North American Energy Update

*Opportunities and Challenges for Rail in **Upstream, Refining, Chemicals, & Renewables***

Railroad Financial Corporation Chicago

Prepared For:

Rail Equipment Finance Conference 2020

March 3, 2020
La Quinta, CA

Graham Brisben, CEO
PLG Consulting

PLG Consulting

Experience // Expertise // Excellence

About PLG

PLG TEAM

- Real-world, industry veterans
- Over 40 logistics and supply chain strategists, operations experts, analysts and project managers
- Delivering value to over 200 clients since 2001

CORE EXPERTISE

- Surface transportation and logistics
- Chemicals
- Oil and gas
- Bulk commodities
- Manufacturing
- Mining and minerals

SERVICES INCLUDE

- Assessment and optimization
- Due diligence
- Operations
- Logistics procurement
- Marketing analysis
- Engineering
- Business strategy
- Site selection
- Technology
- Supply chain design

Our Clients // Partial List

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Today's Presentation Agenda

1. Looking Back: A Decade of Disruption
2. 2020 Update
3. Looking Ahead to the Coming Decade and Beyond

Presentation available for download now at:
https://plgconsulting.com/presentations/

2010s in Review

2010s: "Decade of Disruption" Recap

- Evolution of unconventional extraction techniques unlocked massive supplies of low cost oil, gas, and NGLs in North America, resulting in
- Massive disruption and change to to how energy is **produced, moved, and consumed** throughout the world

Crude

- Record production of 12MM bpd
- Dominance of Permian Basin
- Multi-decade SAGD investments in Alberta
- Re-plumbing of crude flows in NA
- Crude by rail
- Pipeline build out
- Lifting of oil export ban
- Surging refined products exports

Gas

- Emergence of Marcellus
- 110+ bcfd potential
- Prices below $2/mbtu
- Build-out of LNG export terminals
- Accelerated retirement of coal-fired generation

NGLs

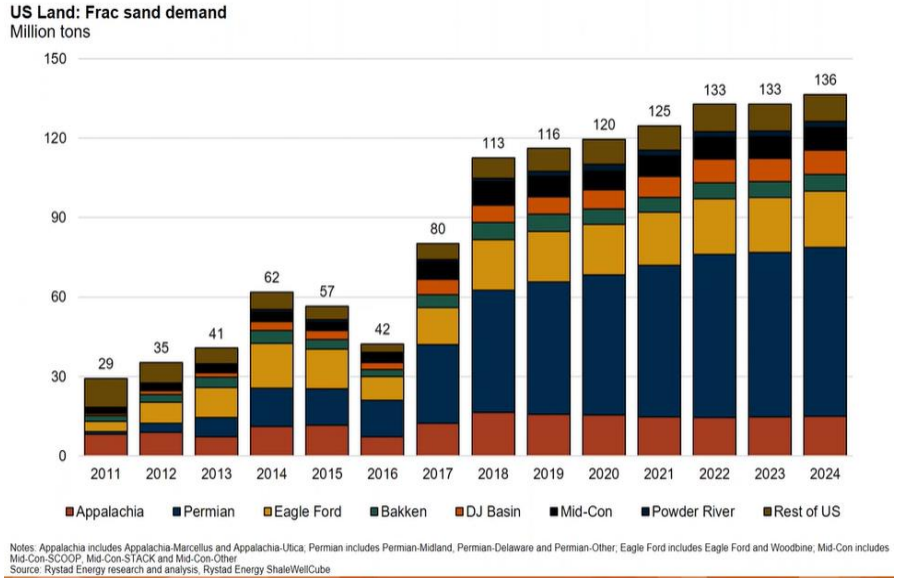
- Emergence of Utica
- Globally competitive ethane/ethylene
- Chemical industry build-out
- 2MM+ bpd of exports

Implications for rail

2020 Update

A Few Words About Frac Sand….

Frac sand demand forecast to grow 3% in 2020 despite a 2% reduction in wells fracked count; increasing lateral lengths and play mix primary drivers behind the increase



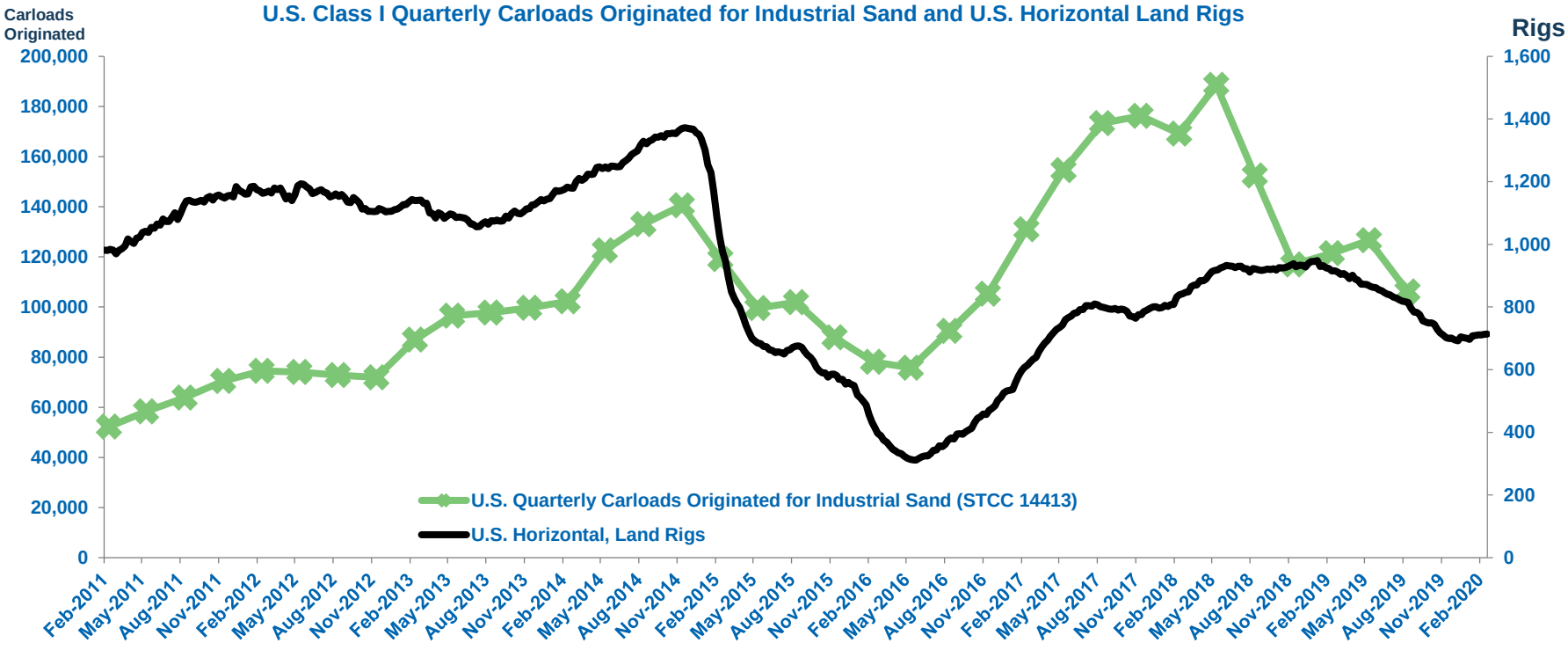
Source: Rystad Energy, November 2019

Frac sand demand is projected to grow along side hydrocarbons production

However, majority of supply now comes from in-basin mines

- Permian had the largest build-out of in-basin frac sand plants
- Haynesville, MidCon, and Eagle Ford also had significant build-out of in-basin frac sand plants
- DJ, Bakken, and Western Canada are areas where in-basin mines are being evaluated

Continued Decline in Frac Sand Rail Shipments



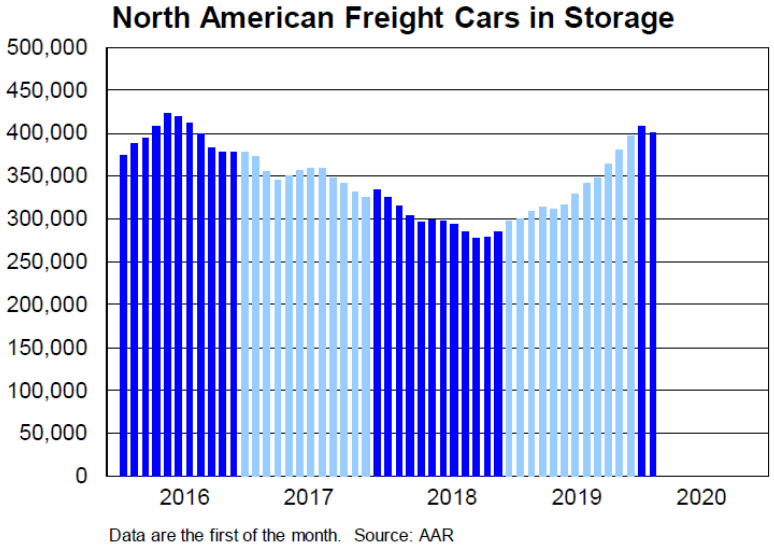
Source: STB (STCC 14413 – Industrial Sand: includes frac sand and other industrial sands), Baker Hughes, February 2020

Small Cube Hoppers Lead the Way for Cars-In Storage

North American Freight Cars in Storage by Major Car Type
(as of February 1, 2020)

