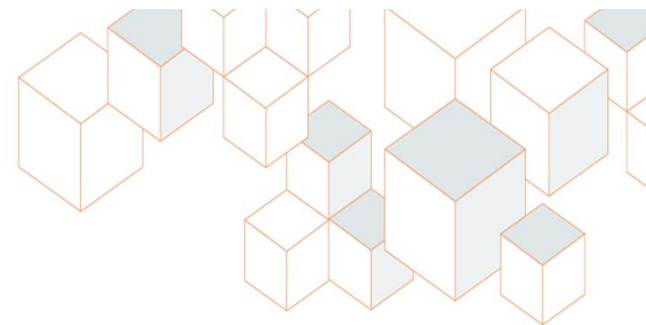


LSU Energy Summit  
*26 October 2016*



---

# Opportunities and Challenges from New Chemical and Plastics Investment

---

Martha Gilchrist Moore  
Sr. Director, Policy Analysis and Economics





## Shifting Competitive Dynamics and New Chemicals Capacity



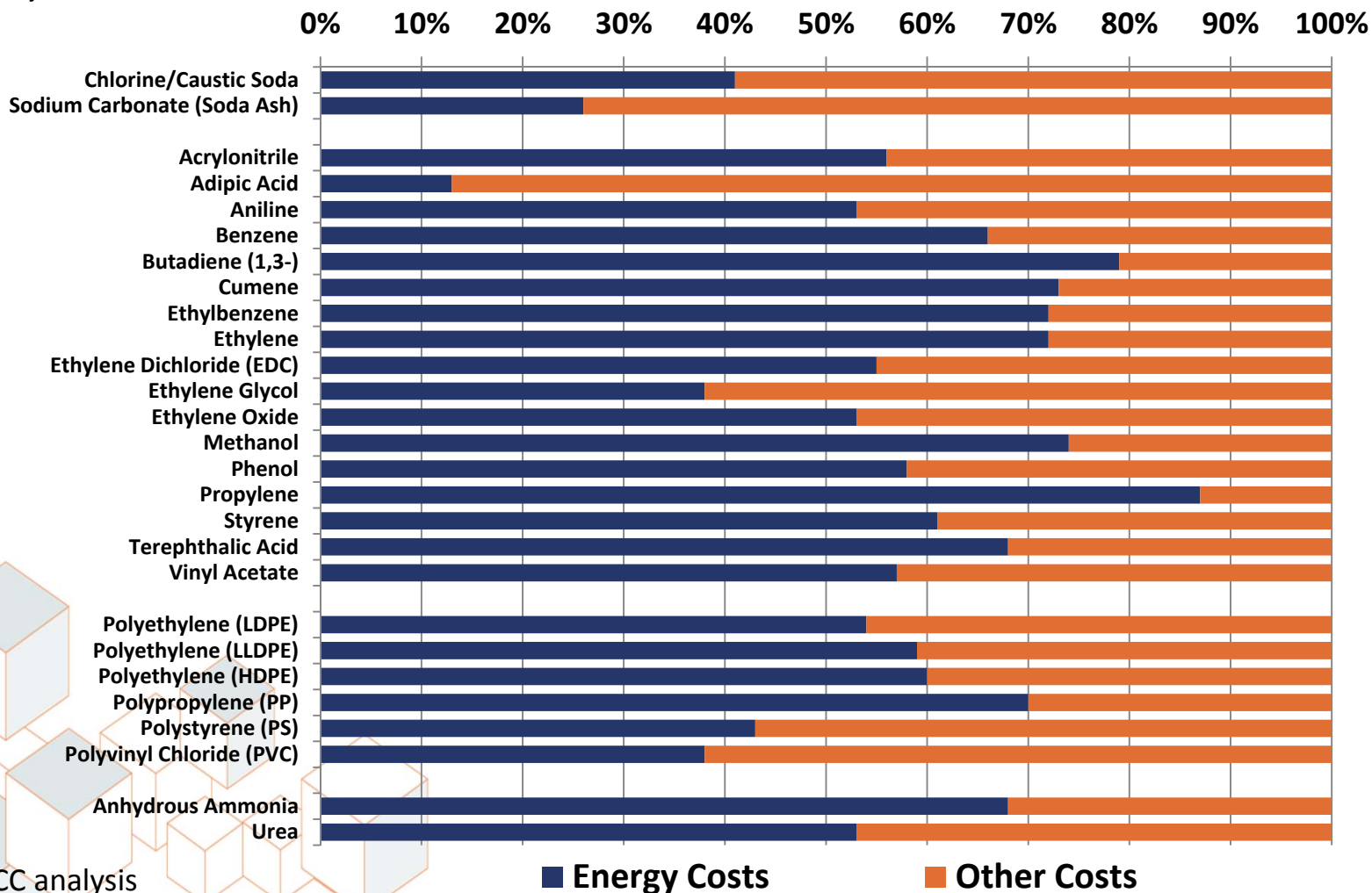
## New Investment in Chemical and Plastics Capacity



