



Advanced Biofuels Canada
Biocarburants avancés Canada

Realizing the promise of Advanced Biofuels

“Conventional Biofuels Industry as a Base for an Advanced Biofuels Industry”

BioCleantech Forum
Ottawa, ON

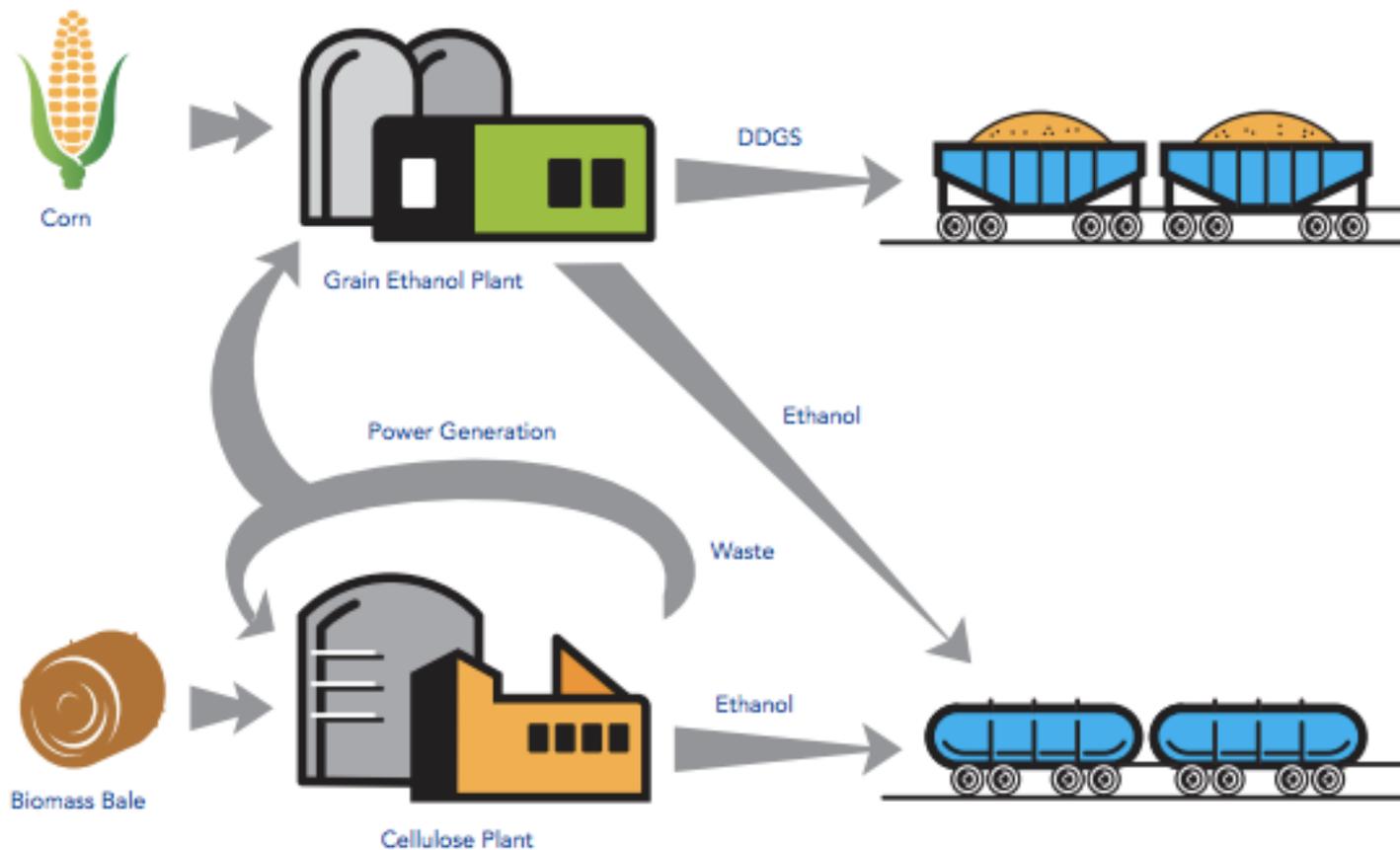
November 3, 2016

First-generation platforms for second-generation biofuels: examples

- Adkins Energy (Illinois) installed the capacity to produce 2 million gallons of **biodiesel** per year using corn distillers oil extracted onsite.
- Central MN Renewables (Minnesota) using Green Biologics Ltd.'s **butanol** and acetone production technology.
- CHS (Illinois) ethanol plant will co-locate a 5 MGPY **biodiesel** facility with corn distillers oil
- East Kansas Agri-Energy - co-located facility that will use corn distillers oil to generate 3 million gallons of **renewable diesel** per year.
- Pacific Ethanol (California) – cellulosic ethanol using Edeniq's Pathway Technology to convert corn kernel fiber into nearly 1 million gallons of **cellulosic biofuel** annually.
- Quad County Corn Processors (Iowa), was the 1st ethanol plant to produce 2 million gallons of **cellulosic ethanol** from corn kernel fiber in 2014 using Cellerate technology
- IGPC Ethanol (Ontario) using ICM's Fiber Separation Technology as a platform to enable **cellulosic biofuels** options