Car Type	Primary Commodities	Total Cars In Service	In Storage	Percent In Storage	Percent of Stored Cars
Box	Paper products, wood products, food prod.	105,443	21,686	21%	5%
Covered Hoppers	Grain, chemicals, nonmetallic minerals	572,388	142,129	25%	36%
Flats	Containers, trailers, lumber, steel, autos	75,265	21,597	29%	5%
Gondolas	Coal, nonmetallic minerals, metals, scrap	206,935	48,089	23%	12%
Hoppers	Coal, metalic ores, nonmetallic minerals	128,705	37,522	29%	9%
Intermodal	Containers, trailers	73,511	12,314	17%	3%
Refrigerator	Food products, farm products, chemicals	10,811	3,059	28%	1%
Tanks	Chemicals, petroleum, food products	433,450	107,109	25%	27%
Vehicle Flat	Autos	66,406	6,710	10%	2%
Grand Total		1,672,914	400,215	24%	100%

Source: Association of American Railroads



As of February 1, 2020, 400,215 freight cars (24% of the fleet) were in storage

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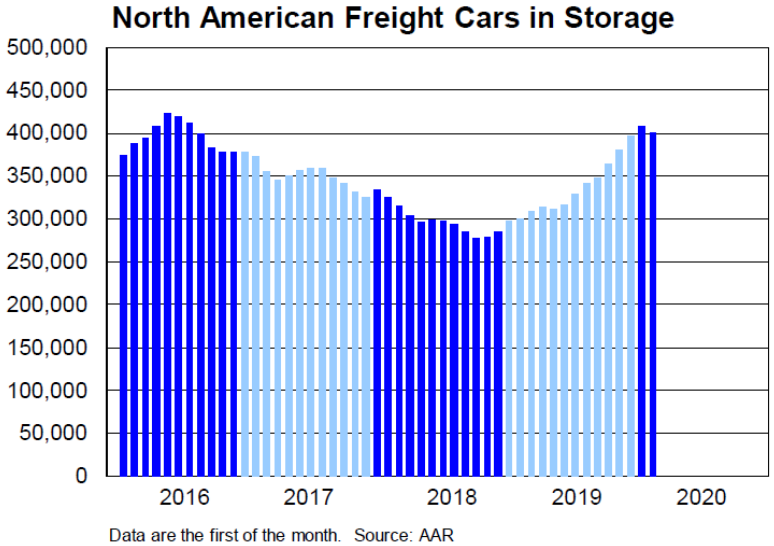

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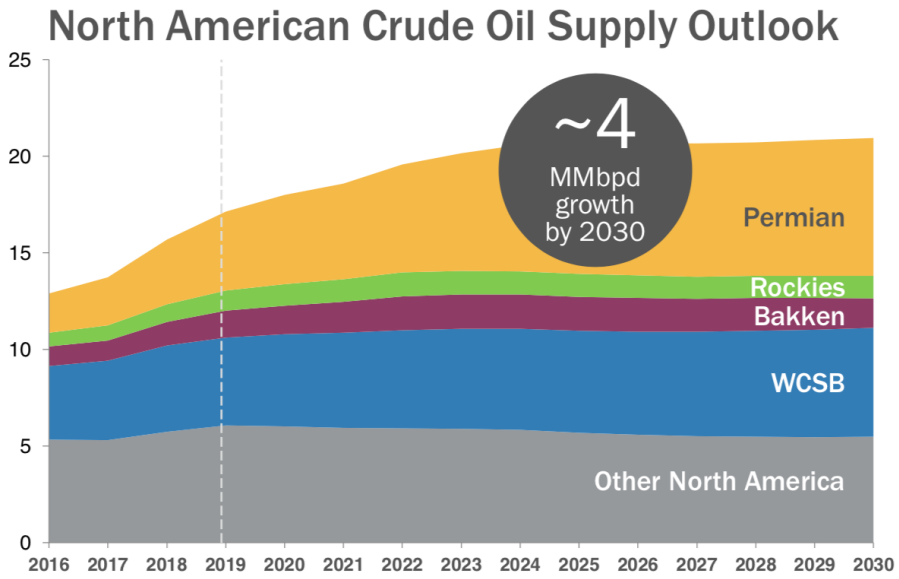
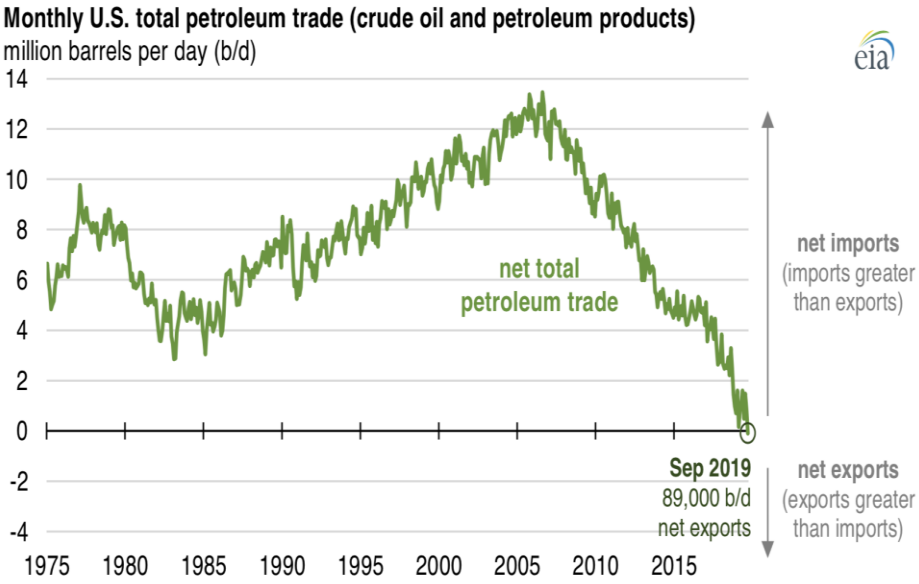
2020 Update – Crude Oil & Refined Products