## Exports and Transportation

# The Chemical Industry is Energy-Intensive

Fuel, Power and Feedstock Costs as a Percent of Total Costs

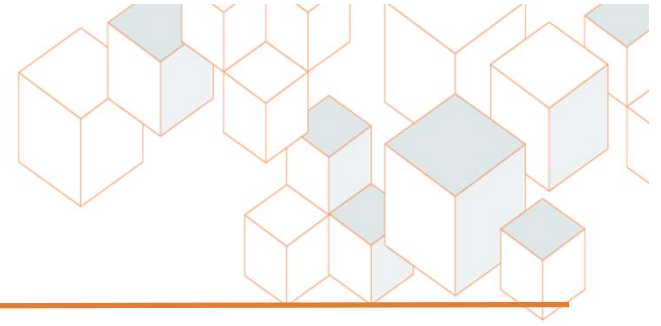


Source: ACC analysis

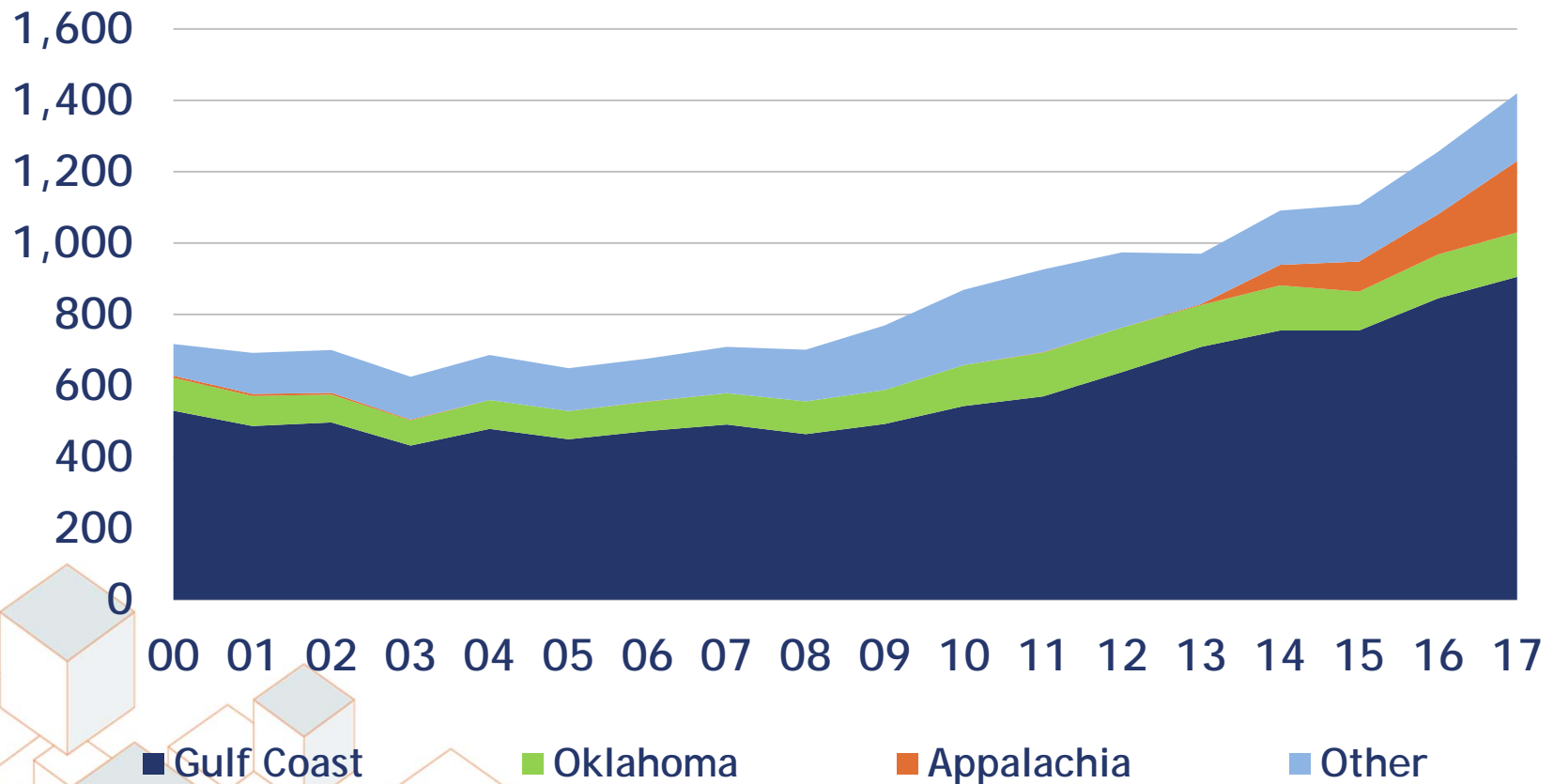
■ Energy Costs

■ Other Costs

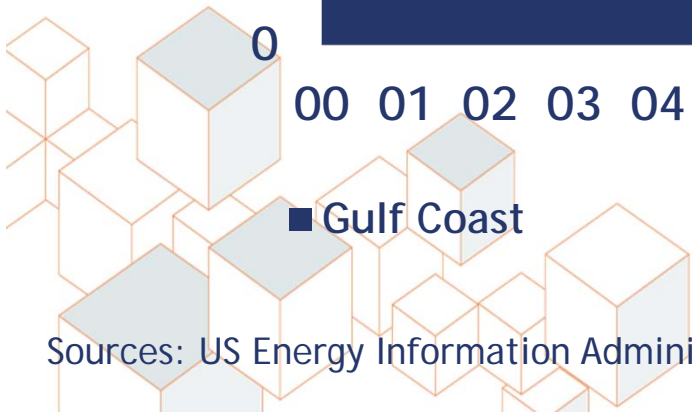
# Surging Ethane Supply



Thousand Barrels per Day

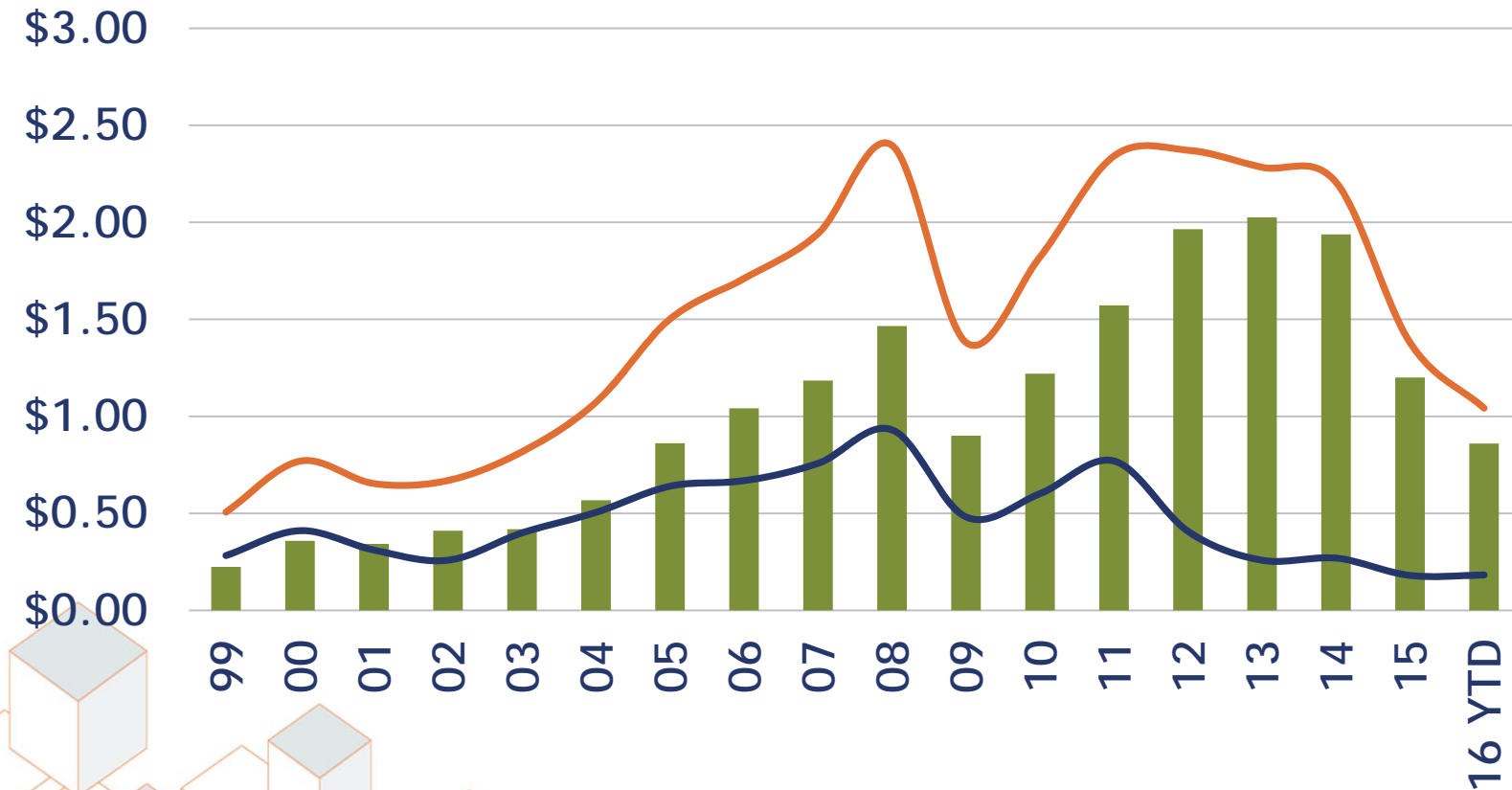


Sources: US Energy Information Administration, ACC analysis



# NA Petrochemical Competitiveness Depends on Feedstock Spread

\$/gallon

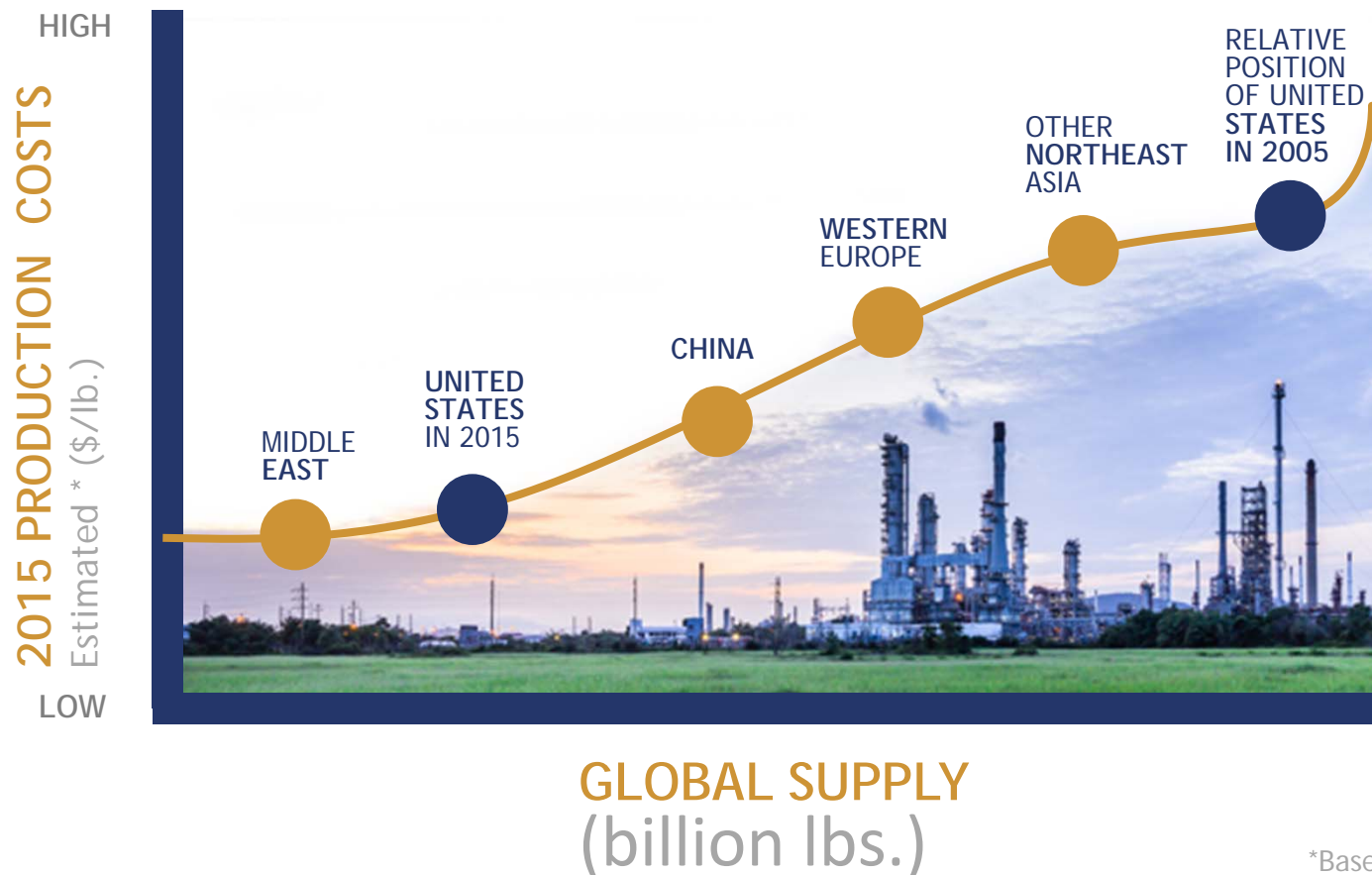


■ Spread between Naphtha and Ethane   
 — Ethane   
 — Naphtha

Sources: US Energy Information Administration, IHS Chemical Week, ICIS

# U.S. Chemical Industry Global Cost Advantage

Relative Position of U.S. (2005-2015)  
(Petrochemical Production Costs)

