POTENTIAL BENEFITS OF EXPANDED CHEMICAL AND PLASTICS MANUFACTURING IN APPALACHIA

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American® Chemistry Council

West Virginia chemistry...

At **$8.7B**, is the **largest** manufacturing industry in the state

Provides **9,132 direct jobs** and another **11,341 related jobs**

Generates **$790M in** payroll across **73** establishments

Has an average wage of **$86,490**, **53% higher** than the average manufacturing wage

Generates **$81M** in state & local taxes, and **$169M** in federal taxes

Invests $279M to build & update equipment and facilities

Ships $1.5B in products to customers around the world

Generates an additional **3,346 jobs** in plastics & rubber products

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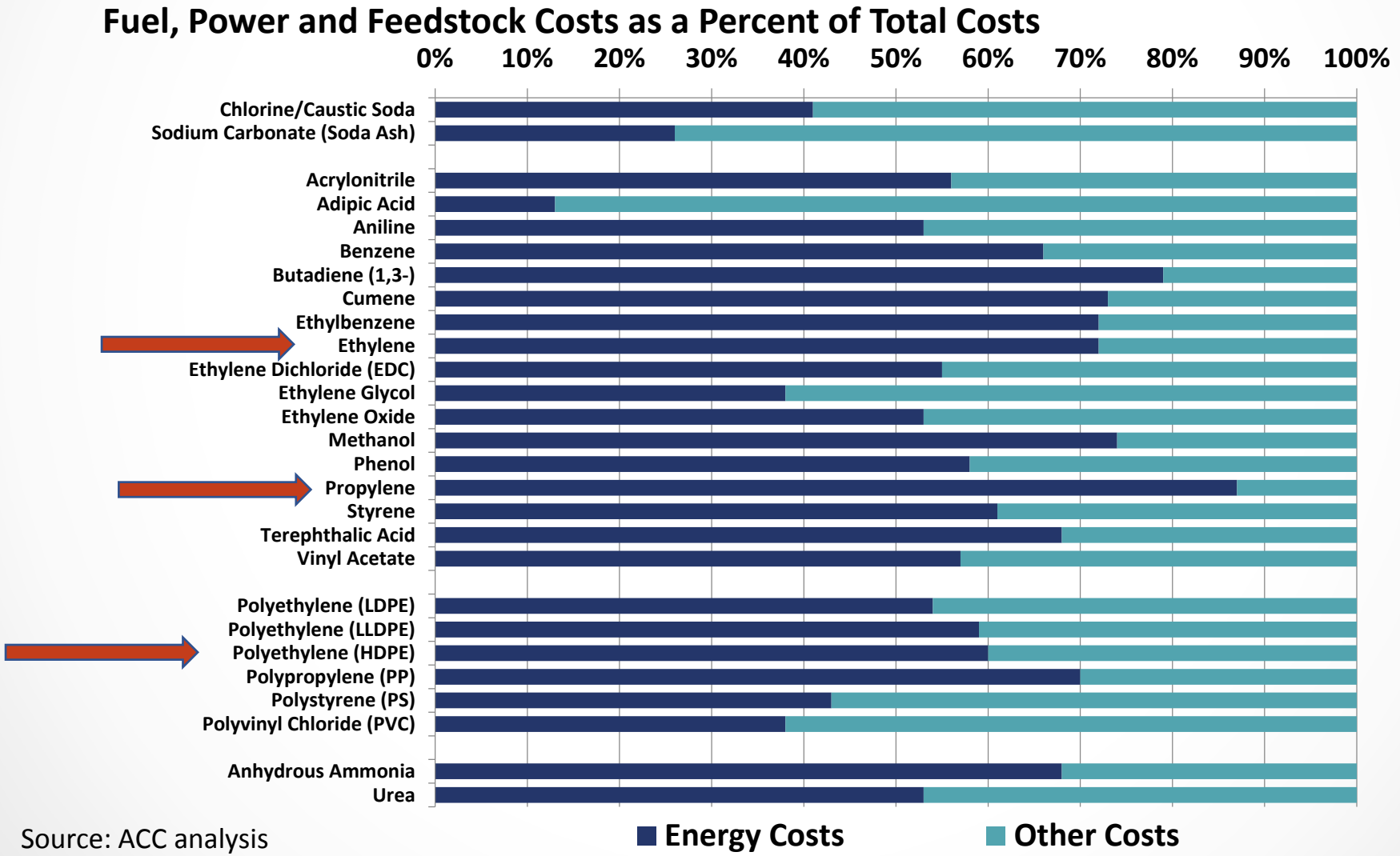
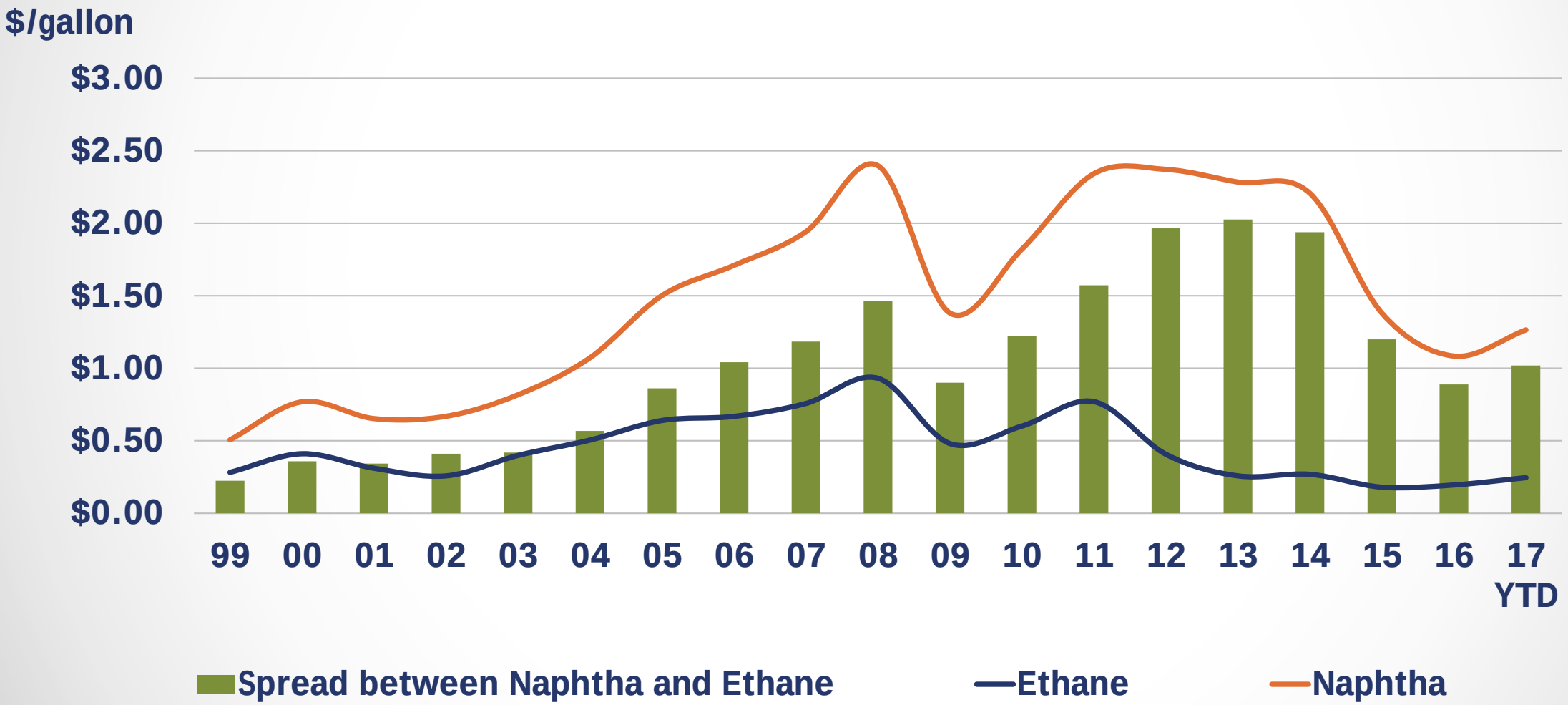
Chemical Manufacturing is Energy-Intensive



