9 April 2013

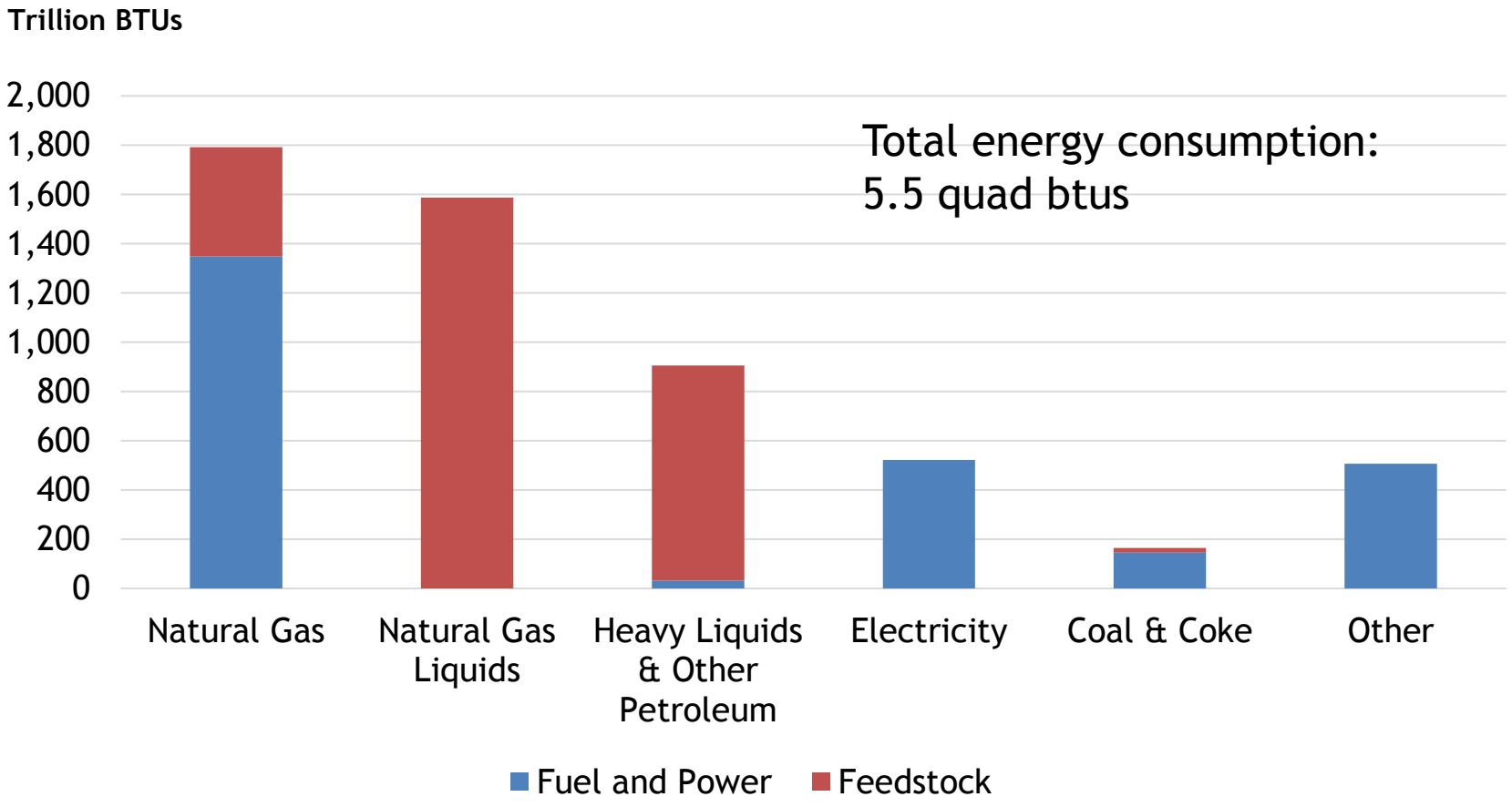
SHALE-ADVANTAGED CHEMICAL INDUSTRY INVESTMENT

Martha Gilchrist Moore
Sr. Director, Policy Analysis and Economics

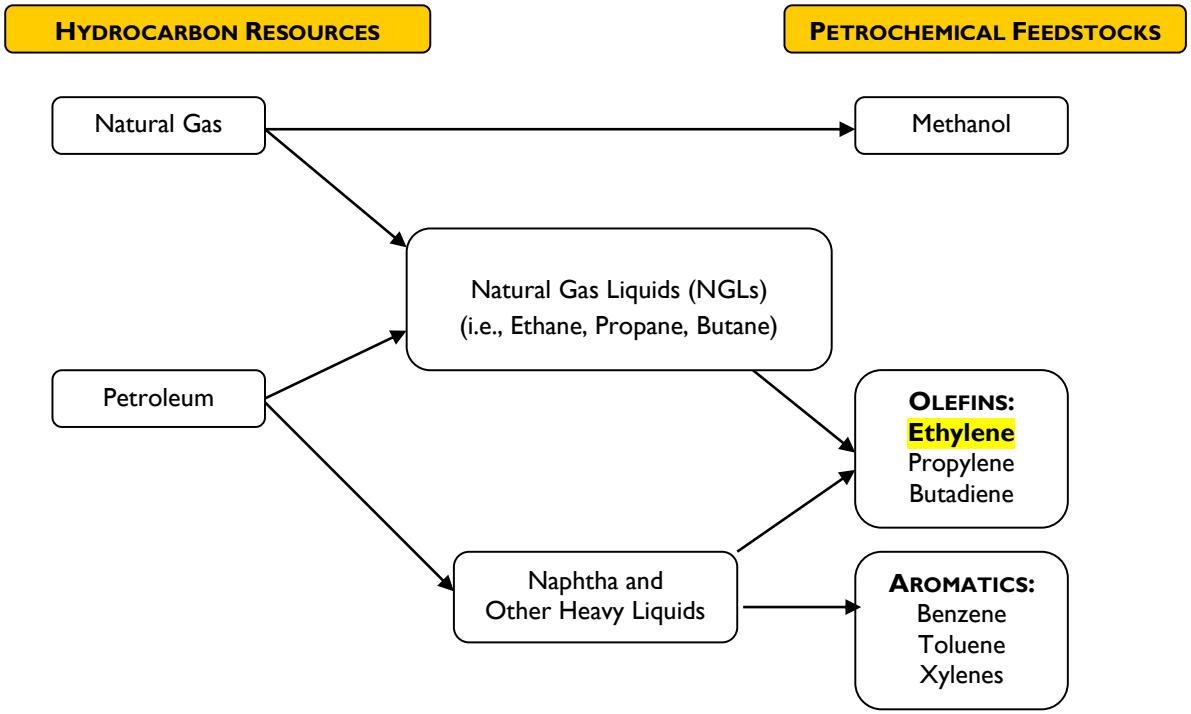
Shale Gas

- Shale gas is possibly the most important energy development in the past 50 years.
- Shale gas now accounts for 30% of production.
- Abundant supplies of natural gas liquids are changing the economics of global petrochemical production patterns.
- Lower natural gas costs are improving the competitiveness of not only chemical producers, but other gas-intensive manufacturers

