IEA Bioenergy
Technology Collaboration Programme

Task 39
IEA Bioenergy

BC Bioenergy Network
PARTNERING FOR A GREENER FUTURE

BC SMART Biofuels Consortium

Housekeeping

- **Initially, all participants will be muted to avoid any possible background noises.**
- **The meeting is being recorded and a copy of the recording will be posted on the IEA Bioenergy Task 39 and BC SMART websites.**
- **Please type your questions into the chat box. We will try to answer as many questions as possible.**

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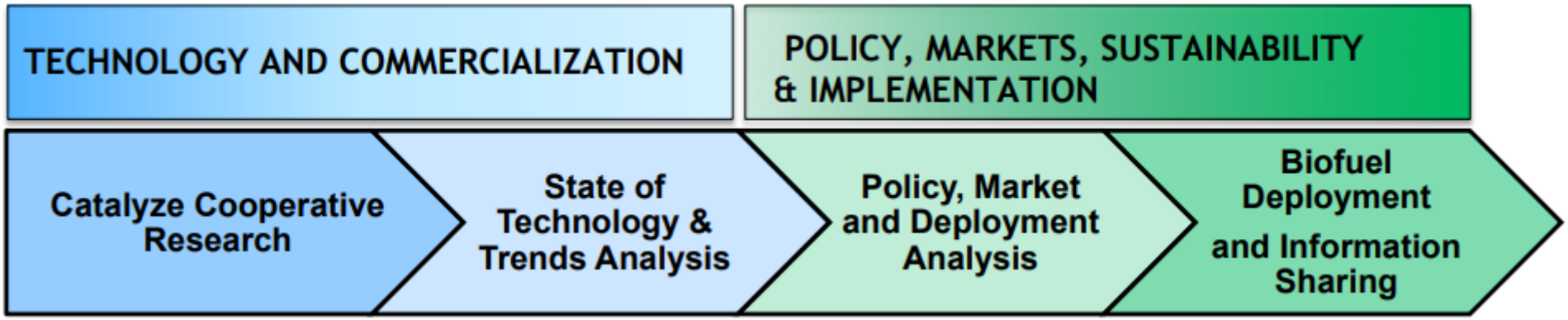
Crystal ball gazing: how do we decarbonise long distance transport during/after COVID-19”

IEA Bioenergy Task 39/BC SMART Panel Discussion

Tuesday, 7:30-9:00 PST (16:30-18:00 CET), 30 June 2020

IEA Bioenergy Task 39

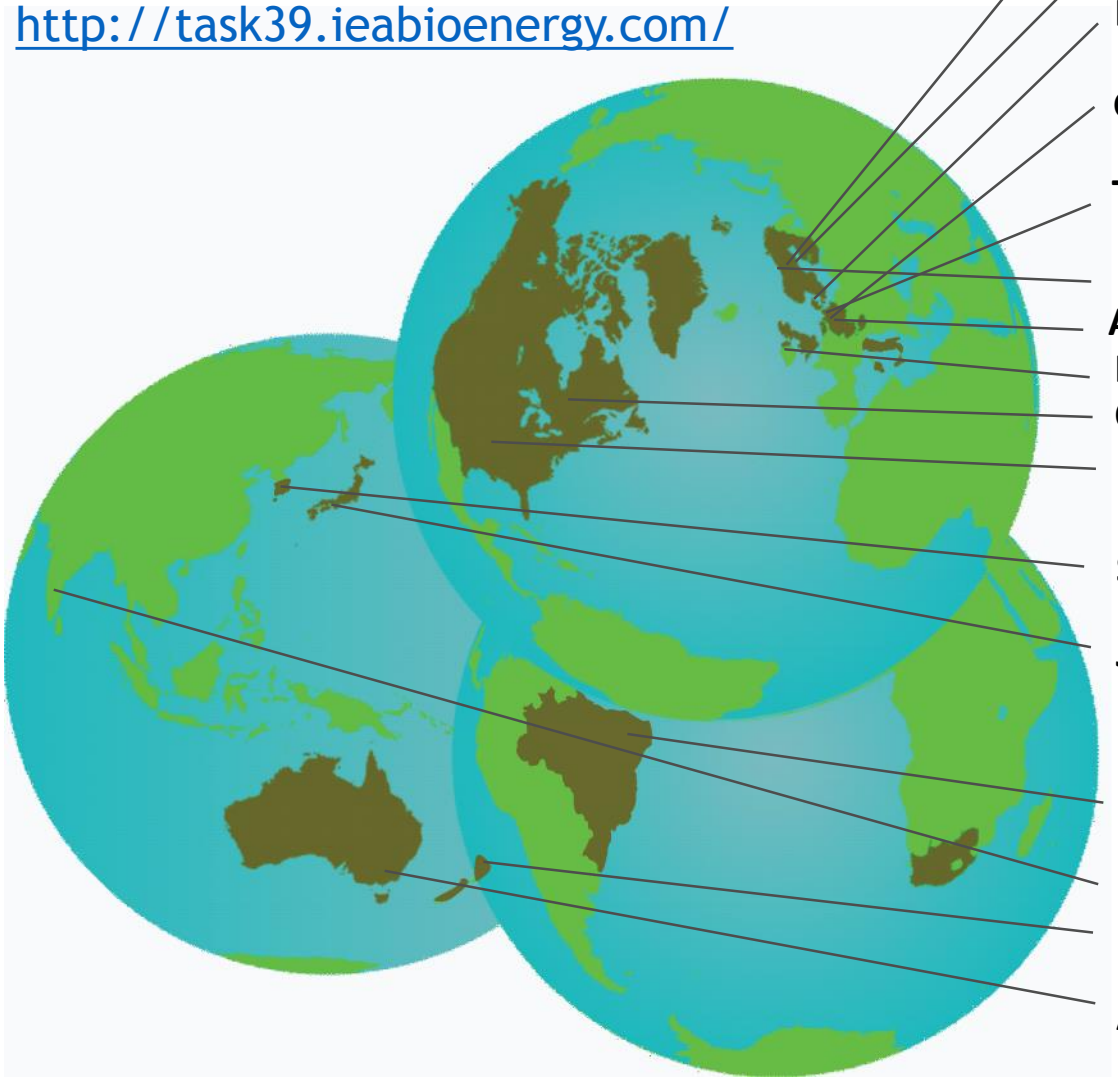
- "To facilitate commercialization of conventional and advanced transport biofuels"
- Collaboration between 16 member countries
- Analyze policy, technology and markets and sustainable biofuel implementation
  - Focus on **Technical** and **Policy** issues
  - Catalyze cooperative research and development
  - Disseminate information & outreach with / to engage stakeholders



IEA Bioenergy Task 39

16 member countries 2019-2021

http://task39.ieabioenergy.com/



BC SMART Biofuel Consortium- http://www.bc-smart.ca/

- **Overall Objective**: Develop and implement a roadmap to decarbonize transportation fuels in BC, in particular fuel for the long-distance transport
- **Coalition-of-the-willing** of industry, BC government and academic stakeholders
- The consortium is structured to be **co-chaired by senior government and industry representatives** supported by a the BC-SMART secretariat
- **Software Task Force:** Build on and further develop the policies and regulatory measures that encourage production and use of sustainable feedstocks and low-carbon intensive biofuels (Government Lead)
- **Hardware Task Force:** Leverage the supply chain and infrastructure to support the production and use of sustainable feedstocks and low-carbon intensive biofuels (Industry Lead)

Current Consortium Members

BOEING

Parkland

BRITISH COLUMBIA
Ministry of Energy, Mines and Petroleum Resources

BC Bioenergy Network
PARTNERING FOR A GREENER FUTURE

PORT of vancouver

WEST COAST REDUCTION LTD.