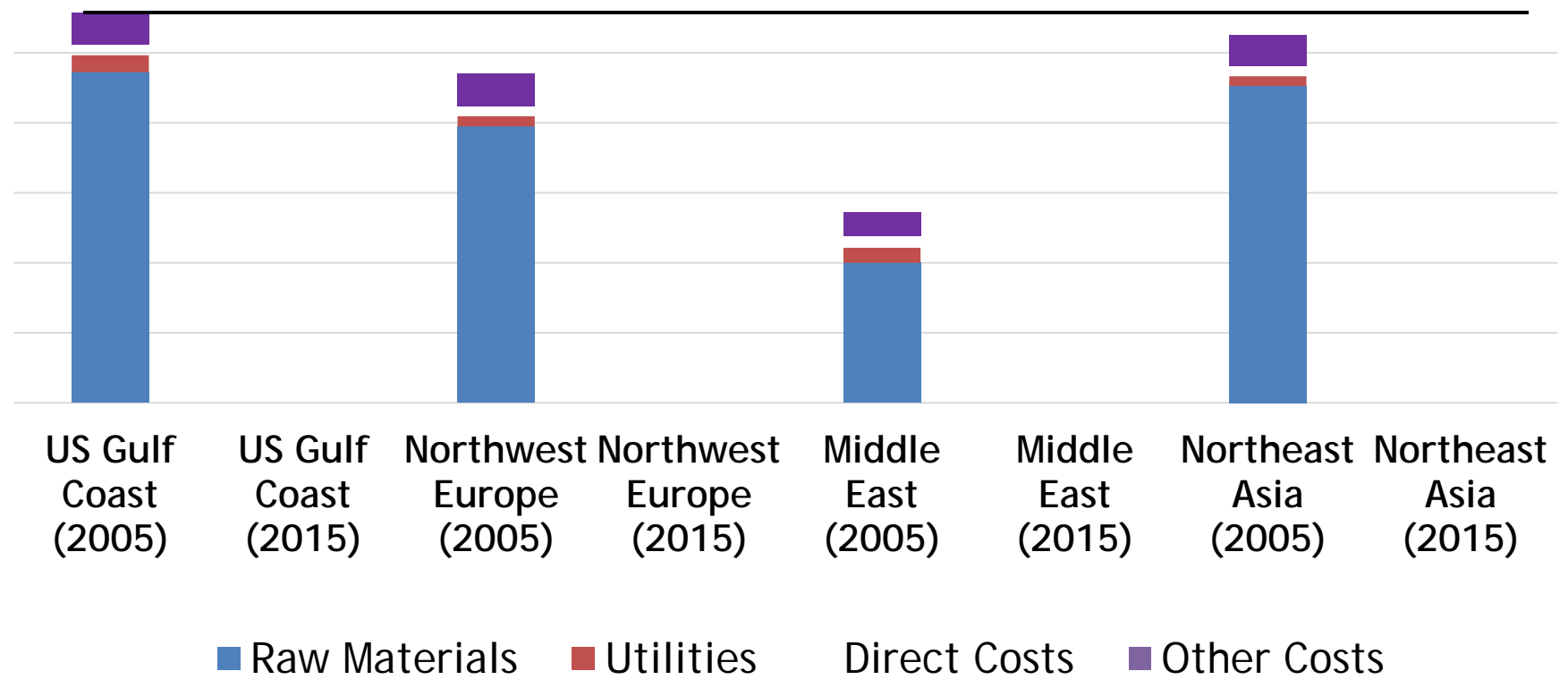


\*Based on estimates from best available data

# Lower US Manufacturing Costs: Case of High Density Polyethylene (HDPE)

\$ per Metric Ton

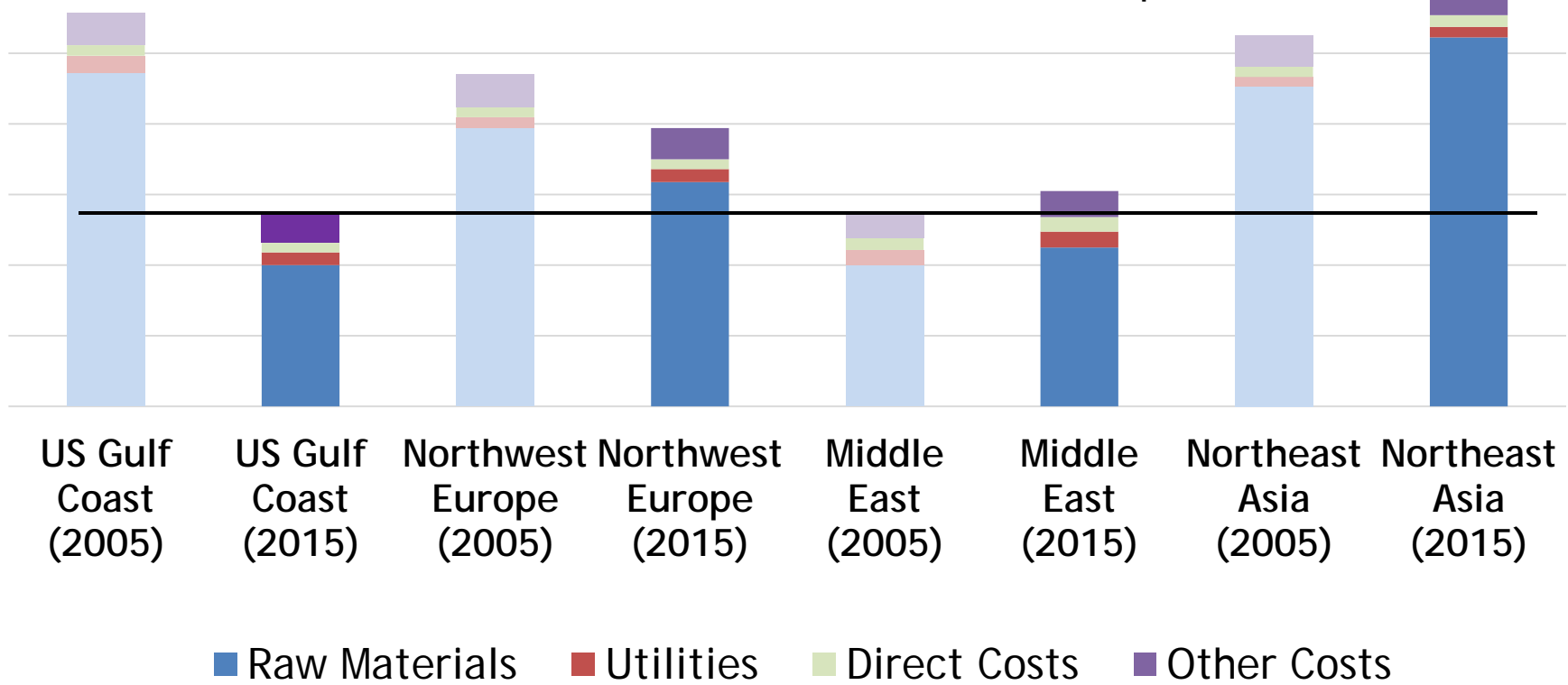
In 2005, U.S. is among highest cost producers globally because of high natural gas costs in U.S.



# Lower US Manufacturing Costs: Case of High Density Polyethylene (HDPE)

\$ per Metric Ton

By 2015, US among the low cost producers globally, but because of falling oil and naphtha prices...a shallower (less steep) cost curve

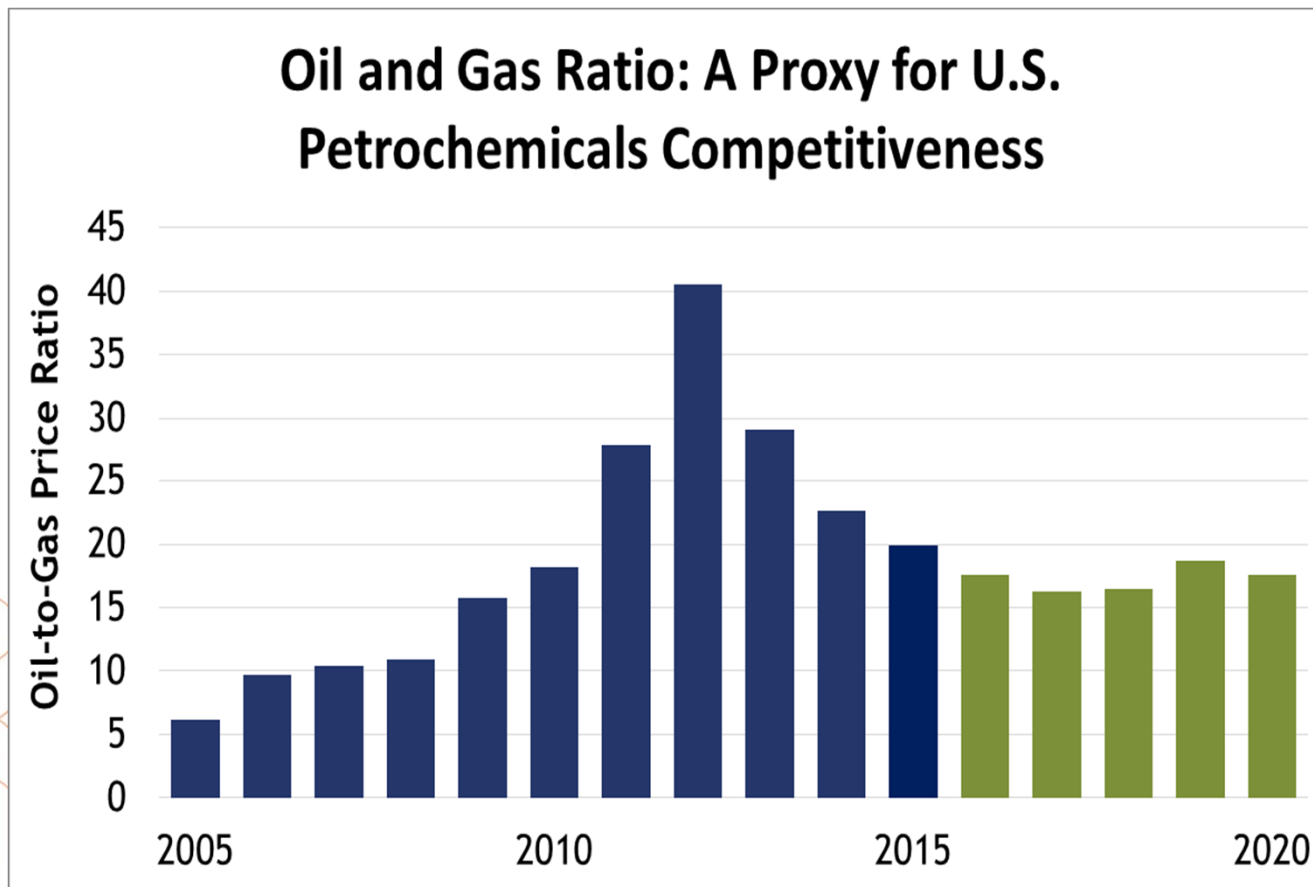




# Oil-to-Gas Ratio: A Proxy for U.S. Petrochemicals Competitiveness



When the ratio is above 7, U.S. competitiveness is enhanced.