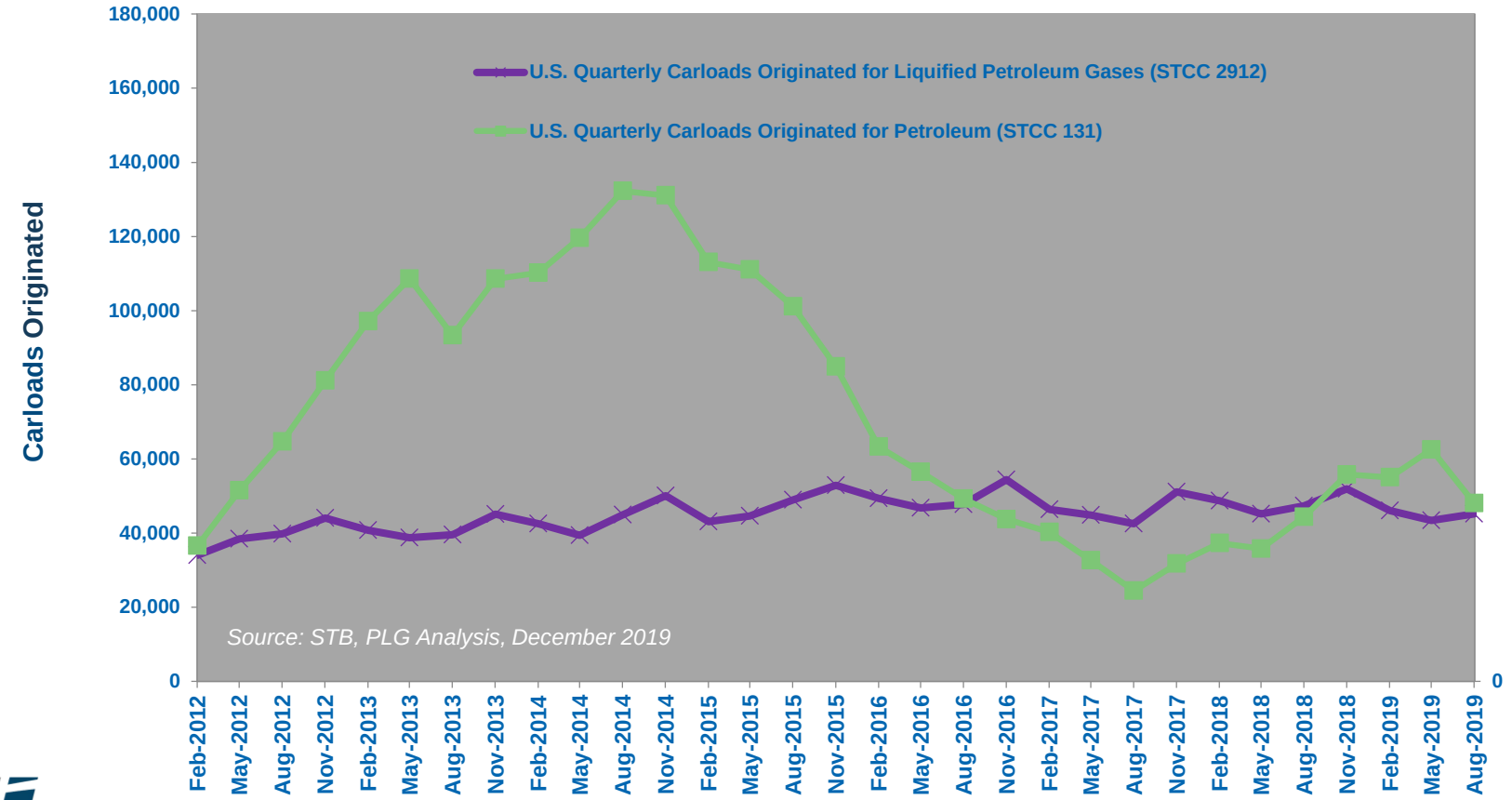


Source: Wood Mackenzie and Enbridge, December 2019



Source: EIA

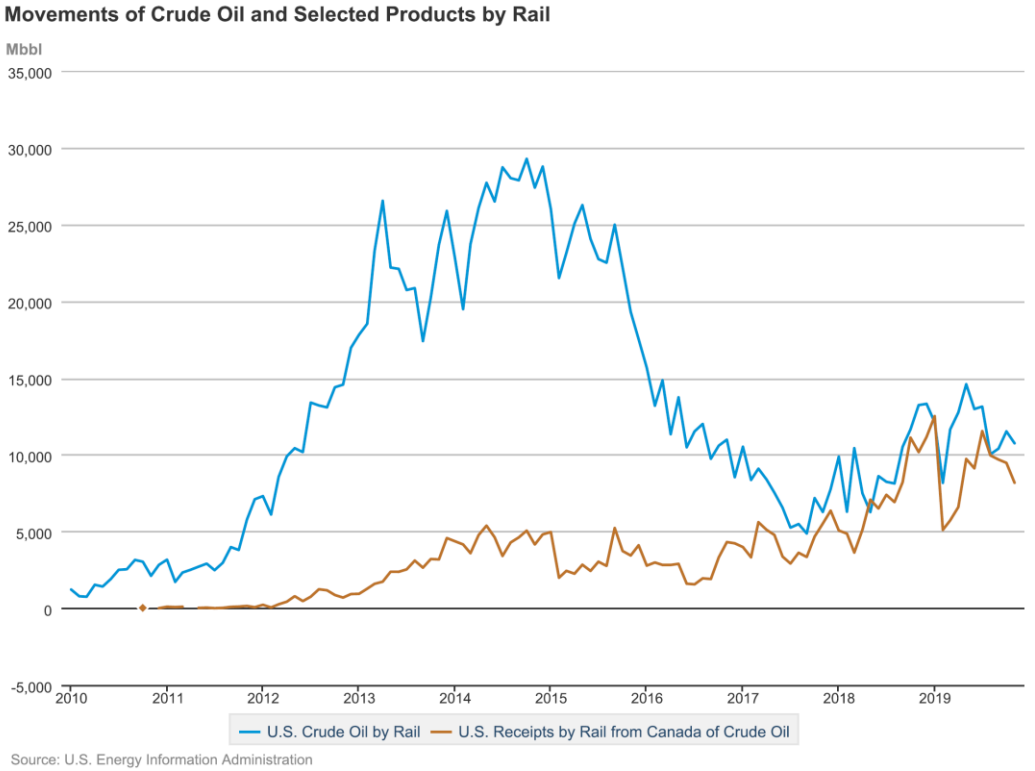
US Crude and LPG Carloads Originated



US & Canadian Crude By Rail Growth

CBR continues to be driven largely by PADD 2 and Canada movements

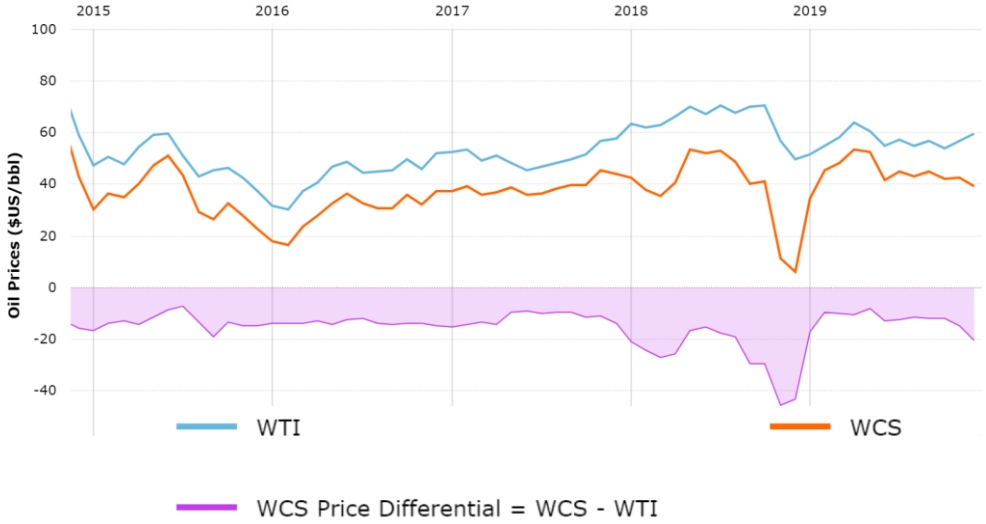
Crude by Rail Volumes (monthly) By PADD and Total U.S./Canada



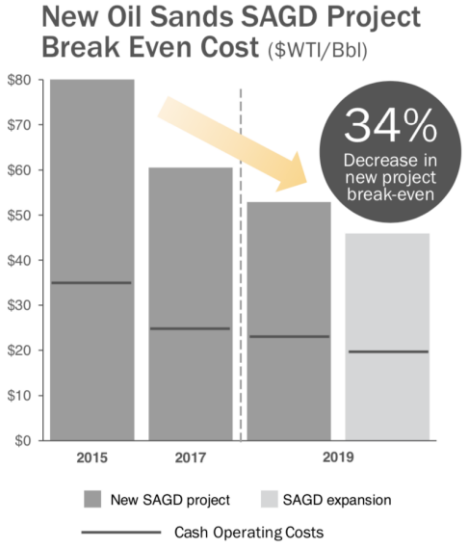
Source: U.S. Energy Information Administration

Differentials Relatively Stable and Supportive of Canadian CBR

- Government intervention on mandated production curtailment quickly closed WTI-WCS differential but for a time reduced use of CBR
- Gradual easing of curtailment and continued lack of pipeline capacity has caused CBR to grow again

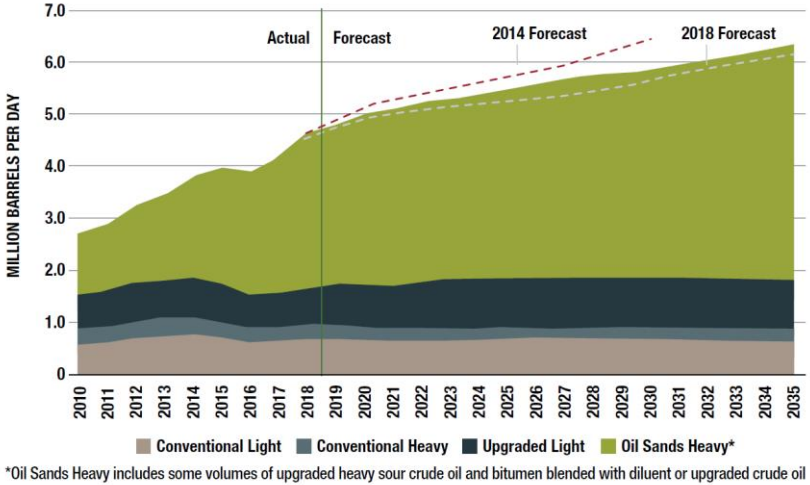


Source: Government of Alberta https://economicdashboard.alberta.ca/OilPrice



Source: Enbridge, December 2019

Canadian Production Increasing Amid Ongoing Pipeline Uncertainty

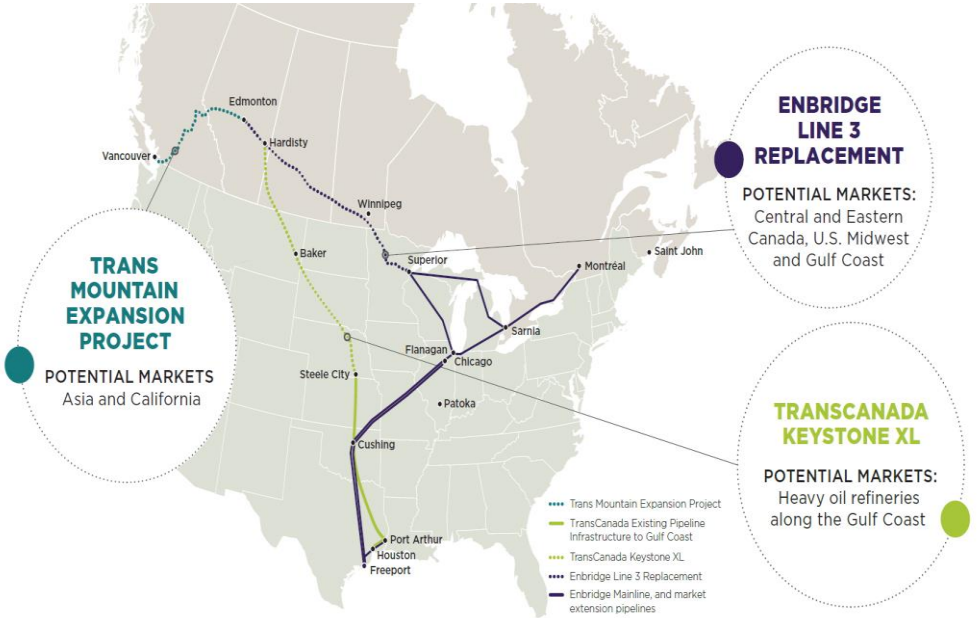


*Oil Sands Heavy includes some volumes of upgraded heavy sour crude oil and bitumen blended with diluent or upgraded crude oil

