Fuelling Canada's clean energy future:

The David Suzuki Foundation & Queen's University recommendations

to the Government of Canada's clean fuel standard consultation

by

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To: Mark Cauchi, Executive Director; Oil, Gas and Alternative Energy Division; Environment and Climate Change Canada

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While the co-authors of this contribution were participants in the Trottier Energy Futures Project (TEFP) — funded by the Trottier Family Foundation, the Canadian Academy of Engineering and the David Suzuki Foundation — the recommendations that follow are attributable only to the David Suzuki Foundation and Queen's University's Institute for Energy and Environmental Policy. The final TEFP report was completed in April 2016, and is available for download.[1] The TEFP developed a quantitative modelling approach to understand means of achieving an 80 per cent reduction in GHG emissions by 2050. The report was widely cited within *Canada's Mid-Century Long-term Low-Greenhouse Gas Development Strategy*, delivered by ECCC in 2016.[2]

The TEFP explored a variety of energy supply and demand scenarios. In a "business-as-usual" case, the report illustrates that projected energy use for passenger transport is expected to decline (due to efficiency improvements), while projected energy demand for freight transport would increase substantially; essentially highlighting a major shift from use of gasoline to use of diesel fuel in this sector. Current trends with respect to industry suggest that energy consumption will increase, and may slightly favour natural gas over electricity in coming years. With relation to buildings, the TEFP reports that current trends will continue the domination of natural gas (for heat, hot water and steam) and electricity (for appliances). Interestingly, under the business-as-usual case, electricity supply in Canada's energy mix is only seen to rise slightly, from 22 per cent now to 23 per cent in 2050. The TEFP then developed a series of scenarios to try to anticipate the required development of renewable energy (and associated conservation measures) to offset the growth in emissions associated with the business-as-usual case. The scenarios developed by the TEFP suggest that the most dominant change required by 2050 is the progressive reduction of the role of fossil fuels for meeting energy-based end uses — from 74 per cent today to 25 per cent or less. This change in end uses will require electricity supply to increase from 22 per cent to 60 per cent, or more, and for biomass/biofuels to increase from four per cent to 15 per cent or more.

The TEFP report provides significant insights into the potential makeup of Canada's future energy mix, and explores the energy required for transportation, industrial use and buildings. In this contribution, we draw from the TEFP report to support a series of four principal recommendations. We relate these recommendations to specific questions raised in the Discussion Paper posted on the ECCC website. Furthermore, given the strong evidence supporting the need to electrify as many energy end-uses as possible — but particularly transportation — we include two additional recommendations to ensure that electricity is appropriately considered.

The David Suzuki Foundation and Queen's University recommend:

1. Combine the Clean Fuel Standard with an enhanced Renewable Fuel Regulation in order to establish significant new, low-carbon energy sources for transportation.

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[1] https://www.cae-acg.ca/wp-content/uploads/2013/04/3_TEFP_Final-Report_160425.pdf

[2] http://unfccc.int/files/focus/long-term_strategies/application/pdf/canadas_mid-century_long-term_strategy.pdf

2. Expand the use of Renewable Fuel Regulations, paired with Clean Fuel Standards, to cover solid, liquid and gaseous fuels used in aviation and marine applications, as well as in stationary generation and heating across both industrial applications and individual building use.
3. Commit support to enhance GHGenius as Canada's preferred tool to measure environmental footprints associated with solid, liquid and gaseous fuels.
4. Consider mechanisms to support conservation efforts that complement the Clean Fuel Standard.
5. Include robust electricity pathways within the program to account for the increasing need for vehicle and home heating electrification.
6. Use only the most comprehensive and accurate data for credit generation to maintain the program's integrity and build market confidence.

1 Combine the Clean Fuel Standard with an enhanced Renewable Fuel Regulation in order to establish significant new, low-carbon energy sources for transportation

One of the key findings from the TEFP was that, even under the most promising scenarios, the dominant remaining source of GHG emissions in 2050 is energy consumption in the transportation sector (63 per cent of all energy-related emissions). The dominant challenges with further reductions in this sector were seen to be potential limitations on availability of feedstock for production of biofuels, high costs for electrifying inter-urban rail transport, and challenges with the use of hydrogen (which is expensive) for heavy freight transport. To achieve best-case scenario reductions in GHGs by 2050, the transport sector alone needs to reduce emissions from about 171 Mt/a in 2014 to 141 Mt/a in 2030.

