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Canadian Clean Fuel Standard

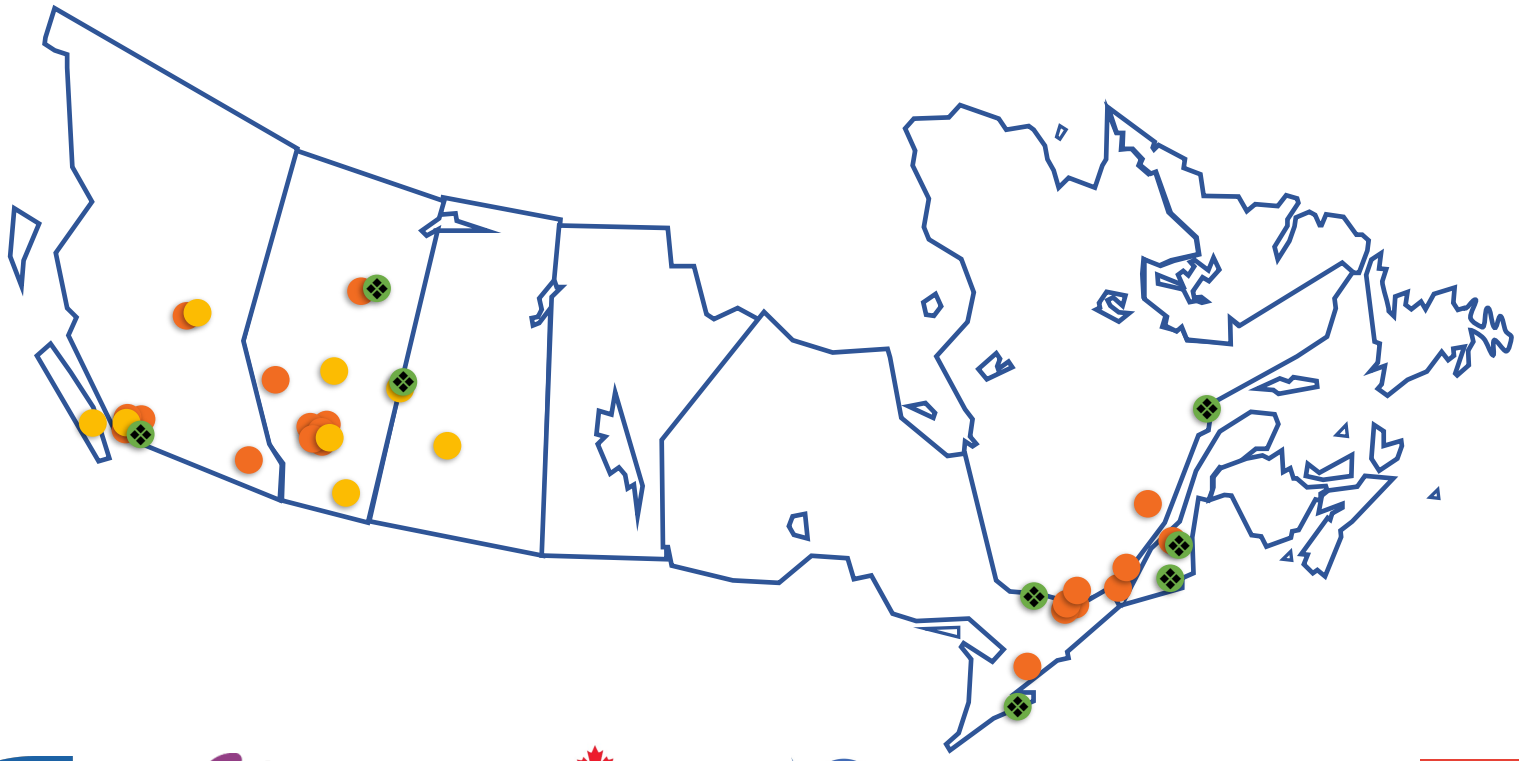
Fred Ghatala, Director Carbon & Sustainability

August 25, 2021

Agenda

- Snapshot: Canadian Renewable Fuel Industry
- Key Issue: Federal Clean Fuel Standard
- Provincial Policy on the Move
- Election 2021

Advanced Biofuels Canada - Members



- Production
- Processing
- Office/Research

ADM
argus
Carbon Engineering
CANADA CLEAN FUELS
CANARY biofuels
CONSOLIDATED BIOFUELS Ltd.
CANFOR
ELBOW RIVER
ecoengineers
Enerkem
ENSYN
HALDOR TOPSOE
Honeywell UOP
INNOLTEK INNOVATION RENOUVELABLE
IOGEN CORPORATION
LanzaTech
LanzaJet
OPIS
RADICLE
REG Renewable Energy Group
steeper ENERGY
TARGRAY
Verbio
vorsana
WEST COAST REDUCTION LTD.

Advanced Biofuels Canada

Diverse Technologies, Products

Technologies:

Innovation

- Bio-chemical
- Thermo-chemical
- Transesterification
- Biomass co-processing
- Catalytic de-polymerization/ hydrothermal liquefaction
- Catalytic upgrading
- Gas fermentation
- Hydrotreating
- Direct Air Capture

Products:

Low Carbon Fuels

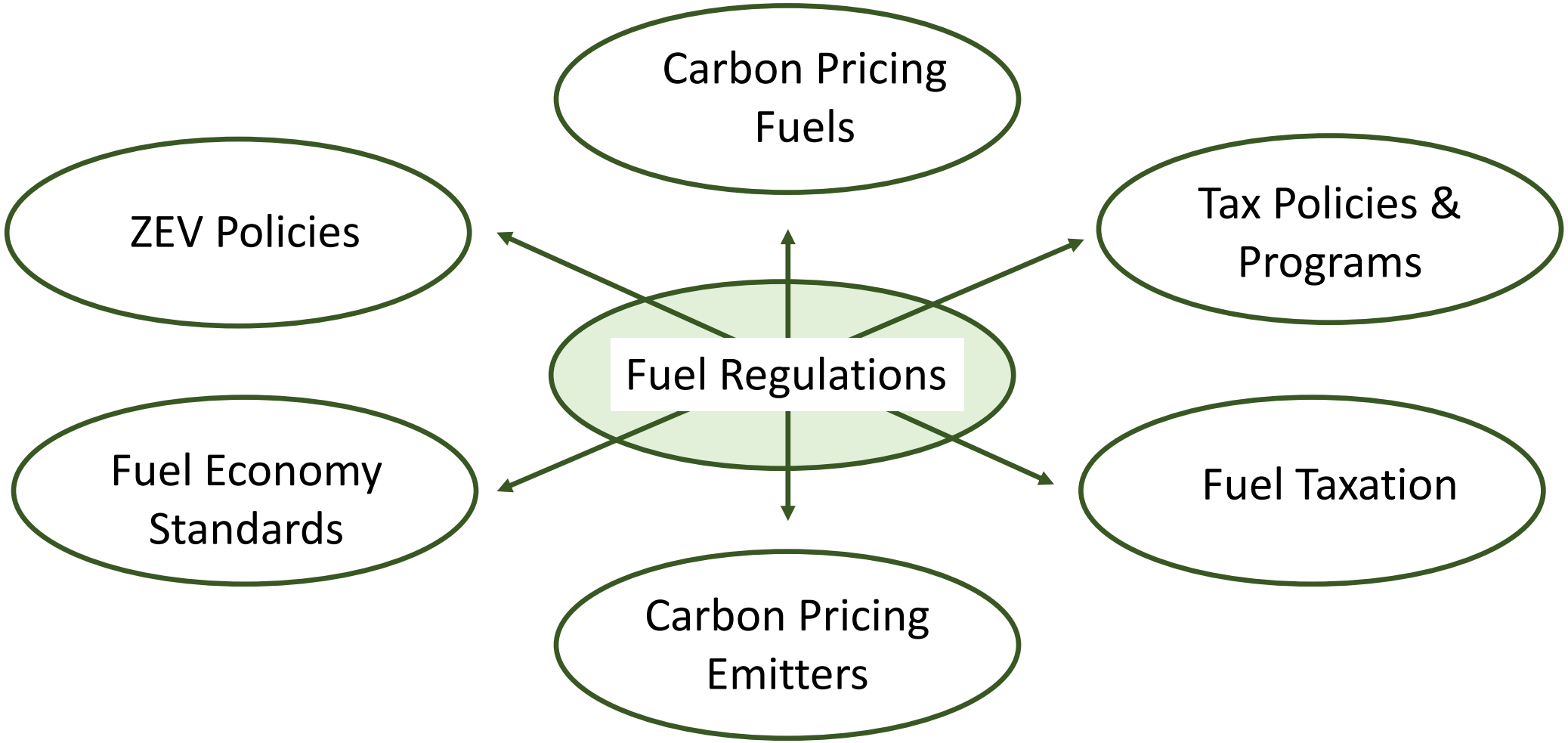
- Advanced Ethanol
- Biocrude
- Biodiesel
- Biogas (H_2, RNG)
- Biojet (SAF)
- Bio-methanol
- Renewable Fuel Oil
- Renewable Gasoline
- Renewable Hydrocarbon Diesel (HDRD)
- Synthetic Diesel

Co-Products:

Bio-Products

- Bio-chemicals
- Fatty acids
- Glycerin
- Animal feed & nutritional supplements
- Green polymers
- Light & heavy fuel ‘ends’
- Liquid CO_2
- Phosphate
- Renewable naphtha
- Renewable Liquid Petroleum Gas (R-LPG)

Complementary Policies



Canadian Fuel Regulations (2021)

Denotes GHG requirement

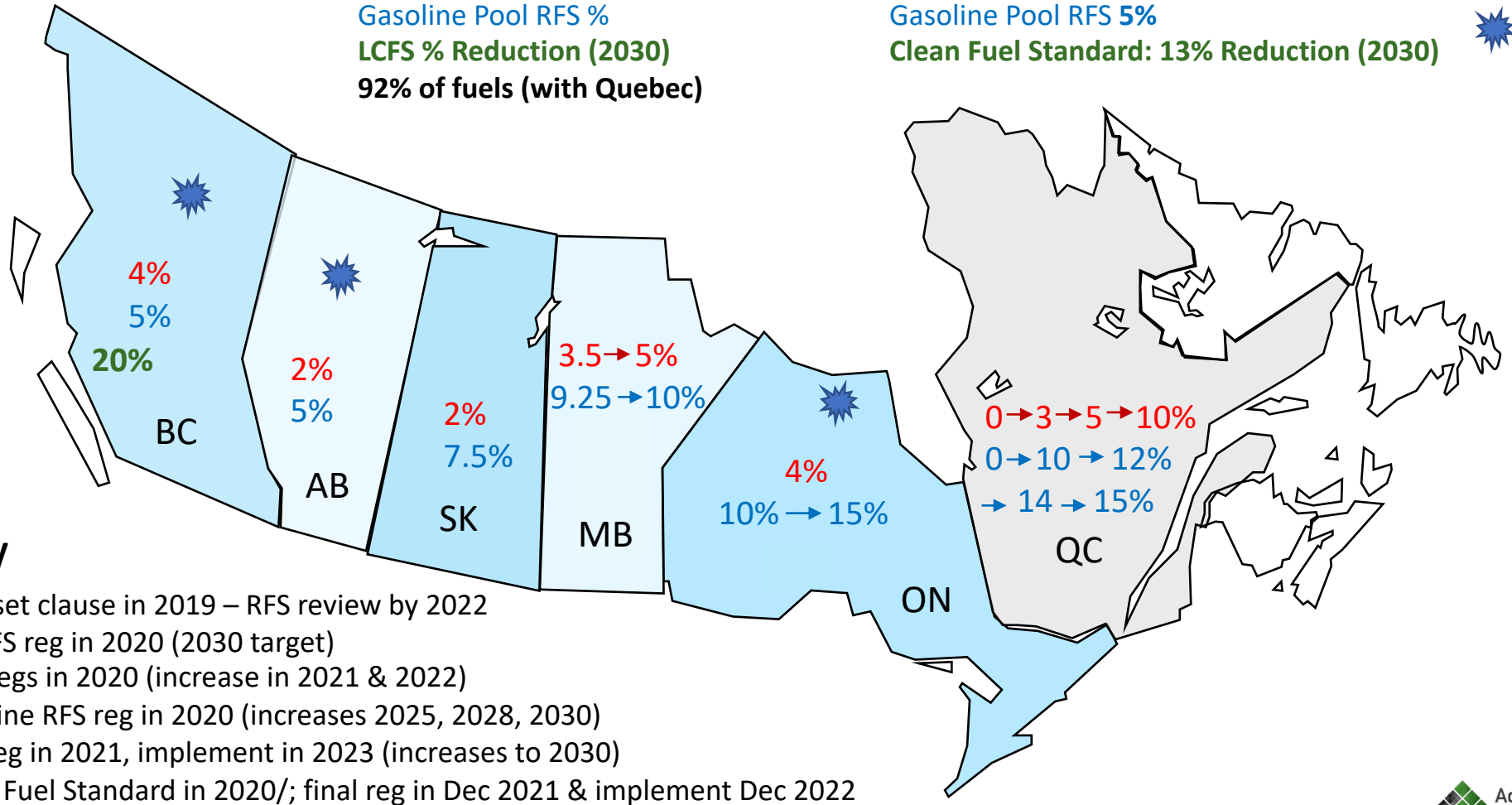
Denotes active development

Provincial Mandates

Diesel Pool RFS %
Gasoline Pool RFS %
LCFS % Reduction (2030)
92% of fuels (with Quebec)

Federal Mandates

Diesel Pool RFS **2%**
Gasoline Pool RFS **5%**
Clean Fuel Standard: 13% Reduction (2030)



Current Activity

AB: eliminated sunset clause in 2019 – RFS review by 2022
BC: new statute/LCFS reg in 2020 (2030 target)
MB: amended RFS regs in 2020 (increase in 2021 & 2022)
ON: amended gasoline RFS reg in 2020 (increases 2025, 2028, 2030)
QC: new draft RFS reg in 2021, implement in 2023 (increases to 2030)
Federal: draft Clean Fuel Standard in 2020/; final reg in Dec 2021 & implement Dec 2022

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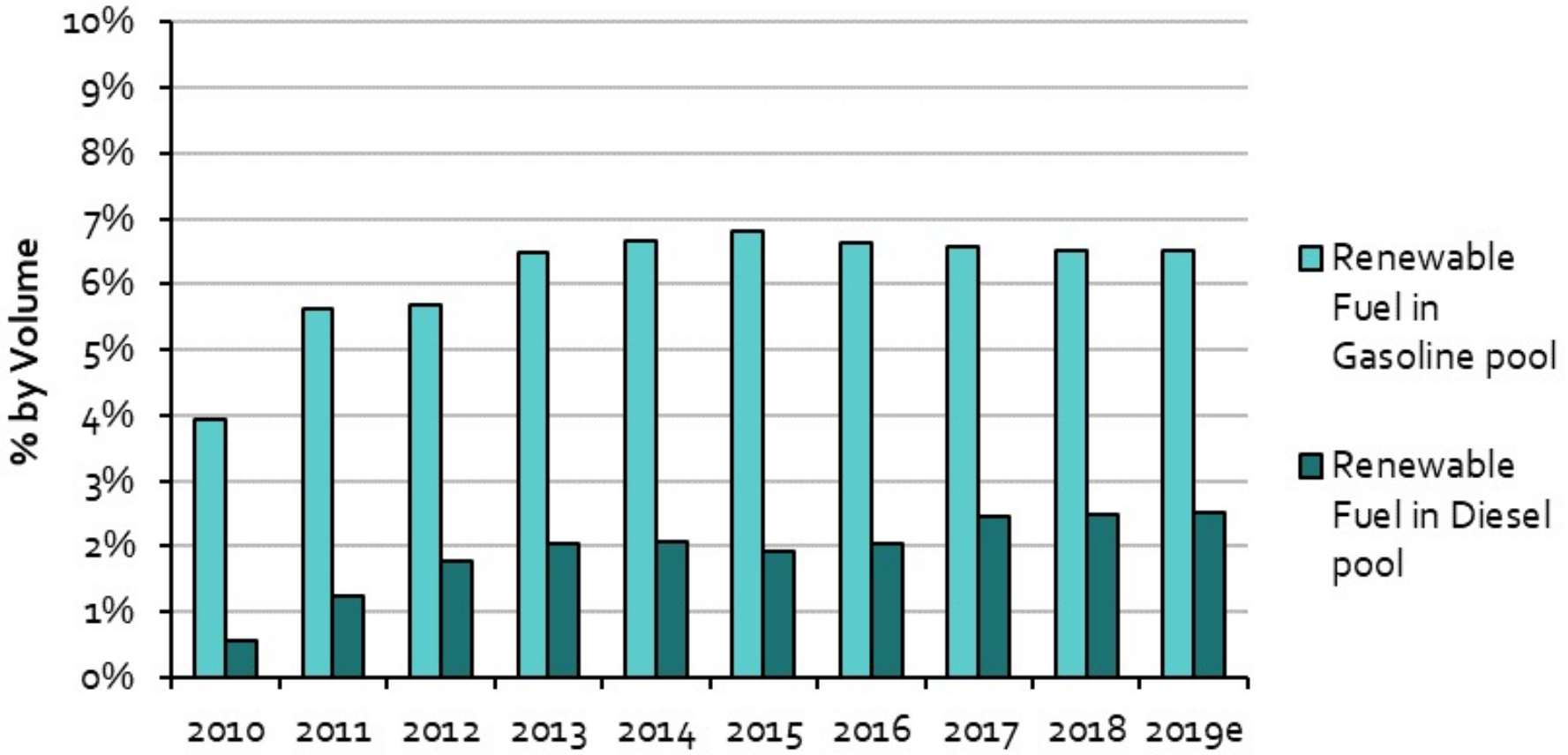
Canada's Fuel Markets



Source: Navius Research *Biofuels in Canada 2020*

Renewable Fuel Producers

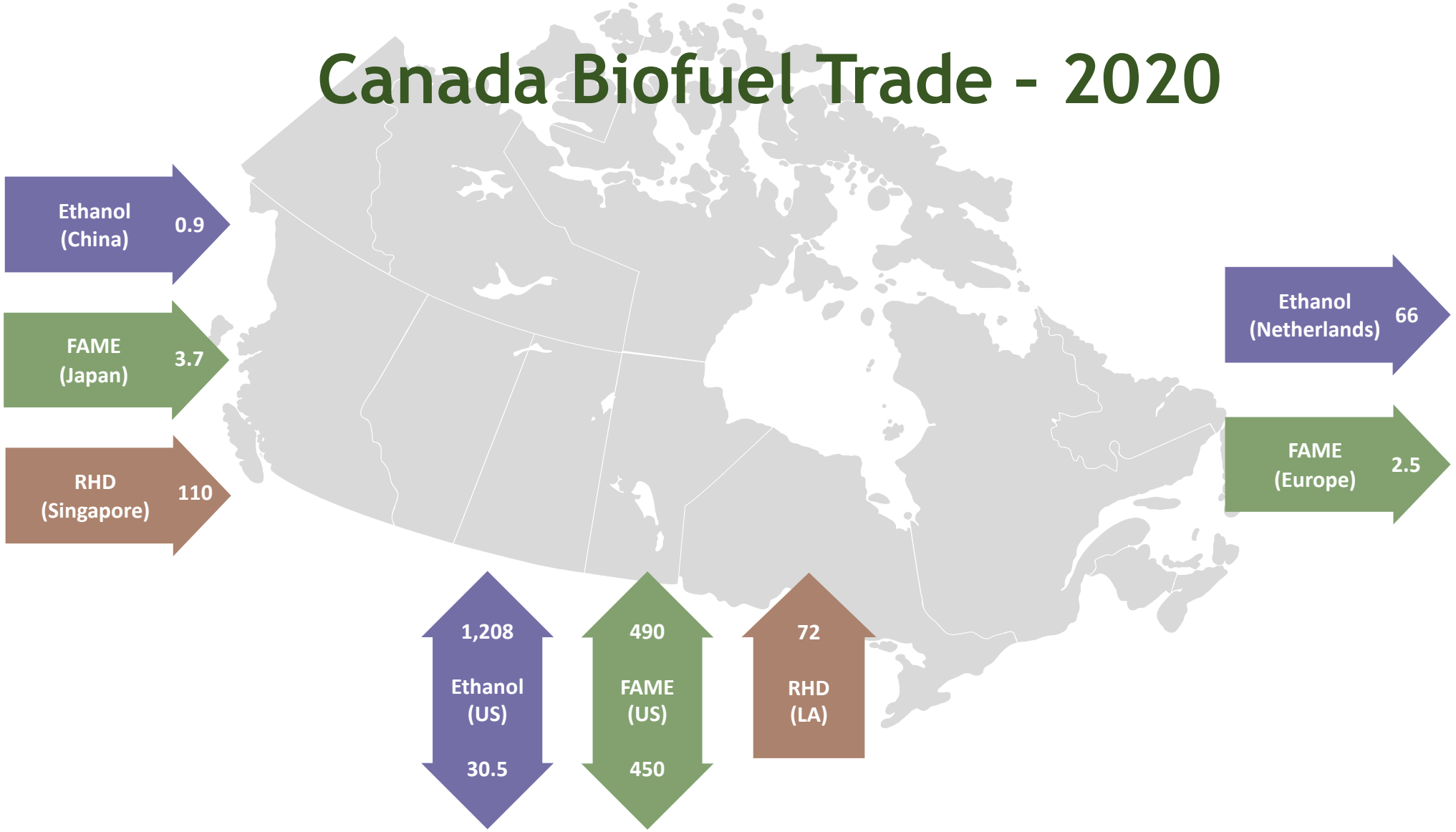
1. Primary Biodiesel Facilities
   i. ADM (320 MLY)
   ii. Atlantic – Verbio (170 MLY)
   iii. Darling – CLOSED - (56 MLY)
   iv. World Energy – BIOX (60 MLY)
   v. Parkland – co-processing (100 MLY)

Primary Biodiesel Capacity: 600 MLY
Renewable Diesel Capacity: nil

2. Primary Ethanol Facilities
   i. Greenfield Global – 4 plants (682 MLY)
   ii. Federated Co-op – Terra Grain (150 MLY)
   iii. Husky – 2 plants (300 MLY)
   iv. IGPC (380 MLY)
   v. Suncor (400 MLY)

Primary Ethanol Capacity: 1.9 BLY
Advanced Ethanol Capacity: 40 MLY

Canada Biofuel Trade - 2020



2020 Biofuel Trade (million litres)	Ethanol	FAME	RHD
Imports	1210	494	182
Exports	97	453	-

Source: Statistics Canada (totals may not sum due to rounding)

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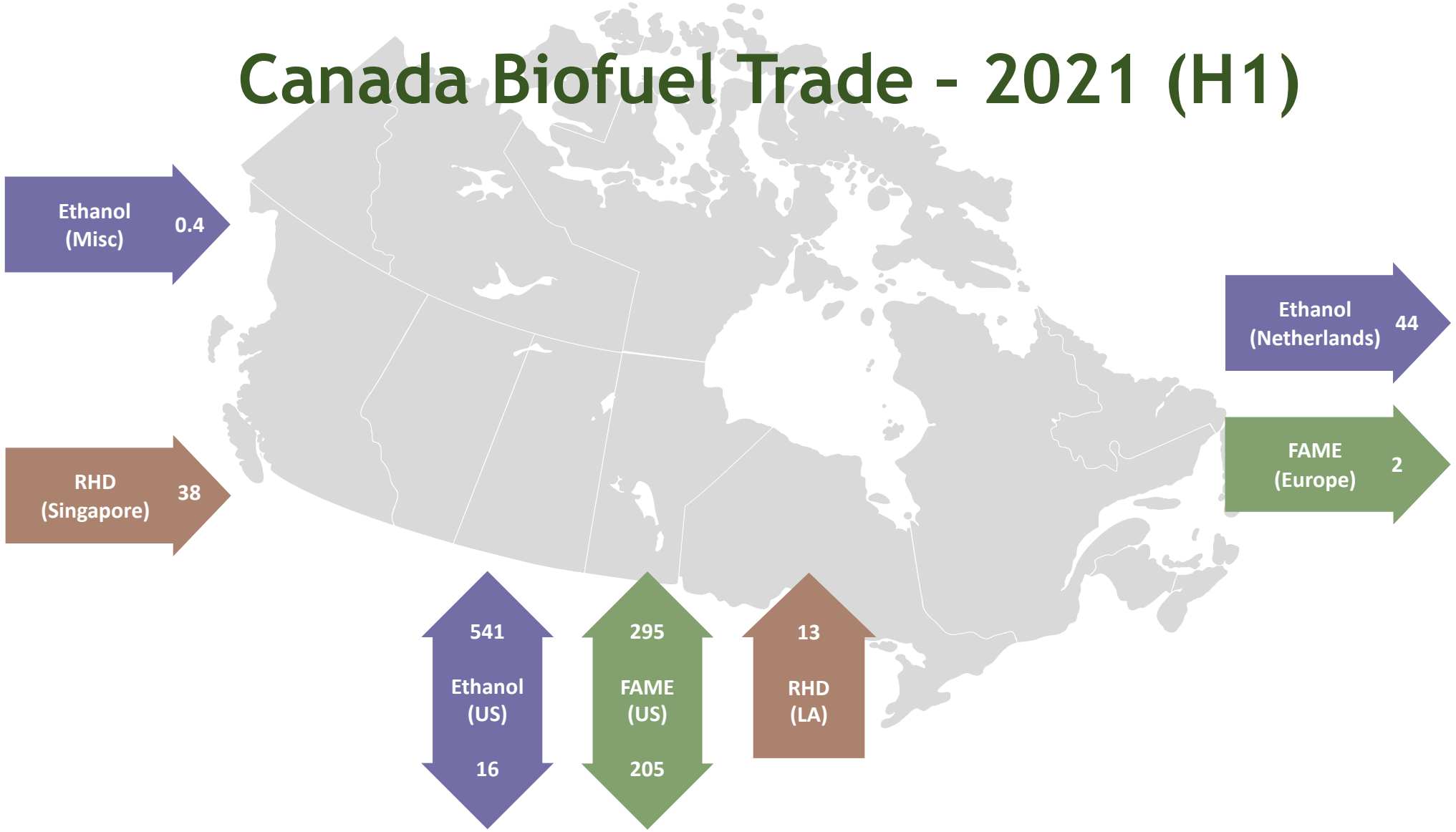
Canada Biofuel Trade - 2021 (H1)



2021 (H1) Biofuel Trade (million litres)	Ethanol	FAME	RHD
Imports	541	295	51
Exports	60	207	-

Source: Statistics Canada (totals may not sum due to rounding)

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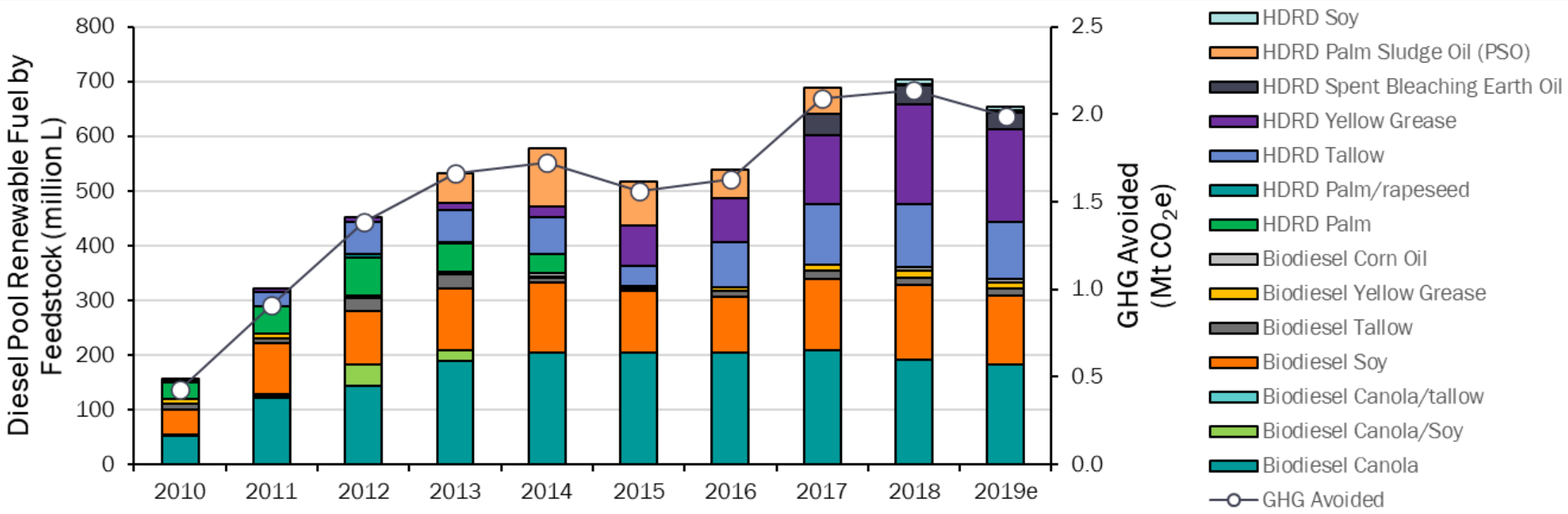
Renewable Fuel Use - Distillate



Source: Navius Research – *Biofuels in Canada* 2020

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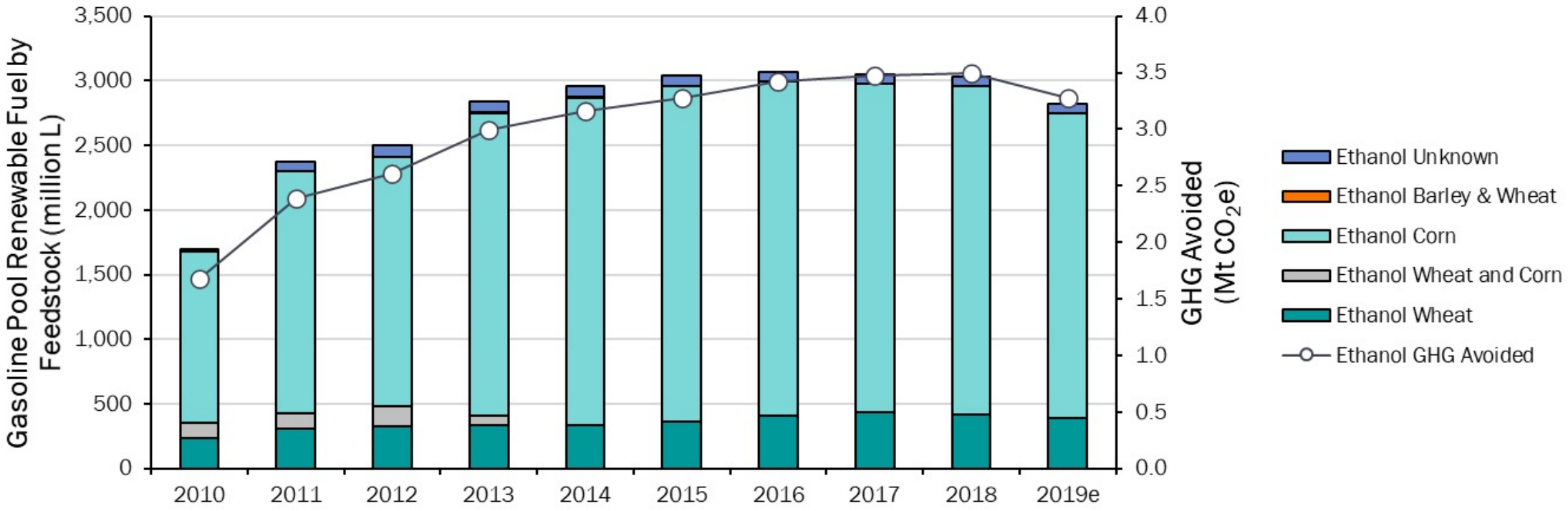
Renewable Fuel Use - Gasoline



Source: Navius Research – *Biofuels in Canada* 2020

Clean Fuel Standard

Canada Gazette, Part I, Volume 154, Number 51: Clean Fuel Regulations

December 19, 2020

Statutory authorities

Canadian Environmental Protection Act, 1999

Environmental Violations Administrative Monetary Penalties Act

Sponsoring department

Department of the Environment

WHAT'S DIFFERENT ABOUT THE CFS?

- The CFS builds on the existing federal blending mandate in 2 key ways:
  - **Life-cycle approach**
    - Includes all stages of fuel production and use, from extraction through processing, distribution and end use
    - Allows for innovation across a wide spectrum of activities, all of which contribute to reducing emissions from fuels
  - **Carbon intensity approach**
    - The life-cycle GHG emissions associated with producing a fuel, measured per unit of energy
    - Reducing carbon intensity over time drives innovation across the life-cycle
  - ***Covered fuel types***
    - *Gasoline, Diesel, LFO+HFO removed in July 2021, jet and marine are likely opt-in*
- For Canada, moving to the Clean Fuel Standard means:
  - **Recognizing that not all biofuels are equal**: the CFS creates incentives for lower-carbon biofuels and fuels produced from waste
  - **Supporting alternative technologies**, such as hydrogen and electric vehicles
  - **Driving innovation** in how fuels are extracted, produced, distributed, and used
  - **Taking a flexible and efficient approach**: the CFS creates a credit market to keep costs down compared to more prescriptive regulations

APPROACH FOR LIQUID FUELS

- The CFS will apply to fossil fuel suppliers, generally refineries
- It will build off of the current approach, incorporating the biofuel blending requirement from the *Renewable Fuels Regulations*, along with credit surpluses under those regulations
- Regulated parties must reduce carbon intensity of their fossil fuels by 2.4 grams of CO2e per megajoule in 2022, increasing to 12 g CO2e/MJ in 2030
  - Phasing-in allows regulated parties to use credits from business-as-usual renewable fuel blending in early years, and provides lead time for investments

Annual carbon-intensity reduction requirements and limits									
Year	2022	2023	2024	2025	2026	2027	2028	2029	2030
CI Reduction (%)	3%	4%	5%	6%	8%	9%	10%	11%	13%
CI Reduction (gCO_2e per MJ)	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0

- In order to provide a level playing field, the requirement is only on fuel used in Canada; not exports

