

# Polyethylene – Issues and Trends 2019 and beyond

Flexible Packaging Association

March, 2019

# Agenda

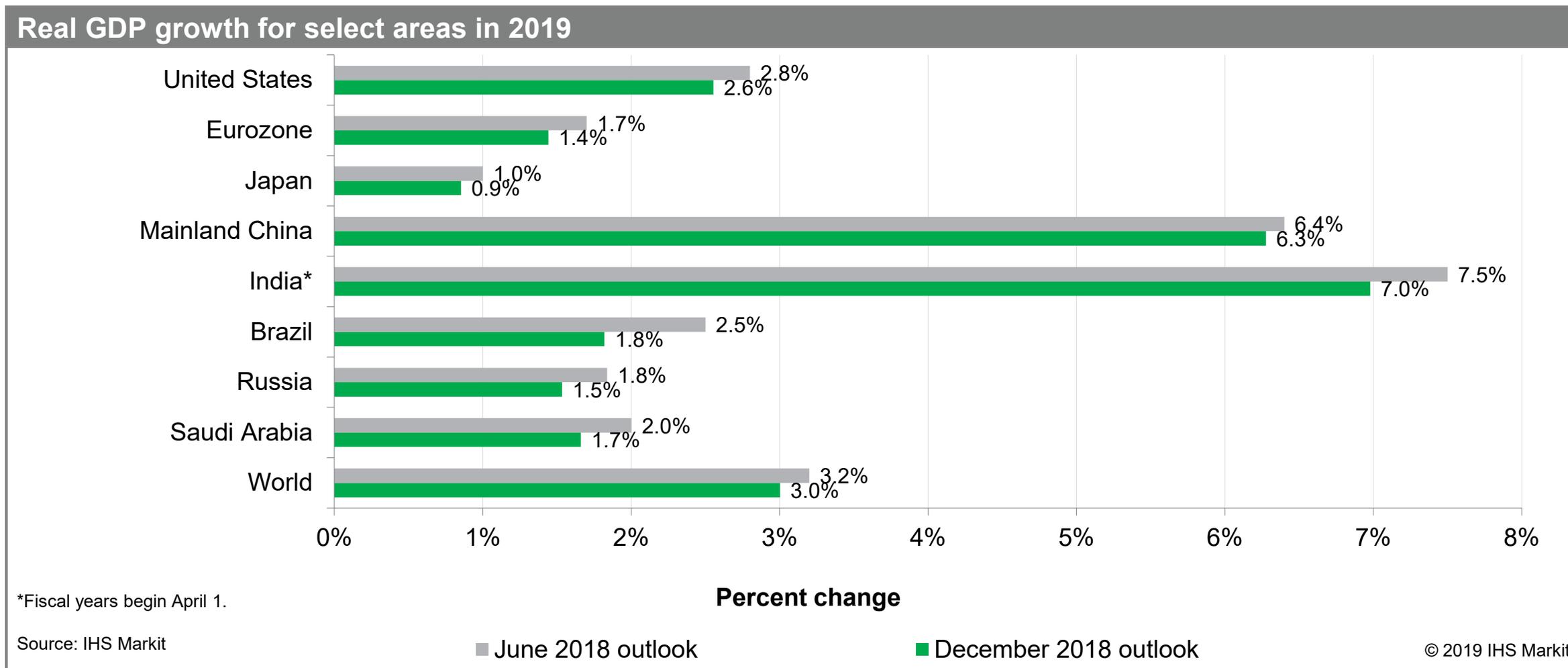
Economy/ Energy

Ethylene

Polyethylene



# GDP projections lowered for key regions



The image shows a landscape at sunset or sunrise, with a warm, golden-orange glow. In the foreground and middle ground, several wind turbines are silhouetted against the bright sky. The turbines are in various stages of rotation, with their blades blurred to indicate movement. A person is visible on a platform or ladder of one of the turbines. In the background, there are power lines and other industrial structures. A teal-colored horizontal band is overlaid across the middle of the image, containing the word "Energy" in white text.

**Energy**

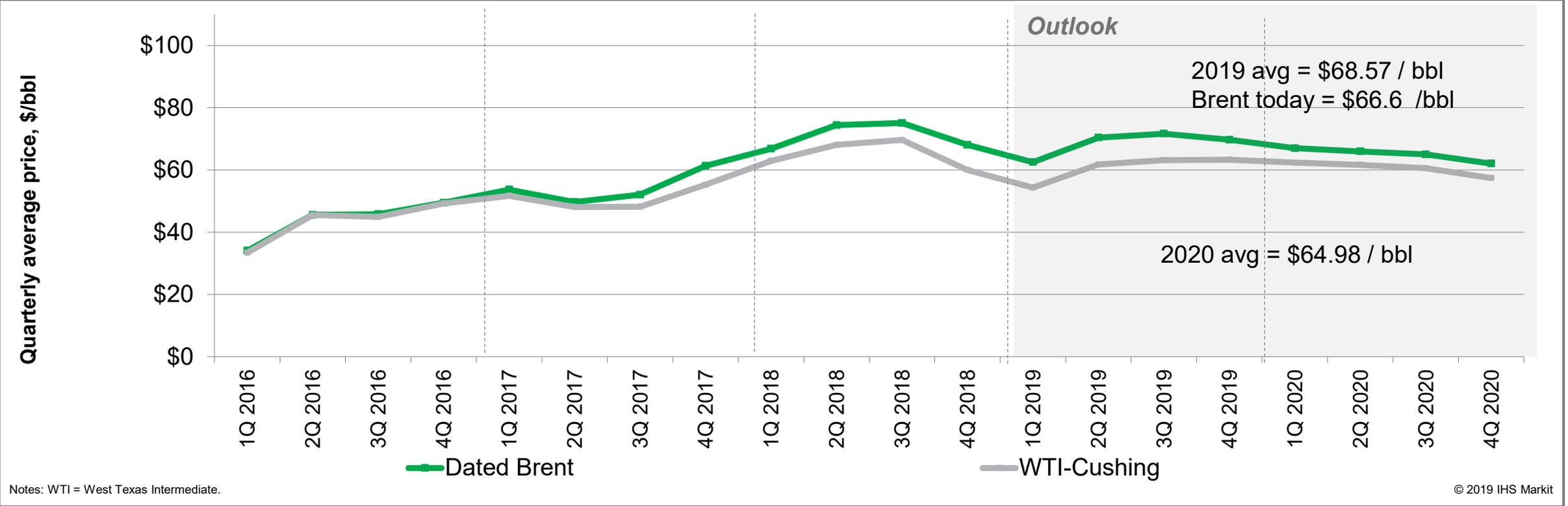
## Key signposts in the global oil market

1. **Strong demand:** How long will it continue- Economic strength?
2. **Vienna Alliance :** 1.2 MM BBL/day cut effective Jan 1. by opec and non opec – reverses plan to increase by 1 MM BBL/day. What is price impact
3. **US oil production:** will grow from 11.7 MMb/d in 4Q18 to 12.9 MMb/d in 4Q19 as new pipelines provide more takeaway capacity for Permian oil. Growth continues in 2020, with output averaging 13.5 MMb/d. \$30 breakeven
4. **Iran and Venezuela output-** What are export capabilities?
5. **Storm Alert-** The course of US-China relations—spanning trade, technology, and geopolitics implications?



