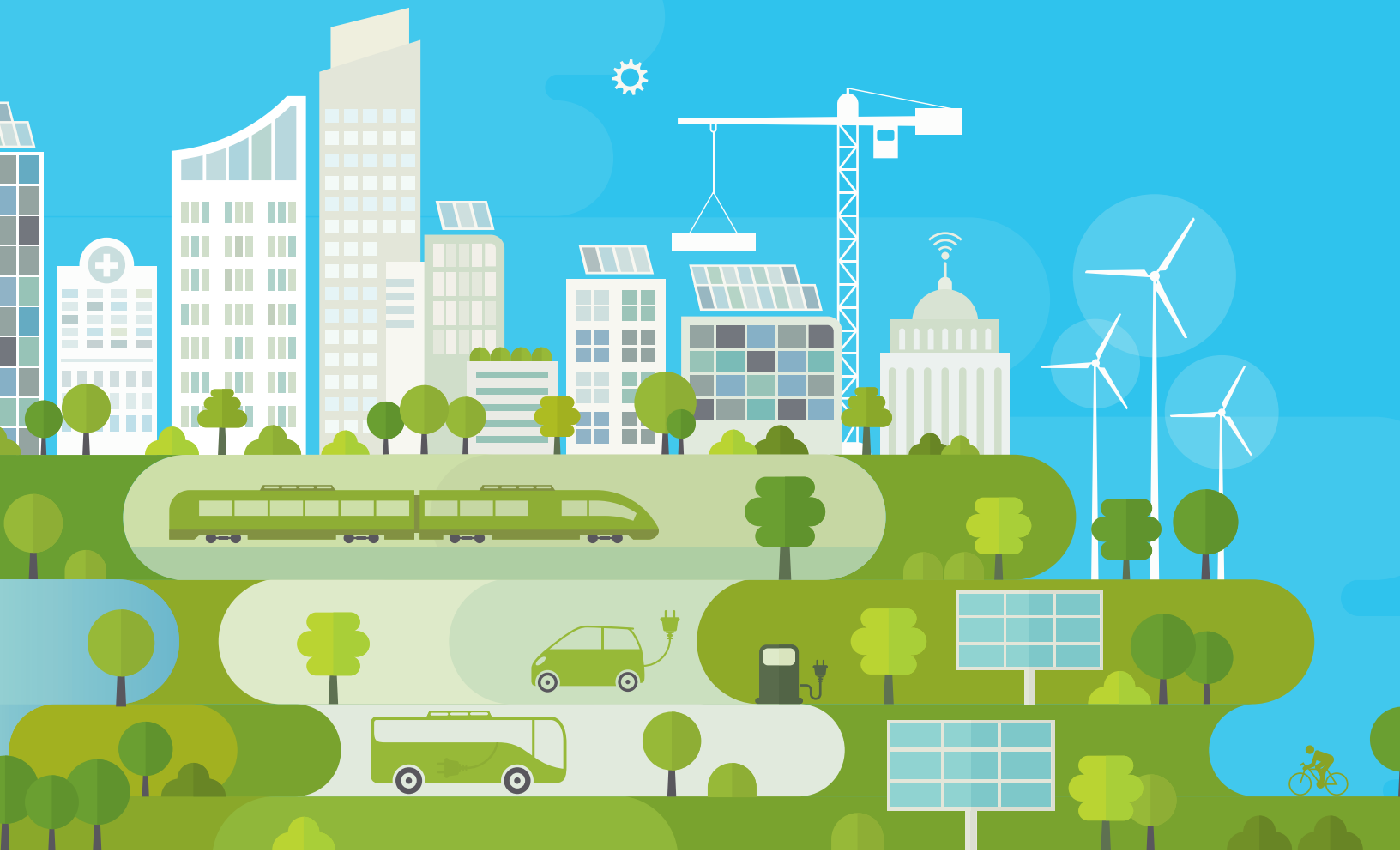
Clean Fuel Standard:

Summary of stakeholder written comments on the Discussion Paper



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Clean Fuel Standard: Summary of stakeholder written comments on the Discussion Paper

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Acronyms

CO_2e	Carbon dioxide equivalent
CFS	(Canadian Federal) Clean Fuel Standard
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
ICAO	International Civil Aviation Organization
iLUC	indirect land use changes
IMO	International Maritime Organization
ISO	International Organization for Standardization
LCA	life-cycle analysis
LNG	liquefied natural gas
Mt	Megatonnes

Executive Summary

Canada has committed to reducing its greenhouse gas (GHG) emissions by 30 per cent and developing solutions to achieve at least 80 per cent emissions reductions by 2030 and 2050, respectively, below 2005 levels. In November 2016, the Government of Canada announced that it would develop a Clean Fuel Standard (CFS) to increase the use of lower-carbon fuels and alternative technologies, such as electricity, hydrogen and renewable fuels, including renewable natural gas.[1] The government further noted that the policy would have broad coverage and include liquid, solid and gaseous fuels in transportation, industry and buildings. The CFS is anticipated to reduce annually 30 megatonnes (Mt) of carbon dioxide equivalent of GHG emissions by 2030.

The government published the *Clean Fuel Standard: Discussion Paper* to seek stakeholder feedback and received comments from across economic sectors, environmental organizations, academia and the public.[2] Overall, submissions noted strong support for the CFS and its objectives, including broad agreement on the importance of contributions from all economic sectors in emission reductions necessary to achieving Canada's climate objectives.

Regulatory Design and Methodology

Overall Design Elements

Stakeholders provided comments on the possible design elements for the CFS. A number of submissions expressed support for the application of the CFS to the transportation sector first, followed by the building and industrial sectors. Some stakeholders called for a voluntary opt-in option to the CFS for the industrial sector and for accompanying incentive-based funding programs. Stakeholders requested differentiated treatment under the CFS with due considerations related to intermediary products, regional circumstances and competitiveness. Alternatively, case-by-case facility considerations were also proposed.

There was a general level of support for simplicity of reporting and varying views on quarterly versus annual reporting requirements as well as strong support for transparency and public disclosure, including recommendations on what should be included in the reporting criteria. Although there was support for periodic review, perspectives on its frequency varied.

Determining Emissions and Carbon Intensity

Stakeholders noted the importance of determining the appropriate level of carbon intensity targets and the schedule of emission reductions in the CFS. There was no consensus on whether carbon intensity targets should be sector specific. Regarding fuel- and sector-specific targets, supporting comments referenced environmental benefits of differentiated targets while opponents referenced flexibility and the economic impacts of such an approach.

Compliance Mechanisms

The importance of transparent compliance mechanisms and robust data was highlighted to help build market confidence, reduce administrative costs and maintain environmental integrity. Stakeholders across a number of sectors expressed support for flexibility, having multiple mechanisms to achieve compliance (compliance pathways) and the use of market-based mechanisms such as credit trading. Cost containment mechanisms provide a predictable range of credit costs in the market for regulated parties to comply. Stakeholders supported a price floor, which would prevent credit prices from falling below a minimum price, noting its role in providing market certainty to alternative fuel providers and as an important component of the program's stability. A number of submissions

[1] See Environment and Climate Change Canada's Clean Fuel Standard here: https://www.ec.gc.ca/energie-energy/default.asp?lang=En&n=EB5AAF7C-1

[2] *The Clean Fuel Standard: Discussion Paper* can be viewed here: https://www.ec.gc.ca/lcpe-cepa/D7C913BB-13D0-42AF-9BC7-FBC1580C2F4B/CFS_discussion_paper_2017-02-24-eng.pdf

expressed the need to consider a price ceiling, which would not allow credits to be traded over a set maximum price, as a way to effectively limit the costs of complying with the CFS.

Regarding additional measures that could complement the CFS, stakeholders recommended the following three principal options: tax measures (e.g., tax credits, accelerated depreciation); production support (e.g., performance-based production credits); as well as capital incentives and grants. A number of comments noted the need to focus on reducing the risk of high-impact technology solutions and emerging technologies, and that a technology fund would be useful in incentivizing commercialization and early action efforts.

Socioeconomic and Environmental Considerations

Comments on environmental impacts focused on the environmental benefits and risks of specific cleaner fuels (such as propane, liquefied natural gas, methanol, ethanol, biodiesel) and the need to harmonize with existing actions and commitments regarding the environment. There was also discussion of the scope and role for sustainability criteria to measure CFS impacts beyond GHGs such as air pollutant emissions, releases to water and soil, biodiversity and species at risk, as well as human health impacts.

Feasibility and Readiness of Lower-Carbon Fuels

There were divergent perspectives on the availability and market readiness of renewable and alternative fuels. Energy efficiency was noted as an important option to consider as a compliance pathway. Various infrastructure limitations were identified, including the need to modify fuel refining and terminal and retail outlets to accommodate renewable fuels, as well as the limited availability of low-carbon fuel transmission, distribution and retail infrastructure. Infrastructure was noted both as a barrier and an enabler, and some mentioned that appropriate investments could support the adoption of lower-carbon fuels and lower-emitting vehicles. Stakeholders also highlighted the importance of ensuring that fuels are compatible with relevant technologies and equipment in order to provide stable, safe and consistent energy.

Sector-Specific Considerations

A number of submissions outlined views on sector-specific considerations. There was strong support for transportation sector-specific targets, though some disagreed. Some stakeholders recommended taking into account technology readiness, vehicle and fuel type, while some argued that infrastructure needs would constrain the uptake of fuels. Specific rail, marine and aviation operational conditions were also highlighted. Rail was noted to operate in a North American context, while international standards and safety considerations were noted to be of paramount importance in marine and aviation sectors. For instance, equipment compatibility with biofuels and stringent safety requirements, specifically for aviation fuels, can limit biofuel blending permitted by regulated authorities (i.e. Transport Canada, FAA, EASA). There were limited comments regarding the building sector. Some expressed that there is less information about the cost of emission reductions in the building sector, while others felt that existing measures and policies could be used to reduce emissions in the sector. A number of stakeholders identified energy efficiency as the quickest, most cost-effective GHG emission-reduction opportunity in the sector. Comments related to the industrial sector referenced emission intensity and trade exposure of operations requiring cost and competitiveness considerations. Comments noted existing energy optimization efforts, concerns regarding technical feasibility and compatibility of alternative fuels within industrial operations, and the need to avoid duplication of regulations.

Interaction with Other Programs

Domestic Policy Interactions

There was strong support for avoiding duplication of policies that achieve the same objectives, and the need to harmonize and align various policies to optimize outcomes while reducing compliance cost. In this regard, stakeholders specifically noted vehicle fuel-efficiency regulations, building codes, energy-efficiency codes and standards. There were extensive comments on interactions with carbon pricing and with renewable fuel regulations. Generally, support was expressed for carbon pricing as a cost-effective market tool to reduce emissions; however, stakeholders noted that the proposed federal price on carbon would be insufficient to drive necessary emission reductions. Submissions expressed support for complementary policies while highlighting the importance of taking into account interactions with the price on carbon. There was a fairly broad level of support for volumetric requirements for biofuels and, in some cases, even raising existing requirements of the renewable fuels standards, noted as a means to drive additional demand for renewable fuels and eliminate the patchwork of provincial policies. Others noted that a carbon-intensity-based approach will be sufficient to incent biofuels and that volume mandates can be phased out once the CFS is in place and achieving emission reductions as expected.