The TEFP provides a number of scenarios for future energy generation that can achieve significant emission reductions. In the figure below, the implications of these scenarios for the transportation sector are shown. S1 illustrates the business-as-usual case, while the code under each of the other four scenarios indicates different technology pathways and different reduction targets (S3 uses traditional technologies, S8 combines these technologies with "disruptive" new technologies; R60, R70 correspond to 60 per cent and 70 per cent reductions in combustion-related emissions by 2050). The use of biofuels and electric vehicles begin to make up a majority of transportation energy requirements by 2050, although diesel, gasoline and aviation fuels are still in wide demand. Dramatic change compared to business as usual is required. Most significantly, cleaner fuels need to be combined with conservation measures as the total amount of energy "available" to the sector declines significantly.

[Q14] What lower carbon fuels and alternatives are available for use in each transportation sub-sector (e.g., on-road heavy duty, on-road light duty, off-road, rail, marine, aviation)?

[Q15] What is the technology-readiness for possible lower carbon fuels and alternatives in this sector?

The demand area that drops the most under TEFP scenarios is that of gasoline. Multiple pathways exist to offset light-duty fuel use, including biofuels (i.e., ethanol), electrification (electric cars or hybrid vehicles), and hydrogen (fuel-cell vehicles). These technologies are all at Technological Readiness Level (TRL) 8 or 9 — either in industrial demonstration or in wide-scale industrial use. Scenario 8 also considers the introduction of cellulosic ethanol to complement conventional ethanol. Cellulosic ethanol is currently at TRL 7, with initial industrial plants now operating in the U.S. and E.U. TEFP models suggest moderate to rapid growth in ethanol demand — between 3.2 and 5.8 billion litres per annum (bl.a) of additional capacity in conventional ethanol, above the existing 1.4 bl.a of capacity currently in Canada. This would require something between 10 and 20 new plants of significant capacity (i.e., facilities at 200+ million litres per year capacity). If disruptive technologies enable cellulosic ethanol, Canada could use as much as 7.6 bl.a of this fuel by 2050 (20 to 40 new plants). Diesel consumption also declines in TEFP scenarios, in an almost linear fashion from 2015. Most diesel consumption is offset by conservation or by biodiesel. Conventional biodiesel is at TRL 9; Fischer-Tropsch fuels, a form of renewable diesel, is currently at TRL 6-7 (when sourced from biomass). Scenario 3 requires about 14.2 bl.a of conventional biodiesel (~40 facilities), while Scenario 8 (which allows disruptive technologies) calls for 10 billion litres of capacity in Fischer-Tropsch fuels (approximately 20+ large plants), as well as 12.5 billion litres of traditional biodiesel (30+ large plants). In almost all scenarios, capacity will be required very quickly — by 2025 or so — suggesting that rapid new development of biofuel capacity must be facilitated.

[Q16] What barriers to the use of lower carbon fuels and alternatives are there in the transportation sector (technology, legislation, other)

A significant technical barrier to utilizing lower carbon fuels is the lack of production capacity, particularly related to biofuels (but also important for electricity generation). A second technical barrier is a lack of clarity around the available, sustainable feedstocks for biofuel development. These barriers may be addressed by selecting policies that will aggressively drive new capacity establishment.

[Q17] What may be needed for transportation to transition to lower carbon fuels?

The need for rapid deployment of renewable low-carbon fuels is clear from TEFP model runs. It is not clear that a Clean Fuel Standard alone can drive rapid investment in new capacity. One option might be to reconsider the Renewable Fuel Regulation, increasing renewable content mandates for both light-duty (gasoline) from five to 10 per cent (or more) and heavy-duty (diesel) from two to four per cent (or more). The Clean Fuel Standard should focus on achieving the best possible performance associated with all fuels, fossil- and renewable-based.

[Q10] Should different carbon intensity reduction targets be set for different fuels? If so, on what basis (e.g. more stringent target for fuels that have a higher carbon intensity)?

