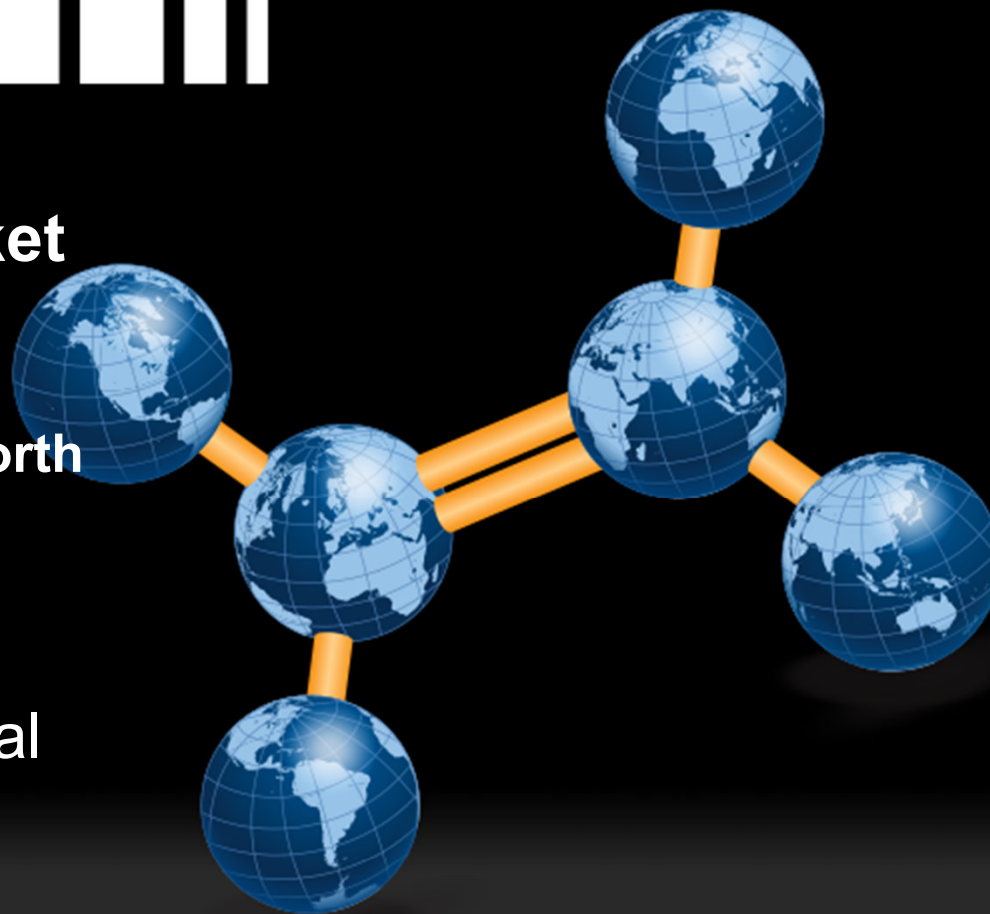


Global Ethylene Market Outlook: Low Cost Feedstocks Fuel The Next Wave Of Investments In North America and China

Mark Eramo

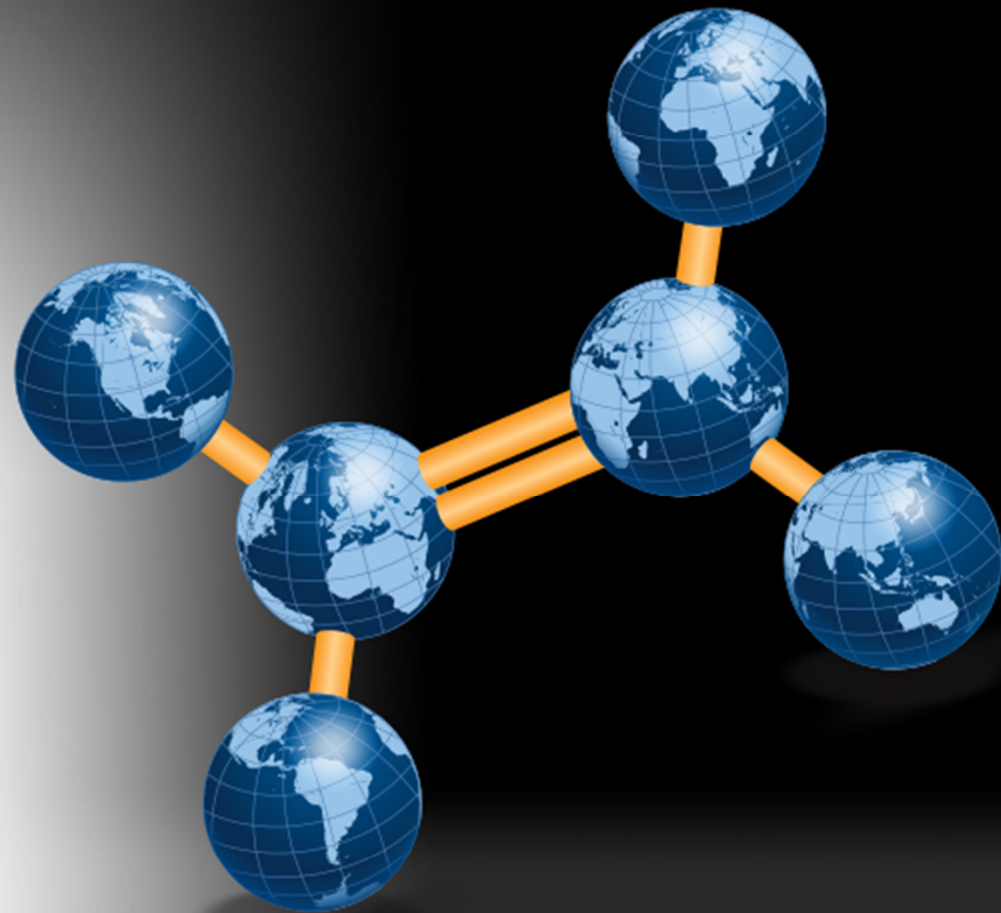
Vice President, Chemical
Insights

IHS Chemical



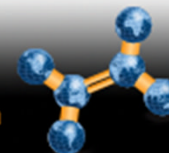
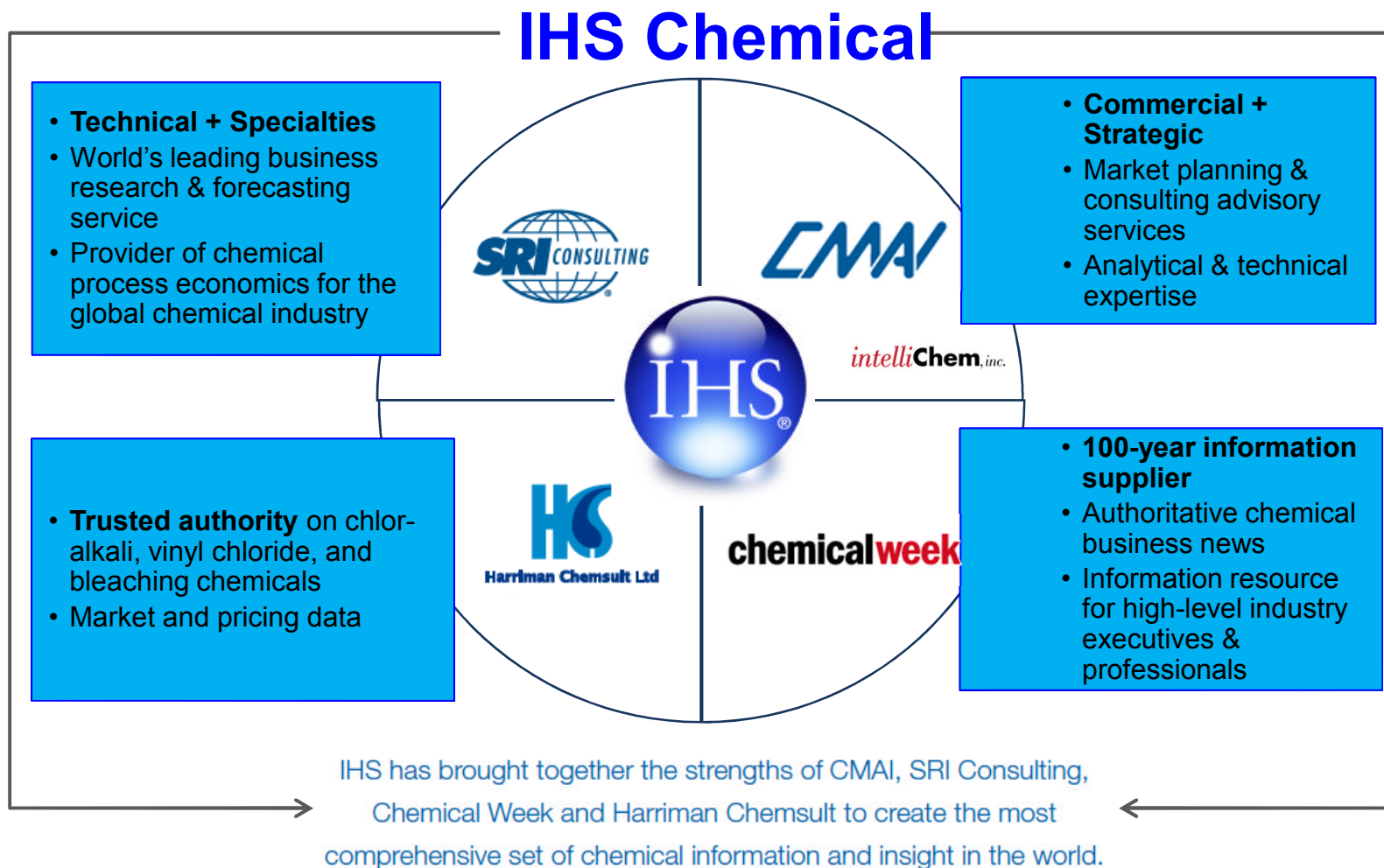
Opening Session

Ethylene Market Outlook



Technip

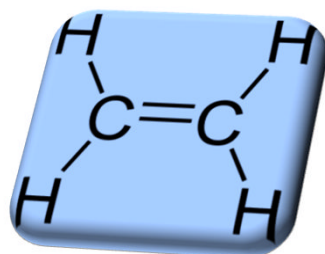
Best-in-class brands brought together



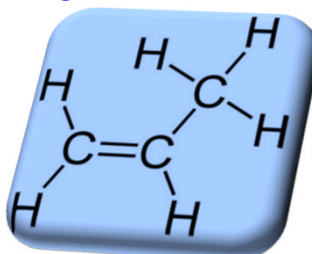
Chemical Industry Building Blocks



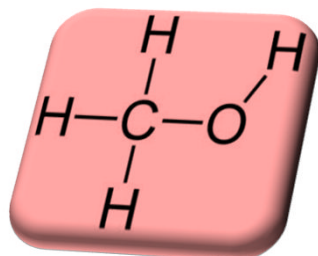
Chlorine



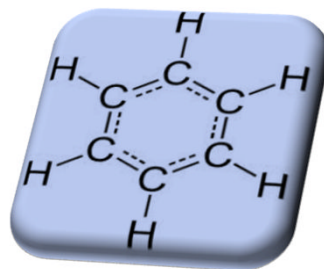
Ethylene



Propylene



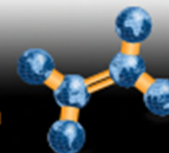
Methanol



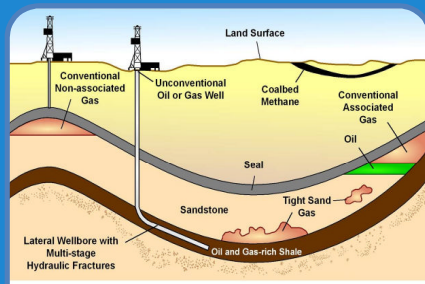
Benzene

- The Chemical Industry is a key enabler of modern living: Medical, Transportation, Construction, Packaging, Food Processing, Water Distribution, Fuel, etc...
- Investments driven by cost advantage and/or proximity to demand centers
- Demand growth is accelerating outside of the developed regions
- Strategy development requires complete understanding of the value-chain

Petrochemical Value-Chain From The Wellhead to Wal-Mart



Chemical Investment Seek To Leverage An Advantage...



Energy & Feedstocks

...make up 60-70% of the costs of chemical production. Investments seek a competitive advantage



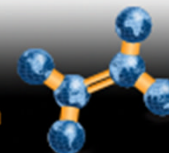
Demand Growth

Proximity to demand growth essential without distinct cost or technology advantage. Trade access also key.

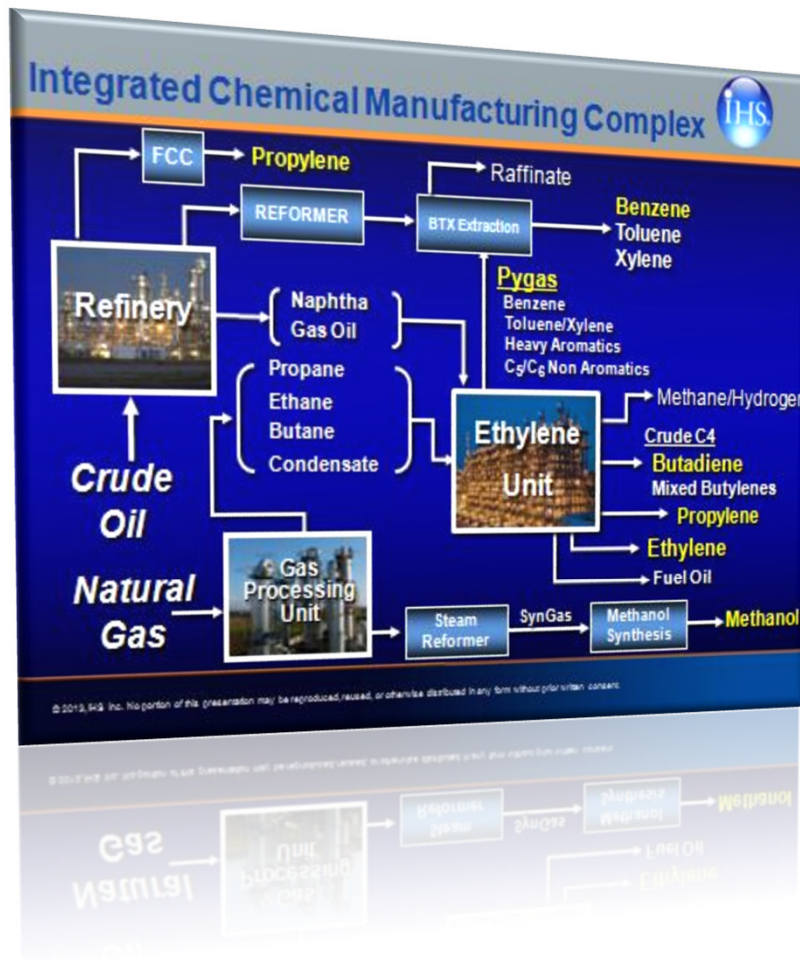


Technology

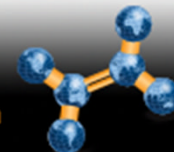
Technology to enable efficient and competitive production costs and high performance products. First to market is important



Agenda

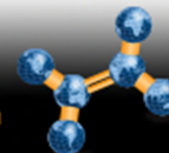
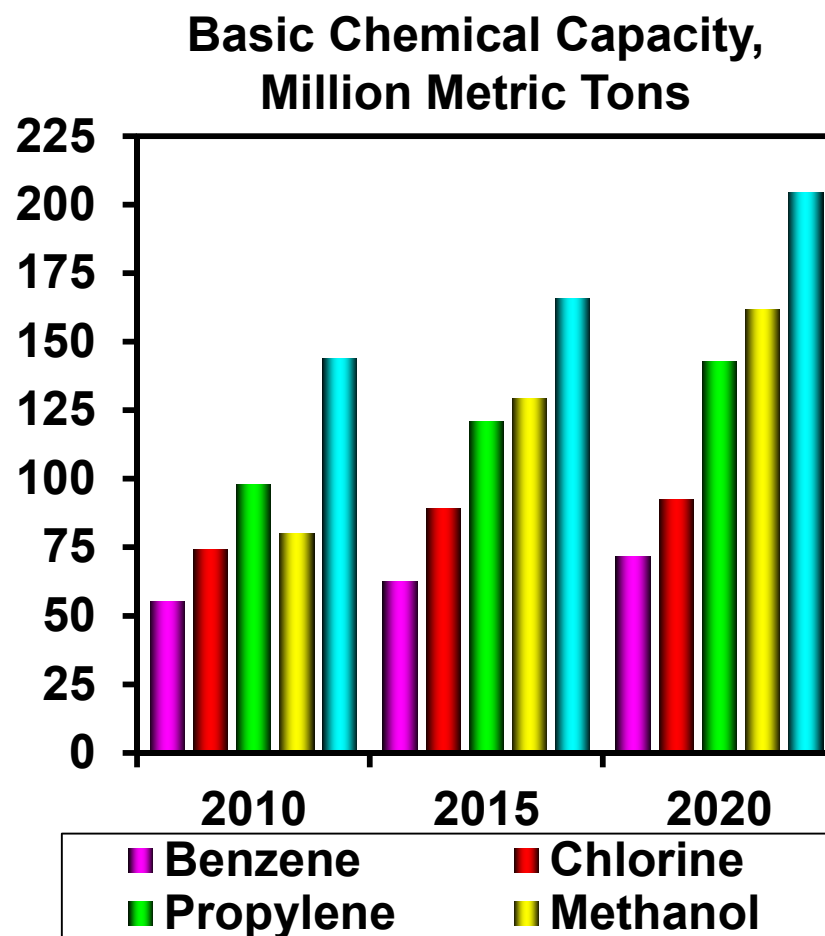


- Chemical Building Blocks
- Changing Demand Trends
- Impact of Energy
- Shift in New Capacity
- Evolving Trade Patterns
- Profit Cycle is Mixed



Ethylene, Methanol and Propylene Expanding At A Rapid Pace

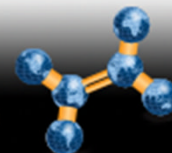
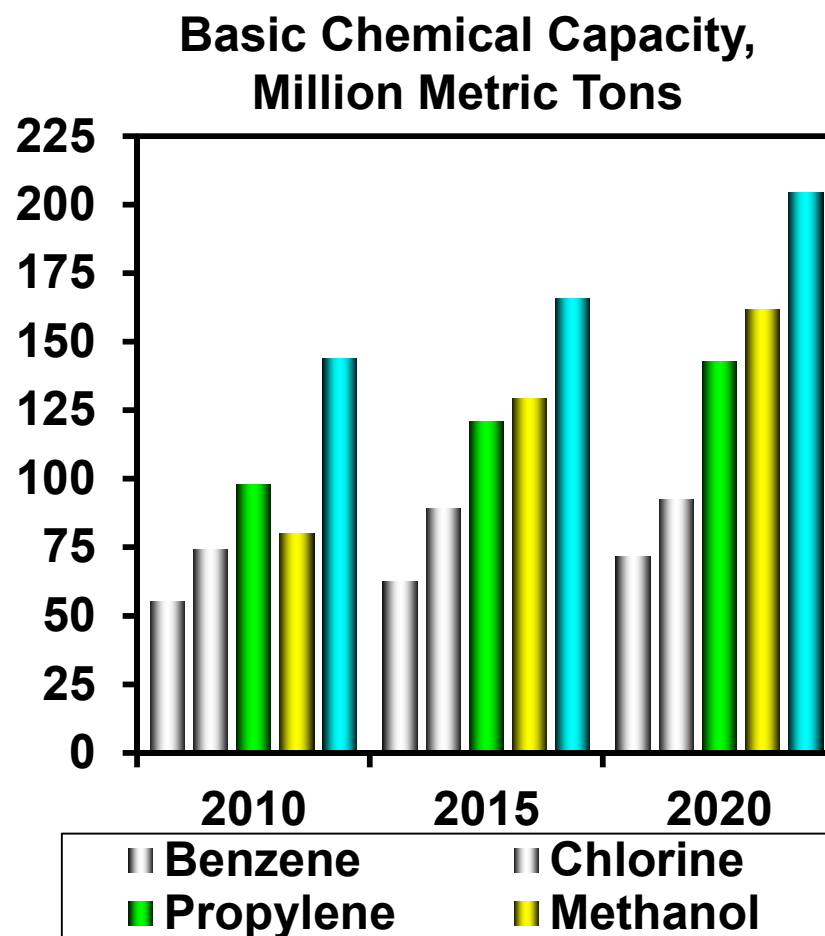
- Ethylene is the largest of the basic chemical building blocks
- Ethylene, propylene and methanol are expanding at a rapid pace...driven by shale in North America
- Benzene and chlorine showing more modest growth



Ethylene, Methanol and Propylene Expanding At A Rapid Pace

2020 Global Capacity:

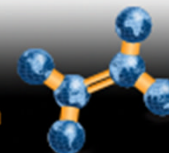
- Ethylene:
200 Million Tons
- Methanol:
160 Million Tons
- Propylene:
140 Million Tons



Demand for Basic Chemicals Driven By Durable/Non-durable Goods



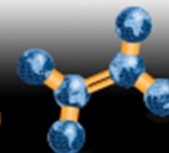
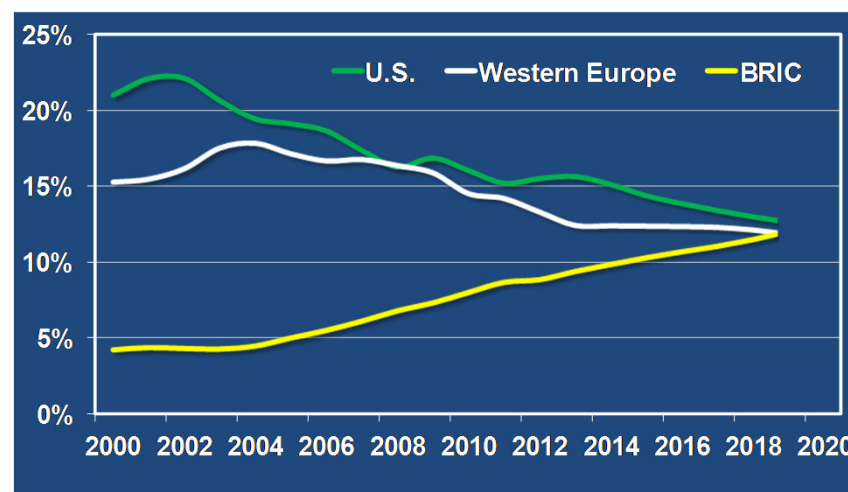
- Strong economic growth supports basic chemical demand growth
- Modest growth in 2012/13 suggesting lower consumer spending
- Emerging markets are driving tomorrow's demand growth
- China dynamics are changing, but remains critical to most markets



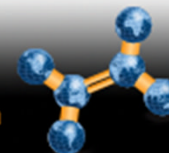
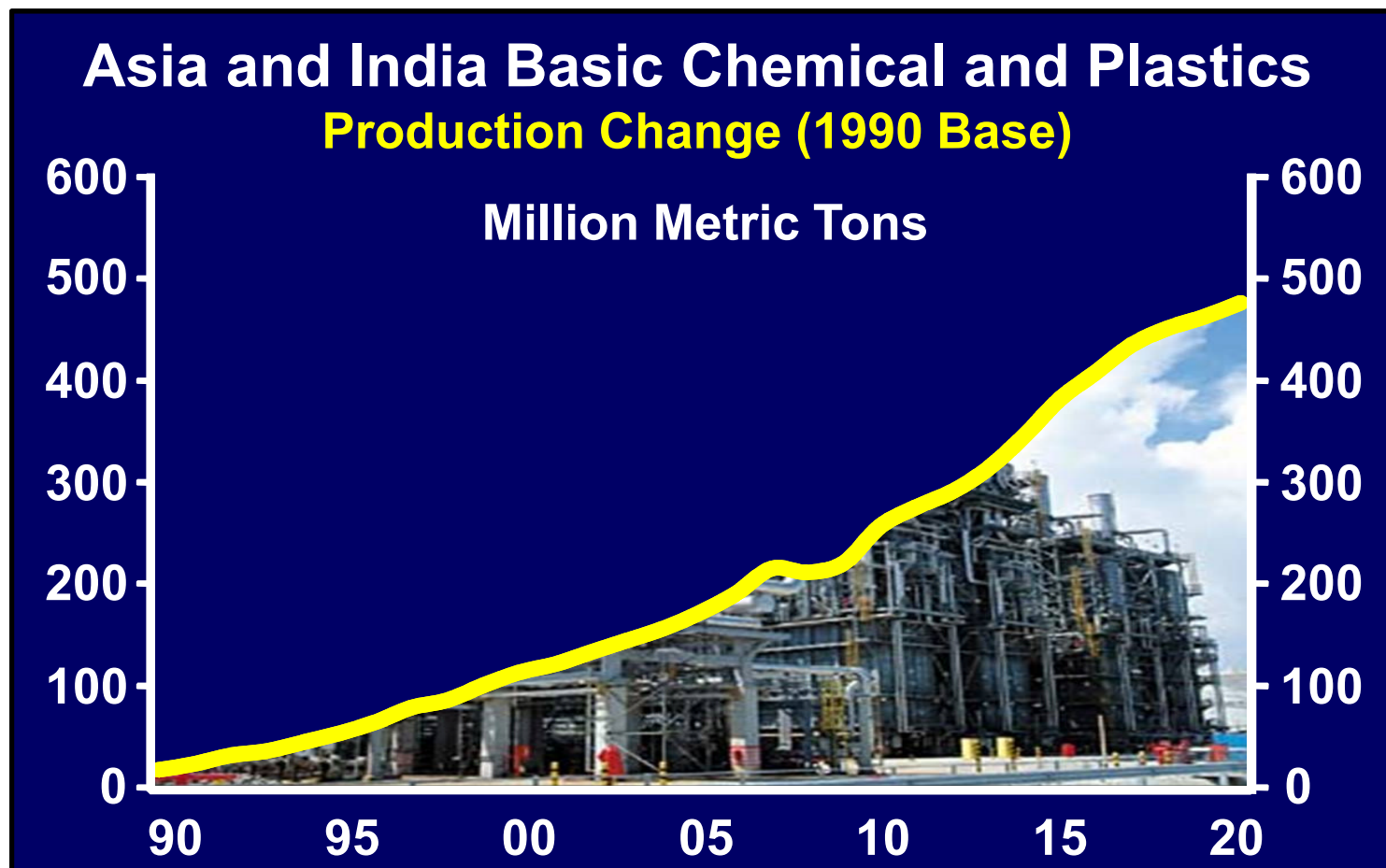
The Rise of the Emerging Market Consumer

- The share of Global GDP related to consumption is converging in noted markets
- Emerging market's share will match that of U.S. & Europe within the next 7 years
- Message to producers is clear: *do not ignore the absolute size of U.S. and European market, but for rapid growth you need to look to the emerging world GDP*

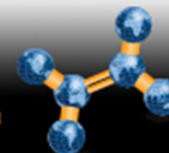
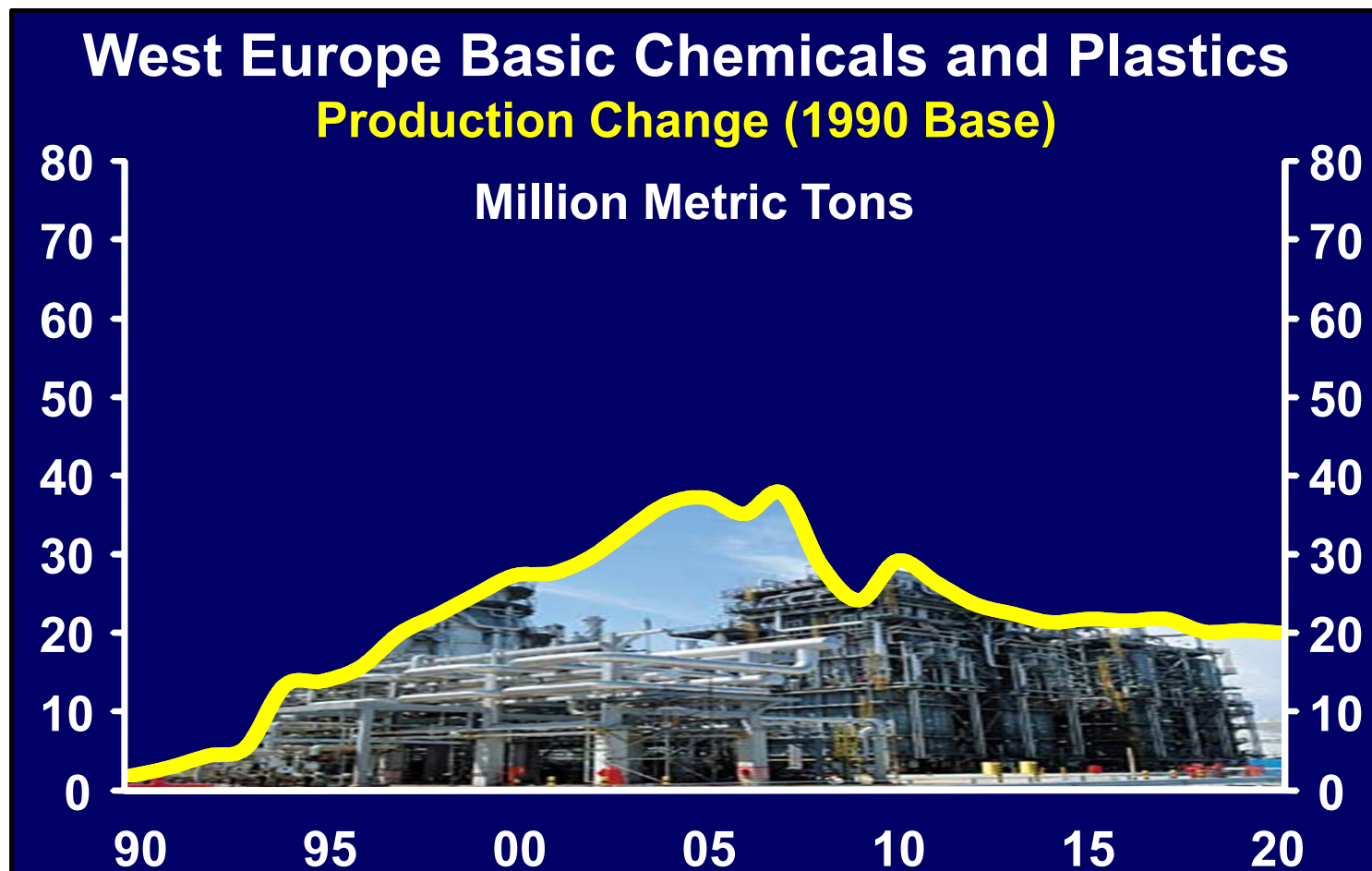
Ratio of Domestic Consumption to Global



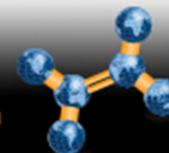
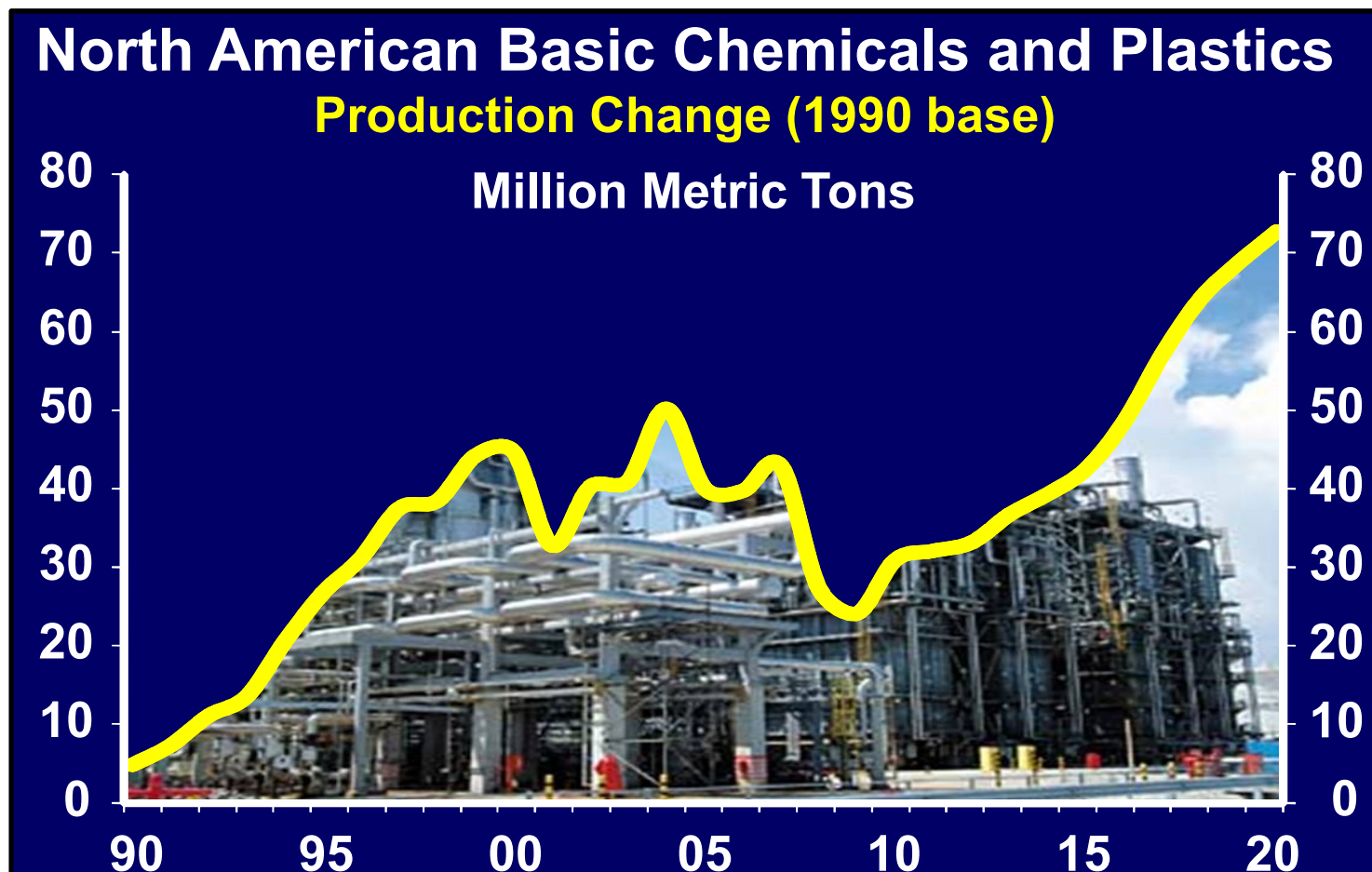
Production growth continues to be supported by rapid growth in real demand...



Challenging economic conditions & threats of imports continue to weaken outlook...

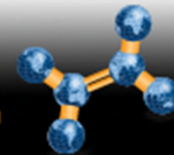


New capacity is necessary to return this region to historical production levels...

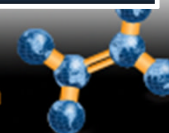
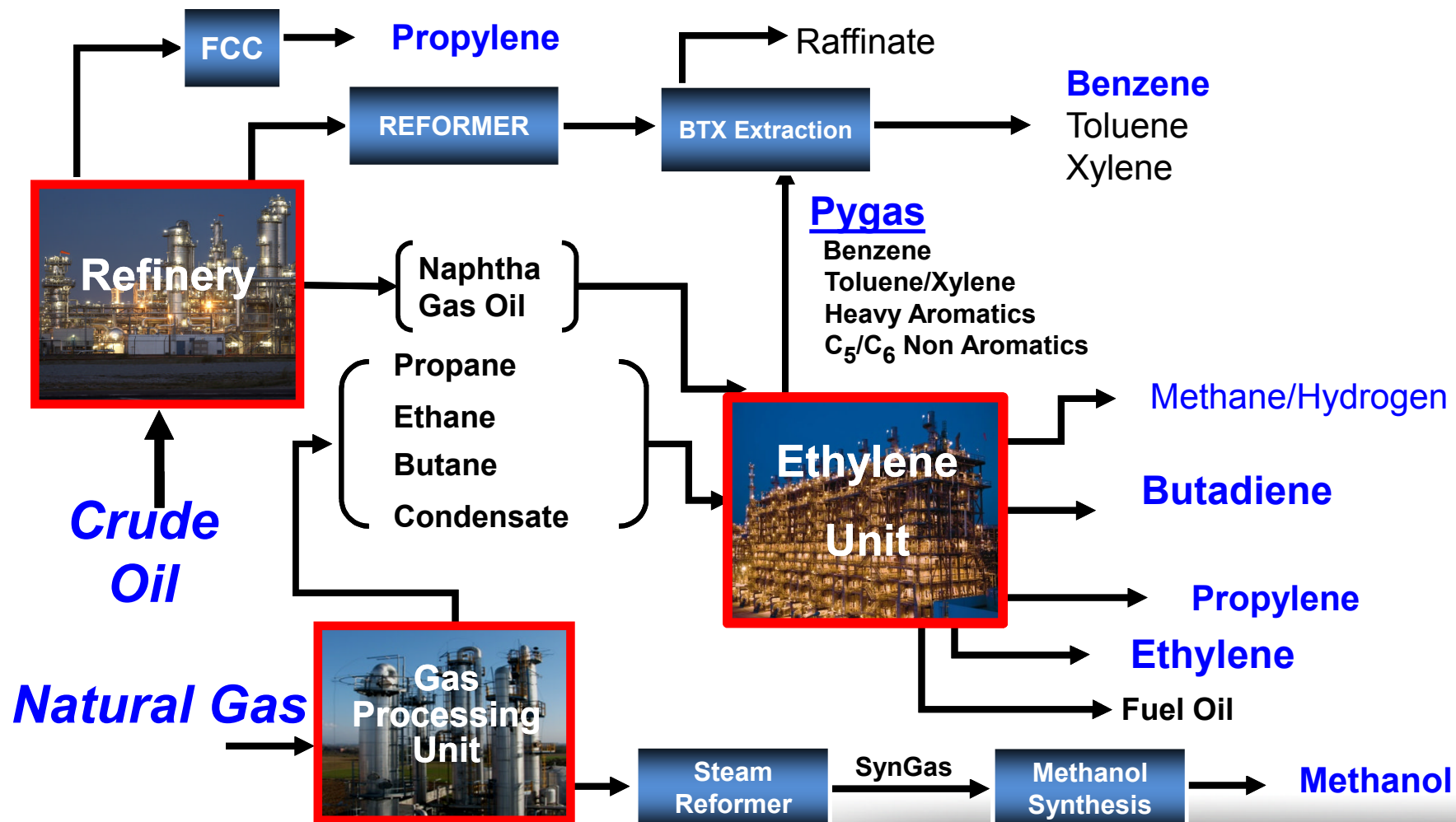


Capacity Expansions' Driven By Low Cost Feedstock & Integration Strategy

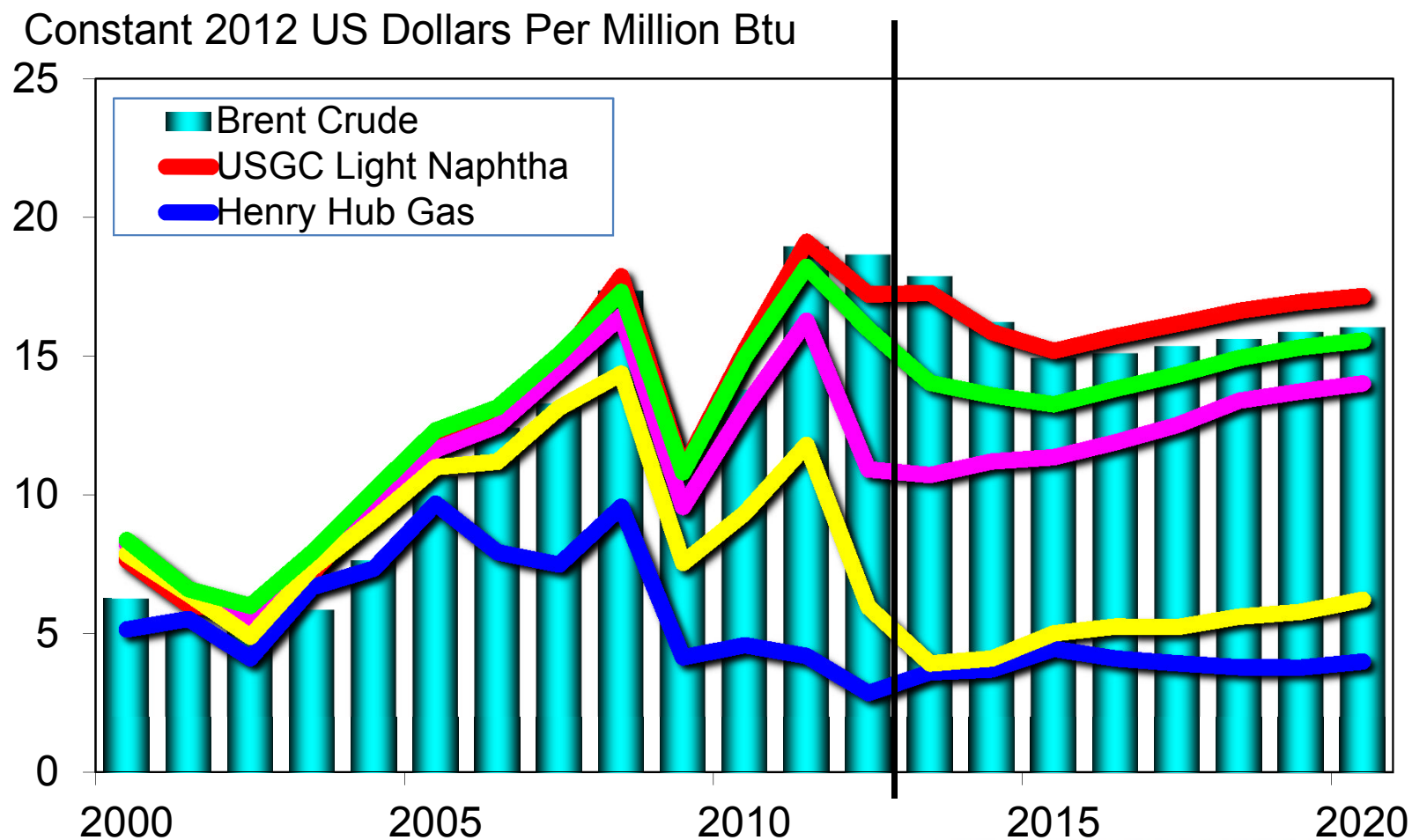
- Cost of production is closely tied to cost of hydrocarbon feedstock's
- Location of advantaged feedstock's play key role in capital investment decisions
- North America prepares for a surge in capacity
- Asia and Middle East continue to build as planned



Hydrocarbon Feedstock Costs: Key Driver In Chemicals Manufacturing

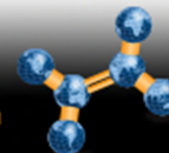
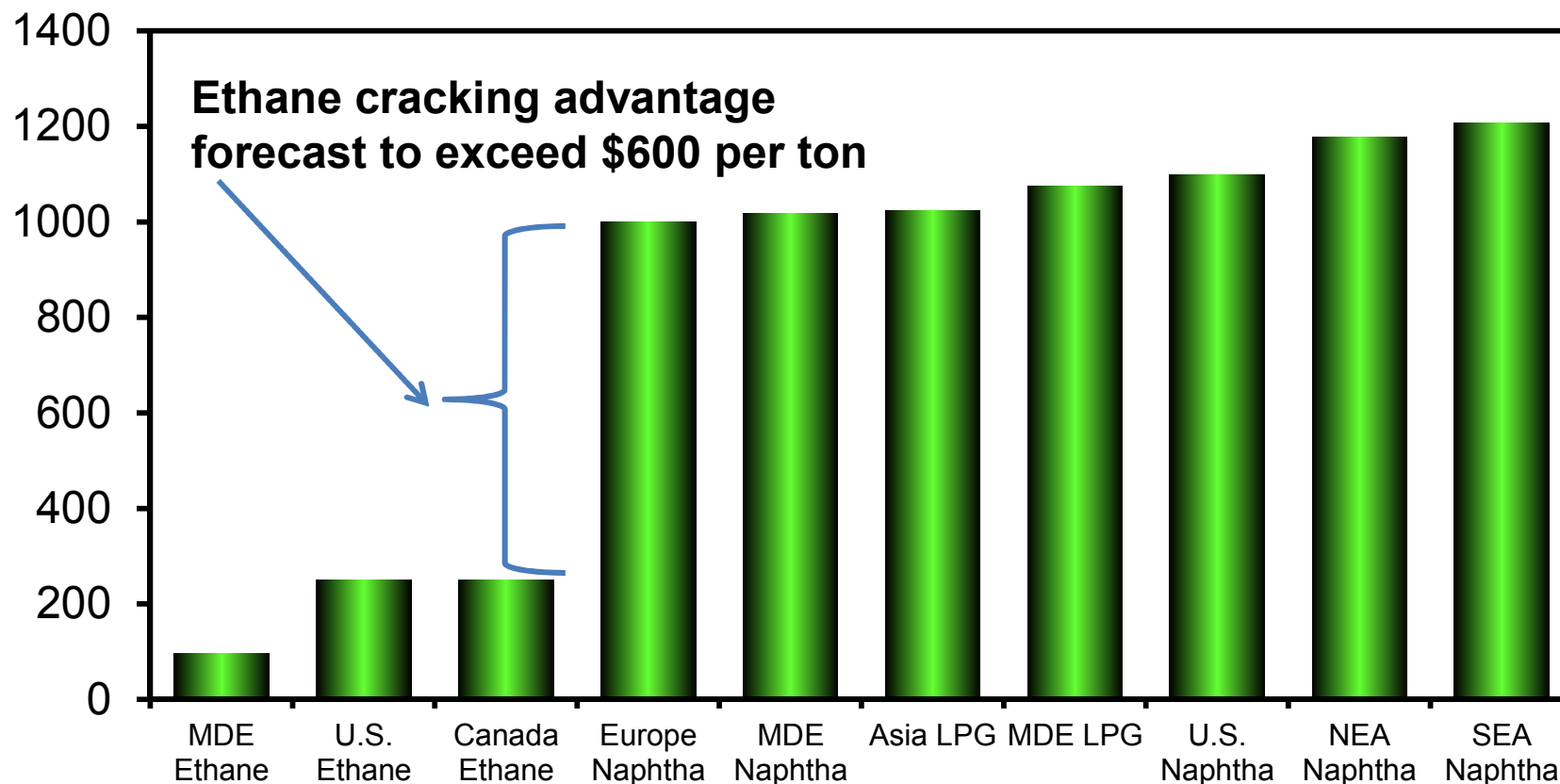


Brent Crude Oil and USGC Energy & Feedstock Prices

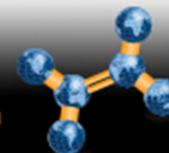
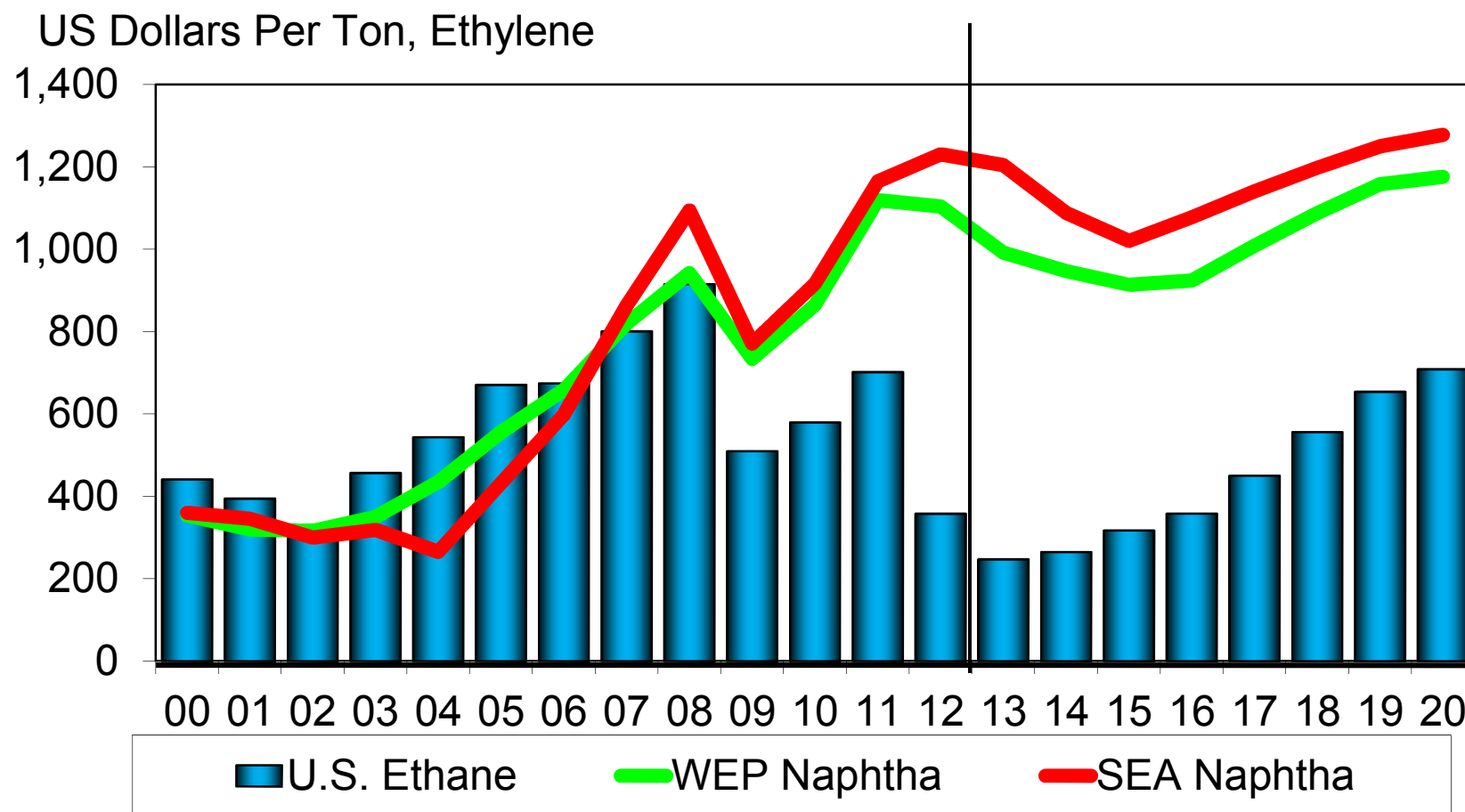


World Ethylene Cash Costs – 2013 Forecast

US Dollars Per Metric

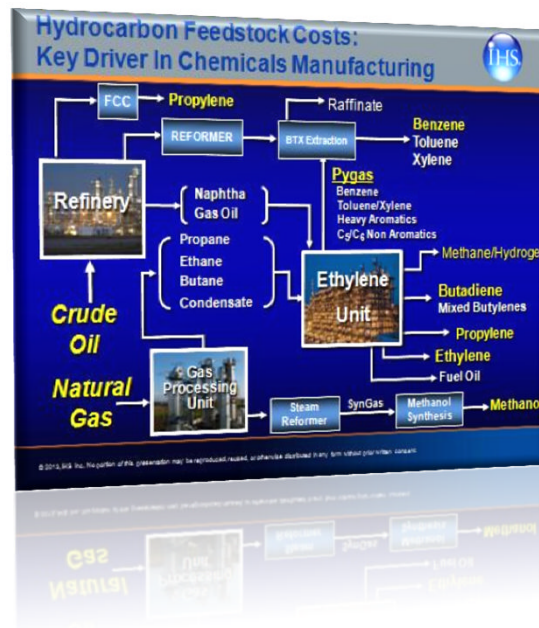


Ethane Cash Cost Advantage Is Significant and Sustainable

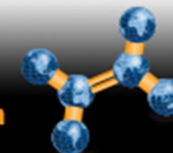


Energy Dynamics In North America Are Changing The Global Landscape

- **Abundance of New Hydrocarbons:** Shale gas and unconventional oil has ushered in a new era of hydrocarbon production in North America.
- **Additional Natural Gas Liquids (NGLs):** Ethane, propane, and butane production to increase sharply in conjunction with rapid growth in gas production.

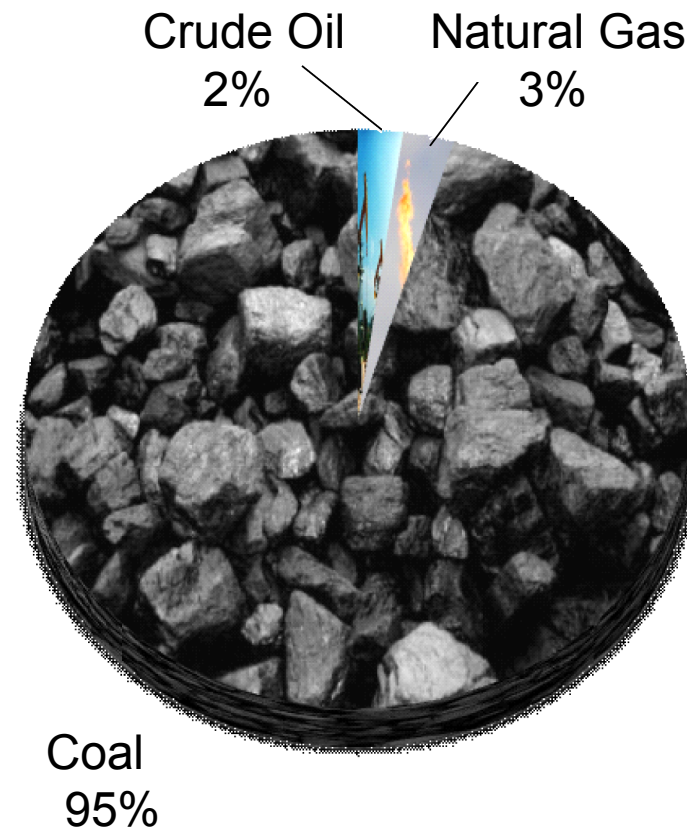


- **New Competitive Chemical Investments:** To leverage the supply of advantaged feedstocks, chemical producers have initiated plans to invest over \$20 billion in new chemical assets and infrastructure



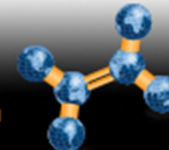
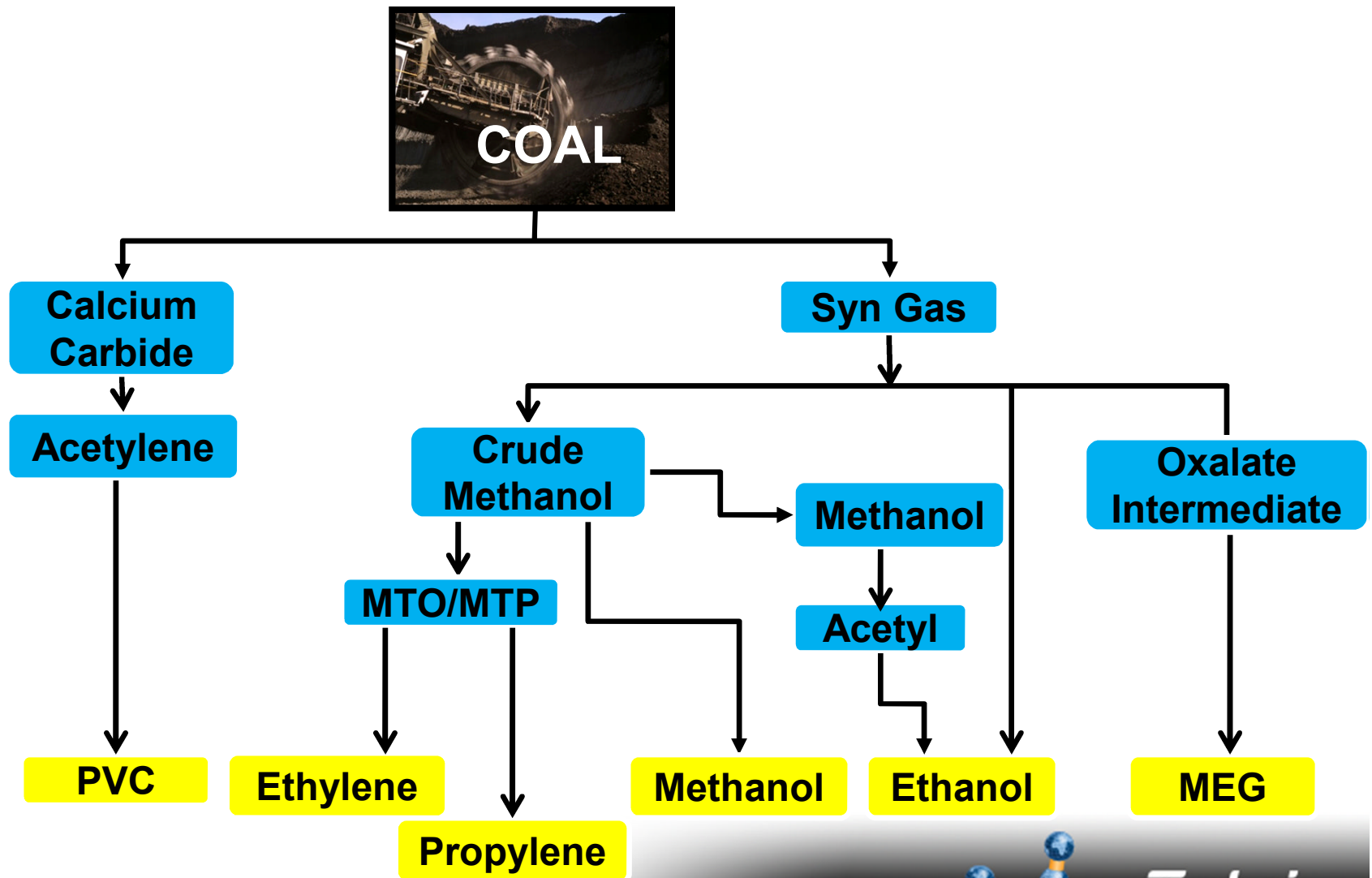
China: Scarce in Oil and Gas Reserves, But Plentiful in Coal

- China has limited crude and natural gas reserves, but a large coal reserve
- Majority coal reserves are in the west region
- Logistic bottleneck leads to “Stranded” coal



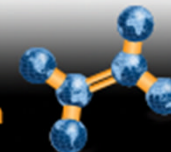
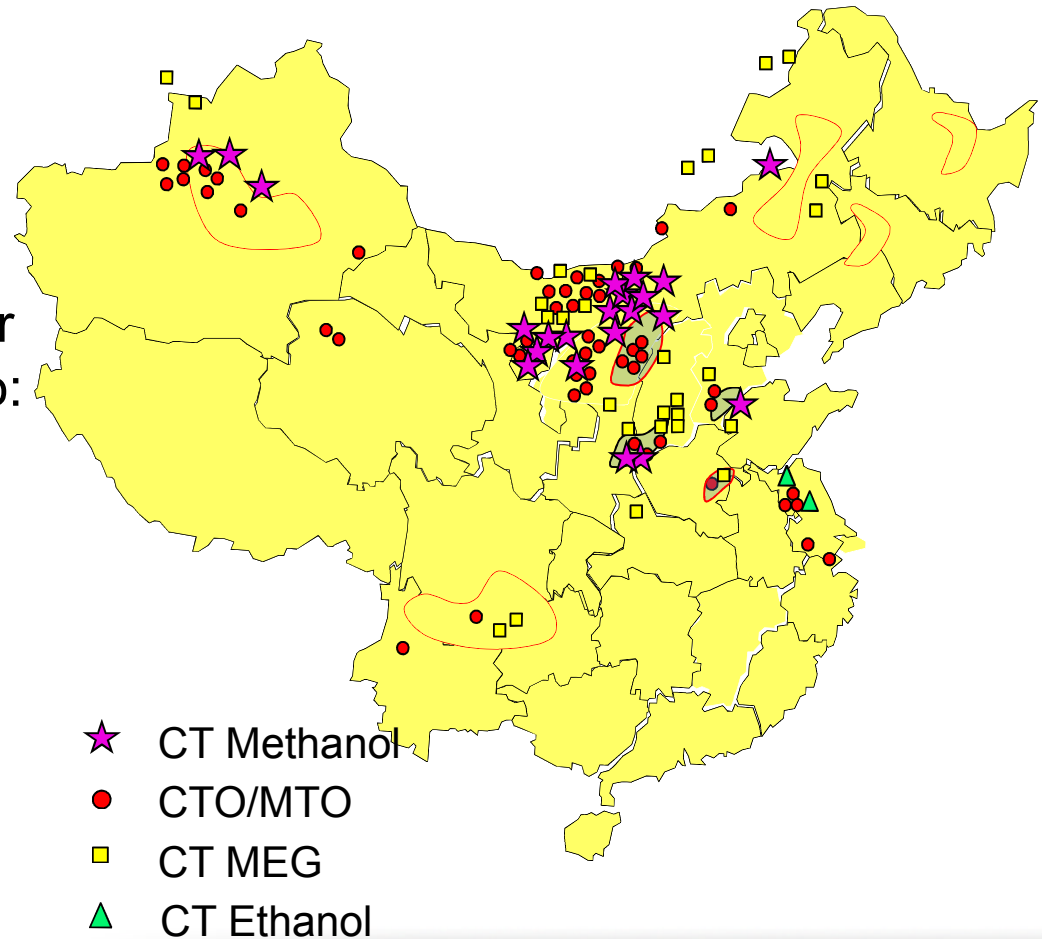
Source: China National Bureau of Statistics

Coal Chemical Product Chains



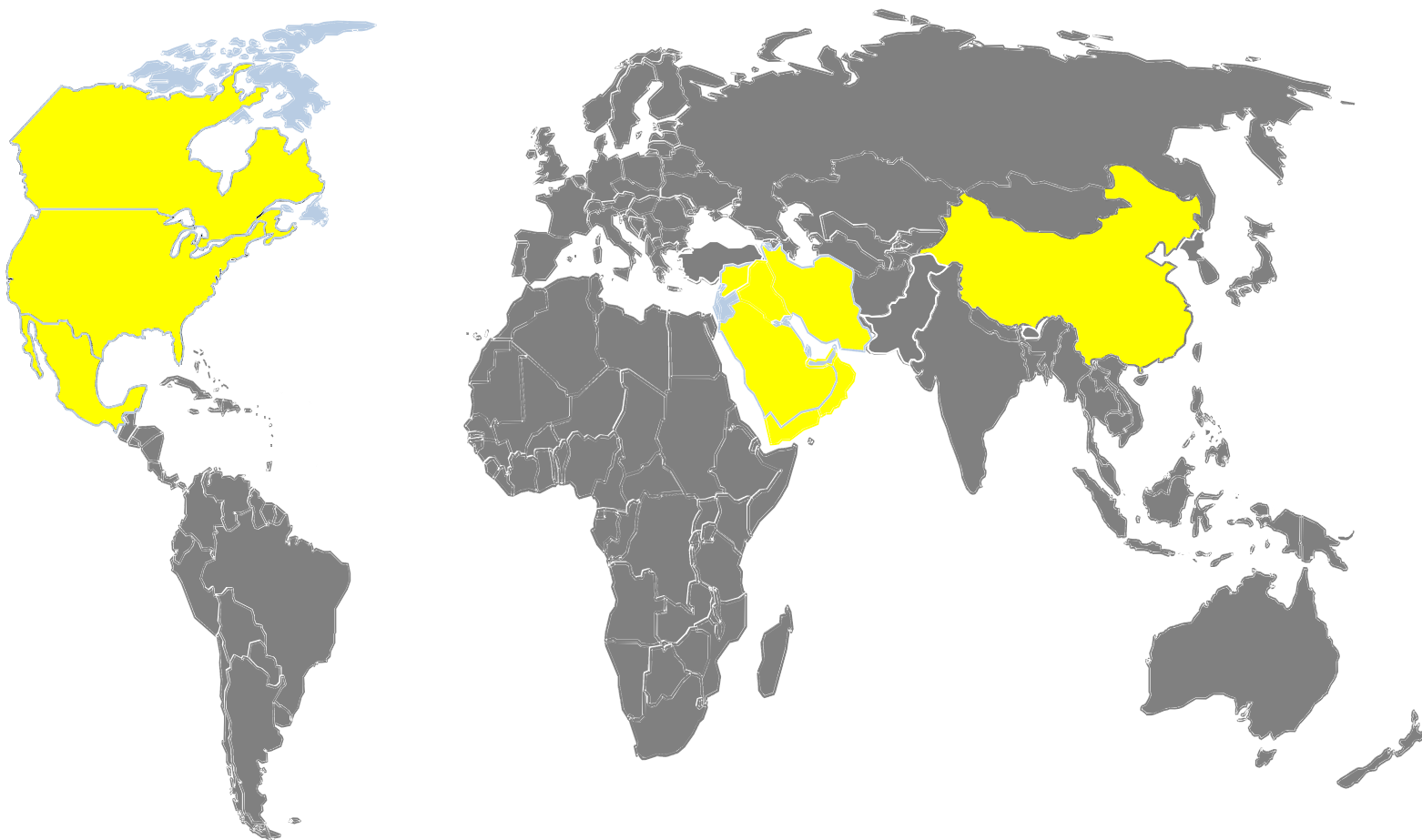
China Coal Chemicals Projects – A “Black Gold” Rush Opportunity

- State owned, private and foreign companies all participating
- Numerous projects were announced however fewer will be actually built due to:
 - Tight government control
 - High capital cost
 - Water availability
 - Carbon emissions and waste disposal issues

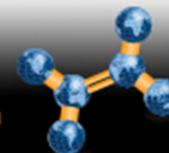




Global Chemicals Investment Focused In Three Regions With Varying Strategies



Inaugural Ethylene Forum

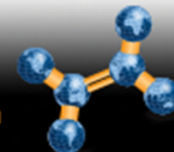


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Strategies & Advantages Will Vary By Region Or By Country



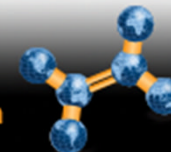
- North America
 - Surge in new investment driven by shale oil & gas
 - Stagnant domestic growth shifts focus to exports
- Middle East
 - Moderated investment pace
 - Seeking domestics/regional supply options along with exports
- China
 - Strong domestic investment focused on reducing import dependencies as domestic demand evolves from “re-exports” to domestic needs



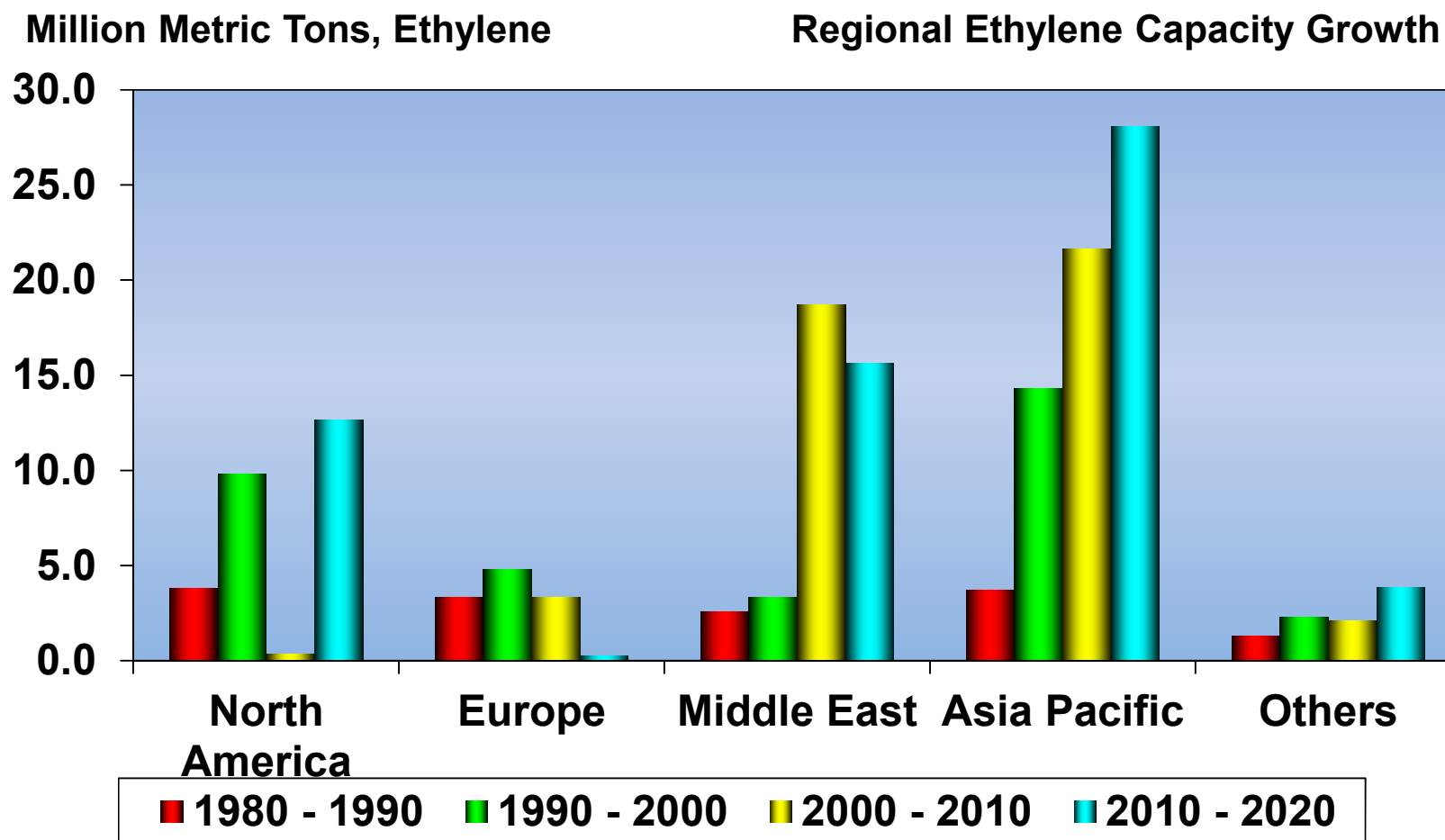
Strategies & