

# AN ECONOMIC AND ENVIRONMENTAL ASSESSMENT OF EASTERN CANADIAN CRUDE OIL IMPORTS



**Western  
Canadian Supply**

**Eastern  
Canadian Supply**

**Eastern Refinery  
Market**



**Foreign Supply**

Allan Fogwill  
President and CEO  
CERI Breakfast Series  
Calgary, Alberta  
January 24, 2017

# Canadian Energy Research Institute

## Overview

Founded in 1975, the Canadian Energy Research Institute (CERI) is an independent, registered charitable organization specializing in the analysis of energy economics and related environmental policy issues in the energy production, transportation, and consumption sectors.

Our mission is to provide relevant, independent, and objective economic research of energy and environmental issues to benefit business, government, academia and the public.

CERI publications include:

- Market specific studies
- Geopolitical analyses
- Commodity reports (crude oil, electricity and natural gas)

In addition, CERI hosts an annual Petrochemicals Conference and Energy Forum.

# Canadian Energy Research Institute

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- Chemistry Industry Association of Canada
- Government of Saskatchewan
- Ivey Foundation
- University of Calgary

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- Alberta Energy Regulator
- Advisian Worley Parsons Group
- Petroleum Services Association of Canada
- Lithuanian Energy Institute
- Deloitte Canada Ltd.