Significant reductions in GHG intensity could be achieved within existing renewable fuel plants by eliminating fossil fuels (i.e., using biomass for energy). Carbon intensity reduction targets for renewable fuels mandated by a higher Renewable Fuel Regulation could be more aggressive than those set for fossil fuels — i.e., aim for 100 per cent net emission reductions with renewables by 2030, versus 10 to 20 per cent for fossil fuels. In this scenario, the primary role of the Clean Fuel Standard should be to accelerate the cleanliness of renewable fuels generated under an increased mandate.

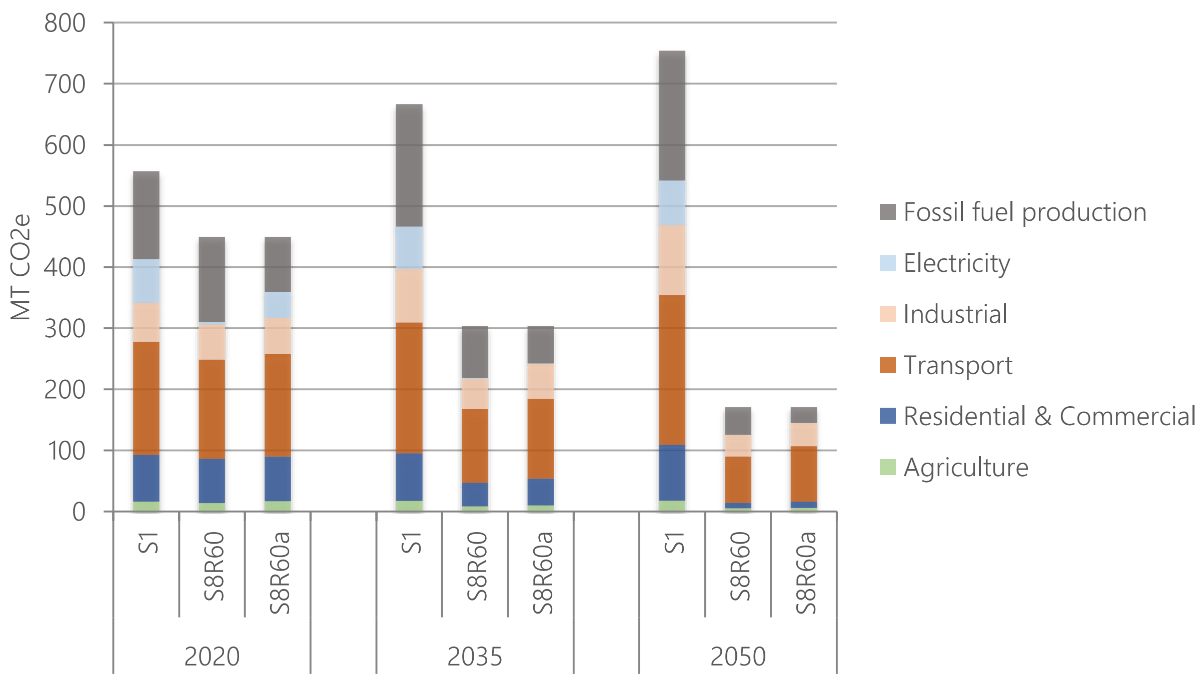
2 Expand the use of Renewable Fuel Regulations, paired with Clean Fuel Standards, to cover solid, liquid and gaseous fuels used in aviation and marine applications, as well as in stationary generation and heating across both industrial applications and building use

The previous section dealt largely with ground transportation. While only a fraction of total transport emissions, the aviation and marine transport subsectors are also important emitters. In both subsectors, biofuels may provide an option for greening transportation.

While the TEFP forecasts that transportation will remain the single largest contributor to emissions, the role of industry (at eight per cent) and buildings (two per cent) will also be significant. Energy consumption for the industrial sector increases from 2,336 PJ in 2013 to 3,976 PJ in 2050 (58 per cent increase). At the same time, emissions associated with the industrial sector and with buildings may fall, depending upon the source of electricity and the amount of fuel switching that occurs. The figure below illustrates the baseline as well as two scenarios where deep cuts are made to residential, commercial and industrial emissions.

The study notes that there are fuel-switching limitations, particularly in industrial applications, but emission reductions may also happen due to other forces. In the industrial sector, for example, the TEFP report notes that rising costs of fossil fuels (due to carbon pricing) may result in changes in industrial processes that reflect the impacts of such costs. The introduction of carbon pricing may be an important "driver" for reducing combustion emissions in the industrial sector.