International Policy Interactions

Stakeholders also commented on the interaction of the CFS with requirements outside of Canada, especially international standards in the marine and aviation sectors, and the importance of alignment within the North American context for sectors operating across borders.

Table of Contents

Introduction **1**

Review Of Stakeholder Comments **2**

1.0 Objectives **2**

1.1 Emissions Target 2

1.2 Innovation 2

2.0 Regulatory Design and Methodology **3**

2.1 Overall Design Elements 3

2.1.1 Phasing 3

2.1.2 Regulated Party 3

2.1.3 Exceptions and Special Provisions 4

2.1.4 Reporting Requirements 4

2.1.5 Policy Review 5

2.2 Determining Emissions and Carbon Intensity 5

2.2.1 Sector-Specific Targets 6

2.2.2 Fuel-Based Targets 6

2.2.3 GHG Emissions Modelling 7

2.3 Compliance Mechanisms 9

2.3.1 General Observations 9

2.3.2 Credit Trading System 10

2.3.3 Fiscal Tools 11

3.0 Socioeconomic and Environmental Considerations **13**

3.1 Cost Considerations 13

3.1.2 Cost Estimates 13

3.1.3 Impacts on Industry and Consumers 14

3.2 Competitiveness 14

3.3 Environmental Impacts 14

3.3.1 Air Quality 15

3.3.2 GHG Emission Projections 15

3.3.3 Sustainability 16

4.0 Feasibility and Readiness of Lower-Carbon Fuels **17**

4.1 Fuel Availability 17

4.1.2 Feedstock Availability 17

4.1.3 Liquid Fuels 17

4.1.4 Gaseous Fuels 18

4.1.5 Domestic versus Imports 18

4.2 Fuel Compatibility 18

4.2.1 Liquid Fuels 18

4.2.2 Gaseous Fuels 19
4.2.3 Hydrogen 19
4.2.4 Electricity 19
4.3 Energy Efficiency and Technology Choice 20
4.4 Infrastructure 20
4.4.1 Liquid Fuels 20
4.4.2 Gaseous Fuels 21

5.0 Sector-Specific Considerations 22
5.1 Transportation 22
5.1.1 On-Road Transportation 22
5.1.2 Rail Transportation 22
5.1.3 Marine Transportation 23
5.1.4 Aviation 23
5.2 Buildings 24
5.3 Industry 24
5.3.1 Oil and Gas 24
5.3.2 Mining 25
5.3.3 Cement 25
5.3.4 Forestry Products 25
5.3.5 Agriculture 25
5.3.6 Fertilizer 25

6.0 Interaction with Other Programs 26
6.1 Domestic Policy Interactions 26
6.1.1 Carbon Pricing 27
6.1.2 Renewable Fuels Requirement 28
6.2 International Policy Interactions 29

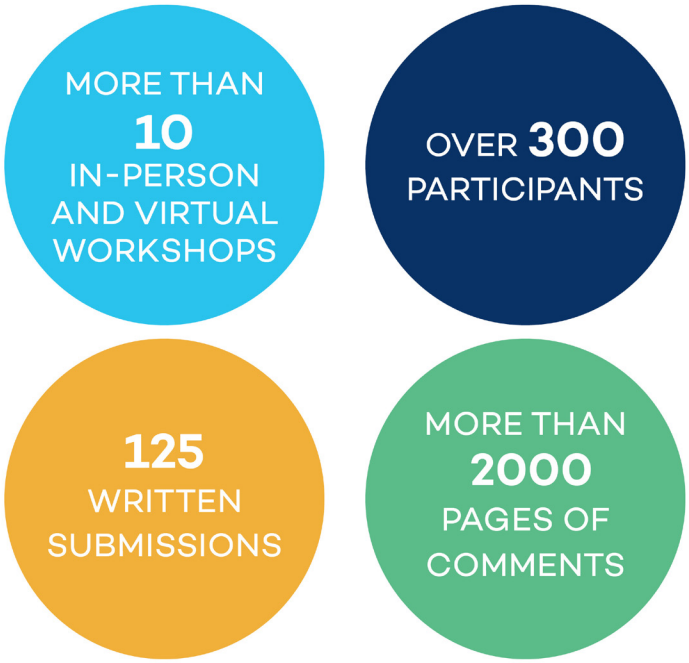
Introduction

On November 25, 2016, the Government of Canada announced plans to consult with provinces, territories, Indigenous Peoples, industry, environmental non-governmental organizations and other stakeholders to develop a Clean Fuel Standard (CFS). The CFS seeks to increase the use of lower-carbon fuels and alternative energy sources and technologies, and with the overall objective to achieve 30 megatonnes (Mt) of annual reductions in greenhouse gas (GHG) emissions by 2030. To facilitate consultations, an initial roundtable was held with key stakeholders on February 7, 2017, and a discussion paper was released on February 24, 2017, outlining technical questions related to scope, timing and design.

A series of workshops and webinars took place in March and April of 2017 in order to exchange views on key elements in the design of the regulatory framework. On March 6, 2017, stakeholders attended a workshop in Ottawa and hundreds of participants joined a series of technical webinars to discuss scope (e.g., fuel suppliers, transportation sector, industrial and building sectors, determining carbon intensity, sustainability and compliance mechanisms). There has been significant interest from numerous parties in engaging in the consultation process. In addition to the valuable questions raised and comments provided during workshops and webinars, more than 125 written submissions were received.

To effectively analyze this extensive content, a simple coding system was used: QSR International's NVivo software. Content was organized reflecting the *Clean Fuel Standard: Discussion Paper* categories and key themes within discussion questions. All documents were transferred into the software program, an analytical framework was established and key word searches and coding queries were used to help identify key trends, themes, recommendations, and similarities and differences among positions. Common elements and areas of convergence and divergence were grouped within themes for further analysis and synthesis.

This report reflects the outcomes of that process and provides a synthesis of stakeholder perspectives. It outlines key positions related to CFS objectives, design elements, approaches for determining emissions and carbon intensity, compliance mechanisms, fuel and sector-specific comments, socioeconomic and environmental considerations, and perspectives on how the CFS may interact with other provincial, territorial, federal, and international policies and initiatives.



REVIEW OF STAKEHOLDER COMMENTS

1.0 Objectives

Stakeholders submitted a range of perspectives on the objectives of the CFS. There was a broad level of agreement on the need for all economic sectors (including across supply chains) to participate in efforts to reduce Canada's carbon footprint, with strong support for driving clean growth and innovation. Perspectives on the objective of achieving 30 Mt of carbon dioxide equivalent (CO_2e) emission reductions by 2030 varied on the compliance approach, milestones and schedule. Some stakeholders noted the target as ambitious, while a few believed that it did not go far enough. Stakeholders also provided comments on the feasibility of the policy (*c.f.*, Section 3).

1.1 Emissions Target

The 30 Mt target was noted as achievable because of feasible and cost-effective pathways across a number of sectors, while others believed that it would require substantial changes to the economy. One business association expressed concerns about whether the 2030 timeline was achievable, while a number of renewable energy sector companies and an association shared the common position that achieving the target over a period of 10 years was challenging.

On the other hand, a number of submissions expressed concerns that the target did not go far enough. Some stakeholders called for interim milestones and for longer-term policy signals, including deep decarbonization by 2050. In November 2016, Canada released a mid-century strategy, with various pathways towards achieving 80 per cent emissions reductions by 2050 from 2005 levels. Longer-term targets were noted to increase regulatory certainty, improve price stabilization and drive innovation.

1.2 Innovation

Many stakeholders also noted that innovation should be one of the objectives of the CFS, and called for incentives and support measures. It was noted that a CFS could drive technology solutions and next-generation clean fuels, support energy-efficiency measures and drive infrastructure investment. Some stakeholders referenced the need for additional program measures to support innovation and enable investment to meet policy objectives (*c.f.,* Section 2.2.3).

2.0 Regulatory Design and Methodology

2.1 Overall Design Elements

This section provides a synthesis of perspectives on design elements of the CFS, including approaches to its application, emission intensity determination, emissions modelling and compliance mechanisms.

2.1.1 Phasing

Stakeholders provided a wide range of comments on the phase-in of sectors as well as options related to opt-in provisions. Some stakeholders expressed support for the immediate application of the CFS across economic sectors. A number of submissions expressed support for the application of the CFS to transportation first, followed by buildings and industrial sectors. Some stakeholders called for a voluntary opt-in option for industrial sectors and for accompanying incentive-based funding programs. Incentives measures are discussed in Section 2.3.3 and sector-specific comments are noted in Section 5 of this report.

2.1.1.1 Phased Approach

Supporters of a gradual application of the CFS supported the application of market forces with incremental signals to reduce risks and compliance costs. Regarding policy signals, a phased approach was noted as being straightforward while allowing a smoother transition for fuels to penetrate markets in incremental stages. Some stakeholders highlighted that this approach could allow some activities to start quickly and maximize immediate policy impacts, while more complex compliance strategies are developed. Finally, in addition to ensuring viable pathways, it was noted a phased approach could help spread overall operating risk across time and allow assessment of compliance credits. Relatedly, in order to allow the regulated entity to adapt and transition, a "reporting only" period was also presented as an option.

2.1.1.2 Opt-in Provision

It was noted that industrial consumers have different market structures and solutions, and that emission-intensive and trade-exposed sectors should be consulted later or be exempted but allowed to opt-in to encourage early participation. A number of industrial sectors, including oil and gas, mining, cement and forestry, noted that their operations were emission-intensive and trade-exposed, that they faced competition from other jurisdictions with less stringent regulations; they cautioned on carbon leakage.

2.1.2 Regulated Party

Stakeholders provided perspectives on the point at which a CFS should be applied (hereinafter, "the regulated party"), including the application of the policy to producers and importers of fuels as well distributors, end users and technology providers. The need for definitions of regulated parties (e.g., energy suppliers, importers, distributors) and treatment of fuel types was also noted. Comments were also provided regarding credit generation, including by clean fuel producers and by third parties (*c.f.*, Section 2.3.2).

There was general agreement that the regulated party should be producers and importers of fuels, with some providing broad comments and others specifying fossil fuel producers, renewable fuel producers or both. Some noted that fuel suppliers should be a regulated party, while others noted distributors or point of sale as the appropriate application of the CFS for small-scale users and in the case of natural gas. The need for a consistent approach applied to utility companies was also highlighted. Comments on determination of the regulated party referenced the importance of simplicity, minimizing the number of regulated parties and alignment with approaches in other jurisdictions.

2.1.3 Exceptions and Special Provisions

Many stakeholders requested differentiated treatment under the CFS with due considerations related to intermediary products, regional circumstances and competitiveness. An alternative approach proposed was a case-by-case facility consideration versus an industry-wide exemption.