# Agenda

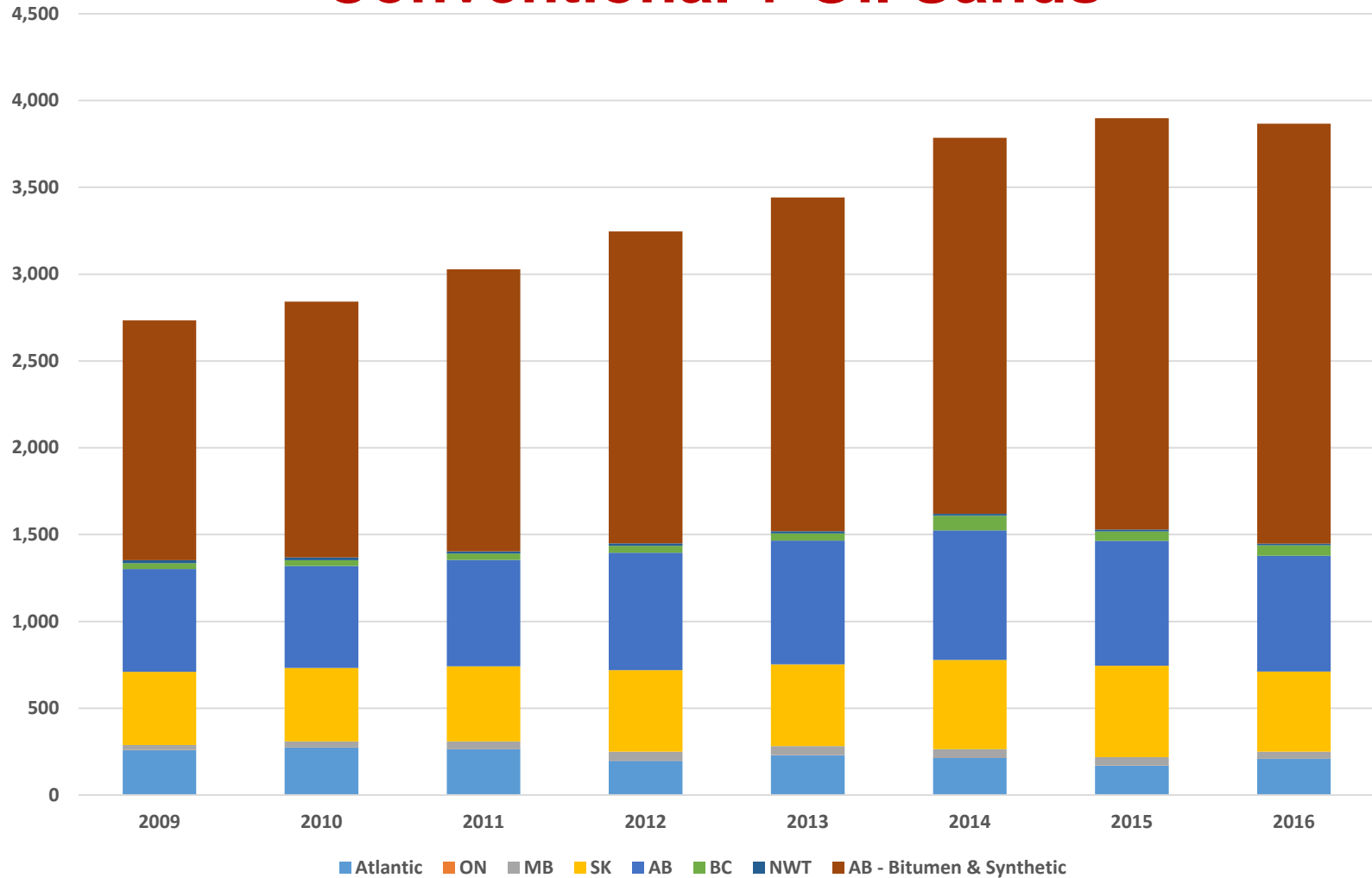
**Background**

**Method**

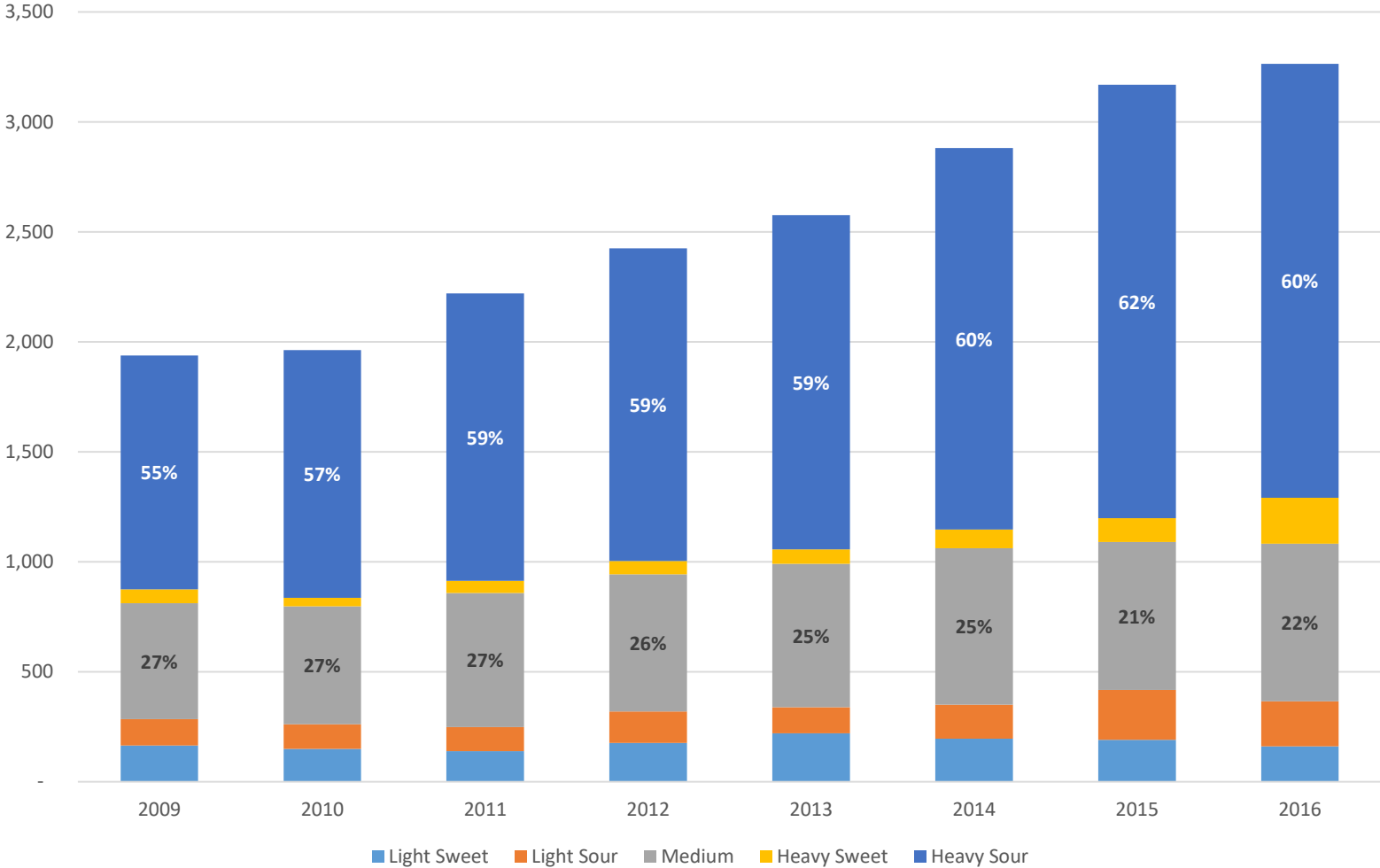
**Results**

**Conclusions**

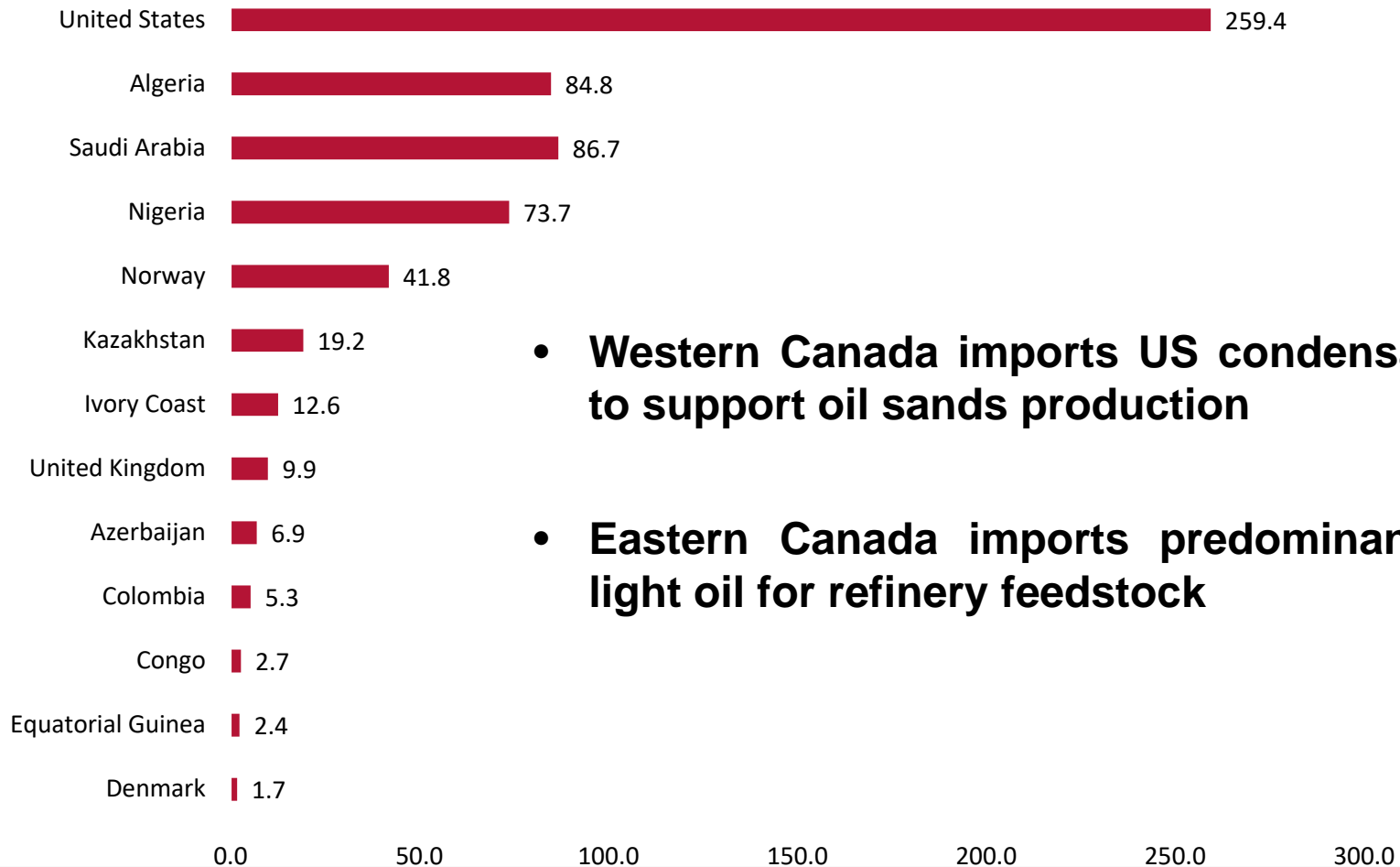
# Canadian Crude Oil Production by Province, Conventional + Oil Sands