In buildings, including houses and commercial buildings, primary energy uses are associated with space heating, space cooling and water heating. Retrofit options for existing homes and buildings and standards and codes for new buildings are relevant options to achieve GHG emission reductions.



[Q14, 19] What lower carbon fuels and alternatives are available to industrial/buildings sectors?

[Q15, 20] What is the technology-readiness for possible lower-carbon fuels and alternatives in these sector?

The TEFP predicts significant increases in industrial sector emissions under the business-as-usual case — from 64 million tonnes per annum (Mt.a) of CO_2-equivalent emissions in 2020, to 88 Mt.a in 2035, to 115 Mt.a in 2050. To achieve deep reduction goals, the TEFP suggests that industrial emissions must decline by to 50 Mt.a of CO_2-e by 2035 (a 38 Mt.a reduction compared to business-as-usual), and to 35 Mt.a of CO_2-e by 2050 (an 80 Mt.a reduction compared to business-as-usual). These types of reductions in emissions may only be achieved through dramatic process re-engineering, or through fuel switching from coal to natural gas, biofuels and ultimately to clean electricity. Fuel switching is possible and commercially demonstrated (TRL 9). Similarly, the TEFP anticipates that emissions associated with residential and commercial buildings will rise slightly over this period in the business-as-usual case — from 76 Mt.a in 2020 to 78 Mt.a in 2035 to 91 Mt.a in 2050. Deep reductions may be achieved in building-related emissions, however, through gradual phase-out of natural gas (as well as heating oil and propane) and uptake of clean-electricity-driven technologies, including ground source heat pumps (TRL 9). For both industry and buildings, shifting to new alternative low carbon fuels — required for deep decarbonization — will require significant investment in new technologies.

[Q19, 24] What barriers to the use of lower carbon fuel are there in the industrial and buildings sector (technical, legislative, other)?

[Q20, 25] What may be needed for industry/buildings to transition to lower carbon fuels?

A technical barrier to the uptake of lower carbon fuels in the industrial sector is the cost associated with fuel switching. Large cash investments are usually required to upgrade the fuel intakes and machinery involved. Fuel switching may also drive up operating costs. In the buildings sector, ground-source heat pumps remain expensive. In both sectors, a disruptive switch in energy use is required: this can be best facilitated by pairing a Renewable Fuel Regulation (to drive the disruptive change) with a Clean Fuel Standard (which ensures that the replacement fuel is clean).

[Q21] Are there particular issues or flexibilities associated with the use of lower carbon fuels in specific industrial sectors that should be taken into account in the design of the Clean Fuel Standard?

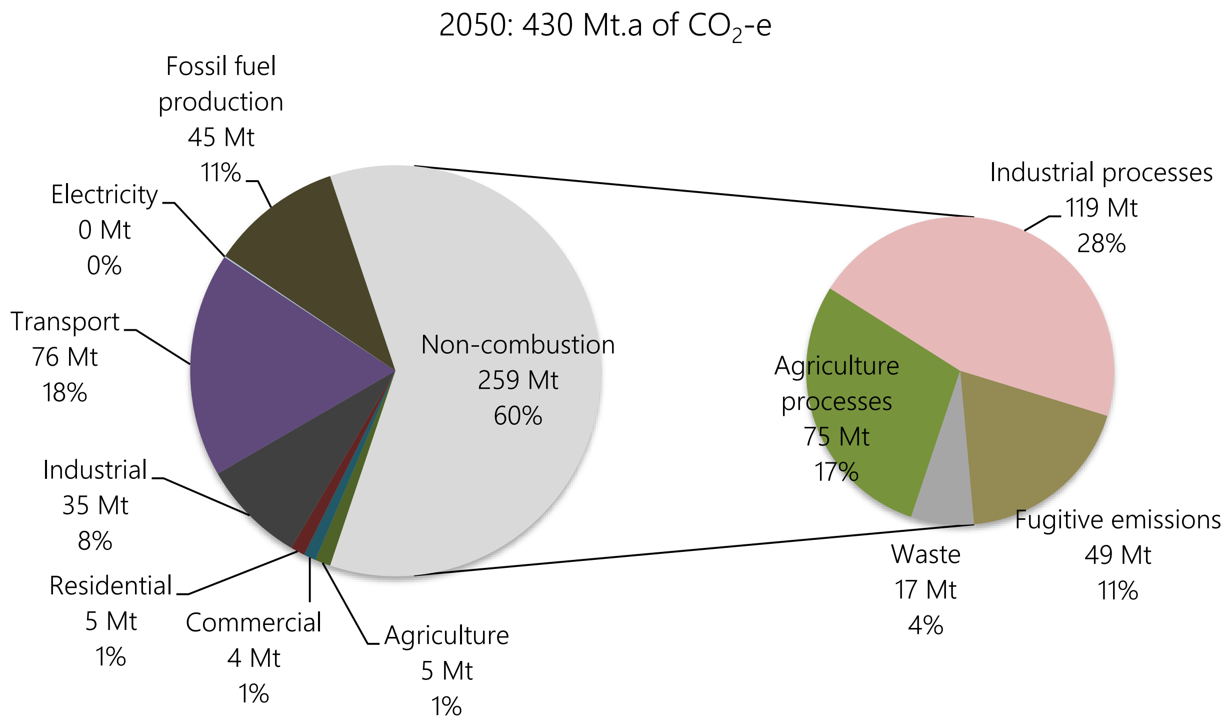
[Q37] What would be the benefits or drawbacks to phasing in carbon intensity reductions under the Clean Fuel Standard? What approach to phasing in carbon intensity reductions would be most effective and why?