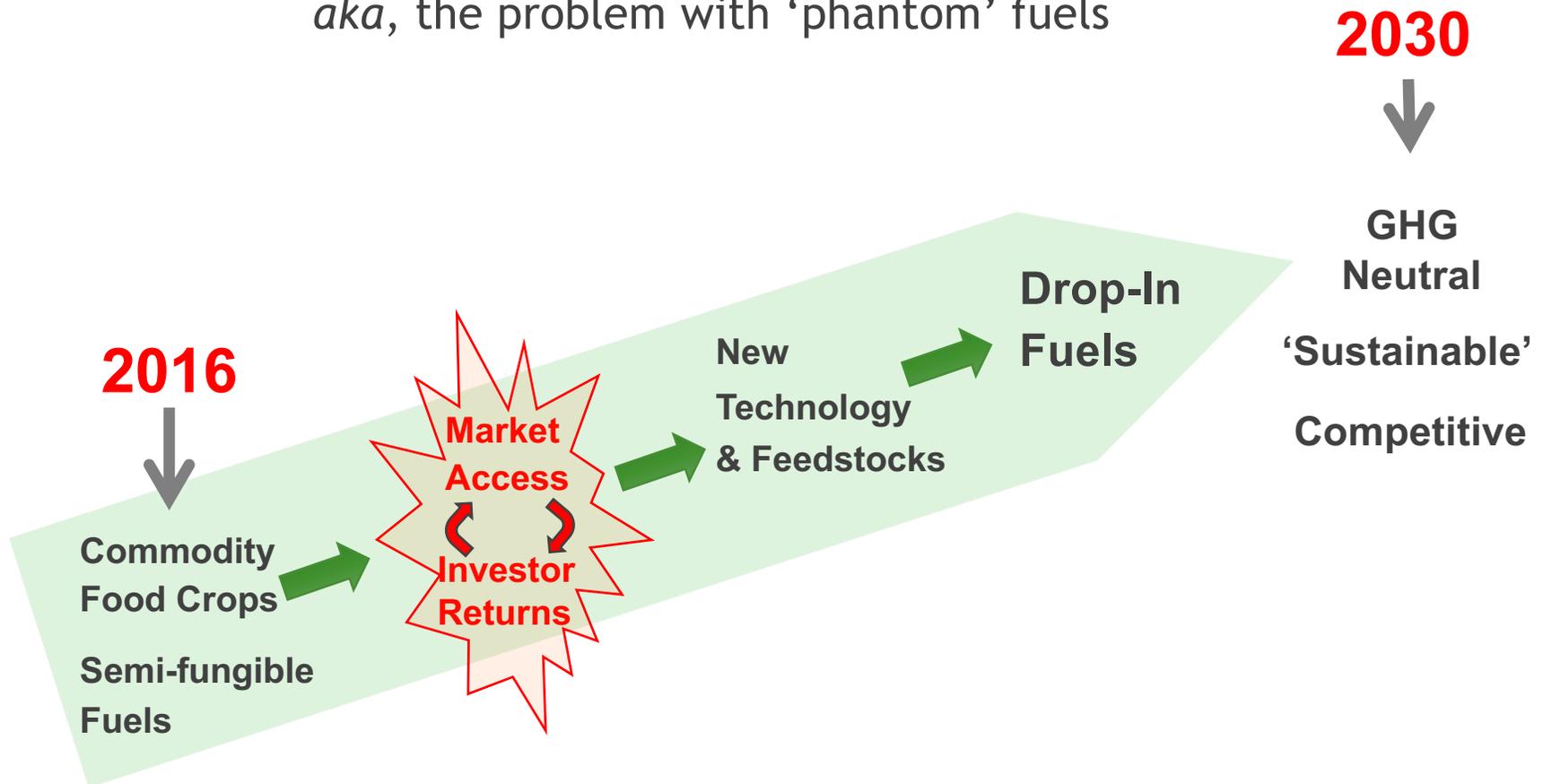
POET-DSM Integrated Biorefining Model

- Cellulosic ethanol plant co-located with grain-based plant
- Waste stream from cellulosic plant to generate power for both plants



actual
No markets, No finance: why 2G fuels need 1G shoulders

aka, the problem with 'phantom' fuels



In both passenger and freight, advanced biofuels are indispensable...

