



SEPTEMBER 2014

GLOBAL OLEFINS

Cost, Demand, Price and Trade

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Ethylene and Propylene



Where are they coming from?

Where are they going?

AGENDA

Energy Outlook

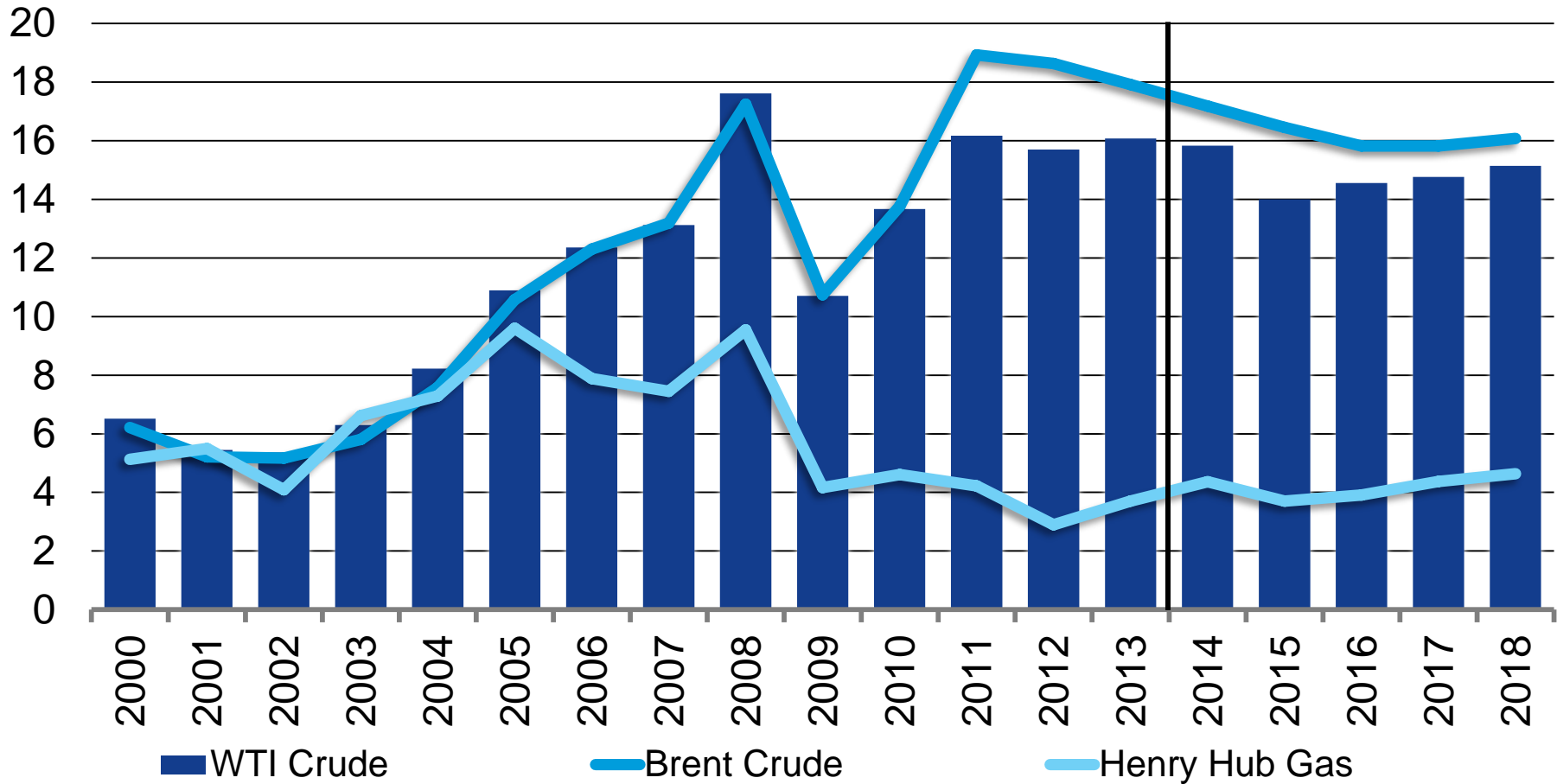
Ethylene View

Propylene View

Base Energy

Energy: Global Crude / North American NG

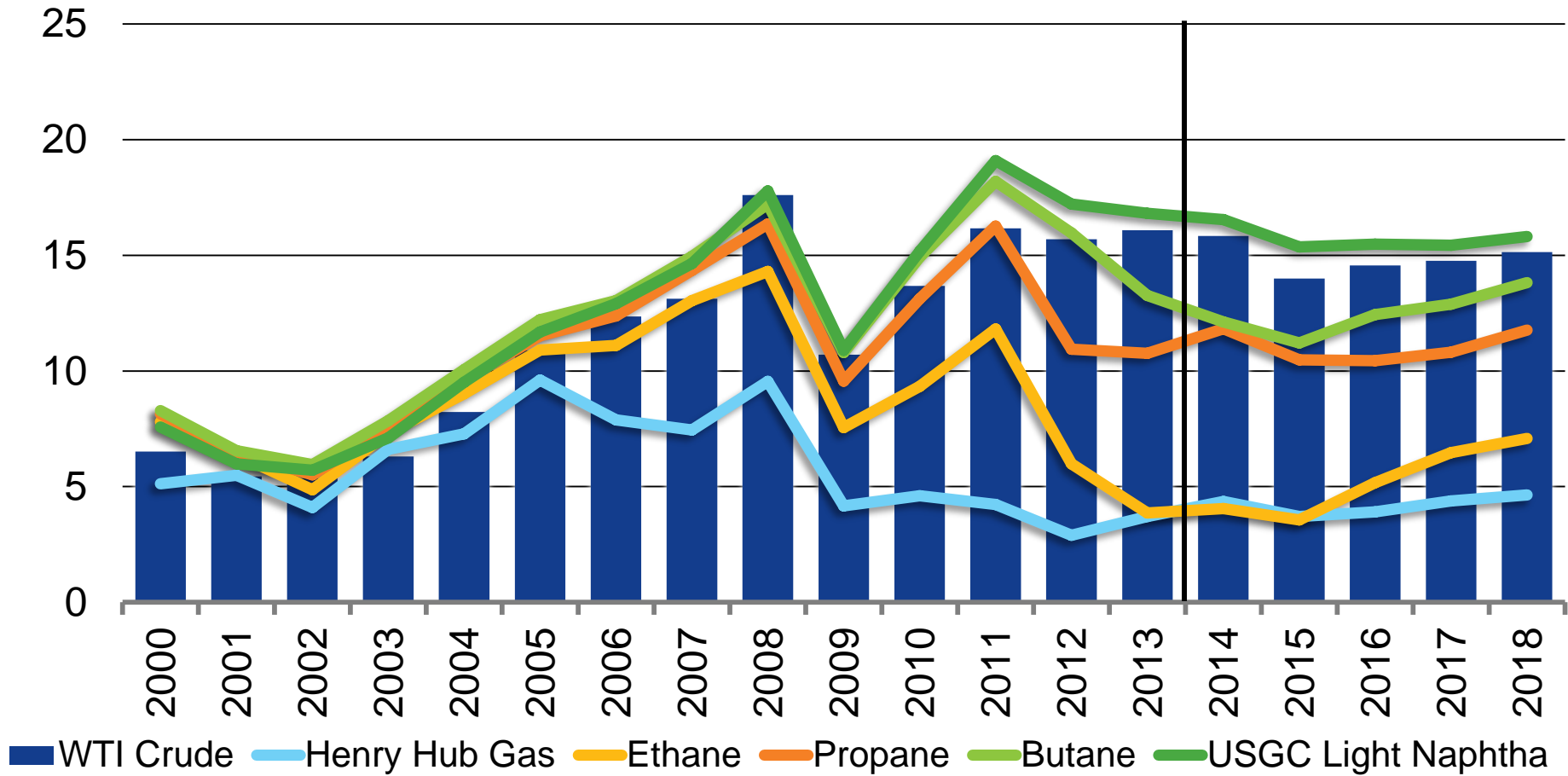
Constant 2012 Dollars Per MMBtu



Energy: North America Natural Gas Liquid's

Mont Belvieu NGLs Price Playing Field – Global Redesign

\$/MMBTU



ETHYLENE

Technology

Cost and Margins

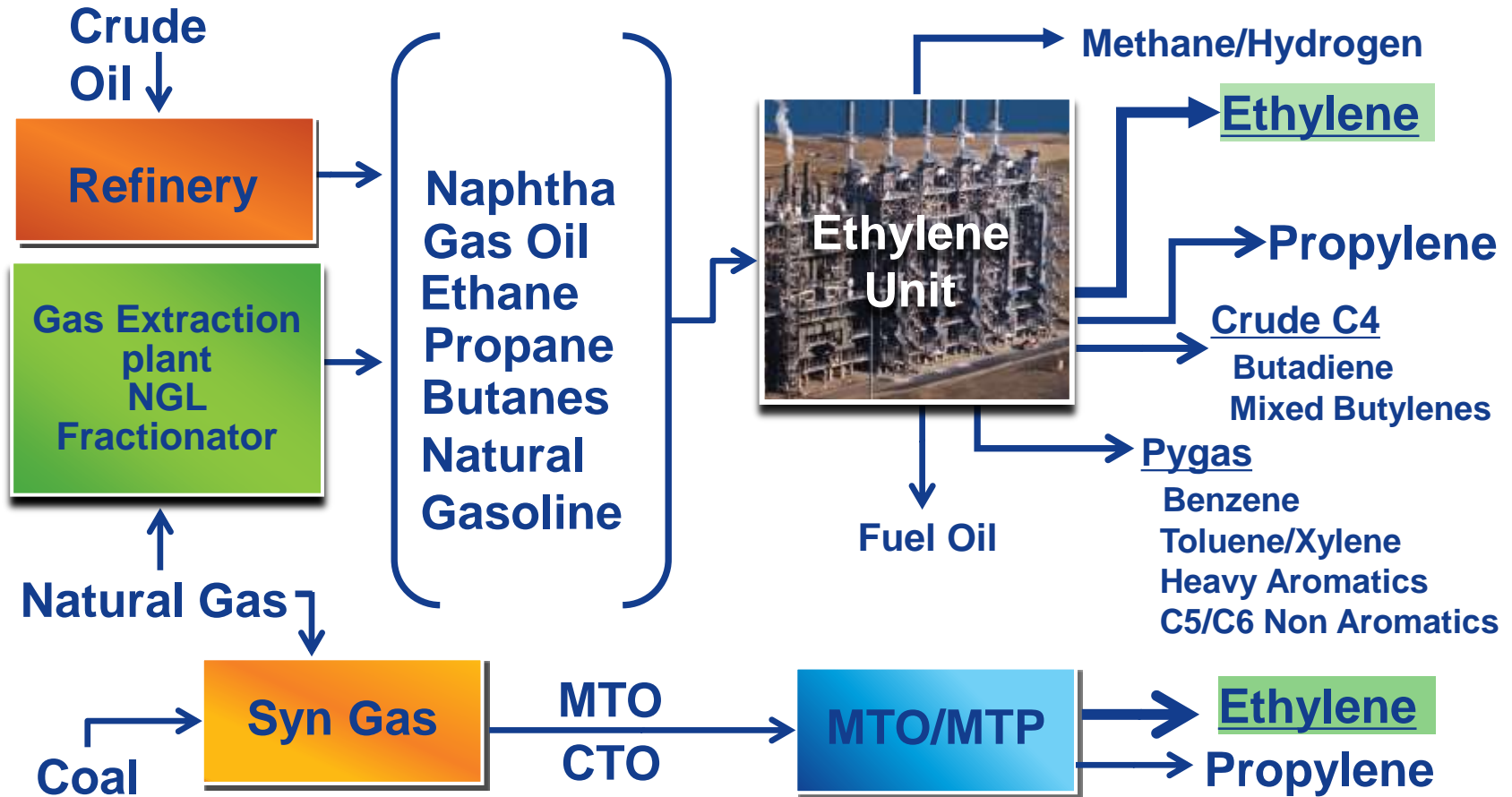
Supply:

Regional

Feed type

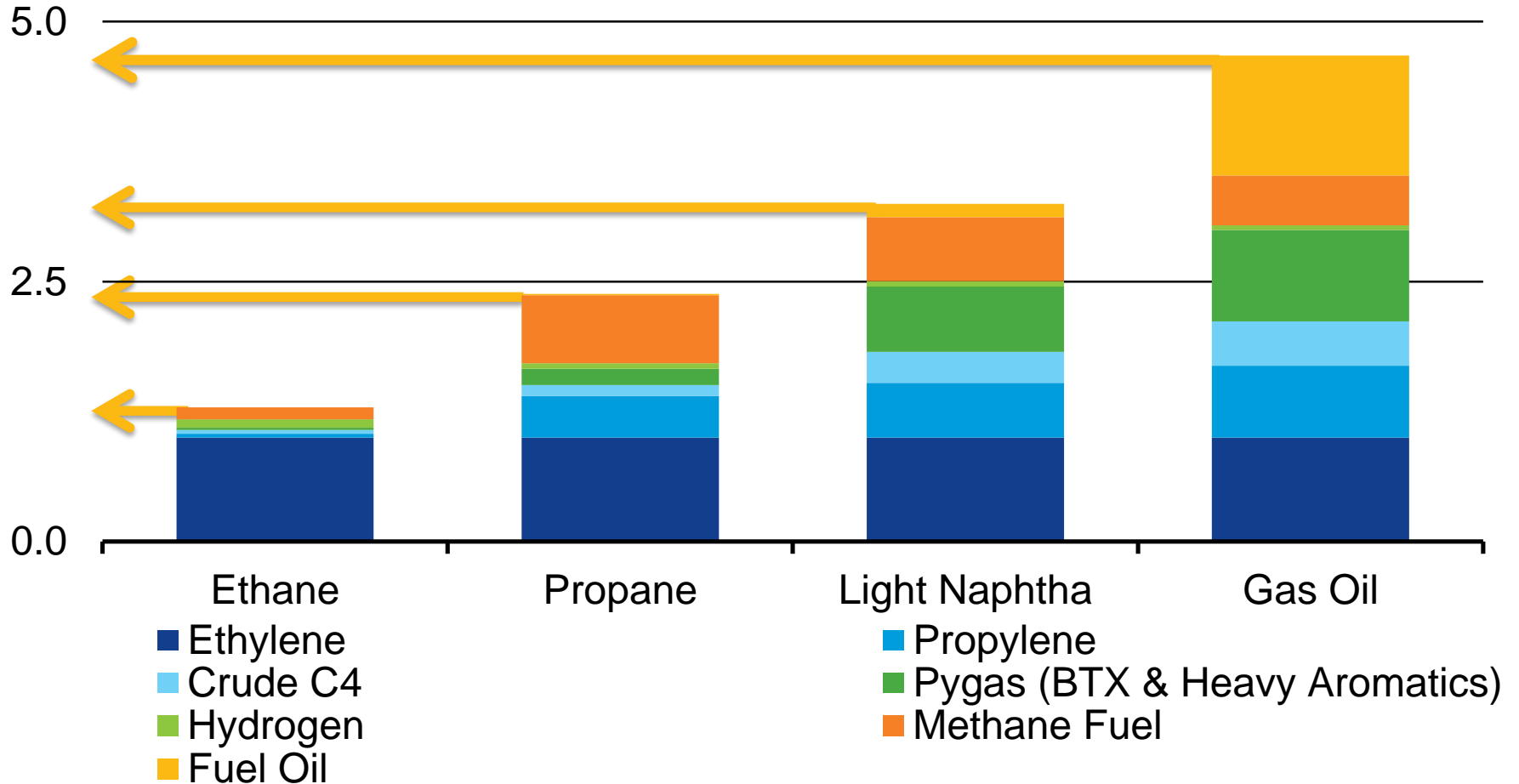
Trade

Primary Ethylene Production Routes

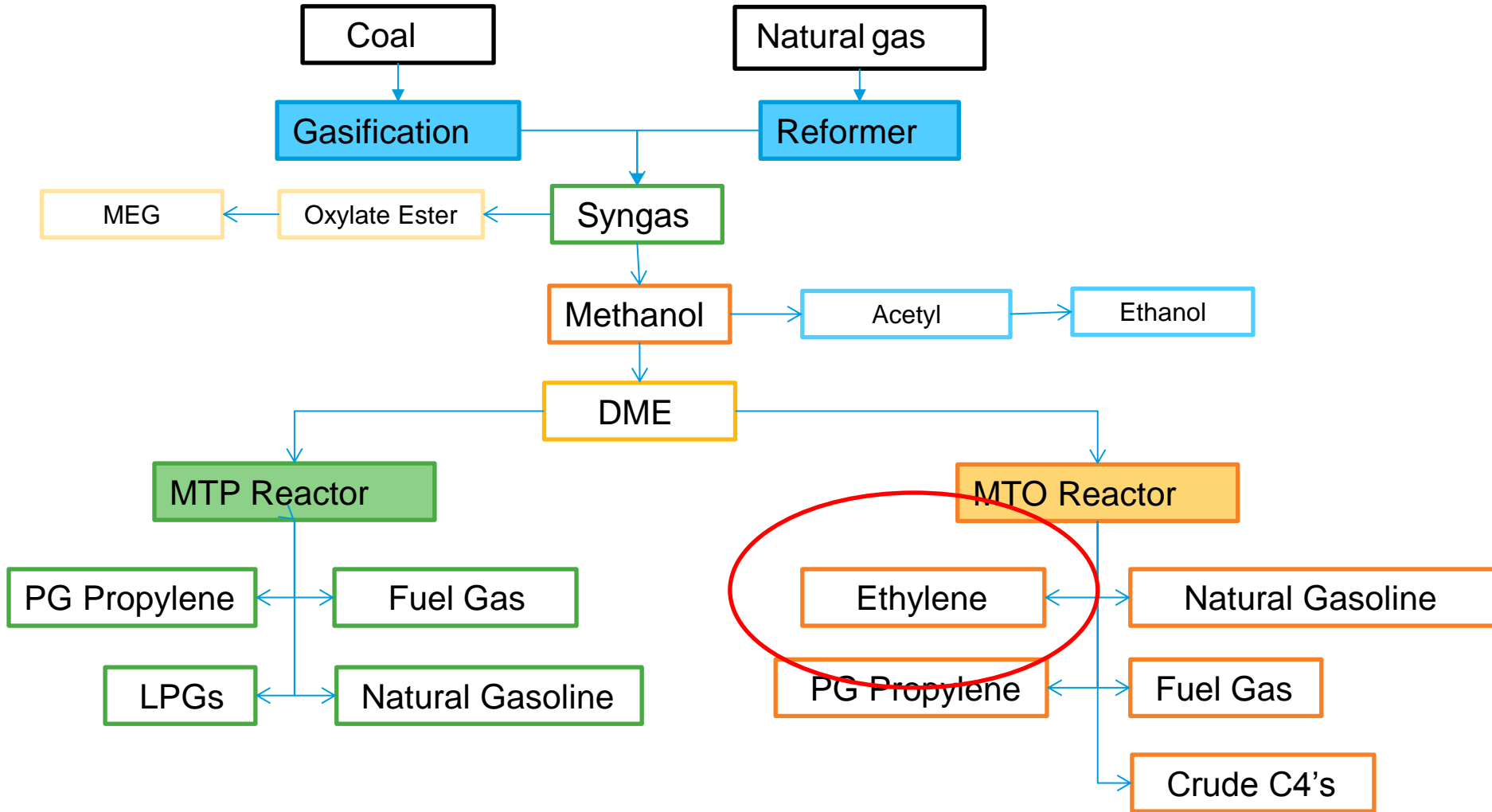


Cracker: Co-Product Yields and Feed Rate

Ton/Tons of Ethylene



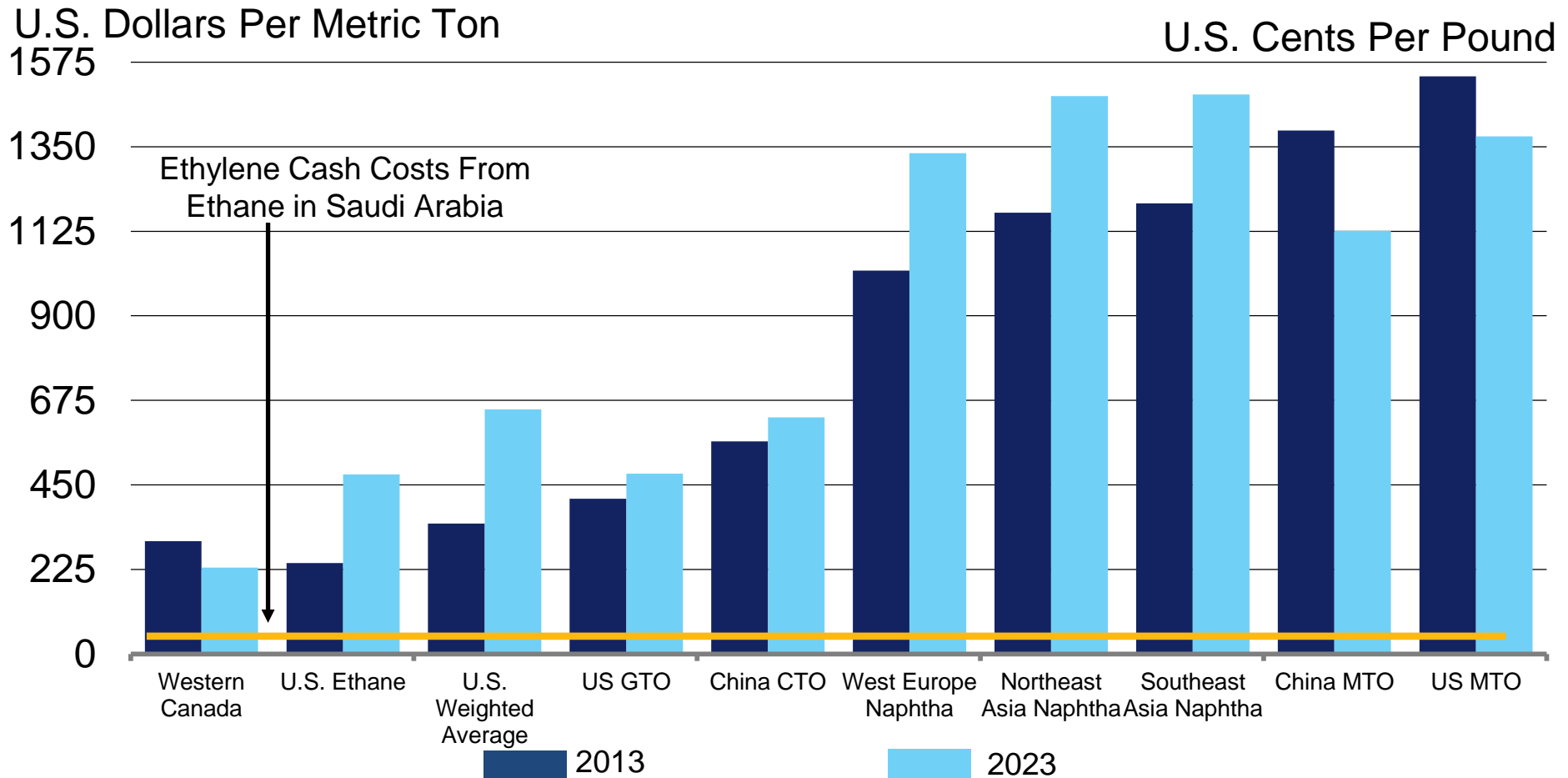
Process Flow: Coal and Natural Gas to Olefins