YVR VANCOUVER AIRPORT AUTHORITY

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

AIR CANADA

seaspan

WESTJET

COPA
Canadian Oilseed Processors Association

HARBOUR AIR SEAPLANES

NORAM

UBC

NESTE

Moderator

Dave has worked in the downstream energy business for over 30 years, primarily for a major integrated oil company, including his recent position as the Director of Policy and External Affairs at Parkland Fuel Corporation. Currently Dave is a VP at the Canadian Fuels Association which represents Canada's petroleum refining, distribution and marketing sector. He has been involved in the development of environmental policy at the federal, provincial and local levels.

David Schick, Vice President of the Canadian Fuels Association

Who We Are

Canadian Fuels ASSOCIATION canadienne des carburants

We represent Canada's downstream petroleum industry:

- Refining, distribution, transportation and marketing
- Supply 95% of transportation fuels in Canada, including gasoline, diesel, jet fuel, and marine fuels as well as specialty lubricants
- Support Canada's economy with reliable, competitively-priced high quality fuels
- **Members are actively engaged in solutions to support transition to a low carbon economy**

Canada's Refining Sector

Canadian Fuels ASSOCIATION canadienne des carburants

Canada's Refining Sector

Canadian Fuels ASSOCIATION

Canada
Refining Capacity: 1,964 kb/d
Product Demand: 1,891 kb/d

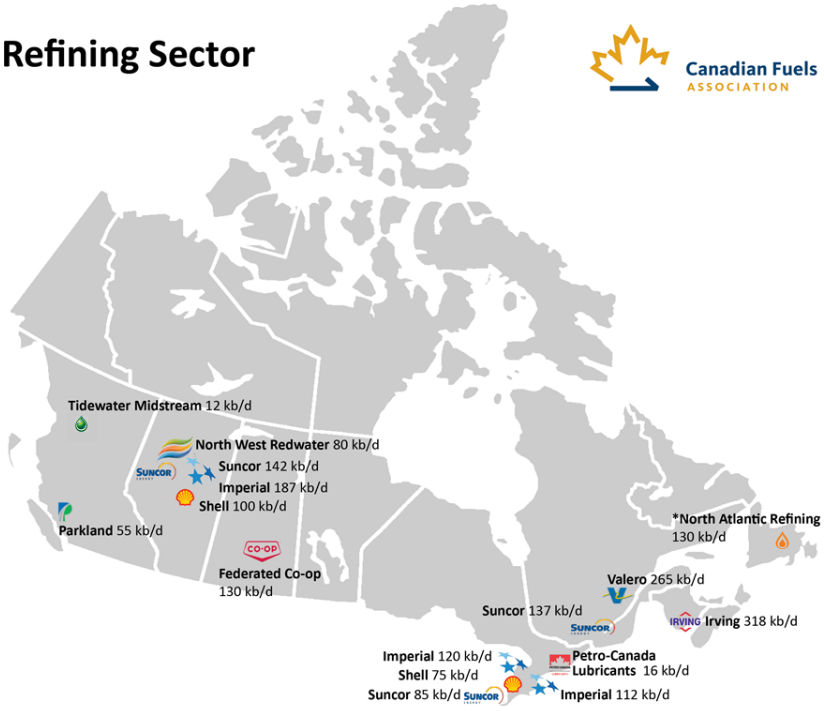
British Columbia
Capacity: 67 kb/d
Demand: 232 kb/d

Prairies
Capacity: 639 kb/d
Demand: 576 kb/d

Ontario
Capacity: 408 kb/d
Demand: 558 kb/d

Quebec
Capacity: 402 kb/d
Demand: 365 kb/d

Atlantic
Capacity: 448 kb/d
Demand: 160 kb/d



Data sourced from respective companies' published figures and Statistics Canada as of 2019. Due to confidentiality issues, refining capacity numbers were used instead of total production numbers. Domestic sales by reporting companies, exclusive of export and sales to other reporting companies, are adjusted for exports and imports by non-reporting companies. Number may not add up due to rounding. *Non-member refinery.

Canadian Fuels Association 2020

Industry Snapshot

- 16 refineries located in 7 provinces
- 2018 refining capacity : 114 billion litres a year
- 2018 product demand: 109 billion litres a year
- GDP contribution: **$10.2 billion** *(2018)*
- Direct refinery employment: 18,039 *(2017)*
- Total annual capital investment: $1.7 billion *(2016)*
- Nearly **$12 billion** invested in improving fuels and facility- environmental performance since 2000

9

Canadian Fuels ASSOCIATION | ASSOCIATION canadienne des carburants

We'll take you there
On vous mène à destination

Canada's Clean Fuel Standard

canadianfuels.ca

The Clean Fuel Standard

Canadian Fuels ASSOCIATION canadienne des carburants

- Clean Fuel Standard (CFS) goal is to reduce GHG emissions on all fuels by up 30 Mt/year by 2030. A federal policy that is incremental to existing provincial low carbon policies
- Policy intent: Market-based and outcome-focused: intended to support lowest-cost solutions and innovation. Technology agnostic
- CFS is a complex policy affecting the entire economy
- Compliance will be challenging for obligated parties
- GHG reductions through all phases of fuel life cycle. Uniquely for low carbon policies includes gaseous and solid fuel streams as well as buildings and industry. The bulk of the reductions will come from the transportation stream
- **CFA members are committed to working with government to achieve policy success**

CFS Context

Canadian Fuels ASSOCIATION canadienne des carburants

- COVID impacts complicate the CFS rollout
- Canada's resource economy, vast geography, urban vs rural differences and climate presents challenges and opportunities for low carbon policies
- Leveraging Canada's established energy infrastructure is essential for policy success
- Co-processing is a good opportunity for Canada due to abundant biomass

Panelist

Geoff has over 20 years of experience in the Canadian aviation fuel and environment industry including implementing policy and strategy for low-carbon and sustainable aviation.