Oil price declines have created some uncertainty about future

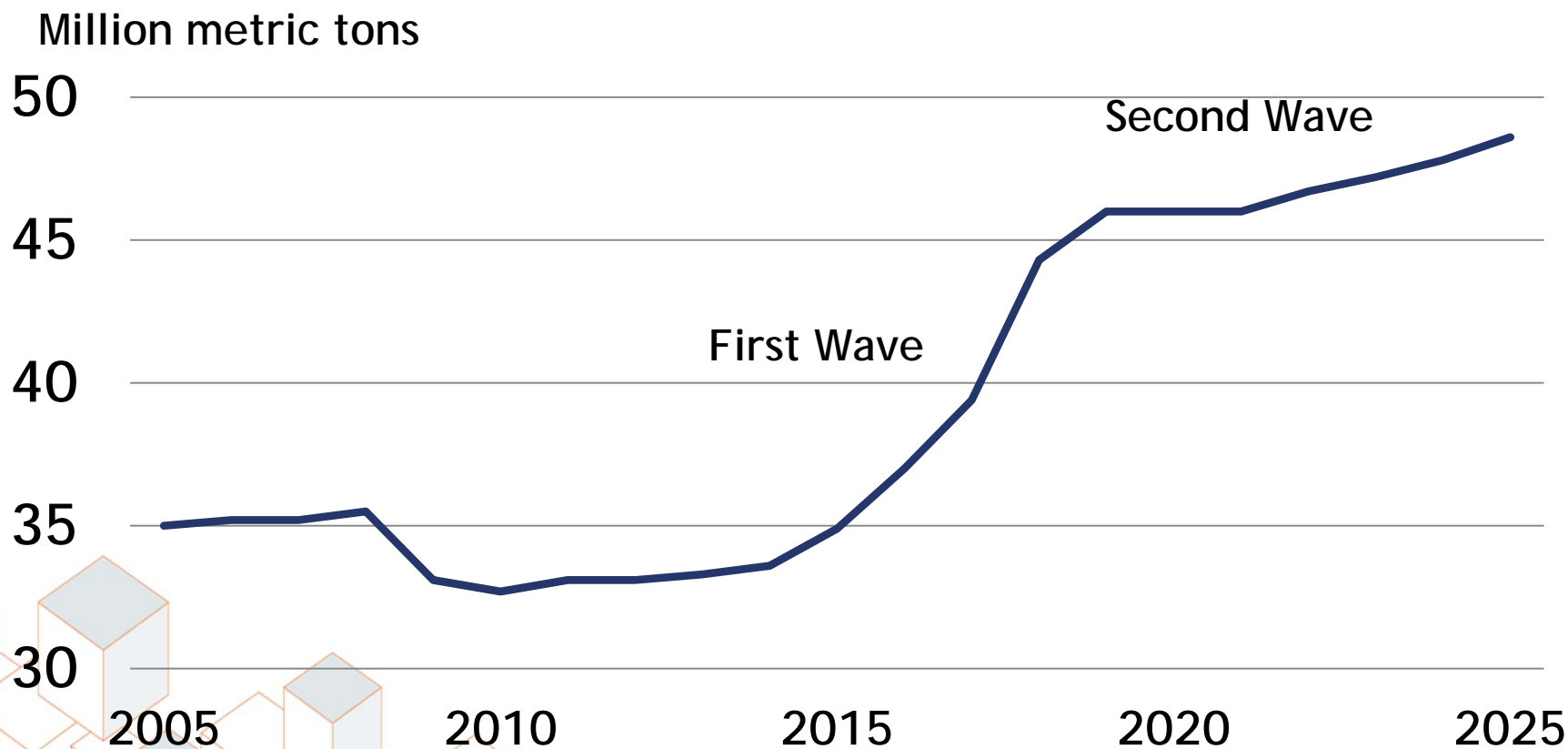
Current ratio remains very favorable for U.S. competitiveness

Sources: EIA, ICE, NYMEX



# New Investment in Chemical and Plastics Capacity

# North American Ethylene Capacity

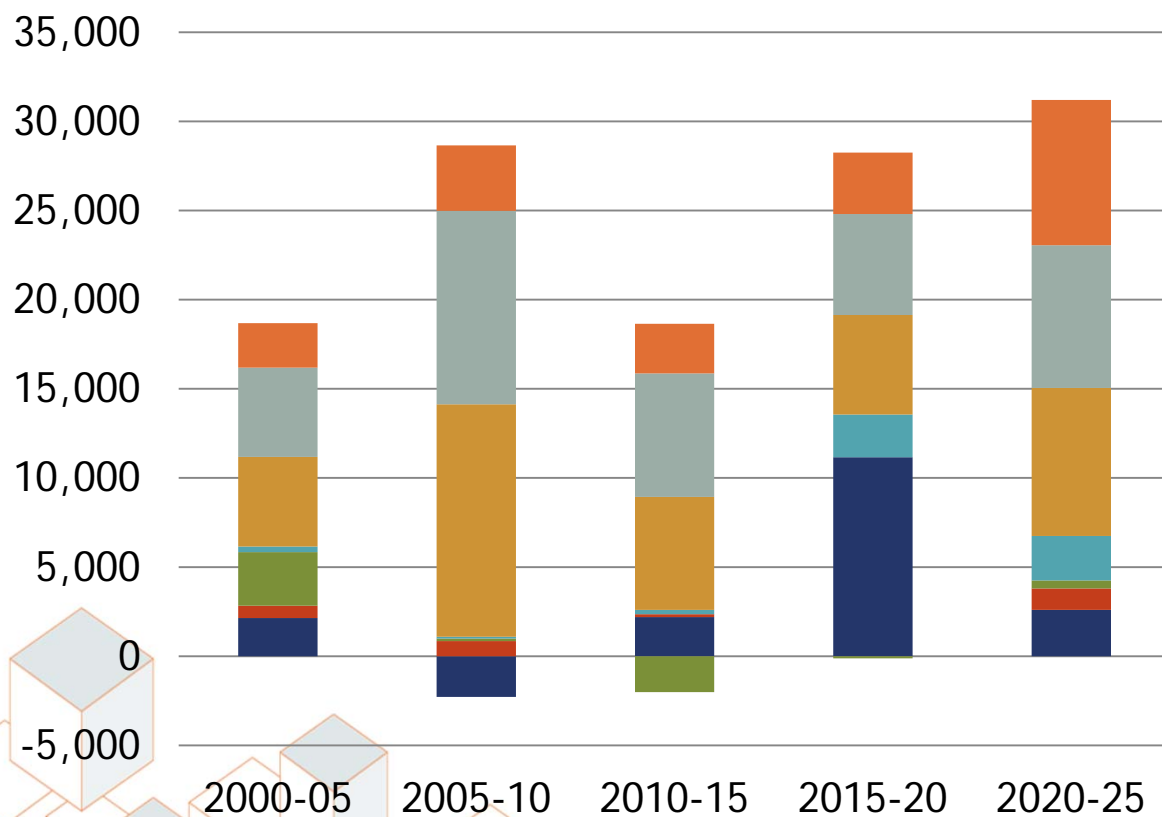


Source: ICIS

# Net Ethylene Capacity Additions by Region

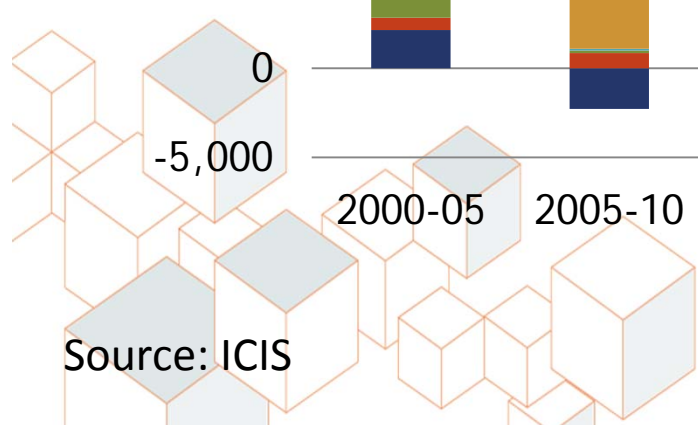


Thousand metric tons



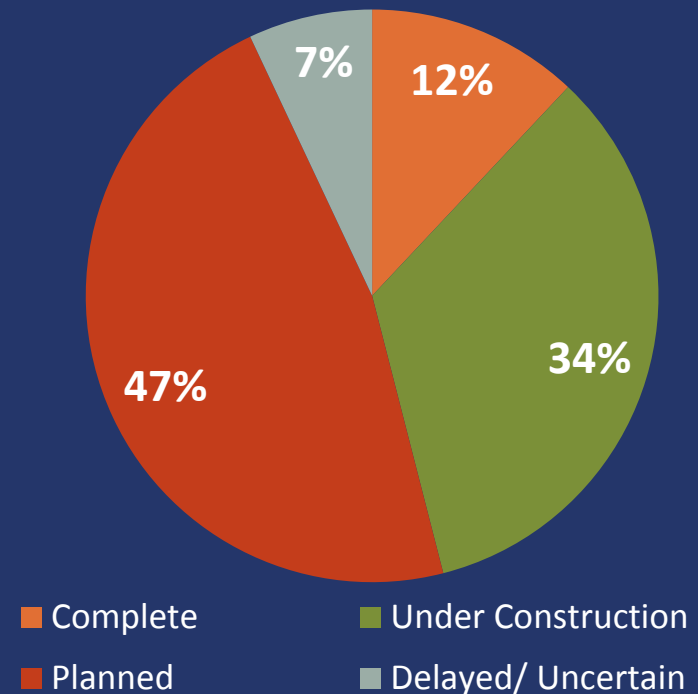
- Other Asia-Pacific
- Northeast Asia
- Africa and Middle East
- Eastern Europe
- W. Europe
- Latin America
- North America