Table 2.5 **Western Canada Crude Oil Supply**

Million b/d	2018	2020	2025	2030	2035	Change
Light	1.40	1.49	1.62	1.64	1.61	0.21
Heavy	3.26	3.52	3.85	4.23	4.73	1.47
Total supply*	4.66	5.00	5.47	5.87	6.34	1.68

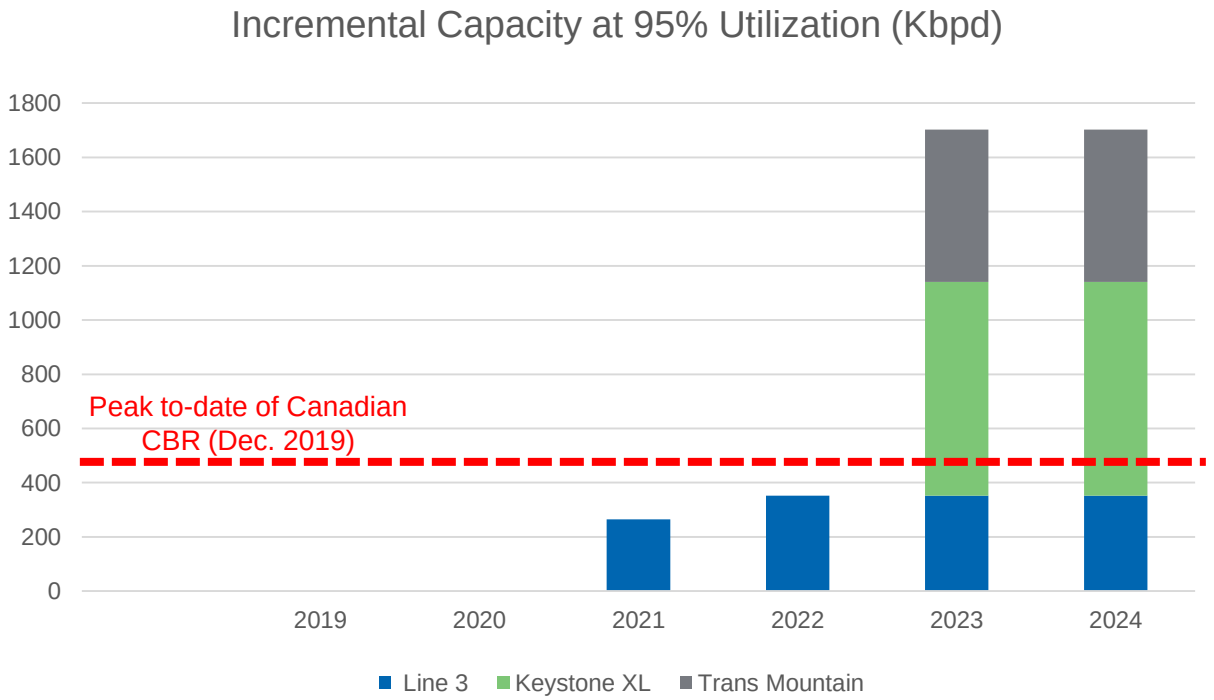
*Totals may not add up due to rounding



Ssource: Canadian Association of Petroleum Producers, 2019 Crude Oil Forecast Markets & Transportation

Continued Pipeline Delays are Extending the Canadian CBR Opportunity

Enbridge Line 3 could be operational in early 2021 – received MPUC permit on Feb. 3, 2020



Source: PLG Analysis

Pipelines Have Started 2020 With Some Big Wins

- Government of Canada TransMountain ($12.6 B CDN) to the west Coast won a court challenge from 4 First Nations groups before the Federal Court of Appeal – the court ruled that they have been properly consulted and that 120 out of 129 First Nation groups either support or do not oppose it

- Enbridge Line 3 ($9.0 B CDN) to the US Midwest received final Minnesota Public Utilities Commission acceptance of revised environmental impact statement and issued a “certificate of need” clearing the way for construction

- TC Energy Keystone XL ($ 8.0 B USD) to the US Gulf Coast plan received approval from the Nebraska Supreme Court for its planned route through the state resolving an issue that has lasted a decade

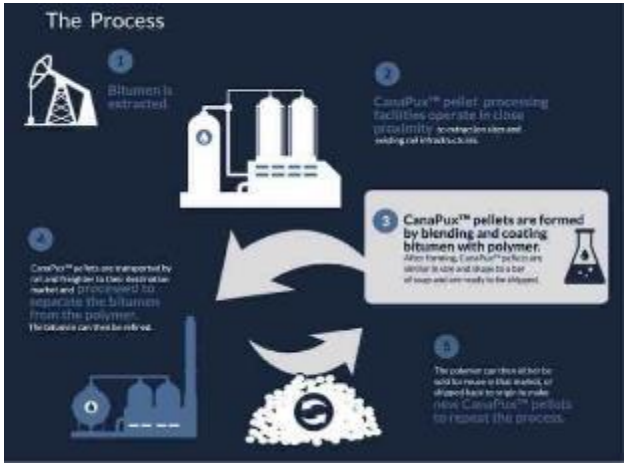
Source: RBN, June 2019

Western Canada Crude by Rail Opportunity

Western Canada CBR has two to three year window for significant volume – but lots of complexities

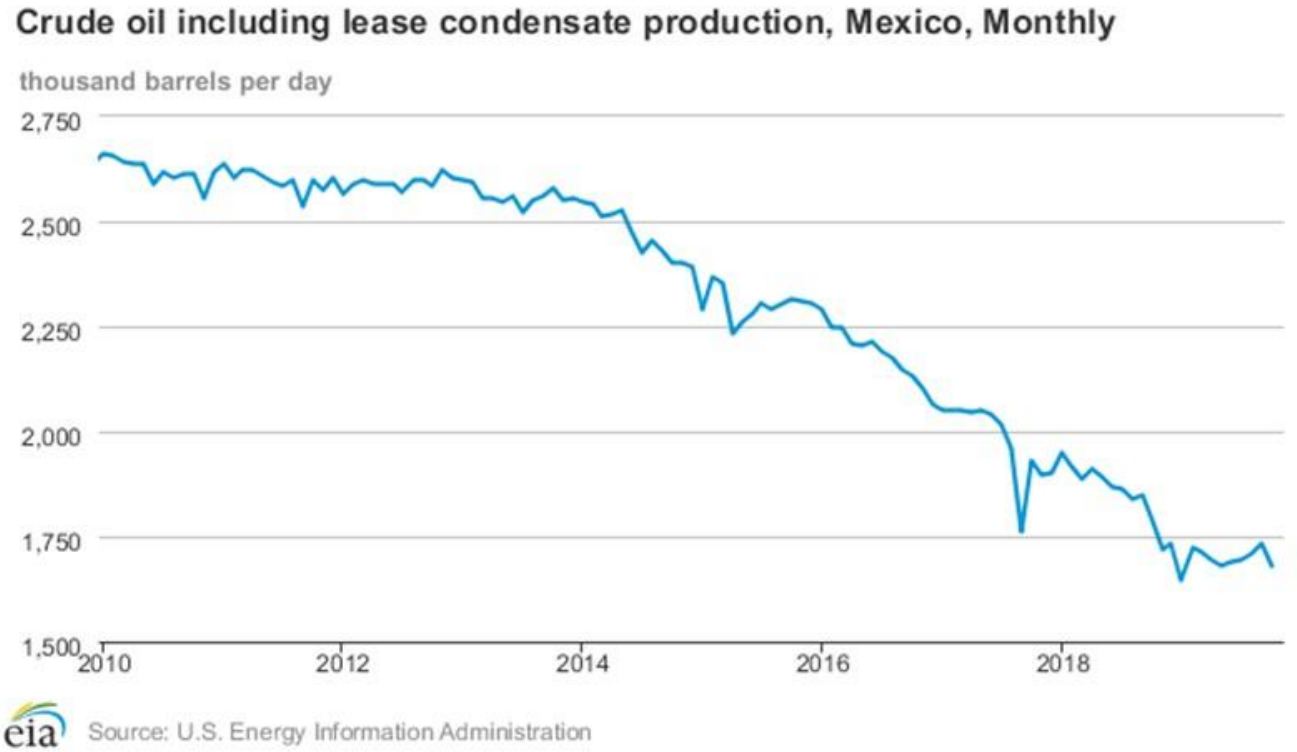
- Sunk capital costs of Oil Sands projects necessitate continued production
- Pipelines and local refineries at or near capacity and timelines for capacity expansion have continued to be pushed out
- CBR potential for ~500 kbpd range in short term, primarily to USGC and west coast destinations
- Recent train derailment of crude in Saskatchewan involving new DOT117J tank cars that released their contents and caught fire resulted in Government mandating speed restrictions on trains with hazardous goods primarily directed at Metro Areas. For unit crude trains (80+ cars) speed limit goes from 64 to 48 km/hr. (40 to 30 mph); and trains with 20-79 cars goes from 64 to 56 km/hr. (40 to 35 mph)
- Work continues on pilot demonstration projects such as CN's CanaPux bitumen pellets that could overcome a number of safety concerns but it will be another 1-2 years before commercial viability becomes clearer

