching within a sector, such as a switching from diesel to landfill gas in vehicles (Figure 9).

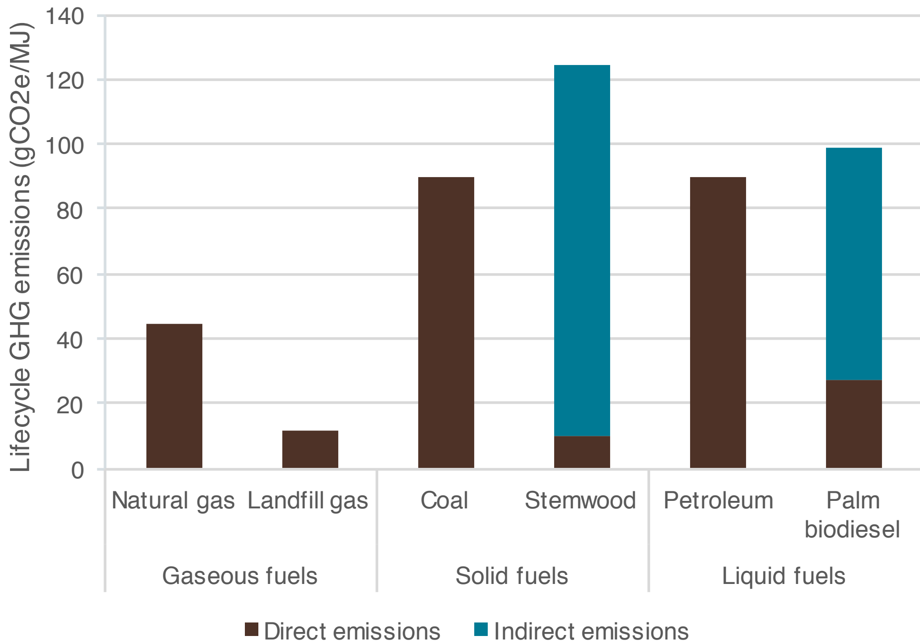

Figure 9: Illustration of potential GHG intensities of different fuel types

**Note: the illustrative GHG intensity of landfill gas in Figure 9 reflects a typical GHG intensity for in-state landfill gas in California's Low Carbon Fuel Standard. The GHG intensity for landfill gas shown in Figures 7 and 8 is the median value for all natural gas suppliers to California, which includes cross-state transportation emissions.*

We note that the Clean Fuel Standard obligation will be on fuel producers and importers (and on distributers for natural gas, with details to be determined for other types of gaseous fuels). There would thus not be a direct incentive for a natural gas distributor for example, to switch to using stemwood. The natural gas distributor does not decide what type of boiler or furnace consumers use, and if a consumer switches from a gas boiler to a solid fuel boiler, the fuel supply to that consumer would not longer be part of the natural gas producer's pool. But we would still expect this policy design to incentivize switching. A forestry company would collect large amounts of credits for supplying stemwood, and presumably would sell some of those to coal producers and importers. The forestry company would likely pass on the value of that incentive by reducing the price of stemwood. A supplier or distributor of landfill gas, on the other hand, would not generate very high credit amounts for a given amount of fuel delivered, and would not reduce the price of natural gas by as much as the discount on stemwood. A consumer would then see the greatly reduced stemwood price and may decide to switch from a gas boiler to a solid fuel boiler due to that low price. Consumers retiring old boilers or otherwise in need of a new boiler would be particularly incentivized to purchase new solid fuel boilers.

Setting separate GHG reduction requirements and baseline GHG intensities for each sector, instead of each fuel type, would eliminate this perverse incentive to use solid and liquid fuels instead of gaseous fuels. This policy design would add some regulatory complexity, but we argue that the benefit of preventing perverse climate outcomes may be worth the administrative cost. Canada could require all fuel producers to track and report which sectors to which they are supplying fuel in an early reporting year of the Clean Fuel Standard program. Canada could then use that information to calculate a baseline GHG intensity for each sector based on its current fuel mix. Fuel suppliers would have different GHG reduction requirements for each sector they supply and would be obligated to meet each independently. In this system, Canada could consider identifying tradable credits by sector as well as fuel type and, if needed, could restrict credit trading cross-sector to ensure that each sector meets its target.

We note that the above GHG intensity estimates are presented on the basis of fuel before it is combusted. Low carbon fuel policies in the EU and US all calculate GHG intensities pre-combustion, reflecting the energy content of the fuel itself. This makes sense because other policies promote greater efficiency of vehicles. However, the GHG intensity of coal electricity is often reported post-combustion, per MJ of electricity provided by a combustion facility. It will be important for Canada to clarify whether solid and gaseous fuels used outside transportation will be assessed on a pre-combustion or post-combustion basis. Calculating GHG intensities on a post-combustion basis would incentivize efficiency improvements in combustion, which may provide additional benefits if such improvements are not already covered by another Canadian policy. However, assessing GHG intensities on a post-combustion basis for solid and gaseous fuels but on a pre-combustion basis for liquid fuels would introduce a significant amount of regulatory complexity.

Lastly, the Regulatory Framework states "For gaseous fuels, consideration will be given to setting volumetric requirements for renewable content or a hybrid approach, such as volumetric requirements with GHG performance standards." This statement seems to suggest that Canada is considering setting a simple volumetric requirement, rather than a GHG performance standard, to gaseous fuels. Renewable gaseous fuels can have very different GHG intensities, and by setting a simple volumetric target, Canada would lose its leverage in promoting the less GHG intensive of these pathways. We highly recommend that, regardless of whether a volumetric requirement is imposed, Canada set a GHG performance standard for gaseous fuels.

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