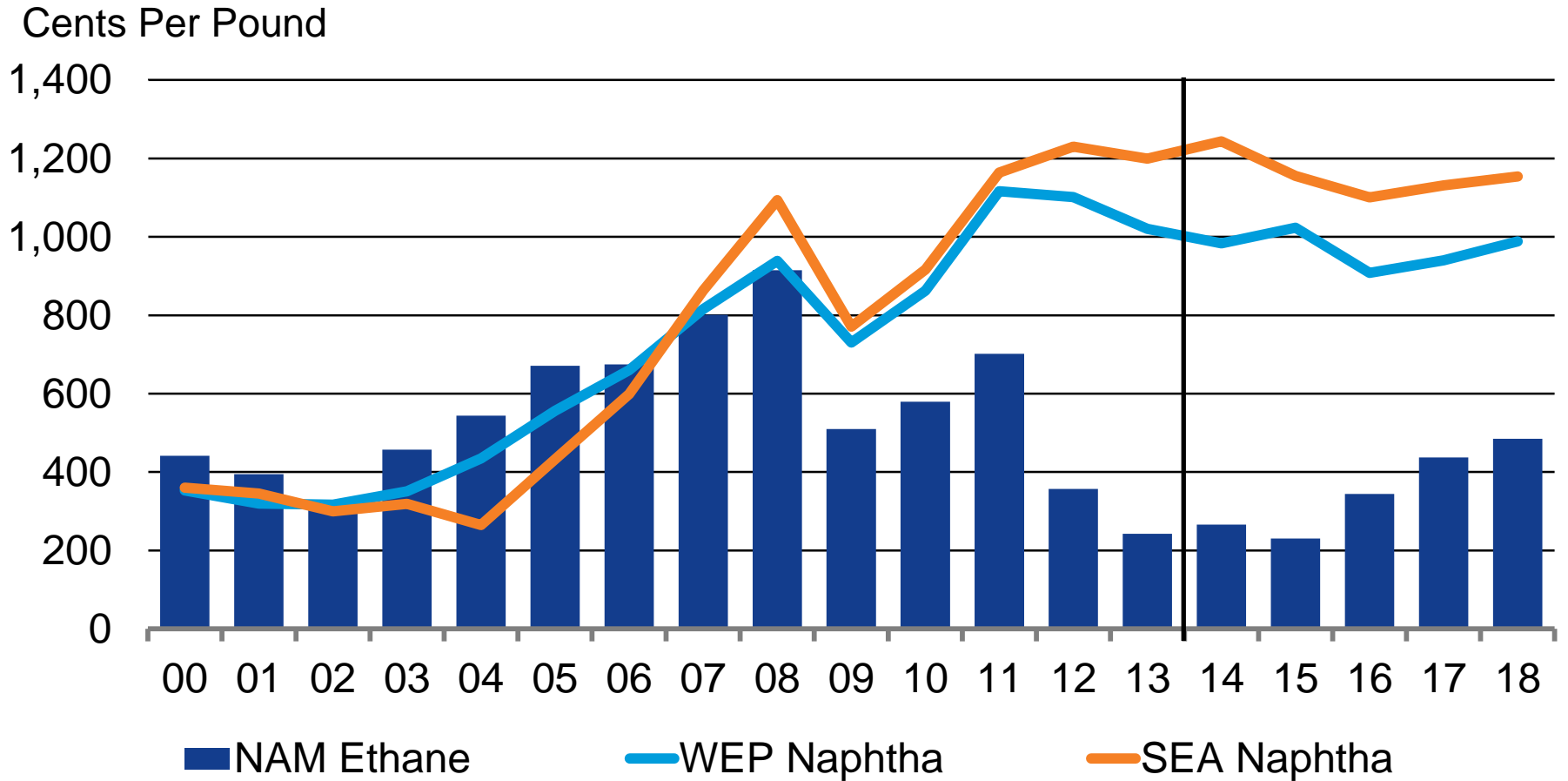
Ethylene Cash Cost Snapshot

Different Technologies around the world

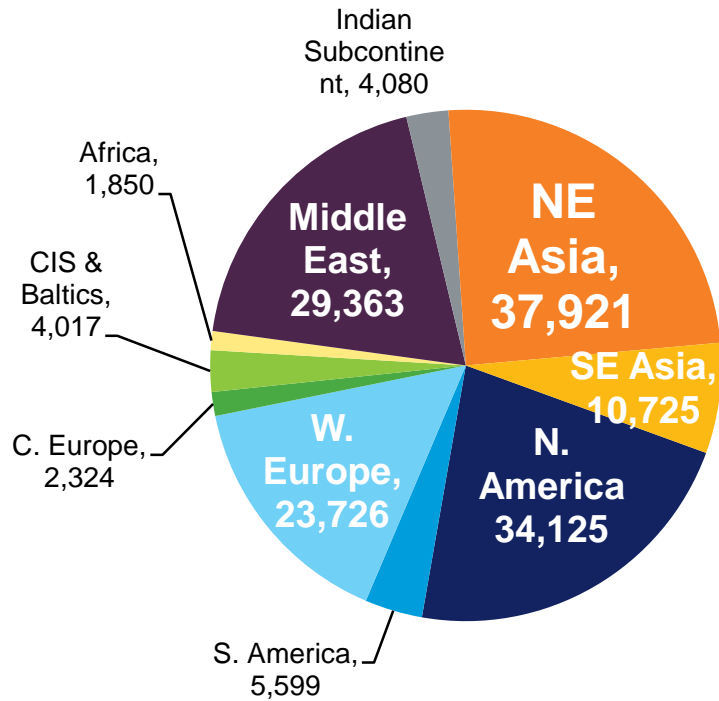
(Cash cost = Feed + VC + FC – co-product)



Regional Ethylene Cash Costs

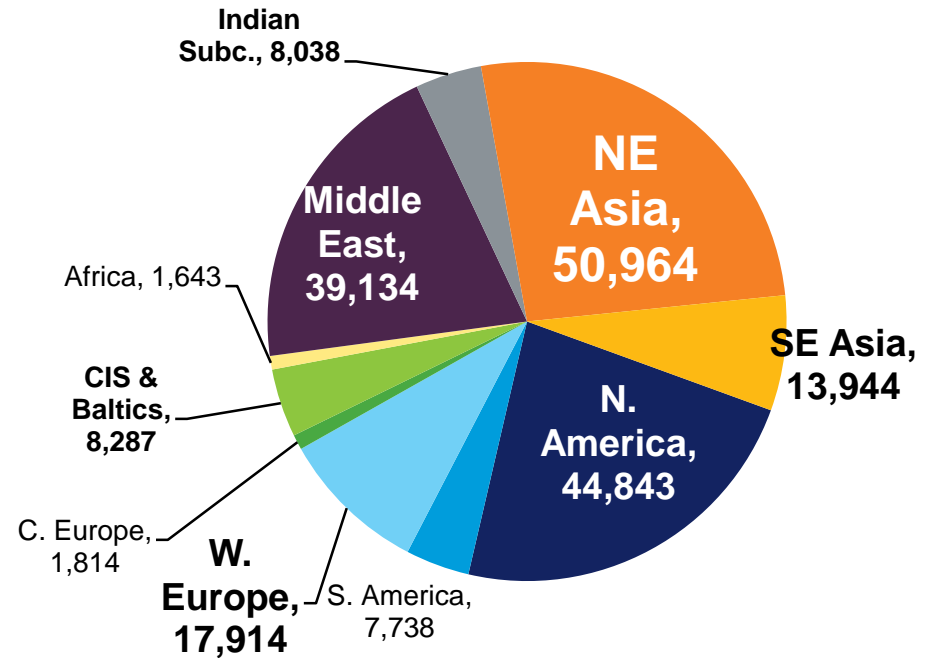


Ethylene Demand



133 Million Metric Tons

2013



194 Million Metric Tons

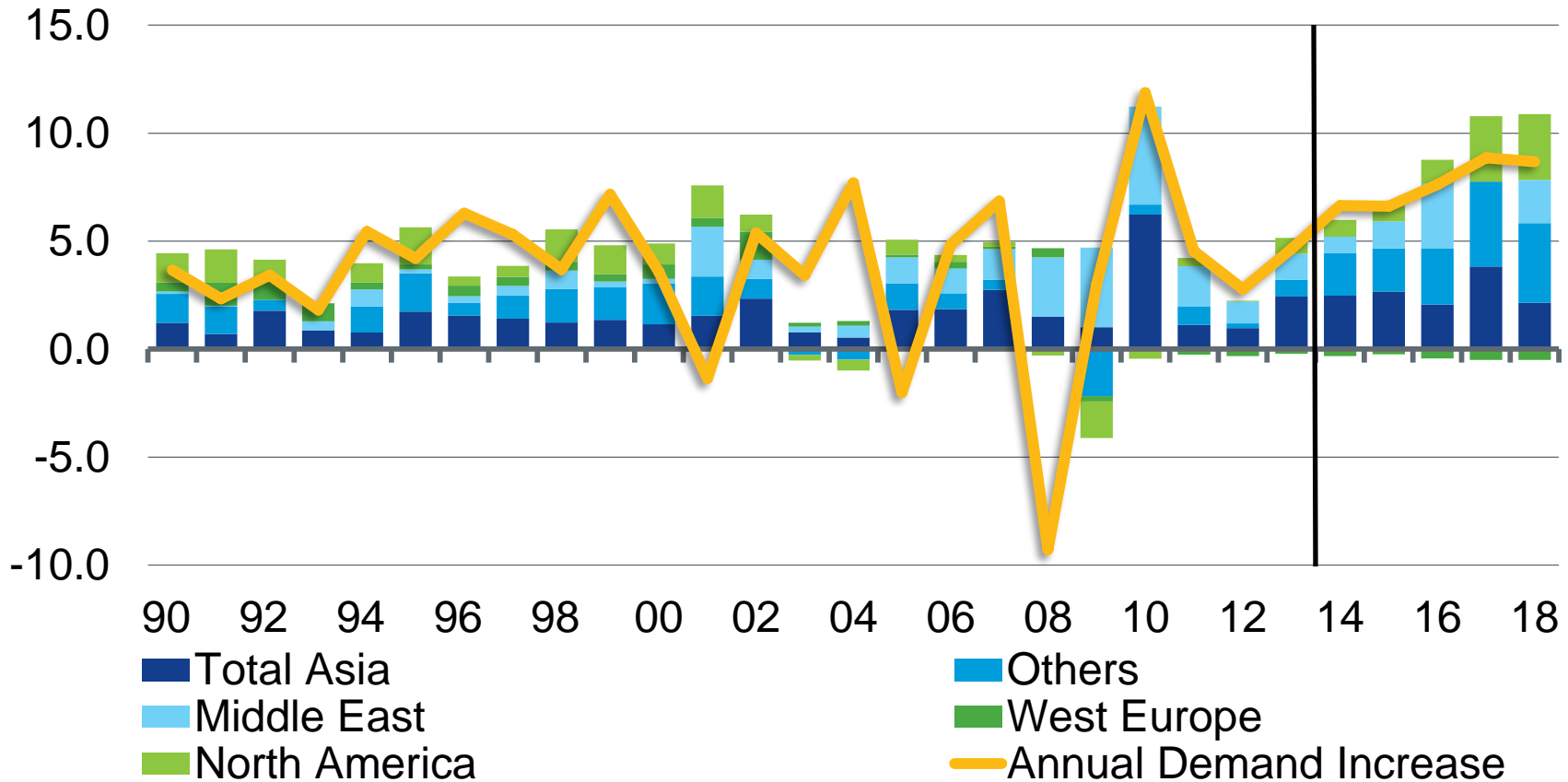
2023



Ethylene Capacity Additions

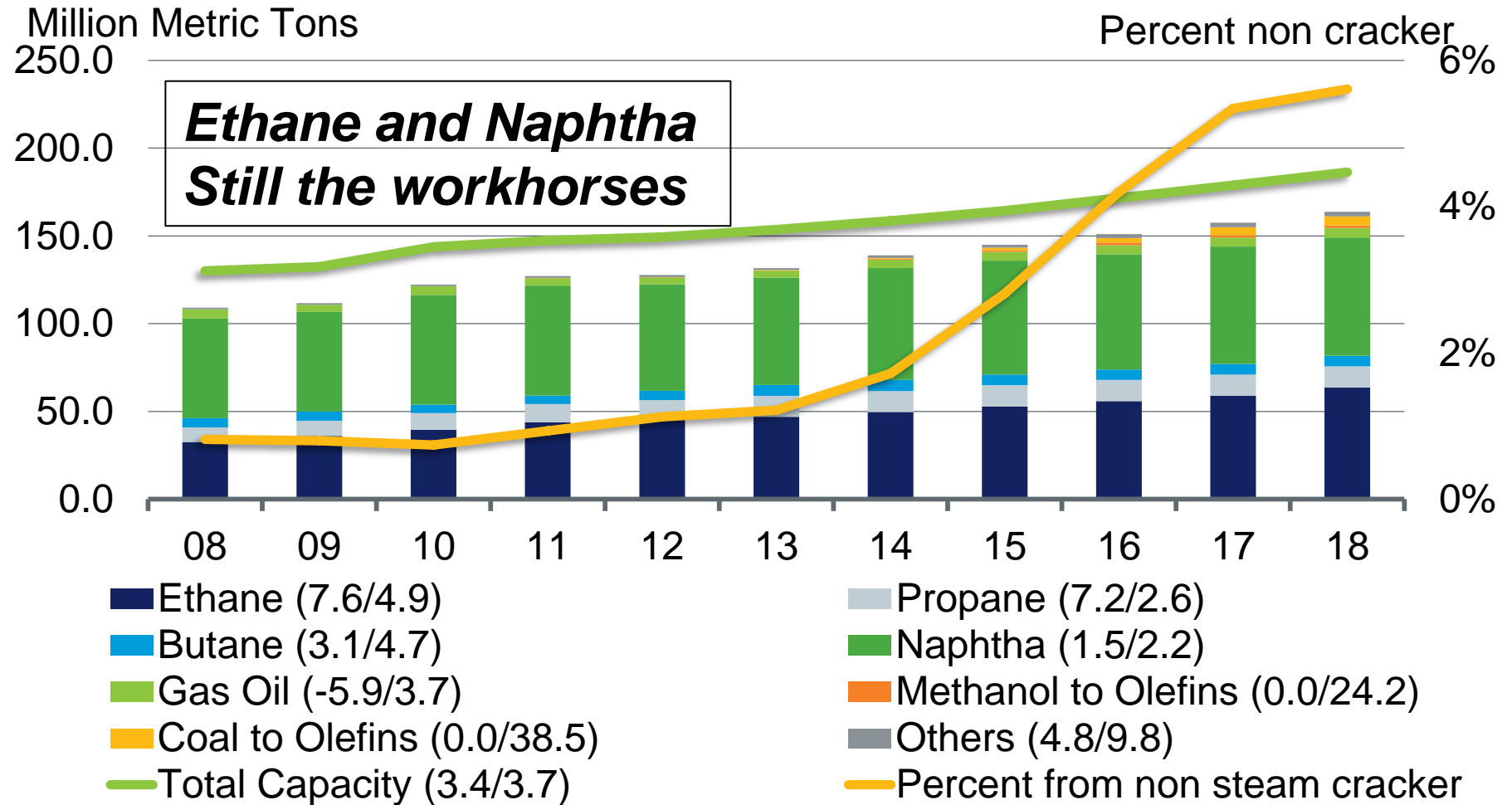
Capacity additions in sync with demand growth forecast

Million Metric
Tons



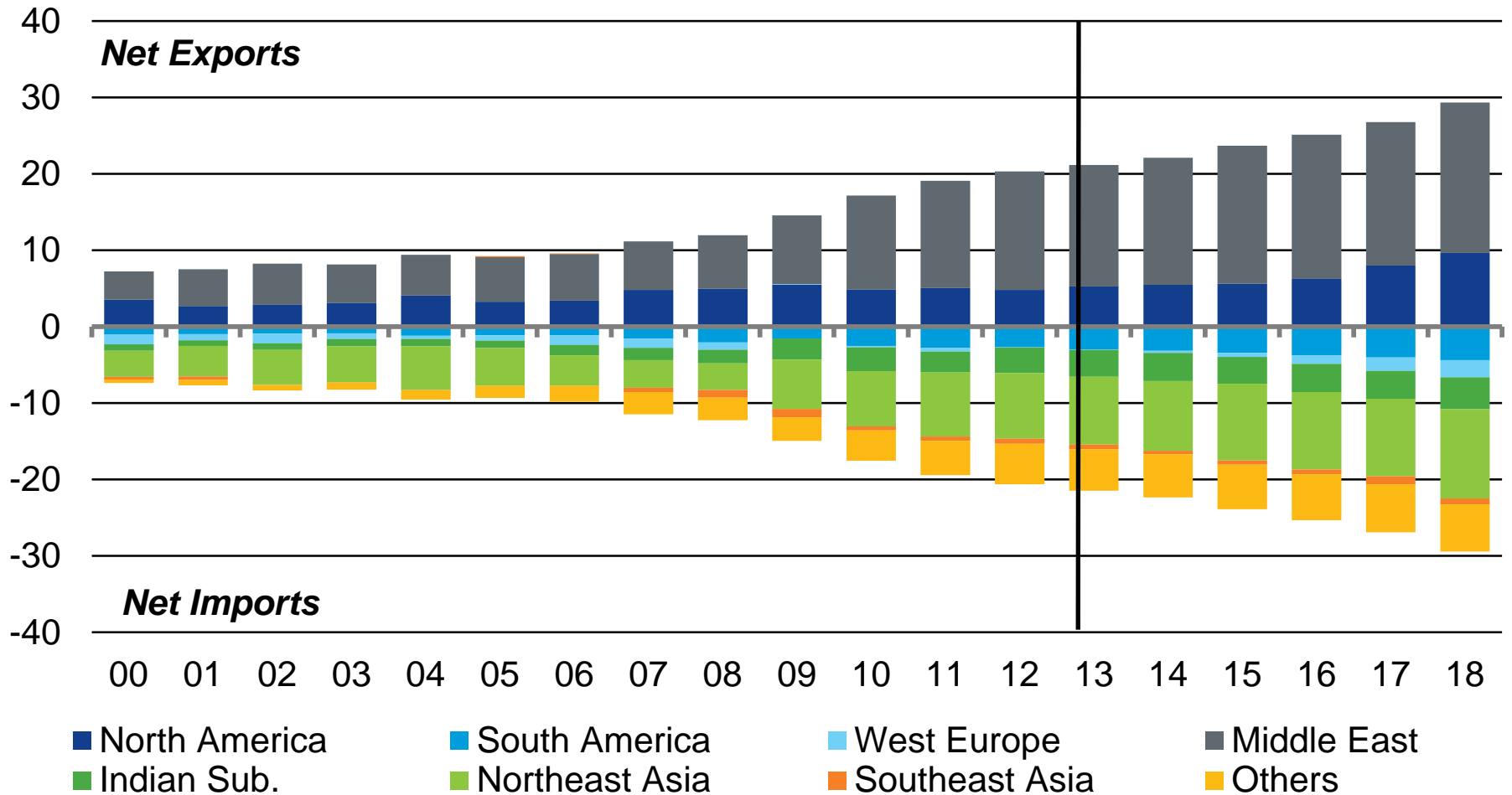
Global Ethylene Supply

Capacity, Feed Stock, and Percent Production from non-Traditional Sources



Low Cost Regions Will Push Excess Supply To Other Regions

Million Metric Tons



Deep Dive into North America

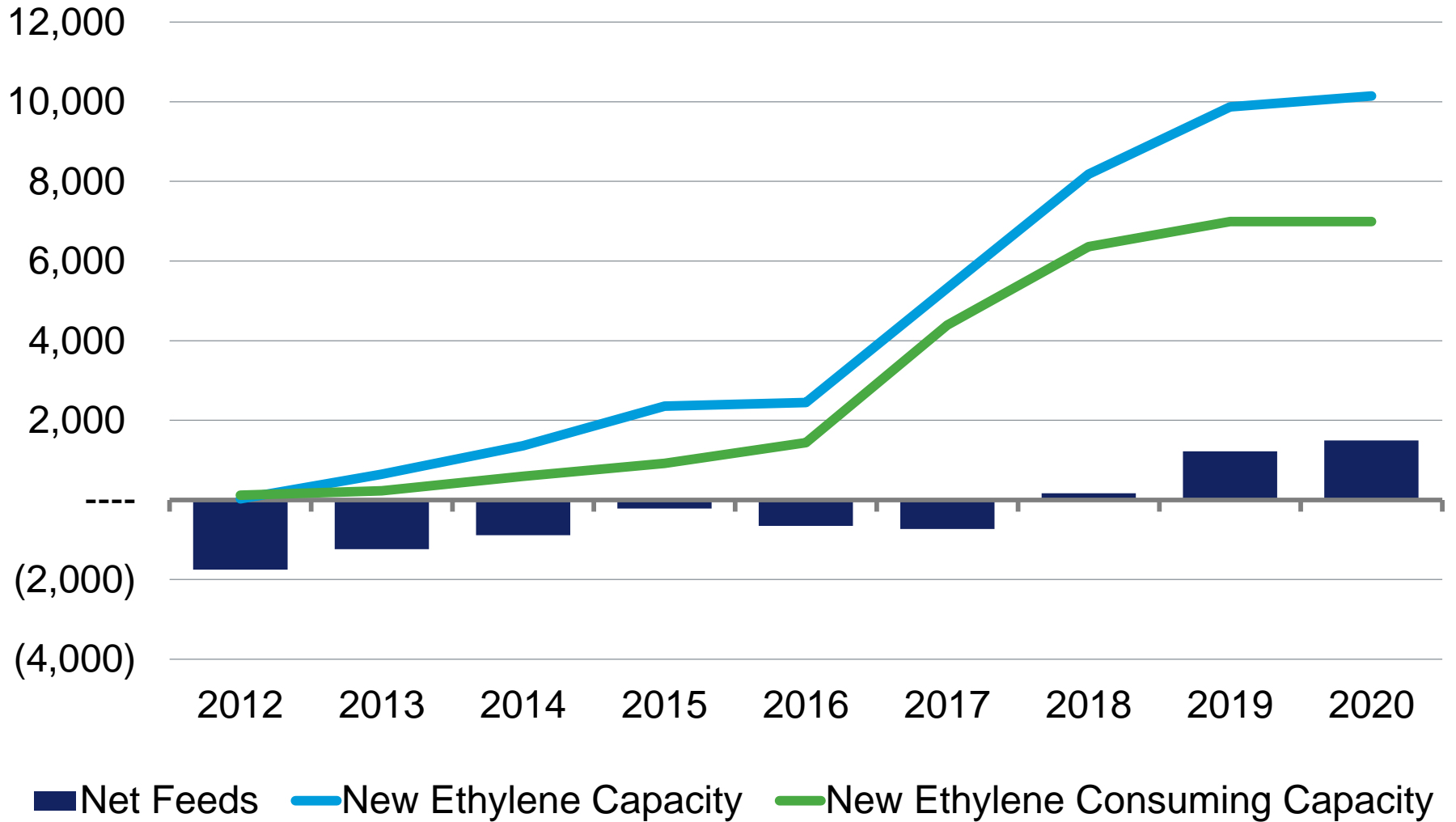
Unprecedented capacity additions in North America due to ample ethane supply

<u>Ethylene Capacity Additions</u>									<u>Total Additions</u>
Projected North American Ethylene (2014 - 2020) (Thousand Metric Tons per Year)		<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>through 2020</u>
<u>Company</u>	<u>Location</u>								
BASF/Total	Port Arthur, TX	170							170
ChevronPhillips	Cedar Bayou, TX				150	1350			1500
	Freeport, and								
Dow	Plaquemine		220		600	900			1720
Eastman	Longview, TX	17							17
Equistar	All Locations	385	114	363					862
ExxonMobil	Baytown, TX					750	750		1500
FHR	PT Arthur		100						100
Formosa	Point Comfort, TX					1150			1150
Oxy/Mexichem	Ingleside, TX					137	413		550
Sasol	Lake Charles, LA					387	1163		1550
Westlake	All Locations	94	122						216
Williams	Geismar, LA		258						258
Braskem Idesa	Mexico			1000					1000
Nova	Sarnia				168				168
	Firm:	666	814	1363	918	4674	2326	0	10761

Capacity addition announcement continue

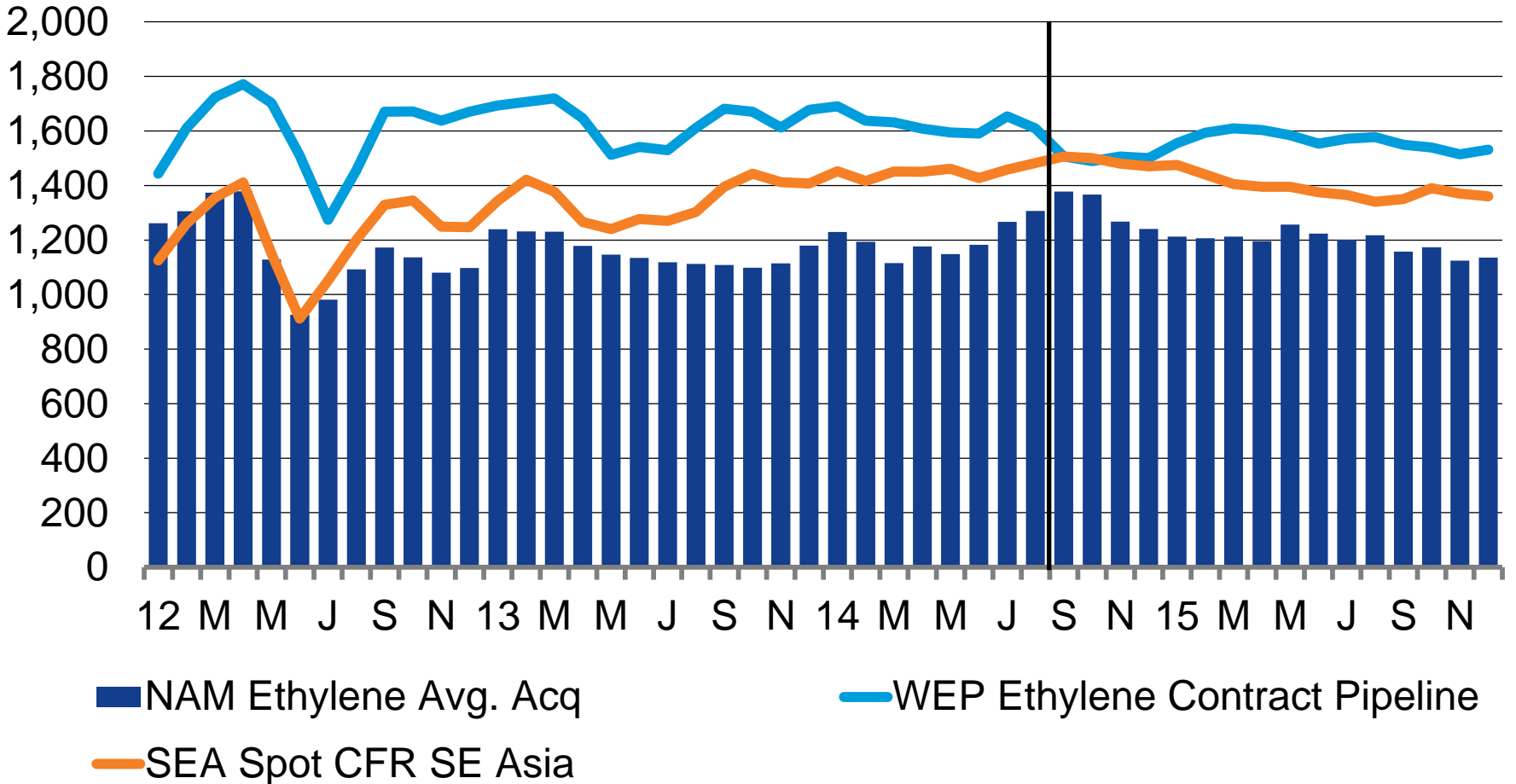
<u>Ethylene Capacity Additions</u>											<u>Total Additions</u>
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<u>Company</u>	<u>Location</u>										
Aither Chemicals	WV.					200					200
Appalachian Resins	Salem Township, OH				275						275
Ascent	WV.				1000						1000
Axiall/Lotte	Lake Charles, LA				500	500					1000
Formosa	Louisiana						0				0
Hanwha	TBA							1000			1000
PTTCG	TBA							1000			1000
ShinTech	Louisiana					500					500
Shell	Monaca, PA					1500					1500
Total	TBA						1000				1000
Williams	Geismar, LA					750	750				1500
Other 2											0
	Announced:	0	0	0	1775	3450	1750	2000	0	0	8975

US – Capacity Integration



Global Ethylene Prices

\$US Per Metric Ton



PROPYLENE

Technology

Cost and Margins

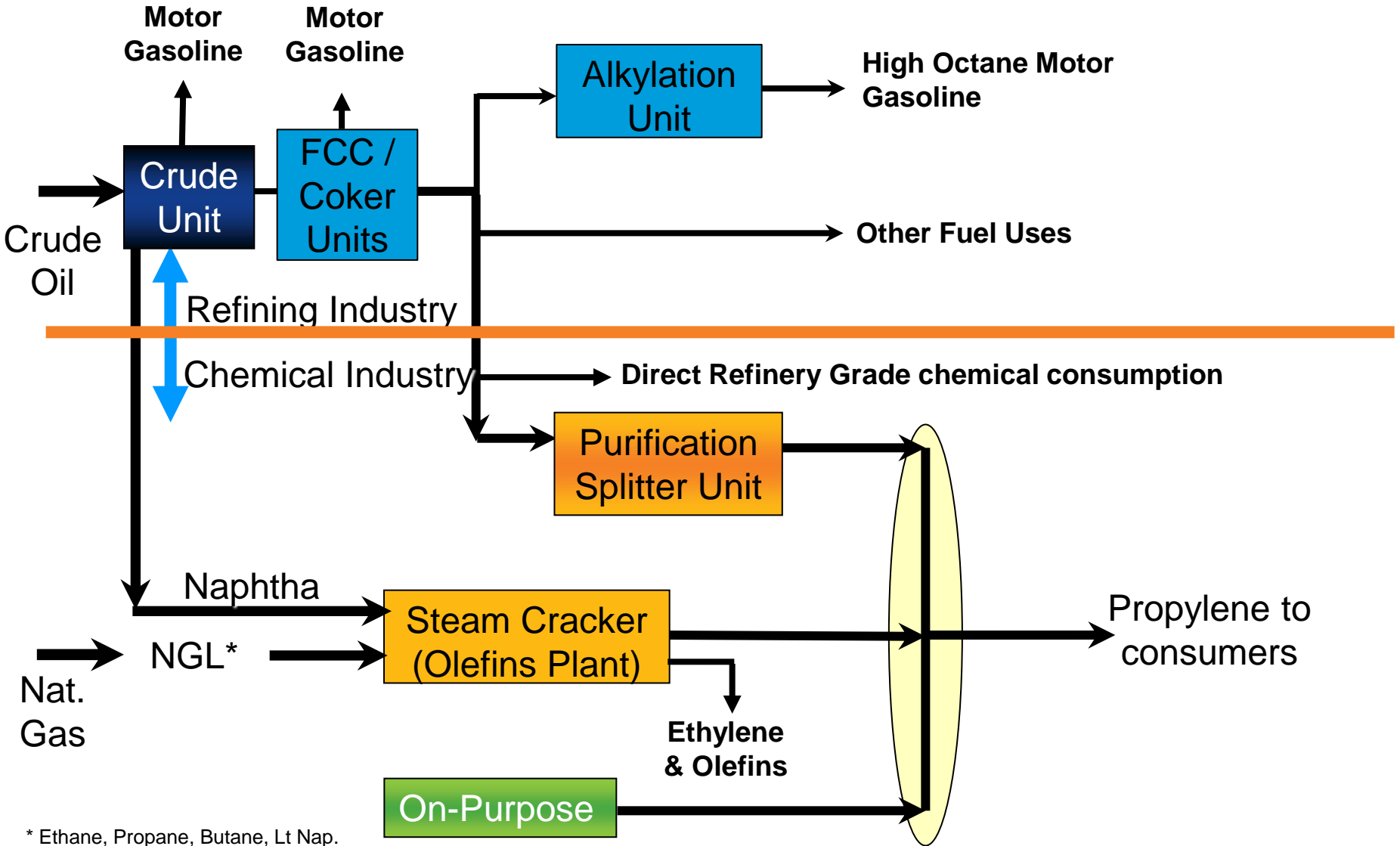
Supply:

Regional

Feed type

Trade

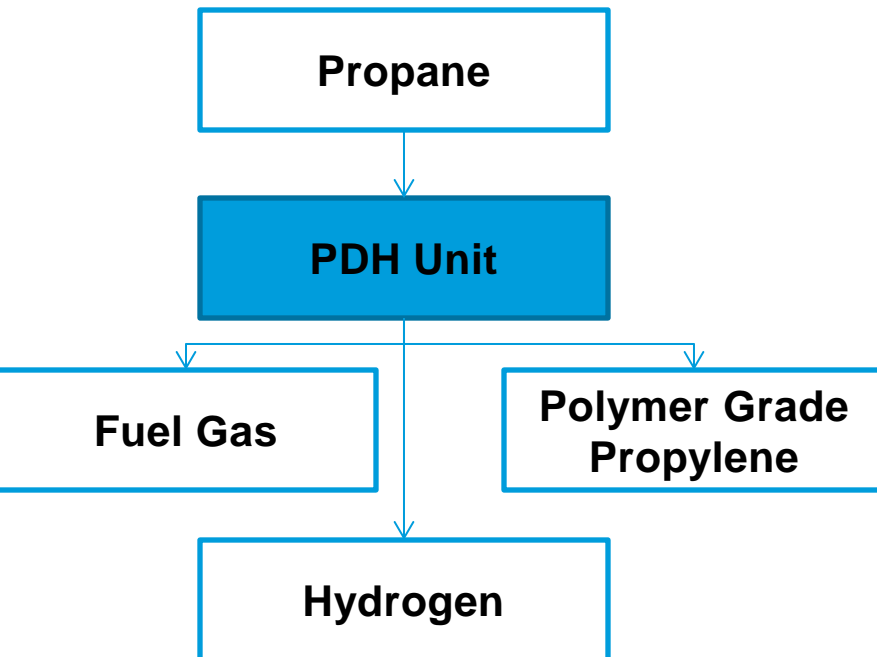
Key Routes to Produce Propylene



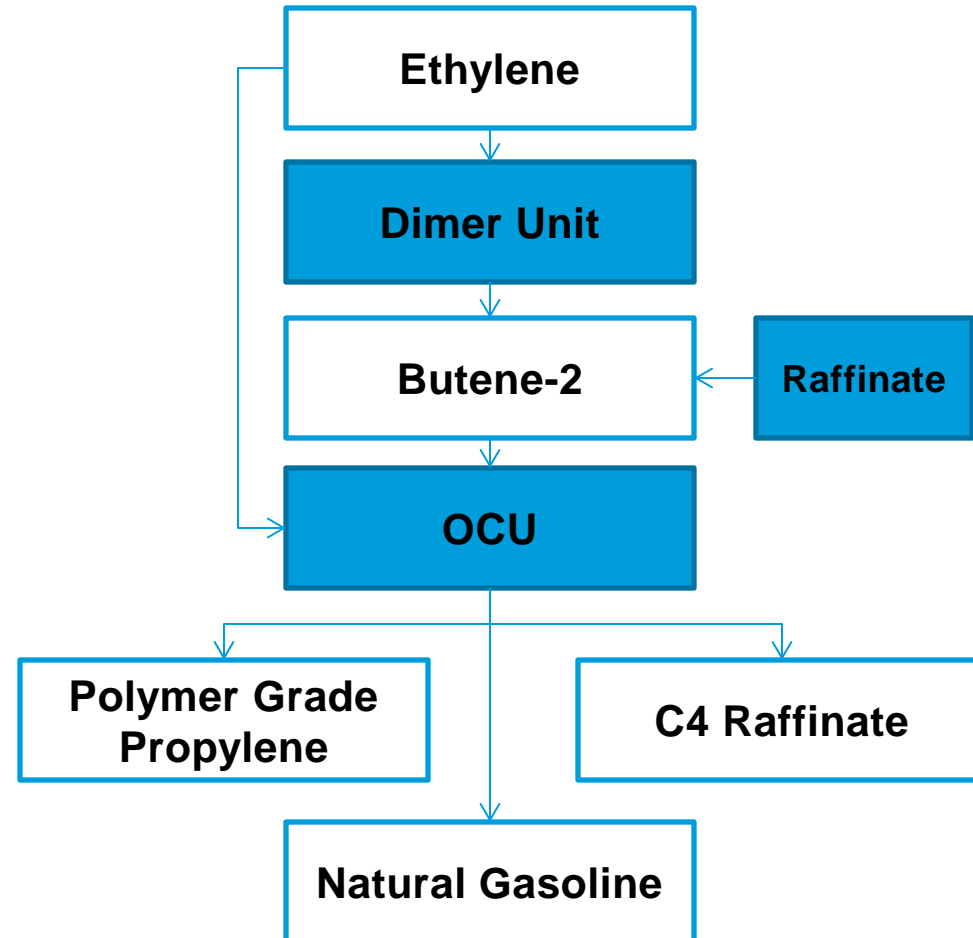
* Ethane, Propane, Butane, Lt Nap.