# US Imports from Canada by Crude Type



# Crude Oil Imports to Central and Eastern Canada by Country (2016)



- **Western Canada imports US condensate to support oil sands production**

- **Eastern Canada imports predominantly light oil for refinery feedstock**

# The Refinery Challenge

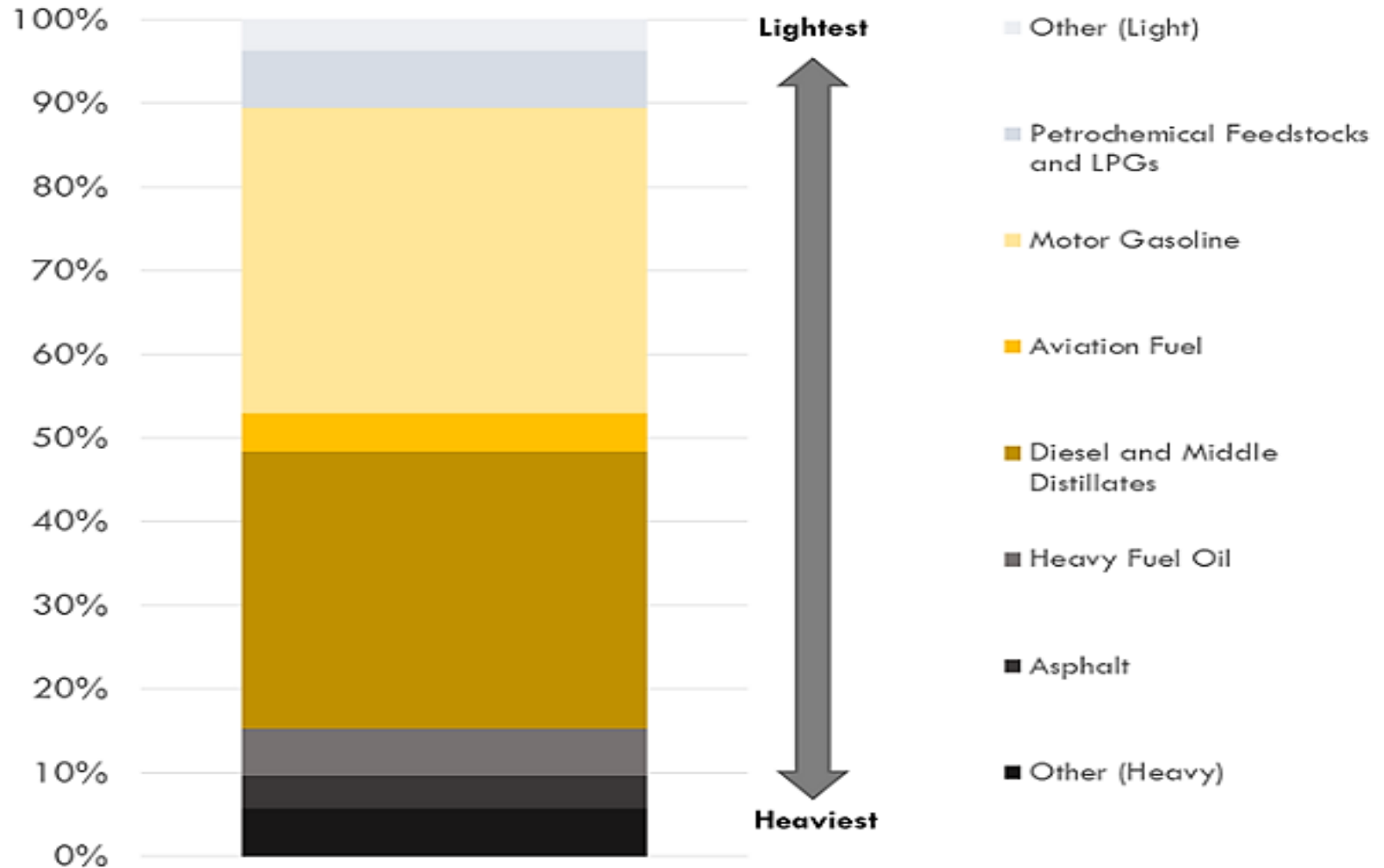
**Minimize operating expenses and maximize margins through the optimization of:**

- **Crude oil type used (crude slate)**
- **Refinery size and configuration**
- **Final product range (product slate)**

**Other factors include the proximity to crude oil producing areas and available transportation infrastructure.**

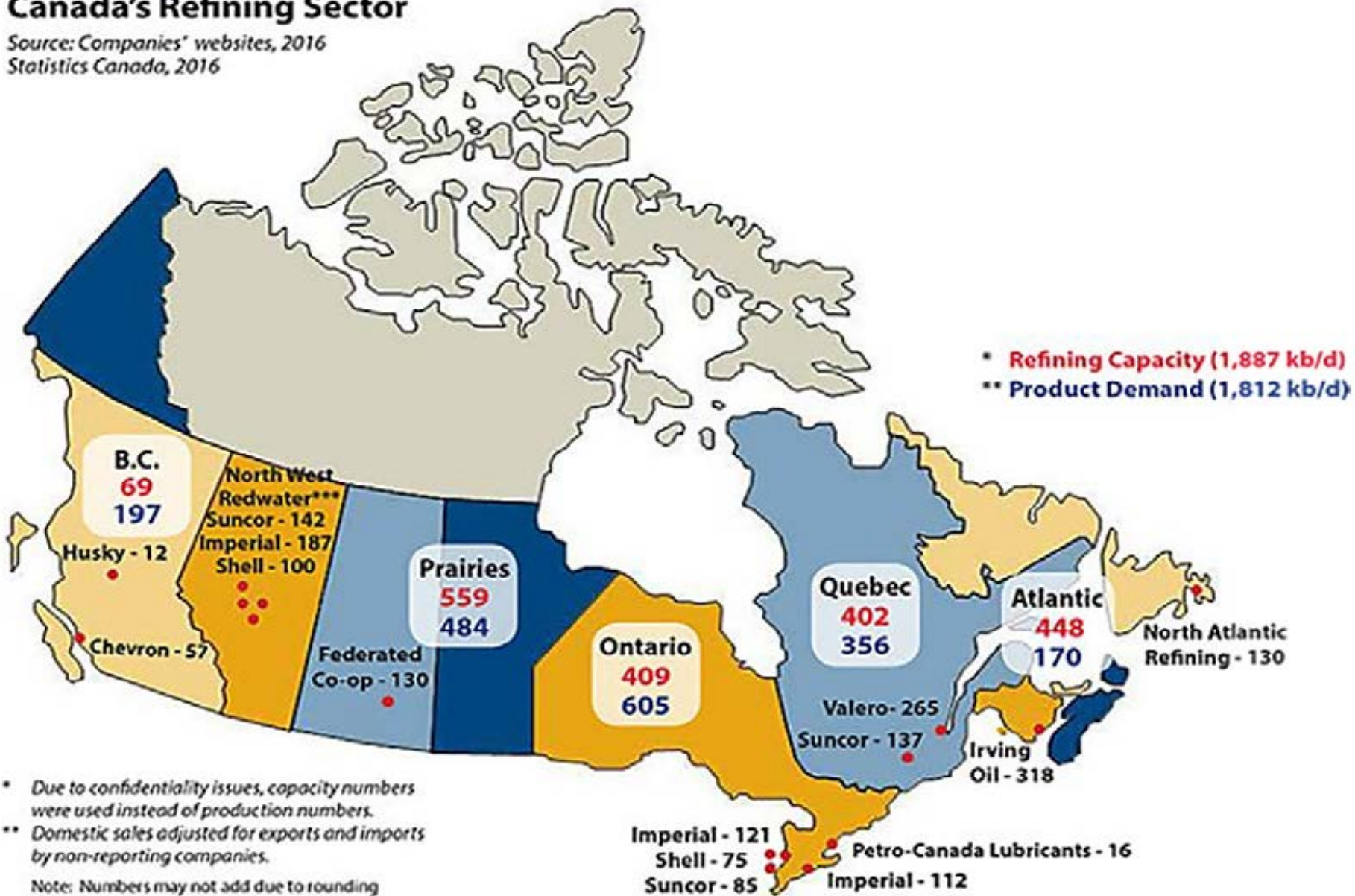


# Breakdown of a Barrel of Canadian RPPs



# Canada's Refining Sector

Source: Companies' websites, 2016  
 Statistics Canada, 2016



\* Due to confidentiality issues, capacity numbers were used instead of production numbers.  
 \*\* Domestic sales adjusted for exports and imports by non-reporting companies.  
 Note: Numbers may not add due to rounding  
 \*\*\* North West Redwater to open refinery in Fall 2017

# The Feedstock Challenge

## Western Canada refining:

- Exclusively use crude sourced from Western Canada

## Central and Eastern Canada refining is more diverse:

- ON – accesses Western Canadian crude oil from the Enbridge mainline + US crude from North Dakota.
- QC – Western Canadian crude oil by pipelines and rail, Eastern Canadian oil by the Portland-Montreal pipeline, and foreign crude oil by tankers
- NB – CAN crude oil by rail, Eastern Canadian oil and foreign crude oil by tankers
- NL - Eastern Canadian oil and foreign crude oil by tankers

# Crude Intake

Refinery	Capacity	Utilization Rate (%)	Total Intake	Light	SCO	Heavy	Bitumen
Imperial, Sarnia	121	86%	104.1	51.4	21.5	6.0	25.2
Shell Canada, Corunna	75	88%	65.9	37.5	13.6	14.8	-
Suncor Energy, Sarnia	85	92%	77.8	47.0	16.1	14.8	-
Imperial, Nanticoke	112	86%	96.3	61.7	19.9	14.8	-
Suncor Energy, Montreal	137	92%	125.4	109.0	-	-	16.4
Valero, Lévis	265	88%	232.8	131.9	81.2	8.1	11.6
Irving Oil, Saint John	318	87%	277.8	250.6	11.9	15.3	-
North Atlantic Refining, Come by Chance	115	81%	93.1	93.1	-	-	-
<b>Total</b>	<b>1,228</b>		<b>1,073</b>	<b>758.8</b>	<b>180.1</b>	<b>80.9</b>	<b>53.1</b>
<b>Percent</b>				<b>73%</b>	<b>15%</b>	<b>7%</b>	<b>5%</b>

# Base Case

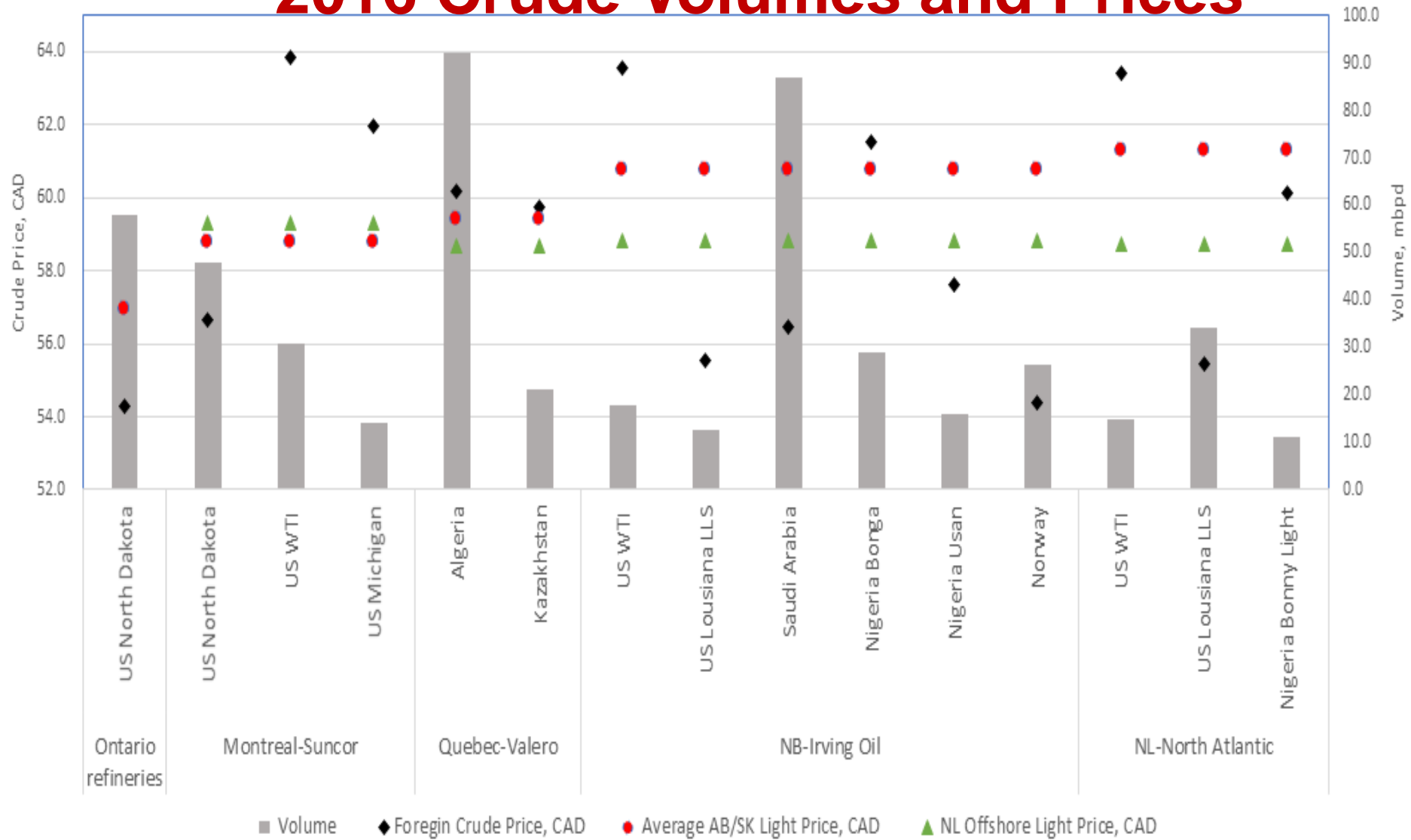
## 1. Current status

- 56% of Crude is imported
- 39% of crude oil from western Canada
- 5% of crude oil from Eastern Canada