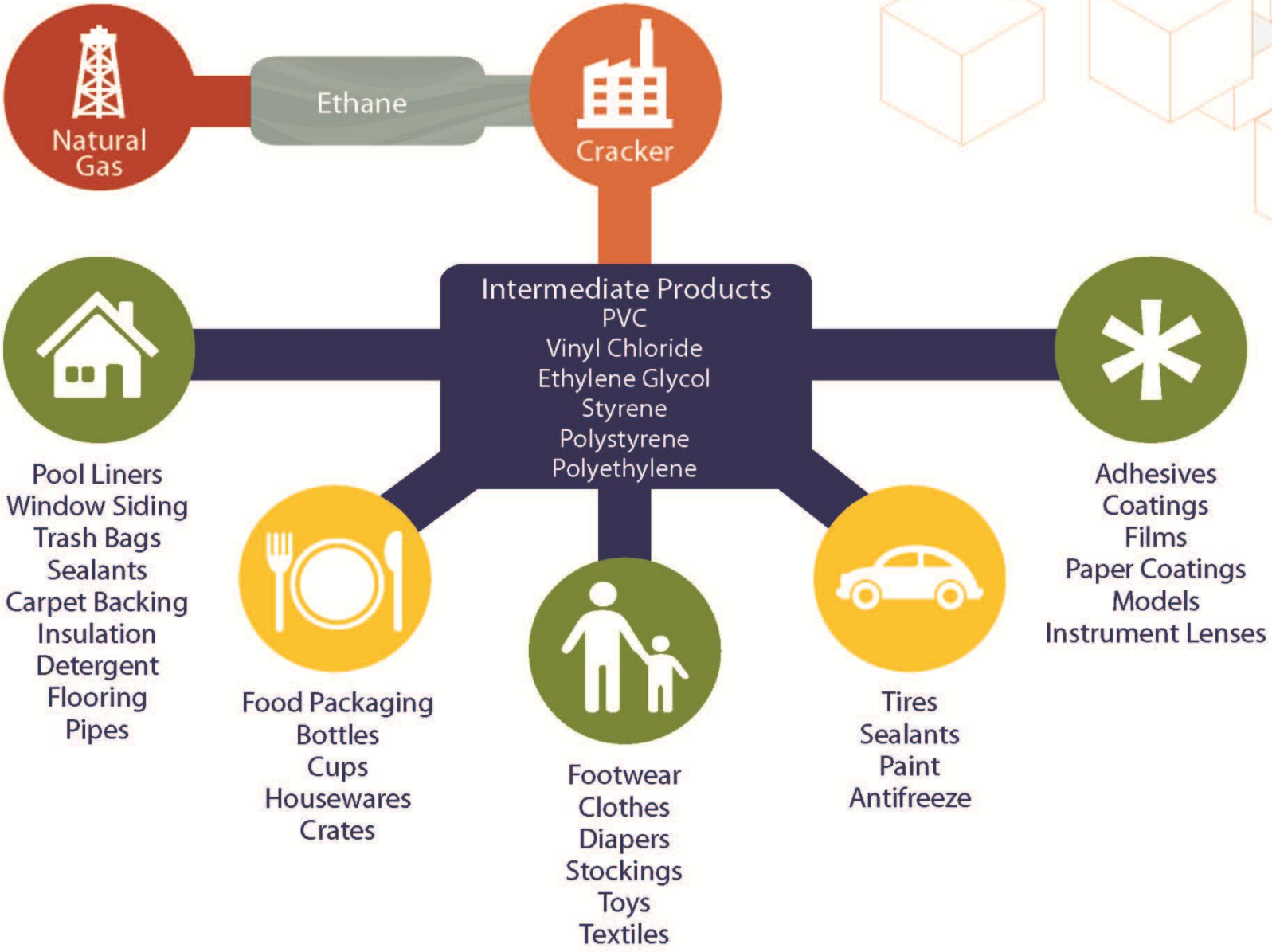
Chemical Industry Energy Requirements



Petrochemical Feedstocks

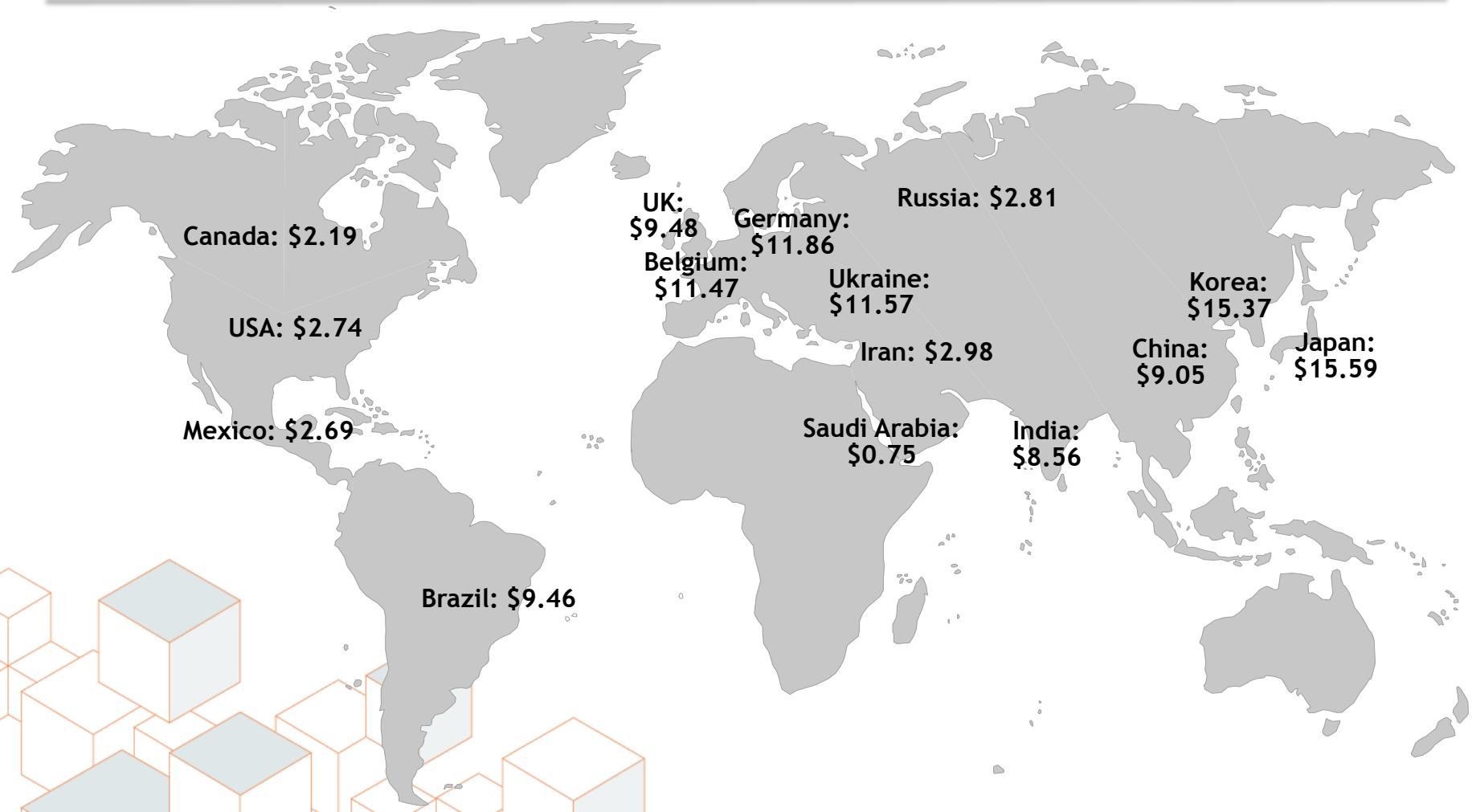


ETHYLENE CHAIN



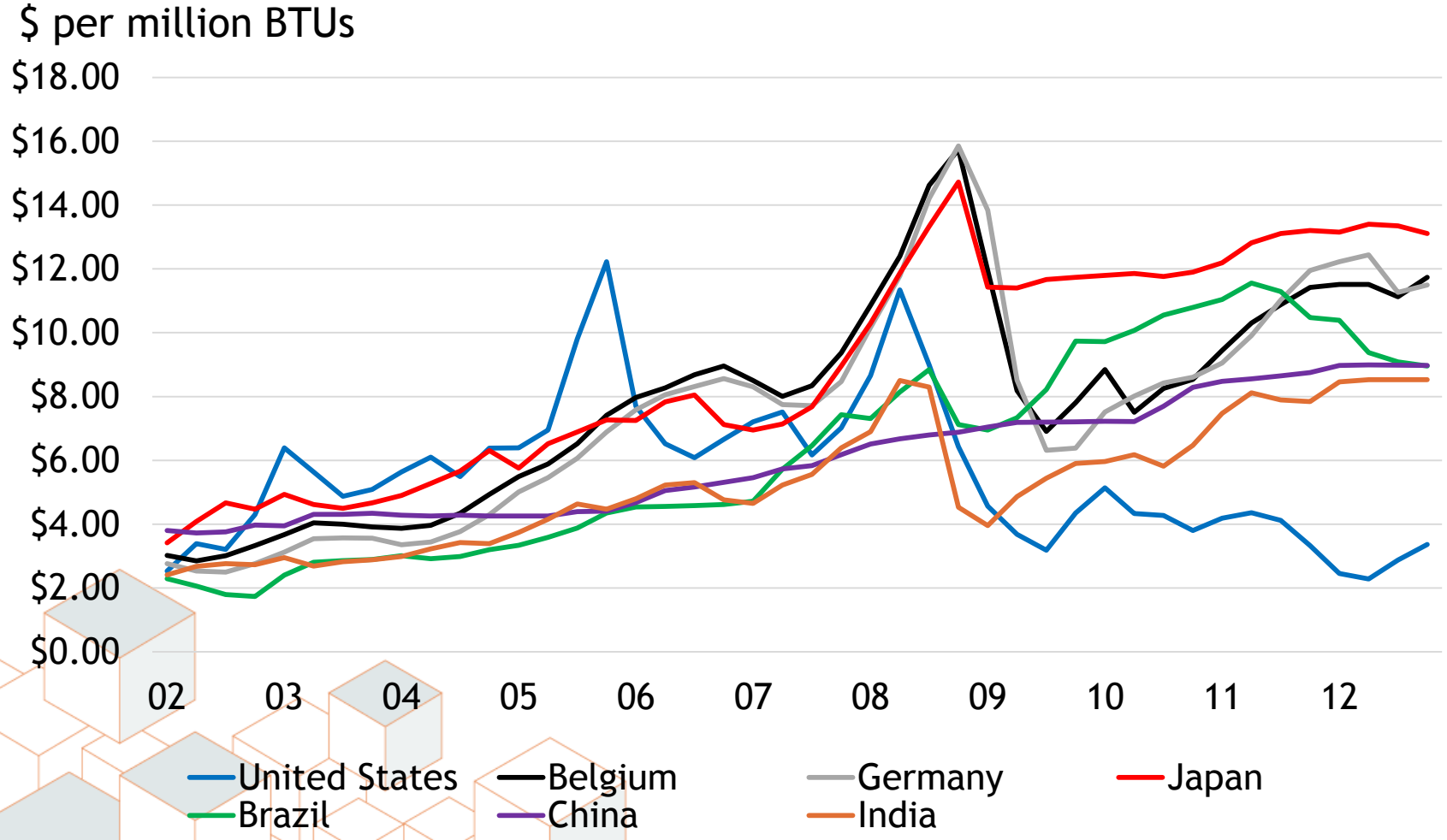
Global Natural Gas Costs: 2012

($US per million BTUs)



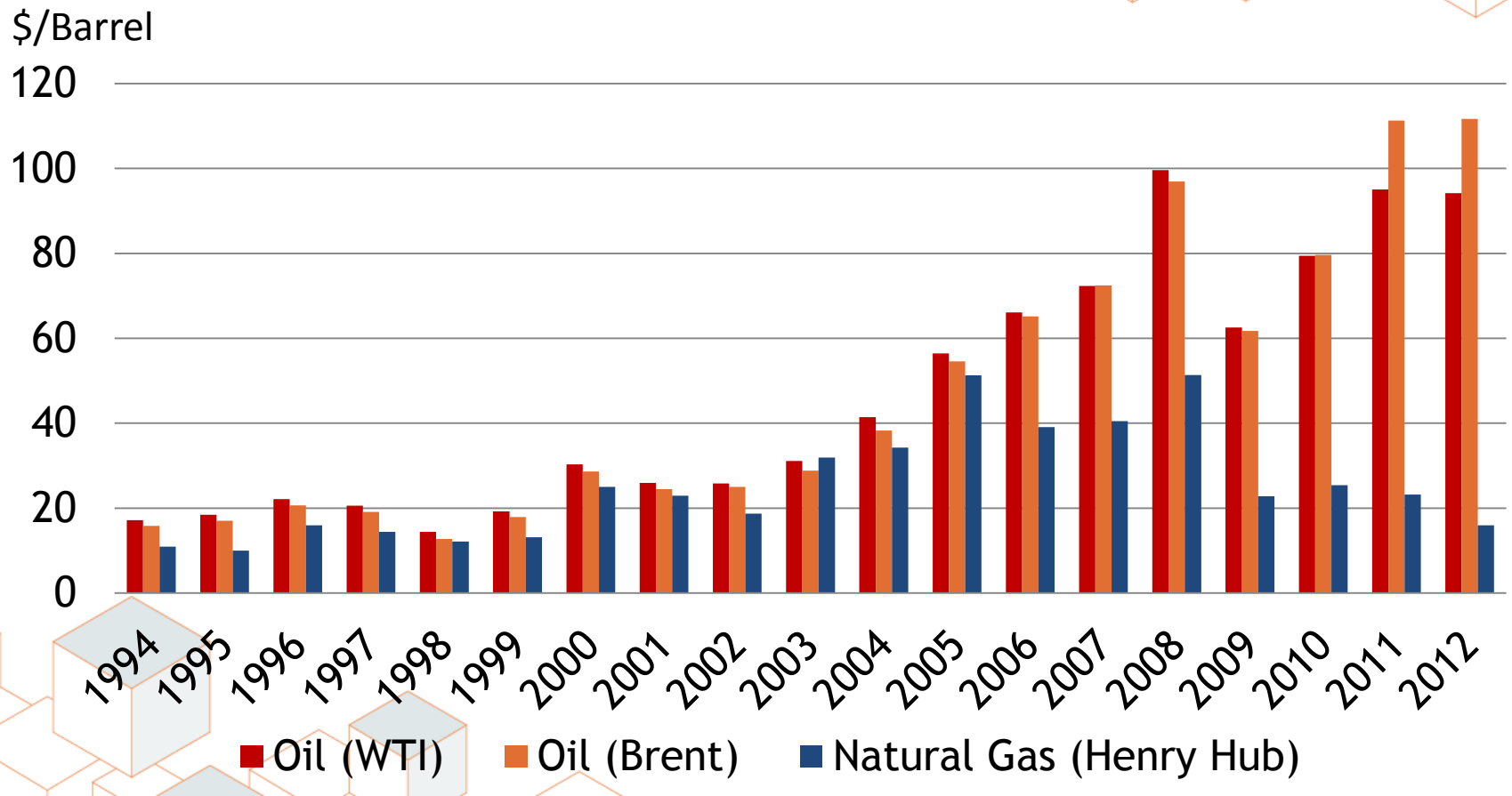
Note: Prices generally reflect domestic wellhead/hub prices or imported prices via pipeline. Some nations (e.g., Japan and Korea) import LNG. Thus, the higher prices. Other nations import LNG if it's a minor share of demand but these prices aren't generally reflected in the above.