Source: ACC analysis

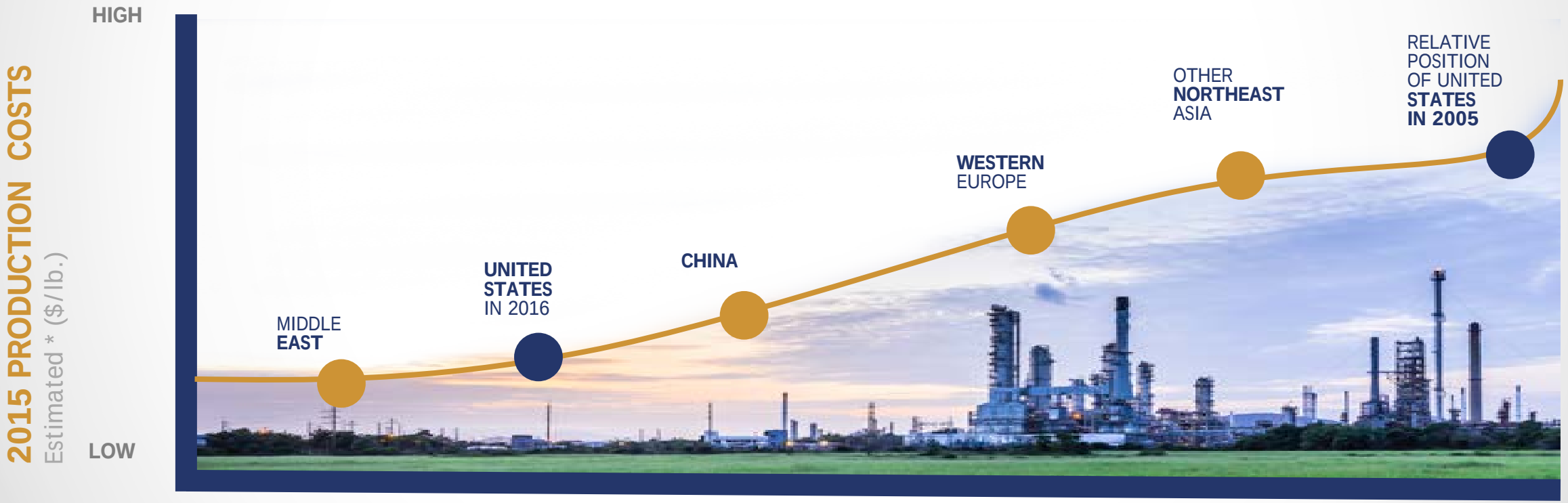
Feedstock Spread Drives Petrochemical Competitiveness