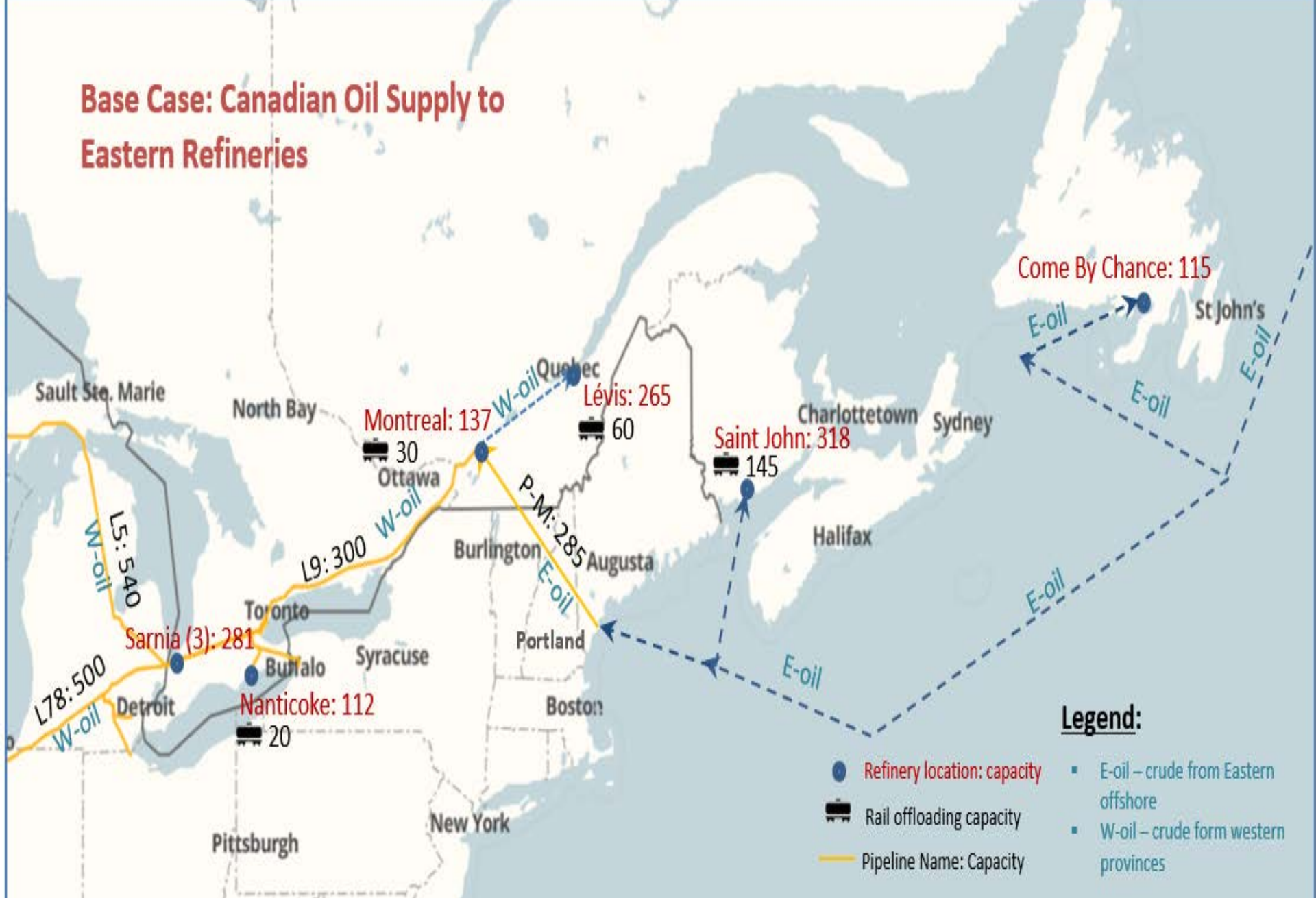
## 2. Imported Crude Intake by province

- ON – 17% - US
- QC – 66% - US, Algeria, Kazakhstan, Nigeria
- NB – 79% - Saudi Arabia, Nigeria, US, Norway
- NL – 96% - US, Nigeria, Norway