Geoffrey Tauvette, Low-Carbon and Sustainable Aviation Expert

Decarbonizing Aviation

Geoffrey Tauvette
linkedin.com/in/geoffreytauvette

Jun 30, 2020

2020 IATA projections for global aviation

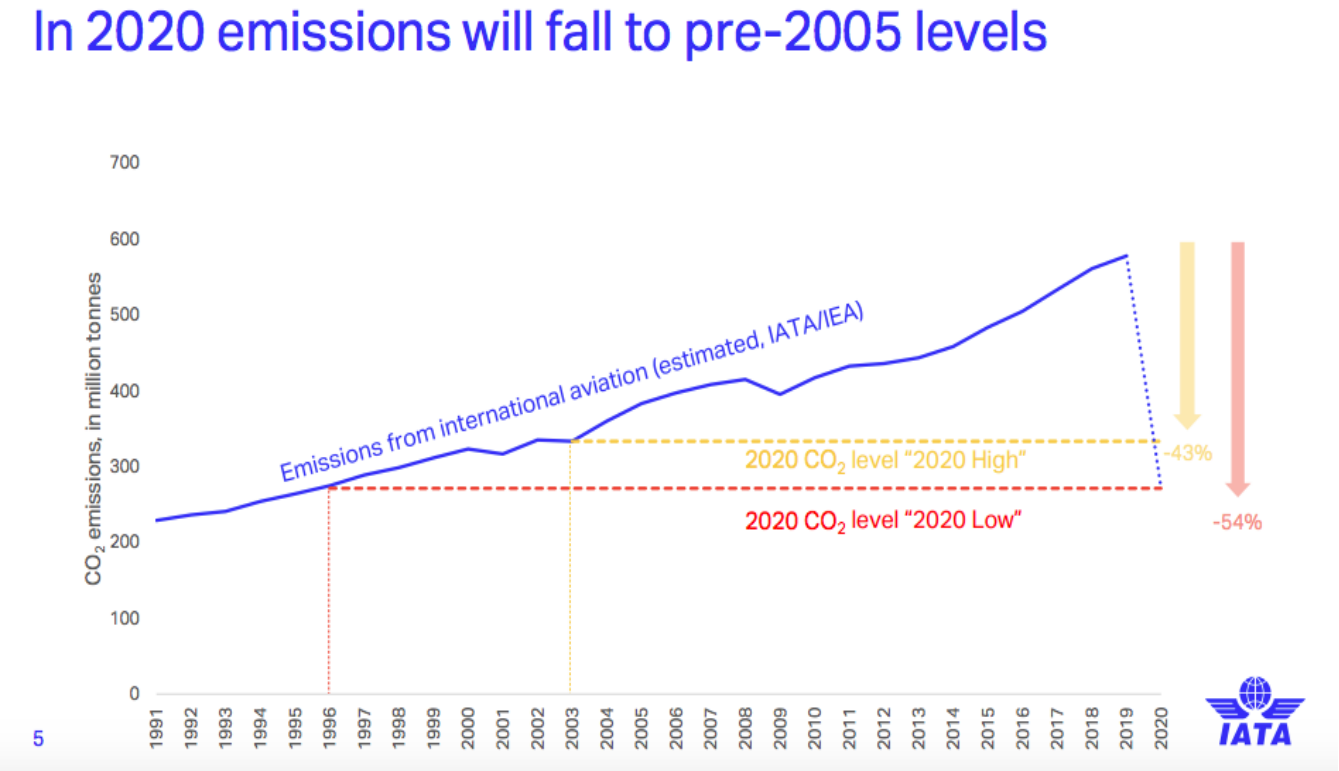
$84.3B loss
-20% margin

Unprecedented - airlines are in survival mode

Question is, does environment and sustainability remain a key component of aviation's growth strategy?

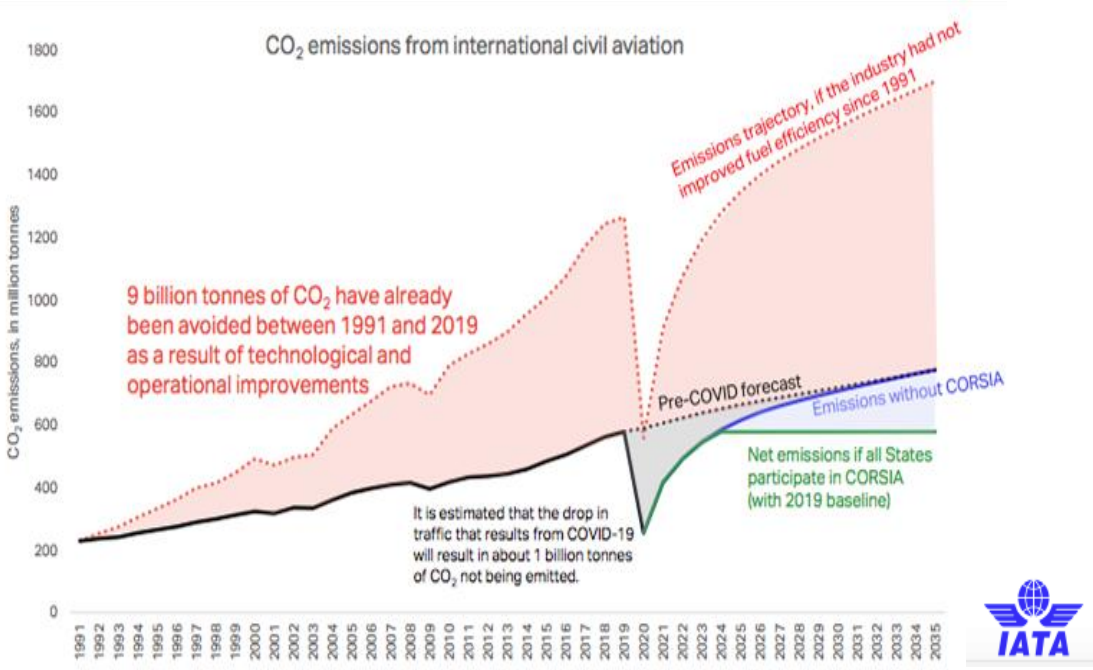
1. **What about emissions**
2. **CORSIA effective from Jan 1, 2020**
3. **Technology improvements**
4. **SAF**

What is COVID impact on emissions?



- **Airlines are parking older, gas guzzling fleet**
- **And places that were suffering from overtourism have clean air, clean water but no tourism revenue…**

- **It will take a few years but aviation growth is projected to return to preCovid levels**
- **There is pent up travel demand - leisure, business travel may take longer**



- **CORSIA (carbon offsets) or SAF effective Jan 1, 2021 - needed to meet carbon neutral growth and aspirational emission targets**
- **Some airline bailouts have come with environmental conditions**

What about technological innovation and SAF?

- Reduced cash slows innovation
  - No profit, slow fleet replacement
  - No fleet replacement, slower OEM innovation
  - Fuel efficiency is operational focus

- SAF is best medium term solution
  - SAF costs still high
  - Offset costs likely cheaper
  - Low-carbon fuel standards and/or mandates move forward
  - But, policies still favour ground transportation, so little SAF supply

What does it mean?

Airlines will focus on Survival, Stability and Recovery, pent up demand?

- Profitability will impact new fleet and ability to buy SAF

Key tenants to attract back customers will be

- Safety and Hygiene

Still, airlines must deal with their environmental footprint

- *SAF is still best option but without subsidies to develop supply and policies to ensure carbon and price competitiveness against ground transport, new supply will be a challenge*
- *Offsets market needs to evolve i.e carbon storage*

Panelist

Chantale leads Canadian National (CN)' sustainability strategy, working closely with key internal and external stakeholders, to advance sustainable supply chain solutions. She is a volunteer and a member of the Board of Al Gore's Climate Reality Project Canada.

Chantale Despres, Director-Sustainability, Canadian National Railway

Decarbonising the Long Distance Transport Sector

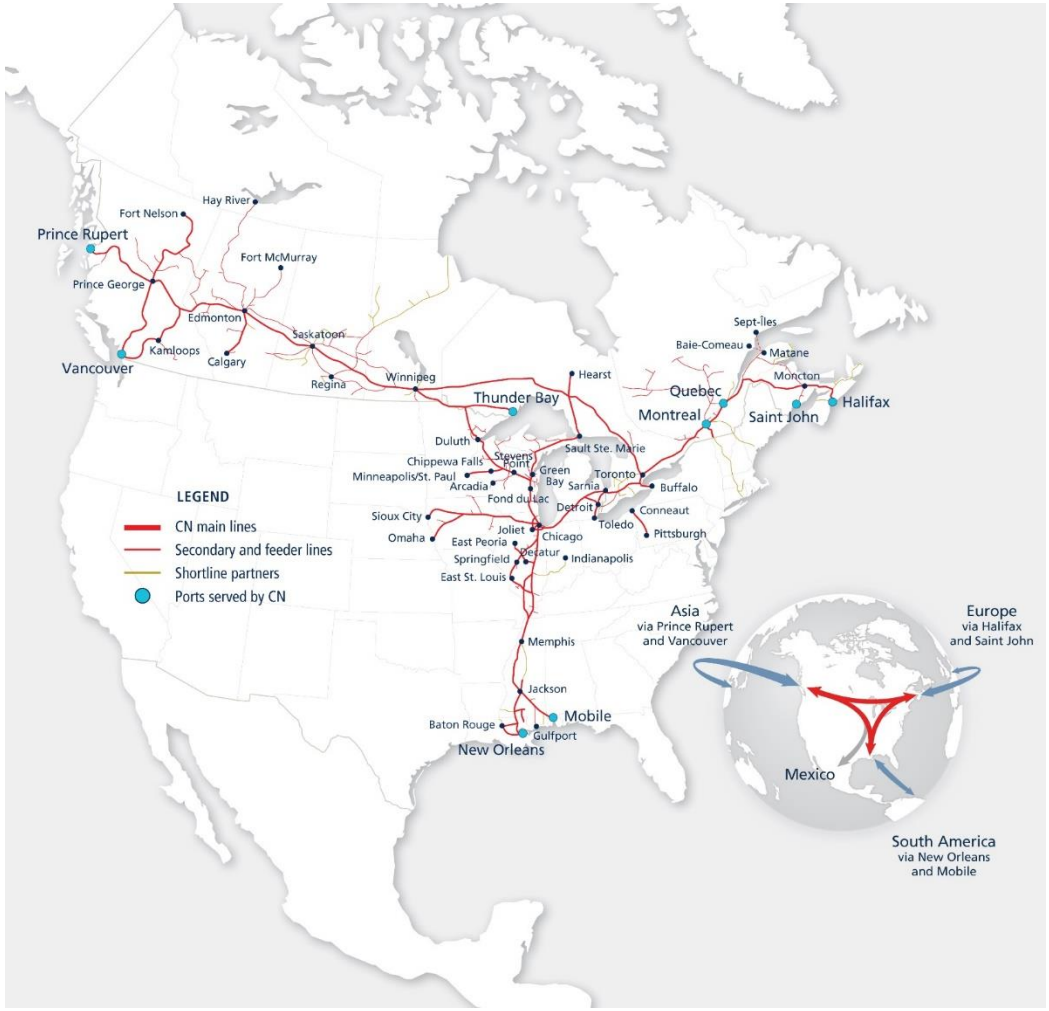
IEA Bionergy / BC-Smart
Panel Discussion

Chantale Després
Director Sustainability
CN

June 2020

Our Business At-a-Glance

CN is a leading North American transportation and logistics company, and our 20,000-mile network spans Canada and Mid-America, connecting ports on three coasts



2018 Key Statistics

Route Miles 20,000	Revenues $14.3B
Value of Goods Handled $250B+	Capital Investments $3.5B
Ports Served 9 ports	Employees 25,720

CN is Moving the Sustainable Economy

Our connections with our customers, supply chain partners and governments are enabling us to deliver sustainable and profitable business that drives economic prosperity in a low carbon environment

Enabling Our Customers to Feed the World	**Providing a New Way to Move Bitumen**	**Bringing Electric Vehicles to Market**	**Leveraging Our Reach to Power the Future**	**Delivering Cleaner Energy Alternatives**	**Connecting the World to Biofuels**	**Moving Scrap for Reuse and Recycling**

CN is Collaborating with Customers to Deliver Clean Energy to the World

As a mover of the clean economy, we are proud of the relationship we have with Pinnacle Renewable Energy enabling the international transportation of cleaner energy products from wood pellets to many producers and users of renewable electricity around the world.

Just last year, Pinnacle opened its seventh wood pellet plant on our rail lines – its first in Alberta. Shipping pellets from this newest plant to the Prince Rupert terminal by unit train instead of truck saves approximately 570 tonnes of CO_2 emissions.

Environmental Benefits of Shipping by Rail

Rail has a tremendous potential to reduce the environmental impact of transportation - As a mover of the economy, CN is committed to playing a key role in the transition to a lower carbon economy

Providing Low Carbon Transportation Solutions

Collaborating for More Efficient Supply Chains

Supporting Growth in Sustainable Products and Markets

An Efficient and Environmental Friendly Way to Move Goods

75%

MOVING FREIGHT BY RAIL INSTEAD OF TRUCK REDUCES GHG EMISSIONS BY 75%[1]

4–5 times

TRAINS, ON AVERAGE, ARE FOUR TO FIVE TIMES MORE FUEL EFFICIENT THAN TRUCKS[1]

479 miles

ONE TRAIN CAN MOVE ON AVERAGE A TON OF FREIGHT 479 MILES ON A SINGLE GALLON OF FUEL[1]

300+ trucks

ONE SINGLE FREIGHT TRAIN CAN REPLACE OVER 300 BIG TRUCKS[2]

90%

TIER 4 LOCOMOTIVES REDUCE PARTICULATE EMISSIONS BY AS MUCH AS 90%[2]

(1) The Association of American Railroads (2) The Railway Association of Canada

Introducing Renewable Fuels

- The growth of the renewable fuel market has presented an important opportunity for us to further reduce our emissions by using biodiesel blends in our locomotive fleet
- In 2018, the use of renewable fuels in our fleet saved almost 100,000 tonnes of carbon
- In the coming years, we look forward to working with our suppliers to explore the greater use of renewable fuels

45 million

Tons of carbon avoided through fuel efficiency gains since 1993

Low Carbon Transition Plan
Mitigating and Adapting to Climate Risks and Opportunities

We support the Taskforce on Climate-related Financial Disclosures' recommendations