Biofuels play critical role beyond EV, hydrogen

NexGenPathway4:
MovetoZero Emission
Transport Fuels

Figure 31 Biofuels GHG Abatement in Transportation

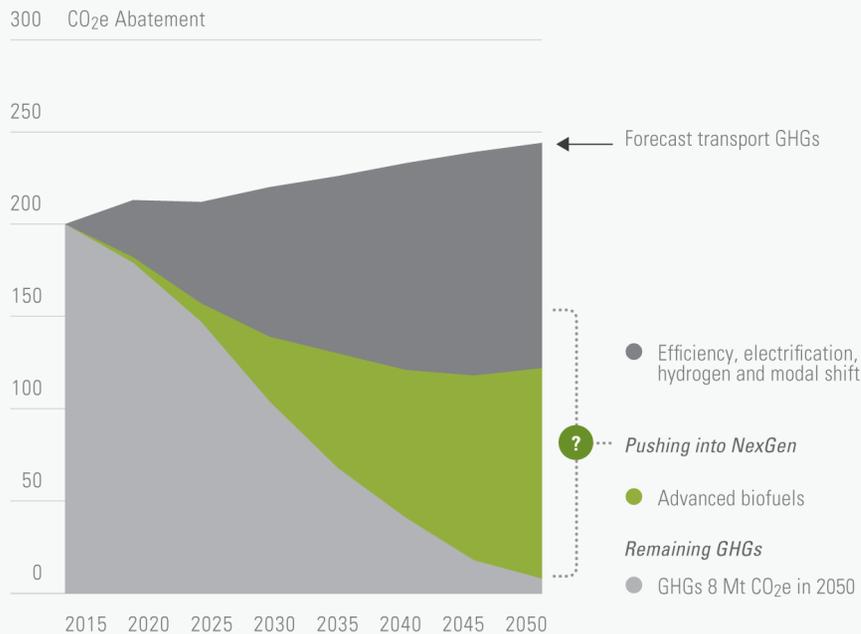
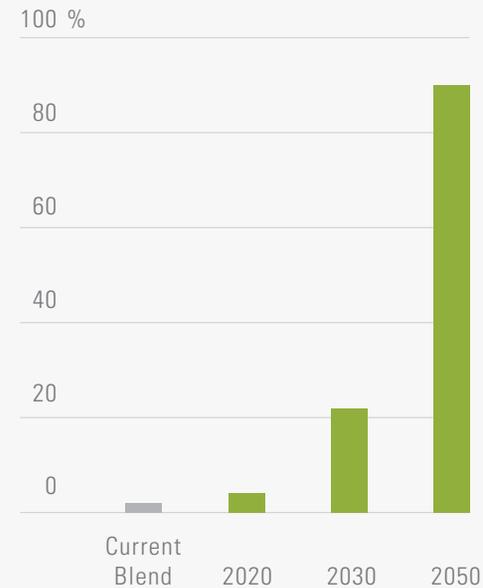


Figure 32 Average blend of biofuels in liquid transport fuels



Amongst the hurdles facing advanced biofuels? – the ‘carbon pricing silver bullet’

Carbon pricing is being promoted as the most effective, lowest cost GHG reduction approach.

But:

- Transportation is acknowledged to respond poorly to carbon pricing
- The structure of carbon pricing (BC, AB, QC) and fuels industry structure have fully muted carbon price signals
- Carbon prices would have to be $> \$200/t$ to impact fuel use significantly, and structured properly

No carbon price signal on fuels...despite a carbon price

PETRO-CANADA Français

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Daily Price

Important notice for Quebec customers only: See information related to the Quebec Cap and Trade System Charge

Terminal rack price postings are effective midnight, local time for the locations listed, on the date cited below. Prices are updated daily at 3 a.m. EST/EDT.

Suncor Energy provides the daily rack pricing for the following products:

- > **Reg UL Oct 87** : Regular Unleaded, Octane 87
- > **Mid UL Oct 89** : Midgrade Unleaded, Octane 89
- > **Sup UL Oct 91** : Super Unleaded, Octane 91
- > **Reg UL E-10** : Regular Unleaded, 10% Ethanol
- > **Mid UL E-5** : Midgrade Unleaded, 5% Ethanol
- > **ULS Diesel** : Ultra Low Sulphur Diesel
- > **#1 ULS Diesel** : Ultra Low Sulphur Diesel No. 1
- > **Seas. FFO** : Seasonal Furnace Fuel Oil
- > **Stove Oil** : Stove Oil

Effective: Oct. 29, 2016 All pricing in Canadian cents per litre, excluding taxes.