# 2016 Crude Volumes and Prices

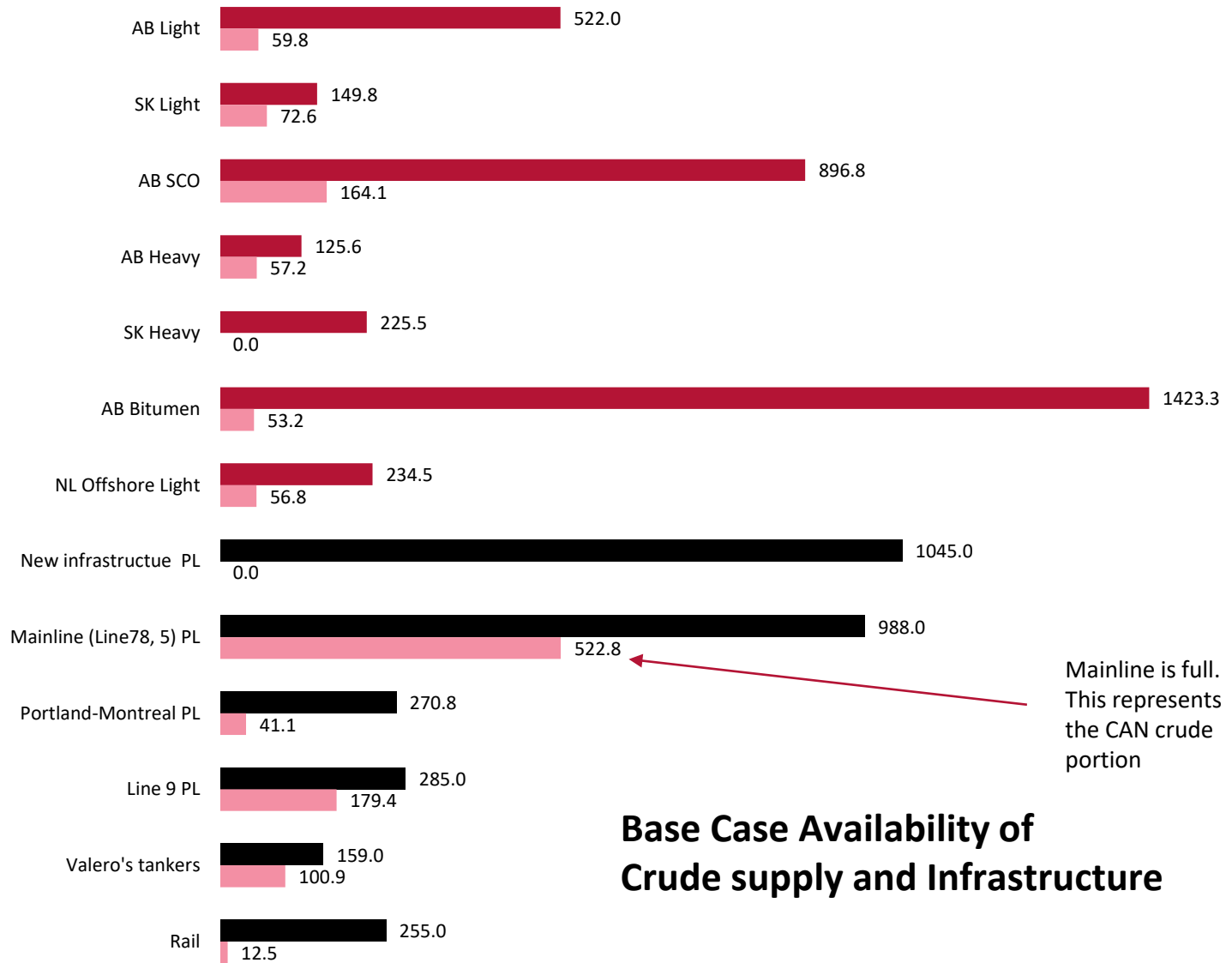


# Base Case: Canadian Oil Supply to Eastern Refineries



- Legend:**
- Refinery location: capacity
  - E-oil – crude from Eastern offshore
  - W-oil – crude from western provinces
  - 🚂 Rail offloading capacity
  - Pipeline Name: Capacity

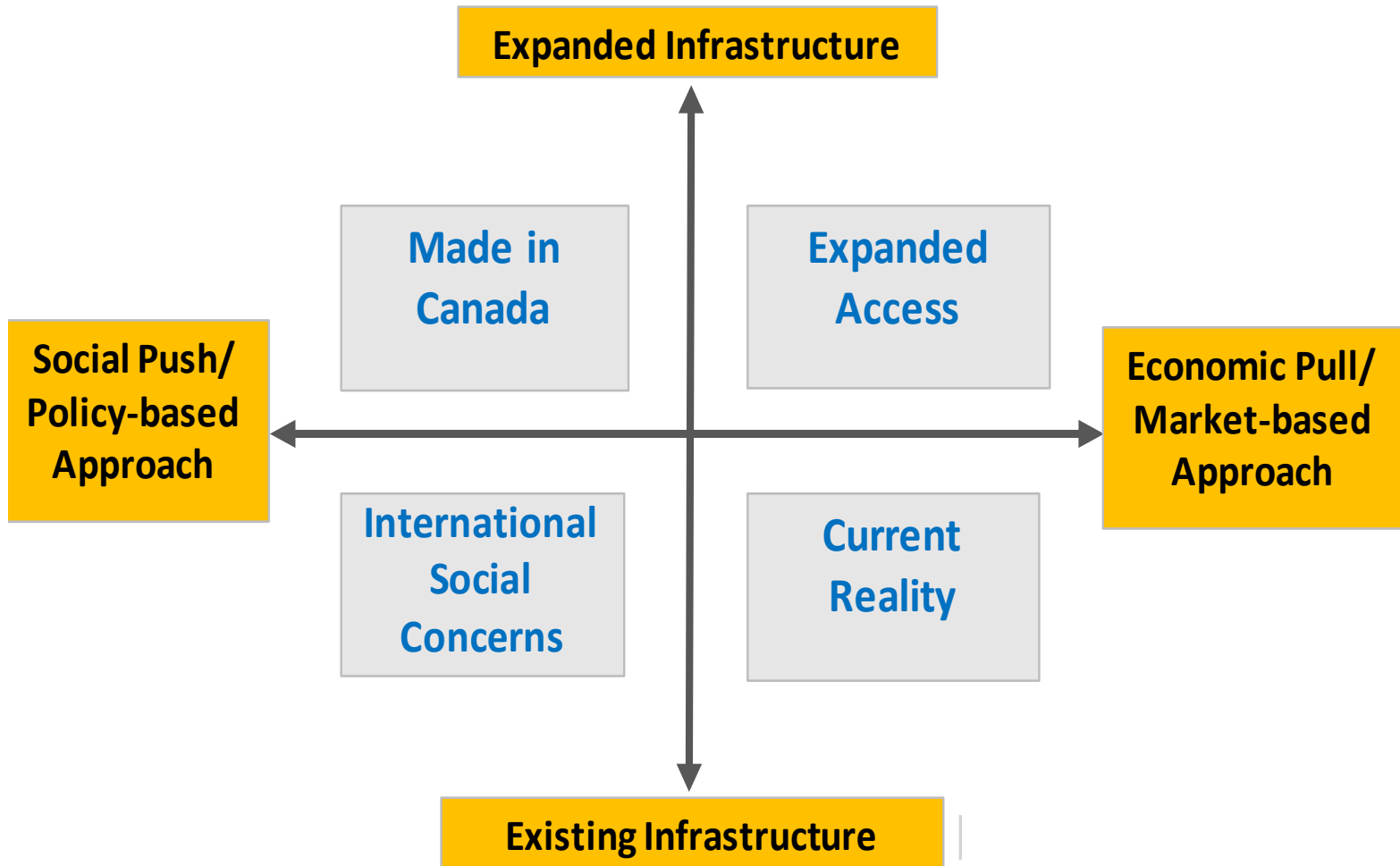
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## Base Case Availability of Crude supply and Infrastructure



# The Four Scenarios



# The Questions

1. How much additional oil can be economically sourced through existing infrastructure? – **Current Reality.**
2. How would the cost of feedstock and emissions levels differ if oil from authoritarian states was substituted? – **International Social Concerns.**
3. With additional transportation pipeline infrastructure, how much more “economic” oil could be used? – **Expanded Access.**
4. What would the cost of feedstock and emissions levels be if all foreign crude was substituted using expanded transport infrastructure? – **Made in Canada.**