Clean Fuel Standard - Proposed Design

20 Mt Clean Fuel Standard

Design Issues:
- Credit over-supply
- No clarity on non-fossil clean fuel demand

Liquid Class Fuel

Compliance Category 1: Cleaner fossil fuels

Compliance Category 2: Biofuels & synthetic fuels

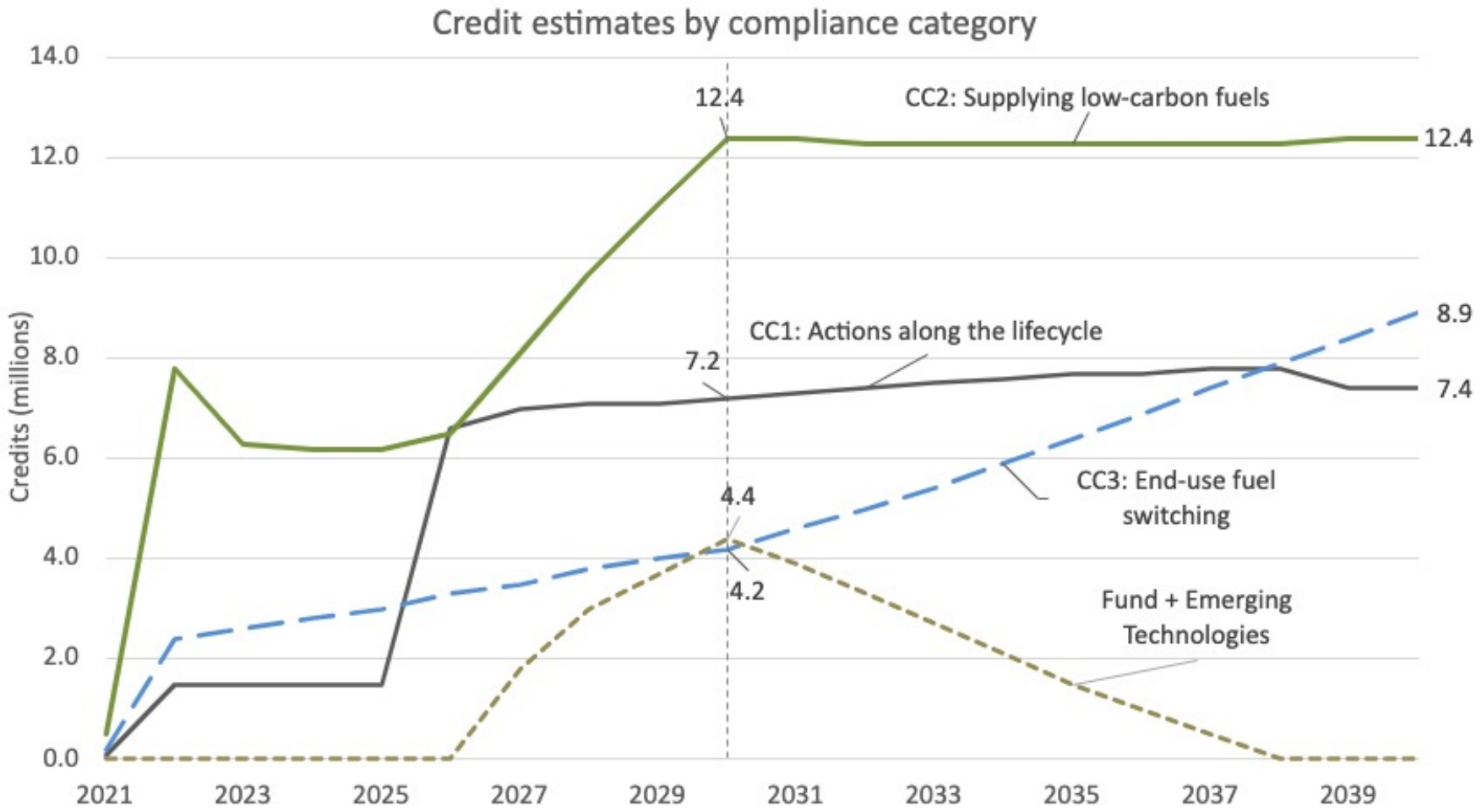
Compliance Category 3: Electric vehicles & gaseous transport

10%

Gaseous, Solid

Compliance Fund + Export Credits + Compliance Deferment + Industrial CCS

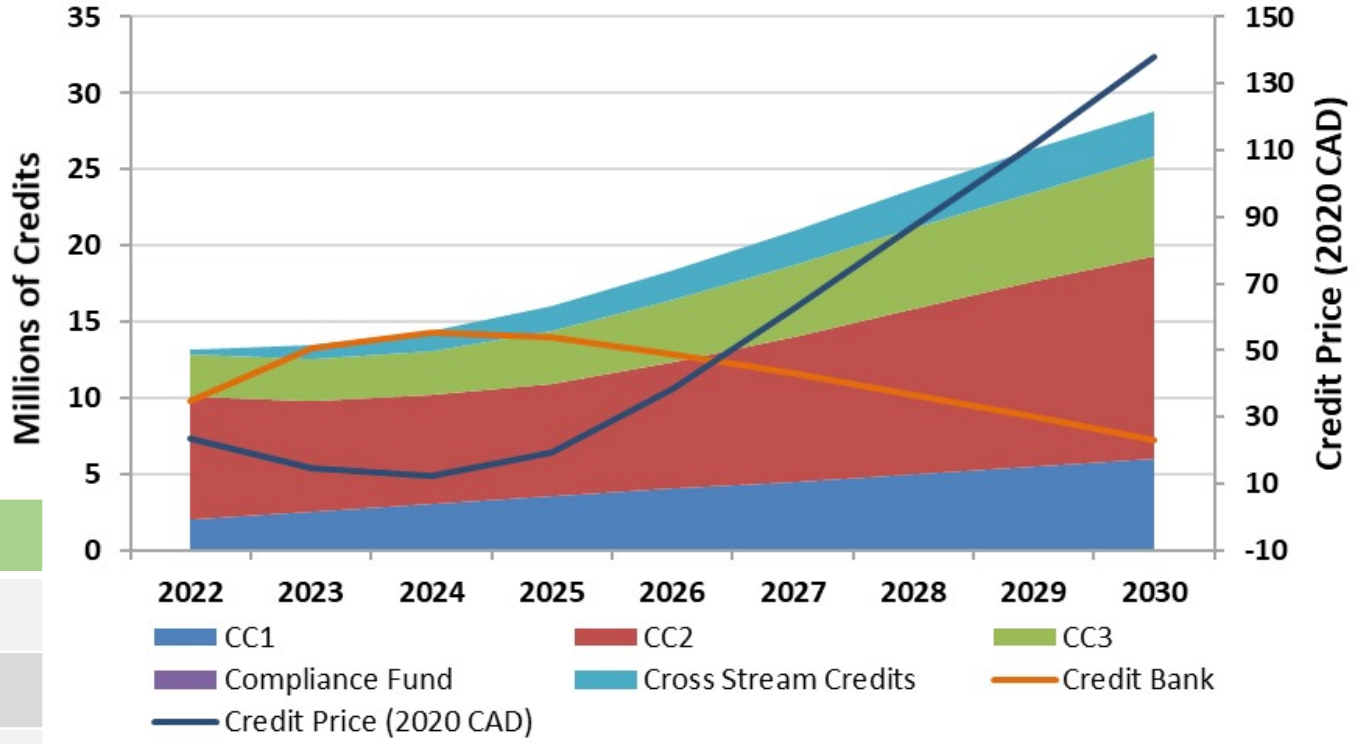
Federal Clean Fuel Standard



Clean Fuel Standard - Demand

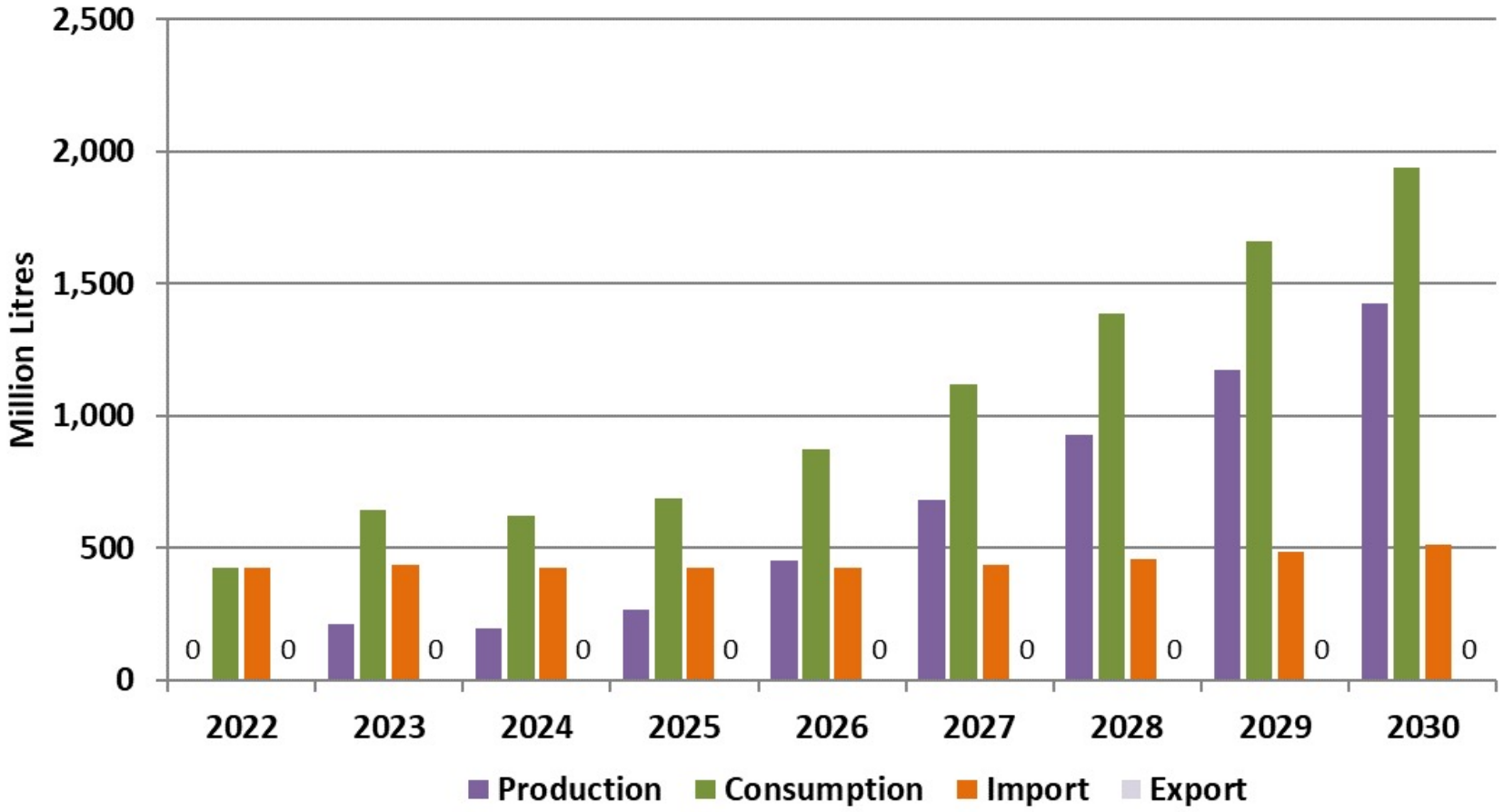
- Scenario modeling based on defined credit generation (CC1, CC3, X-stream, fund)
- Solve for biofuels

	2018	2030
Biodiesel	1.3%	3.1%
Renewable Diesel	1.2%	5.8%
Ethanol	6.5%	14.1%



Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
Analysis of the Implications of Canada's Proposed Clean Fuel Standard

Clean Fuel Standard
Renewable Diesel & Co-processing



Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
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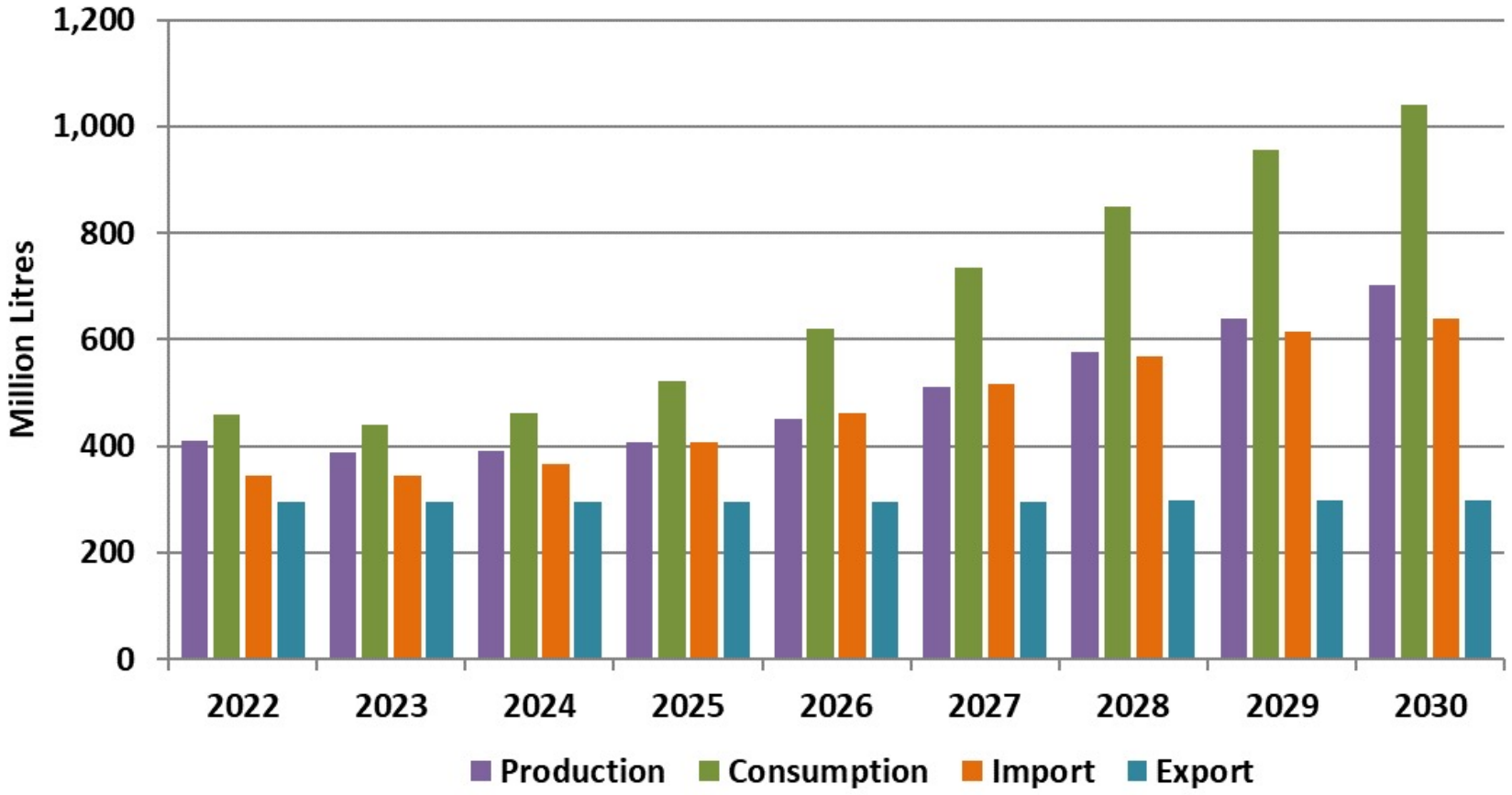
Clean Fuel Standard
Biodiesel



Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
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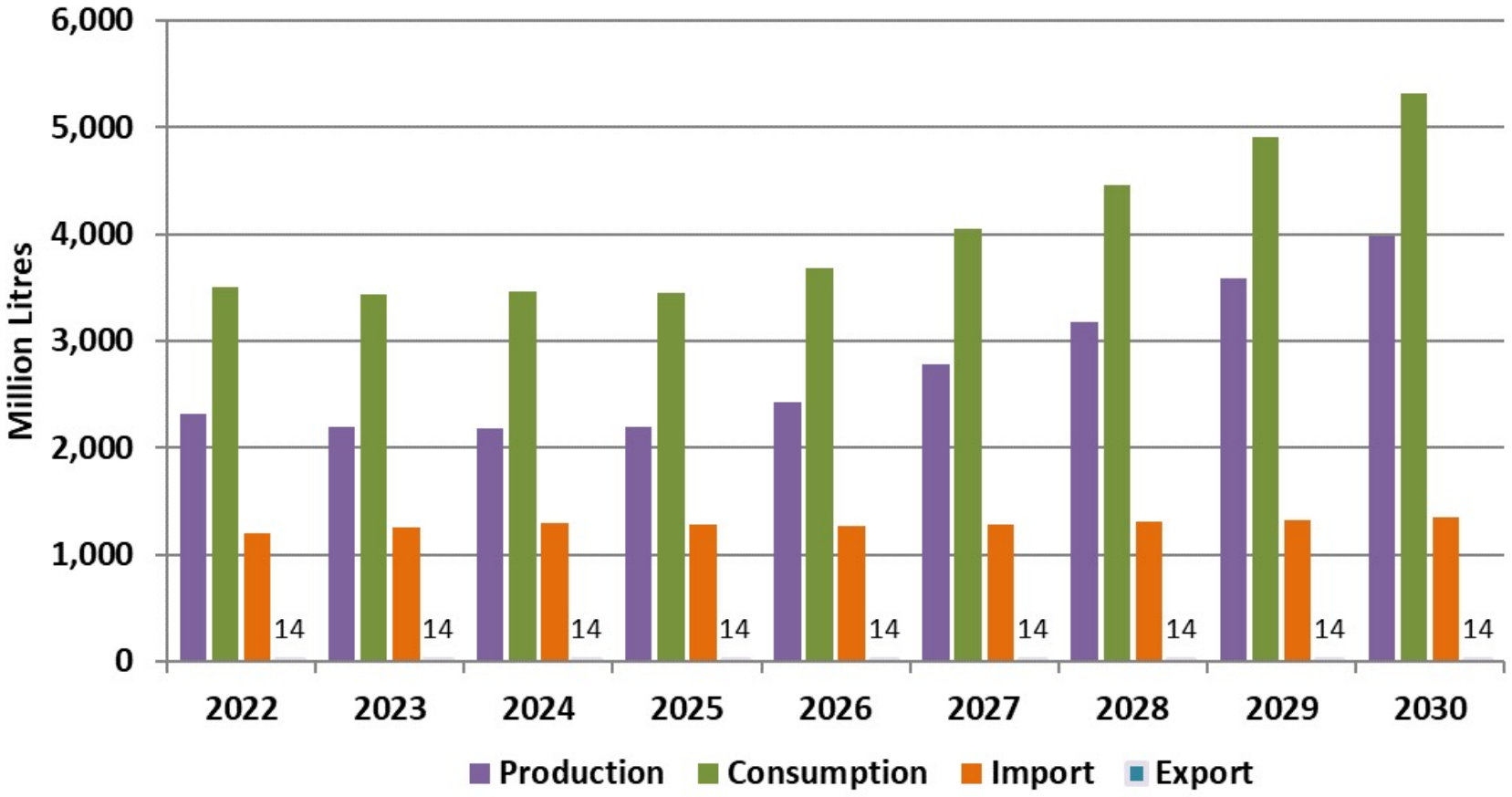
Clean Fuel Standard
Ethanol



Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
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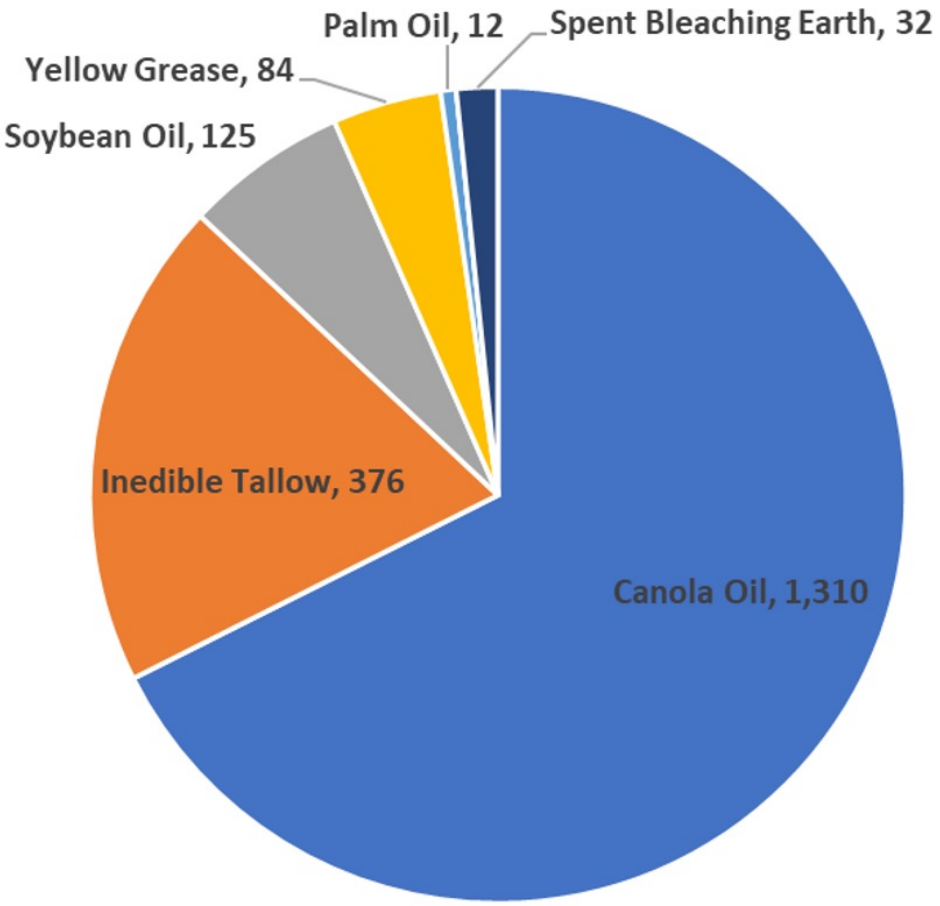
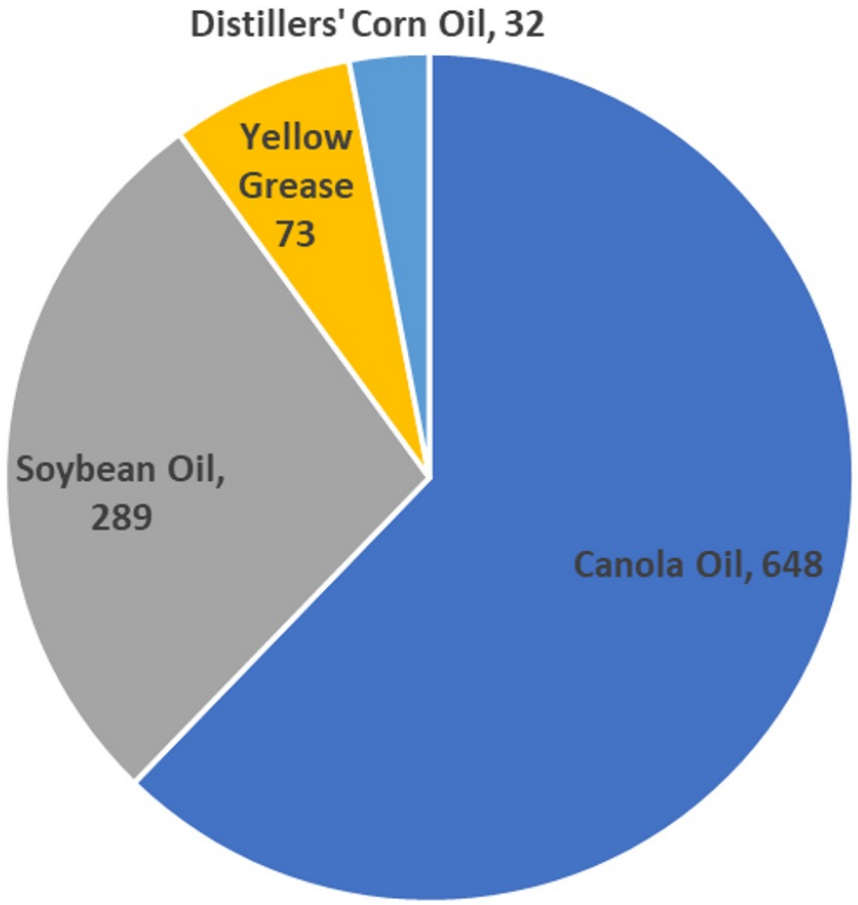
2030 CFS Driven Feedstock Use CC2 Scenario, kT

World Agricultural Economic and Environmental Services

RD: 1,938 kT (65%)



BD: 1,042 kT (35%)



Clean Fuel Standard - Key Issues

- Land Use & Biodiversity Criteria (LUB)
  - Farmer declarations
  - Excluded land (no land cleared post 2020, reference to EPA aggregate compliance)
  - 'Recognition of Legislation' by Minister (damaging agents 'pests', protected areas)
  - EU RED ILUC risk approach

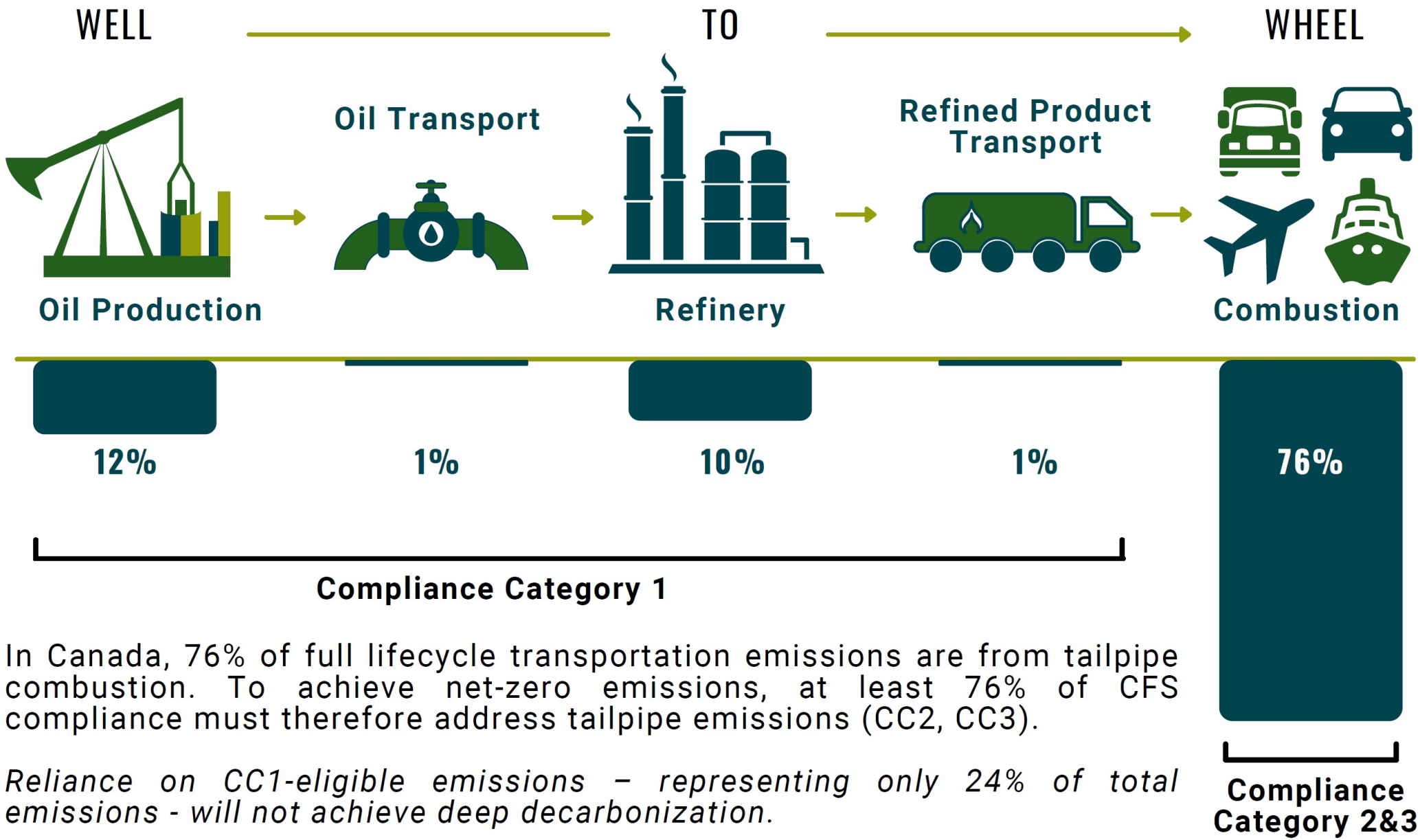
- Lifecycle Assessment Model (LCA)
  - Newbuild (not GHGenius or GREET)
  - Available with final regulations = high uncertainty of CI scores and approval process
- 'SAF' as opt-in, potential for reconsideration in 1st review
- Biofuel demand signal – 'net zero guardrail'

PROPOSED CLEAN FUEL REGULATIONS AMENDMENT:

NET-ZERO GUARDRAIL

Canada's Clean Fuels Standard (CFS) design disproportionately focuses on 'cleaner' crude oil, gasoline, and diesel. Industry announcements show potential for 100% compliance from upstream emissions reductions projects (e.g. CCS). The CFS also credits actions that have no relationship to transportation.

This design failure will 'lock-in' reliance on fossil fuels and make it impossible for Canada to achieve net-zero emissions in the transportation sector. As drafted, the CFS will suppress investment in clean fuels/energy capable of delivering net-zero emissions (e.g. renewable natural gas, biofuels, electric and hydrogen vehicles, co-processed fuels).



In Canada, 76% of full lifecycle transportation emissions are from tailpipe combustion. To achieve net-zero emissions, at least 76% of CFS compliance must therefore address tailpipe emissions (CC2, CC3).

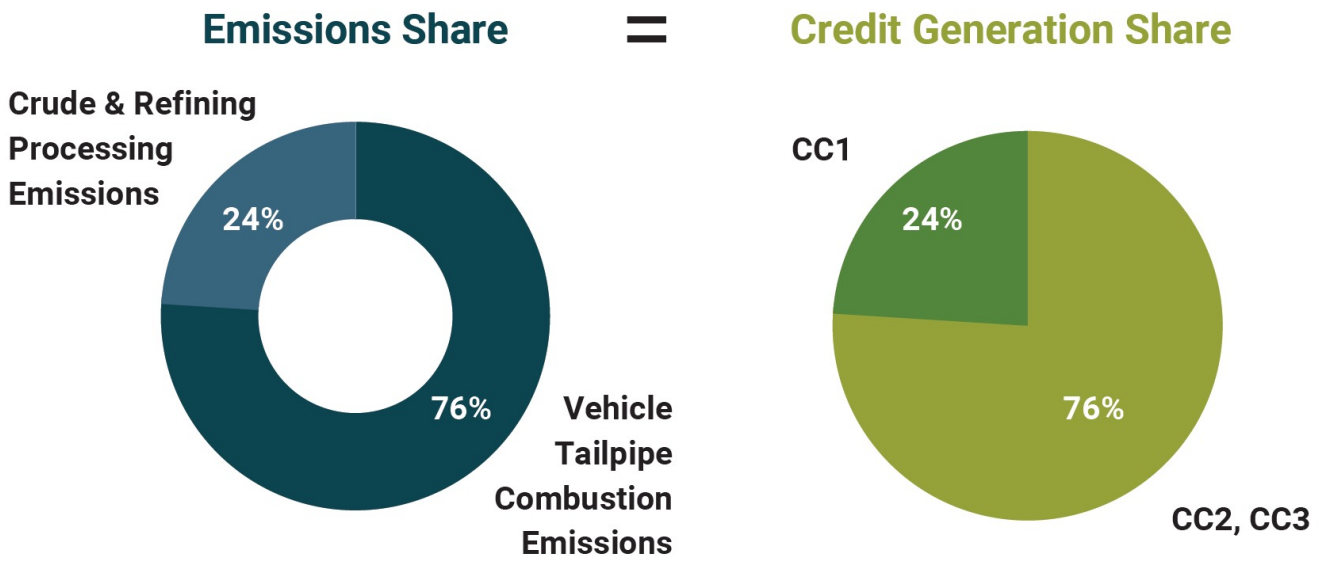
Reliance on CC1-eligible emissions – representing only 24% of total emissions - will not achieve deep decarbonization.

NET-ZERO GUARDRAIL: HOW IT WORKS

The guardrail would be a contingent provision that comes into effect only in the event that a primary supplier's combined use of CC2 and CC3 credits + coprocessing is less than the proportionate tailpipe emissions (76%).

IF: Compliance Category 2&3 Credits < 76% → **TRIGGER GUARDRAIL**

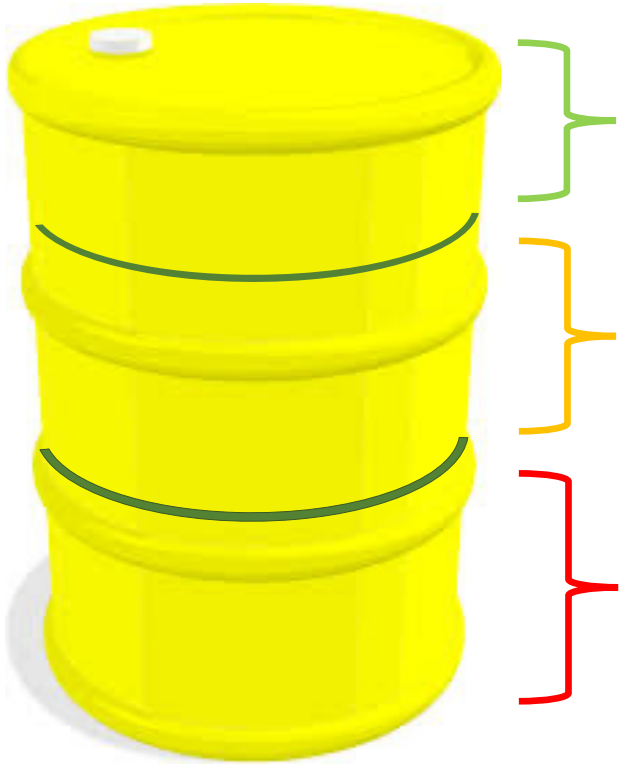
NET-ZERO GUARDRAIL: CREDITS PROPORTIONAL TO FUEL LIFECYCLE



The guardrail would not limit credit generation from other pathways and, if surplus CC1 or other credits are generated in a period, the credit banking provision in the draft CFS regulations will enable them to be used in future years.