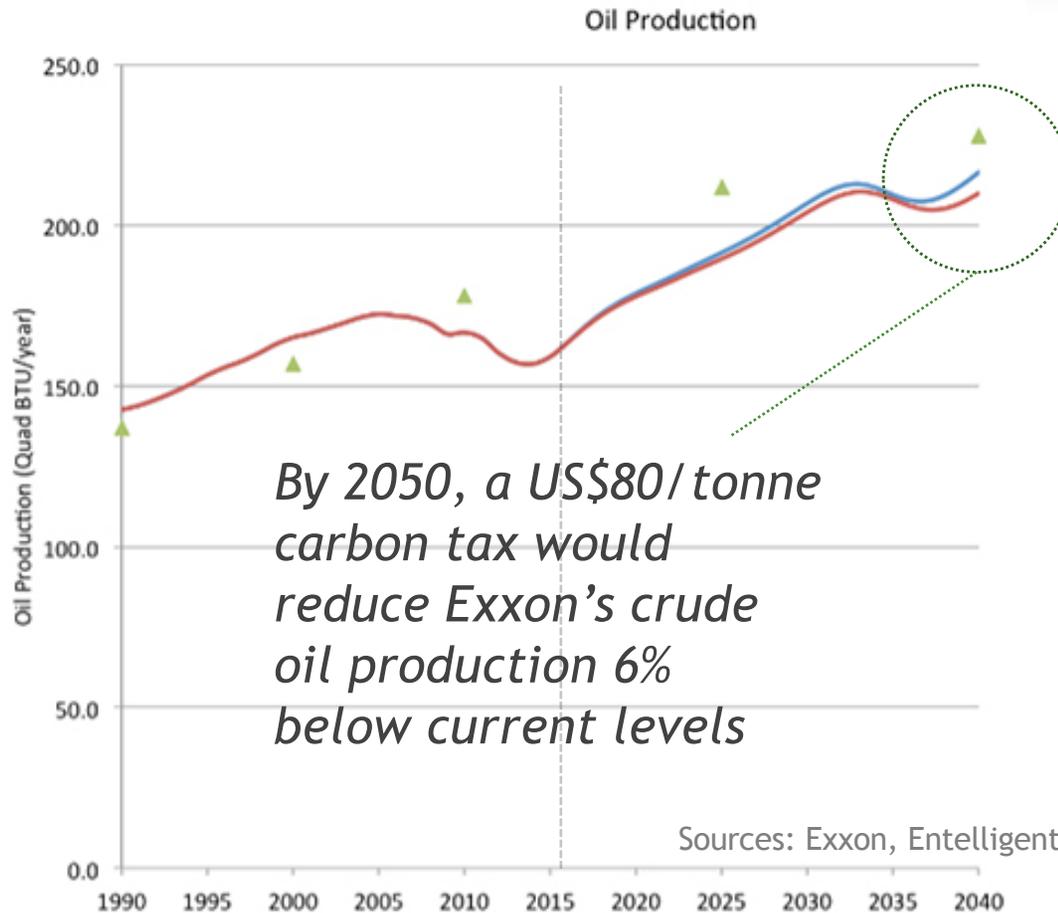
	Reg UL Oct 87	Mid UL Oct 89	Sup UL Oct 91	Reg UL E-10	Mid UL E-5	ULS Diesel	#1 ULS Diesel	Seas. FFO	Stove Oil
Halifax, Nova Scotia	57.30	60.05	63.30			63.50		61.10	67.50
Charlottetown, Prince Edward Island	58.60	61.35	64.60			64.80		62.40	68.80
Saint John, New Brunswick	57.50	60.25	63.50		57.50	63.90		61.50	67.90
Montreal, Quebec	60.00	64.75	69.50	60.00	64.75	64.50	71.50	64.00	71.50
Quebec, Quebec	60.00	64.75	69.50			64.50	71.50	64.00	71.50
Rimouski, Quebec	61.20	65.95	70.70			65.70	73.20	65.20	73.20
Ottawa, Ontario	58.00	62.00	66.00	58.00		57.90	61.40	57.40	61.40
Kingston, Ontario	59.60	63.60	67.60	59.60		58.80	62.30	58.30	62.30

VALERO **Prix à la rampe de chargement / Terminal Rack Prices**
Entrée en vigueur / Effective Date : 2016/11/02

Produit / Product	Montréal, QC	Québec, QC	London, ON	Maitland, ON	Ottawa, ON	Sarnia, ON	Toronto, ON	Kingston, ON	Nanticoke, ON	Halifax, NS	Chatham, NB	Corner Brook TNL
ORD-E / RUL-E	63.20			61.60	61.60		62.20	63.20	62.20			
ORD / RUL		63.20	62.40		61.60	62.40	62.20	63.20	62.20	60.60	63.20	63.00
INTER / MUL	67.95	67.95	66.40		65.60	66.40	66.20	67.20	66.20	64.35		
SUP / PUL	72.70	72.70	70.40	69.60	69.60	70.40	70.20	71.20	70.20	68.10	70.70	70.50
UFTS / ULSD	69.60	69.60	62.70	62.90	62.90	62.40	62.70	63.40	62.50	64.00		70.10
UFTS / ULSD QC1	69.60	69.60		62.90	62.90		63.70	63.40	63.50			
UFTS / ULSD QC2	72.40	72.40		65.30	65.30			65.80				
UFTS / ULSD QC3	69.60	69.60										
UFTS / ULSD QC4	69.60	69.60										
UFTS / ULSD QC5	70.60	70.60										
UFTS / ULSD QC6	72.40	72.40										
UFTS / ULSD QC7	73.60	73.60										
UFTS / ULSD QC9	70.60	70.60		64.40	64.40			63.40				
UFTS / ULSD ON1	70.10		62.70	62.90		62.40	62.70	63.40	62.50			
UFTS / ULSD ON2	70.10			62.90	62.90		62.70	63.40	62.50			
UFTS / ULSD ON3				62.90	62.90		62.70	63.40	62.50			
UFTS / ULSD ON4				64.90	64.90		64.50	65.40	64.30			
UFTS / ULSD ON5				64.40	64.40		64.20	64.90	64.00			
UFTS / ULSD ON6				66.30	66.30		66.20	66.80	66.00			
UFTS / ULSD MAR1										64.00		
UFTS / ULSD MAR2	70.80	70.80								65.30	71.50	
UFTS / ULSD MAR3	70.80	70.80								67.30	71.50	