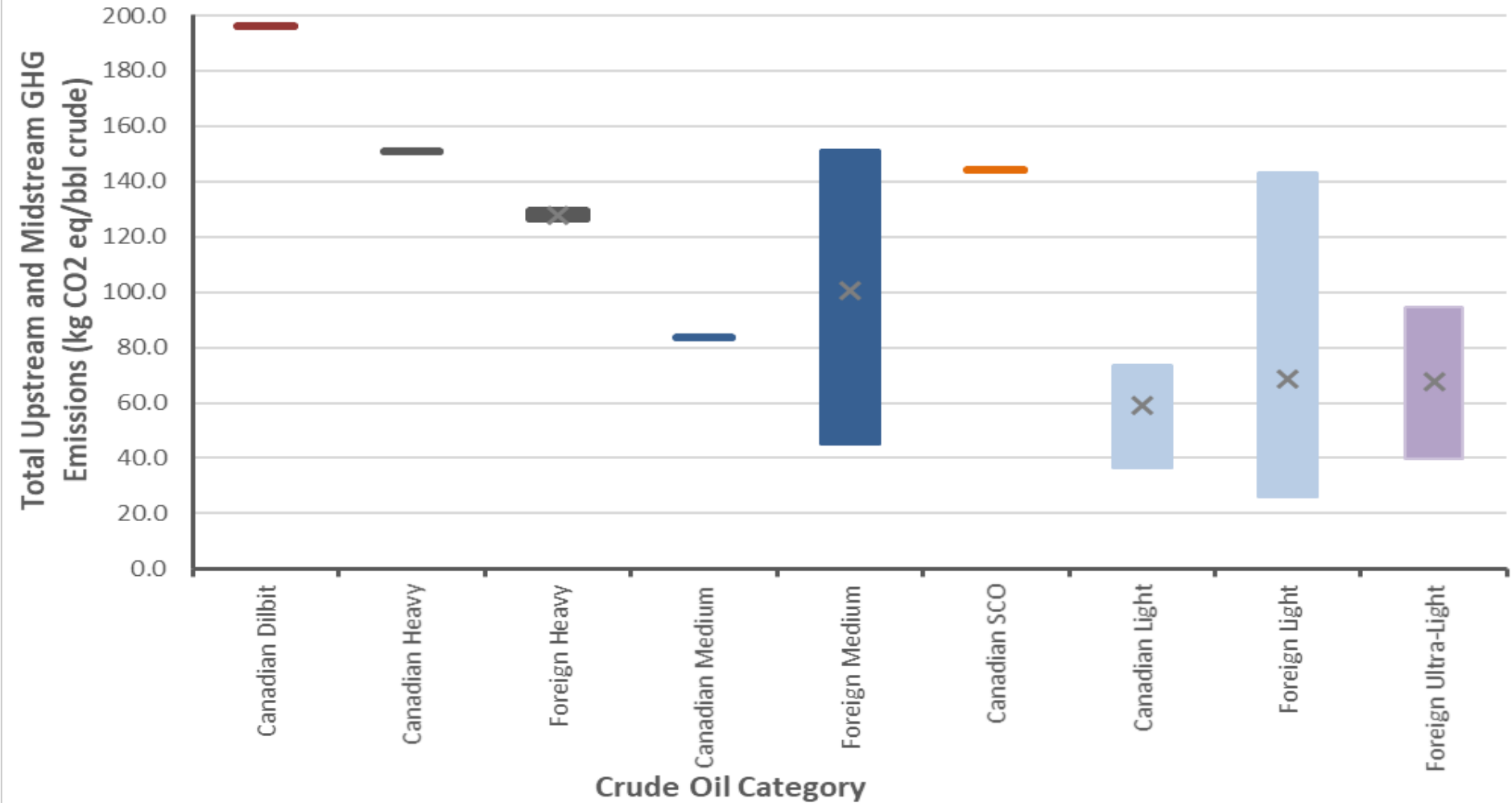
# Assumptions

1. Like for Like substitution
2. Western Crude was substituted in ON, QC and NB. Eastern Crude substituted in NB and NL
3. Pipeline delivery takes precedence over rail
4. Market based scenarios – Current Reality and Expanded Access – more expensive imports are substituted
5. Policy based scenarios – Made in Canada and International Social Concerns – cost of feedstock was not a factor
6. Transportation Costs - \$4-8/bbl pipeline, \$1-2/bbl tanker, and \$7-10/bbl rail

# Scenarios

Crude	Refinery Locations			
	ON	QC	NB	NL
AB light		<p>Made in Canada</p> <p>Current Reality</p> <p>Expanded Access</p> <p>Int'l Social Concerns</p>	<p>Made in Canada</p> <p>Current Reality</p> <p>Expanded Access</p> <p>Int'l Social Concerns</p>	
SK light	<p>Made in Canada</p>	<p>Made in Canada</p> <p>Current Reality</p> <p>Int'l Social Concerns</p>		
NL light		<p>Current Reality</p> <p>Int'l Social Concerns</p>	<p>Made in Canada</p> <p>Current Reality</p> <p>Int'l Social Concerns</p>	<p>Made in Canada</p> <p>Current Reality</p> <p>Int'l Social Concerns</p>