Source: ICIS

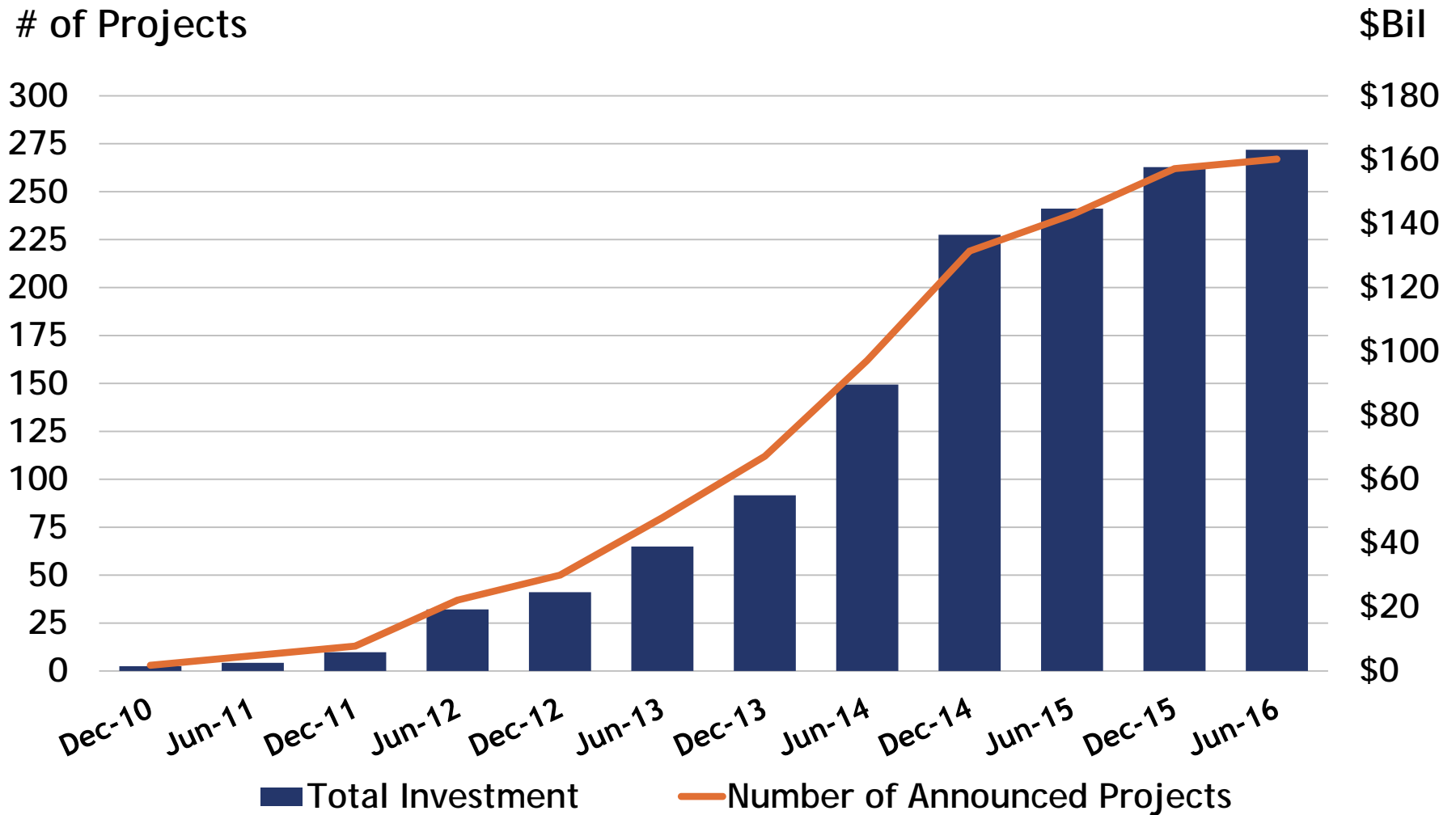


# ACC Database of New Chemical Industry Investment in the U.S.

- Building began as early as 2010 with small projects to increase ethane utilization
- As of mid-October, ACC is tracking 277 projects valued at \$168B
- 61% of projects are foreign or include a foreign partner
- Additional projects in Canada and Mexico
- In addition, ACC is tracking more than 500 plastic processor projects

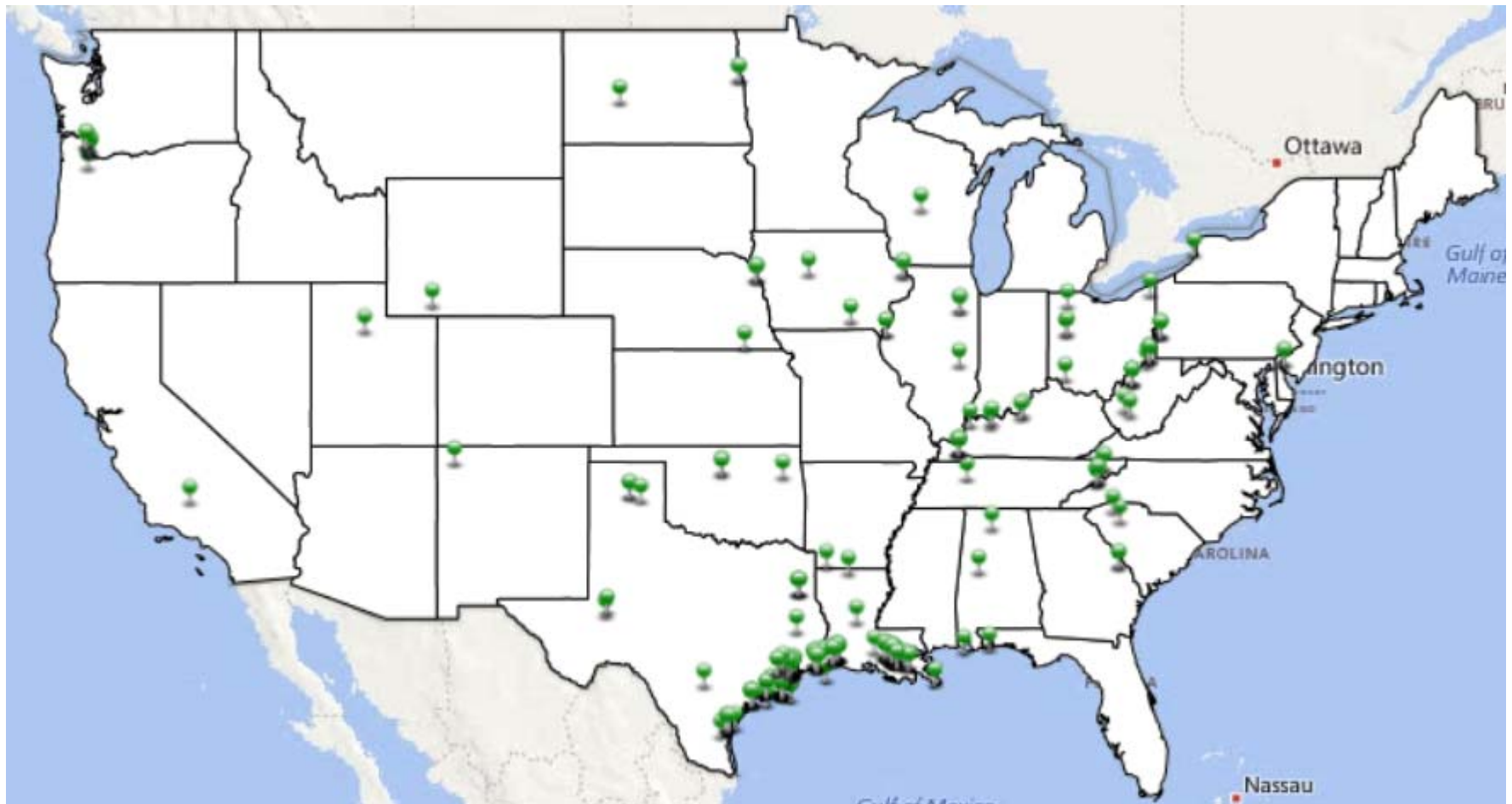


# Cumulative Announced Chemical Industry Investments from Shale Gas



Source: ACC analysis, December 2010 - June 2016

# Geography of Shale-Advantaged Chemical Investment



\* Each green pin represents one or more announced chemical industry investments

# Shale Advantage Driving Capacity Expansion Across Many Products



## Ethane, Propane and NGL Feedstock

- Ethylene - capacity expected to grow by half
- Ethylene Derivatives - PE, vinyls, MEG, EO, etc.
- Ethylene cracker co-products - on-purpose propylene (PDH, MTP), butadiene
- Propylene derivatives - polypropylene
- Complementary products, i.e., chlor-alkali for PVC, industrial gases, etc.