Source: CBC News, Jan 17, 2019



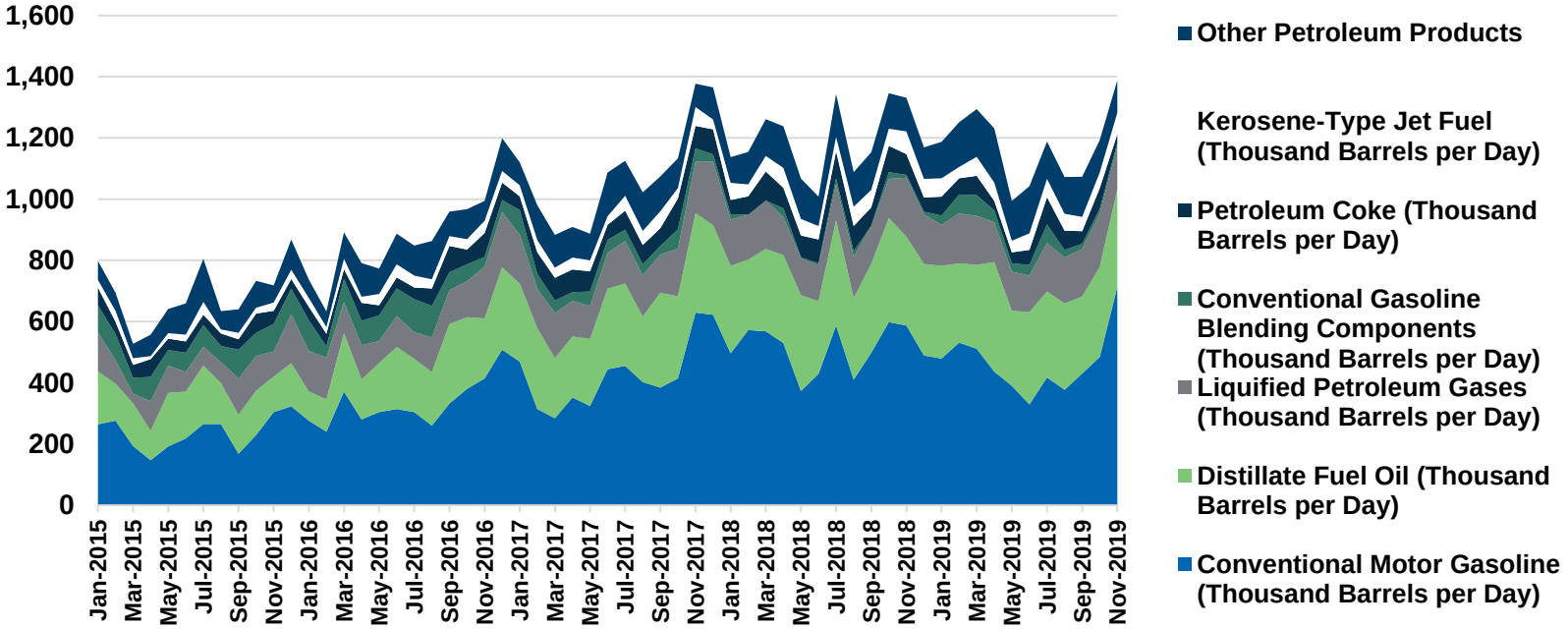
Source: https://cninnovation.ca

Mexican Crude Production Has Declined Sharply in the Past Six Years



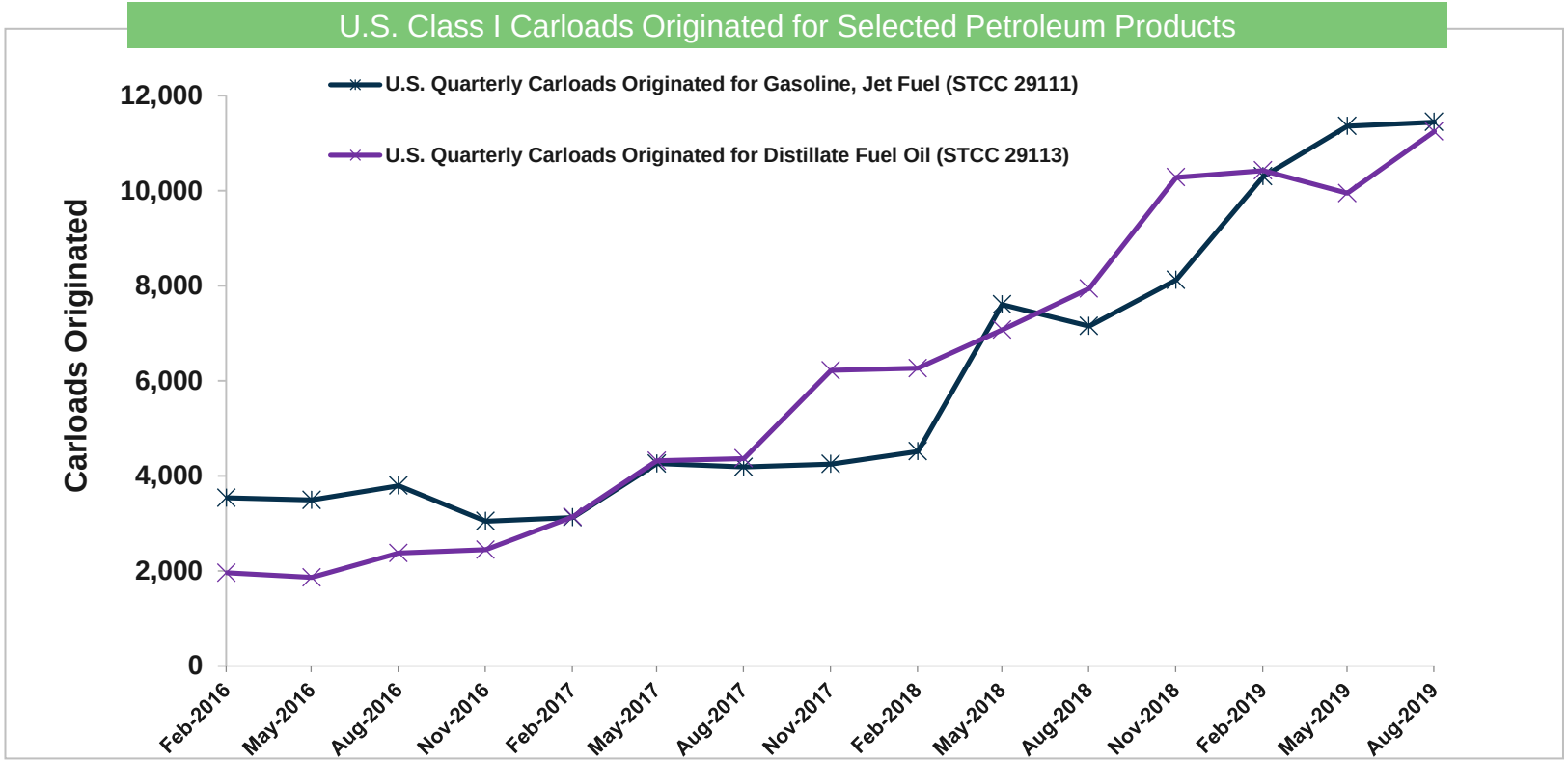
US Refined Products Exports Meeting the Growing Demand for Energy in Mexico

U.S. Exports to Mexico



Source: EIA, February 2020

Mexico Represents Significant New Potential for Diesel, LPG, and Gasoline Rail Shipments