# GHG Emissions



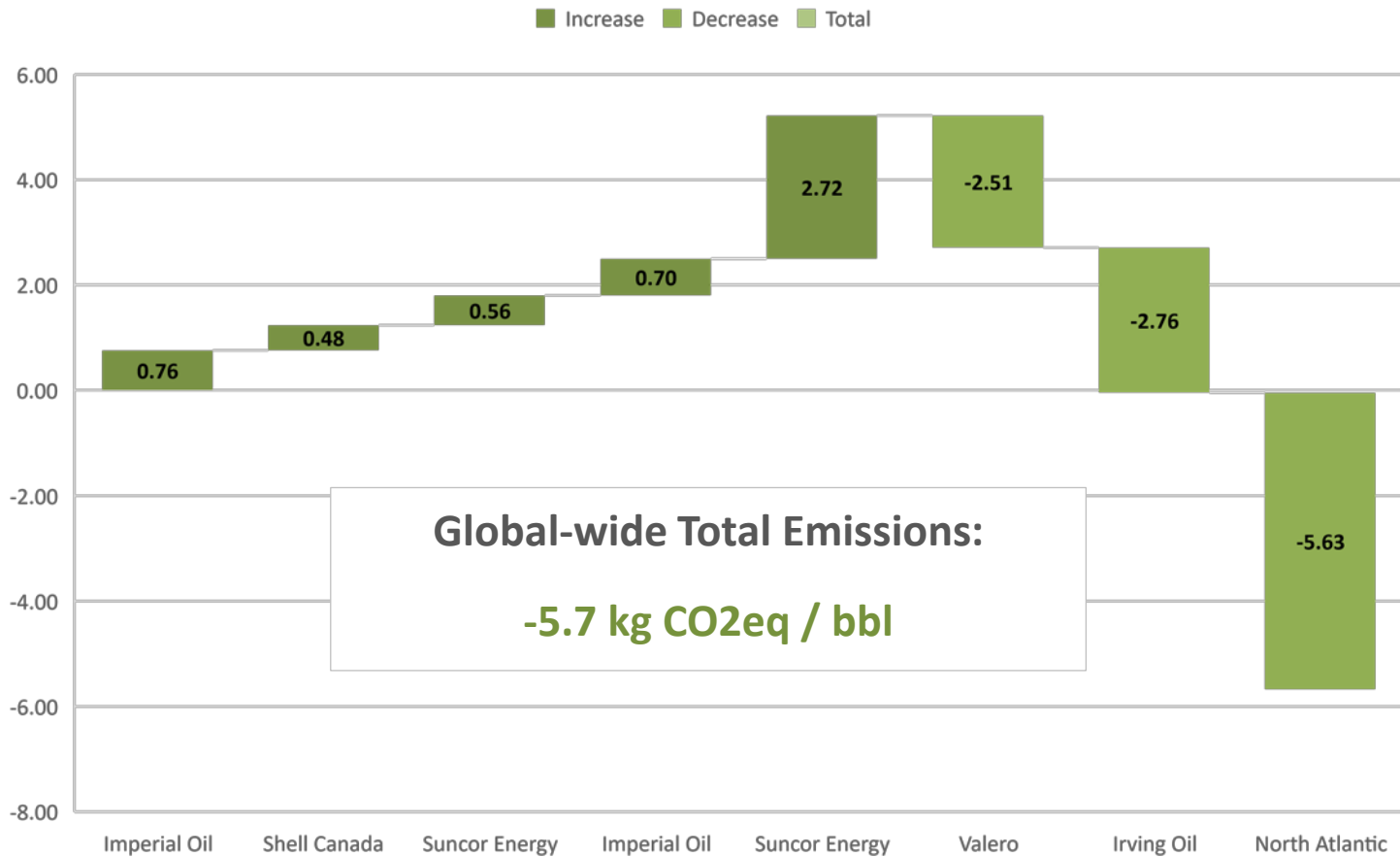
# GHG Emissions

Emissions are calculated by including (downstream not included):

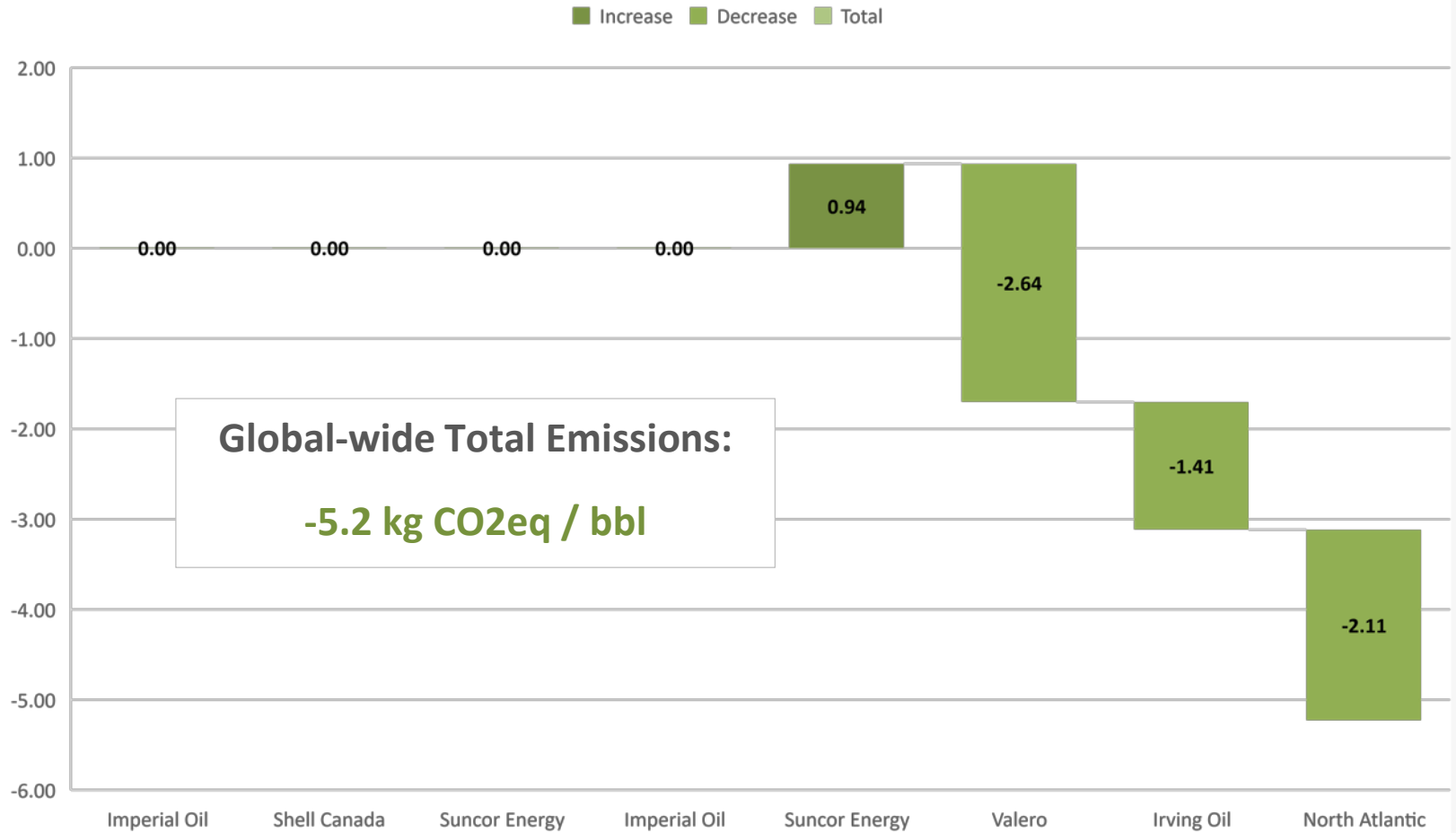
- Upstream
- Transportation
- Refinery

Transportation emissions do not exceed 30% of total upstream GHG emissions for the majority of crudes

# Change in Emissions Intensity Made in Canada



# Change in Emissions Intensity Expanded Access





# Conclusions

		Expanded Infrastructure		Existing Infrastructure	
		<i>Made in Canada</i>	<i>Expanded Access</i>	<i>Current Reality</i>	<i>ISC</i>
<b>Category</b>					
<b>Flows</b>	Additional Western Canada Supply (Mbpd)	424	248	120	123
	Additional Eastern Canada Supply (Mbpd)	177	96	160	177
	Total Additional Canadian Crude (Mbpd)	601	344	280	300
	Substituted Foreign Oil (%)	100%	57%	47%	50%
	Total Western Canadian / Eastern Canadian / Foreign Crude Supply (Mbpd)	838 / 235 / -	663 / 154 / 257	534 / 218 / 321	538 / 235 / 301
<b>Cost</b>	Cost of Feedstock (\$million)	-23	-317	-210	+79
<b>GHG</b>	Emissions (tones CO <sub>2</sub> eq per year)	-2,222,442	-2,048,275	-2,035,632	-2,819,336
	Decrease of Emissions (%)	-6.2%	-5.7%	-5.7%	-7.9%

# Thank You for Your Time

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## UPCOMING STUDIES:

**A Comprehensive Guide to Electricity Generation Options in Canada**

**Economic Impacts and Market Challenges for the Methane to Derivatives Petrochemical Sub-Sector**

## UPCOMING CONFERENCE:

**Petrochemical Conference: June 10-12 2018,  
Kananaskis, AB**

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