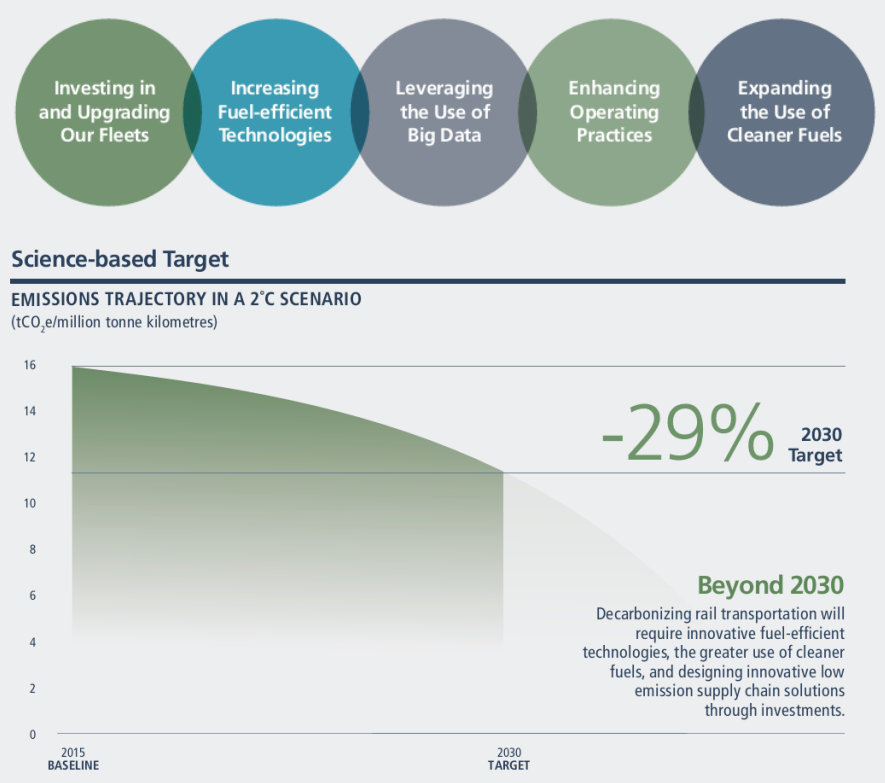
Governance

Strategy

Risk Management

Long-term Science-based Target

Our Strategic Focus Areas



Our Strategy: Advancing Our Carbon Positive Initiatives

Innovations in fuel-efficient locomotives, rail technology, and data analytics, combined with enhanced operating practices and cleaner fuels will help us realize further emissions reductions

Investing in and Upgrading Our Fleets

Fleet Renewal

Increasing Fuel-efficient Technologies

Innovative Technology

Leveraging the Use of Big Data

Big Data

Enhancing Operating Practices

Operating Practices

Expanding the Use of Cleaner Fuels

Cleaner Fuels

Sustainable Mobility: Piloting the Use of Electric Trucks

- Collaborating with Lion Electric for the conception, design and manufacturing of eight tandem axle, Class 8, zero-emission, electric trucks
- Trucks will be tested for various tasks such as urban delivery, container shuttle service to port operations and cross-town service
- The project is also spurring innovation and creating jobs in nearby communities

100 tonnes

Of carbon avoided per year estimated through the use of new electric trucks

Looking to the Future: The Next Power Generation

- Collaborating with governments and industry, we are looking to the future now
- Discussions on the prospects of electrification and hydrogen power trains are underway
- The rail industry in Canada has been actively working with the Government of Canada since 1995 to address the impacts of its activities on the environment
- Recently, we participated in a study examining the opportunities and challenges of electrifying rail operations across the country

Targets:

Through the recent renewal of a long-standing Memorandum of Understanding (MOU) with Transport Canada, committed to a 6% intensity-based reduction in GHG emissions, measured against 2017 baseline, over a five-year period ending in 2022

Proactively set a target to reduce our Criteria Air Contaminants intensity by 6% over the same period

Panelist

Peter leads the team responsible for Seaspan's business development, sales and customer service activities. Seaspan is the largest private ferry, tug and barge Transportation Company on Canada's West Coast. Before joining Seaspan, Peter spent 25 years in the forest products industry, most recently as VP, Forest Operations & Wood Products at FPInnovations.

Peter Lister, Vice President- Commercial Services, Seaspan

COVID-19 and the Decarbonization of Long-haul Marine & Trucking Transportation

Peter Lister, P.Eng., MASc, ICD.D

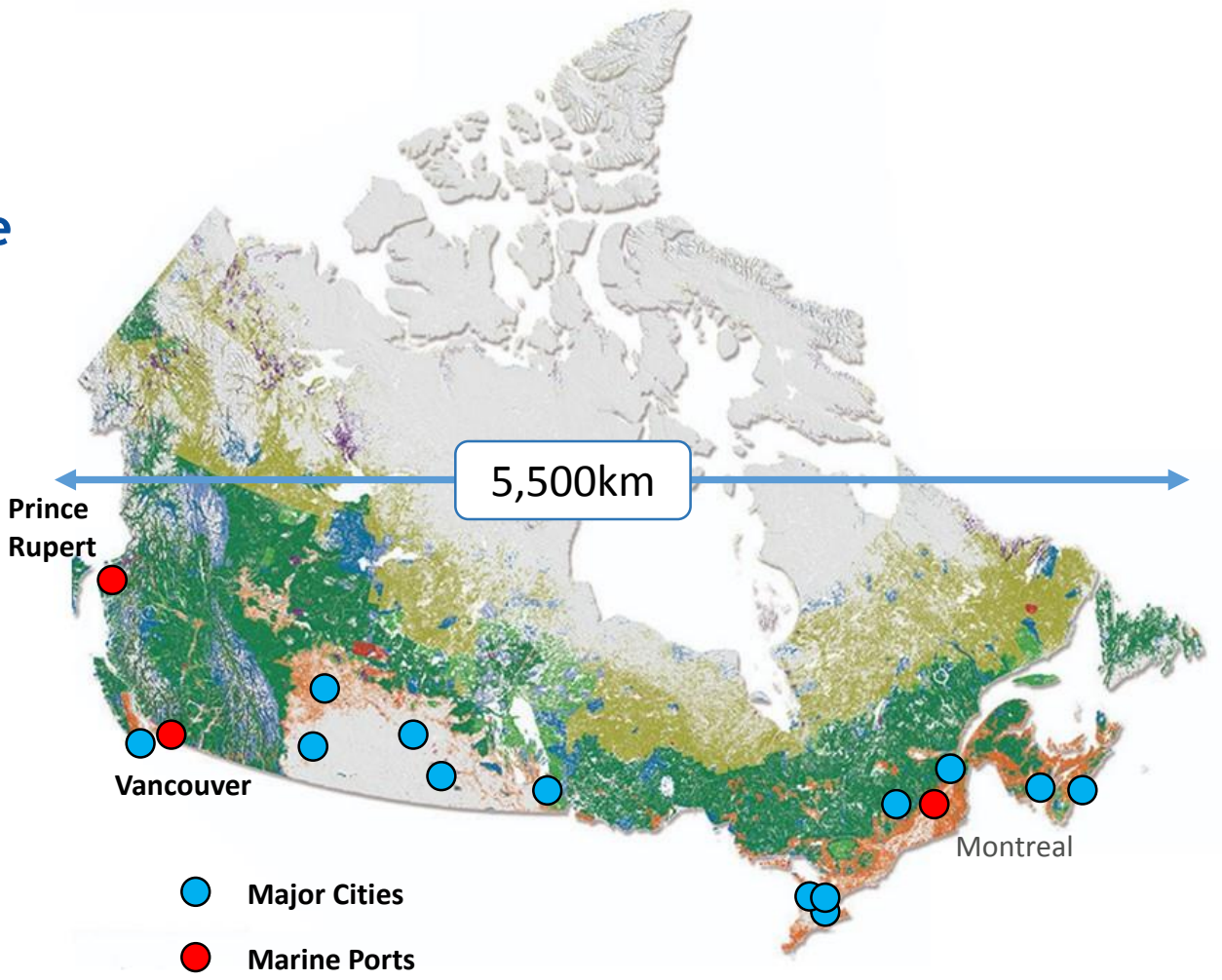
VP Commercial Services

June 30, 2020

seaspan MARINE

Canada is a big country…

- 10 million km^2
- 37.5 million people
- Heavily reliant on long distance transportation by
  - Rail
  - Truck
  - Ship