Biofuel Blend Value: Carbon Tax Exemption
Energy + Compliance + Carbon

- Federal carbon tax:
  - $40/T (2021) to $170/T (2030)
  - $50/T in 2020
  - Plus $15/year (2023-2030)
- Federal carbon tax on fuels exempt biofuels in blends above E10 or B5



Carbon tax value $
(Blend-based exemption)

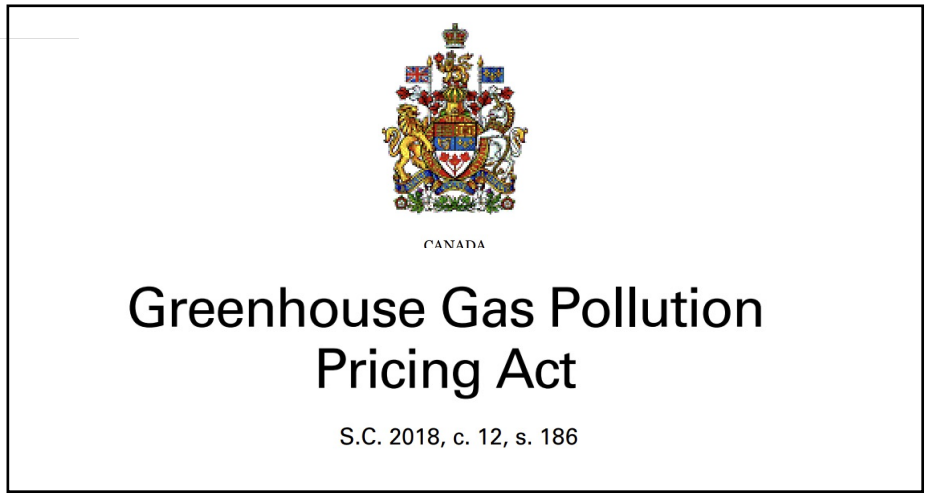
Compliance value $
(RFS, LCFS, CFS credits)

Fuel value $
(gasoline or diesel)

Fuel Use: Gas, Diesel, Distillates
Process requirements: Hydrogen, catalyst, energy
Fuel quality: Cold flow, Fungibility

Note: illustrative - not proportional

Carbon Tax: Biofuels & Fossil Fuels



- Federal carbon charge - $40/T (2021) to $170/T (2030)
  - $50/T in 2022
  - Increases by $15/year (2023-2030)

CAD (per gallon)	2022	2025	2030
Carbon Price	**$50**	**$95**	**$170**
Gasoline	$0.42	$0.79	$1.42
Diesel	$0.51	$0.96	$1.73
Jet	$0.49	$0.91	$1.63
Biofuels*	$0.00	$0.00	$0.00
SAF	$0.49	$0.91	$1.63

* Full exemption if blend exceeds 10% in gasoline or 5% in diesel

Market Value of Carbon – Biofuel Blends

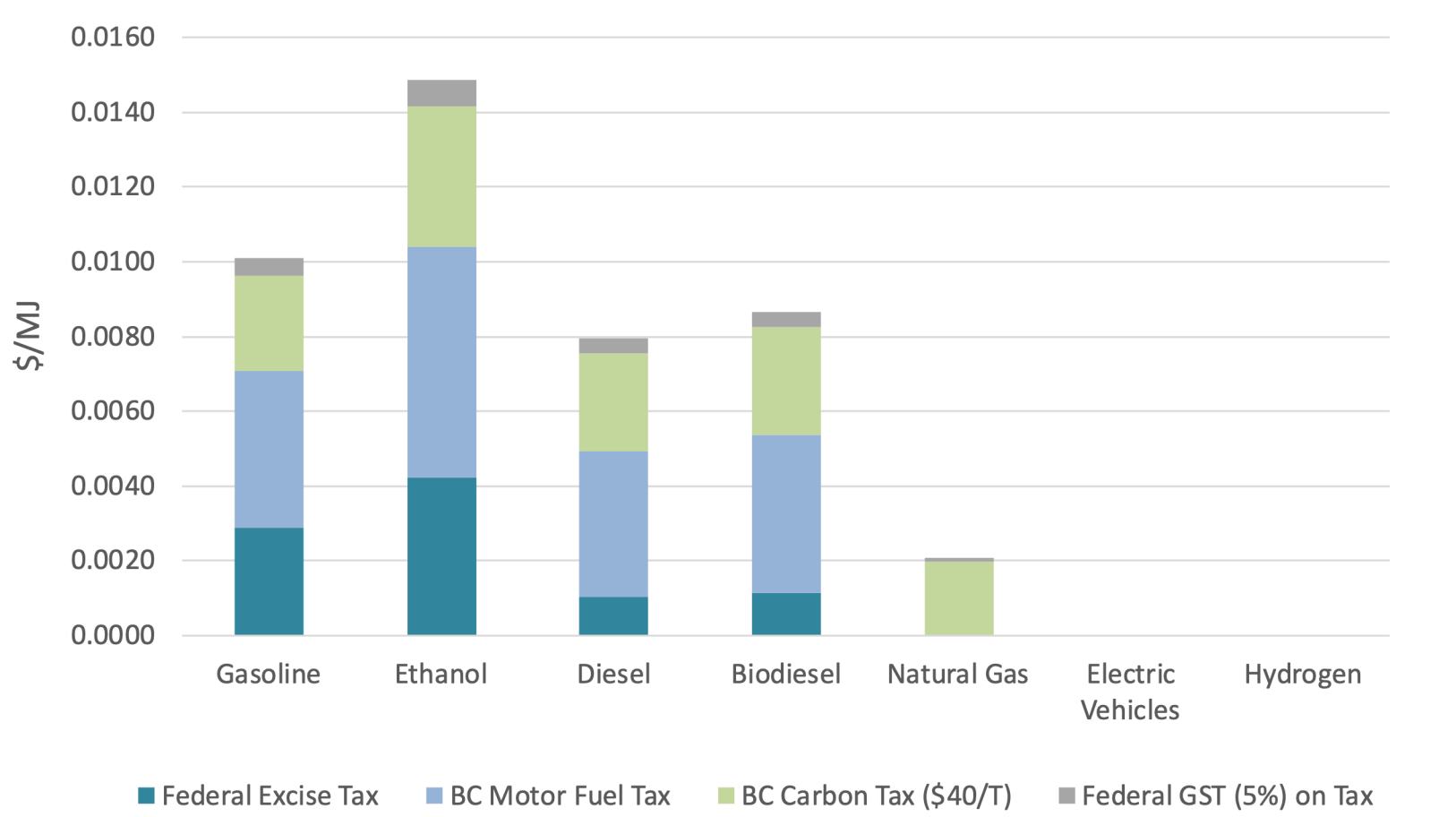
- Combine carbon tax exemption and credit value (@ CAD 100/credit)

CAD (per gallon)	2022	2025	2030
B20	$0.20	$0.28	$0.42
B99	$1.48	$1.93	$2.68
E25	$0.12	$0.20	$0.33
E85	$0.68	$0.99	$1.52

* Proposed *Clean Fuel Standard* carbon intensity reduction schedule & constant $100/credit value
* Based on canola biodiesel (AB) and corn ethanol (ON) GHGenius default carbon intensities

Transportation Fuel Taxes (2020)

- Alternative fuels and ZEV vehicles have shifted the tax burden
- Fuel tax reform needed to align funding / policy



Tax components on transportation fuels in BC

Carbon Pricing: Emitters

Greenhouse Gas Pollution Pricing Act

GGPPA adopted in June 2018

- National carbon pricing 'backstop' system
  - Output-Based Pricing System (OBPS) on industrial emitters
  - Stacking: OBPS + CFS

	Benchmark (% exempt)	**Tightening Rate**	**Type**	**Carbon Price** ($/t 2021)
Federal OBPS	80 – 95%	None – s.t. PCF review	Sector / products	$40
Alberta TIER	90%	1% p.a. to High Performance Benchmark max.	Facility	$40
Ontario EPS	98% 92% by 2022	2% p.a.	Facility	$40
Quebec C&T	n/a	1-2% p.a.	Economy-wide	Auction
Saskatchewan MRGG	85 – 99.6%	0.5% 5% by 2030	Facility baseline specific	SK Technology Fund contribution (2020 = $30)

Alberta Climate Policy Review - Spring 2021

- Technology & Bio-based Solutions Roundtable
  - ❖ Renewable Fuel Standard (RFS)
  - ❖ Bioenergy Carbon Capture & Storage (BECCS)
  - ❖ Mitigate / leverage impacts of federal regulations / fiscal policies

- Opportunities
  - ❖ Carbon pricing – biofuels, on-farm fuels
  - ❖ Modernize RFS
    - ✓ 2% (2021) to 5% (2024)
    - ✓ Carbon intensity value
    - ✓ Credit market system
  - ❖ Collaboration: crops, forestry, rendering, refiners, biofuels
    - ✓ Refiners seeking to re-position in face of ZEV mandates & climate policies

Quebec - draft low carbon fuel standard

Obligated party – 'Distributor'

Fuel manufacturer that supplies a wholesaler or retailer

Fuel importer

Eligible low carbon content

Bio-based (organic material)

Residual ('discarded') material per *Environment Quality Act* chapter Q-2

Ambient CO2 and flue CO2 emissions

Blend requirement – Gasoline RON <91 AKI

10% - 2023 (CI @45 below gasoline)

12% - 2025

14% - 2028

15% - 2030

Blend requirement - Diesel

3% - 2023

5% - 2025

10% - 2030

Low Carbon fuel volume – adjustment

Low carbon fuel volumes (litres) are increased/decreased by a factor based on average CI reduction

Average CI reduction for gasoline is 45% from 2022 to 2027, and 50% from 2028 on

Average CI reduction for diesel is 70% from 2022 to 2028, and 75% from 2028 on

Carry-over

Maximum 5% per year (must use in subsequent year) - Unused credits expire

Cross pool conversion

1.0 low carbon intensity gasoline litre = 0.33 low carbon intensity diesel litre

1.0 low carbon intensity diesel litre = 1.0 low carbon intensity gasoline litre

Credit trading

Distributor to distributor only

Trade period January 1 to March 31 of following year

Exclusions

No palm

Aircraft, watercraft, scientific research, military fuels

Premium gasoline (≥91 AKI)

Heating fuel volumes (diesel)

Excluded regions

Region A (northern QC and Gaspé) – permanent

Region B (north, east of Montreal) – until end of 2024

Can generate credits in these regions

Ontario - *Cleaner Transportation Fuels: Renewable Content in Gasoline and Diesel Fuels*

2019 updated the 5% *Ethanol in Gasoline* mandate

- allow a wider range of renewable fuels to meet the gasoline content requirement ('Director's Directions for new pathway approvals)
- increase the blending requirement to 10% effective January 1, 2020.

November 2020

- Increase renewable content in gasoline to 11% in 2025, 13% in 2028, 15% in 2030.
- Renewable content is to have a carbon intensity that is 50% lower than that of regular gasoline by 2030 (currently 45%). Volumetric credit or debit if exceed or fall short of minimum CI reduction

Credit trading allowed – no regulatory oversight

CI reduction verification – obligated party responsible (will require from biofuel producer)

BC - *Renewable and Low Carbon Fuel Requirements Regulation (RLCFRR)*

2010 – 5% biofuel content gasoline, 4% in diesel ('Part 2')

2013 – eff. start of 'Part 3' low carbon requirement

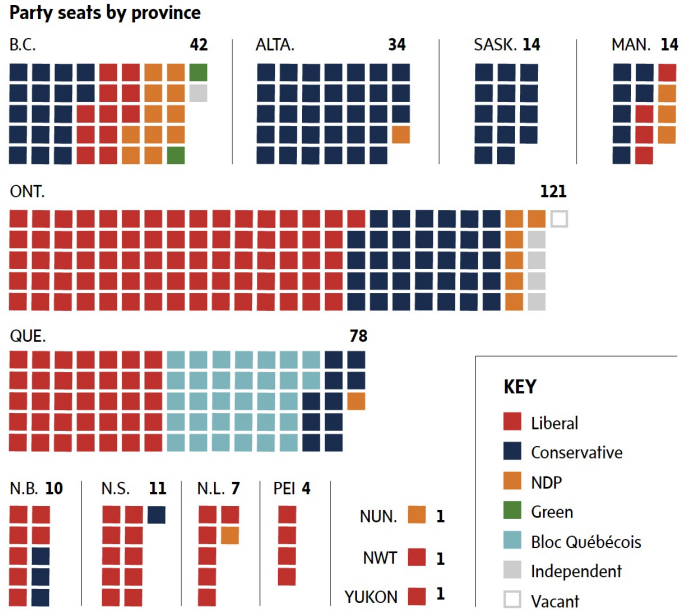
- 10% CI reduction below 2010 by 2020, back-ended compliance schedule
- No ILUC

2020 – 20% reduction below 2010 by 2030, straight-line schedule* and small supplier phaseout

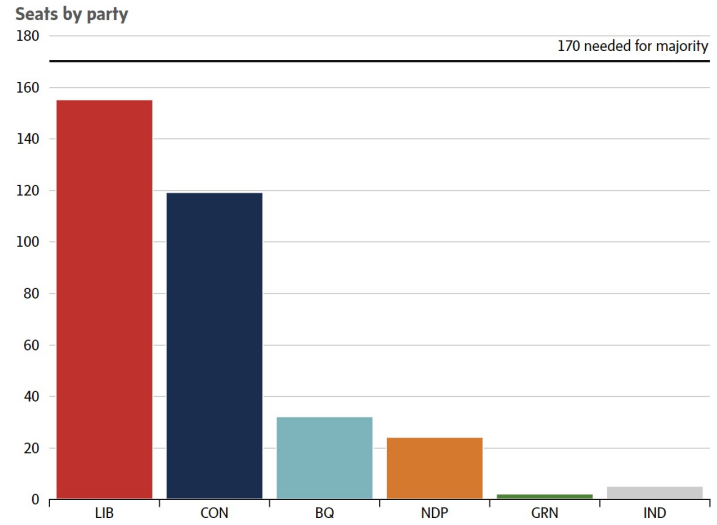
2021 — amendments to EV charging eligible parties, recognize renewable naphtha, enable 'name and shame' non-complaint parties

Fall 2021 consultations for further amendments: aviation fuels, credit clearance market, pivot from penalty to low-CI investment facility

Federal Election: September 20th 2021



THE GLOBE AND MAIL, SOURCE: OURCOMMONS.CA



Federal Election: Party Positions

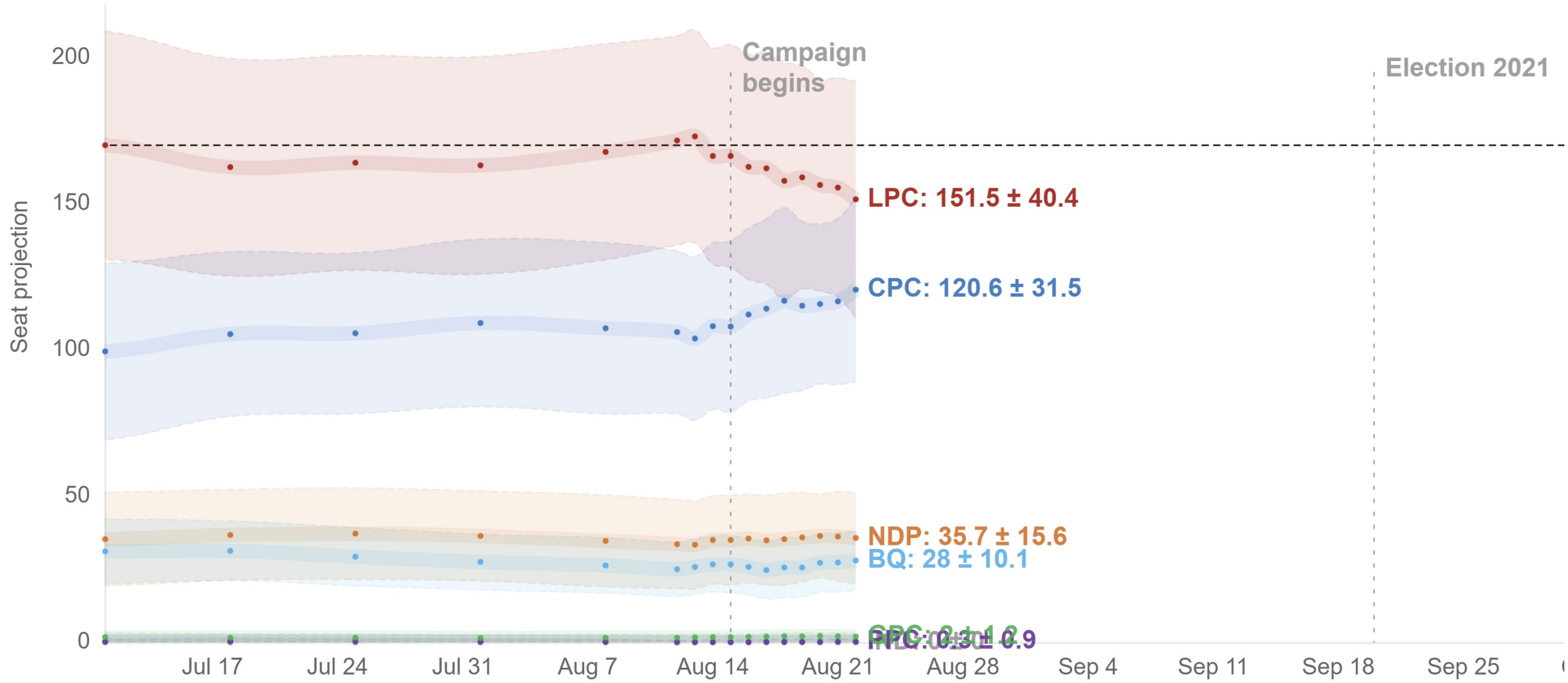
- Continuation of Clean Fuel Standard + H2 + CCUS policies and investments
- Carbon Pricing to $170 by 2030 (currently at $40)
- Canada target of 40-45% below 2005 GHG levels by 2030
- Canadian Net-Zero Emissions Accountability Act, 100% ZEV sales by 2035

- BC-style LCFS
- Carbon Pricing to $50 w/ ‘personal low carbon savings account’
- $5B to CCUS
- 15% RNG mandate by 2030
- 40-45% below 2005 GHG levels by 2030
- Canadian Net-Zero Emissions Accountability Act

- More stringent carbon pricing for industrial emitters
- Significant ‘green jobs’ focus

- 60% reduction of GHG below 2005 levels by 2030
- Opposes the Trans Mountain pipeline expansion, end all oil + gas exploration