Global Natural Gas Price Trends



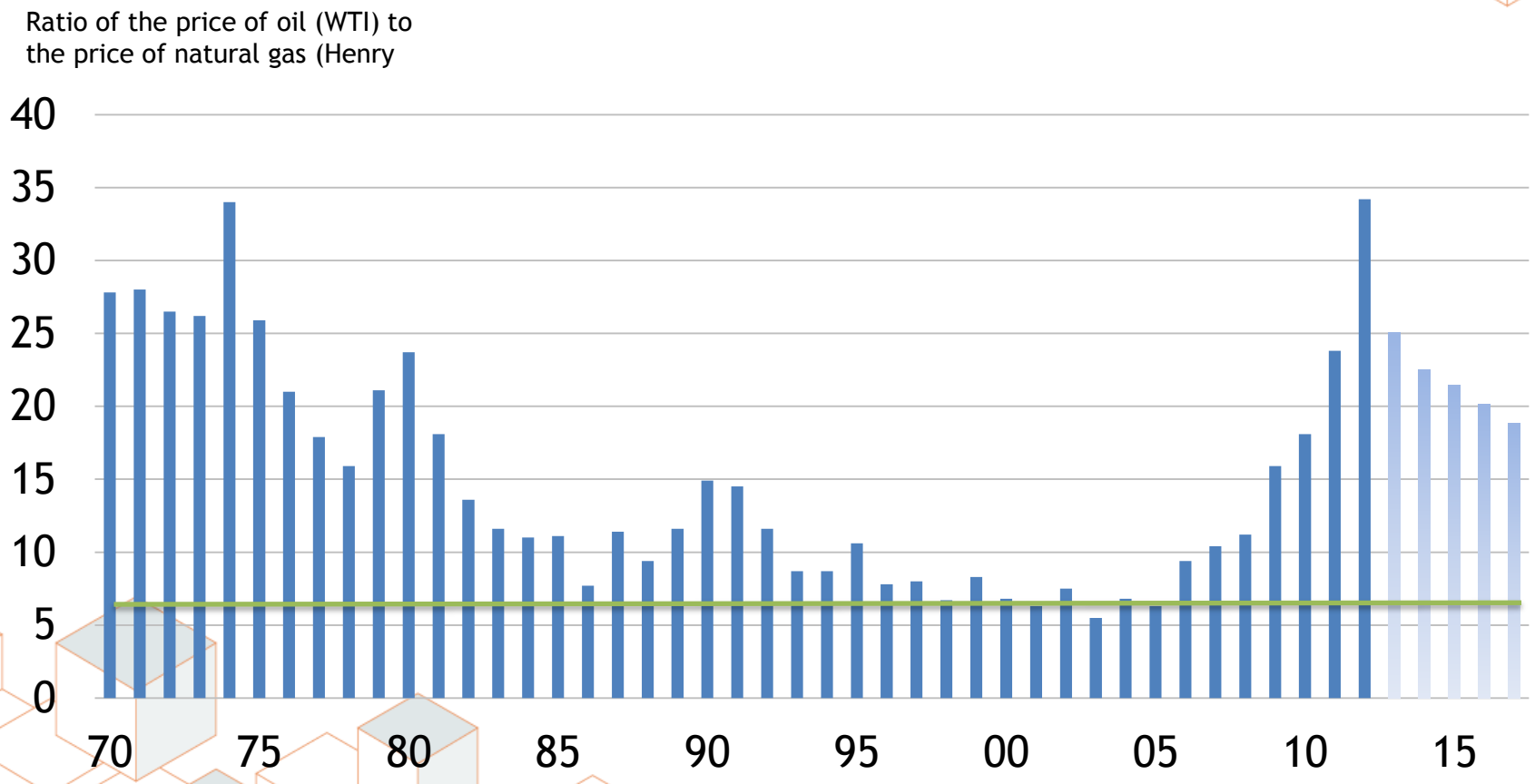
Source: EIA, Petrobas, IMF, World Bank, various national statistical agencies

Oil and Natural Gas Prices (oil equivalent)



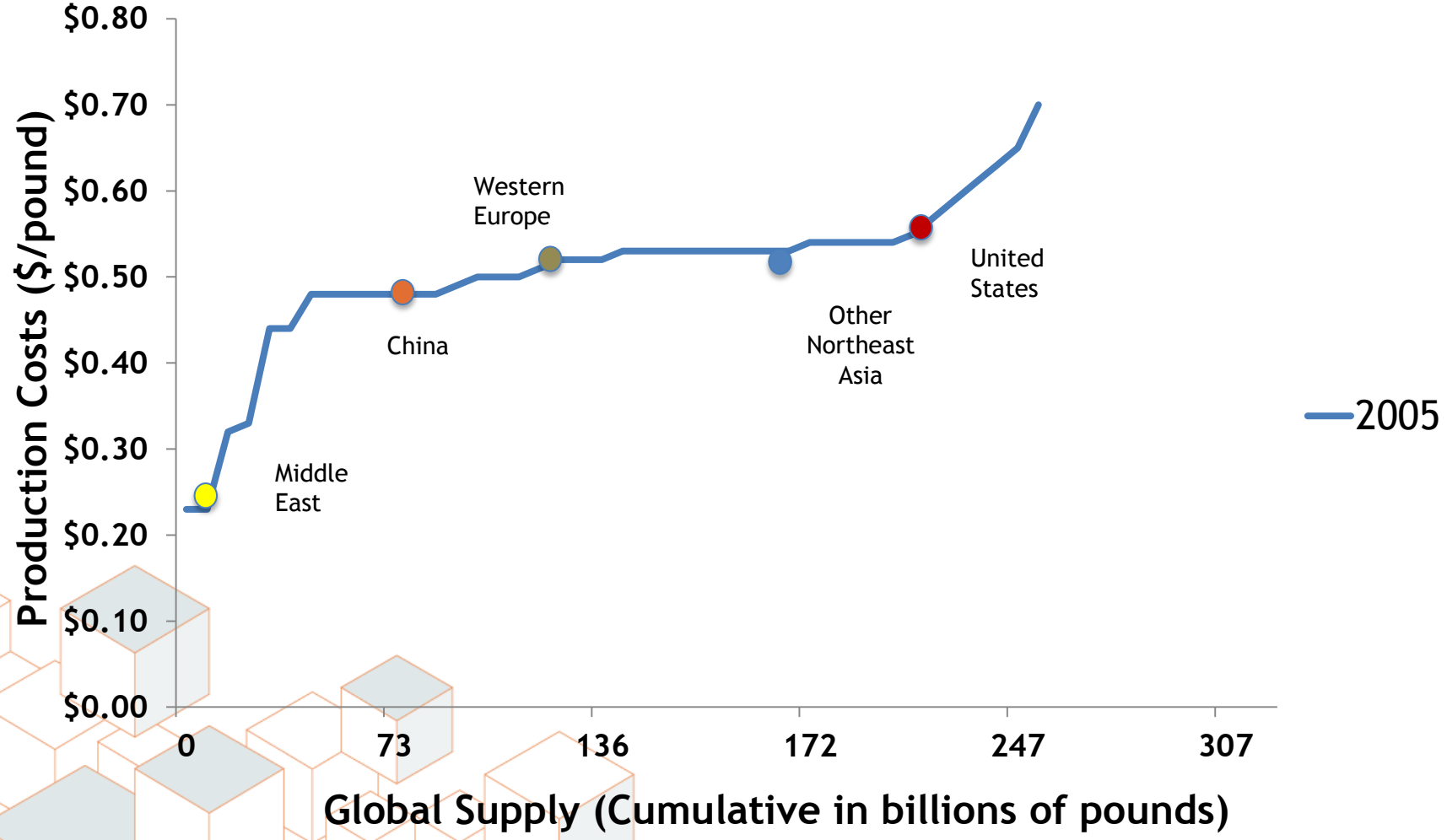
Source: Energy Information Administration