Long Haul Trucking

- 326,000 long-haul trucks in Canada[1]
- Consume 6.2 billion litres of diesel each year[1]

- Limited opportunity for electrification
- Some LNG, but infrastructure an issue

- Low-carbon fuels best option for decarbonization
- Clean BC standard: 20% renewable content by 2030

1 Canadian Vehicle Survey, 2009 - Statistics Canada

Canada's Major Ports

3,160 vessels each year

2019 Volume (000s)	
Autos (units)	450
Breakbulk (tonnes)	17,165
Containers* (tonnes)	26,877
Bulk (tonnes)	99,697
Total (tonnes)	**144,168**
*3,399 TEUs	

450 vessels each year

2019 Volume (000s)	
Breakbulk (tonnes)	n/a
Containers* (tonnes)	12,120
Bulk (tonnes)	17,345
Total (tonnes)	**29,512**
*1,533 TEUs est.	

2,525 vessels each year

2019 Volume (000s)	
Breakbulk (tonnes)	123
Containers* (tonnes)	15,087
Bulk (tonnes)	25,380
Total (tonnes)	**40,590**
*1,745 TEUs	

Decarbonizing Shipping

- IMO 2050 Target
  - At least a 50% reduction in GHG emissions from global shipping compared to 2008 levels

- Emission Control Areas (ECAs)
  - 0.1% sulfur fuels
  - Annex IV Tier III engines
- IMO 2020
  - Applies to ships operating outside ECAs
  - 0.5% Sulfur max (from 3.5% in 2012 & 4.5% prior)
    - or exhaust scrubbers
    - or alternative fuels like LNG, Methanol

Impact of COVID-19 on Shipping Traffic

CONTAINER

Vancouver#	10%	↓
Prince Rupert#	1%	↑
Montreal*	0.4%	↑

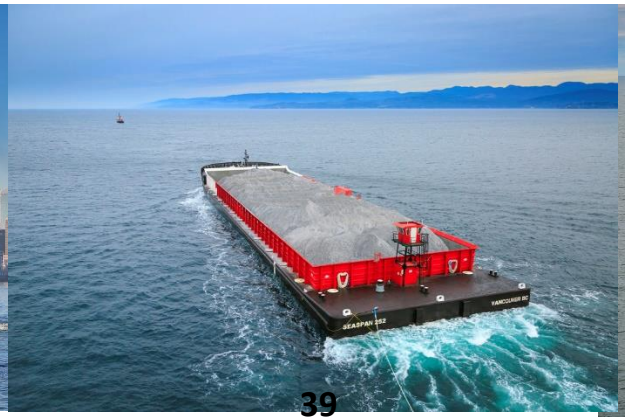
BULK

Vancouver#	0.5%	↓
Prince Rupert#	9%	↑
Montreal*	10%	↓

Sources:
 # Federation of Shipping, April 2020
** Port of Montreal, May 2020*

Seaspan Marine

- Largest private fleet of ferries, tugs and barges in Canada
- Based in North Vancouver, BC
- 35 vessels, 130+ barges
- 33 million liters of ULSD (0.0015% sulfur) each year
- Port of Vancouver “Blue Circle” environmental award last 4 years
- Green Marine member



Seaspan's LNG Ferries

- Seaspan Swift & Reliant (2017)
  - 2x 2,200 kW Schottel twin thrusters
  - 2x Wartsilla Dual Fuel Gensets
  - 500 kWh Corvus Li battery bank

- 2 New Vessels (on order)
  - 2x 2,600 kW Schottel twin thrusters
  - 2x Mann Dual Fuel Gensets
  - 2,000 kWh Corvus Li battery bank

- Emissions reduced by approximately 50% per trailer compared to previous vessels

What's Next for Seaspan?

- Reducing environmental impact is a core value

Robert Allan Rastar 4000-DF

- **40m long, 998 gross tons**
- **6,360kW (10,000HP) propulsion**
- **LNG / Diesel dual fuel**

Robert Allan ElectRA 2800

- **28m long, 475 gross tons**
- **4,200kW (3,600HP) propulsion**
- **6,000 kWh battery bank**

Both designs provide an est. 2,000 tons per year reduction in CO_2

Thank you!

Peter Lister, P.Eng., MASc, ICD.D
VP Commercial Services
Seaspan Marine

Peter.Lister@Seaspan.com

Panelist

Chris is an expert on matters pertaining to the oilseed processing industry. He also serves as a senior executive with the Canola Council of Canada (CCC). He has worked at various levels of the agriculture industry for over 20 years, in both a domestic and international capacity.