Sources: US Energy Information Administration, ACC analysis

Global Cost Advantage for U.S. Producers

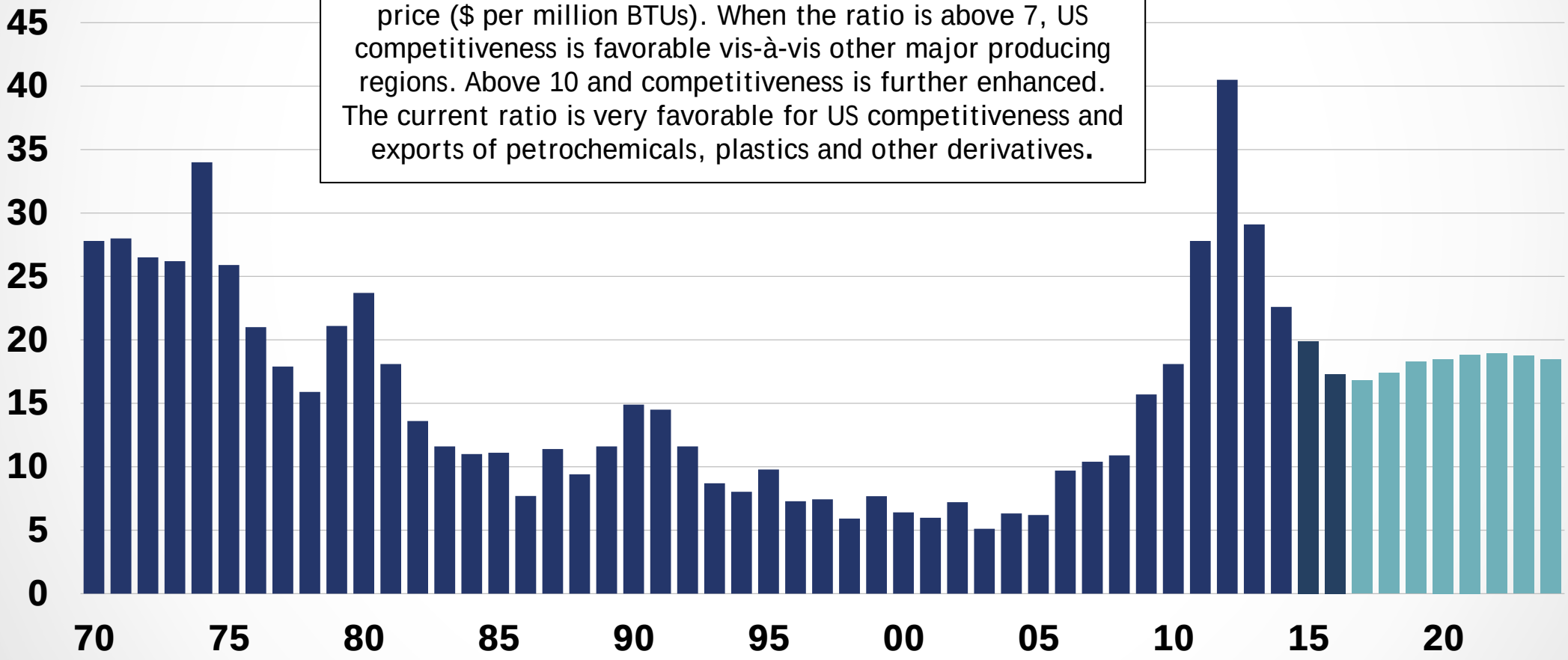
Relative Position of U.S. (2005-2016)
(Petrochemical Production Costs)



*Based on estimates from best available data

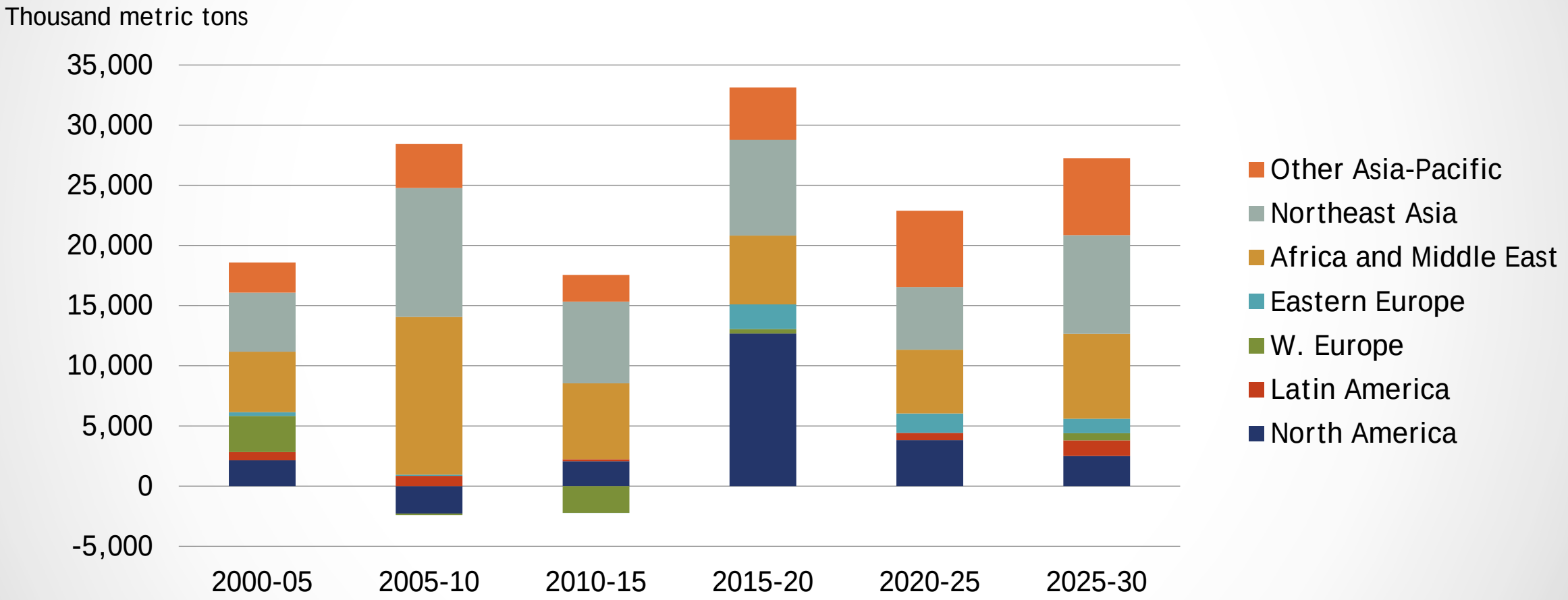
Oil-to-Gas Ratio: A Proxy for US Petrochemical Competitiveness