Oil-to-Gas Ratio: A Proxy for US Gulf Coast Competitiveness



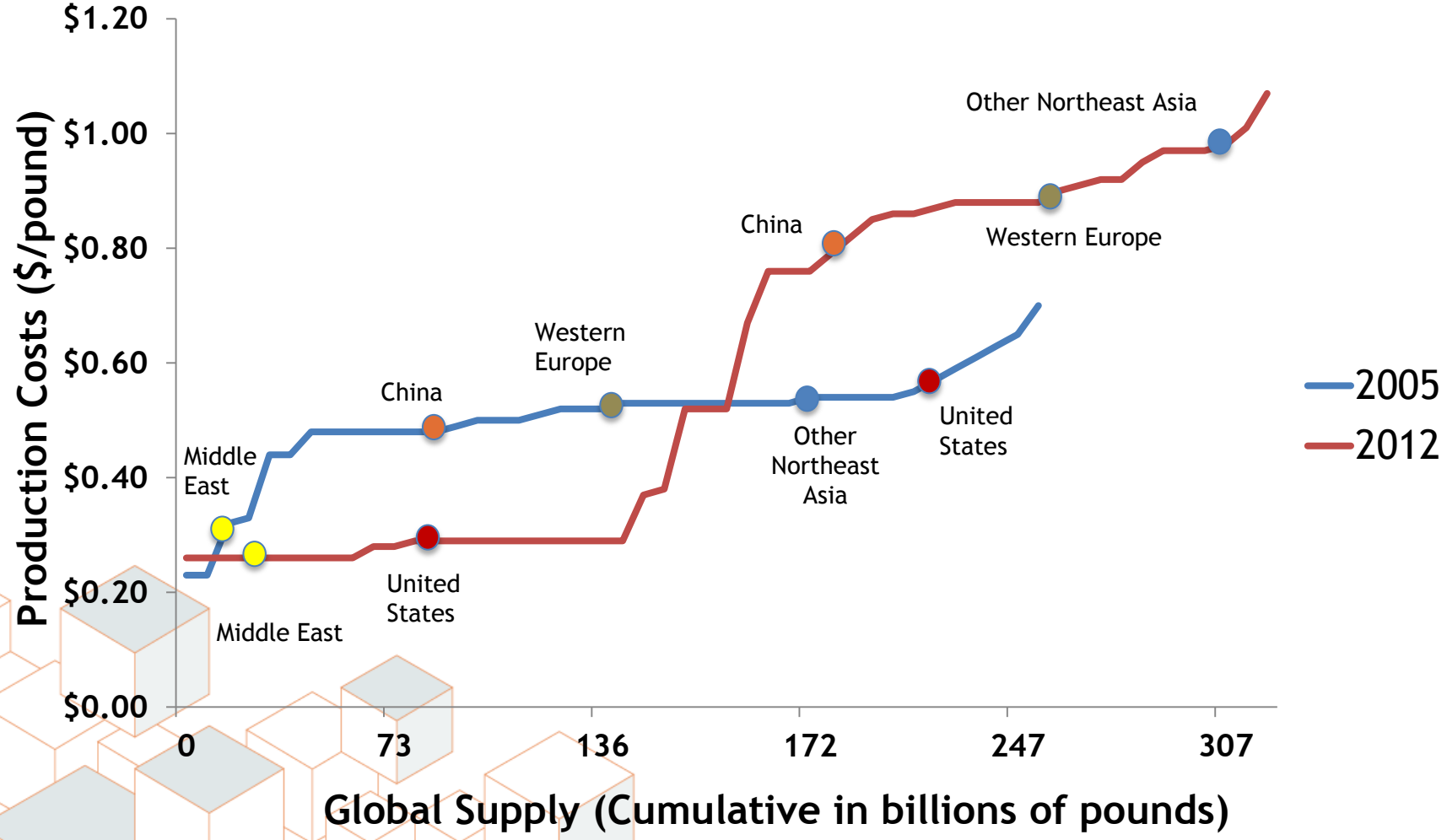
Global Ethylene Supply Curve

(Petrochemical Production Costs by Country/Region)