# Saudi output cuts plus embargoed barrels push Brent higher in 1H19, but increase in US production stabilizes prices in 2H19 and 2020

Dated Brent and WTI-Cushing crude oil price outlook to 2020



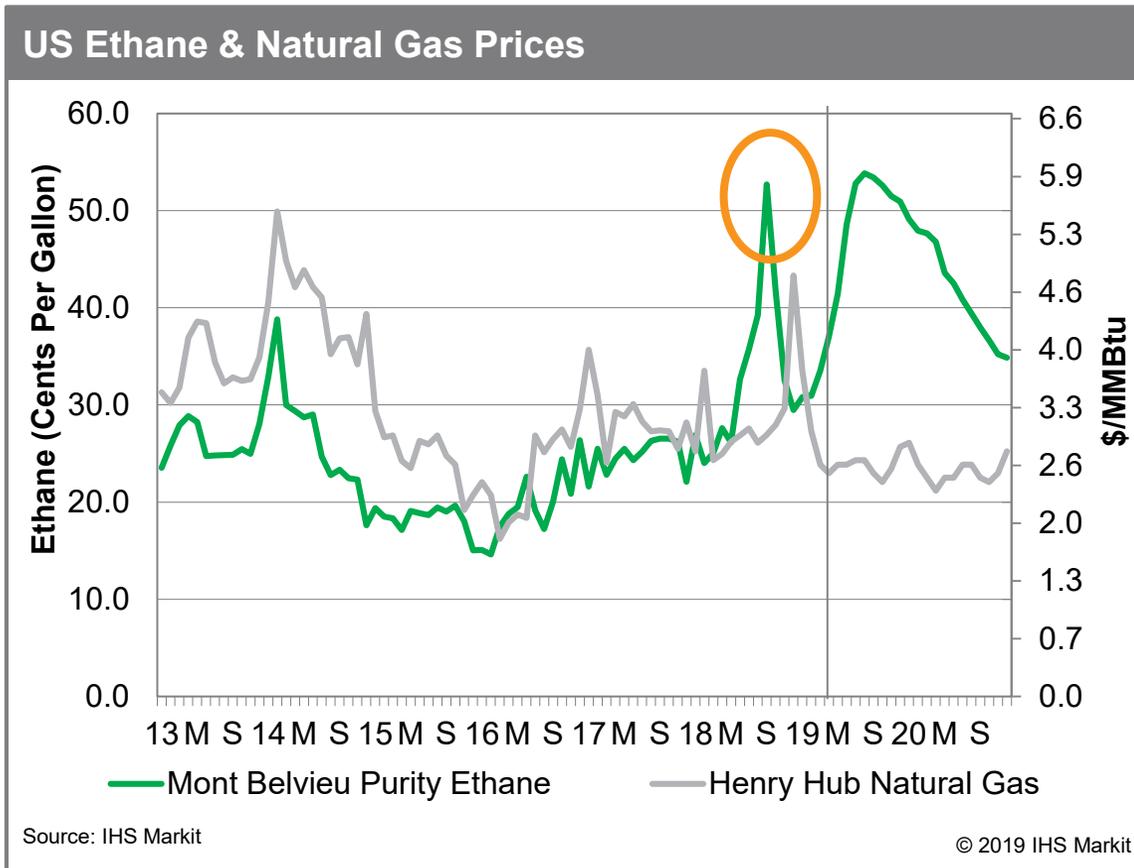
Benchmark crude price outlook (dollars per barrel)

	3Q 2017	4Q 2017	1Q 2018	2Q 2018	3Q 2018	4Q 2018	1Q 2019	2Q 2019	3Q 2019	4Q 2019	1Q 2020	2Q 2020	3Q 2020	4Q 2020
<b>Dated Brent</b>	\$52.06	\$61.31	\$66.81	\$74.40	\$75.08	\$68.06	\$62.52	\$70.41	\$71.66	\$69.69	\$66.97	\$65.95	\$64.98	\$62.03
<b>WTI</b>	\$48.16	\$55.23	\$62.89	\$68.03	\$69.63	\$60.14	\$54.69	\$61.03	\$62.53	\$63.22	\$61.75	\$61.64	\$60.56	\$57.43

Source: IHS Markit, Argus Media Limited (historical)

Note: For our monthly Dated Brent and WTI price outlook, please see the accompanying "IHS Markit Outlook for Global Oil Market Fundamentals" file.

## New demand likely to pressure ethane prices upward

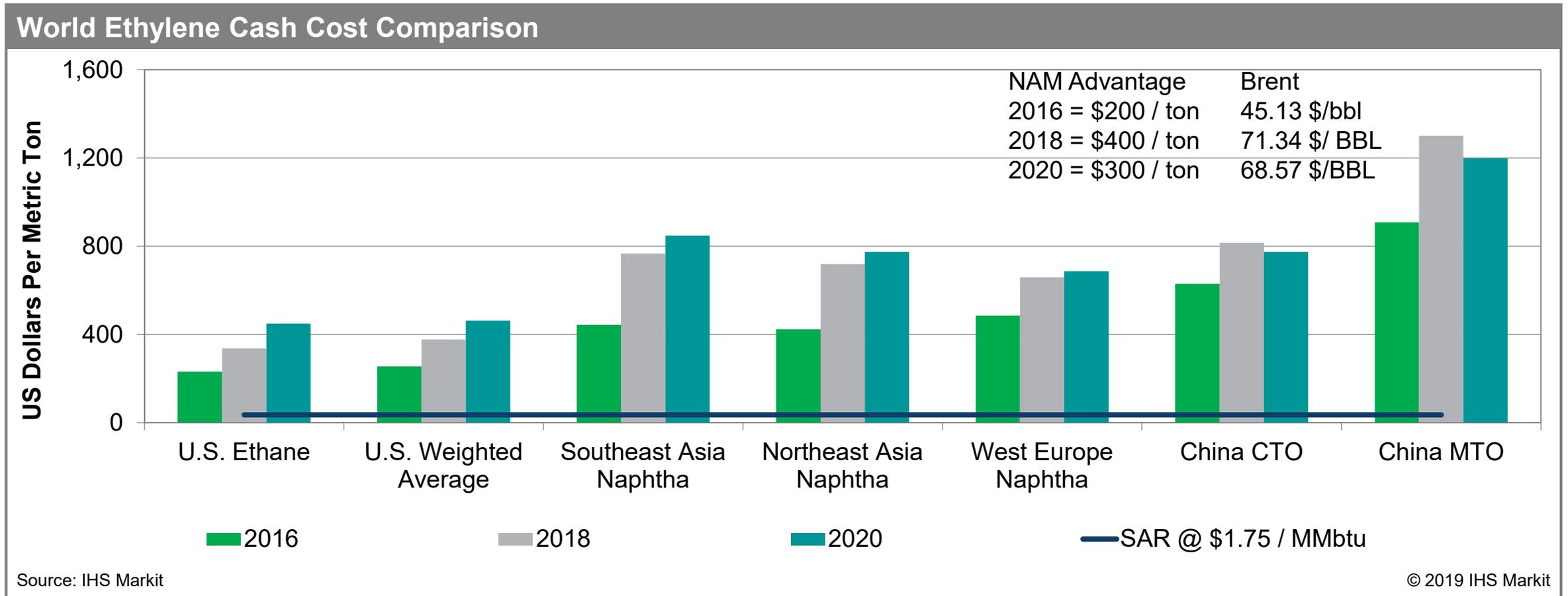


- Ethane price corrects after September spike.
- 2019 - Ethane moves to parity with next best feed.
- 2020 ethane tracks down with NGL infrastructure additions. Pipes and fractionation
- Ethane prices to remain volatile as new crackers come on line and continuing export flows.
- 2019 ethane average = 44.5 cpg... today = 28 cpg

# Ethylene

# World Ethylene Cash Costs

US loses some cost advantage but maintains about \$300/ton spread to NEA Naphtha in 2020



## North America Ethylene and Der. Capacity Additions

*No surprises on what is coming, question is when and ramp up timing.*

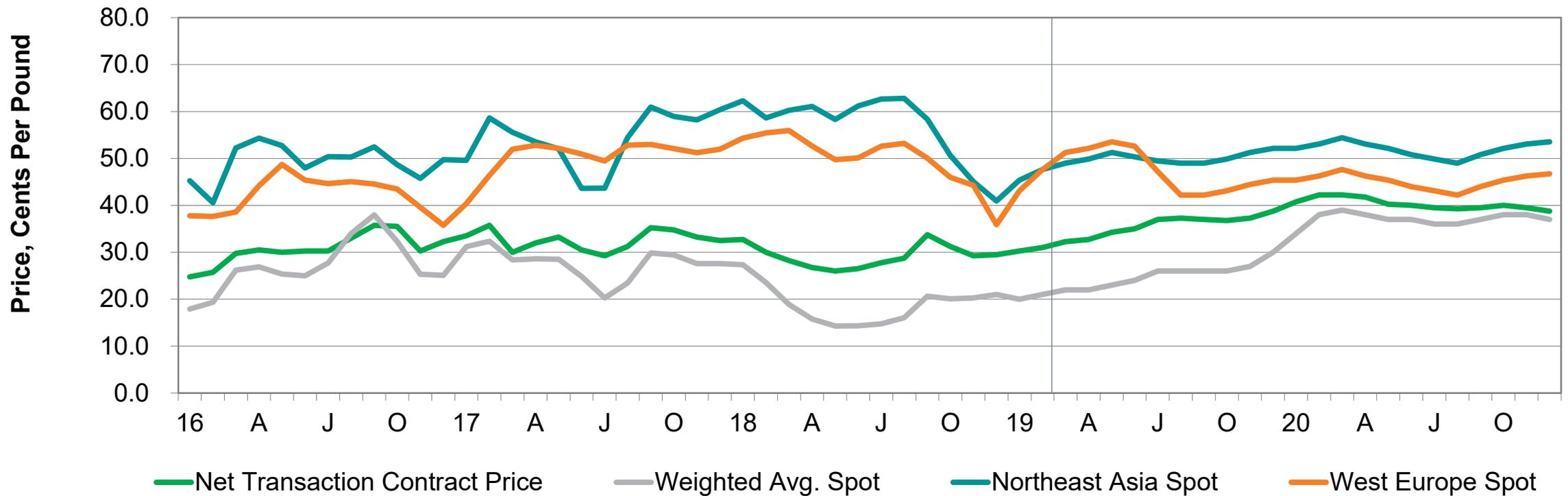
2018 US capacity = 33.5 mmt : 7.7 mmt scheduled: 4.7 mmt in 2019