Chris Vervaet, Executive Director- the Canadian Oilseed Processors Association

CANADIAN OILSEED PROCESSORS ASSOCIATION

Bioenergy Task 39/BC SMART: Panel Discussion

June 30, 2020

canolacouncil OF CANADA

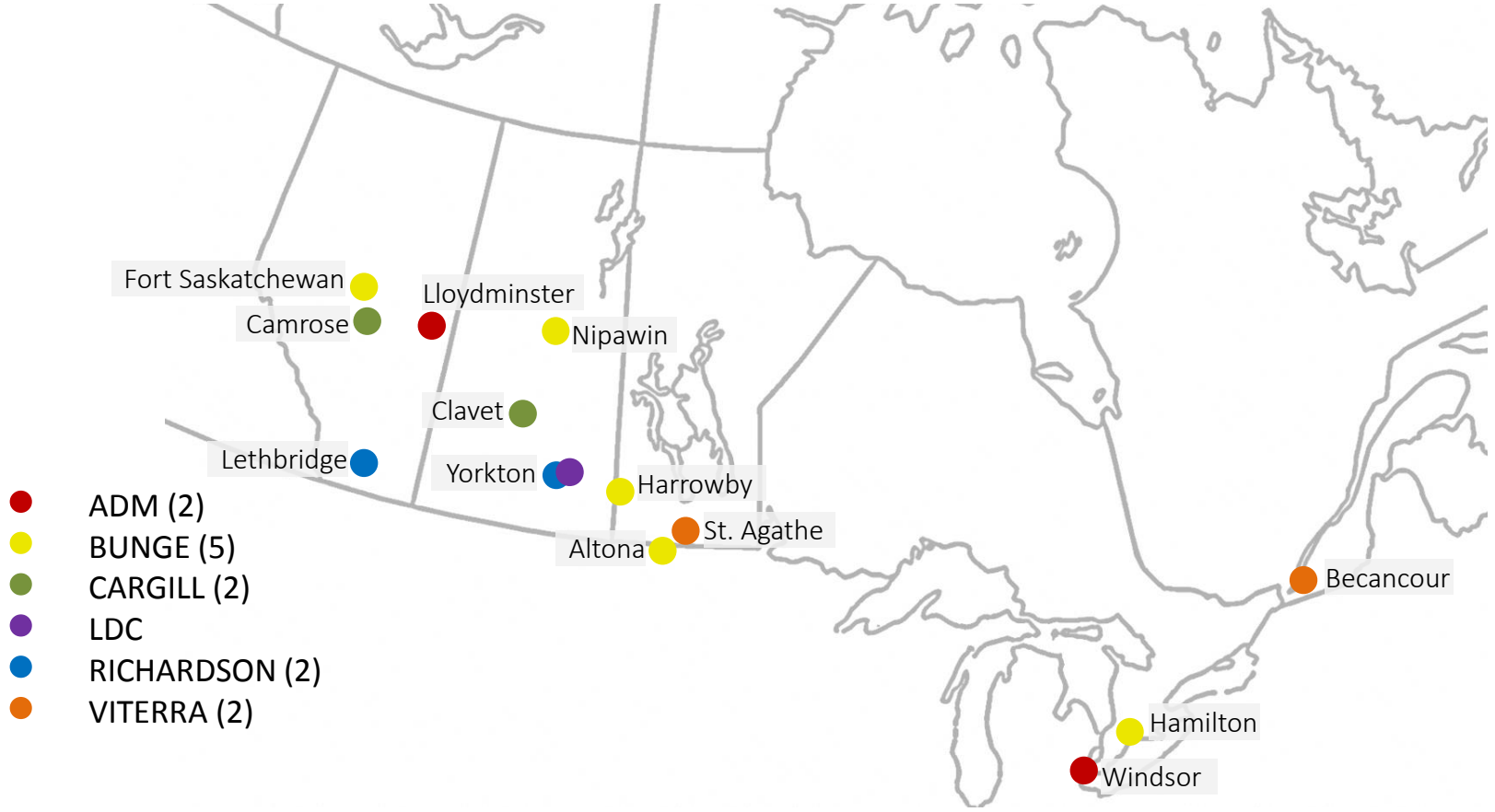
The Canola Industry in Canada

- **Canola Council of Canada -** an industry association that combines the interests of the entire supply chain, including:
  - Seed developers
  - Farmers
  - Seed exporters
  - Seed processors

- **Canadian Oilseed Processors Association (COPA)** - represent the canola processors in the CCC value chain, who turn canola seed into value added products:
  - Oil (food and biofuel feedstock)
  - Protein meal (animal feed)

Oilseed processing in Canada

- Oilseed processors are responsible for $7.8 billion in economic activity[1], a threefold increase from a decade ago.



- There are 14 processing facilities owned by 6 companies in Canada

1. COPA estimate

Decarbonizing & economic opportunities

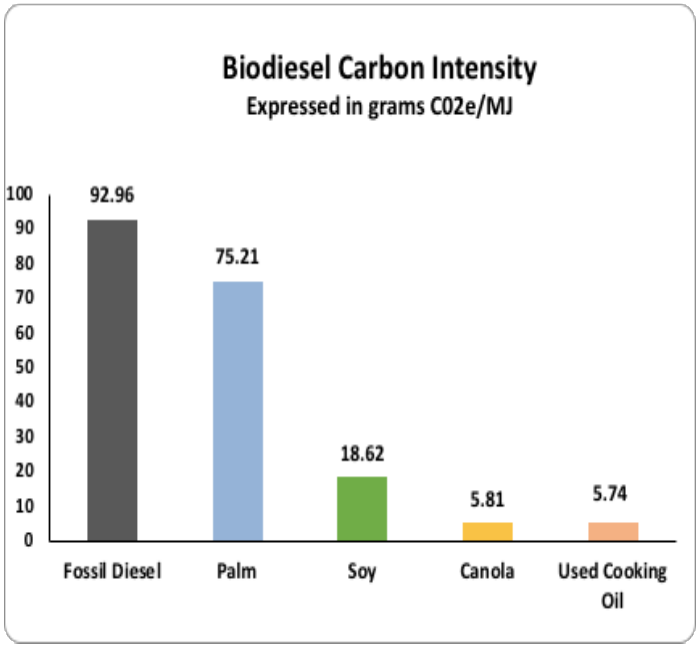
- Biofuel policies that support lower carbon liquid / transportation fuels
  - A significant growth opportunity for our industry.

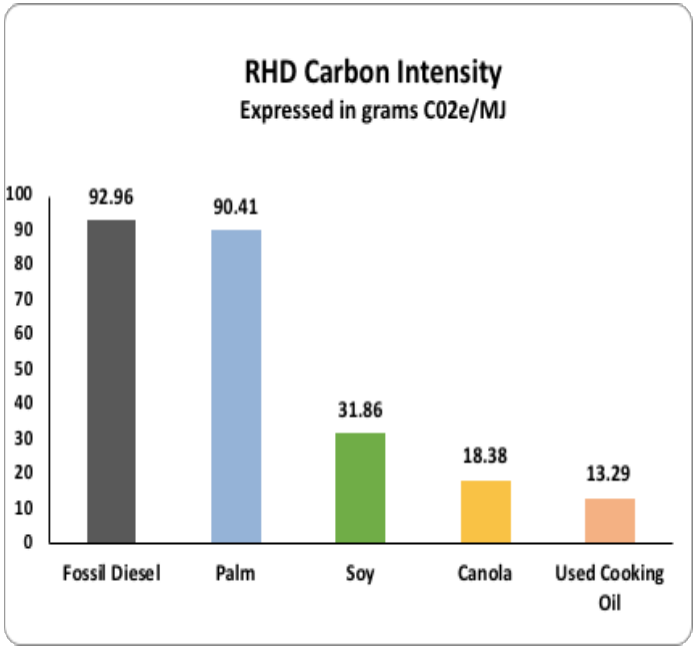
- BC LCF regulation and proposed Clean Fuel Standard (CFS) have the potential to:
  - Drive demand for canola-based biofuels.
  - Create a domestic market insulated from China / global uncertainty.
  - Support more value-added processing in Canada.
  - Contribute to significant GHG emission reductions.

- To capitalize on the opportunities, canola's advantages and contributions must be recognized.

Advantage - GHG reductions

- Canola has among the lowest carbon intensities in the world, making it an ideal feedstock for GHG reductions.
- Canola-based biofuels already reduce GHG emissions in Canada by 1.4 million tonnes of CO2 equivalent per year.



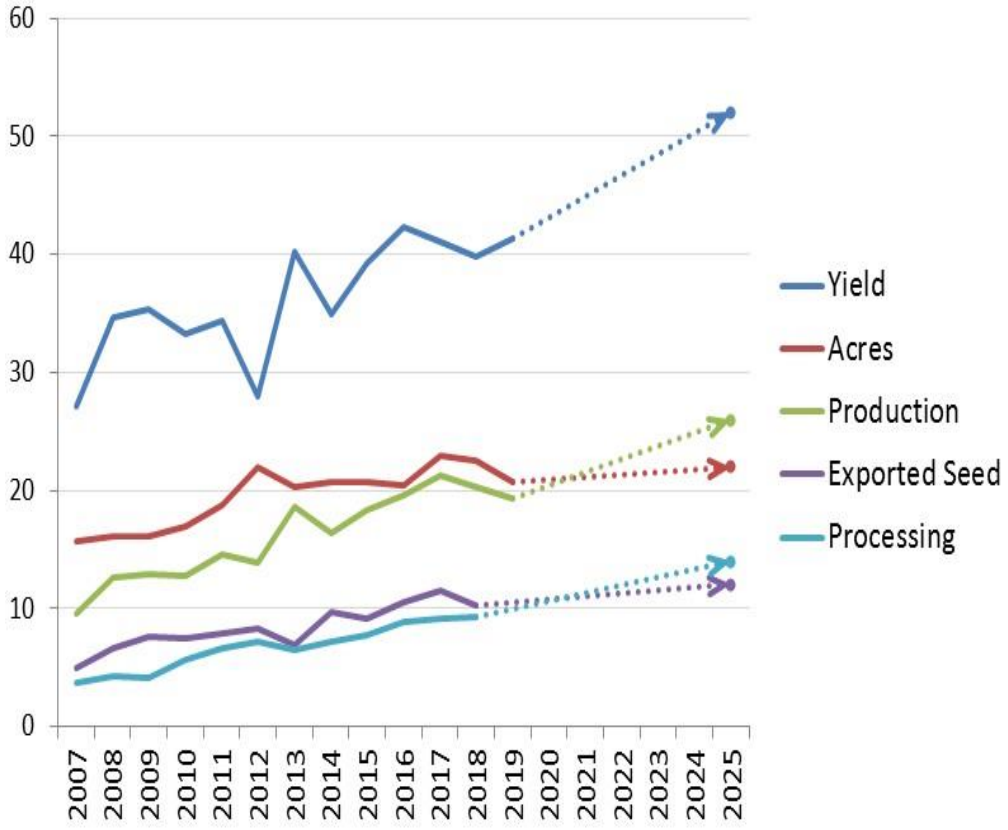


Source: GHGenius, 2018

Growing Industry – Lots of Future Supply

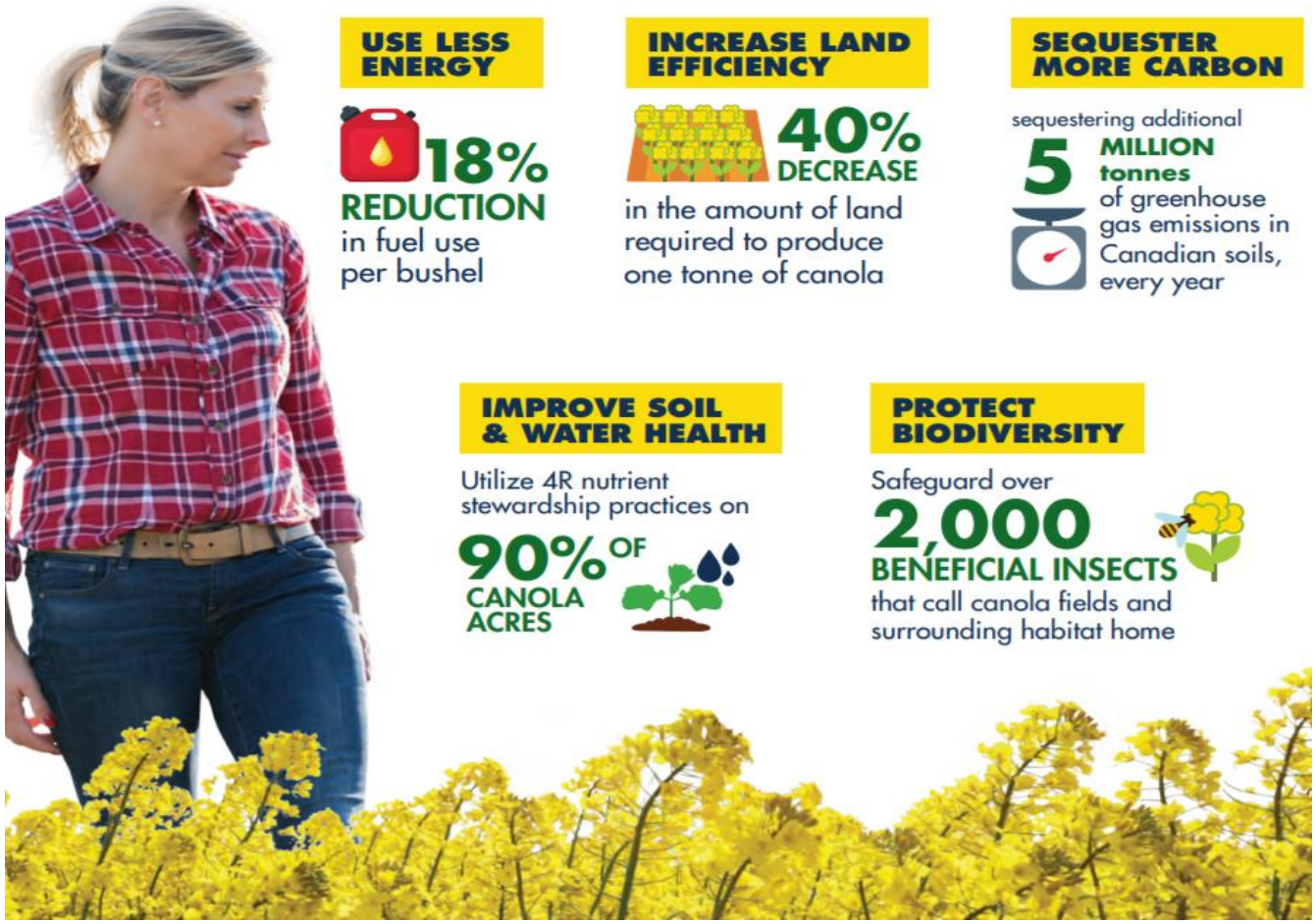
- The canola industry is focused on the future - set 2025 production targets.

	2019	2025 goal
Production	18.6	**26.0**
Acres	21.0	22.0
Yield (bu/acre)	40.0	52.0
Export	8.2	12.0
Processing	9.6	14.0



Sustainability – Canola Delivers

- Growth targets supported by 2025 sustainability goals.



Summary - The Canola Advantage

✓ Proven	Already delivering tangible emissions reductions.
✓ Efficient	Canola biofuel helps reduce GHG lifecycle emissions by up to 90% compared to fossil diesel.
✓ Sustainable	Canadian canola growers are world leaders in sustainable practices.
✓ Ready	Ample and growing supply with track record of industry making the necessary investments.

CANADIAN OILSEED PROCESSORS ASSOCIATION

Thank You

Panel Discussion

David Schick, Vice President of the Canadian Fuels Association

Geoffrey Tauvette, Low-Carbon and Sustainable Aviation Expert

Chantale Despres, Director- Sustainability, Canadian National Railway

Peter Lister, Vice President- Commercial Services, Seaspan

Chris Vervaet, Executive Director- the Canadian Oilseed Processors Association