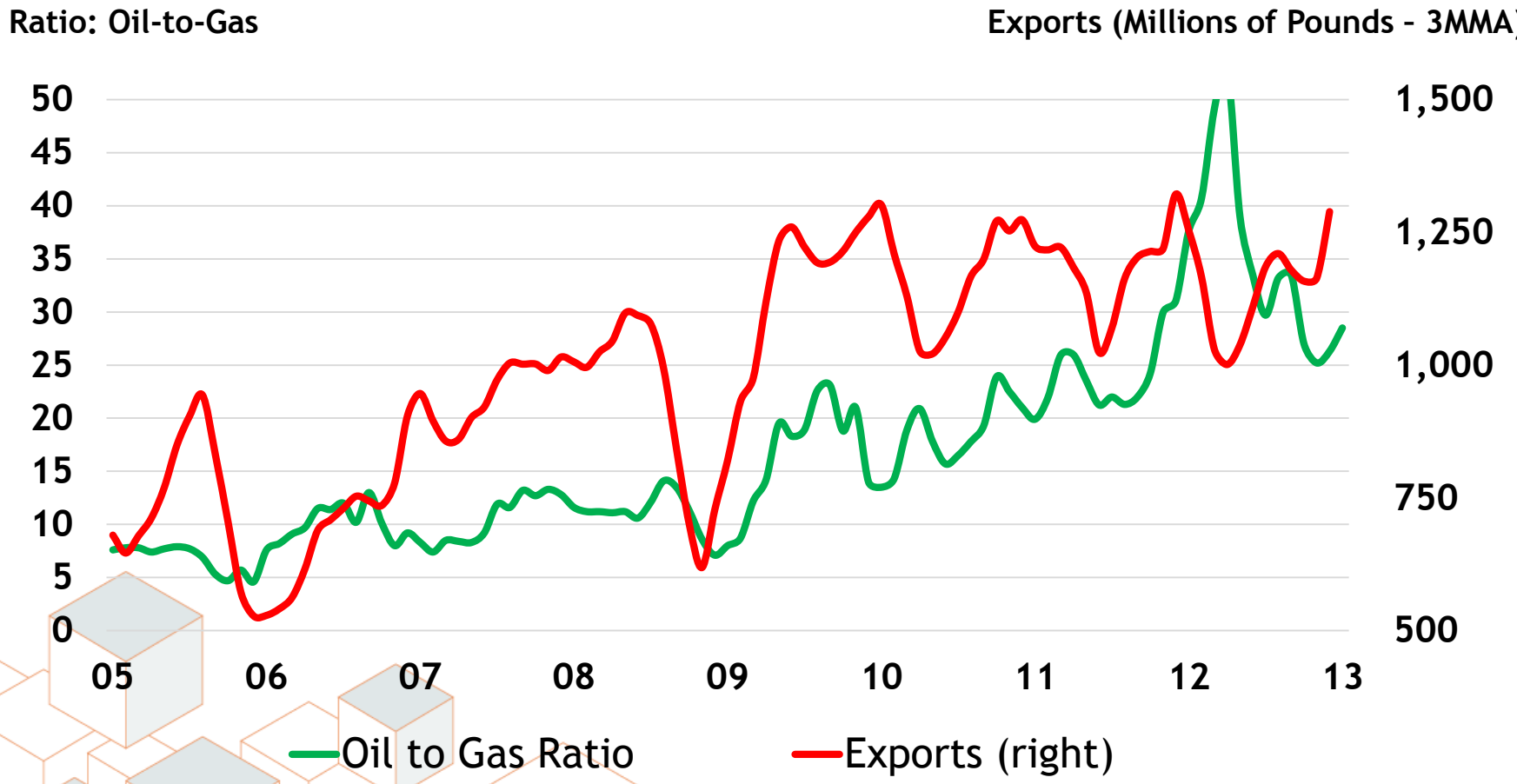


Global Ethylene Supply Curve

(Petrochemical Production Costs by Country/Region)