Divide Brent oil price ($ per barrel) by Henry Hub natural gas price ($ per million BTUs). When the ratio is above 7, US competitiveness is favorable vis-à-vis other major producing regions. Above 10 and competitiveness is further enhanced. The current ratio is very favorable for US competitiveness and exports of petrochemicals, plastics and other derivatives.



Sources: EIA, ICE, NYMEX

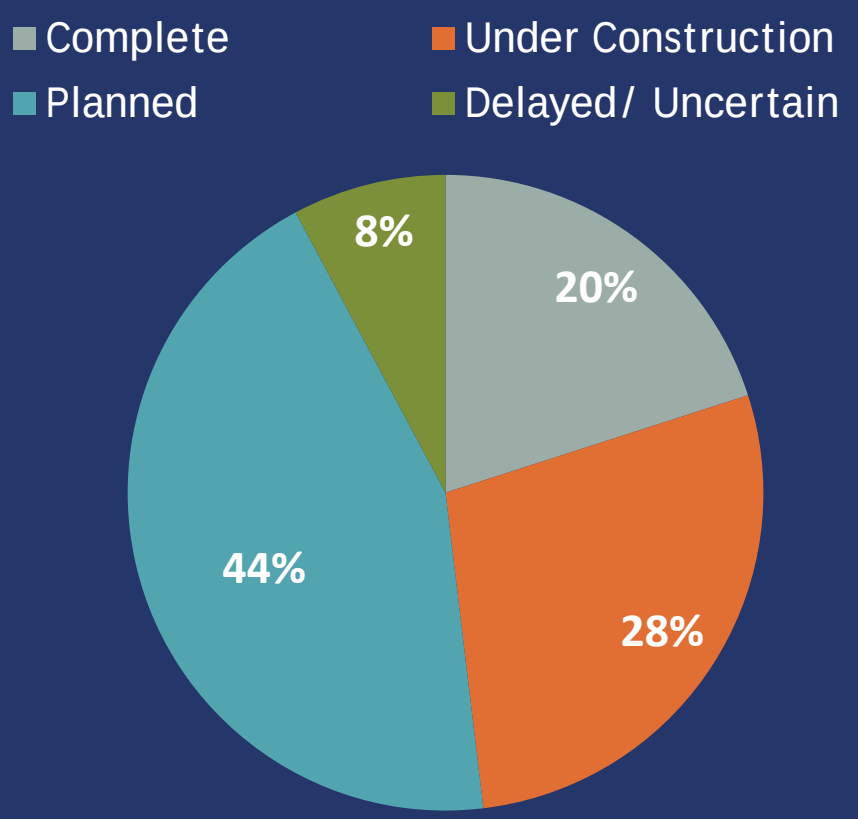
Net Ethylene Capacity Additions by Region