Federal Election: September 20th 2021



Federal Climate Plan - December 2020

- Funding Programs (>$17 billion – 64 measures)
  - ❖ Clean Fuel Fund - $1.5b – deadline Sep29-21
  - ❖ Net Zero Accelerator - $8b
  - ❖ Agriculture Clean Technology Fund - $165m
  - ❖ Agricultural Climate Solutions - $185m
- Tax measures
  - ❖Zero Emission Technology Manufacturers – 50% federal tax cut
    - Agriculture/Forestry NOT eligible
  - ❖ Accelerated CCA – clean manufacturing
    - Agriculture/Forestry NOT eligible

The Work Ahead

Internal Combustion Engines

IEA 2021 - Announced Net-zero Pledges Case (APC)

Figure 1.2 ▷ Number of national net zero pledges and share of global CO_2 emissions covered

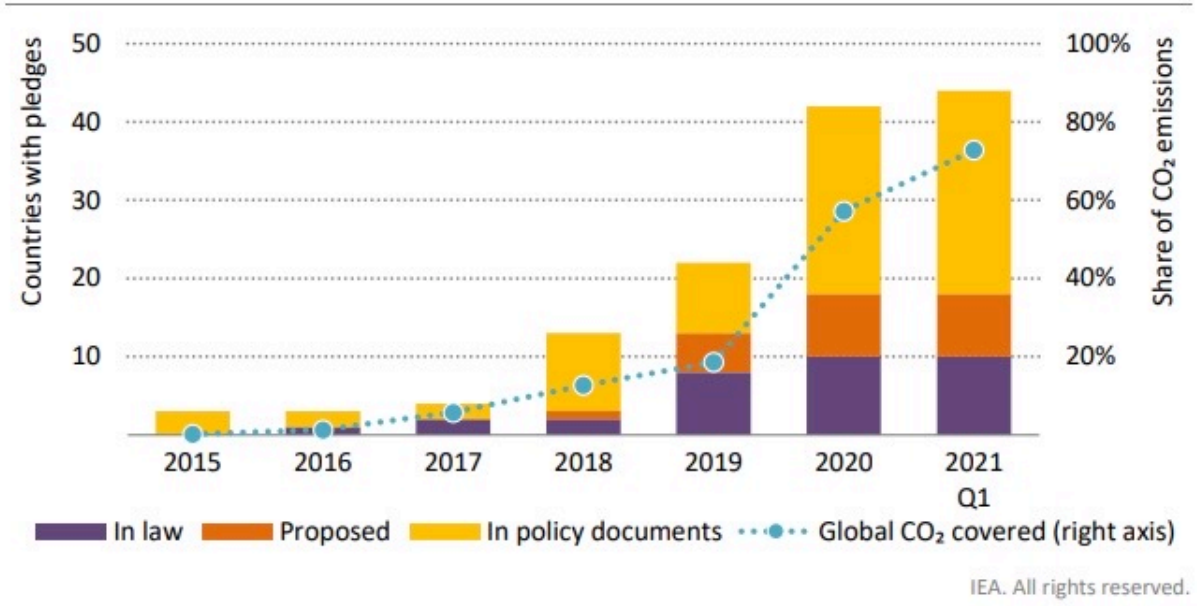
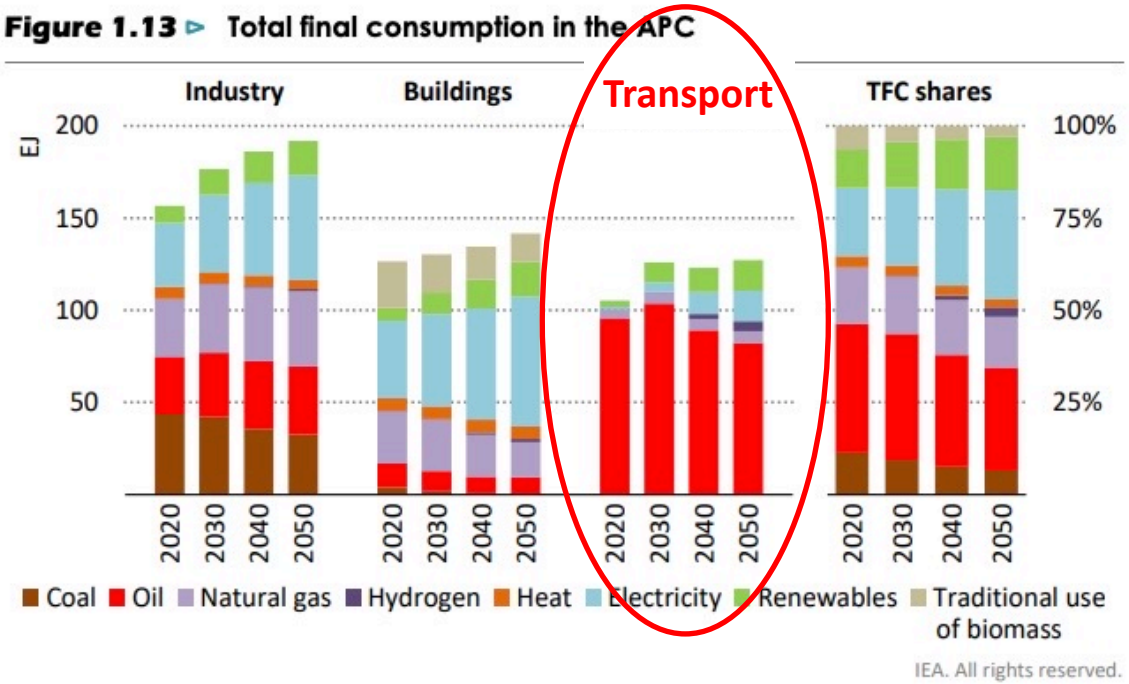


Figure 1.13 ▷ Total final consumption in the APC



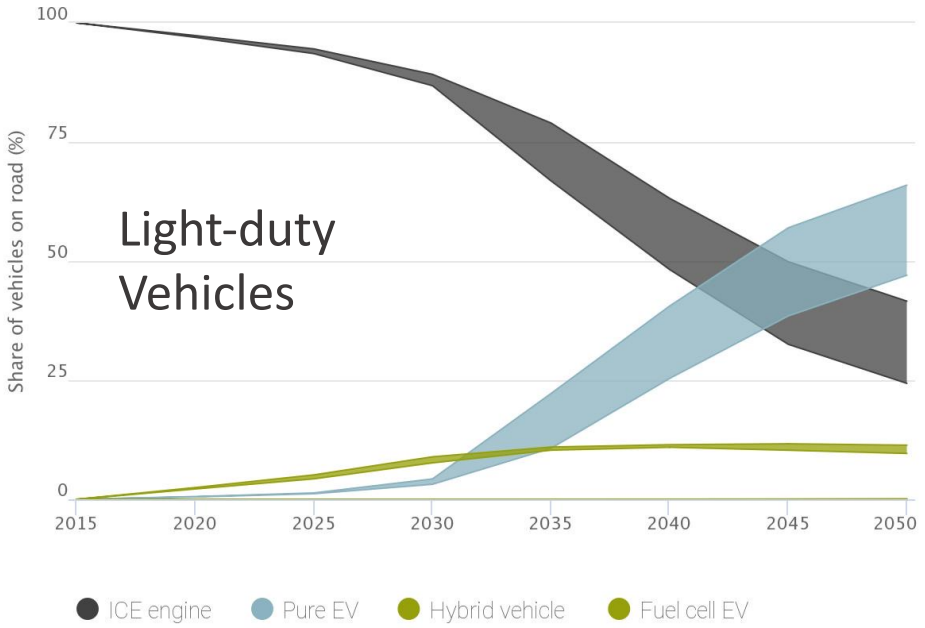
68% of global GHG under law/proposal/policy for net zero 2050

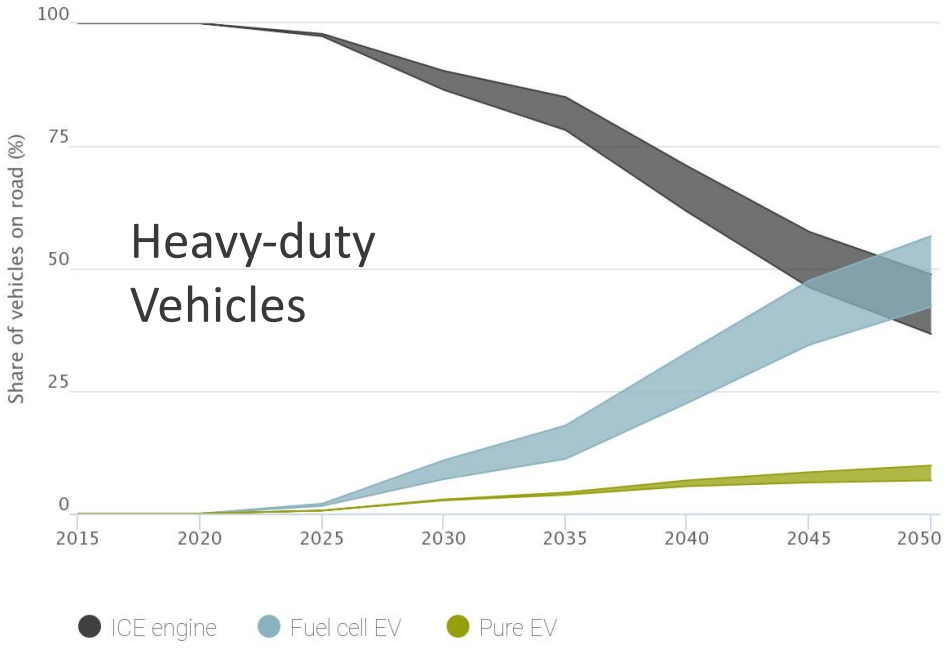
Scenario: Pledges 100% executed

Total final energy in Transportation = 83% ICE

Source: IEA 2021

Internal Combustion Engines





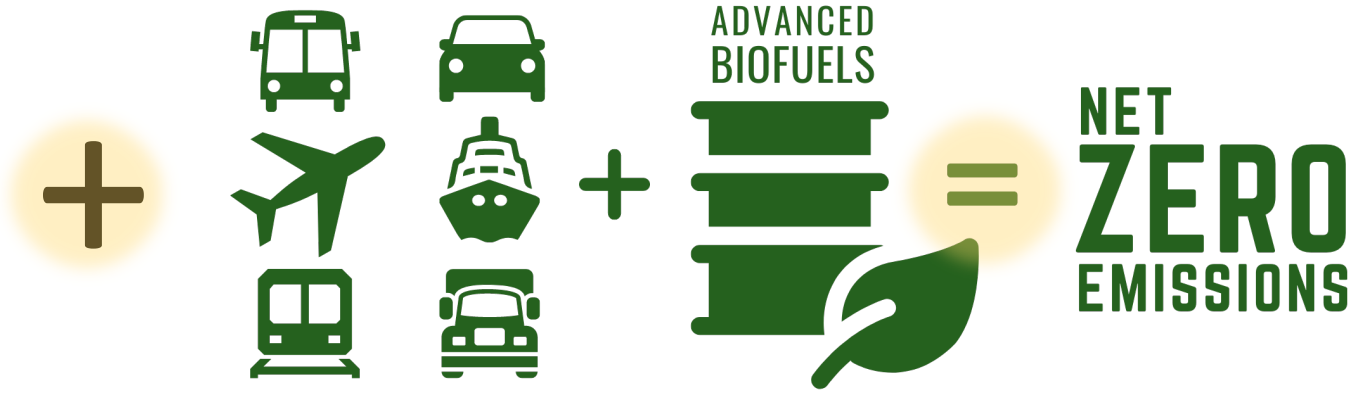
Share of ICE vehicles >50% of LDV/HDV total until mid-2040's or later

Source: Navius/CICC

Re-framing Zero Emissions Vehicles

Transportation decarbonization policies should reflect…

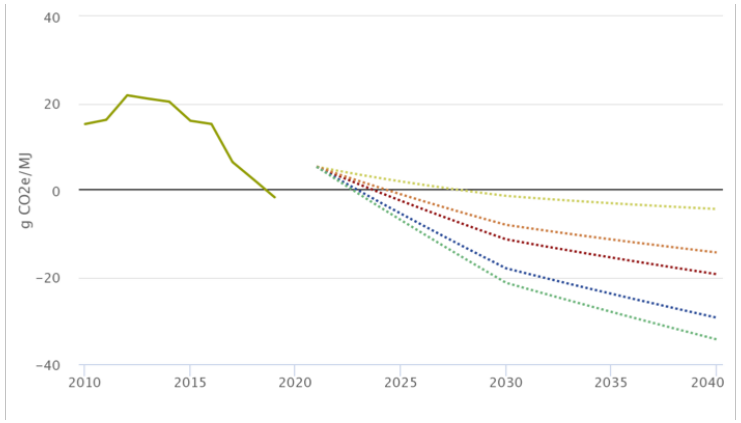
Reliance on Internal Combustion Engine (ICE) vehicles



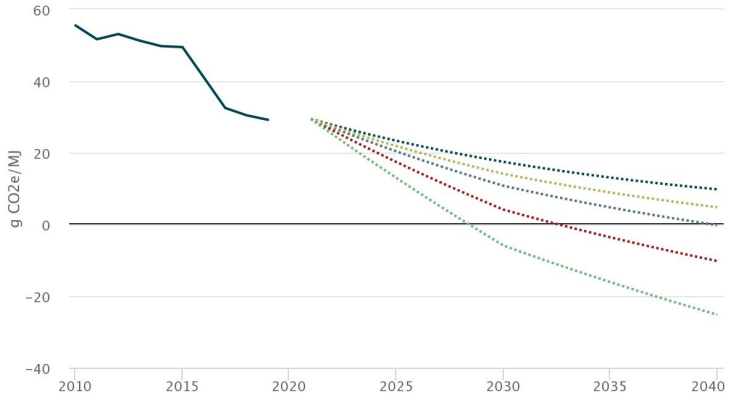
Biofuels: Net-Zero Ready

BC LCFS Carbon intensity reductions 2010-2019

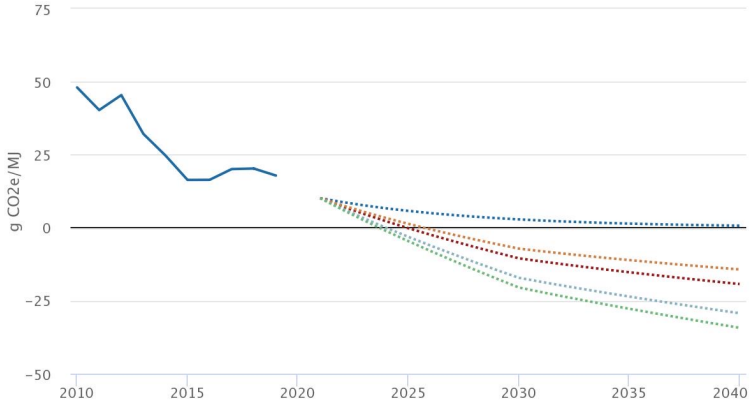
Biodiesel ⬇84%



Ethanol ⬇45%



HDRD ⬇58%



Biodiesel is a commercially supplied net-negative biofuel (BC: 2019 compliance year).

Advanced ethanol and HDRD will be net-negative 2025-2030 using available carbon dioxide removal ('CDR') technologies (BECCS, Soil sequestration, etc.).