Fossil and biofuel blends - parity-priced across jurisdictions with and without carbon pricing.

Carbon pricing will have an insignificant impact on transportation crude oil production



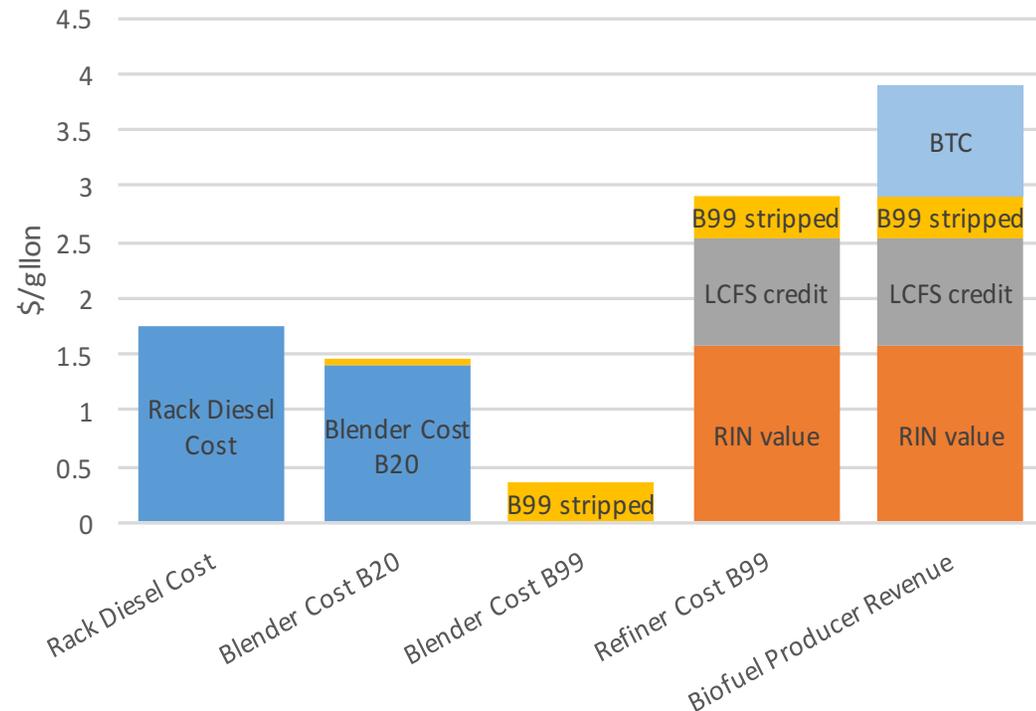
“Transportation Policy Recommendations

- Carbon Pricing mechanism most effective GHG reduction option for all sectors
- No need for inefficient, duplicative measures (e.g., renewable fuel standards)”

“Of the policy options being considered by governments, we believe a revenue-neutral carbon tax is the best.” VP Govt Affairs, Exxon