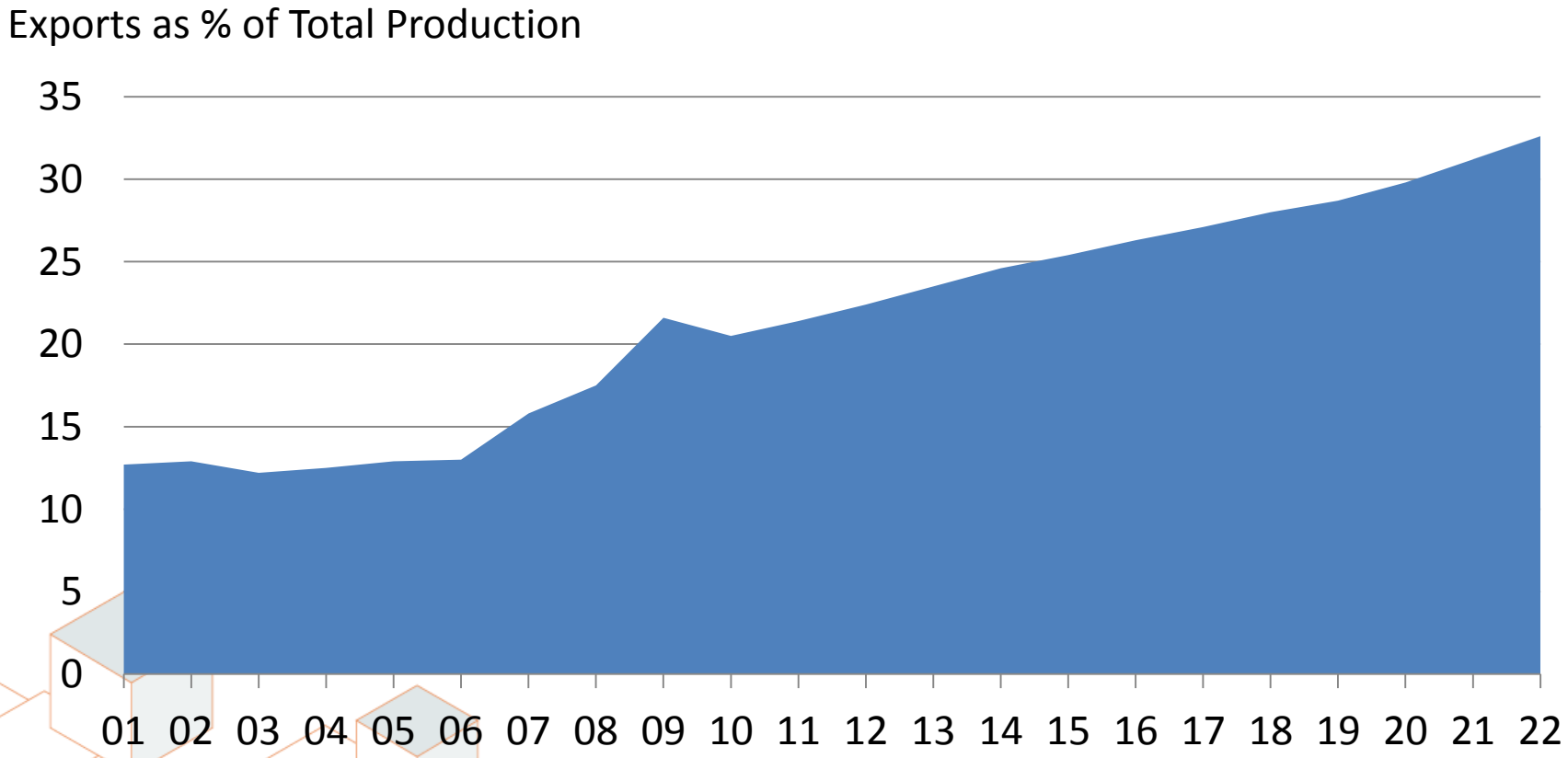


North American Thermoplastics Exports and Oil-to-Gas Ratio are Correlated



Note: Thermoplastics includes LDPE, LLDPE, HDPE, PP, and PVC

Exports Gaining as a Share of North American Thermoplastics Production



Petrochemical Competitiveness

Then…

USGC petrochemicals competitively disadvantaged

Near top of global cost curve

Major capacity build in the Middle East with stranded ethane from that region

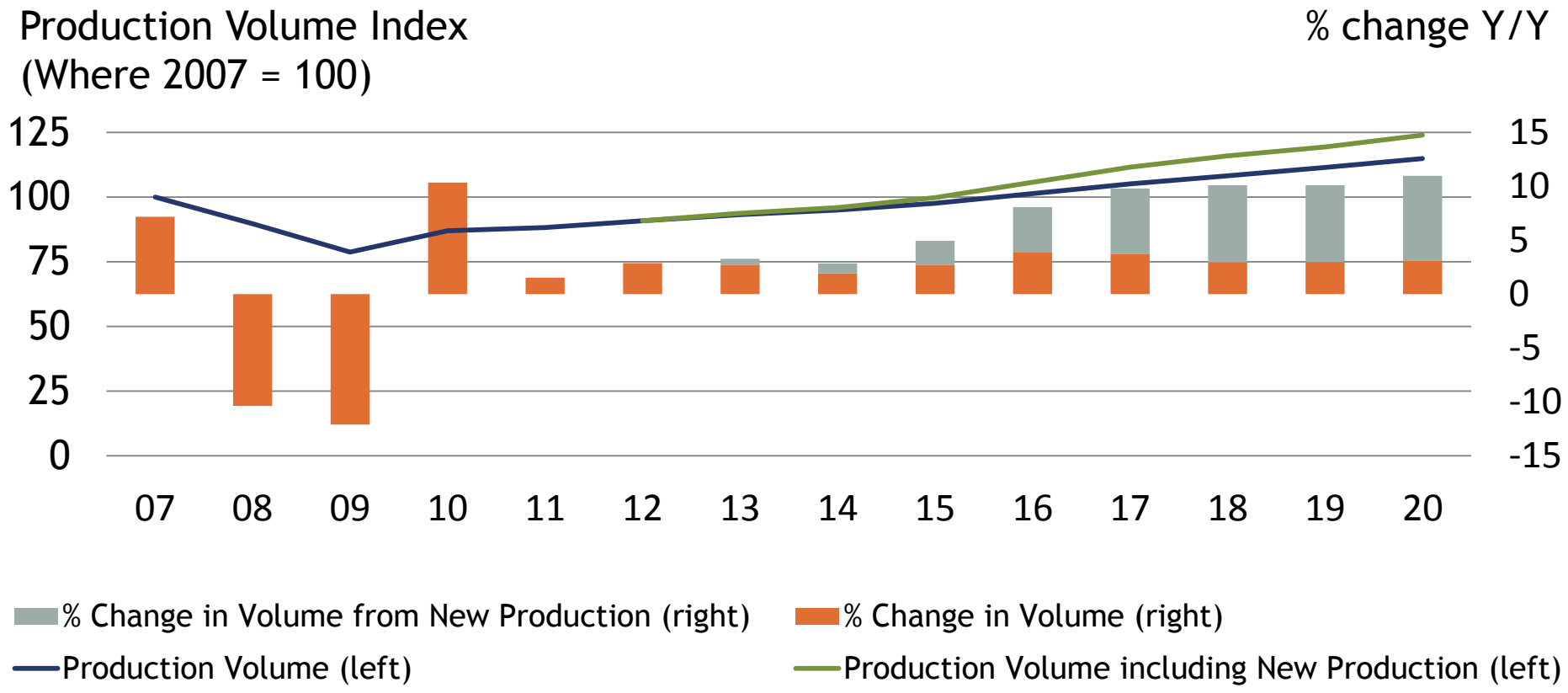
Now…

By 2011, USGC cost position had improved that region follows Middle East

Ethane supplies tightening in Middle East; era of low-cost feedstocks may be over - some producing nations may ride up the cost curve

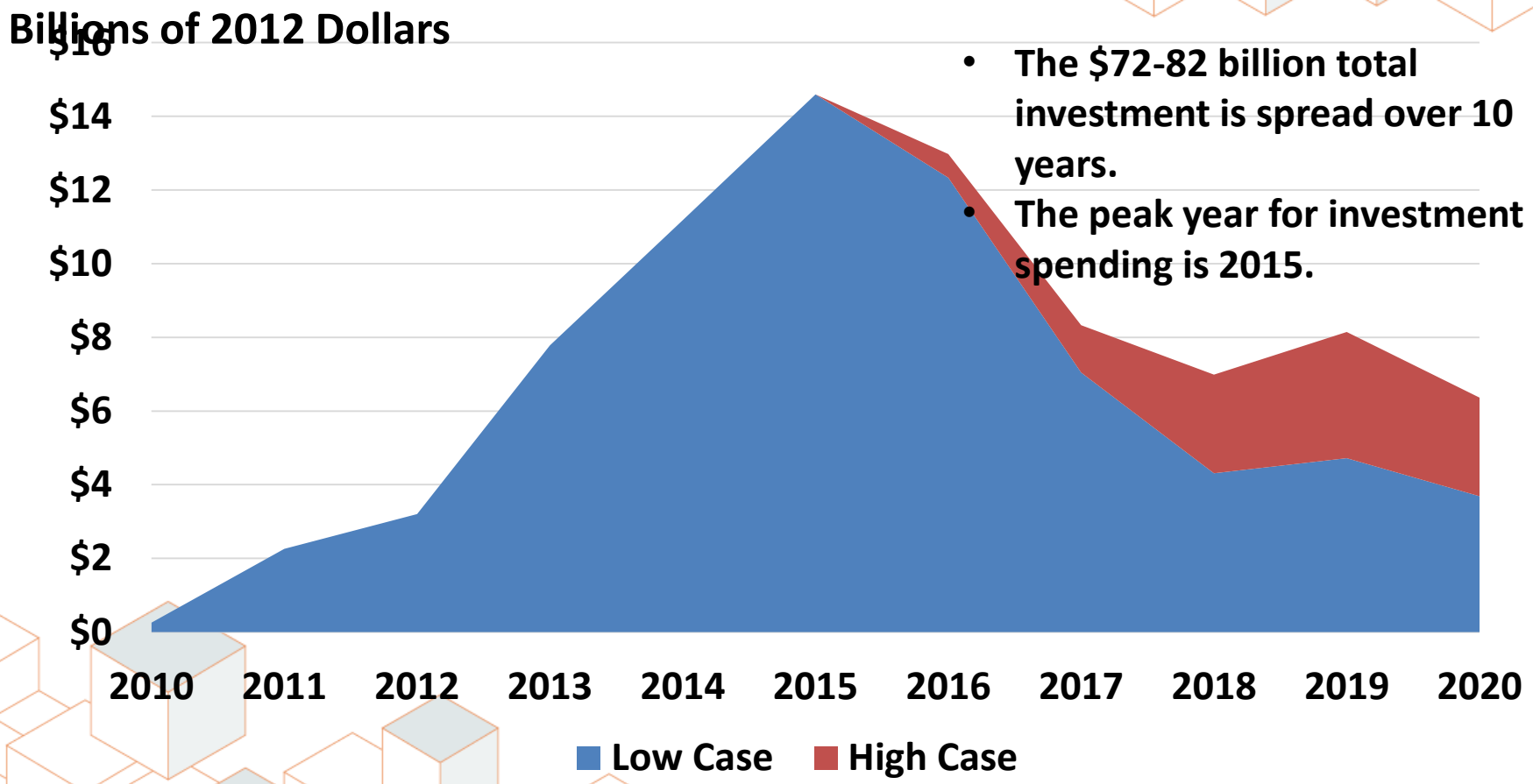
Outlook for Chemicals (excluding Pharmaceuticals)

Consensus forecast does not account for supply shocks, i.e., shale gas. With production from announced investments is accounted for, production growth is substantially higher. Growth shifts from an average of 3.0% per year in the baseline to 7.8% per year with output from new investments.



Sources: Federal Reserve, American Chemistry Council

Incremental Shale-Advantaged Chemical Industry Investment (2012-2020)



- The $72-82 billion total investment is spread over 10 years.
- The peak year for investment spending is 2015.