Fully fungible neat fuels and high-level biofuel blends in ICE are carbon-competitive with 'zero emission' vehicles (e.g. BEV, H2)

Source: BC Energy Mines and Low Carbon Innovation, ABFC

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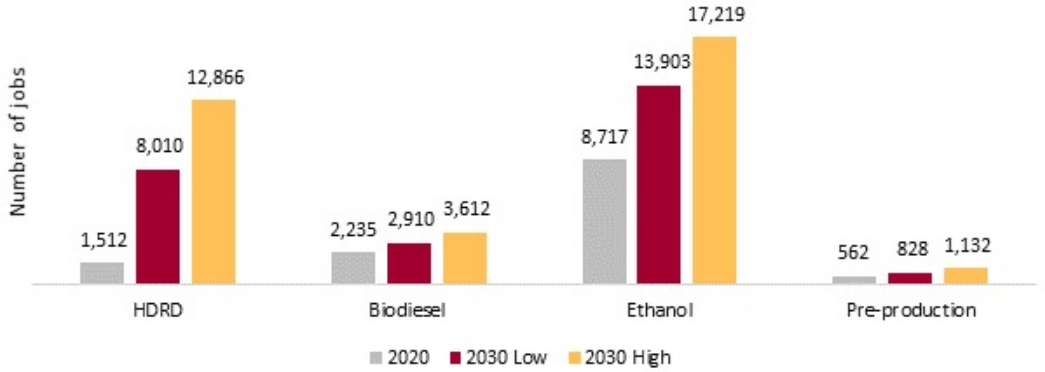
Economic Impact & Jobs

Renewable Fuels Scenario
> 21,000 jobs
+ CAD 10 billion output



Total Effects	*Employment*	*Labor Income*	*Value Added*	*Output*
2020 Baseline	13,026	$783.6	$1,691.7	$5,284.4
2030 Low Estimate	25,650	$1,625.3	$3,400.3	$11,210.2
Increase over Baseline	12,624	$841.7	$1,708.6	$5,925.8
% Change over Baseline	97%	107%	101%	112%
2030 High Estimate	34,828	$2,062.5	$4,350.2	$15,217.5
Increase over Baseline	21,802	$1,278.9	$2,658.5	$9,933.1
% Change over Baseline	167%	163%	157%	188%

Source: Bureau of Business and Economic Research, U of MN Duluth, January, 2021
Economic Impact of Current and 10-Year Projections of Biofuels Production in Canada

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Net Zero Realities: Renewable + Petroleum cooperation to address emissions from current Internal Combustion Engines

REDUCE ALL POSSIBLE UPSTREAM FOSSIL FUEL EMISSIONS THROUGH 4R'S

(REDUCE, REUSE, RECYCLE, RECOVER)

MAXIMIZE CO-PROCESSING WITH FOSSIL REFINING (PROCESS FUELS: RENEWABLE H2, ELECTRICITY) AND FEED SLATES (BIOCRUDE)

E85 WITH CO-PROCESSED GASOLINE & ETHANOL,

R80/B20, CO-PROCESSED DIESEL WITH BIODIESEL & RENEWABLE DIESEL

PROGRESS TOWARDS 'NET-ZERO EMISSION FUELS' AND ALIGN OEMS WITH FUTURE FUELS

ENGINEER FOSSIL FUEL QUALITY TO MAXIMIZE BIOFUELS BLENDING

(G-BOB, D-BOB)

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Reference Appendix

Clean Fuel Standard - Analysis

Summary Tables

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WAEES
World Agricultural Economic and Environmental Services

WAEES 2020 CFS Scenario Modelling - Nov. 2020

With additional analysis by ABFC

FF-CC1: Fossil Fuels - Compliance Category 1

EV-CC3: Electric Vehicles - Compliance Category 3

ECCC-TT: Environment Canada - Target and Trajectory

RF-CC2: Renewable Fuels - Compliance Category 2

* *Nominal prices from WAEES output deflated to real 2020 prices at annual inflation rate:* **1.261%**

Credit Generation Assumption Comparisons Across Scenarios in 2030

	Scenarios			
	FF-CC1	**ECCC-TT**	**EV-CC3**	**RF-CC2**
million metric tonnes				
Fossil Fuel Improvements (CC1)	14	8	6	6
Renewable Fuels (CC2)	model	model	model	model
Electric Vehicles (CC3)	3	3	9	6
Emerging Tech Credits	0	2	0	0
Cross Stream Credits (10%)	3	3	3	3
Compliance Fund	model	3	model	model

Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
Analysis of the Implications of Canada's Proposed Clean Fuel Standard

Biofuel Impact in 2030 by Scenario

*(% change from **2022**)*	Scenarios			
	FF-CC1	**ECCC-TT**	**EV-CC3**	**RF-CC2**
	million metric tonnes in the year 2030			
Non-Biofuel Compliance Credits	20	19	18	15
	growth from 2022 to 2030 in million liters			
Biodiesel				
Domestic Production (MLY)	162	170	202	292
% change	39%	41%	49%	71%
Imports (MLY)	156	175	199	293
% change	46%	51%	58%	85%
Renewable Diesel				
Domestic Production (MLY)	690	904	1,039	1,428
Imports (MLY)	30	39	54	85
% change	7%	9%	13%	20%
Ethanol				
Domestic Production (MLY)	694	844	1,057	1,667
% change	30%	36%	46%	72%
Imports (MLY)	54	69	99	151
% change	4%	6%	8%	13%
	volumetric percent blend rates in the year 2030			
Blend Rates				
Ethanol	11.3%	11.7%	12.4%	14.1%
Biomass Based Diesel	5.7%	6.4%	7.1%	8.9%
Biodiesel	2.3%	2.4%	2.6%	3.1%
Renewable Diesel	3.4%	4.1%	4.6%	5.8%

WAEES
World Agricultural Economic and Environmental Services

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Canada Clean Fuels 2030 - Production, Use, and CFS Compliance Credit Price

Million Litres	2018	Scenarios			
		FF-CC1	ECCC-TT	EV-CC3	RF-CC2
Biofuel Use					
Biodiesel	368	775	799	859	1042
% blend (volumetric)		*2.3%*	*2.4%*	*2.6%*	*3.1%*
HDRD / Renewable Diesel	343	1146	1368	1519	1938
% blend (volumetric)		*3.4%*	*4.1%*	*4.6%*	*5.8%*
Ethanol	3034	4251	4418	4658	5320
% blend (volumetric)		*11.3%*	*11.7%*	*12.4%*	*14.1%*
Biofuel Production					
Biodiesel	308	578	581	613	702
% increase from 2018	-	*88%*	*89%*	*99%*	*128%*
HDRD / Renewable Diesel	0	690	904	1039	1428
% increase from 2018	-	*(n/a)*	*(n/a)*	*(n/a)*	*(n/a)*
Ethanol	1748	3009	3160	3371	3981
% increase from 2018	-	*72%*	*81%*	*93%*	*128%*
CFS Credit Price (2020 CAD)	n/a	73	83	97	138

WAEES
World Agricultural Economic and Environmental Services

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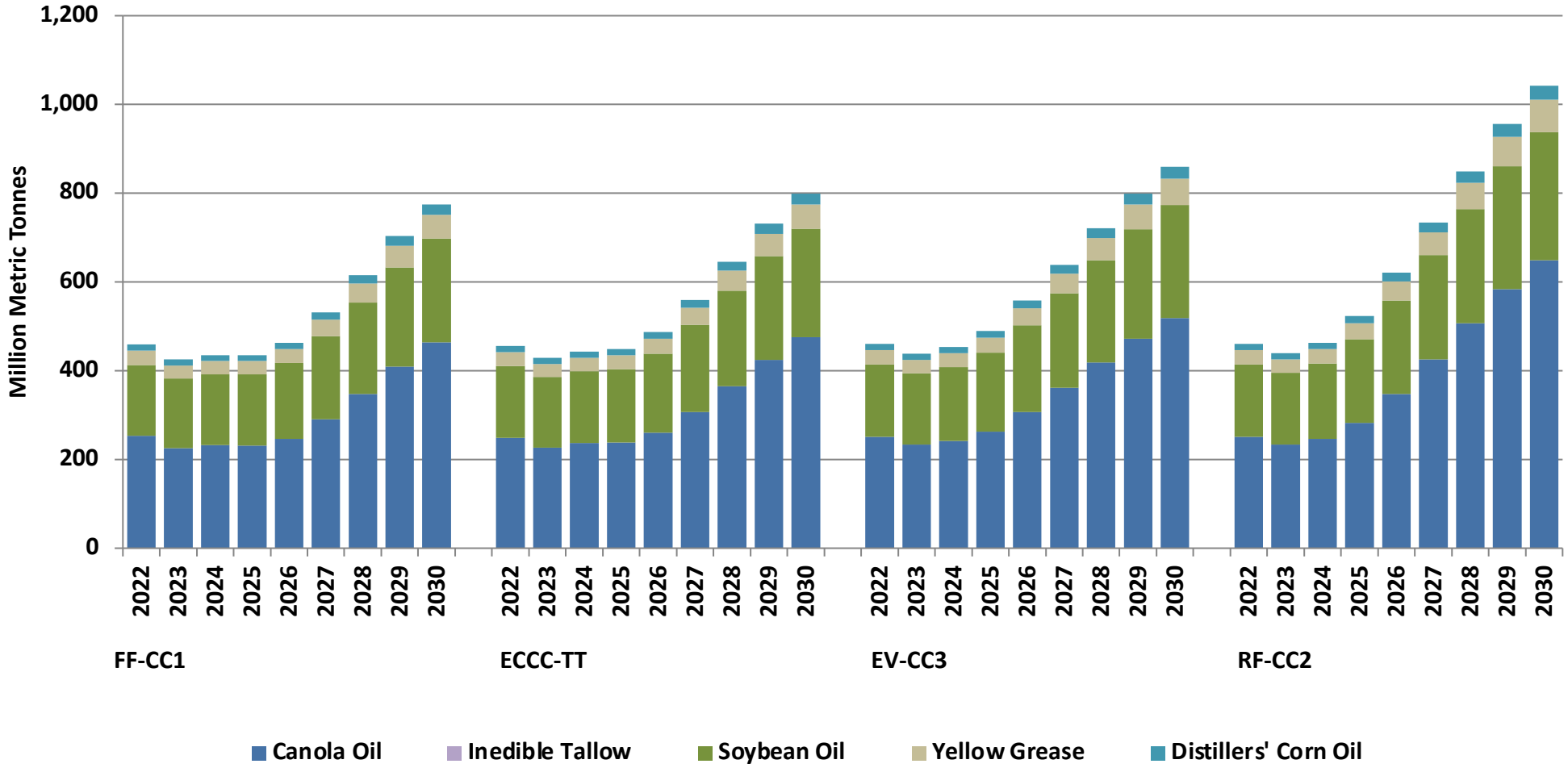
CFS Driven BD Feedstock Use

World Agricultural Economic and Environmental Services



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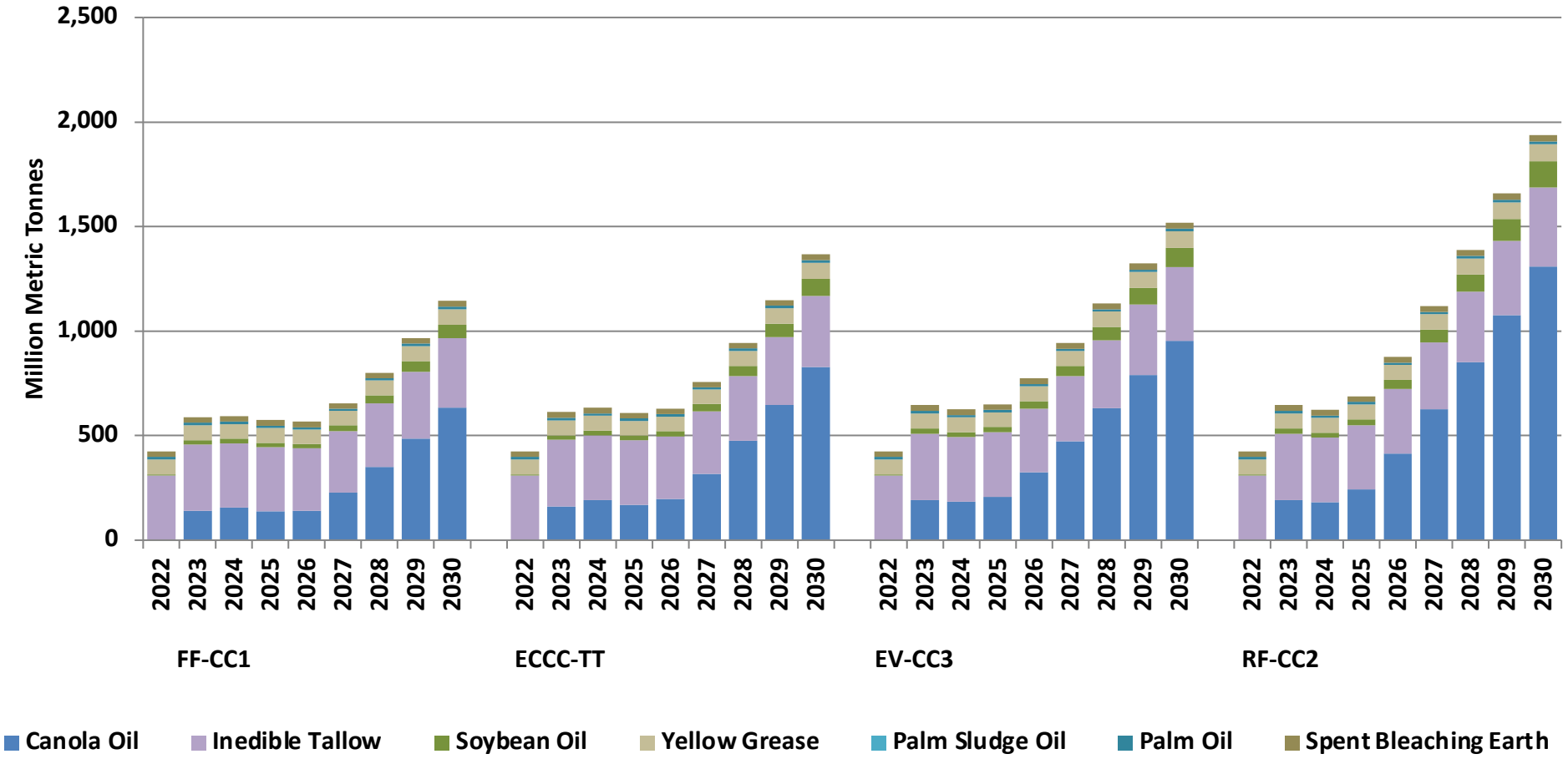
CFS Driven RD Feedstock Use



World Agricultural Economic and Environmental Services

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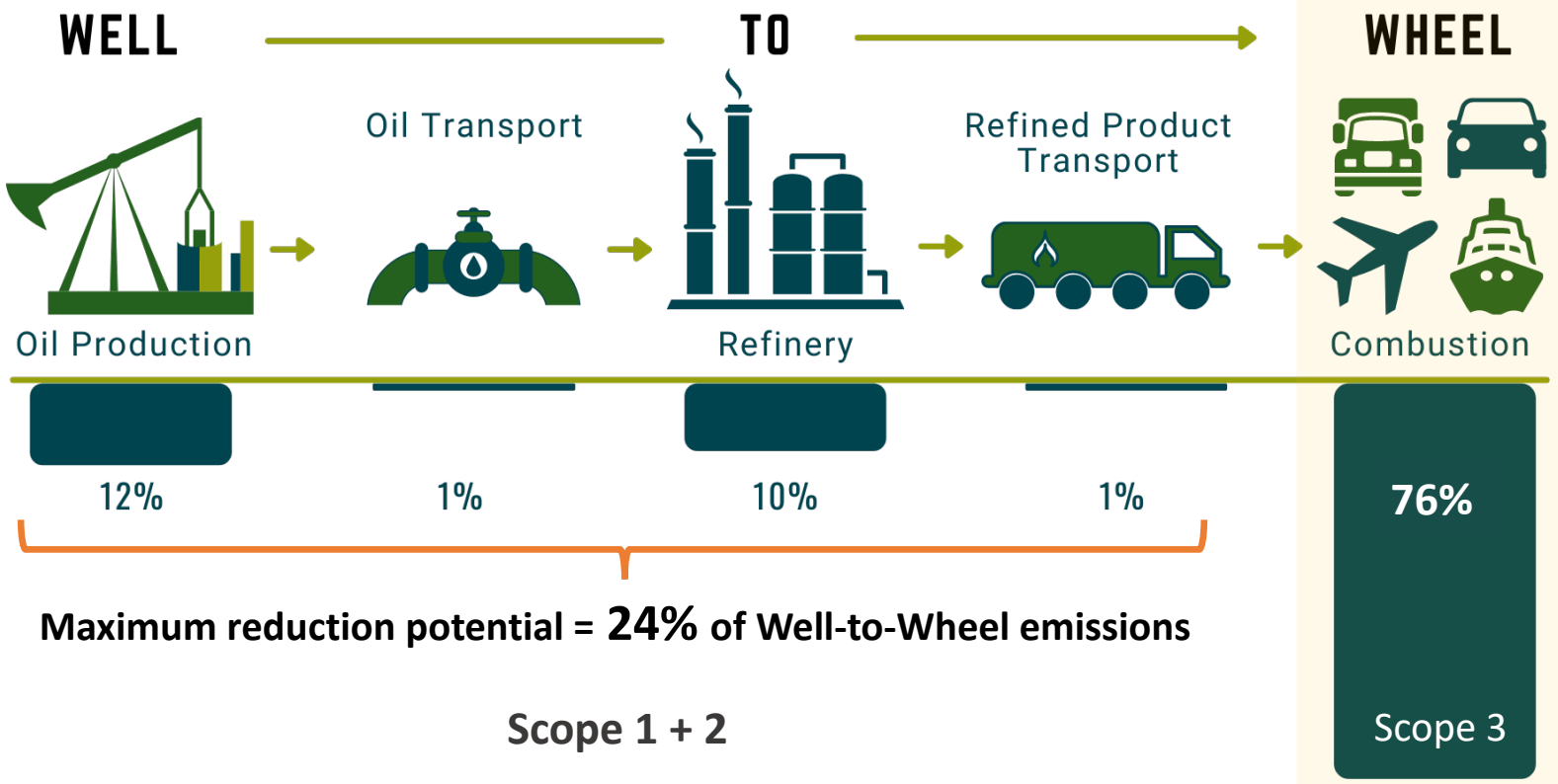
Internal Combustion Engines - Net-Zero 2050?