A Clean Fuel Standard, particularly in early phases, may drive investment into "cleaner" applications of fossil fuels, rather than new technologies that can use non-fossil alternatives. This is the drawback to phasing in carbon intensity reductions, as small changes represent the easiest option for both industrial energy users and for landlords and property owners. The TEFP, however, has highlighted the need for rapid changes in both sectors, which will require rapid investment in new technologies. Extending the Renewable Fuel Regulation to require industry and buildings to immediate shift a portion of the energy use to renewable energy sources would drive a stepwise transformation in energy use across these sectors; the Clean Fuel Standard would serve to ensure that renewable fuels employed met GHG emission reduction targets.

3 Commit support to enhance GHGenius as Canada's preferred tool to measure environmental footprints associated with solid, liquid and gaseous fuels

The TEFP analysis suggested that likely scenarios of deep decarbonization, which focused on the combustion emissions associated with our economy, could see Canadian emissions drop to 430 million tonnes per annum (Mt.a) of CO_2-equivalents. Of the remaining combustion emissions (about 172 Mt.a), transportation remains the most important source. The primary mechanisms for reducing emissions in this sector are a shift to biofuels (which have some emissions associated with use) and to clean electricity (which can have zero emissions associated with energy generation).

A critical issue is the way in which emission intensity is measured. Pathways for all energy options, such as the use of ethanol in internal-combustion engines or the deployment of electric vehicles within specific provinces (which each have unique electricity sources), need to be considered. Reference pathways (oil to diesel and gasoline) must also be provided within the Canadian context. This suggests that oilsands and other non-conventional oils need to be considered as well. The TEFP study used representative GHG emission reductions for each biofuel considered, compared to reference cases (for example, 35 per cent reduction in GHG intensity per PJ of ethanol versus PJ of gasoline). In reality, however, GHG emission intensities associated with specific fossil- or renewable-based fuels will vary depending upon source, production pathway, distribution, utilization and disposal of wastes.



[Q24] What life-cycle analysis method should be used under Canada's Clean Fuel Standard to assess life-cycle carbon intensity?

[Q25] What system boundaries should be considered for raw materials and finished products?

The method Canada's Clean Fuel Standard should employ to assess life-cycle carbon intensity is the International Standards Association ISO 14044:2006.[3] This standard sets the methodology and system boundaries for any life-cycle assessment (LCA). All work done to determine GHG intensities of specific fuels should conform with international standards on life-cycle assessment.

[Q26] What tools are best suited to conduct the life-cycle analysis under Canada's Clean Fuel Standard for the various fuels (liquid, gaseous and solid)? What gaps exist, if any, in existing tools like GHGenius or GREET to address these fuel types?