2.1.3.1 Intermediary Products

Comments on exclusion of feedstocks and intermediary products recommended the treatment of intermediary products not as a fuel but rather as part of the production process. Comments ranged on the use of low-carbon fuels in the production of value-added products to petroleum coke as part of the production process and not as fuel.

2.1.3.2 Regional Considerations

Concerns were raised on the availability of alternative fuels in remote areas and select regions. While some commented that exemptions should be permitted in the most extreme cases (noting that ethanol has been exported to many areas with no restrictions), others supported delaying the application of the CFS in remote and coastal areas. Stakeholders emphasized implications of increases in heating oil costs in Atlantic Canada (due to high demand) as well as limited transmission of alternative fuels and their local availability in remote areas (which was noted to have a strong market incentive to use onsite-produced fuels). The need for considerations related to regional climatic conditions was also noted (see also Section 4.2).

2.1.3.3 Sector-Based Special Provisions

Some stakeholders referenced the lack of compliance pathways, or options for compliance, in support of their recommendation for the exclusion and/or a voluntary opt-in provision with credit generation for a number of sectors, including: rail, marine, aviation, buildings, oil and gas, mining and cement. Oil and gas sector stakeholders commented on the exclusion of fuels and products designated for export. Competitiveness limitations borne out of contractual agreements (e.g., non-competition clauses or franchising) was noted as a potential limitation that could prevent fuel suppliers from diversifying their supply and that it could lock them into a situation where they must rely on credit markets for compliance.

2.1.4 Reporting Requirements

Stakeholders provided perspectives on reporting and enforcement of the CFS, including on approach, reporting criteria and frequency. There was a general level of support for simplicity of reporting and varying views on quarterly to annual reporting requirements. There was also a strong level of support for public disclosure and various recommendations on reporting criteria.

2.1.4.1 Approach

Stakeholders expressed caution about the potential reporting burden and its complexity. Referencing a large number of operations across the country, it was noted that the application of carbon intensity and data collection (e.g., for regulatory and facility-level reporting and monitoring requirements) will be time-consuming and result in added costs. Stakeholders emphasized the need for a simple reporting structure. Among them was the recommendation for a single window system that aligned with other government reporting requirements. This could include existing GHG measurement and reporting requirements across different levels of government or establishing a centralized national fuel registry and compliance portal.

2.1.4.2 Reporting Criteria

A number of submissions shared perspectives on elements that could be included in the reports and expressed strong support for transparency. Recommendations on the elements of reporting requirements included volume and type of fuel used, feedstock, and carbon intensity of fossil fuels and lower-carbon alternatives (e.g., electricity and hydrogen). Submissions also provided comments on the need for public disclosure of reporting requirements and a forward-looking public report on the anticipated approach to compliance.

2.1.4.3 Disclosure

The need to track and publish aggregate indicators on compliance and progress was referenced in a number of submissions, including progress related to emissions reductions, transportation fuels system, lower-carbon fuel strategies, investments and technologies. Better information was noted to increase investment opportunities and result in the more effective implementation of market strategies. Publicly available compliance and forward-looking reports were recommended, with a number of benefits referenced, including: increasing transparency, allowing government to review and improve the effectiveness of the program, providing data for research purposes and supporting investment decisions.

2.1.4.4 Frequency

Submissions expressed strong support from clean fuel suppliers for quarterly compliance reports (including a reference to a similar approach in California), with some support for annual reports. Comments on time lag between compliance period and reporting deadline were also made, with a suggestion of submissions within 60 days of the compliance period. Recommendations for annual training sessions noted the need for capacity building and increased accountability among regulated parties.

2.1.5 Policy Review

Stakeholders expressed general support for periodic review processes embedded in the policy. They noted the need to adjust, improve and determine next stages of the policy and its requirements based on new science-based information, alignment with other polices and outcomes, market conditions and technology options.

Although there was support for periodic review, perspectives on its exact frequency varied. Suggestions were made for a mid-CFS review and periodic reviews every two to four years as well as reviews starting in 2022 with redesign in 2026. Some stakeholders suggested conducting assessments of compliance benefits on an annual basis, as well as reviews of compliance feasibility every three years, and periodic target adjustment. Annual audits of feedstock calculation methodology (e.g., mass balance) were also suggested in order to add another layer of protection to the integrity of the policy.

2.2 Determining Emissions and Carbon Intensity

Stakeholders provided perspectives on baseline determination, feedstock and fuel intensities, sector-based considerations and the scope of carbon intensity determination (from GHGs to land use changes). At a high level, there was strong agreement about the importance of determining the right level of carbon intensity targets, and that compliance pathways, or mechanisms for compliance, should be science-based and modelled. Recommendations were also provided on predictable and transparent targets that gradually increase over time.

Approach

Stakeholders provided perspectives on the use of volumetric-, mass- and intensity-based approaches. There was a general level of support for an emission intensity-based approach. There was also support by some stakeholders on a volumetric approach to renewable fuels (*c.f.*, Section 6.1.2). A number of stakeholders expressed support for

baseline setting and emission intensity determination through science-based considerations and with input from stakeholders. Comments from the oil and gas sector noted that the baseline year would affect timing and schedule, while a sector company noted the importance of appropriate baselines in ensuring a level playing field.

Carbon Intensity Targets

Proponents of gradually increasing stringency noted three primary benefits: compliance by blend-ready feedstock while lower-carbon alternatives are developed, interim milestones to avoid delay on compliance until the end and generation of over-compliance credits in early years for use in later years with higher targets. Referencing experience in other jurisdictions, renewable sector comments cautioned against a low initial carbon-intensity target resulting in credit generation, price uncertainty and its effect on investment decisions needed to support the more ambitious future targets. On the other hand, oil and gas sector comments cautioned against aspirational targets as well as the need to take into account cost-effective and feasible pathways through conservative modelling and peer-reviewed inputs.

2.2.1 Sector-Specific Targets

Submissions provided divergent perspectives on whether carbon intensity and emission-reduction targets should be sector specific. The majority of comments provided expressed disagreement about setting different emission-intensity requirements for the same fuel used in different sectors or applications. There was strong support for transportation-sector-specific emission-reduction targets, though some disagreed (*c.f.*, Section 5.1).

Proponents of sector-specific targets noted that additional emission-reduction requirements would warrant differing sectoral targets, and referenced the feasibility and existing renewables utilization. The importance of maximizing emission-reduction opportunities with due considerations to economic and technical feasibilities across sectors for the same fuel type was also noted.

Opponents of sector-specific targets noted the need for equitable targets set across all sectors and regions, with a later phase-in of northern and coastal communities. They emphasized that different targets for the same fuels in different sectors create challenges related to complexity of reporting and compliance as well as risks associated with competitiveness and confidentiality. While not supporting a sector-based approach to carbon emission intensity across provinces for the electricity sector, an oil and gas sector association expressed support for province-specific targets that take into account non-renewable imports during peak demand.

2.2.2 Fuel-Based Targets

Comments provided on renewable feedstock, fuel type and crude specific targets noted environmental benefits of differentiation, while opponents referenced economic impacts and the technical feasibility of such an approach.

2.2.2.1 Renewable Fuels

Proponents of carbon-intensity targets for renewable fuels were primarily from renewable energy and agricultural sectors. They noted the need for a science-based approach to target setting, including the emission-reduction feasibility of different fuels, well-to-wheel analysis and a sliding scale approach to incentivize lower-carbon renewables while ensuring technology neutrality. They also provided very specific intensity target recommendations, including support for 50 per cent emissions reductions as well as a recommendation for 100 per cent and 10–20 per cent emission-reduction targets by 2030, in renewables and fossil fuels, respectively. Others believed that the CFS should have eligibility requirements for renewable fuels used in Canada or support for products made domestically that take into account Canada's lower electricity emission portfolio, feedstock choice and transportation distances.

Opponents of carbon-intensity targets for renewable fuels sector included an oil and gas sector stakeholder that noted concerns of such an approach resulting in the creation of boutique fuels.

2.2.2.2 Petroleum Fuels

Proponents of establishing carbon intensities by fuel type (e.g., gasoline and diesel) noted the emission intensity difference between fuels and blends. They emphasized that separate targets could and should maximize emission-reduction outcomes and deployment of low-carbon fuels, optimize outcomes related to efficiency gains (e.g., end-use energy requirements of transportation versus stationary use) and set decarbonization pathways for each fuel type. It was noted that economic and technical considerations, including end-product quality and reliability, should also be taken into account.

Opponents called for uniform carbon-intensity targets and referenced the importance of using market forces, the use of credits for emission-intensity improvements (irrespective of the fuel type) or for replacement of higher-intensity fuels, and the interchangeability of fuel types for surplus compliance.

2.2.2.3 Crude Type and Geological Formation

While some oil and gas sector stakeholders emphasized that differentiation should be avoided, one oil and gas sector company noted the need for consideration related to a 50 per cent variance between crude type, including GHG impacts, equitable treatment and fairness. An environmental organization also expressed support for crude type differentiation as an essential part of GHG emission-intensity improvement.

2.2.3 GHG Emissions Modelling

There was general level of support for life-cycle modelling, with emphasis on a science-based approach that is transparent and has appropriate governance structures.

2.2.3.1 Principles

There was strong support for life-cycle analysis (LCA) that is guided by an approach consistent with the International Organization for Standardization (ISO) and includes considerations related to Canadian conditions and data. Comments on a consistent approach applied across Canada and industries were also noted. Submissions expressed support for a science-based approach, with suggestions on the inclusion of sensitivity and dynamic analysis as well as accurate, recent life-cycle inventories that applied Intergovernmental Panel on Climate Change global warming potentials. Stakeholders expressed support for a transparent approach to and strengthening of governance structures of LCA modelling, including comments on oversight of LCA and stakeholder input. Finally, a broad range of stakeholders expressed the need for regular updates to accommodate innovation in technology changes, pathways and scientific data.

2.2.3.2 System Boundaries

Parameters recommended for consideration in LCA modelling included: feedstock production (e.g., grid connectivity, transportation distances, energy inputs and its intensity), co-processing and co-products, and end use (e.g., onsite or for sale). It was further noted that considerations should be given to LCA of different energy production, regional electricity grid variation, end-use technologies, and emission reductions across the value chain (e.g., carbon capture and storage, energy-efficiency measures, and lightweight materials). Respondents provided a wide range of perspectives regarding system boundaries set on cradle-to-gate, well-to-wheel and cradle-to-grave. A number of renewable fuel sector comments supported boundaries set from feedstock production to point of sale, while another group of sector stakeholders extended the boundary to fuel use. There were also fuel-specific recommendations, including a well-to-wheel boundary for natural gas, and for waste and residue feedstock, a suggestion on the boundary set subsequent to waste production.

2.2.3.3 Indirect Land Use Changes

A number of renewable fuels and agricultural sector respondents (first-generation producers and feedstock suppliers) did not support the inclusion of indirect land use changes (iLUC) in the CFS while environmental organizations and a number of next-generation renewable and alternative fuel producers expressed support.