Maximum reduction potential = 24% of Well-to-Wheel emissions

Scope 1 + 2

Fuel switching/ displacement of crude oil is the only solution to 76% of lifecycle emissions

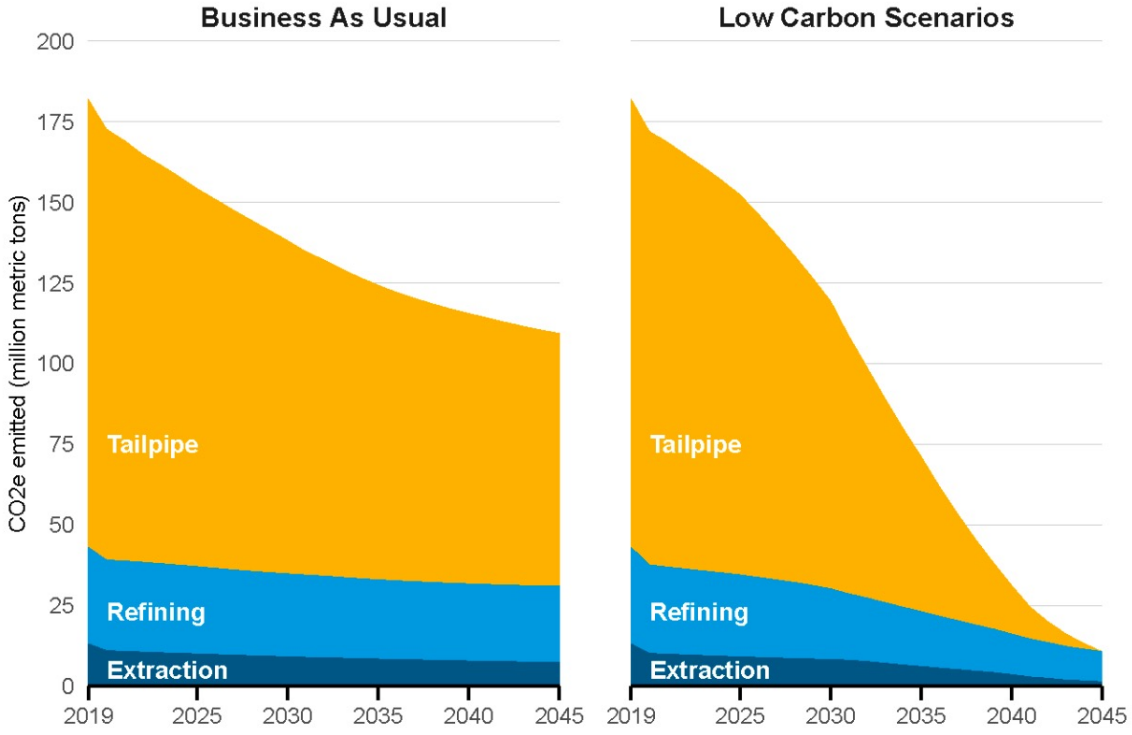
- Biofuels
- Non-fossil synthetic fuels
- Renewable natural gas
- Electric vehicles
- Hydrogen

Source: GHGenius, ABFC

California — Decarbonizing the Transportation Sector

UC Davis — policy mechanisms to reduce fossil fuel demand. Primarily, accelerated transition to zero-emission cars, trucks, and buses, coupled with renewable low carbon fuels, plus expansion of low-carbon transportation choices that would reduce motor vehicle use.

UC Santa Barbara — policies to manage parallel reductions in emissions from oil extraction and refining, such as oil production quotas, refinery decarbonization policies, etc.



Proportionately, tailpipe emissions (Scope 3) much be activated more aggressively, and on accelerated timeframe, than upstream (Scope 1 + 2). Upstream lower priority <2030.

EU Fuel Quality Directive requires fuel supplier regulated GHG reduction to be proportionate (upstream, downstream)

Source UC Davis, UC Santa Barbara (2021)

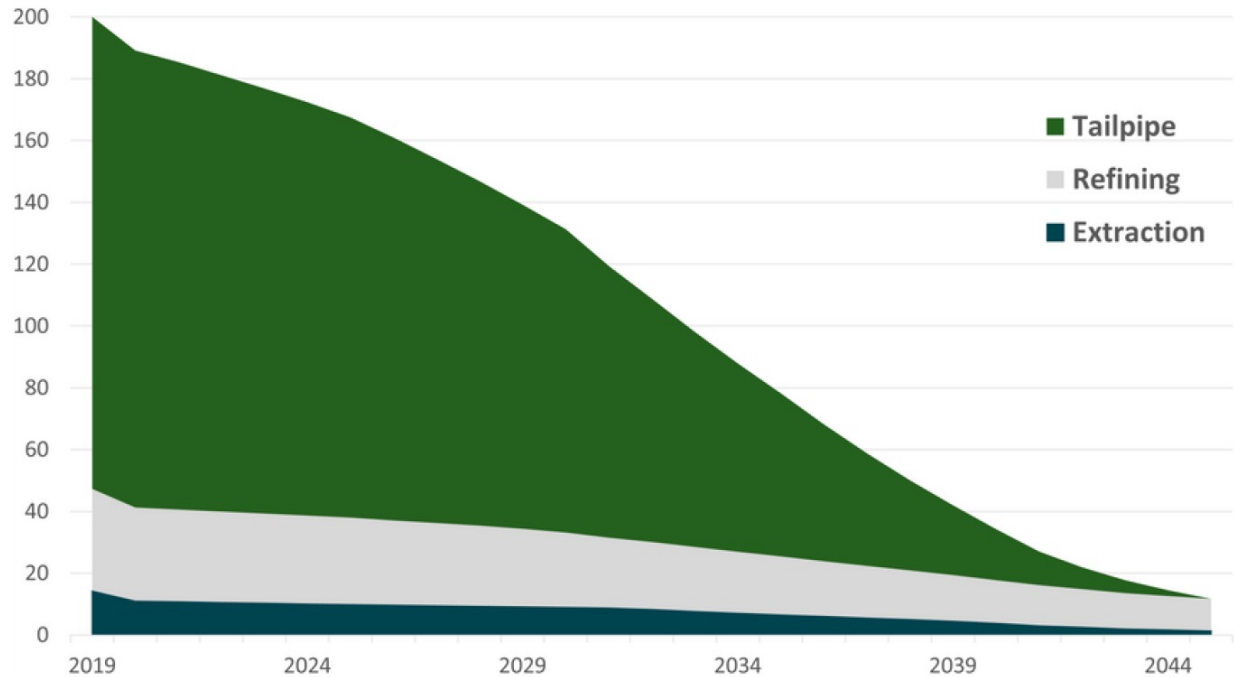
CURRENT DRAFT CFR: POLICY FAILURE

The draft CFS regulations contain significant provisions that enable:

- obligated parties to avoid credit generation from net-zero-compatible fuels and energies
- non-obligated sectors to generate credits (e.g. cement, fertilizer)
- credit generation activities that have no association with transportation or liquid fuel emissions

California, BC, and EU regulations do not allow these provisions.

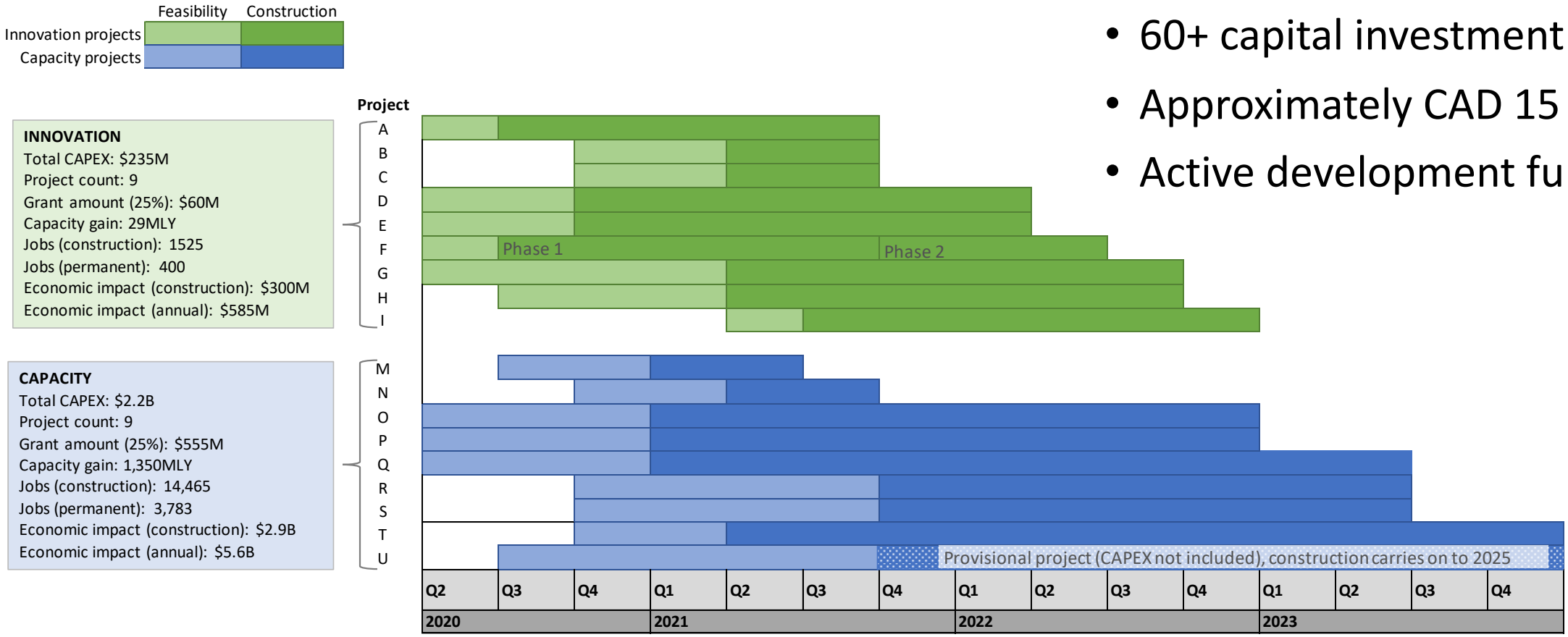
COMPARISON: CALIFORNIA NET-ZERO



To meet California Net-Zero targets, 86% of LCFS credits would need to be from CC2&3.

Advanced Biofuels Canada - Capital Projects

Shovel Ready – Fall 2020



- 60+ capital investment projects
- Approximately CAD 15 billion
- Active development funnel

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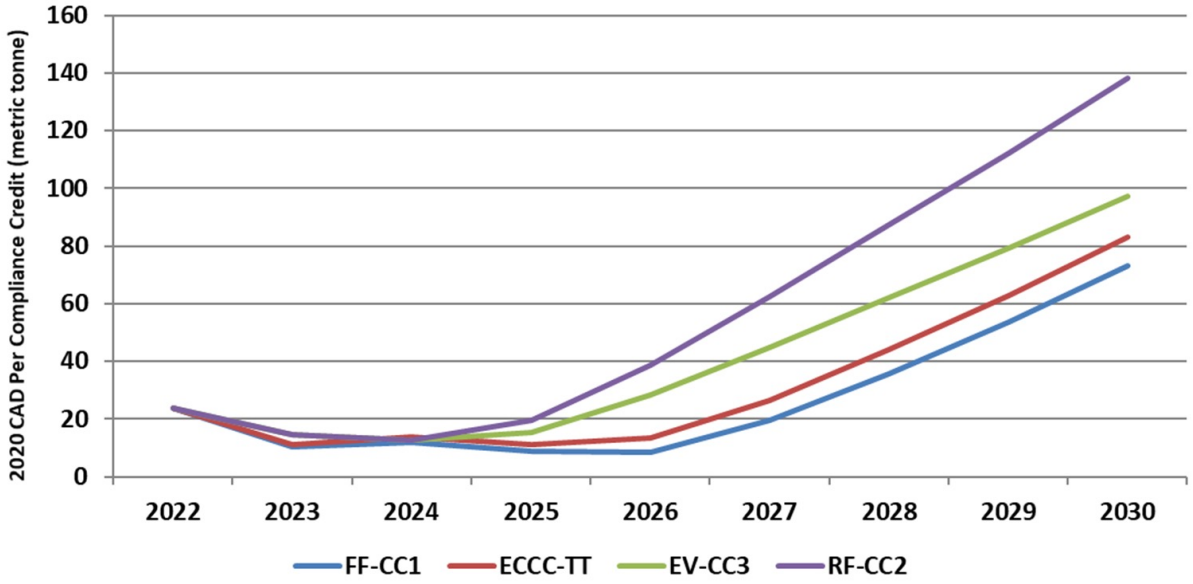
Credit Value: Low Carbon Intensity Fuels

- Clean Fuel Standard compliance credits
- Stack: provincial credits (e.g. BC LCFS, ON CTF regs)
- WAEES modeling suggests biofuels compliance achieved at CAD 75 - 140/credit



Source: World Agricultural Economic and Environmental Services, Dr. John Kruze, November 2020
Analysis of the Implications of Canada's Proposed Clean Fuel Standard

Clean Energy - Tax Policies & Programs

- **2030 Strengthened Climate Plan (Dec 2020)**
  - 64 policy/program measures (existing, new)
  - CAD 15 billion
  - Federal income tax cut – 50% (clean sectors)

Oil & Gas & Industry

>$4.3 billion

Biofuels & Synthetic Fuels

~$1.0 billion

Clean Power EVs /H_2

> $7 billion

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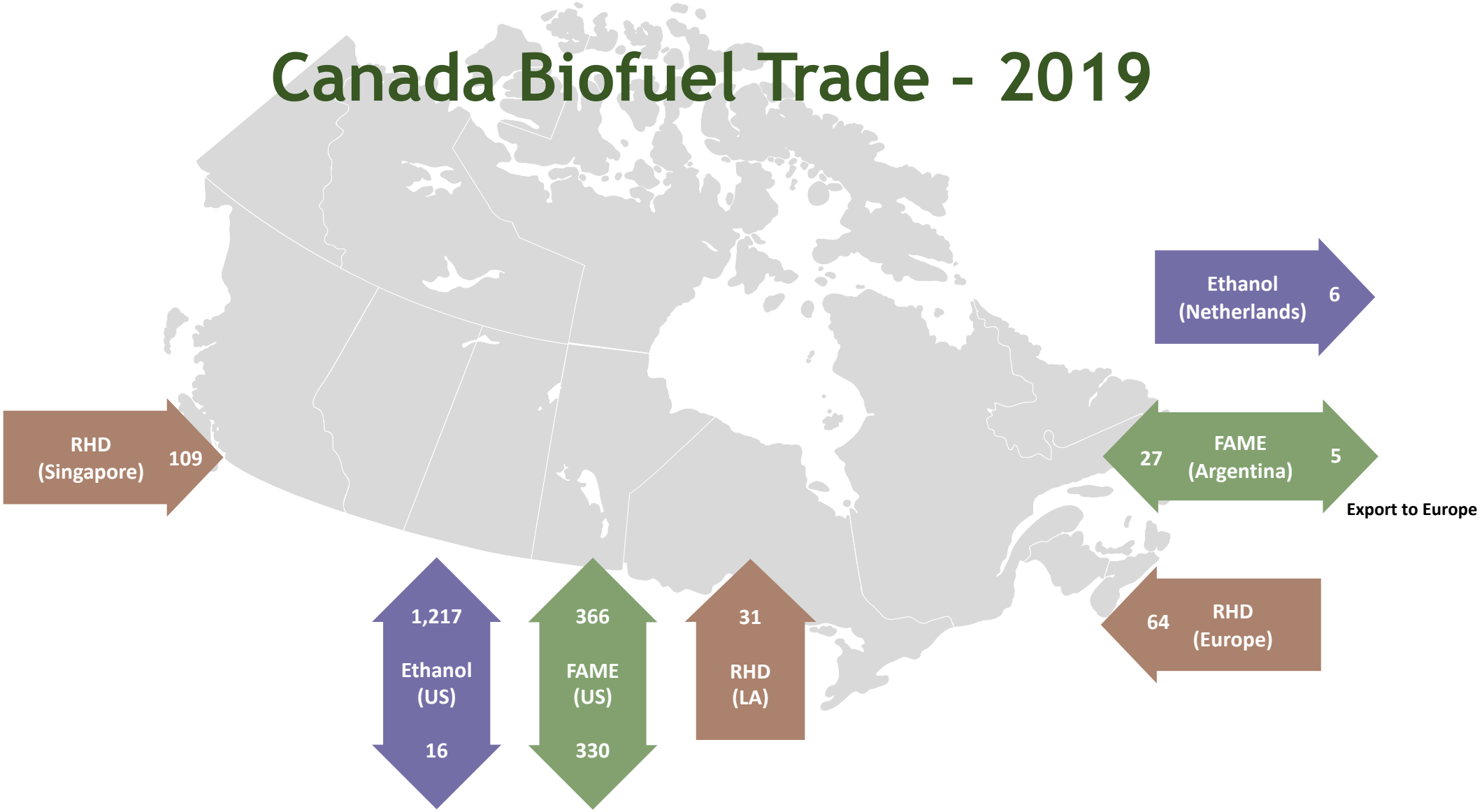
Canada Biofuel Trade - 2019



2019 Biofuel Trade (million litres)	Ethanol	FAME	RHD
Imports	1,217	393	204
Exports	23	335	-

Source: Statistics Canada (totals may not sum due to rounding)

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CFS: Part of Canada's climate plan

- Clean Fuel Standard (CFS) forms a key part of Canada's *A Healthy Environment and a Healthy Economy* climate change plan
  - First announced in 2016 as part of the *Pan-Canadian Framework on Clean Growth and Climate Change*

- The CFS will reduce emissions from producing and using liquid fuels in Canada
  - Liquid fuels include gasoline, diesel and oil (LFO and HFO, including HHO, removed from scope in July 2021)
  - Mainly used in transportation, and to a lesser extent in industry and buildings

- The liquids CFS is estimated to deliver over 20Mt of emissions reductions by 2030, as well as:
  - Provide an incentive for low carbon fuels and technologies
  - Use a market-based approach to mitigate costs compared to more prescriptive regulations

- Designed to complement carbon pricing
  - Carbon pricing drives continuous incremental improvements across the whole economy
  - The CFS targets larger transformation of fuel production and use in Canada – which might not be possible with carbon pricing alone, and which is needed for long-term decarbonization

modernizing Canada's approach on fuels

- The CFS replace the federal renewable fuel blending mandate, and complement provincial requirements

- **Federal Policy:** successful but needs updating
  - Federal Renewable Fuel Regulations for transportation fuels have been in place since 2010; require refiners to blend 5% ethanol in gasoline, 2% biodiesel in diesel
  - Delivers about 5 Mt/year of GHG reductions
  - Refiners are over complying and banking credits
- **Provincial Policies**: provinces have taken action
  - Five (BC, AB, ON, SK, MB) have renewable fuel mandates equal to or higher existing federal requirements; QC has draft regulations
  - AB and ON have carbon intensity requirements for renewable fuels
  - BC also has a low-carbon fuel standard

- Jurisdictions like California, BC, Oregon have put in place low-carbon fuel standards for transportation fuels
  - Have led to significant emission reductions, stimulated clean innovation and accelerated the transition to low-carbon fuels and alternative technologies