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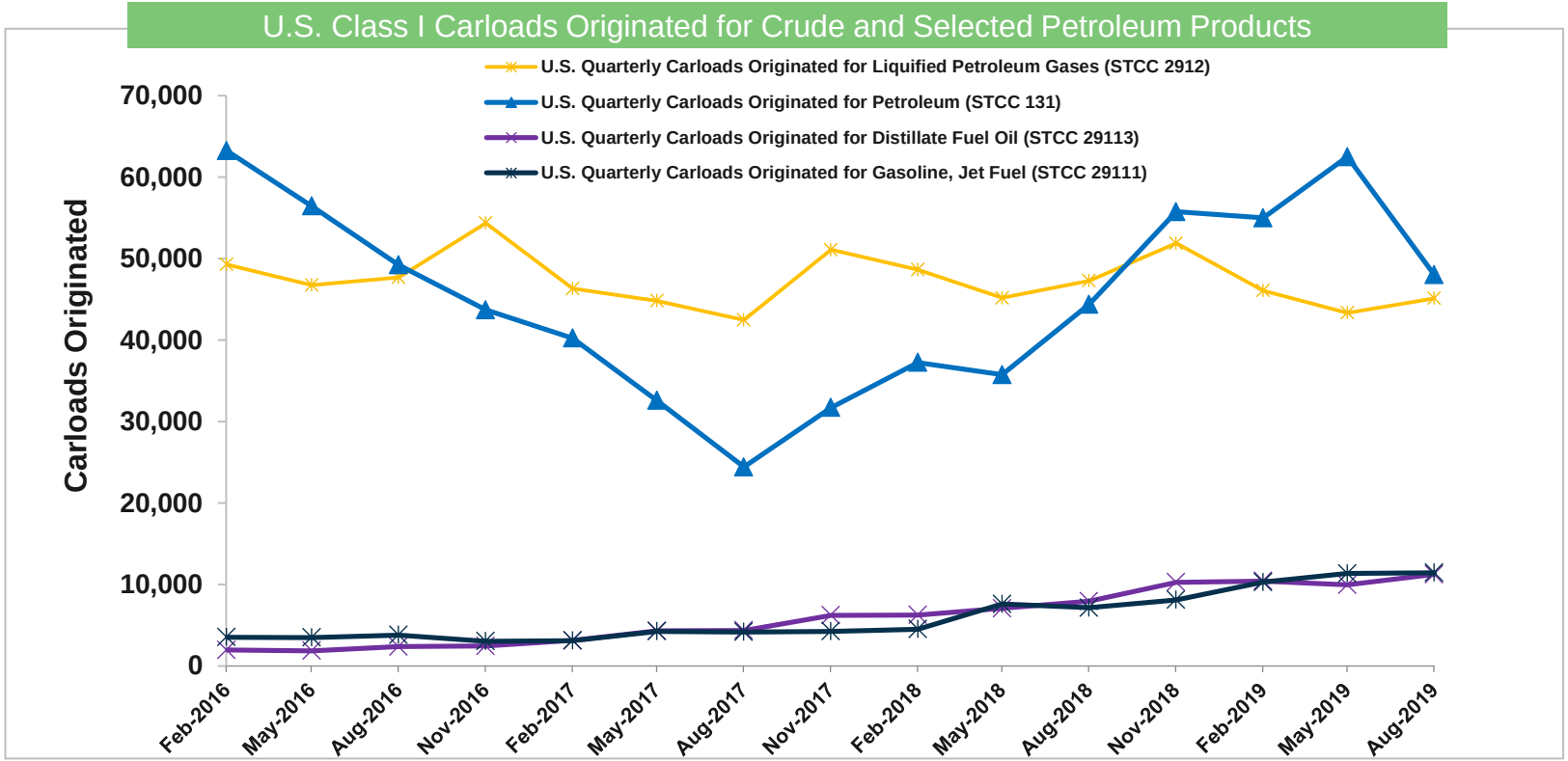
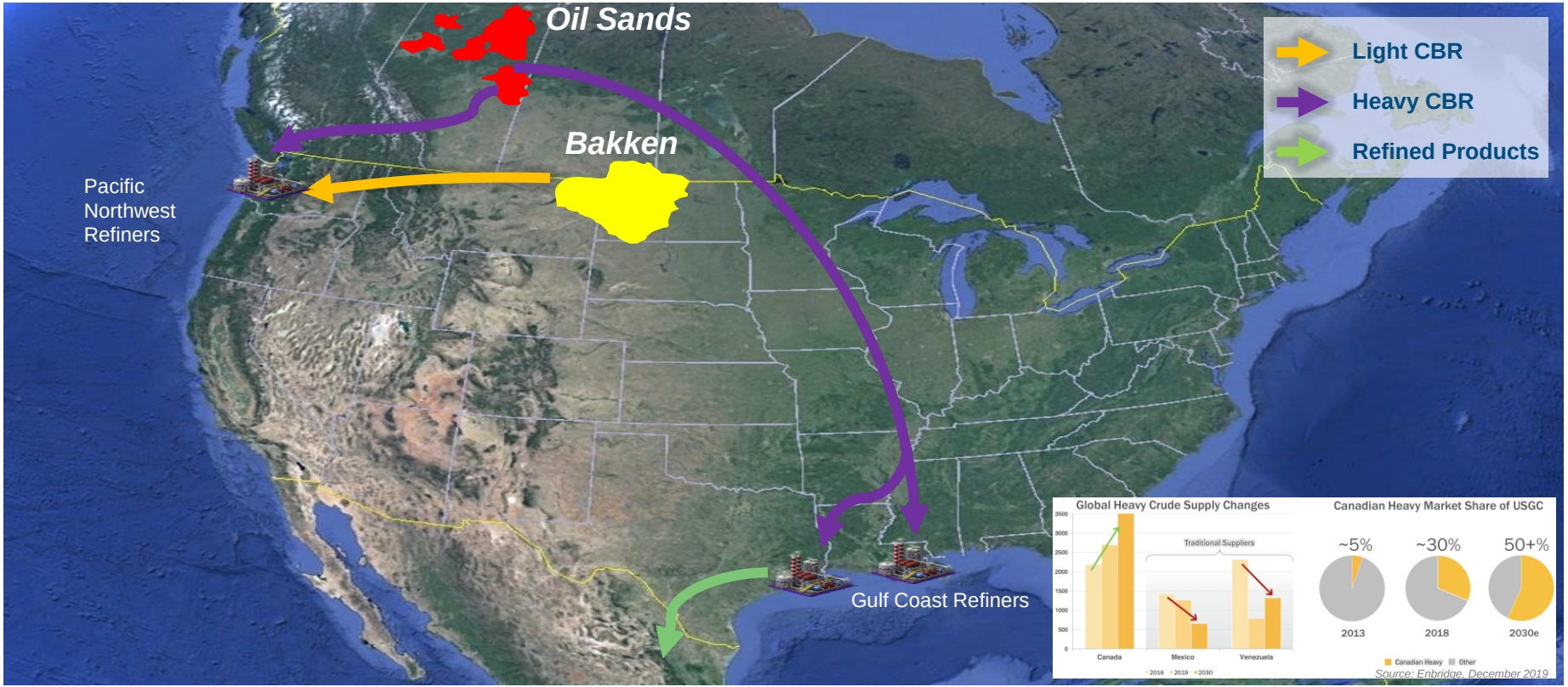


Source: Surface Transportation Board, December 2019

Structural Opportunities for Petroleum Trade via Rail



Cars Required for CBR and Other Flammable Service

Based on 4th Quarter 2019 Numbers the Number of Cars that Need to be Replaced/Retrofit to DOT-117J or DOT-117R by Service/Date

Commodity Category	Compliance Date	Number of Cars	This Qtr Cars per Month	Last Qtr Cars per Month
Crude Oil				
Non-Jacketed DOT-111's	1/1/2018	1	N/A	N/A
Jacketed DOT-111's	3/1/2018	0	NA	N/A
Non-Jacketed CPC-1232's	4/1/2020	225	75	83
Jacketed CPC-1232's	5/1/2025	8,522	133	132
Total Crude Oil		8,748	208	215
Ethanol				
JKT & Non-JKT DOT-111's	5/1/2023	12,387	310	306
Non-Jacketed CPC-1232's	7/1/2023	1,545	37	34
Jacketed CPC-1232's	5/1/2025	206	3	3
Total Ethanol		14,138	350	343
Other Flammable Liquids				
Packing Group I	5/1/2025			
Packing Group II & III	5/1/2029			
Total Other Flammable Liquids		36,225	323 - 566	305 - 523
Total All		59,111	881 - 1124	863 - 1081

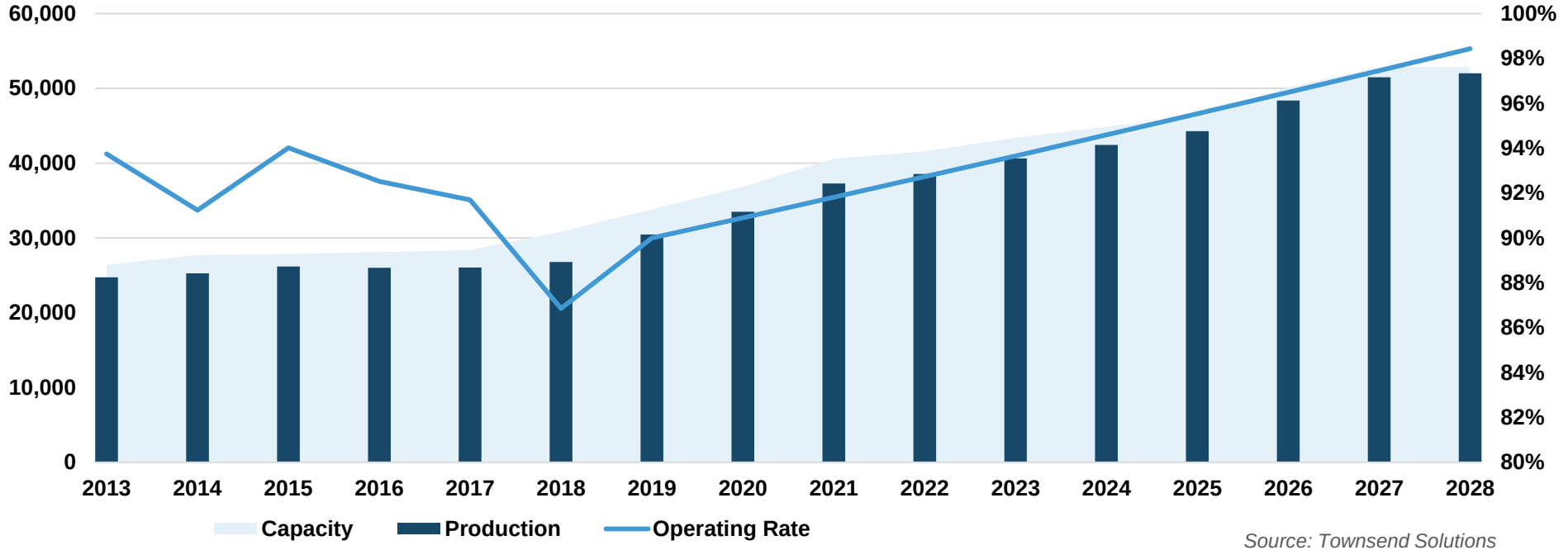
Source: AAR, January 2020

Cars per Month Required vs. Last Month Actual Production

Production	Cars / Month
Cars/Month to Meet Deadlines	881 - 1124
DOT-117 Production Avg. Last 3 Months	625
DOT-117R Production Avg. Last 3 Months	762
Total Production Last 3 Months Average	1,387
Surplus Production	402 - 587

Source: AAR, January 2020

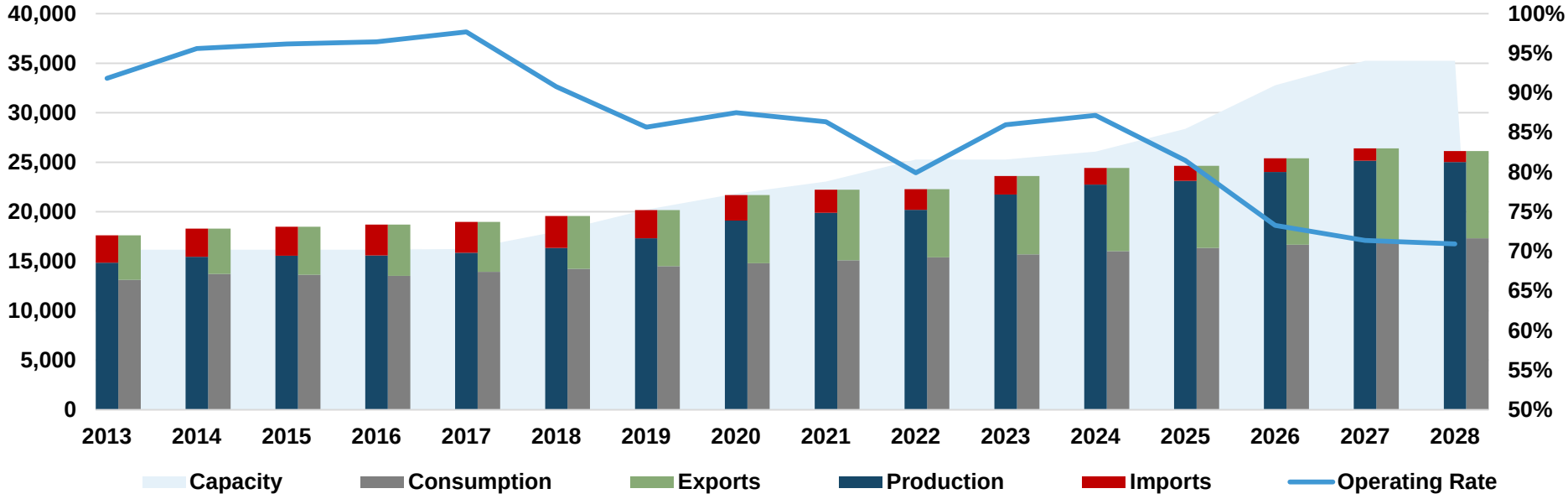
US Ethylene Capacity & Production (KTPA)



Source: Townsend Solutions

Production of ethylene tends to follow the capacity growth due to global market demand of derivatives

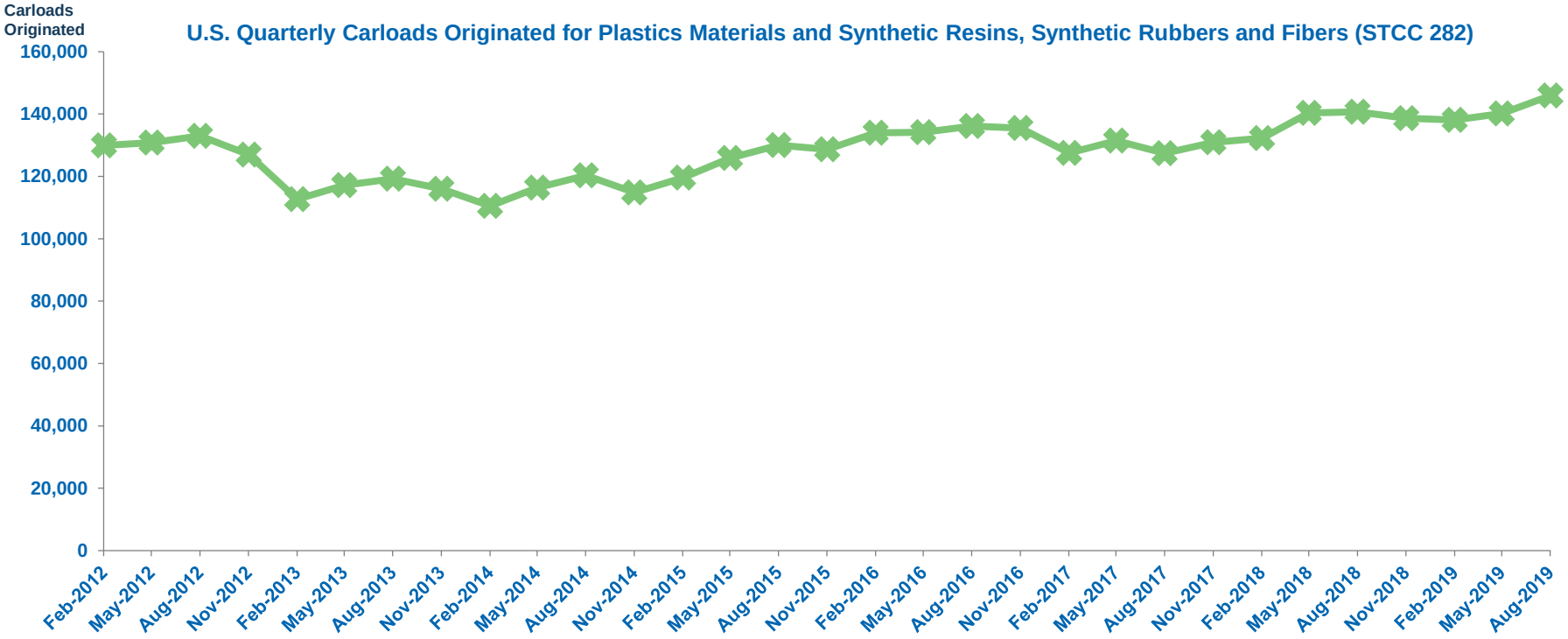
U.S. Polyethylene Production (KTPA) Capacity



Source: Townsend Solutions

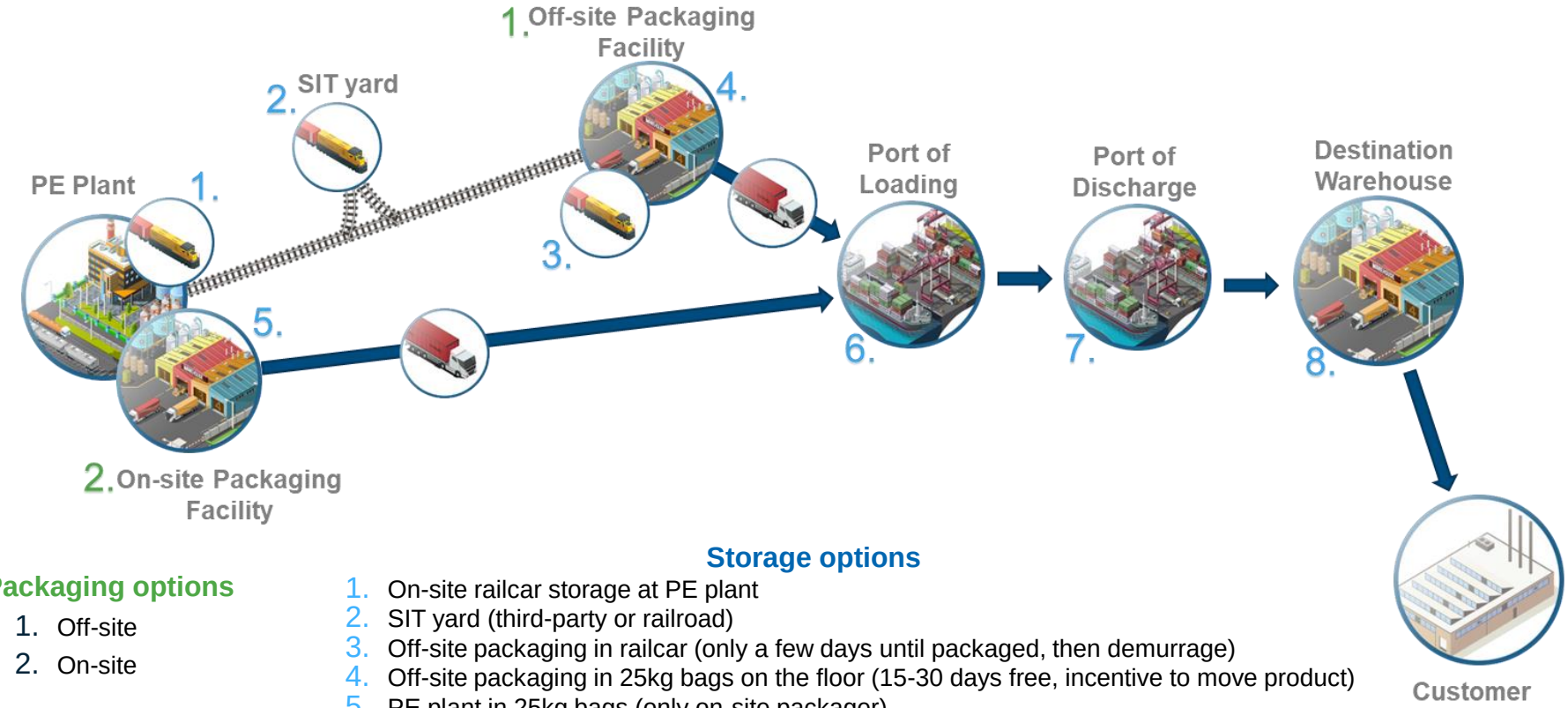
North American exports will grow from a current 2.5 MM tons to 6.7 MM tons over the forecast period, meaning an additional 4 MM tons annually will leave the region. The large U.S. producers may be able to accelerate the export growth with aggressive strategies to displace uncompetitive producers in some regions.