Company	Location	Total Growth	Derivative	Startup Cracker
Indorama	Lake Charles, LA	430	Back Integrate	Q4-18/Q1-19
Formosa	Point Comfort, TX	1,250	PE	Q2/3-2019
Sasol	Lake Charles, LA	1,550	EOX, PE, other	1H-2019
LACC	Lake Charles, LA	1,000	EOX, back integrate	1H-2019
Shin-Etsu	Plaquemine, LA	500	Back Integrate	2H-2019
Bayport Polymers	Port Arthur/Bayport, TX	1,000	PE	2020+
Dow	Freeport, TX	500	Back integrate	2020+
Shell	Monaca, PA	1,500	PE	2021+

- Other ethylene projects in the news: Exxonmobil/Sabic, PTT/Daelim (new partner), Formosa (2 trains in LA over time), Badlands (2 trains over time), Ascent (or another on footprint in WV), NovaChem in Giesmer, others

# US Ethylene price moves back to par with rest of world. 2019 a transition year. Higher ethane and new export capability fcst to push prices higher

US Net Transaction vs Weighted Average Spot

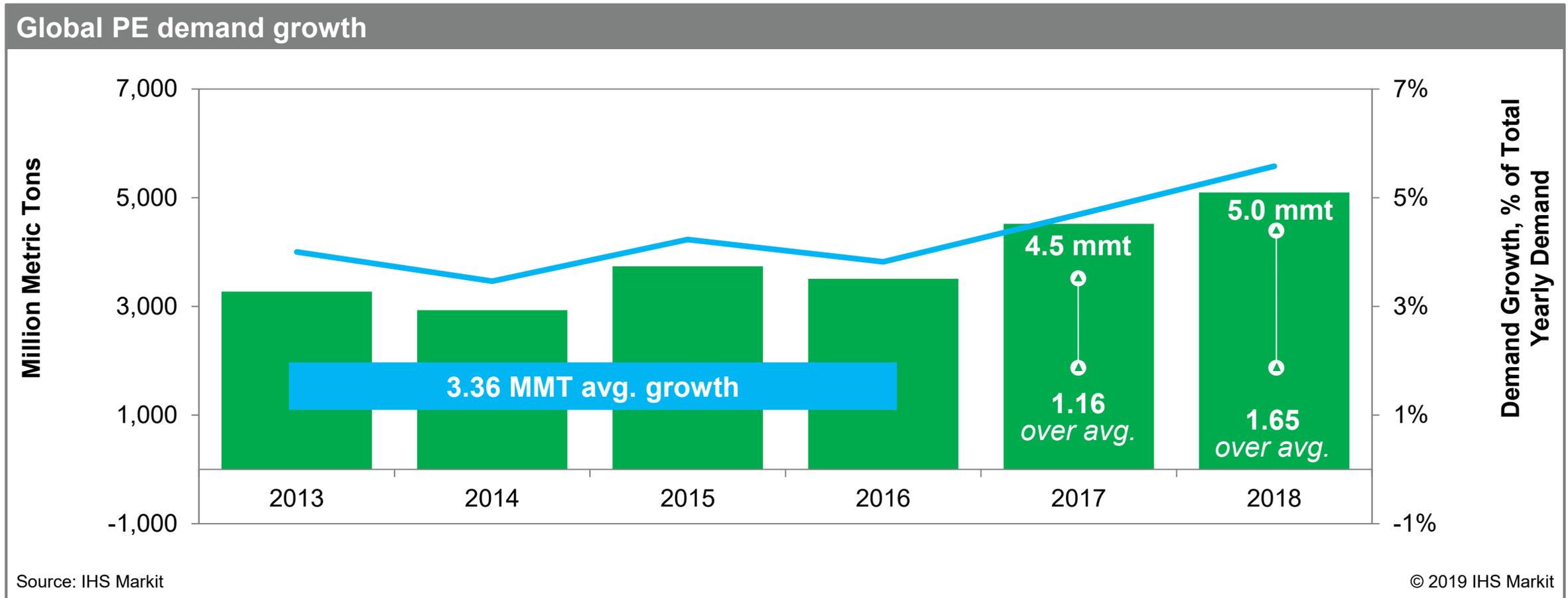


Source: IHS Markit

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# Polyethylene

# Global PE demand strength...but headwinds developing – or just normalization of demand



# PE Key Issues and Trends: 2019 and beyond

## Headwinds develop??

### International

- Economic slowdown impacts demand growth in 2019 / 2020
- China – “global demand driver” impacted by internal and external issues
- US / China trade war impacts demand, trade flows, operating rates, margins
- Sustainability movement dampens demand growth
  - Bag bans proliferate
  - PE “deselection” continues as major consumer packaged goods companies implement sustainable programs
  - Aggressive targets set by several governments designed to increase use of recycle content in packaging products