How strong credit markets - RFS, LCFS - can decarbonize fossil fuels

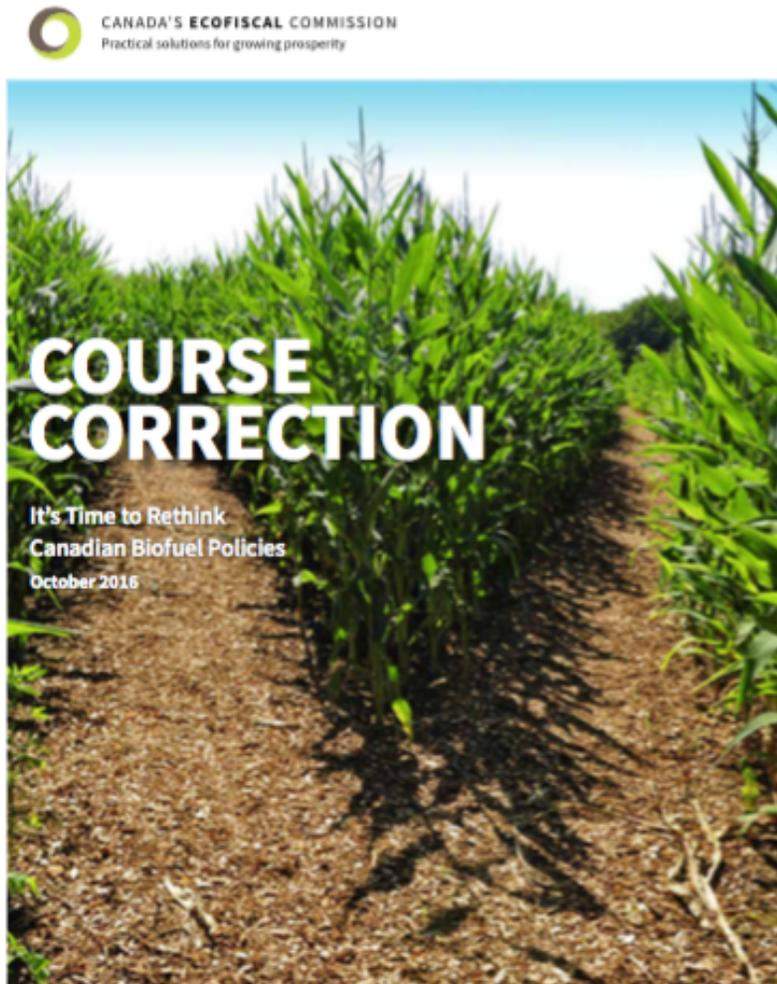
1. Low carbon biofuels generate credits (very low CI fuels generate more credits)
2. Obligated parties can sell low carbon fuels or buy credits
3. High credit revenues for biofuel producers allow them to sell physical product the physical fuel well below fossil
4. Non-obligated parties are profit-motivated to sell as much low carbon fuel as possible



**** but need active accessible credit market with openly tradeable instruments - Canada lacks these**

RIN = Renewable Identification Number

Ecofiscal report



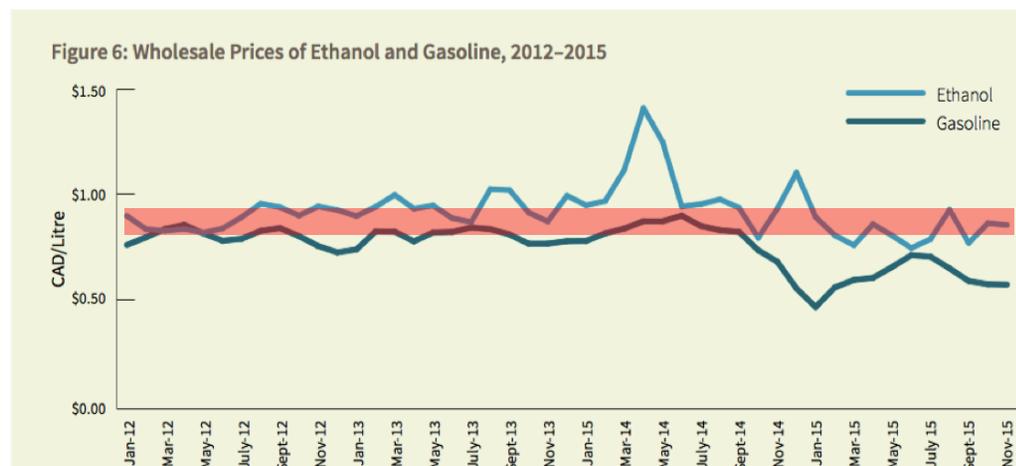
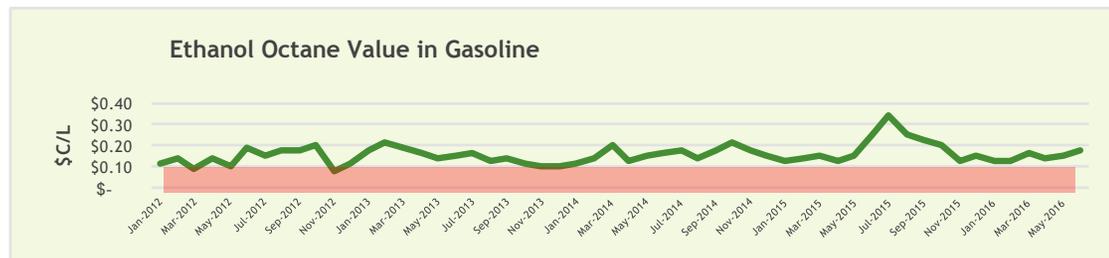
Ecofiscal Commission report “*Course Correction: Why it’s time to rethink Canadian biofuel policies*”

Advanced Biofuels Canada (ABFC), and other fuels and transportation policy experts in industry and academia have assessed the report’s findings and find **significant errors in methodology and understanding of transportation and fuels markets**. The report’s conclusions are also largely inconsistent with the recommendations from a host of global research bodies.

Ecofiscal report - numerous technical errors

Example: Ecofiscal failed to assign any octane value to ethanol blending. During 2010-2015 the weighted average value was \$0.11/L in gasoline.