Plastic Resin Related Railcar Originations



Source: STB, December 2019

Typical North American PE Export Supply Chain Designs



Packaging options

1. Off-site
2. On-site

Storage options

1. On-site railcar storage at PE plant
2. SIT yard (third-party or railroad)
3. Off-site packaging in railcar (only a few days until packaged, then demurrage)
4. Off-site packaging in 25kg bags on the floor (15-30 days free, incentive to move product)
5. PE plant in 25kg bags (only on-site packager)
6. Origin port in 25kg bags in a container
7. Destination port in 25kg bags on pallets in a container
8. Warehouse in destination country in 25kg bags on pallets

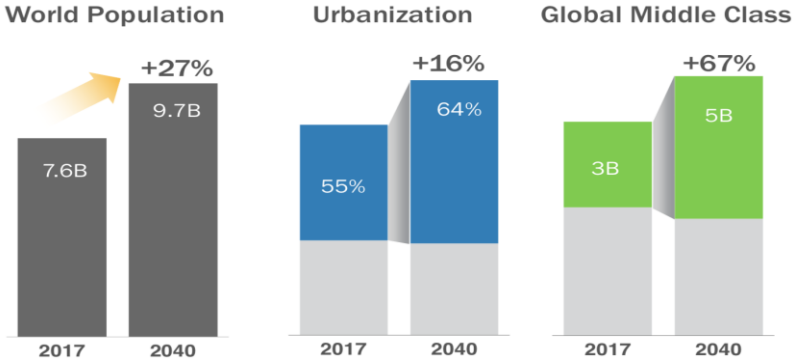
Looking Ahead to the
Coming Decade and Beyond

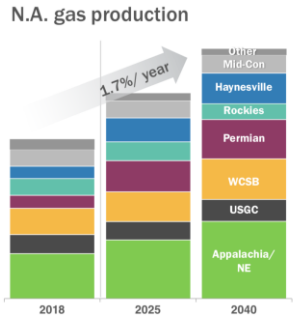
2020s: Exports & ESG

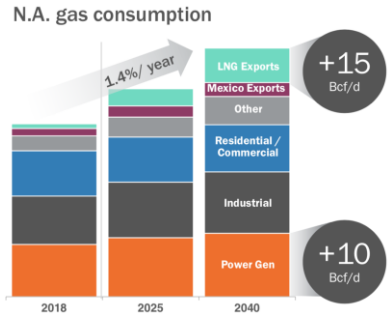
Exports: Following a decade of disruption, North America is now positioned as the leading provider of energy and basic materials to the world

- Crude oil (Asia)
- Gas (Canada, Mexico)
- NGLs (Europe, Asia, South America)
- LNG (Europe, Asia)
- Refined products (Latin America, Asia)
- Resins (Latin America, Africa, Asia)

Rail will continue to play an essential role in these supply chains







Source: IEA 2019 WEO, Enbridge

2020s: Exports & ESG

ESG: Domestically, use of energy and basic materials will continue to evolve due to environmental, social, and governance (ESG) concerns

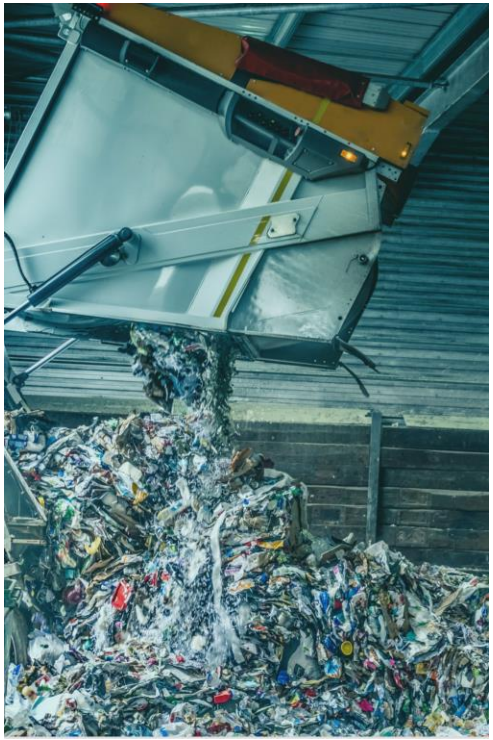
- Transition away from traditional oil-based transportation fuels
- Increased use of renewables for electricity generation
- Emergence of the “circular economy”

These evolutions are creating new opportunities for rail

% Share U.S. Electricity Generation

Fuel	2000	2010	2020	2030	2050
Coal	**52%**	**45%**	**22%**	**17%**	**13%**
Natural Gas	16%	24%	38%	35%	36%
Nuclear	20%	20%	19%	15%	12%
Renewables	9%	10%	20%	32%	38%
Other	3%	1%	1%	1%	1%

Source: Energy Information Administration



Source: CLP

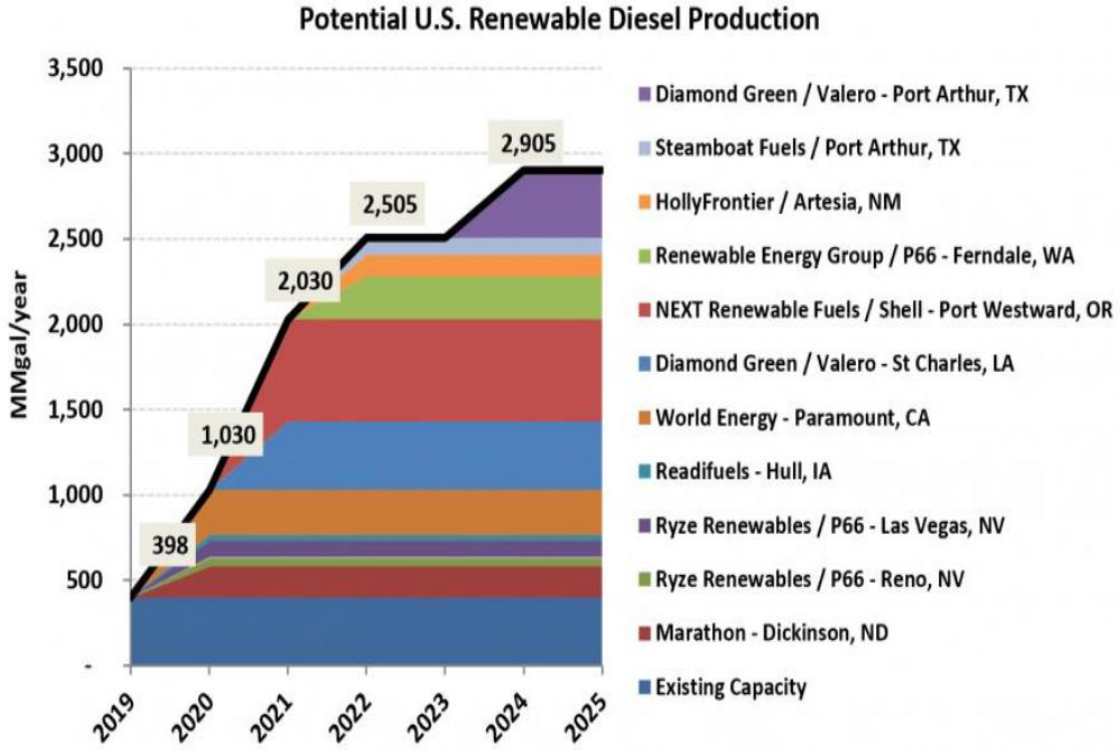
Renewable Diesel Opportunity

- 1:1 replacement for traditional diesel
- Feedstocks include soybean oil, corn oil, used cooking oil, animal fats
- Nearly all projects require rail for inbound feedstocks, outbound product, or both

"When we look at opportunities to produce products where there is going to be growth in the market and they are going to have sustainably high margins, we look to renewable diesel."

Joe Gorder, CEO

Valero



Source: Baker & O'Brien, December 2019

Looking Forward To Your Questions!

Thank You!

For follow up questions and information, please contact:

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