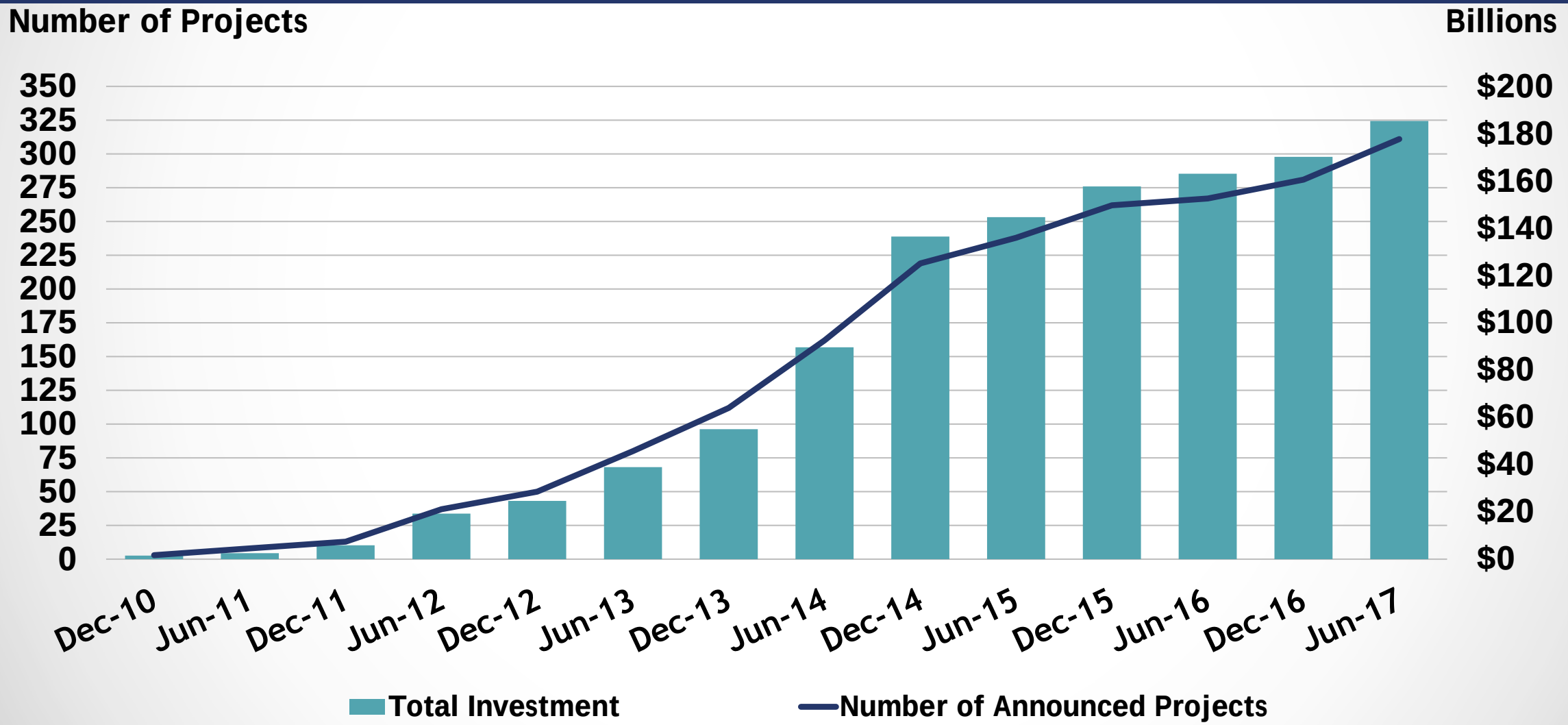
Source: ICIS

New Chemical Industry Investment in the U.S.