Proponents expressed the following perspectives supporting their position:

- Scientific consensus, acknowledged by leading international jurisdictions, that the use of food feedstock for renewable fuel production has an impact on international markets and land use decisions.
- Increases in agricultural land use for feedstock production and resulting extensive destruction of tropical forests (e.g., palm oil monoculture for biodiesel).
- iLUC impacts could displace GHG gains from displacement of fossil fuels and incentivize climate-incompatible pathways.
- Need for a policy signal to invest in second-generation alternative fuels beyond food-based feedstock with greater emission-reduction potential.
- iLUC is necessary to strengthen certainty and stability in emission intensity policies.

Opponents expressed the following perspectives supporting their position:

- Modelling is complex, uncertain and contentious, and lacks broad consensus.
- iLUC values in other programs exclude all factors impacting land use change.
- Canadian-specific land use changes are not currently included in GHGenius.
- Canadian practices demonstrates very little iLUC impact but are not reflected in iLUC models.
- That iLUC should not discriminate against renewables but, if considered, should extend to fossil fuels, alternative vehicles and other alternatives.

Recommended methodologies by proponents of iLUC fall within two categories: economic modelling and a prescriptive approach. Comments include support by the scientific community of economic modelling as the best means for assessing iLUC, and their application in other jurisdictions (i.e., California and the European Union) warrants merit for their use while providing learning experiences. However, opponents noted that the two jurisdictional models apply incorrect assumptions and boundaries. The alternative approach suggested would be to exclude certain types of fuels and/or to include sustainability criteria to address emissions from land use changes comparable to the approach under the European Commission Directive (*c.f.*, Section 3.3). One submission commented that prohibition of direct agricultural expansion would not result in avoidance of iLUC because it is market-driven.

2.2.3.4 Choice of Models

GHGenius: Strong support for GHGenius was expressed by stakeholders across a number of sectors. The exception included a comment that GHGenius may only apply to renewable fuels and not petroleum diesel. When compared to other models, it was noted that GHGenius is better at reflecting underlying systems changes. Weaknesses of the model noted included: the need for recognition of non-hydrocarbon vehicle technologies, comparison of existing and alternative fuel pathways, concerns regarding an inability to address data uncertainties, considerations related to regional differences and trade-exposed sectors in the use of the model, and its inability to take into account iLUC.

U.S. Models: It was noted that the U.S. Environmental Protection Agency (EPA) uses four models to assess environmental impacts: (i) Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model (GREET), (ii) Food and Agricultural Policy Research Institute models (FAPRI), (iii) Forestry and Agricultural

Sector Optimization Model with Greenhouse Gases (FASOM), and (iv) Moderate Resolution Imaging Spectroradiometer model (MODIS). Submissions referenced both support and opposition to California's Global Trade Analysis Project (GTAP) model. The GREET Model was supported by a few stakeholders, while comments on its primary weaknesses included a lack of Canadian data and that its systems boundaries did not include emissions from co-products. Support for Oil Production Greenhouse gas Emissions Estimator (OPGEE) noted the model's ability to take into account land use changes, including soil carbon, biomass carbon and forgone emissions sequestration. The Biograce GHG Tool was noted to take into account land use changes and soil impacts. Aligning with the International Civil Aviation Organization (ICAO) Alternative Fuel Task Force guidance on LCA calculations related to alternative jet fuels was also noted.

2.3 Compliance Mechanisms

2.3.1 General Observations

Stakeholders provided perspectives on approaches to compliance, noting the importance of transparent mechanisms and considerations related to compliance pathways to achieving desired outcomes.

2.3.1.1 Rewards and Penalties

A number of industry stakeholders noted the importance of rewarding early action as well as appropriate lead time in encouraging compliance, emissions reduction objectives, and investments required for enabling technologies and infrastructure. An incentive-based approach without compliance obligations was also suggested, particularly where need for exemptions were noted. An environmental organization recommended a review of carbon emissions reduction benefits of incentive measures. Others suggested the need for enforcement as necessary to achieving targets and transitioning to cleaner fuels and called for sufficiently strong penalties for non-compliance. A recommendation was also made to lower penalty thresholds over time.

2.3.1.2 Cost Containment

There was agreement among a number of stakeholders across sectors that compliance costs should be contained with supporting analysis. Recommendation on cost containment tools included: price ceilings, gradual reductions, credit trading (c.*f.*, Section 2.3.2) and fleet averaging. However, a stakeholder noted that if cost containment mechanisms are to be used, they should not completely release regulated parties from obligations.

Comments expressed on the principle of a price floor for compliance credits noted its role in providing market certainty to alternative fuel providers and as an important component of the program's stability. A number of submissions expressed the need for consideration of price ceilings, noting its role in supporting policy objectives while containing compliance cost. A few comments expressed explicit support for a price a ceiling of CAD 200–250 per tonne CO_2e, with some calling for indexing to inflation. This level of a price ceiling was noted to be comparable to the approaches applied in California and British Columbia, and others suggested that the price ceiling policy of these jurisdictions and credit clearance mechanisms should be reviewed as part of developing the CFS. Referencing that, in California, compliance costs have been lower than the price ceiling, caution was expressed against setting the cap too low as this could undermine the market as well as the objectives of the CFS.

Additional cost containment tools, including credit reserve and the emergency credit facility, relaxing targets when specified price thresholds are met and a limited quantity of credits to be maintained by non-obligated parties (e.g., brokers) in order to prevent market manipulation was also recommended.

2.3.1.3 Flexibility

There was a correlation of comments between compliance feasibility and flexibility. Stakeholders across a number of sectors expressed support for flexibility and multiple compliance pathways, or mechanisms for compliance, with comments that flexibility would impact business models and competitiveness (e.g., emission-intensive and trade-exposed sectors). Several stakeholders from the renewable fuels industry noted that the amount of flexibility and the need for additional compliance mechanisms depends on the envisioned emission-reduction schedule; specifically, if the sectors have separate targets, then compliance mechanisms should be specific to those sectors. At the same time, an oil and gas sector company cautioned that a stringent standard with flexible compliance options may dilute outcomes. Stakeholders also suggested several flexibilities with regard to the crediting system.

2.3.2 Credit Trading System

Comments were provided on eligibility and credit determination, costs and ensuring integrity of a credit-generation and trading program.

2.3.2.1 Eligibility

Recommendations made on various types of projects and activities that should be eligible for credit generation can be categorized in the following themes:

- Over-compliance (e.g., going above blending requirements) and early action
- Clean energy production
- Improvements to the emission intensity of fossil fuels
- Onsite clean energy use and integration of emission-reduction measures
- Energy-efficiency improvements
- Clean energy infrastructure and technology investments
- Emission reductions achieved under market mechanism (e.g., cap and trade)
- Modal shifts

In addition to clean energy production and emission-intensity improvements, a number of stakeholders expressed support for credit generation for projects that result in additional activities to reduce emissions or facilitate CFS market development. However, a number of stakeholders suggested that only efforts within the fuel life cycle, but not any other projects, should be eligible for credits. Considerations on ineligibility of credits also included recommendations against the use of credits by fuel producers to develop and market fuels that are not compatible with vehicle technologies. Finally, comments were also provided regarding opt-in provisions for credit generation, including for aviation fuel blends, electricity producers and electric vehicle fleet owners.

2.3.2.2 Additional Criteria

To further policy objectives, recommendations on additional criteria and considerations regarding compliance credits generation and use included:

- Credit multipliers to achieve targeted policy objectives (e.g., account for higher cost alternative fuels and increase regional deployment of technology penetration)
- Recycling of credit revenues in low-carbon fuel development and expansion
- Additional credits for companies to collaborate in emission-reduction efforts

2.3.2.3 Flexibility

Comments were made in support of exchange of compliance units and credits, their transferability between years and, in many cases, fungibility between fuel pools. Some suggested allowing banking of over-compliance credits, noting that it would create an incentive for early action and can reduce cost. Caution was noted regarding setting the stringency too low, and that it could result in excess credit generation. Proponents of establishing limits around compliance credits suggested caps for credits generated outside of the fuel supply chain and prioritization of lower-cost, lower-carbon technologies. A number of submissions recommended limits to credit exchanges between sectors and non-participating parties. A renewable energy sector stakeholder noted that such limitations would encourage innovation across all sectors. There was no convergence on limits to compliance credits, and several stakeholders advised against limits on credit generation and/or trading in the system. An environmental organization noted that under a non-partitioned scenario (one target for all sectors), unlimited credit trading between and among fuel types can help achieve GHG reduction targets.

2.3.2.4 Governance

Stakeholders highlighted the general importance of transparency of compliance requirements, data quality and oversight as critical for integrity of the CFS and meeting its policy objectives. There was a general level of agreement that the government should review strengths and weaknesses of approaches taken in other jurisdictions, including British Columbia, the EU Renewable Energy Directive and California.

Transparency: Strong support was expressed for transparency. A transparent system to determine the initial value of an emission credit was noted as important for evaluating the return on capital investments, and that details on credit trading (including transaction volume and price information) should be publicly accessible. An energy sector association noted concerns on lack of transparency of project-based credits and called for rigorous protocols for credit determination and public registry of projects.

Data Quality: Comments noted the need for robust data, and that data quality could help build market confidence, reduce administrative costs and maintain environmental integrity. This included recommendations on data use to identify high-value projects, as well as to prioritize credit-generation opportunities. One stakeholder referenced recommendations by many environmental and industry groups in the United States on the use of information from original equipment manufacturers to create immediate credit generation while other data sources become available.

Oversight: Stakeholders provided perspectives on the need to maintain the integrity of the credit system through a robust methodology that avoids double counting (e.g., against offset credits), while some suggested the need for additionality, permanence and verifiability as key to the integrity of the program. The need for monitoring and clear protocols on the ownership of credits is also emphasized. A stakeholder suggested a public or private Cleantech Credit Bank to support credit generation by non-obligated parties. Perspectives were also provided on the need to take into account interactions of credits with subnational policies, and that they should be complementary to such measures.

2.3.3 Fiscal Tools

Stakeholders expressed strong support for funding measures, either complementary to a regulatory regime or as a means of achieving comparable objectives. A number of stakeholders noted existing funding measures, while some called for eligibility criteria of those programs to include projects that would support the CFS. Comments also included the need for policy rationale for any form of subsidy and complimentary measures.

Others commented on additional federal support measures, with recommendations that fall into four principle categories: tax measures (e.g., tax credits, accelerated depreciation), production support (e.g., performance-based

production credits), capital incentives and grants. A number of comments referenced the need for reducing risks associated with high-impact and emerging technology solutions. Most comments focused on federal measures, but stakeholders specifically noted a co-funding model that aligned with regional differences. Another stakeholder suggested a third-party innovation consortium to manage support for innovations.

Recommendations were made on funding measures to support a variety of initiatives, including:

- Alternative fuels infrastructure
- Adoption and procurement of cleaner fuels
- Investments to accelerate alternative fuel development
- Energy efficiency and facility-based operational improvement
- Research and innovation

3.0 Socioeconomic and Environmental Considerations

Comments on possible economic impacts of the CFS addressed issues of competitiveness and costs. Submissions highlighted disparity regarding whether or not Canadian industrial competitiveness could be affected domestically and abroad, have an impact on fuel prices, and who would bear any possible increased costs. Many stakeholders called for a cost–benefit analysis, while emphasizing the importance of competitiveness considerations.