On-Purpose Propylene Production

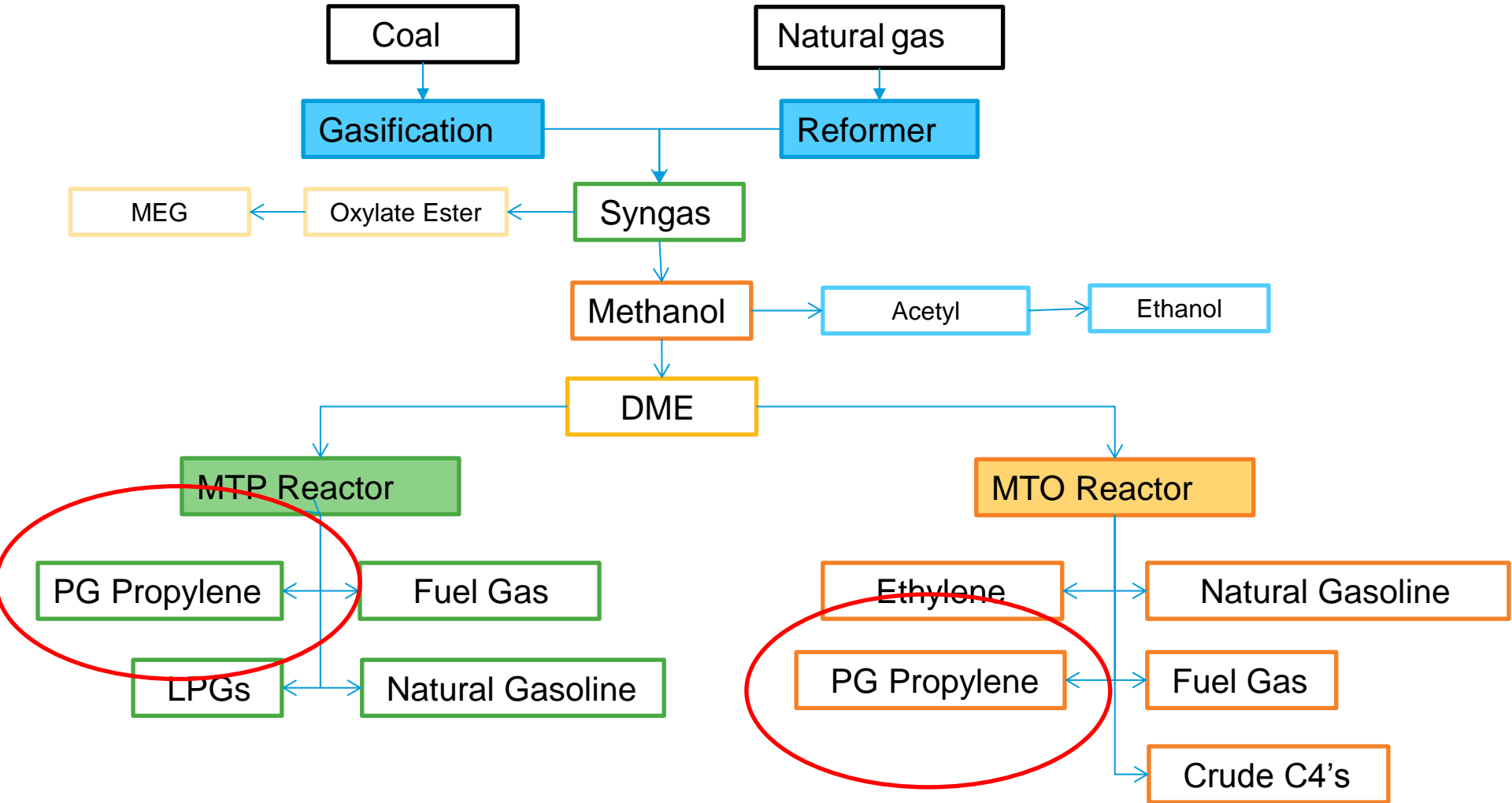
PDH block flow



Metathesis dimerization block flow



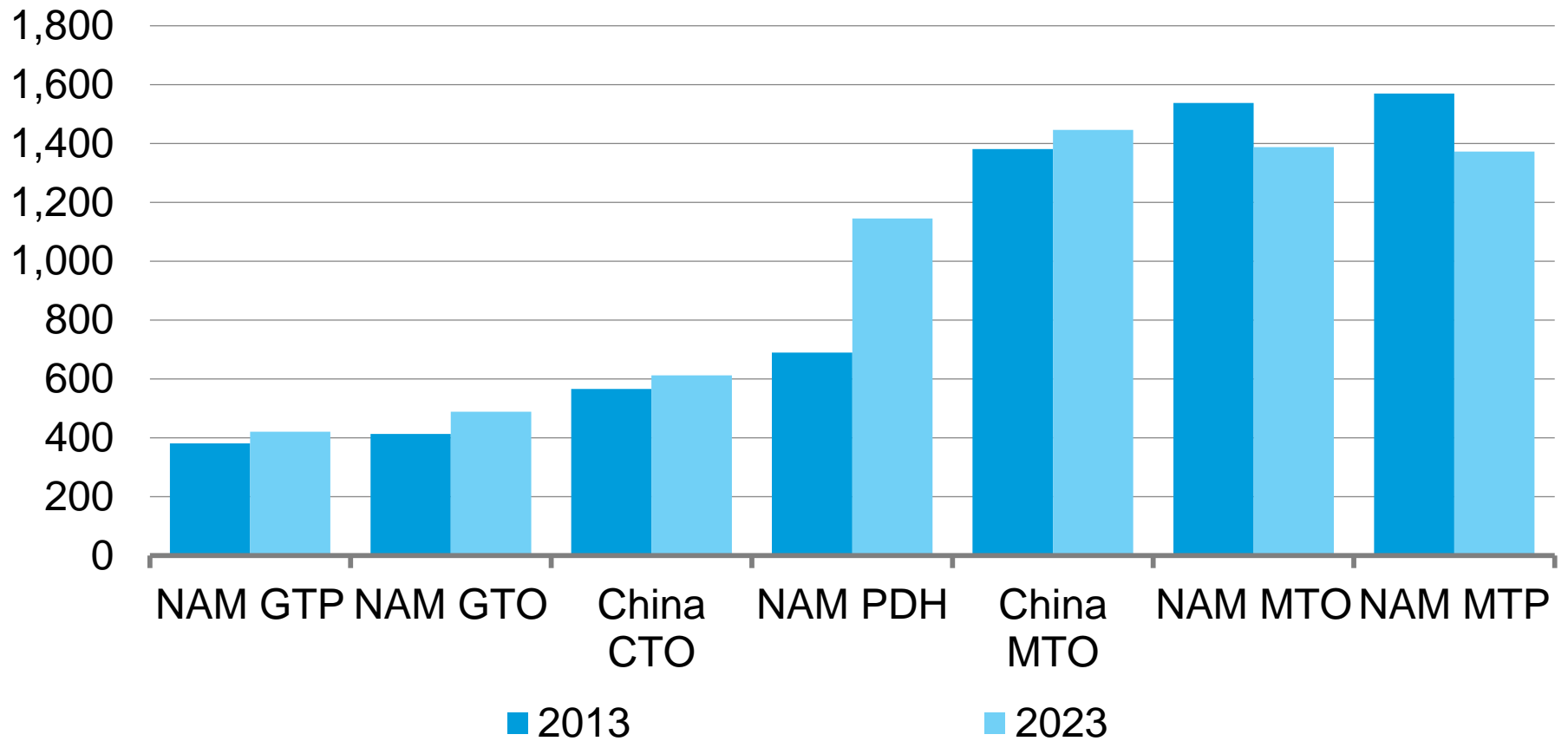
On-Purpose: Coal and Natural Gas to Olefins