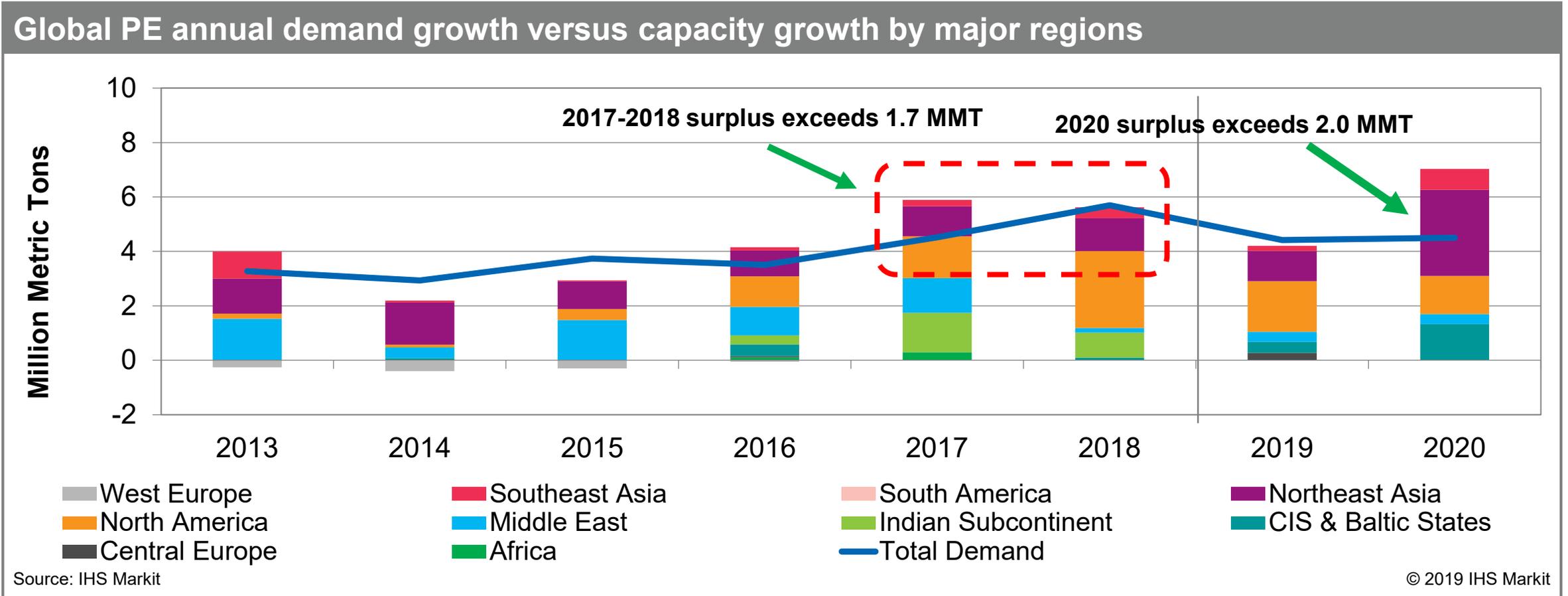
# China Slows

China key indicators reflect slow-down

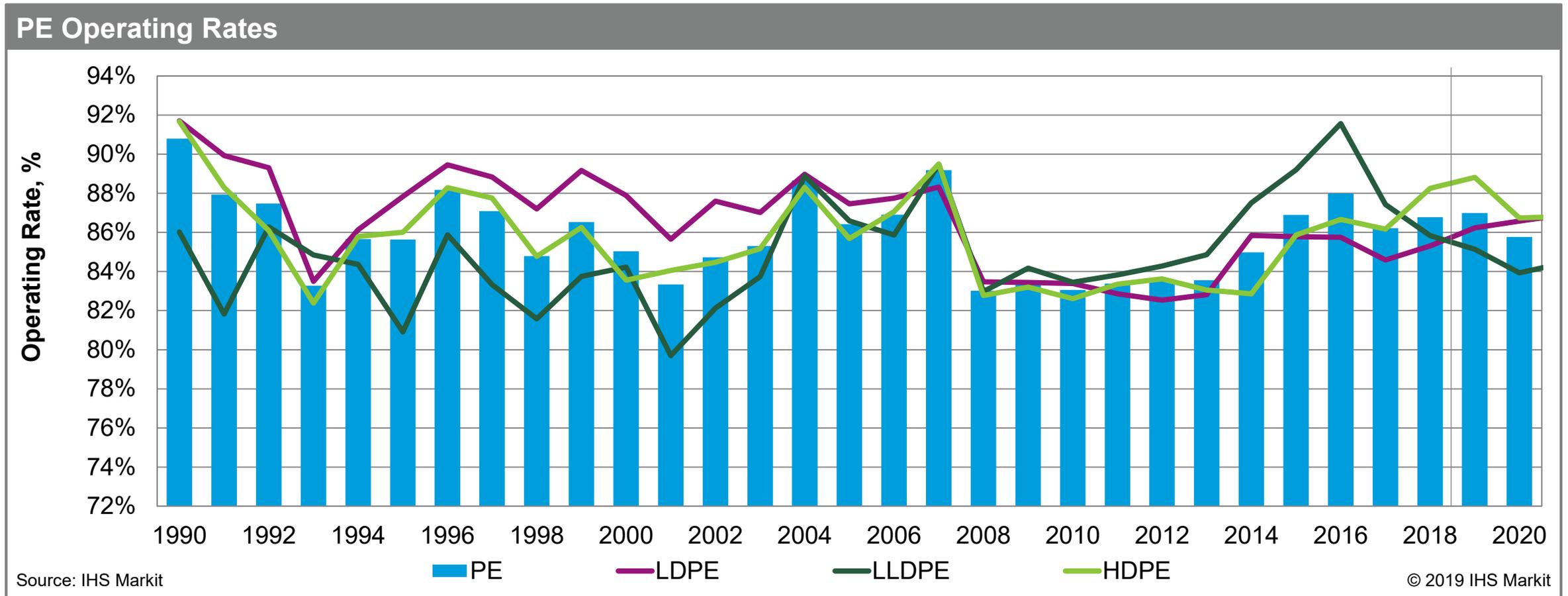
	2017	2018	2019	2020
<b>GDP</b>	6.9	6.7	6.3	6.1
<b>Elasticity</b>	1.6	1.3	1.1	1.1
<b>Demand Change (%)</b>	10.8	9.5	6.6	6.4
<b>Op Rate (%)</b>	93.7	90.5	88.3	85.4
<b>Intgrtd. Mgn. - LLDPE \$/MT</b>	381.0	144.0	101.0	74.0



## Global excess capacity stabilizes in 2019 Surplus capacity returns in 2020



## Increased surplus capacity for LLD, Less for LD & HD



## North America: Issues and trends

**Significant new capacity:** ramp up 2017 projects + 2018 starts – additional 2019 starts

**Domestic demand strength** + ~5%

**Export volume** ramps up

**Trade war** diverts China exports

**PE prices and margins** pressured by new capacity

**NAM cost advantage** declines with lower crude and higher feedstock prices

**Sustainability** issues loom...

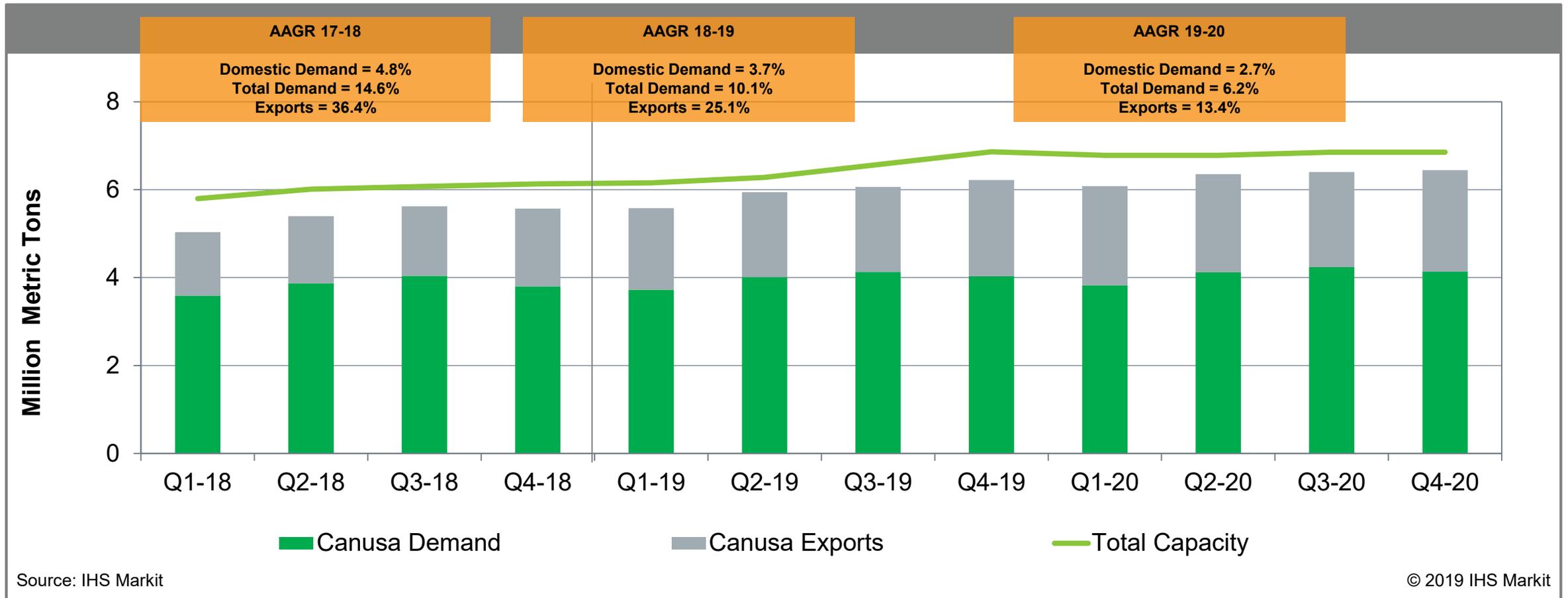


## Demand drivers NAM

### Region sees best domestic demand growth since 2010

- **Converter base appears to be expanding**
- Strong 2018 GDP
- **Reshoring to support “Made in America” campaigns**
- China tariffs reduces PE finished goods from China
- PE Pipe market (8% of total demand) growing near 16% due to the strong oil industry and municipal use
- Inventory restocking in the first quarter of 2018 to offset effect of Hurricane Harvey
- **Improved PE competitiveness versus other materials like PET and PP**
- 2018 Tax bill friendly for business, drives machinery capacity investment