3.1 Cost Considerations

Many stakeholders expressed concern that implementation of the CFS could result in higher costs for suppliers and industry, as well as increased costs for consumers. Numerous reasons for higher costs were identified, including:

- Extra costs that may result from the need to switch fuels in operations leading to significant capital investments and/or initial capital costs and equipment upgrades.
- Increase in demand for low-carbon fuels could lead to an increase in cost for industrial and transportation fuels, which could hurt industries.
- Costs associated with switching to electricity to reduce carbon emissions might not be financially sustainable.
- Limited fuel-switching options in certain regions, especially in isolated regions, or those without required infrastructure.
- Increased demand for feedstock as a fuel could result in price increases, putting operations of some users in Canada at risk.

Specifically related to the transport sector, the following were identified:

- Higher costs of lower-carbon-fuelled vehicles compared to diesel vehicles.
- Higher shipping costs for industry associated with the CFS.
- Costs to convert engines when the technology is available.
- Significant costs associated with ensuring adequate infrastructure is available, including fuelling stations (natural gas) or charging stations (electricity).
- Operations and maintenance costs for fleet.
- Consumer buy-in issues due to increased costs.

3.1.2 Cost Estimates

One group of stakeholders voiced concerns that, based on external estimates, costs to reduce emissions could be as high as CAD 185 per tonne of avoided GHG with ethanol policies, and range between roughly CAD 130 and 165 per tonne with biodiesel policies, directly comparing these costs to the CAD 50 per tonne of CO_2e planned across Canada by 2022 for carbon pricing. Conversely, another stakeholder submitted disaggregated costs, arguing that a CFS designed similarly to British Columbia's model would result in costs of only CAD 0.04 per litre of gasoline. Analysis by this stakeholder also found that, in the building and industry sectors, by 2030 the costs of a CFS would be limited to "an extra $6 per month on household heating bills." Depending on the model that the CFS takes, this stakeholder also posited that electric vehicles in Ontario, for instance, could generate credit revenue of CAD 410 annually, which could then be recycled.

3.1.3 Impacts on Industry and Consumers

In addition to diverse views on costs associated with the CFS, there is also disparity among stakeholders on who would bear additional costs. Many highlighted the challenges and, at times, impossibility of passing on extra costs stemming from the CFS to end users and customers, meaning that certain industries would in some cases bear these costs. In the transport sector specifically, one stakeholder suggested that it was unlikely that the full cost of implementation would be passed on to consumers. Conversely, other stakeholders cautioned that CFS costs could translate into direct costs passed onto consumers, including higher prices for home heating and consumer goods in general. One stakeholder mentioned that additional costs stemming from a CFS that consumers would have to bear would be on top of a carbon tax, for instance, resulting in a "double hit."

While many stakeholders raised concerns about costs, others emphasized that, with the right design, any economic impact on consumers could be limited. A wide spectrum of stakeholders also shared views about potential economic benefits from a CFS. For example, one agriculture sector stakeholder argued that more availability of low-carbon fuels, such as biofuels, would lead to better competition in the transportation fuel sector to the benefit of both consumers and industry.

Three stakeholders identified examples from California and British Columbia to show that the price impact for consumers was minimal, including for petroleum-based gasoline and diesel fuels, as well as for consumers who rely on natural gas for heating purposes.

3.2 Competitiveness

Industrial sectors, in particular, referenced emission-intensive and trade exposure of operations, and concerns regarding increased costs resulting in competitiveness challenges against jurisdictions with less stringent environmental regulations. Stakeholders raised concerns about the possible loss of competitiveness in global markets, especially against competitors that may not face similar CFS regulations, which could lead to relocation of industry (e.g., carbon leakage and risk of increased GHGs) and large consumers outside of Canada. Another cautioned that putting in place fuel standards that are more stringent than the ones found in the United States may have unintended consequences for Canadian consumers.

Comments emphasized that regional circumstances may lead to a CFS being more expensive in some regions and compound the impact of other factors on competitiveness for industry in general and oil and gas sectors specifically. Some industry stakeholders raised concerns that a CFS putting pressure on traditional fuel suppliers to develop new fuels or blends may create challenges for manufacturing processes, further exacerbating competitiveness issues.

Comments were also provided on the impact of regulatory burden on competitiveness, including the overlapping measures such as carbon pricing and recommendations regarding duplication of policies to be removed (*c.f.*, Section 6).

3.3 Environmental Impacts

Comments on environmental impacts focused on the environmental benefits and risks of specific clean fuels (propane, liquefied natural gas [LNG], methanol, ethanol and biodiesel) and the need to harmonize with existing actions and commitments regarding the environment. Given the interrelated and interdependent nature of many environmental standards, some highlighted the importance of taking into account multiple parameters, such as air quality, health-related air contaminants, compositions of gasoline and diesel, and vehicle emissions when determining and designing GHG-emissions-related policies.

One group cautioned that GHG emissions should not be the only determinant of clean fuels. The clean fuel definition should address all emissions and environmental impacts of making and using the fuel. This goes beyond LCA and iLUC to include other air emissions, nutrient use and runoff, impacts on water, pesticide applications, environmental risks and social issues.

Another stakeholder requested that regional and provincial economic and environmental impact analyses be conducted alongside the development of the CFS regulatory framework.

3.3.1 Air Quality

Environmental groups and a member of the renewable fuels industry commented that the CFS should not only regulate GHG emissions but should consider air quality and health-related air contaminants. It was noted that improvements to air quality, technological, health and economic benefits of the CFS should be explained and promoted. A number of stakeholders also highlighted the need to be aware of unintended consequences of increasing cleaner fuels. For example, two associations mentioned that increased use of natural gas could lead to increased flaring and pipeline emissions, and nitrogen oxide pollution from certain types of uses. Another stakeholder provided an example that ethanol has an increased vapour pressure resulting in more evaporative emissions, and lower density resulting in greater volumes of fuel needing to be transported compared with gasoline.

3.3.2 GHG Emission Projections

Comments on emission projections focused on the achievability of the government's proposed emission target and how various fuels, technology and changed behaviours could achieve the target. Stakeholders provided research, analysis and modelling to outline the potential emission-reduction impacts of the CFS under various scenarios. Scenarios generally envisaged a fall in petroleum consumption and a rise in consumption of biofuels (including biogas), natural gas and clean electricity. One respondent projected a four-fold increase in the use of biomass/biofuels over the next 35 years. For more information on modelling, please refer to section 2.2.3.

The renewables industry gave details on the emission-reduction potential of various fuels (ammonia, biofuels, biogas, dimethyl ester, natural gas and non-emitting electricity) and how these can achieve emission targets by 2030 or 2050. An environment group noted that GHG reductions are not necessarily proportional to the amount of clean fuel used. One stakeholder commented that electricity tended to deliver greater benefits than ethanol, for example, because Canadian electricity is largely non-emitting while ethanol production and distribution still generates GHG emissions.

The renewable fuels industry and an environmental group said emissions projections need to take into account future trends such as the use of biomass for electricity generation, carbon capture and storage, harvested wood products and resultant carbon sequestration. It was also noted that projections should take into account alternative sources of emission reductions, including energy conservation, efficiency and a transfer from road transport to rail.

Some stakeholders also commented that the rapid projected growth could result in risks, such as:

- Sustainability of increased agriculture and forest harvesting could be at risk.
- A major shift to electricity could lead to higher GHG emissions if thermal power plants need to provide the electricity.
- Increased use of natural gas may result in greater transmission (pipeline) emissions.

3.3.3 Sustainability

Many respondents generally agreed on the need for sustainability criteria, but differed on its scope. Proponents of broad sustainability criteria included several environmental and second generation producers. They argued that the CFS is likely to incentivize increased harvesting of crops, forest products and "waste" biomass (which may have important ecosystem or soil carbon roles). Sustainability criteria should encompass all the potential impacts, including air quality, biodiversity, fertilizer use, forest management (both area and quality), soil carbon, water, wastes and social impacts. These groups tended to favour use of comprehensive LCAs and inclusion of iLUC. Some argued that criteria should be based on internationally recognized schemes (cited schemes included those under the EU Renewable Energy Directive, U.S. EPA regulation on the Renewable Fuel Standard, the Sustainable Forestry Initiative and the Forest Stewardship Council Canada). Others said that any criteria should recognize and harmonize with existing domestic and international sustainability regulations. Biofuel and environmental groups agreed sustainability criteria should be applied to all fuels equally. Imported biofuels should meet the same sustainability criteria as domestic products.

Proponents of limited sustainability criteria generally argued that GHG emissions should be the only quantitative measure. They argued that Canadian agriculture is already highly sustainable with excellent data. Adopting "renewable biomass" requirements for eligibility would help to ensure biofuel feedstocks are sustainably produced, in line with the U.S. EPA regulations under their Renewable Fuel Standard.

A number of stakeholders highlighted that any standard should respond to advances in progress in scientific understanding and improvements in modelling.

4.0 Feasibility and Readiness of Lower-Carbon Fuels

This section provides a synthesis of comments on the feasibility of lower-carbon fuels and energy-efficiency measures. We note varying degrees of agreement on renewable and alternative fuel market readiness as well as comments on compatibility, quality and safety.

Stakeholders provided divergent perspectives on the availability and market readiness of renewable and alternative fuels. While modest initial targets will likely be attainable with available fuels, some questioned the availability of low-carbon fuels to meet robust emissions reductions targets and highlighted related compliance risks. Key factors for limited supply of advanced fuels include the lack of production capacity, supportive infrastructure and regulations, as well as high costs. Competition with other jurisdictions further exacerbates limited supply. Stakeholders noted the need for additional facilities to increase the production of low-carbon fuel. The need to invest in the next generation of renewable and alternative fuels was also noted. Comments on the electricity sector included the need for electricity pathways to accelerate deployment.

4.1 Fuel Availability

4.1.2 Feedstock Availability

Stakeholders expressed divergent perspectives on feedstock supply meeting renewable fuel requirements, with the agricultural sector noting sufficient supply and disagreement by several stakeholders outside of the sector. Comments from the agricultural sector also included increasing biomass supply through increased availability of other feedstocks (e.g., carinata and production of carinata oil), and limited capacity of agriculture waste and feedstock processors.

Comments included support for existing production being able to meet demand for biodiesel without affecting food, oil or animal feed, and that agricultural waste and purpose-grown crops could provide additional opportunities. Stakeholders noted constraints that could affect the scale-up of operations include supply chain infrastructure (crushing facilities, renewable fuel refineries and blending facilities), capacity and location, as well as capital cost of clean technology and on-farm processes. Incentives created by the CFS to invest in renewable fuels were seen as creating opportunities to overcome these barriers. Additional recommendations to overcome barriers included for the CFS to allow for closer distances between fuel producers and feedstock supply, and to facilitate on-farm processing for on-site use and local distribution.