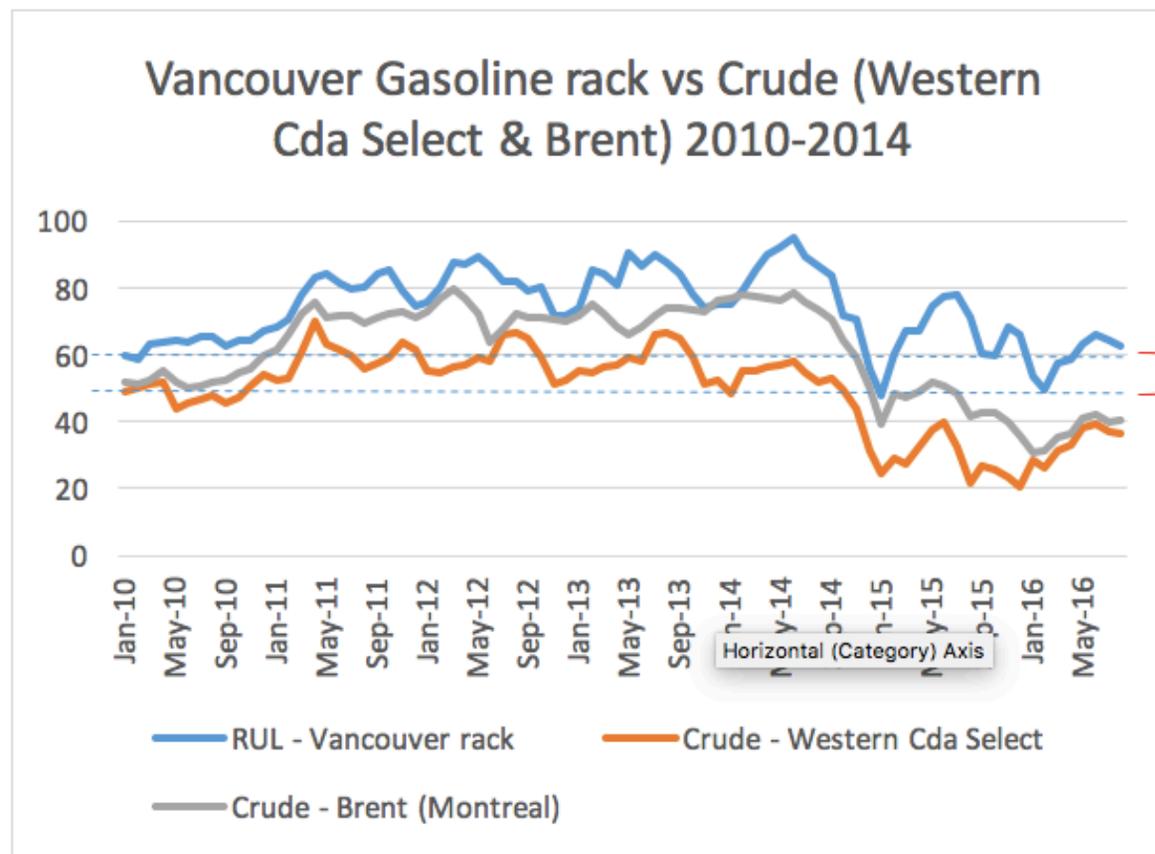
This significantly overstated mitigation costs.



Ecofiscal fundamental lack of knowledge of wholesale fuel pricing

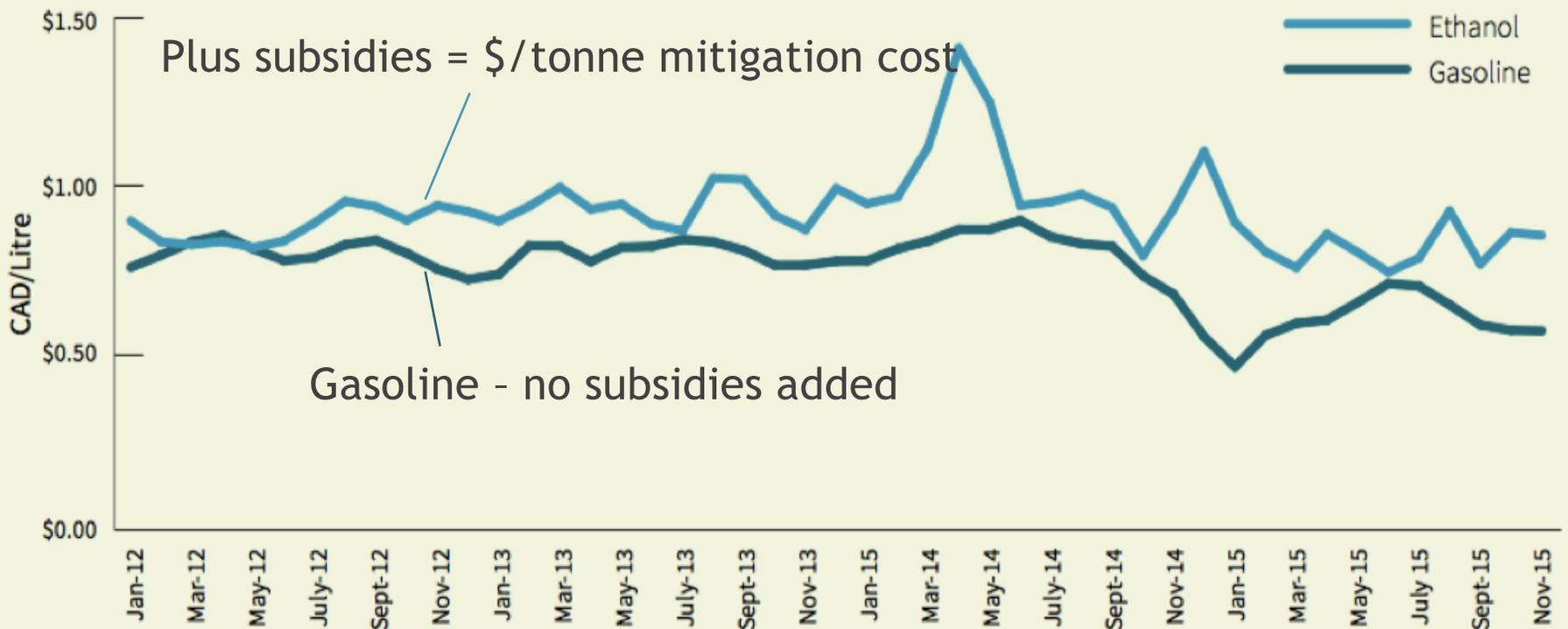
Ecofiscal insistent that biofuels costs passed directly 1:1 to consumers - but had no explanation for how \$ billions of crude costs savings were not similarly passed on to consumers..