# Canada USA Polyethylene: Strong Growth Projected

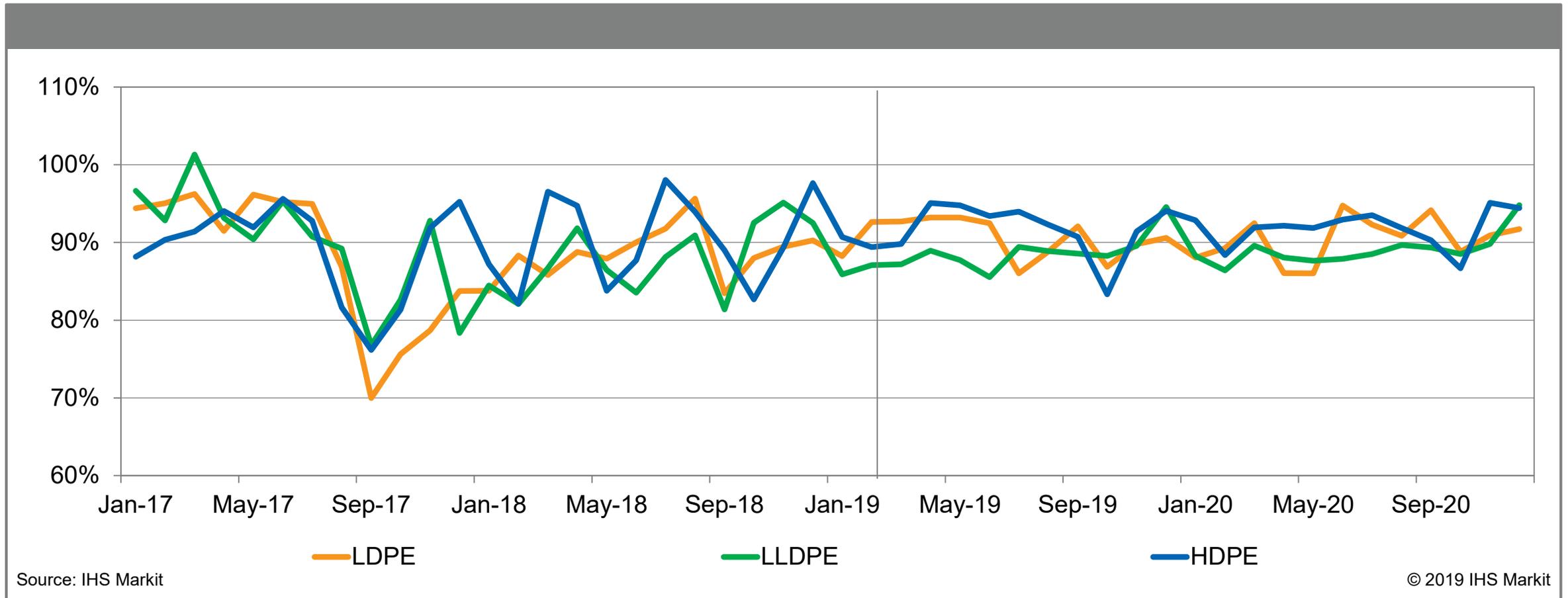


### North America - New Polyethylene Projects 2015 Year End Total PE Capacity 20,400 KTA

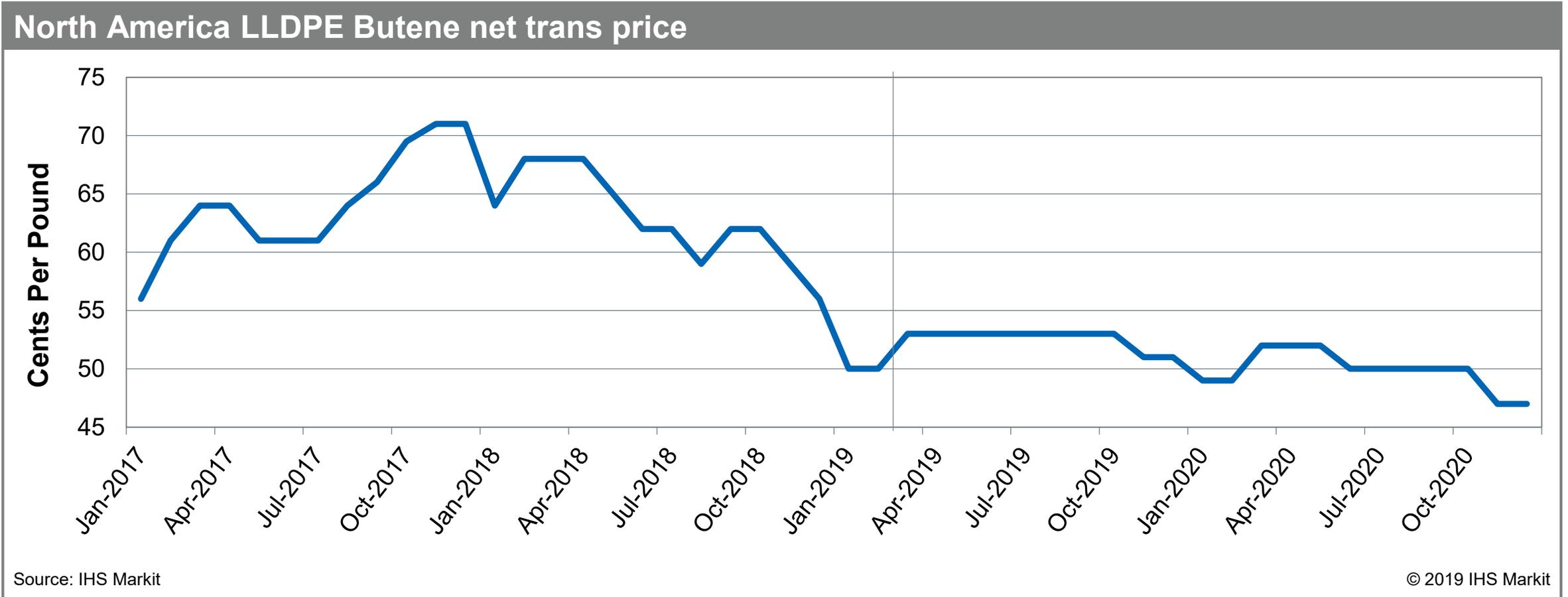
Company	Location	Country	LDPE	LLDPE	HDPE	TBA	Startup	Comments
<b>2016</b>								
Braskem Idesa	Nanchital, Veracruz	Mexico	300		750		Q2 2016	
Dow	Seadrft, Tx	United States			75		Q4 2016	
Nova	Joffre	Canada		432			Q4 2016	
<b>2017</b>								
Chevron Phillips	Old Ocean, TX	United States		500	500		Q3 2017	
Dow	Freeport, TX	United States		400			Q3 2017	
Exxon Mobil	Mont Belvieu, TX	United States		650			Q3 2017	
Exxon Mobil	Mont Belvieu, TX	United States			60		Q3 2017	
Exxon Mobil	Mont Belvieu, TX	United States		650			Q4 2017	
Ineos Sasol	Deer Park, TX	United States			470		Q4 2017	
<b>2018-2020</b>								
Dow	Plaquemine, LA	United States	350				Q1 2018	
Dow	Taft, LA	United States			125		Q4 2018	
Dow (Elastomers)	Freeport, TX	United States		320			Q4 2018	
Sasol	Lake Charles, LA	United States		470			Q1 2019	Delay from Q4 2018
Formosa Plastics Corp	Point Comfort, TX	United States	400				Q3 2019	Delay from Q1 2019
Formosa Plastics Corp	Point Comfort, TX	United States			400		Q3 2019	Delay from Q1 2019
Sasol	Lake Charles, LA	United States	420				Q3 2019	
Exxon Mobil	Beaumont, TX	United States		650			Q4 2019	
Equistar	Laporte, TX	United States			500		Q4 2019	Advanced from Q1 2020
<b>Post 2021</b>								
Shell	Monaca, Pa	United States		500	1000		Q3 2021	under construction
Gulf Coast Growth Ventures*	Corpus Christi, Texas	United States				1300	Q2 2022	FID Not Made; waiting on permit
Bayport Polymers	Bayport, Tx	United States			625		Q3 2022	Delay from 2021
Nova Chemical	Sarnia, ON	Canada		450			Q3 2022	FID made
Dow	US Gulf Coast	United States		600			2022	
PTTGC Daelim	Dilles Bottom, OH	United States		900	700			FID Not Made
FG LA LLC	Louisiana P1	United States		400	400			FID Not Made; waiting on permit
FG LA LLC	Louisiana P2	United States	400		400			FID Not Made; waiting on permit
<b>Totals, 000's MT</b>			<b>1870</b>	<b>6922</b>	<b>6005</b>	<b>1300</b>	<b>16097</b>	
<b>Additional Announcements</b>								
Ascent (Braskem)	Marcellus WV	United States		500	1000		1500	
Badlands NGL	North Dakota	United States		600	600		1200	
Badlands NGL	TBD	United States		600	600		1200	
Appalachian Resin	Salem Township, OH	United States				275	275	
<b>Additional Total</b>							<b>4175</b>	
<b>Totals, 000's MT</b>			<b>1870</b>	<b>8622</b>	<b>8205</b>	<b>1575</b>	<b>20272</b>	