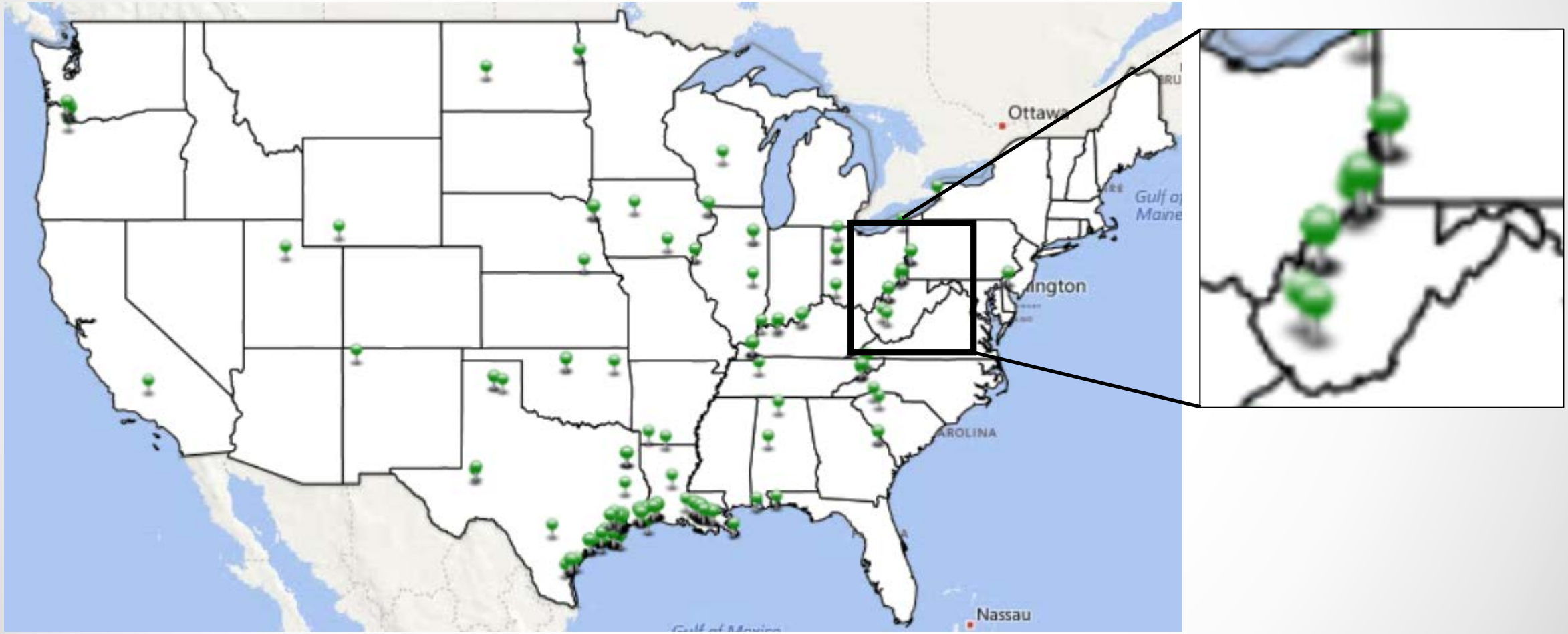
- **Building began in 2010 with small projects to increase ethane utilization**
- **As of September 2017, ACC is tracking 318 projects valued at $185B**
- **62% of projects are foreign-owned or include a foreign partner**
- **Additional projects in Canada and Mexico**
- **In addition, ACC is tracking more than 600 plastic processor projects**