## Methane Feedstock

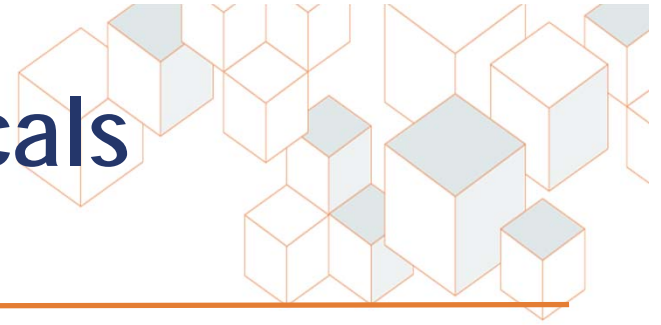
- Methanol and derivatives
- Nitrogenous fertilizers - ammonia, urea and derivatives (AN, UAN)

## Demand Driven Products

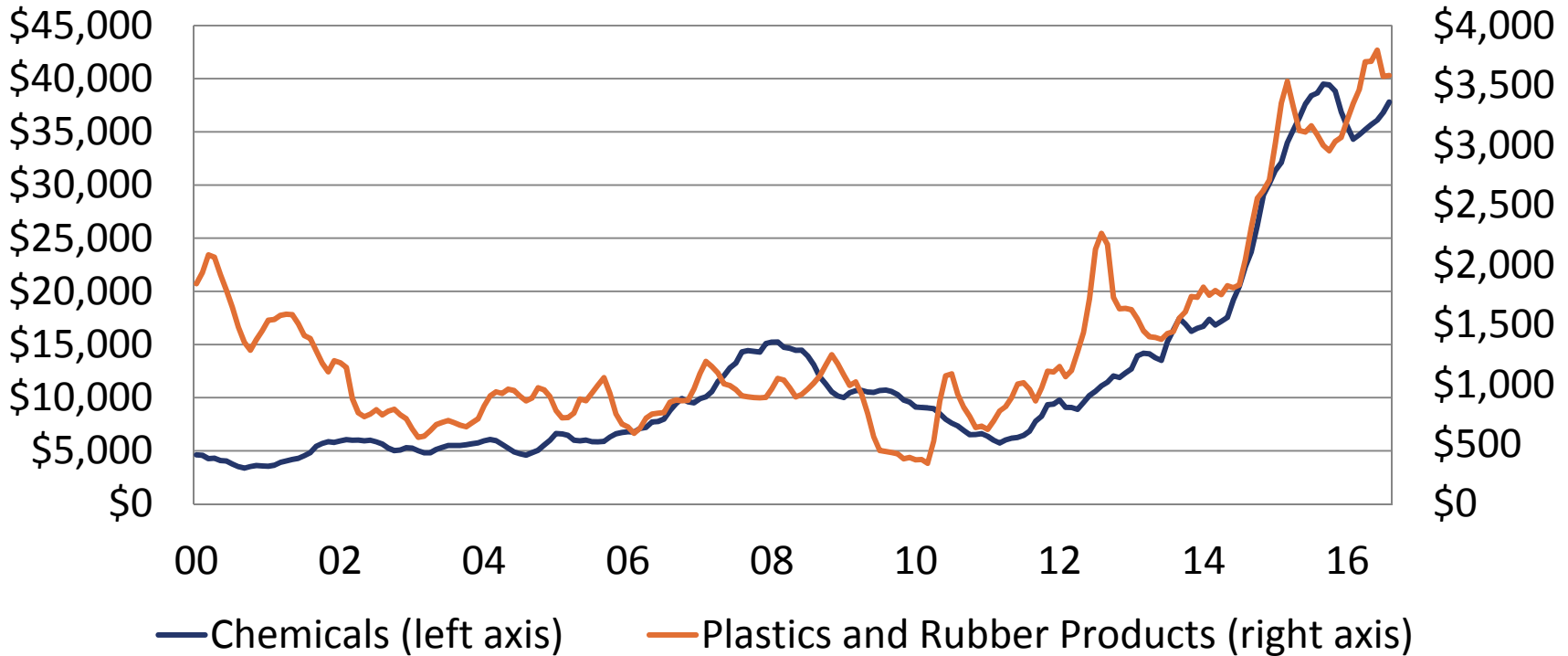
- Chemistry used in hydraulic fracturing, drilling, and oil/gas production



# New Investment in Chemicals and Plastics

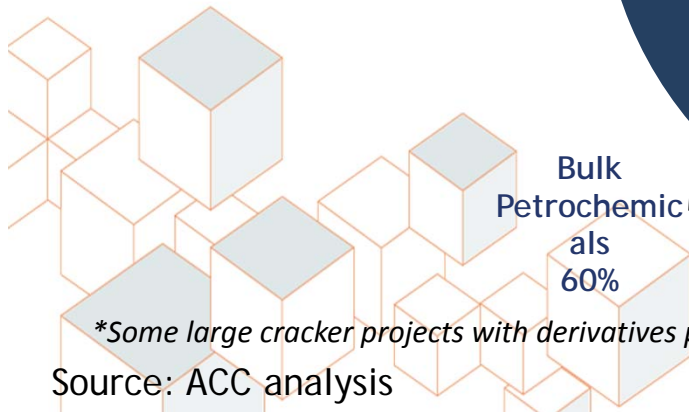
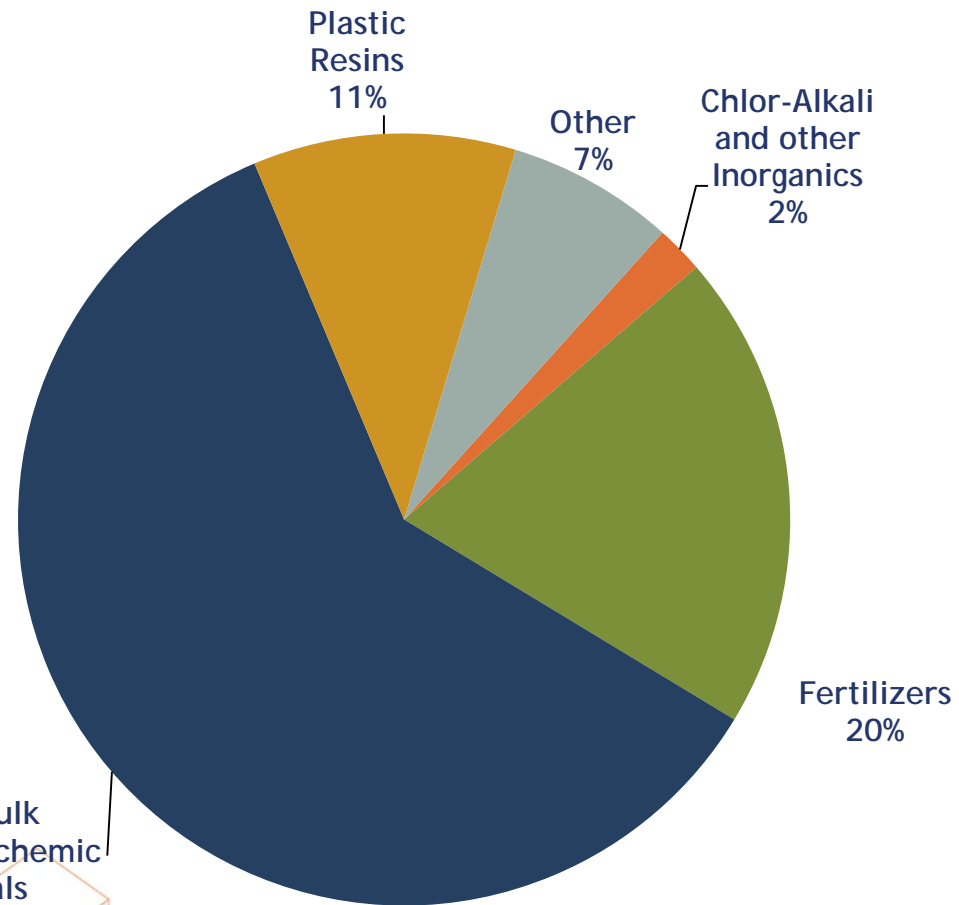
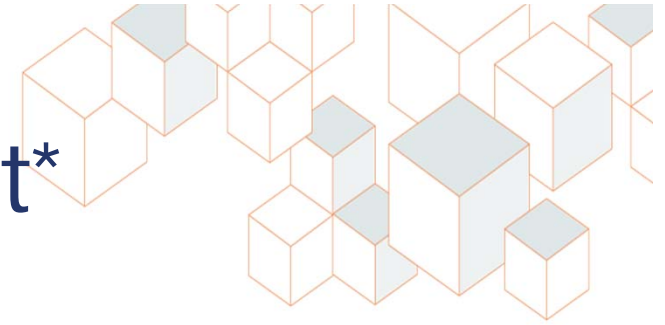


\$ million  
(3 month average annual rate)



Source: Census Bureau

# Investment by Industry Segment\*



*\*Some large cracker projects with derivatives projects not separately broken out*