\* Sabic and Exxon Mobil joint venture

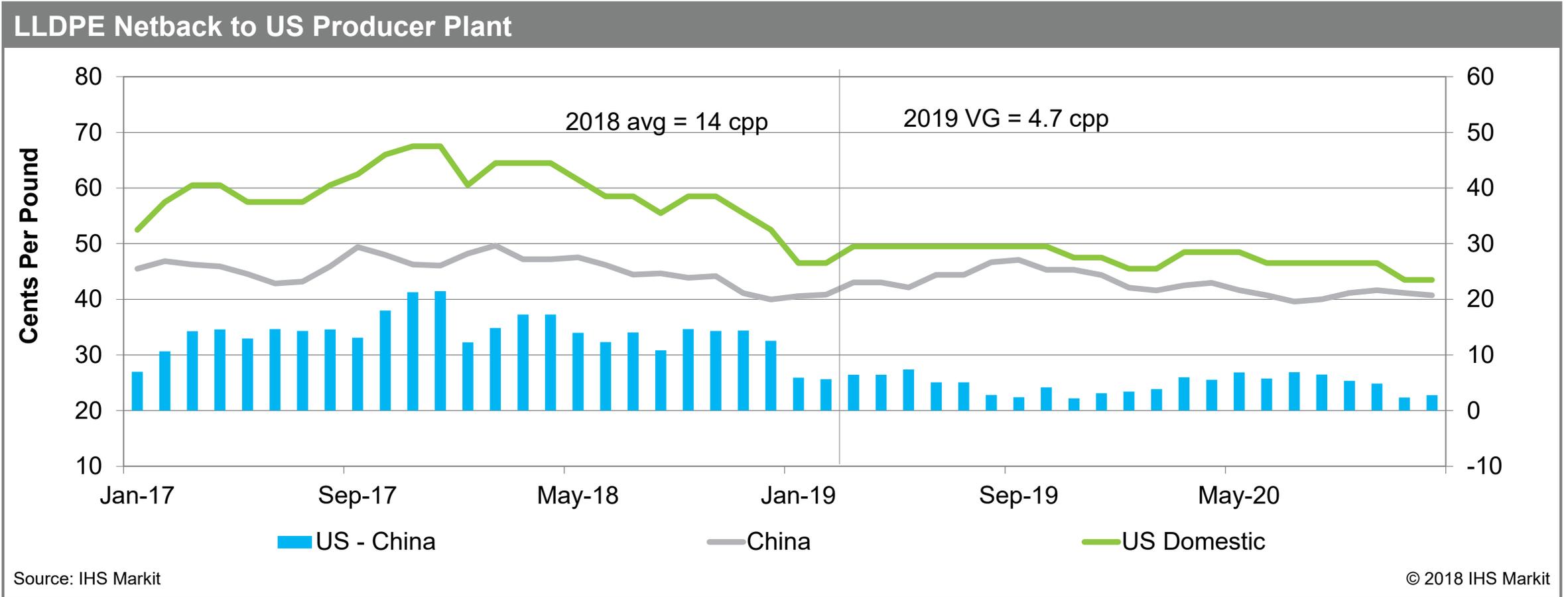
# US/CAN Monthly Operating Rates: Stabilizing at high levels