Currently, Canada has a proprietary tool (GHGenius), developed by NRCan[4]. This tool was developed to measure greenhouse gas intensity on a life-cycle basis for transportation fuels. The tool is based on the Lifecycle Emissions Model developed in California, but has been heavily updated with Canadian data and Canada-relevant pathways. This tool is more suitable for use than a commercial tool (such as SimaPro) or an American option (such as GREET). It is owned by Canada and can be deployed for the use of our people. The maintenance and development of this tool should be the responsibility of the Government of Canada; the tool may be administered by a third party, but the government should ensure that it is kept available and current. GHGenius is the best option to ensure that the tool used to judge GHG emission reductions is consistent, and is aligned with Canadian policy priorities.

[Q27] What are the needs for users of these tools?

Users of these tools need to be able to assess individual energy sources in order to understand the impacts of different energy choices. The typical users will include energy producers who need to see how their production pathway stacks up against the baseline product, and who need to understand how their process refinements can lead to improved GHG intensities. Other users of the tool will be energy purchasers, including industry and landowners, who need to be able to assess different energy offerings. It will be important that users be able to employ the tool in a comparative fashion — something that should not be done with one-off life-cycle assessments. Thus, the data representing different pathways must be vetted by experts and kept up to date. It is important that data on GHG intensity be reported using a common functional unit (i.e., GHGs per MJ energy delivered) to facilitate these comparisons. Most importantly, the tool must be accessible to all stakeholders, but the ownership should remain with government.

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[3] https://www.iso.org/standard/38498.html

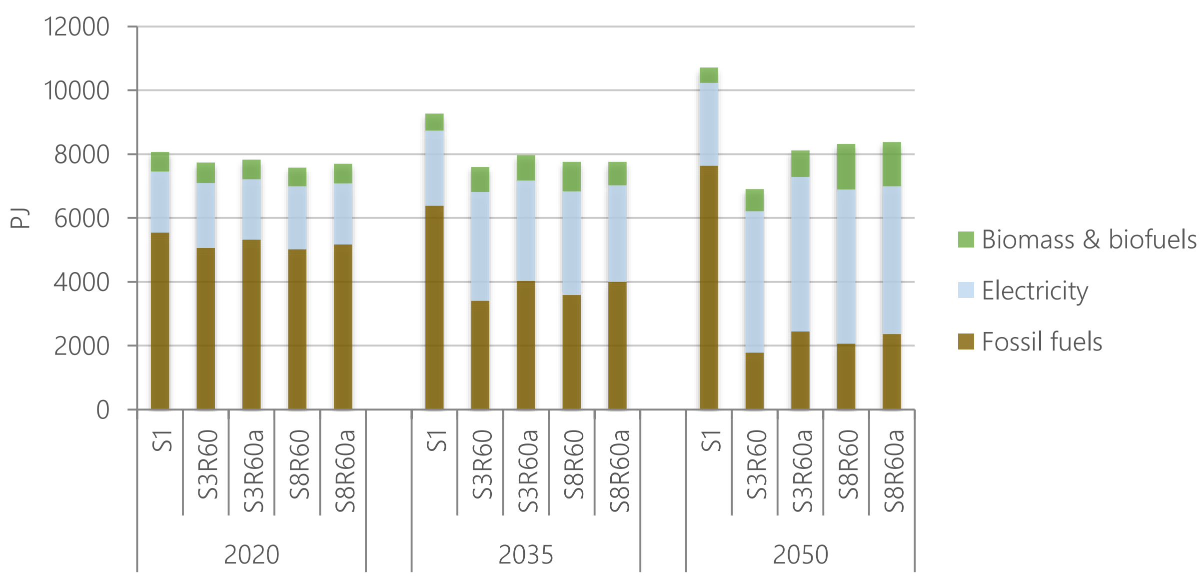
[4] https://www.ghgenius.ca/

4 Consider mechanisms to support conservation efforts that complement the Clean Fuel Standard

It is clear that conservation plays a critical role in meeting future energy demand in Canada in deep decarbonization strategies. The first and best step in reducing overall greenhouse gas emissions is to reduce demand, and the TEFP report clearly suggests that conservation efforts should come before reduction of GHG emissions through shifts to cleaner fossil fuels or renewable energy sources. As shown in the Figure below, the TEFP anticipates that business-as-usual energy production will grow from just over 8,000 PJ in 2020 to over 9,200 PJ in 2035 and to as high as 10,700 PJ in 2050 — all primarily from fossil sources. By contrast, significant reduction in energy use can be seen in multiple scenarios, including the four scenarios shown in the figure (S3 using conventional technologies, and S8 using more disruptive technologies). Conservation and efficiency of energy use may lead to reductions in energy demand of as high as 1,674 PJ in 2035 and 3,807 PJ in 2050. The primary focus in conservation efforts is clearly related to the use of fossil fuels, which decline precipitously across all scenarios compared to the business-as-usual case.

In relation to transport, the TEFP identified limitations on the amount of biodiesel or renewable diesel that could be achieved to help support heavy-duty freight movements, which suggests that conservation and efficiency is the only way to truly deal with heavy-duty emissions. While the TEFP favours electrification of rail for freight motions, the report suggests that a more efficient power design might be related to large-scale battery storage systems that would allow tractor-trailer engines to operate on electrical power. The report also suggests that hydrogen-based fuel cell systems may be possible in transport trucks, or that diesel engines could be replaced with high efficiency combustion turbines.

In relation to buildings, the TEFP analysis suggests that investing in conservation methods for residential and commercial buildings is the best means for reducing GHG emissions, as this allows for end-use demands to be satisfied with less energy input.



[Q38] Fuel production and use can have impacts, both positive and negative, on sustainability. What are these key impacts for fuels used in Canada? Are these impacts different for fuel produced domestically than for imported fuels? Should these impacts be addressed in Canada's Clean Fuel Standard?

The TEFP has made it clear that a very significant component of the overall solution for achieving major reductions in GHG emissions is for biomass and biofuels to assume greatly enhanced roles for replacing dependence on fossil fuels to meet end uses, as well as for decarbonizing the entire supply chain for production of fossil fuels, biofuels and electricity. Over the next 35 years, there is a projected four-fold increase in use of biomass/biofuels. There are, however, several issues and challenges that need immediate attention. These are required as a basis for providing greater clarity for developing a comprehensive integrated plan for defining major transformations, dominantly in the forestry and agricultural sectors to 2050 and beyond.

With projected expansion of the forestry and agricultural sectors to meet both traditional needs and enhanced energy products, there is a special need to address principles of sustainable development. This is especially important, not only for Canada, but also for the world, as a substantial portion of the world's forests and cultivated land are in Canada; 10 per cent of the world's forests and five per cent of the world's cultivated land are in Canada. In the forestry sector, for example, it will be important to maintain the tradition of having forest development plans that comply with laws and regulation, based on sustainable forest management principles, including maintaining ecosystem health and creating economic opportunities for communities. It will be important to promote afforestation and reforestation in the forestry sector, and carbon-retention strategies in agriculture sectors. With introduction of carbon pricing, there will be an enhanced economic case for increasing the proportion of managed forest lands in Canada, as well as enhancing management of existing managed forest lands. There will also be a need to enhance carbon-retention strategies for farmed agricultural lands. The deployment of biofuels and other renewable energy options should be matched with policy that addresses key points related to sustainability and conservation.

[Q6] How would the supply of lower carbon fuels and alternatives affect the design of Canada's Clean Fuel Standard?

One message that is highlighted within the TEFP is that there are certain benefits to prioritizing specific lower carbon fuels, such as biofuels. For example, it is clear that biomass from the agricultural and forestry sectors will almost certainly become the dominant source for production of net negative GHG emissions. The TEFP identified two important areas for this overall strategy: the use of biomass for electricity generation, combined with CCS (BECCS), and strategic management of harvested wood products (HWP), which serve as a carbon sink during their active lifetime. Development of HWP as a strategy for carbon storage requires long-term and sustained commitment. Given the importance of this strategy for meeting the 2050 goal, as well as the even more challenging goal in 2100, this is a strategy that should be strongly supported and initiated immediately. Early development of the BECCS option also needs to be given early attention. Canada's Clean Fuel Standard should help facilitate the development of tools like BECCS, which can lead to greater efficiency of GHG emission capture, and thus help the country better meet its goals related to the low carbon economy.

5 Include robust electricity pathways within the program to account for the increasing need for vehicle and home heating electrification

While the government has largely focused on establishing pathways to reduce the carbon content of traditional fuels, a centerpiece of a Canadian Clean Fuel Standard should also be the usage of electricity as a clean fuel for transportation and heating. Electric vehicle (EV) adoption and high-efficiency electric heat pumps will spur significant greenhouse gas reductions. Much of Canada's electricity system is carbon-emission-free. In addition to the TEFP, other recent research examining pathways for Canada's decarbonization points to the need for both improved energy productivity and increased passenger vehicle electrification.[5]

With more electric vehicles deployed each year in Canada (56 per cent more last year over the previous year[6]), with more low carbon electric heat pump options becoming available, and more clean electricity being generated, the importance of electricity to the overall success of the program will grow over time. Public sentiment about the potential of EVs also supports the need for electricity pathways. While British Columbia has led Canada in clean fuel standards to date, its program has failed to account for this important clean fuel source.

With regard to transportation, there are two simple ways to ensure the program's electricity pathways are robust. The crediting structures should differentiate between the renewable content of the electricity by province and should also account for the dramatically higher level of fuel displacement of an electric powertrain versus conventional combustion engine technology. (EVs are approximately 80 per cent efficient in turning energy into propulsion while traditional vehicles are only 30 per cent efficient.)

First, the Canadian Clean Fuel Standard should take into account the different carbon content of electricity in each province. It should not apply a national average. Second, regarding transportation fuels, note that an electric powertrain is significantly more efficient than an internal combustion engine (ICE) powertrain. The 2014 average U.S. light-duty-vehicle fuel efficiency, which includes new and old conventional combustion vehicles and EVs, is 9.1 kilometres per litre of gasoline. For currently available EVs, the average miles per gallon equivalent of gasoline is over 44 kilometres per litre. Therefore, given the same quantity of kWh, an EV travels roughly 4.8 times further than a traditional combustion vehicle. This difference in efficiency should be addressed in the program. Likewise, similar efficiency advantages exist for electric heat pumps, which do not vent waste heat and exhaust through rooftop chimneys.

[5] Pathways to deep decarbonization in Canada, SDSN - IDDRI. Bataille, C. et al. (2015).

[6] Electric Vehicle Sales in Canada — Final Update. Fleetcarma (2017).

6 Use only the most comprehensive and accurate data for credit generation to maintain the program's integrity and build market confidence

The program's integrity is vital to maintaining strong and long-lasting support from industry and the public. The government can protect the program's integrity by accepting only the most accurate and reliable data. By allowing only the use of robust data for credit generation, the government will not only provide the necessary market confidence and incentives for good actors, it will also help to reduce administrative costs and free up resources to support other climate action initiatives.

It is important to note that the majority of EV charging (over 80 per cent) takes place at home, typically during off-peak hours when there is excess electricity on the grid. Therefore, the ability to accurately and comprehensively capture residential EV charging is key to the success of an electric transportation pathway. However, this information is rarely recorded by other sources outside of the vehicle, such as by using separate utility meters, which are currently prohibitively expensive, or "smart" chargers, which have very low market penetration. Because of this reality, clean fuel programs that use charging estimates, especially ones implemented years ago when there were few alternative data sources, have experienced delays and challenges in maximizing participation and returning value to consumers (see Section 3).

Today, the most accurate and comprehensive charging information for EVs is available because of vehicle onboard telematics technology, which captures 100 per cent of charging events for each EV. Vehicle manufacturers have access to this data and can aggregate charging across their fleet regardless of whether the charging event takes place at home from a wall outlet charger, a Level 2 charger at work or a DC fast-charger along a major transportation corridor. This is why we recommend that the Government of Canada allow EV automakers to generate credits for their EV fleets as a natural aggregator of these credits for EVs.

Using assumption-based estimates to generate credits can undermine market confidence and will send false signals that the program is achieving its carbon reduction objectives. Creating a regulatory framework to determine assumptions and the ongoing maintenance of those assumptions also adds unnecessary administrative burden for the government and will increase the overall program cost. Therefore, wherever robust data exist to support the program objectives, it should be used first. With continued advancements in technology, other entities could receive the ability to generate credits as long as their data are robust enough to prevent double counting of charging events — public charging is a good example. In the United States, many environmental and industry groups have called for the use of Original Equipment Manufacturer (OEM) data to generate transportation credits immediately, with a longer-term outlook of properly incorporating public charging and utility data. This is because they recognize that a hybrid system will take time to develop while the need to count electric-transportation fuel is immediate.