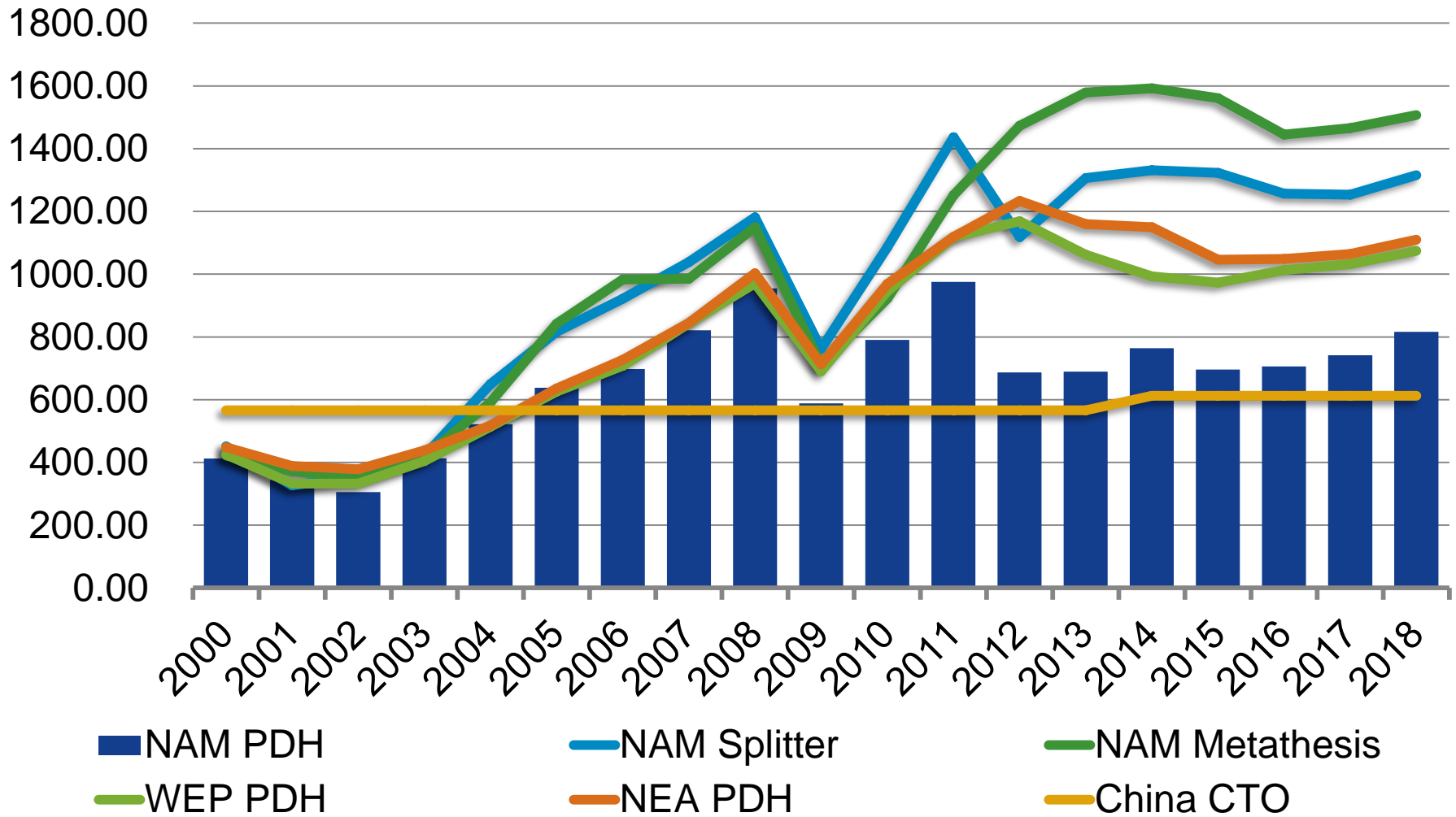
Propylene Market View

US PDH Margins Attracting New Investment –2013 cash costs

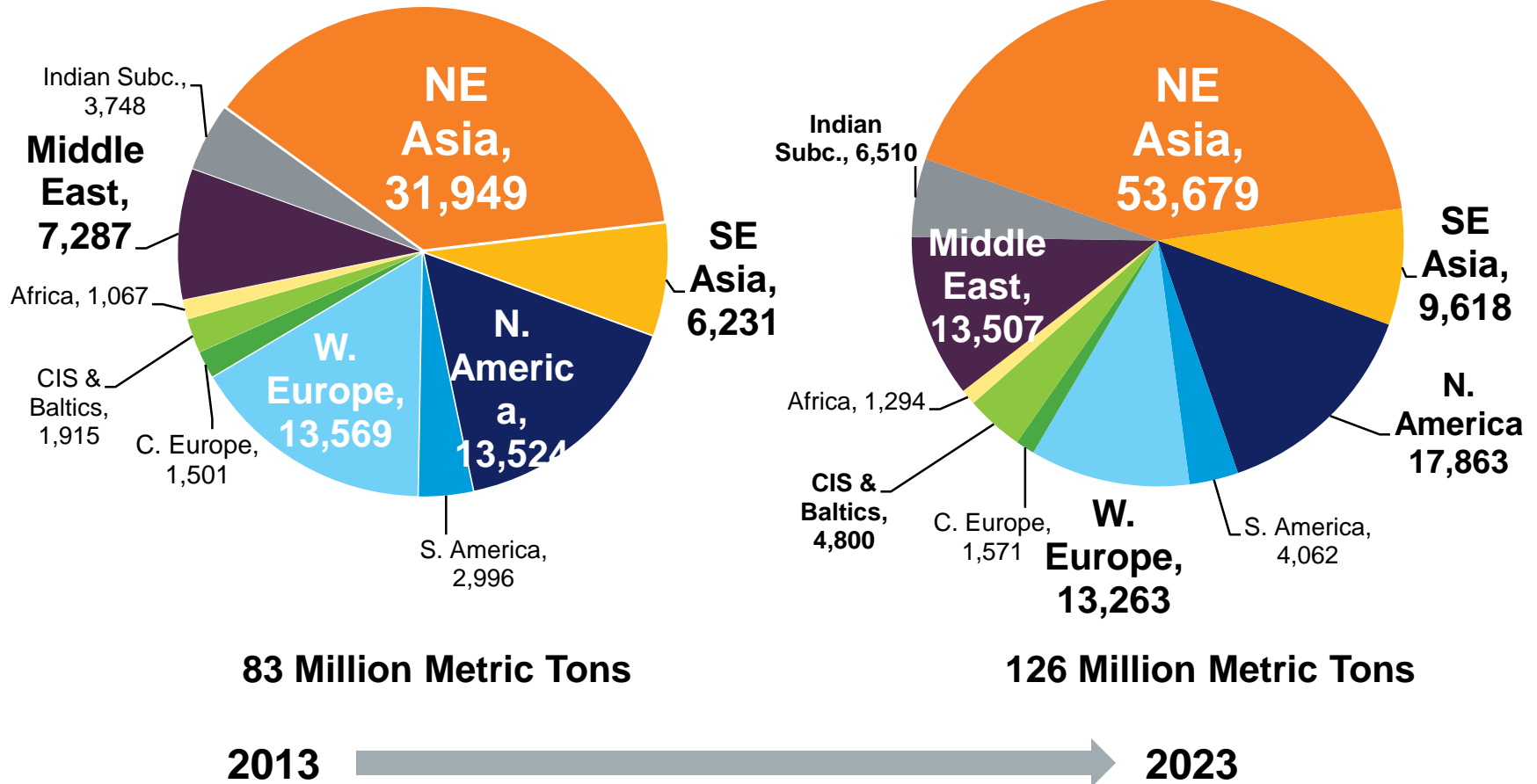
\$US Per Metric
Ton



Propylene Cash Costs

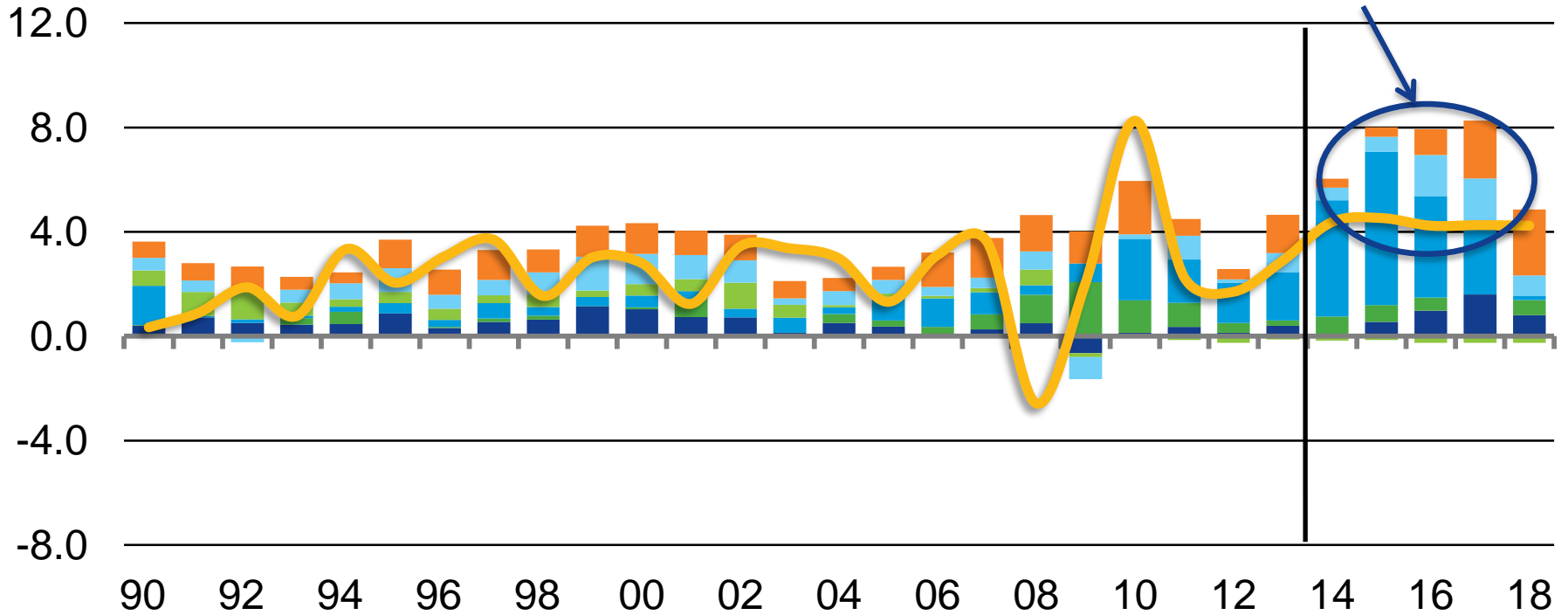


Propylene Demand



Global Propylene Capacity Additions

Million Metric Tons

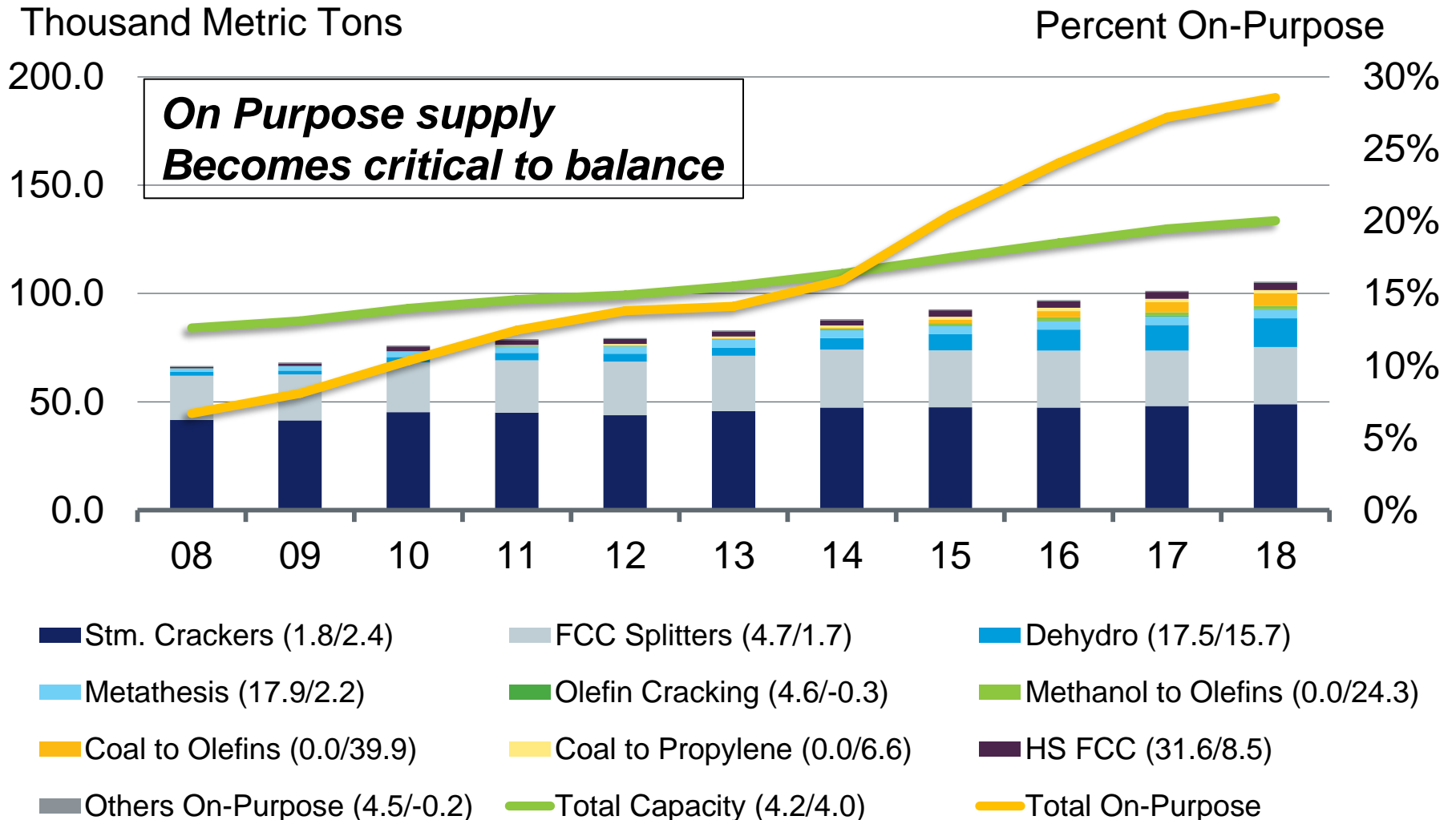


■ North America
■ China
■ Others

■ Middle East
■ West Europe
■ Other Asia

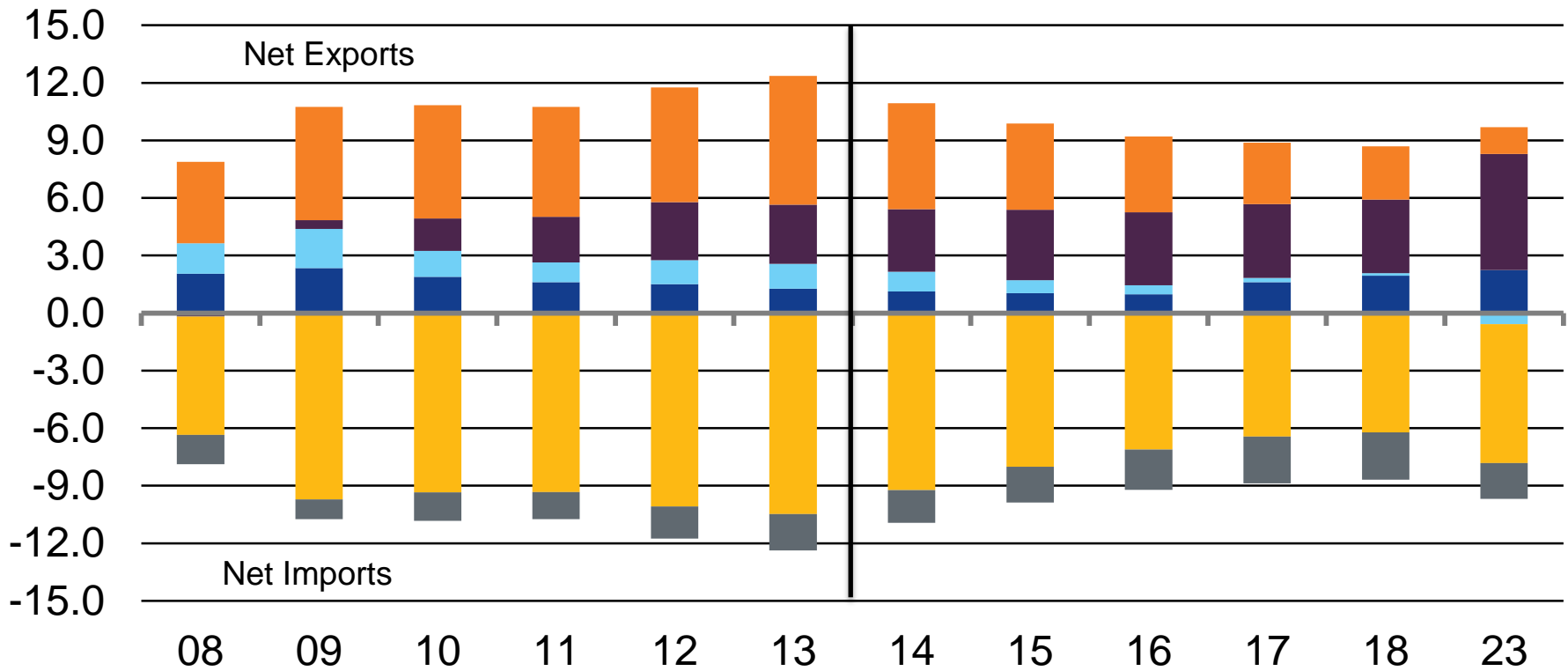
Global Propylene Supply

Capacity, Source, and Percent Production from non-Traditional Sources



Global Propylene Net Equivalent Trade

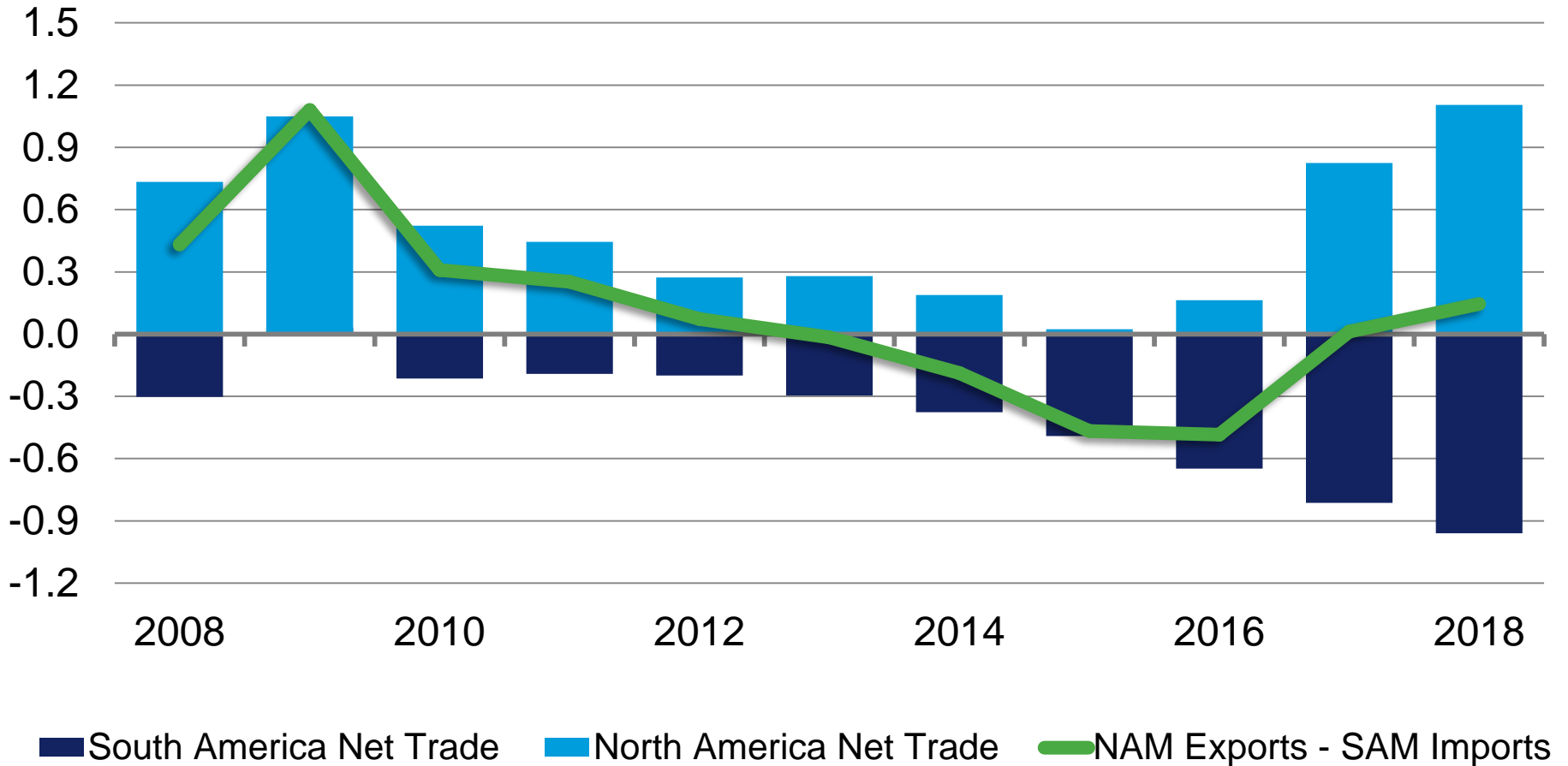
Million Metric Tons



■ North America
 ■ West Europe
 ■ Middle East
 ■ Asia (Ex China)
 ■ China
 ■ Others

Polypropylene: Americas Trade Balance

Net Trade, Million Metric Tons

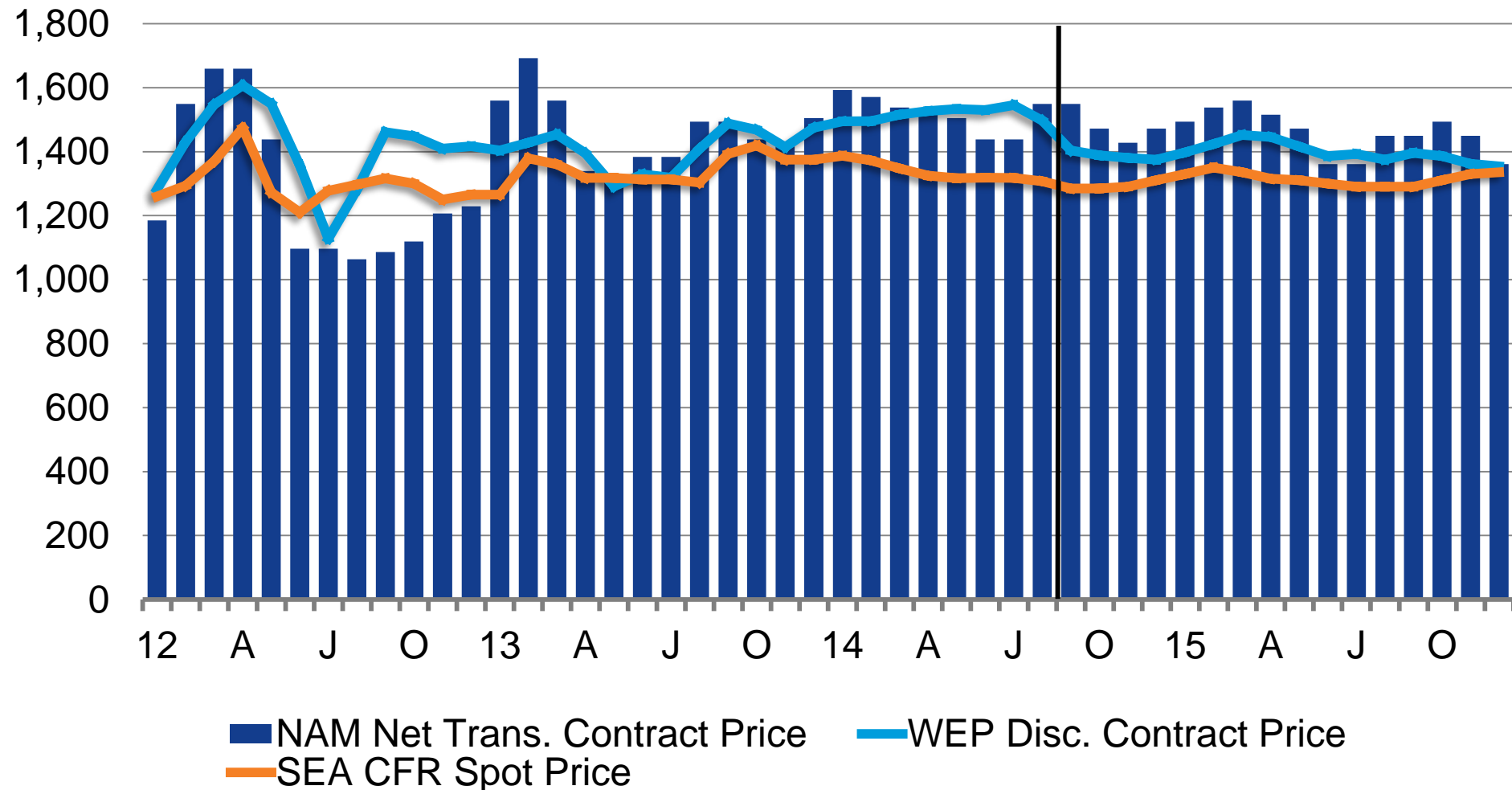


Propylene Market View



Long Term Propylene Price Forecast

Dollars Per Metric Ton



Key Take-Away: cost, demand, trade

- Regional investments are driven by:
 - advantaged feedstock **cost** (\$) or,
 - strong **demand** growth (\$).
- Ethylene and derivatives **trade flows** will grow and will flow from advantaged regions to the rest of the world.
- Propylene and derivatives' **trade flows** will be flat as capacity additions and demand growth match.