# NAM price forecast reflects near term upward pressure until full production materializes

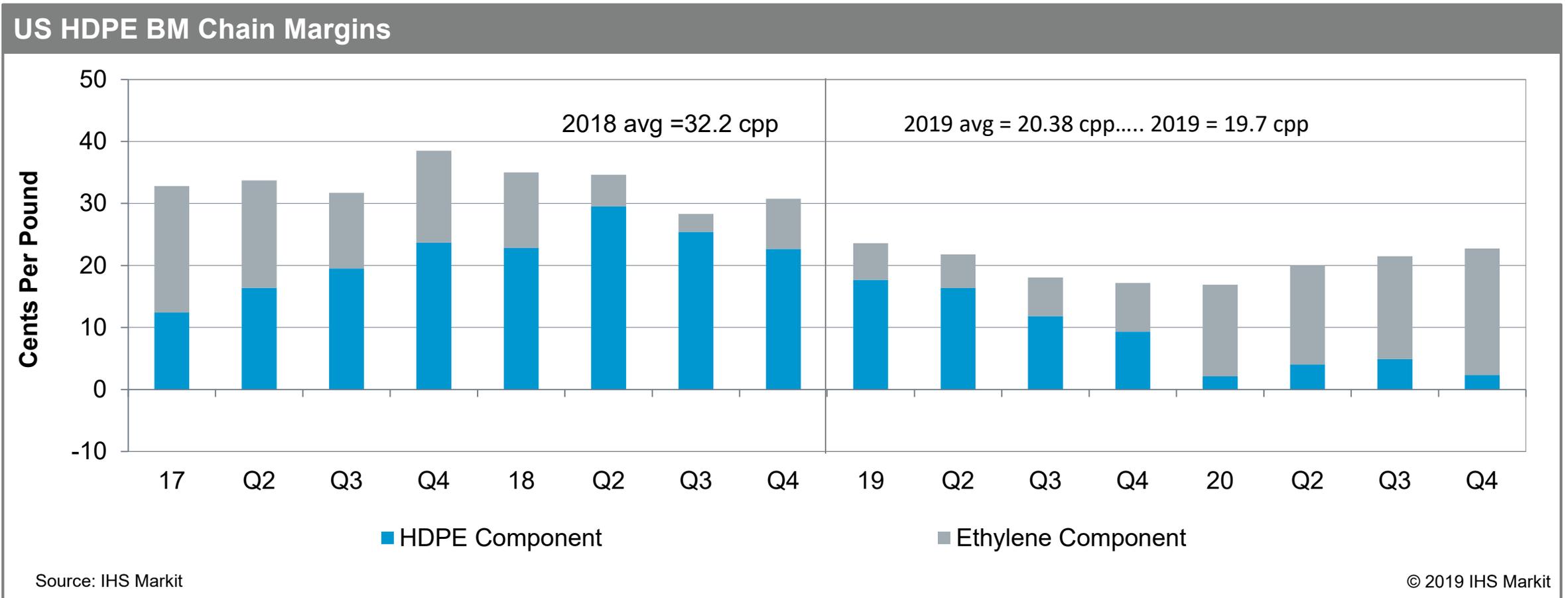


# Domestic premium reduced through 2020



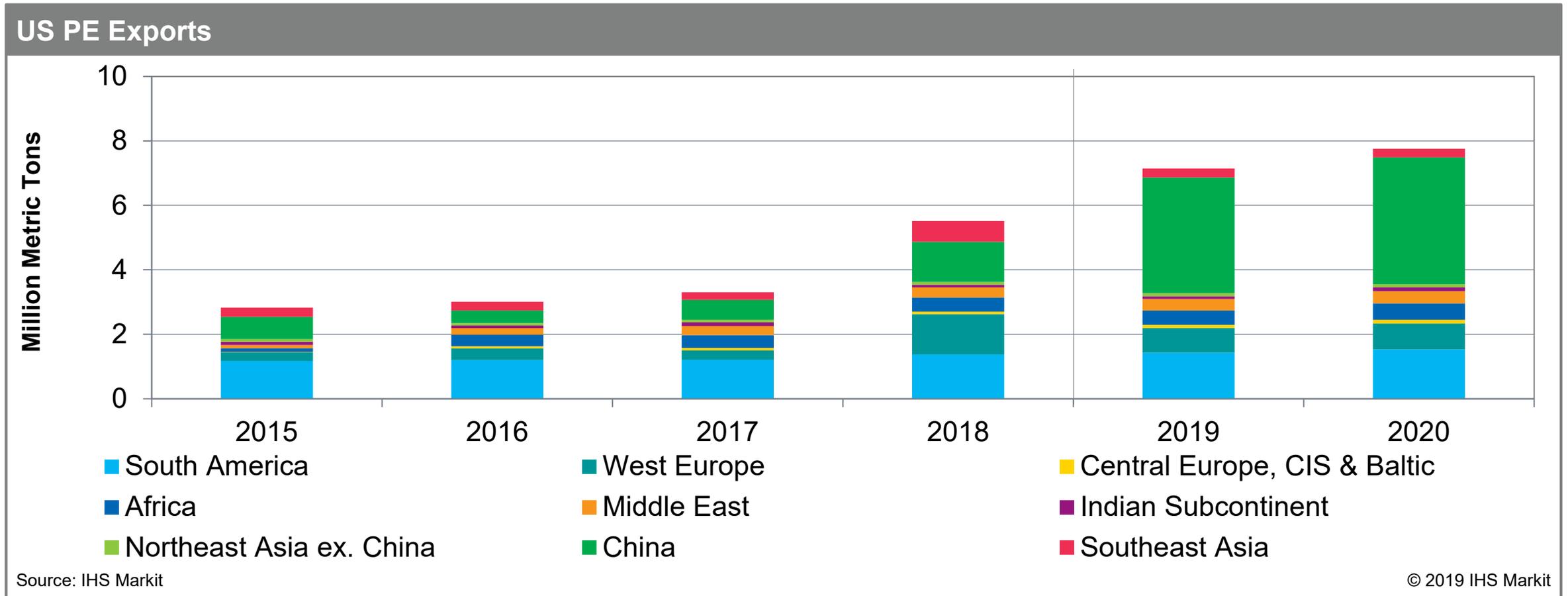
# Integrated margins pressured through 2019

## Ethylene component dominates 2020 forward with lower ethane



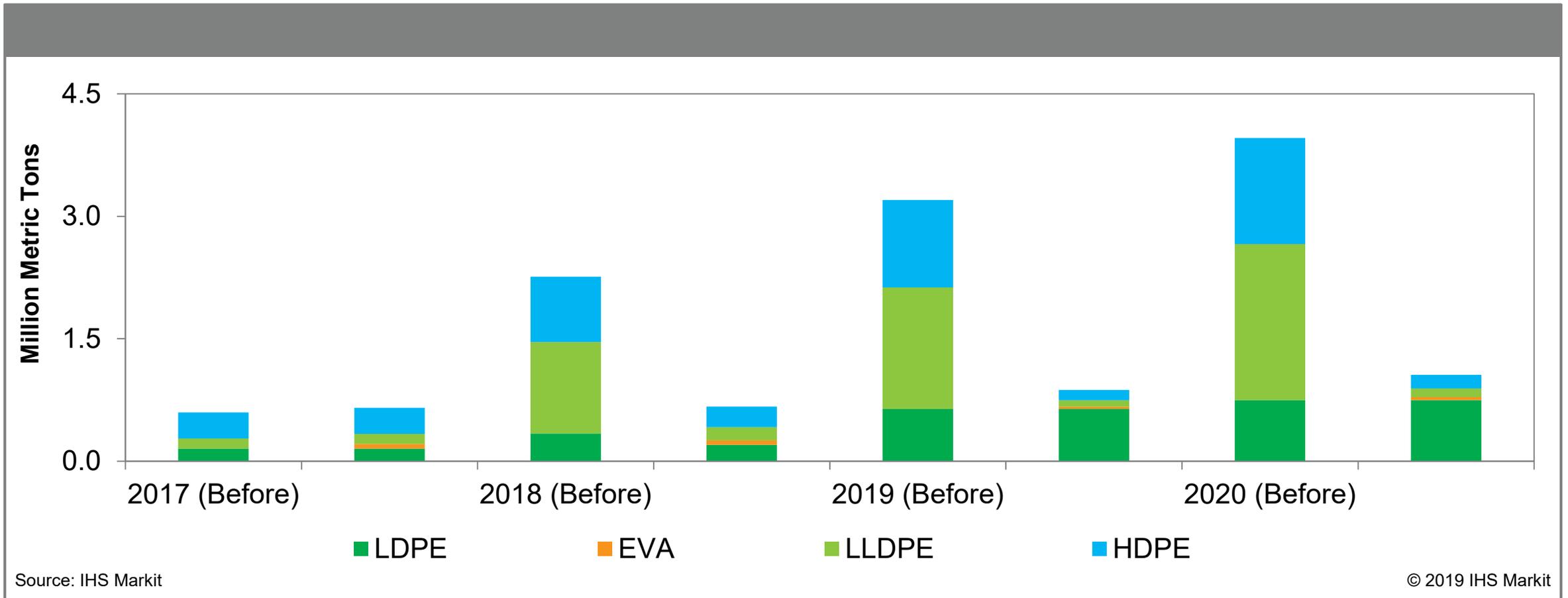
# Export surge: US PE exports accelerate through 2020

China accounting for 50%+ of total (Pre tariff estimates)



# Tariff impact on US PE exports to China

2019 exports decline from forecast of 3.5 MMT to 845 KT

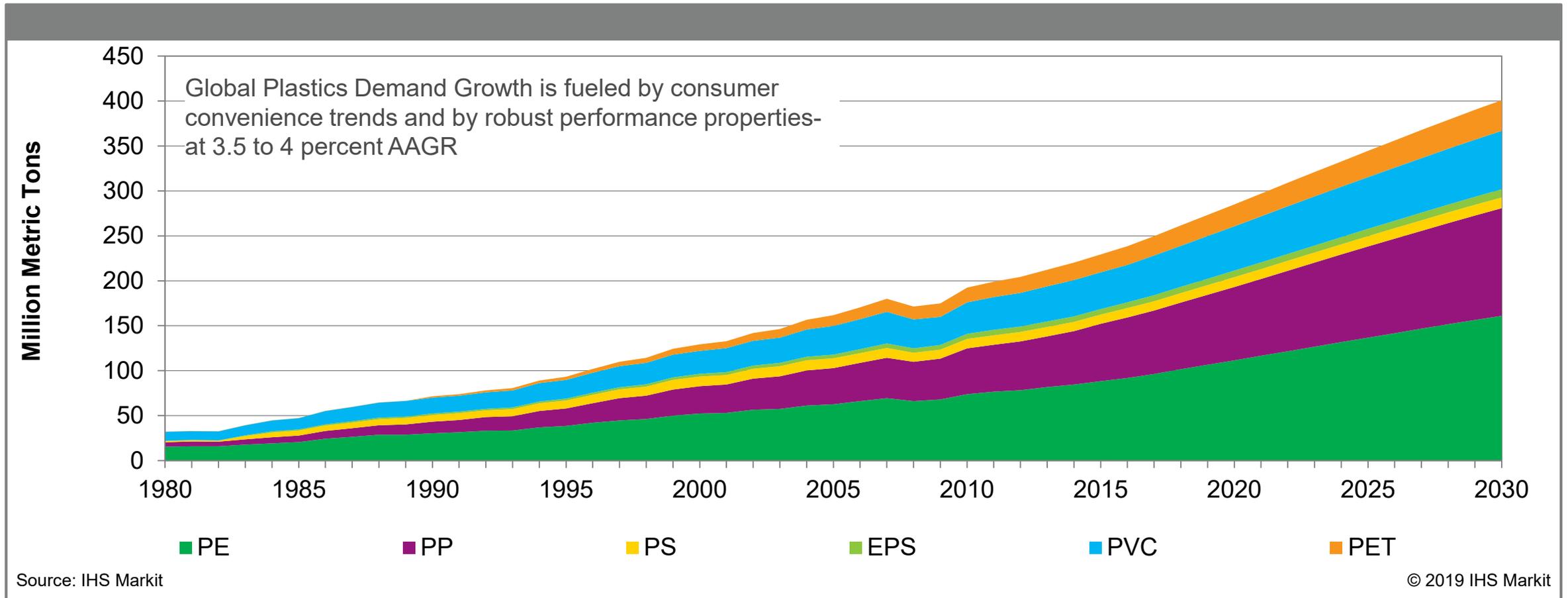


## Trade war – impact!

- Weakened China's economy
- Reduced China PE demand
- Shifts trade routes
- US shifts from price taker to price maker
- Global price reduction of 3 – 5 cpp



If overall plastics consumption continues with the same usage patterns, plastics waste in landfills and the environment will grow to over 10.5 billion metric tons by 2030,