Source: ACC analysis

# Industry Investments & Plastics Processors

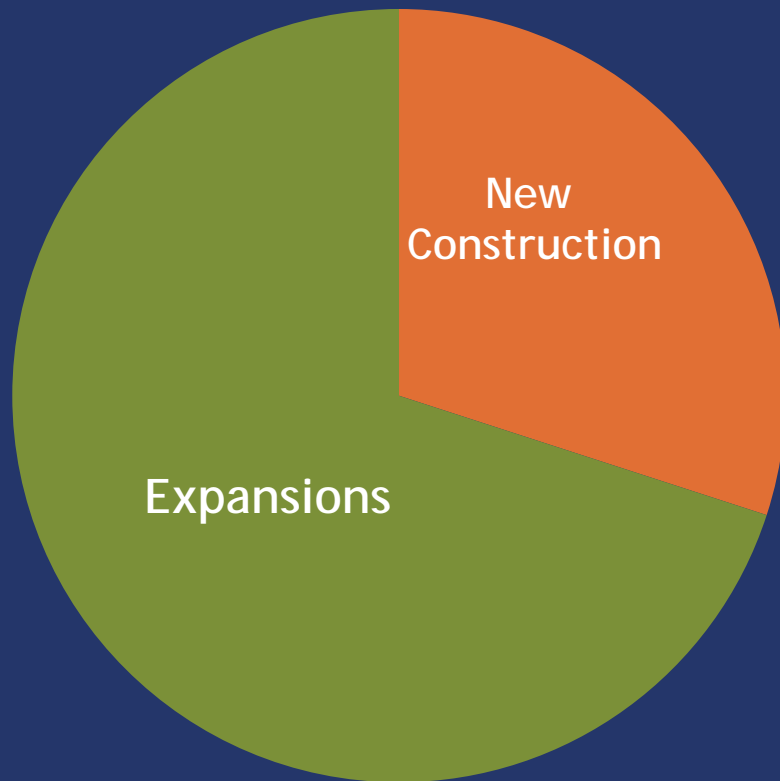
## Shale-Driven Benefits

- 70% of announced chemical industry investment is bulk petrochemicals and plastic resins.
- Increased resin capacity → increased processing capacity

## Other Benefits of U.S. manufacturing

- Increased consumer desire for “Made in the USA” products
- Rising costs (wages) in China
- Reduction of transportation/logistics costs
- Manufacturing proximity to customers, supply chain

# Plastics Processor Projects

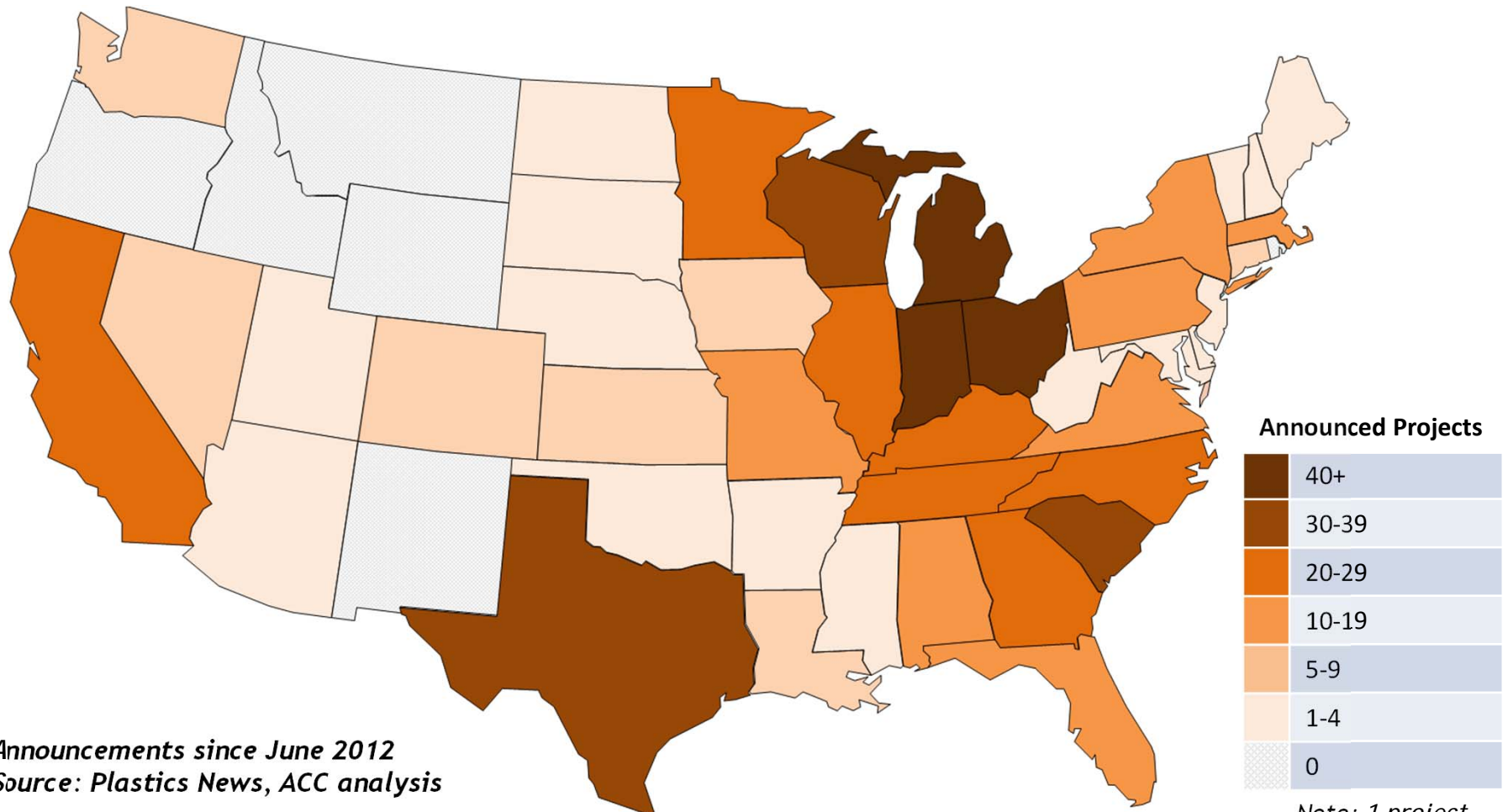


- ACC is tracking over 500 plastics processor projects.
  - 30% New Construction
  - 70% Expansions
    - Adding capacity
    - New lines
    - New equipment
- Since June 2012, plastics processor projects have been announced by over 400 companies in over 40 states.

*Source: Plastics News, ACC analysis*

NOTE: The data is based on publicly available information, which is believed to be accurate, but have not been independently verified by ACC.

# Announced Plastics Processor Projects by State



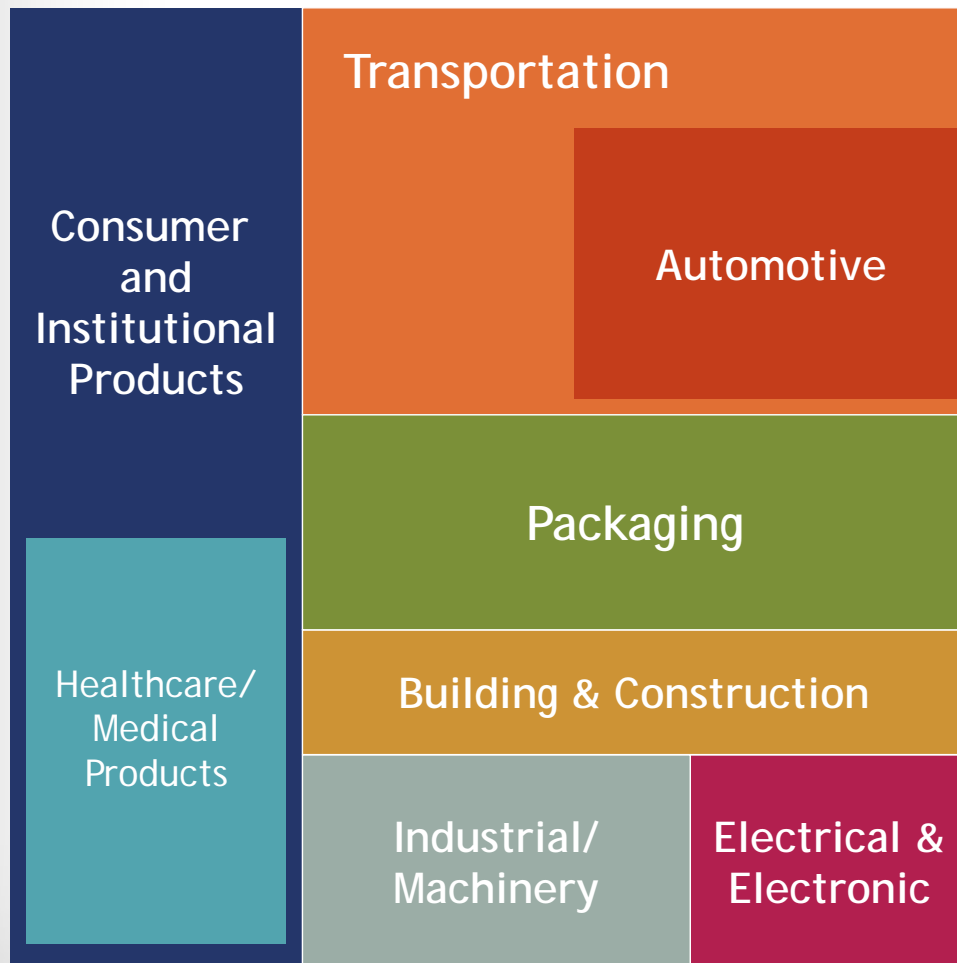
*Announcements since June 2012*  
*Source: Plastics News, ACC analysis*

NOTE: The data is based on publicly available information, which is believed to be accurate, but have not been independently verified by ACC.

Updated 8/1/16

*Note: 1 project has been announced in AK; none in HI (not shown)*

# Impact on Major Markets



## Investment across markets:

- One-third in Consumer & Institutional Products and/or Transportation markets
  - Medical/Healthcare and Automotive are large subsets
- One-fifth in Packaging markets
- Various other markets also experiencing growth

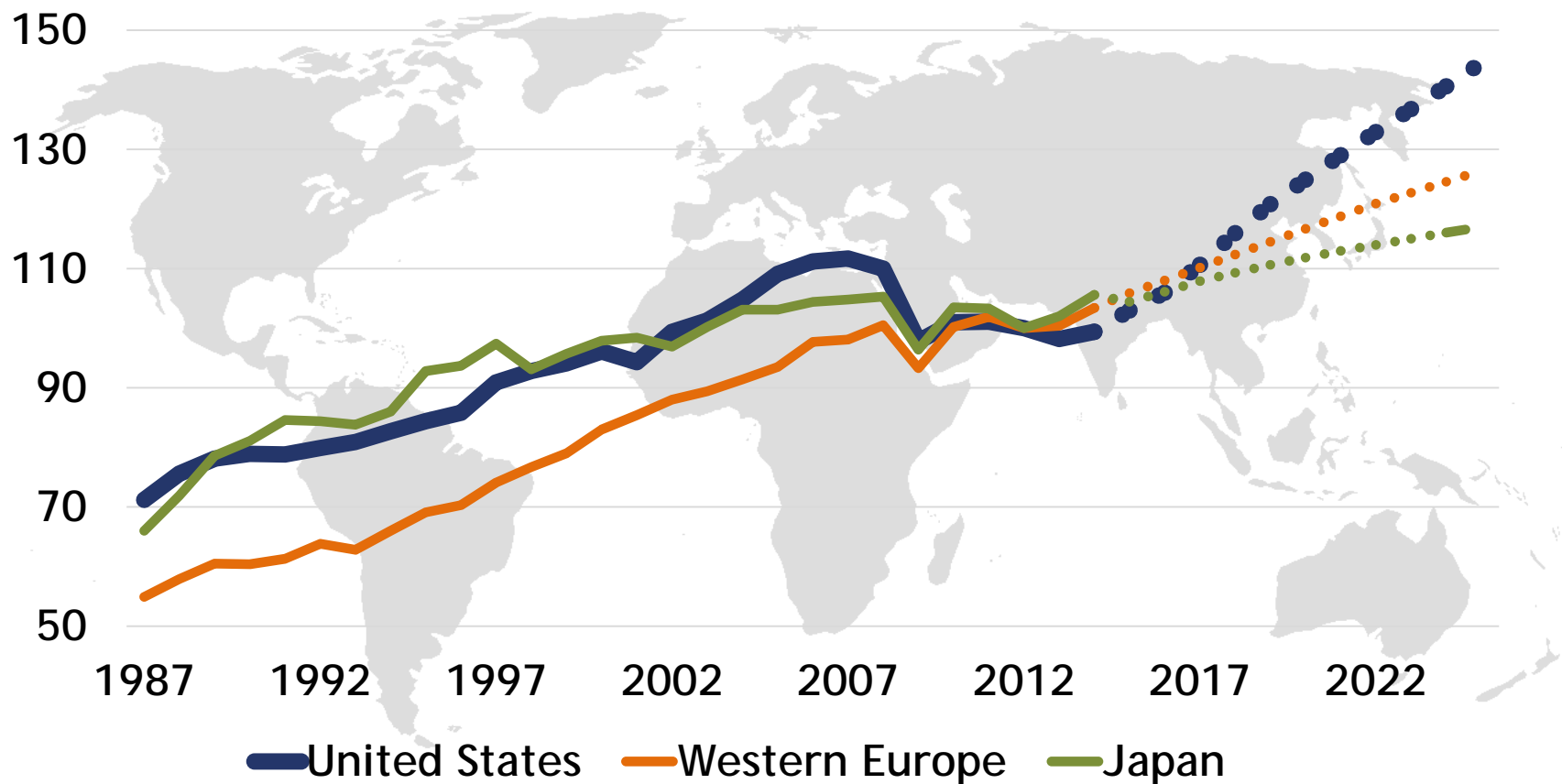
*NOTE: This chart is intended to be a proportional representation, based on ACC analysis and publically available information, of plastics processor projects by Major Markets. The PIPS definitions for Major Markets were used to develop this chart.*



# Exports and Transportation

# U.S. Captures Market Share Away From Western Europe...

Chemistry Production (2012=100)



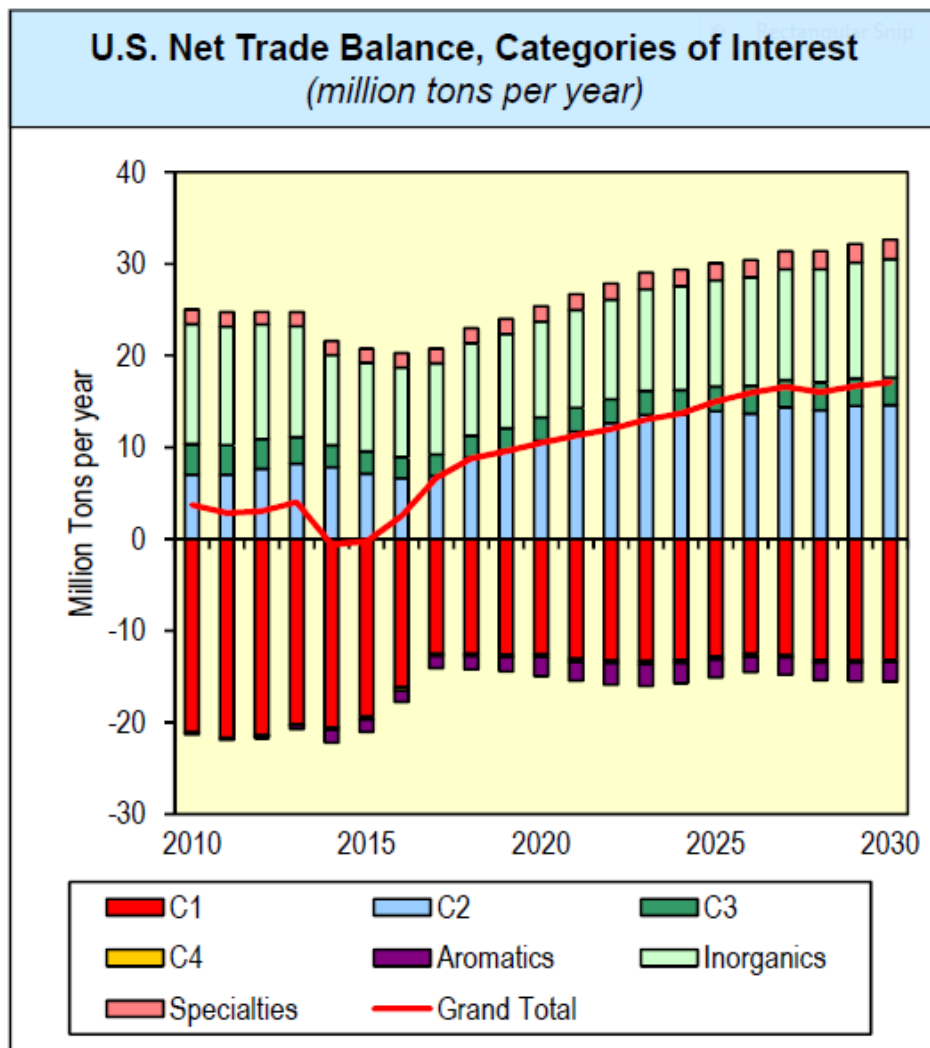
Sources: Eurostat, Federal Reserve, METI, ACC analysis



# Where Will New Production Go?

- Olefins generally move via pipeline. The majority expected to go to domestic derivatives producers, but exports will also increase
- Derivative products, i.e., plastic resins easier to transport
  - About half of plastic resins expected to be exported to markets in Latin America, Asia, and Europe
  - Port of Houston will see largest increase in outbound volumes creating challenges to upgrade and expand infrastructure and networks
- Panama Canal expansion may shift shipping patterns and expand opportunities for exports to Asia

# Much of the New Capacity is Export-Oriented



- U.S. trade surplus for the selected chemicals increases from \$19.5 billion to \$43.3 by 2030.
- Trade deficit in C1 chemistry shrinks, but continues for aromatics
- C2 trade balance expands in just about every regions.
- C3 derivative exports recover after PDH/MTP projects come online.

Source: Nexant

# Key Investment Risks for Chemicals and Plastics

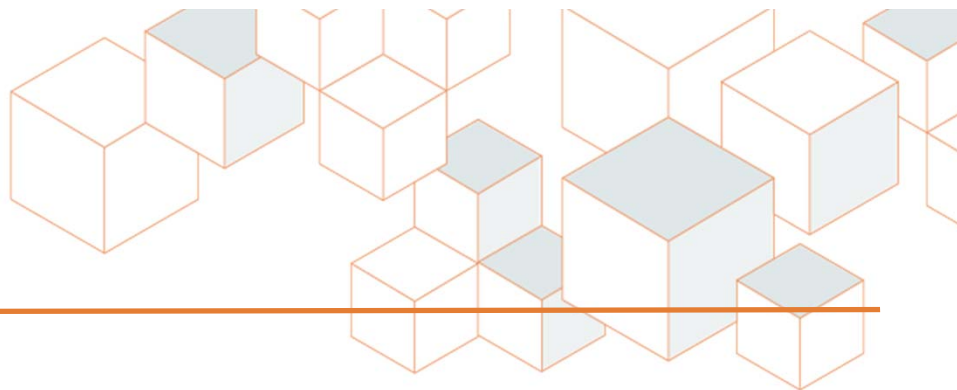
- Workforce development
  - Chemical plant operations personnel, engineers, etc.
  - Construction trades and labor
- Shortages of key equipment, etc.
  - capital cost escalation
- Transportation and Logistics
- Unpredictable energy dynamics
- Market access/trade exposure
- More stringent environmental and other regulations
- Market imbalances created by variations in regional supply vs. demand growth and government policies

# Transportation Challenges

- Port congestion in Houston Ship Channel may lead to alternate routes (i.e., Charleston) or greater use of intermodal
- Container imbalance along Gulf Coast
- Rail car loadings will grow significantly - rail congestion expected to worsen, esp. Houston
- Trucking capacity constrained by driver shortages, etc.
- Expansion of packaging, warehousing capacity

# Questions?

---



[martha\\_moore@americanchemistry.com](mailto:martha_moore@americanchemistry.com)

(202) 249-6182

[www.americanchemistry.com](http://www.americanchemistry.com)