Shale Advantage Driving Capacity Expansion Across Many Products

Ethylene – capacity expected to grow by half

Ethlyene cracker co-products - propylene, butadiene

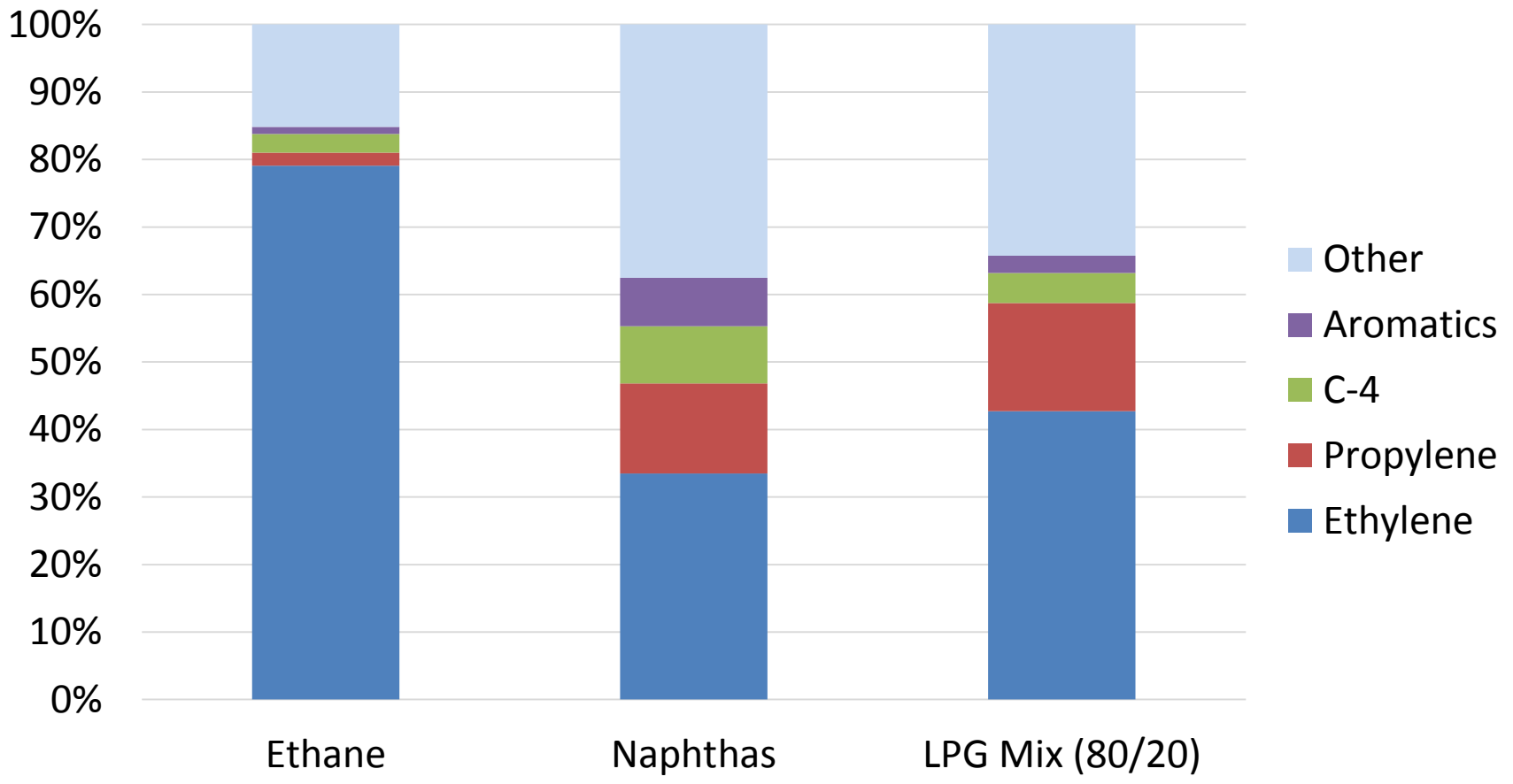
Derivatives – PE, vinyls, MEG, alpha-olefins, etc.

Co-products – chlor-alkali

Methanol

Nitrogeneous fertilizers – ammonia, urea and derivatives (AN, UAN)

Olefin Yields by Feedstock

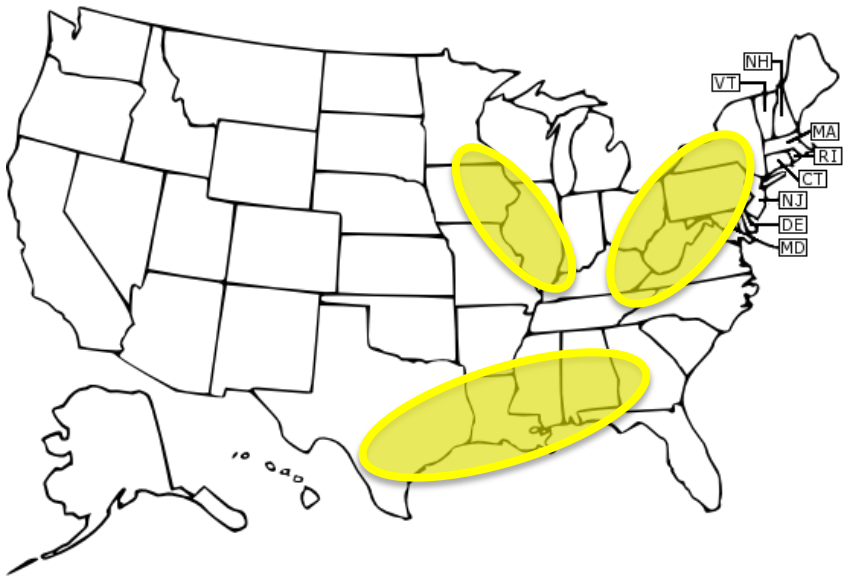


Geography of Petrochemical Investment

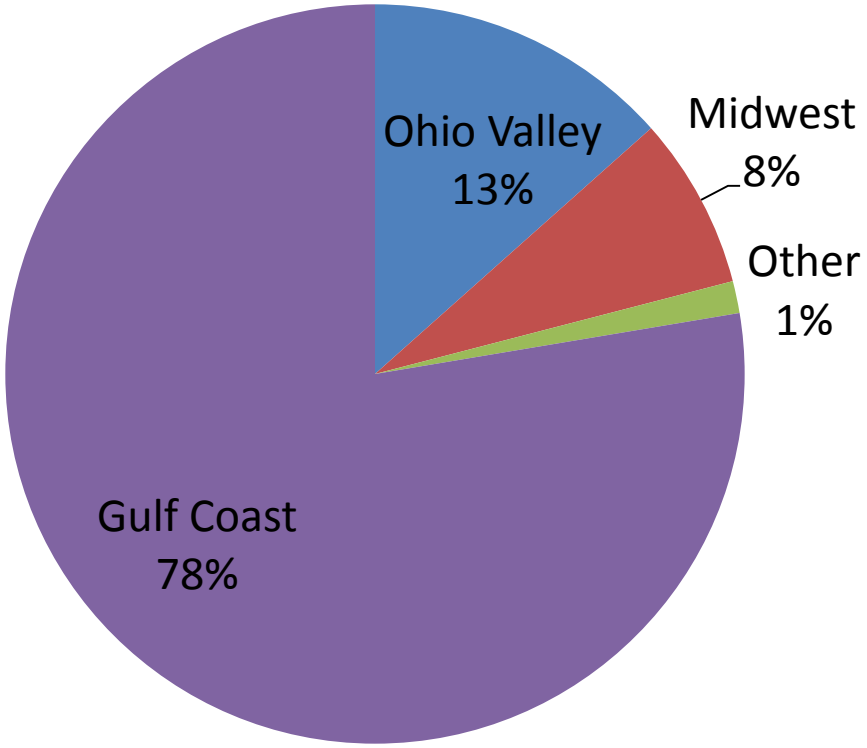
A flood of announced investments by more than a dozen companies to capitalize on new cost advantage

Much of the petrochemical investment will occur along the US Gulf Coast

However, there will be significant investment in new regions, i.e., Appalachia, Midwest



Announced Chemical Industry Investment, 2012-2020



Concluding Remarks

- Shale gas changes everything. Renewed US competitiveness from shale gas is already lifting chemical exports and production and will grow as new capacity comes online.
- Strong investment growth in chemicals already materializing.
- Investments by other customer industries will create additional opportunities.
- Further gains in plastic and chemical exports, employment, and capital spending.
- Challenges: skilled labor, environmental permitting, etc.

Thank you

martha_moore@americanchemistry.com

(202) 249-6182

www.americanchemistry.com