4.1.3 Liquid Fuels

There was a general level of agreement among renewable fuel producers, supported by comments from the agricultural sector, on Canada's ability to meet demand for ethanol and biodiesel—this perspective was not shared by all stakeholders. The wide availability and consumption of ethanol and renewable fuel production in most of Canada, except the Atlantic provinces, was provided as evidence. Stakeholders commented on the limited availability of higher blends (e.g., E85), methanol and bio-methanol, next-generation renewable fuels, drop-in biologically based hydrocarbons and alternative jet fuels. Limited supply of alternative fuels for the aviation sector was noted as a barrier. In addition to the market readiness of such fuels, their immediate emission-reduction potential was referenced. An environmental organization noted that, by 2030, 13 per cent of gasoline and diesel could be offset using alternatives with current technologies.

4.1.4 Gaseous Fuels

Investments to increase the availability of renewable natural gas as a feedstock source was also noted. Comments provided highlight significant supplies of both non-renewable and renewable gases, and LNG's availability in certain provinces. Propane and its fuelling infrastructure were identified as being available and scalable. Canada's renewable natural supply was noted to be currently limited to production via anaerobic digestion, and the need for new technologies to transform woody biomass and agricultural products into such fuels was expressed. Stakeholders called for incentives for commercializing next-generation alternative fuels, which will require conversion technologies and technical expertise.

4.1.5 Domestic versus Imports

It was noted that the CFS could play a role in increasing domestic production of low-carbon fuels. Comments were provided on the availability of imported fuels where an increase in global demand may create supply-side constraints. A renewable fuel sector stakeholder suggested that low-carbon fuels should not give preference to domestic fuels, as that would impact fuel supply. Others believed that the CFS should have eligibility requirements for renewable fuels used in Canada or support for products made domestically that take into account Canada's lower electricity emission portfolio, feedstock choice and transportation distances.

4.2 Fuel Compatibility

It was noted that setting the CFS targets above what can be met with available technology (technology forcing) may not bring about the expected results. There is therefore a need to review the state of lower-carbon fuel technologies in Canada to estimate the need for modification and expansion. For those technologies that have been successfully demonstrated, policy support is required for their deployment on a commercial scale.

Many stakeholders highlighted the importance of fuel quality (including cold weather operationality) and compatibility with relevant technologies and equipment. Concerns were expressed on technical uncertainties and risks related to low-carbon fuel use when replacing conventional energy sources in industrial processes, and the importance of stable and consistent energy sources for safety and high production capacity. For these reasons, it was noted that industry-specific engine or equipment requirements for fuels may prevent low-carbon fuel use. Comments also noted the impact of fuels on engine performance and warranty.

Stakeholders also correlated fuel compatibility with safety. For example, it was noted that, combined with water, ethanol forms a corrosive liquid leading to storage challenges; that higher ethanol blends with gasoline could result in operability and reliability issues due to corrosive impacts; and that higher biodiesel blends could cause problems due to the oxidization and lubrication properties of the fuel. Safety issues were also mentioned with regard to using low-carbon fuels in gas pipelines, vehicles, rail, marine and aviation.

4.2.1 Liquid Fuels

Renewable fuels were noted to be available as alternatives for gasoline and middle distillates for smaller, high-compression engines. A number of stakeholders referenced barriers resulting from the notion of blend limits, holding opposing views on the concept. Stakeholders shared perspectives on the potential technical compatibility of higher blend ratio, beyond 10 per cent ethanol or 5 per cent renewable diesel, in gasoline and diesel for on-road transportation. Others recommended liquid alternatives to gasoline and diesel blends included ammonia and methanol.

Comparable concerns on blends limited in rail and marine sectors were also highlighted, including their impact on performance, warranty and safety. A number of renewable energy sector stakeholders noted that rail and marine sectors were already using renewable fuels, and that dimethyl ether and methanol could also provide feasible

compliance pathways for workboats and large boats, respectively. Ammonia as a dual or sole marine fuel was also mentioned.

Potential low-carbon fuels for aviation were noted to be available, that alcohol-to-jet fuel technology using ethanol feedstock was close to commercial implementation, and that technologies for alternative jet fuel were noted not to be considered a barrier. Jet fuels can also be produced using the same technologies as used to produce low-carbon fuels for road transportation, and a transportation sector association noted the availability of compatible biofuel components. Stakeholders recommended a number of additional blend fuel types, including triptane fuel derived from dimethyl ether, ammonia fuel, forthcoming alcohol-to-jet technology from ethanol, and hydrogen fuel cells for aviation that is undergoing initial testing.

In the building sector, the use of methanol (e.g., from municipal solid waste and biomass) was outlined as feasible for renewable heat and electricity generation for off-grid communities. Ammonia was also referenced as a blend option that could reduce costs by half through combined heat, power and cooling. Bioheat application in cold weather was also noted, including reference to studies that have found its use feasible in buildings.

4.2.2 Gaseous Fuels

Comments in support of increasing gaseous fuels in the transportation sector also expressed the importance of an adequate time horizon and interim period. The wide use of gaseous fuels in the transportation sector (with the exception of aviation) was suggested to provide near-term benefits and cost-effective solutions in certain applications but remains a niche market, requiring significant investment. Other comments related to limited application of gaseous fuels included: low global share of propane light- and medium-duty vehicles in Canada and a lack of robust corridors, limiting compressed natural gas and LNG uptake in heavy-duty vehicles. While a transportation sector association emphasized the need for next-generation natural gas technologies to realize emission-reduction opportunities in the trucking industry, another sector association called for an assessment of potential risks associated with advancing natural-gas-powered trucks. In the marine sector, advancement in LNG was noted, while risks and challenges related to natural gas and LNG bunkering were also highlighted.

In the building sector, natural gas was noted to have a long history and wide application, and current technologies could capitalize on waste and renewable streams. High quantities of natural gas use and a lack of alternative energy sources in automotive manufacturing was noted, including concerns of inclusion of natural gas within the CFS for manufacturing operations. Other gaseous fuels referenced included propane, which was noted for use in rural and remote communities for home energy and to reduce fossil fuel dependency. Propane was also noted to be widely used in mining operations across Canada, including for camp operation, heating mineshafts, smelting and refining.

4.2.3 Hydrogen

Some expressed support for the applicability of hydrogen in transportation, with potential use in public transit (as well as rail), as well as long-range driving benefits, and commercially available refuelling technologies. Initial testing of hydrogen fuel cells for marine transport was also noted. Blending of hydrogen gas with natural gas was suggested as a means of improving emission intensity of industrial process heat and space heating.

4.2.4 Electricity

Comments expressing support for electrification of the transportation sector noted on- and off-road vehicle application of electricity, deployment of charging stations and advances in storage technologies. An environmental organization presented modelling results showing electric vehicles could help to achieve compliance targets by 2030. Others pointed to a lack of electric heavy-duty trucks and the need for significant breakthrough to address range, charge time and lack of available infrastructure for electrical vehicles. Large availability and feasibility of integrating non-emitting electricity into the buildings sector for heating and cooling was also noted.

4.3 Energy Efficiency and Technology Choice

Energy-efficiency opportunities were referenced by a number of sectors, including for buildings, oil and gas, and agriculture. Many stakeholders suggested that the CFS should encourage and prioritize energy-efficiency measures as a low-cost compliance option that could create opportunities for low-carbon fuel switching and quick, cost-effective reductions in energy consumption and emissions.

A number of stakeholders identified energy efficiency as the quickest, most cost-effective GHG emission-reduction option in the buildings sector. Some noted that it could be complementary to lower-carbon fuels or prioritized in the initial phase of the policy for the buildings sector. Retrofit options for the existing built environment as well as new building codes and standards were specifically noted. Furthermore, district and green heating as well as heat pumps were noted to reduce fossil fuel usage. One stakeholder highlighted that technologies enabling heating by micro-combined heat and power were commercialized in other markets.

In the oil and gas sector, it was noted that fuel choice is linked to decisions on equipment that enables fuel conversion efficiency. It was further noted that the CFS could result in fuel switching when more cost-effective efficiency improvements exist. Stakeholders argued that technological readiness and availability of alternative fuels should be considered in an already highly efficient refinery sector. Oil and gas sector companies cautioned that emission intensity improvement at facilities is limited because of high capital costs and efficiently optimized existing equipment.

Agricultural sector stakeholders outlined their efforts to reduce fuel consumption in the sector. Increased uptake of equipment efficiency technologies (e.g., radar speed sensors, position controls, turbocharging) were specifically noted by one sector stakeholder.

4.4 Infrastructure

Stakeholders listed various infrastructure limitations, including: the need to modify fuel refining and terminal and retail outlets to accommodate renewable fuels, as well as limited availability of low-carbon transmission, distribution and retail infrastructure. It was noted that the transportation sector has a more developed low-carbon fuel infrastructure compared to the other sectors, but that there is a need for additional investment to meet CFS objectives.

Infrastructure was identified both as a barrier and an enabler, but with appropriate investments it could drive lower-carbon fuels and vehicles. Related to transportation, a stakeholder commented that rail infrastructure could support a fuel switch on a North American scale. Some noted that funding for electric vehicles and charging stations could support increased vehicle deployment, while others pointed out that charging will occur at home as well, and there is a need for comprehensive and holistic planning regarding large infrastructure investments. Regarding natural gas, similar concerns were raised on refuelling infrastructure posing a challenge for long-haul trucking operations, and developing the required infrastructure in Canada was estimated to cost CAD 200 million over five years. Comparable comments were provided on biofuels with higher than 10 per cent blend. Finally, private and small business ownership structure of fuel retail sites was noted to add a layer of complexity to infrastructure modifications.

4.4.1 Liquid Fuels

Comments were made that, to capture the benefits of ethanol, investments in fuel pump and consumer distribution infrastructure would be needed. Despite wholesale infrastructure for higher ethanol blends in Canada, there is a need for consumer infrastructure (e.g., dispensing infrastructure and fuel delivery). For ethanol, most retail infrastructure was noted as inadequate for blends higher than 15 per cent, requiring significant modifications that could be implemented over three to five years. According to an estimate provided, an increase in ethanol supply

would require additional infrastructure at terminals and refineries (an estimated CAD 40 million to 50 million and 3.5 to 5 years for regulatory approvals).

4.4.2 Gaseous Fuels

Comments outlined that Canadian port facilities will need new infrastructure to support LNG bunkering; currently it is available in Vancouver and Montreal, but it is a challenge in the Great Lakes and the Port of Halifax. There is also a lack of infrastructure for dispensing higher blends of lower-carbon fuels. Additional infrastructure is needed to increase the supply of low-carbon or bio-based diesel in Western Canada.

Comments also included the need for a network of hydrogen fuelling stations and natural gas refuelling infrastructure for the heavy trucking industry. A stakeholder recommended that natural gas infrastructure should be placed strategically to meet the needs of power generation, space and water heating, especially in remote locations. According to an estimate provided, developing an extensive natural gas refuelling infrastructure in Canada would require about CAD 200 million over five years.

5.0 Sector-Specific Considerations

This section provides a synthesis of sector-specific comments and does not include overarching comments discussed in other sections of this report.

5.1 Transportation

Comments were provided on the sector's readiness based on technology, fuel type considerations and the impact of infrastructure on the uptake of fuels. Some stakeholders called for adequate time and a phased approach of the CFS in order to ensure a smoother adoption of alternative fuels and new technologies. There was strong support for transportation sector-specific targets, though some disagreed.

Proponents of a transportation sector-specific target referenced the presence of existing regulatory structures and markets. Supporting comments noted specific targets as necessary for achieving any or significant emission reductions in the sector. Some stakeholders called for a transportation-specific target of 15 per cent emission intensity improvements by 2030, from 2010 or 2015 levels. It was also suggested that the approach should correspond with technology deployment, with a target for gasoline and diesel pools, starting in 2021 that gradually increased to 6 per cent improvement (4 per cent reduction and 2 per cent credits through early action) by 2026, from a 2005 baseline.

Opponents of a transportation sector-specific target emphasized the importance of fuel quality, engine compatibility and compliance burden of various targets (*c.f.*, Section 4). It was also recommended that, in the marine sector, the CFS be limited to application in interior waterways, and that in the aviation sector, considerations be given to operational conditions and availability of alternative supplies.

5.1.1 On-Road Transportation

Comments on the readiness of renewable and alternative fuels for the transportation sector provided varying degrees of support for renewable and alternative fuel options, with comments on their availability and feasibility. A number of stakeholders suggested ensuring that low-carbon fuels are compatible with current and future vehicles. It was noted that there is an ongoing discussion in North America about next-generation vehicles and fuels (e.g., the co-optimization of fuels and engines program), including plans for testing fuel blends and engine technologies for compatibility. It was also noted that adhering to Canadian General Standards Board fuel standards can address fuel suitability issues. It was also noted that it would be important to develop a comprehensive strategy for the sector, with an analysis on impacts of modal choice and feedstock.

Referencing the trucking sector, significant risks associated with new technologies, including financial risks, were highlighted. An association noted the incremental costs of CAD 15,000 to CAD 65,000 per vehicle transitioning to natural-gas-powered trucks. According to an estimate, CAD 100 million over five years could be necessary for natural vehicle technology innovations in Canada. A transportation sector association recommended a working group to discuss emission reductions in the subsector.

5.1.2 Rail Transportation

There was general agreement on consumption of renewable and alternative fuel by rail operators, with various perspectives on the extent of its use, as well as comments on the cross-border integrated nature of the sector.

Proponents of incorporating the sector within the CFS dismissed special provisions for the rail sector, noting existing renewable fuel use in the sector. Hydrogen fuel cell-powered trains, dimethyl ether as a fuel type, natural-gas-powered freight locomotive deployment in the U.S., LNG-enabled locomotives (noted to be anticipated in 2018) and the promise of further emission reductions through electric locomotives were also provided as evidence

of support for the inclusion of the sector under the CFS. A transportation sector association recommended blending up to maximum levels and that governments work with the sector to improve efficiency and fuel switching. Furthermore, it was recommended that modal shift be recognized as a compliance pathway and as a credit-generating mechanism.

Opponents of incorporating the sector within the CFS called for exemptions, noting the small portion of domestic consumption of fuels by the sector, the existence of international standards, the absence of a single cost-effective emission-reduction pathway and ongoing efforts on efficiency opportunities. Existing commitments on procurement obligations were noted to have resulted in emission reductions. If the CFS requirements would be comparable to British Columbia's regulations, the estimated cost of compliance to the sector was estimated at CAD 150 million to 200 million by 2022. Similar concerns were noted regarding high maintenance costs and other challenges that have limited natural-gas-powered freight locomotives.

5.1.3 Marine Transportation

Proponents of incorporating the sector within the CFS dismissed special provisions for the marine sector, while a number of comments noted the need for regulatory support to realize the transitioning. Others suggested that an opt-in option would enable contributions from additional non-ethanol fuels and that credit generation by the sector could enable emission reductions. One stakeholder observed that regulating international shipping under the CFS may be challenging, but the CFS could initially be limited to interior waterways and in-harbour transport.

Opponents of incorporating the sector within the CFS called for an exemption, noting the small portion of domestic consumption of fuels by the sector and the existence of international standards. A transportation sector association noted that inclusion of the sector could undermine current international emission mitigation efforts in the sector. Without expressing opposition, an environmental organization agreed on the need to harmonize the CFS with existing international marine regulations (*c.f.*, Section 6.2), involving ports that could be affected by the CFS. International marine operations were noted to comply with the International Maritime Organization (IMO) requirements and that these efforts have already contributed to emission reductions. It was further noted that the 2020 global cap on sulfur oxide emissions could transform the sector. Stakeholder engagement was recommended, including with marine vessel owners, shipping companies and port authorities.

5.1.4 Aviation

Proponents of incorporating the sector within the CFS noted that it would level the playing field in transport sectors. Others suggested that an opt-in option would enable contributions from additional non-ethanol fuels and that credit generation by the sector could enable emission reductions.

Opponents of incorporating the sector within the CFS called for an exemption while noting the small portion of domestic consumption of fuels consumed by the sector, the application of international standards and lower emission reduction costs in road transportation. The higher costs of alternative jet fuels was also noted.

Consultation with Transport Canada Civil Aviation, the International Civil Aviation Organization (ICAO), and involving airlines and airports in designing the CFS was recommended. The compatibility of life-cycle modelling with approaches taken by ICAO and Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) systems was specifically noted by a number of stakeholders. ICAO was noted to have a 2020 carbon-neutral growth goal, which includes new design standards and the ICAO CORSIA agreement on carbon offsetting (*c.f.*, Section 6.2).

5.2 Buildings

There were limited comments regarding the buildings sector. Stakeholders expressed the need to assess fuel compatibility with existing equipment specifications, the limitations of low-carbon energy generation in certain regions, and considerations related to the emission intensity of the electricity supply for buildings of different regions.

Proponents of incorporating the sector within the CFS noted that, unlike the transportation sector, there is little knowledge on emission reduction costs in the sector, while an association called for a net zero target. Others suggested that an op-in option as well as the need for a roadmap to identify appropriate measures (including fuels and technologies) to achieve lowest-cost emission reductions before a regulatory approach is applied.

Opponents of incorporating the sector within the CFS included comments from two industry stakeholders that noted that its application to the sector would be unprecedented and existing measures and policies could be used to reduce emissions in the sector. It was noted that new end-use technologies in the sector still have associated risks and investments are required.

5.3 Industry

5.3.1 Oil and Gas

Oil and gas sector stakeholders expressed the need for considerations related to competitiveness, while specifically referencing risks related to trade exposure, compliance costs, credits and double regulation. Concerns were expressed about the technical feasibility and impact of the CFS, such as feasibility of alternative fuel use within existing engineering specification, energy-efficiency optimization, use of fuels produced at facilities and fuel switching.

Proponents of incorporating the sector within the CFS included comments from a renewable energy association that noted the feasibility of the refining sector to transition to low-carbon fuels (e.g., through carbon capture utilization, renewable hydrogen utilization and biomass gasification). Others suggested an opt-in option with credit generation for emissions intensity improvements, for example, against an industry average.

Opponents of incorporating the sector within the CFS included comments from oil and gas sector stakeholders. A sector association noted that improvements to the refinery sector's produced fuel emission intensity from a baseline would be globally unprecedented. It was also recommended that refineries be exempt until implications are understood, noting caution that practical alternative fuels were absent and that the CFS could result in the purchase of credits rather than investments in emission reductions. It was noted that a change at refineries from regular unleaded gasoline to conventional blendstock for oxygenated blending would result in inefficiencies and the need for technical modifications with costly and lengthy investments. An oil and gas sector association noted that fuel gas and coke use are highly optimized within the refinery sector, and cautioned that the replacement of the former would result in flaring and that the latter is well integrated in production processes. It further emphasized heating value requirements that may not be achievable by using hydrogen, which would have efficiency impacts (i.e., higher fuel use or outputs), and that changes to volumetric energy content would affect equipment capacities, reliability, efficiency and safety.

Furthermore, it was noted that the sector is unique in the sense that it is both a producer and consumer of energy, and as a result, it would face costs more than any other Canadian industry. The significance of any increase in natural gas costs was highlighted, referring to the 30 per cent of Canadian natural gas used in the oil sands sector.

5.3.2 Mining

Comments on the treatment of the mining sector under the CFS expressed support for an incentive-based, voluntary approach, and enabling industry to generate credits that could be used for compliance. A number of stakeholders noted the need for considerations related to existing coverage of the sector's operations under other policies and regulations. Some commented on the limited technical feasibility of lower-carbon fuel use in the sector, while noting that low-hanging opportunities were already achieved and that additional reductions (especially fuel switching, new fleets and retooling) would be costly. Stakeholders called for exemption for certain operations and conditions, including: fuel suppliers where the fuel is essential to an industrial process (e.g., metal refining and smelting, cement making), facility coal use at steelmaking coalmines, mining vehicle fuels and in geographies where alternative fuels are limited.

5.3.3 Cement

Comments on the treatment of the cement sector under the CFS expressed concerns related to the higher cost resulting from increased the price of industrial and transportation fuels, and that this could draw investment away from lower-cost options to reduce emissions. Caution was expressed that the policy could disadvantage the sector while delivering suboptimal emission outcomes, and that there should be exemptions sector-wide or on a case-by-case basis. It was noted that lower-carbon engineered fuels (e.g., bio-coal, renewable natural gas) were untested in the cement industry, and that novel fuels or fuel blends could lead to production issues or require significant capital modification or equipment upgrades. Concerns were also noted on the price and supply reliability of cleaner fuels, and it was recommended that the sector be afforded flexible access to a diverse range of fuels.

5.3.4 Forestry Products

There was a general level of concern regarding the limited availability of forest biomass. Caution was expressed that the CFS and renewable fuels requirements could increase demand for forest feedstock that would compete with other sectors that rely on wood residuals and have ecological impacts. A comprehensive analysis of feedstock availability (for all uses) was recommended.

5.3.5 Agriculture

Agricultural stakeholders, referencing increased feedstock demand and diversification, expressed support for the CFS but opposed on-site produced fuel use. Considerations regarding small-scale farms as well as access to pipelines or grids were also recommended. Furthermore, while referencing high-capital-cost clean technologies for on-site, low-carbon energy production, the need for investment in renewable natural gas production was highlighted. Sector stakeholders noted Canadian agriculture leading on sustainability, with supportive comments that included: reduction in the sector's environmental impact through modern practices (e.g., crop rotation to reduce fertilizer use, low tilling to reduce soil carbon release), Canadian sustainability metrics with five-yearly reporting, and concerns regarding imported feedstocks' ecological impact. For additional comments on sustainability considerations, see Section 3.3.

5.3.6 Fertilizer

It was noted that the industry is already applying best practice and has reduced its emissions, and that clean fuels were not appropriate for use in the sector given underground mining conditions, equipment requirements and required feedstock characteristics. Natural gas was also noted as the primary feedstock in processing nitrogen and potash, and competitiveness concerns were expressed regarding the higher cost of renewable natural gas. Given the distances product is transported, concerns were expressed about higher transportation fuel price impacts. Sector stakeholders called for a voluntary incentive-based CFS program without compliance obligations, including fuel-switching credit incentive. Finally, comments were provided on the importance of recognizing and harmonizing with existing regulations that the sector operates under, including at the federal and provincial levels.

6.0 Interaction with Other Programs

Stakeholders cautioned that a CFS may negatively interact with a number of other policies and programs, creating complexity. The following recommendations were made:

Duplication: Many stakeholders expressed that obligations from the CFS could be duplicative or cumulative to the ones already in place (e.g., carbon pricing, renewable fuels regulations). It was noted that this may not necessarily lead to additional emission reductions, and may be counterproductive to reducing GHG emissions globally. Some suggested removing renewable fuel regulations either initially or eventually to address duplication of requirements (*c.f.*, Section 6.1.2).

Harmonization: Some stakeholders called for the harmonization of baselines, carbon-intensity targets, fuel blending requirements, accounting methodology and reporting practices. It was noted that duplication and double taxation (arising from carbon pricing) should be avoided. One stakeholder argued that streamlined subnational regulations may be more effective than a federal approach.

Alignment: Some stakeholders noted that the CFS should be aligned with other mature subnational, federal and international programs, avoid creating regional requirements through regulations and encourage regional flexibility in the process. One stakeholder highlighted the importance of the government having a comprehensive understanding of interactions with all existing policies before implementing a CFS.

6.1 Domestic Policy Interactions

Stakeholders emphasized the importance of the CFS being coordinated as a whole-of-government approach, the importance of assessing the interactions of the CFS with other federal and provincial policies, and avoiding duplication of regulations. Numerous federal policies, programs and initiatives were identified that could complement or overlap with the implementation of the CFS. For example, the interactions between the CFS and GHG emission regulations that target light- and heavy-duty vehicles, zero-emission vehicle strategy and federal infrastructure funding were noted. There is also potential for interaction with building codes, Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations and the natural gas emissions intensity standards in the electricity sector, to name a few.

Stakeholders emphasized the importance of federal–provincial policy alignment and collaboration in the design of the CFS. Some stakeholders expressed support for stronger carbon intensity targets to avoid backsliding towards the lowest common denominator. Several stakeholders recommended that compliance mechanisms should be complementary, and a credit generation policy should be compatible with provincial programs or interchangeable with similar systems in other markets.

Stakeholders noted the need for considerations related to costs and benefits of interactions between the CFS and other policies at the federal and subnational levels. Many stakeholders referenced existing provincial carbon pricing, highlighting the need to assess how the CFS would interact with the output-based approach for large emitters and cap-and-trade policies, as well as the importance of not adding additional cost with due considerations to the proposed federal price on carbon (*c.f.*, Section 6.1.1).

6.1.1 Carbon Pricing

Many stakeholders expressed support for carbon pricing policies as a cost-effective means of reducing emissions. Some argued that the price on carbon was not stringent enough to meet policy objectives and that the CFS could be a complementary measure. Others called for the price on carbon to be increased instead of implementing the CFS, expressing concerns regarding additional compliance costs that could affect competiveness.

A number of submissions referenced research related to the cost effectiveness of carbon pricing policies as a primary tool for meeting emission-reduction objectives. One stakeholder emphasized the need for government to demonstrate why complementary measures to carbon pricing are necessary, the CFS interaction with pricing regimes and examples of its cost effectiveness.

Proponents of the use of the CFS as a complementary measure to carbon pricing argue that it is an effective approach to drive innovation and create incentives by applying an implicit price on higher-emission-intensive fuels while encouraging consumption and production of cleaner fuels. A number of organizations referenced experience in California and British Columbia, where a low-carbon fuel standard is applied in tandem with carbon pricing policies to drive additional reductions. It was commented that the CFS could create necessary market conditions for domestic consumption of cleaner fuels and offsetting of fossil fuels, and that, without it, domestic producers would be at a competitive disadvantage against more established regulatory markets. Finally, a number of stakeholders specifically referenced the application of the CFS as a complementary measure in the transportation sector, where the price on carbon is seen as insufficient, and a suite of tools (e.g., cleaner fuels, technologies, and modes of transportation) would be necessary for realizing emission reductions. Justification for CFS was also noted in special circumstances where emissions were difficult to quantify and costs to reduce emissions were higher. A number of stakeholders emphasized a need for caution, and some called for analysis on the interaction of carbon pricing and the CFS.

Opponents of additional requirements through the CFS focused their comments primarily on the cost effectiveness of carbon pricing versus regulatory approaches while highlighting compliance costs and competiveness impacts of the CFS as an additional measure. Preference over carbon pricing policies, such as a carbon tax and cap-and-trade regimes, were noted for their ability to drive cost-effective change, applied across economic sectors, providing simple and predictable market signals and allowing for compliance flexibility (e.g., choice of fuel and technology). The CFS was said to have a distortionary effect and may weaken price signals by redirecting them to carbon intensities. A stakeholder that expressed support for a CFS noted potential preference in the specific application of carbon pricing to stationary sources, for the compliance flexibility available to achieving emission reductions. Others noted that emission reductions would be best achieved where possible through carbon pricing signals, and that additional opportunities were limited. A number of stakeholders expressed concern that a CFS would be duplicative, increase compliance cost, add unnecessary layering and be misaligned with the carbon pricing objectives of reducing compliance burden. Concerns were particularly raised about the impact of the CFS in addition to carbon pricing for emission-intensive and trade-exposed sectors (including on competitiveness and carbon leakage), with an industry association specifically noting the need for considerations around border carbon adjustment.

6.1.1.1 Carbon Pricing Policy Design

A number of stakeholders provided perspectives on the design elements of carbon pricing policies in relation to the objectives of a CFS. Some noted carbon pricing as a tool that can be used to price that which is undesired and exempt from the pricing policy fuels that are desired. However, comments from renewable energy sector companies and an association noted that a carbon price paid by consumers did not differentiate emission intensity of fuels or provide the necessary incentive for higher renewable fuel content. Some support was expressed for pricing fuels based on their life-cycle emissions and to increase public awareness, ensure that the lower-carbon portion of fuels are not charged the same tax and appropriate labelling is applied at the point sale.

6.1.2 Renewable Fuels Requirement

Stakeholders provided divergent perspectives on whether existing renewable fuel regulations should be expanded, work in parallel with the CFS or be phased out. Both proponents and opponents of renewable fuel regulations referenced achieving emission-reduction objectives and reducing compliance burden in support of their position. A number of stakeholders also noted the need to understand the interaction of the CFS with other federal and subnational renewable fuels policies, as well as learning opportunities provided by jurisdictions with comparable approaches.

Proponents of volumetric requirements noted that such an approach has already demonstrated success in reducing emissions, is essential in meeting a CFS's emission-reduction targets, supports the development of the renewable fuels sector and could support its market growth. Stakeholders listed a number of additional benefits, including its benefits for the agricultural sector. Others outlined an approach where more ambitious volumetric requirements replacing existing renewable fuel regulation could reduce regulatory burden and eliminate the patchwork of policies across the country. Caution about backsliding was also noted by a number of renewable energy companies in a switch from volumetric requirements to an emission intensity approach. Some stakeholders specifically asked for the application of volumetric targets in the transportation sector.

A number of stakeholders commented on a hybrid approach of emission intensity requirements in conjunction with renewable fuel targets. It was noted that such an approach could drive innovation and result in additional emission reductions by incentivizing lower-carbon and next-generation fuels. Others noted that, as CFS targets increase, the renewable fuel targets may become redundant, and that they could be phased out gradually or concurrent with the CFS.

If the CFS were to have volumetric requirements, the need for appropriate determination and verification of requirements was noted, including references to the EPA's Renewable Identification Numbers system as a transparent approach to avoiding credit fraud.

Opponents of volumetric requirements primarily noted that emission-reduction objectives are better served with intensity considerations and that the CFS would provide flexibilities that are not otherwise offered by volumetric targets. It was noted that emissions considerations, compliance flexibility and technology neutrality could drive investment towards lower-carbon and next-generation fuels, beyond the current renewable fuel requirements. In addition, concerns were noted regarding the multiplicity of volumetric mandate policies, the patchwork of policies across jurisdictions and related administrative burden.

6.1.2.1 Scope and Coverage

Proponents of volumetric requirements expressed general support for increased stringency of renewable fuel targets, with a number of stakeholders commenting on the need to broaden fuels included. Regarding ethanol, it was noted that the Canadian average content in 2014 reached 7 per cent. On volumetric requirements for renewable alternatives to gasoline (e.g., ethanol), there was broad support among proponents for targets reaching 10 per cent, with some providing views on timelines, including in the short term or between 2020 and 2025. On volumetric requirements for renewable alternatives to diesel (e.g., biodiesel), there was broad support among proponents for targets reaching 5 per cent, with some providing views on timelines, including in the short term, between 2020 and 2025, as well as incremental increases of 0.5 per cent over five years to reach such a target. 2025 was also referenced as a potential date for a policy review. Comments on coverage of renewable fuel requirements included the need for broader definition of alternative fuels and clean electricity, additional feedstocks (e.g., waste streams), and strong support for the inclusion of renewable natural gas.

6.2 International Policy Interactions

A wide range of stakeholders noted their support for alignment or regulatory coherence with North America in general, and with the United States in particular. One stakeholder cautioned that the federal CFS could be incompatible with U.S. regulations if those were to be weakened. Another expressed the need to design the CFS in a way that would prevent Canada from facing any foreign trade tariffs, noting that an approach that favours carbon intensity per gigajoule may be able to achieve this. Sector-specific comments were also provided, including:

Rail: It was noted that railways are highly integrated within a North American network, competing with other operators within the network. U.S. policies and deployment of natural-gas-powered locomotives will have an impact in Canada.

Marine: It was noted that international shipping requires a global solution and that measures outside of the IMO should be avoided. It was noted that the sector operates under standards to reduce GHG emissions, including through energy-efficiency requirements and the IMO Energy Efficiency Design Index and Ship Energy Efficiency Management Plan. Adding additional domestic requirements were noted to be counterproductive, could undermine the IMO's international efforts and could result in competitive disadvantage compared to other jurisdictions.

Aviation: It was noted that the approval of jet fuels and renewable blends is done at the international level and that a national approach could be prohibitively expensive. They referenced the adoption by ICAO in 2016 of the CORSIA. A number of stakeholders noted the need to harmonize with ICAO requirements. Another stakeholder emphasized that aviation fuels are already strictly regulated by a range of bodies, such as Transport Canada, the U.S. Federal Aviation Administration and the European Aviation Safety Agency, noting that Environment and Climate Change Canada should work with Transport Canada Civil Aviation to complete its CFS process.

Buildings: It was noted that manufacturing standards from the United States should be considered, and potentially aligned with, when designing a national approach. References were made to requirements under ENERGY STAR and the American Society of Heating, Refrigeration and Air Conditioning Engineers.