Refiner's crude costs down 26%, but wholesale gasoline up 5%



Subsidies were added to biofuels, but \$3.3 billion of fossil subsidies were ignored

Figure 6: Wholesale Prices of Ethanol and Gasoline, 2012–2015



Skewed, biased ‘research’

Significant errors, clear bias identified by other researchers.

“BioFuelNet has reviewed the report and finds that the analysis is skewed because it ignores the high cost of fossil fuel subsidies (found by the IEA in 2015 to be approximately \$115 per tonne of CO₂), and the reduction of GHG emitted throughout the value chain by using biofuels.” (BioFuelNet)

“After reading the report, we were left with the overwhelming impression that it really does lack objectivity. [...arguments are backed-up by cherry-picked references, selected to support the one-sided arguments in the report rather than presenting an objective assessment of the literature.” (UBC/IEA Bioenergy Task 39)

[T]he report fails to give a measured assessment which seeks to balance climate objectives and fiscal prudence.” (UBC/IEA Bioenergy Task 39)

ABFC's Clean Fuels Strategy

ABFC's Clean Fuels Strategy directly addresses the three primary barriers impeding progress on transportation greenhouse gas emissions:

- (i) implement consistent market signals for lower carbon fuels
- (ii) remediate design shortcomings in Canada's current carbon pricing schemes
- (iii) create level market conditions for Canadian industry to compete successfully over the long term with the policies, regulations, and funding programs in place in the United States.

Clean Fuels Strategy - Results

With effective design and timely implementation, the Clean Fuels Strategy can achieve these outcomes by 2030:

- Greenhouse gases: eliminate over 30 million tonnes of CO₂e (in 2030)
- Investment of \$3 billion in new advanced biofuel production facilities and fueling infrastructure
- Increase new advanced biofuel production capacity by over 2.6 billion litres/year
- Support Canada's rural and natural resource communities:
 - 3.3 million tonnes/year of agricultural commodities
 - 2.85 million tonnes/year of biomass residues and municipal solid wastes
 - Build resilience to protect and grow jobs in forestry, agriculture and bio-cleantech

Key Elements

Key elements to mutually reinforce Canada's climate, energy, and economic development goals.

1. **Carbon Pricing on Transport Fuels** - implement a national carbon levy on transportation fuels that is:

- Based on the full lifecycle greenhouse gas emissions (carbon intensity) of all fuels
- Transparent, predictable, and visible to consumers and fuel market suppliers

2. **Clean Fuels Standard** - amend the federal fuel regulations to:

- a. Progressively reduce GHG emissions from 2020 to 2030
- b. Increase minimum blending levels of sustainable biofuels
- c. Improve compliance flexibility by including all lower carbon fuels, refining improvements
- d. Create a transparent compliance credit market, with firm eligibility and cost containment

3. **CleanTech Growth** - reinvest transportation sector carbon funds to building low carbon fuel production capacity and infrastructure through:

- Capital support for expanding advanced biofuel production capacity and supply chain infrastructure
- Performance-based production credits for low carbon advanced biofuels (including biocrude-based fuels) based on full lifecycle emissions
- Expanded use of refundable tax credits, accelerated depreciation, capital grants, and research funding to support and expand Canada's cleantech innovation ecosystem (e.g. BioFuelNet, SDTC, SR&ED, ACCA)





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