Cumulative Announced Chemical Industry Investments from Shale Gas



Geography of Shale-Advantaged Chemical Investment

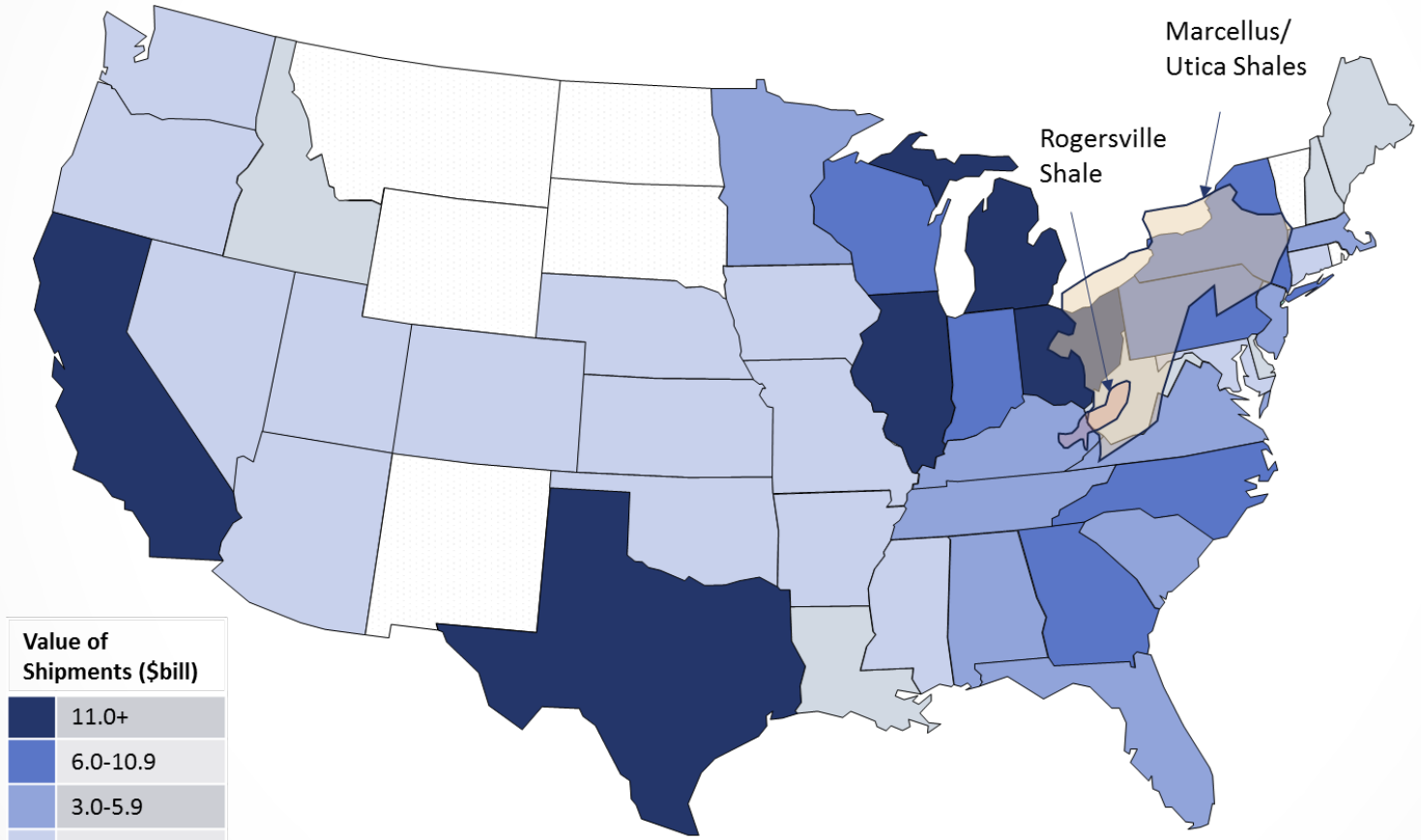


* Each green pin represents one or more announced chemical industry investments

Advantages for Appalachian Chemicals and Plastics

- Proximity to abundant NGL resources in Marcellus/Utica and Rogersville shales
- Proximity to manufacturing markets in Midwest, East Coast, and Canada
- Opportunity to generate jobs and economic activity in Appalachia
- Avoids ethane rejection

Plastic Products Manufacturing in the U.S.



Sources: Census Bureau, Marcellus Coalition, and the University of Kentucky

Note: Shaded areas for shale formations are approximate.

Potential Benefits to Appalachian Economy from New Chemical and Plastics Products Manufacturing

- ACC analyzed a ***hypothetical*** scenario based on ~350,000-400,000 barrels per day of ethane expected to be available by 2025
- Assumes storage and pipeline infrastructure is built
- $35.8 billion in new chemicals and plastics industry investment
  - 5 ethane crackers
  - 2 propane dehydrogenation (PDH)
  - Polyethylene, polypropylene and other derivatives
  - Plastics compounding
  - Plastic products manufacturing
- $28.4 billion in new output by 2025

Economic Impact of New Chemical and Plastic Products Manufacturing ($2016)

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