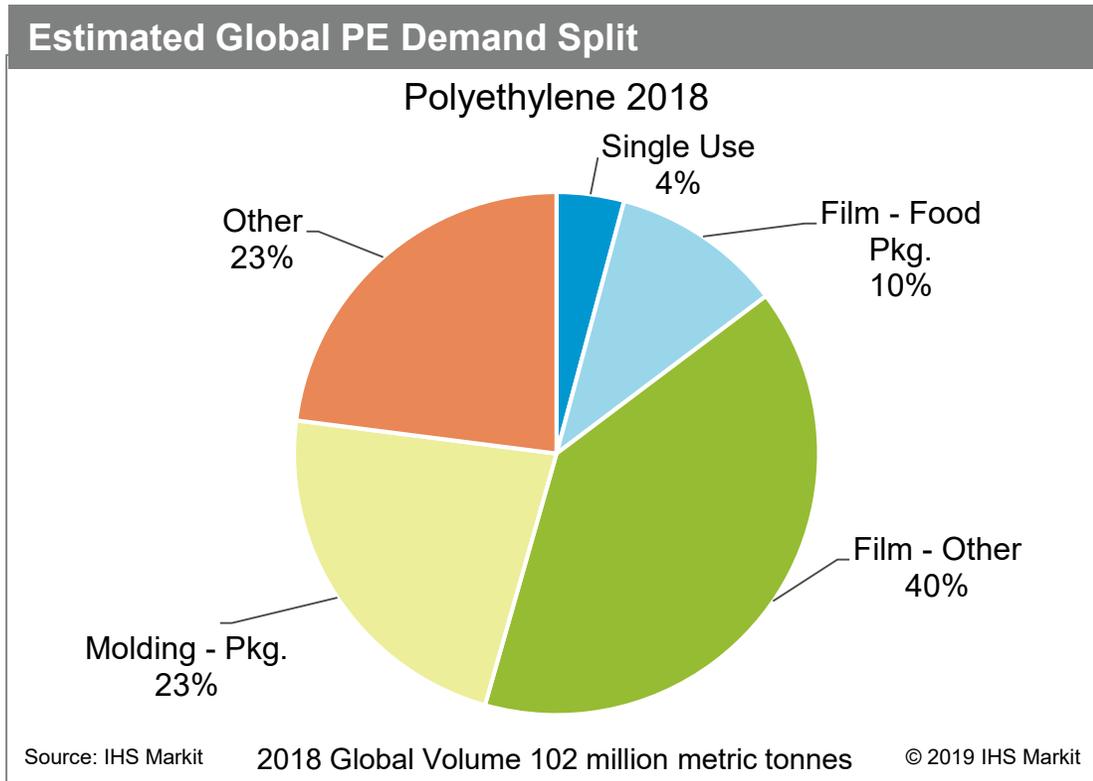


## Sustainability impacts PE

- Plastic Deselection (Bag Bans) restrictions on single use applications
- Increased use of PCR or recycle content
- EPR (Extended Producer Responsibility)
- Legislative edicts and directives – EU Circular Economy
- Corporate Self imposed plastic bans



# Sustainability has potential to displace a significant portion of PE growth – but hurdles exist



- **Prime demand impacted by:**
  - > Bans, movement to alternative materials and returnable/circular consumption schemes
  - > Increased replacement by post consumer/commercial resin (PCR)
  - > **Potentially** offset by technology/infrastructure development for monomer and feedstock recycling
- Single use applications under attack: retail bags, cups, lids
- Food Packaging Film
  - > Cost/Risk outweigh the benefit of incorporating packaging waste back into packaging
- Non-Food Packaging Film
  - > More susceptible to **increased use of PCR but still a high cost/performance issue vs benefit**
- Others more amenable to PCR depending on specific applications

## Global plastic bans or restrictions trend higher recycle targets set around the world

196 bag bans or fees currently in place around the world



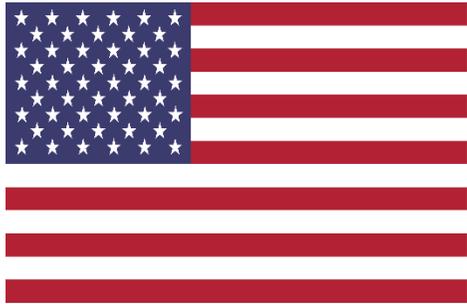
- 34 bans or fees including EU-wide laws + 20 individual countries
- **Target:** recycle 50% of plastic packaging by 2025 and 55% by 2030



- 25 states have full or partial bans on PE carry bags
- Mumbai banned single use packaging; Penalty = 25,000 rupees AND 3 months jail for repeat offenders
- **Target:** eliminate all single use packaging by 2022

## Global plastic bans or restrictions trend higher recycle targets set around the world

196 bag bans or fees currently in place around the world



- Approximately 570 laws within 30 states placing restrictions or fees on plastic bags and EPS food service
- Nearly one half of the laws in CA

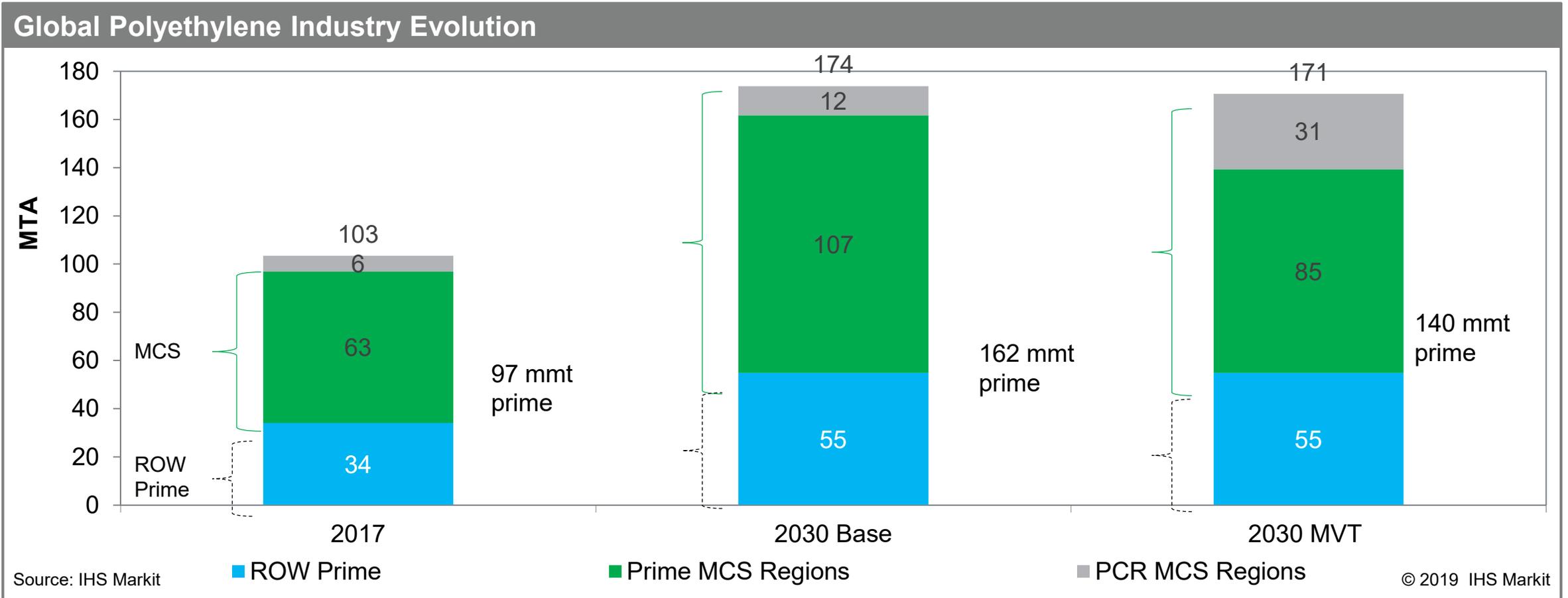


- since 2008: retailers must charge for plastic shopping bags



- 6 provinces have bans or fees

# Global Polyethylene: Sustainability drives PCR demand



## Polyethylene Summary

- Global demand growth moderates
- China market weakened by trade war
- 2.9 MMT US capacity additions in 2019 pressure market
- US adopts price maker posture re exports
- Domestic premium erodes as new capacity starts
- Sustainability beginning to dampen PE demand growth
- Embracing a sustainable product line may be necessary to maintaining “social license to operate”

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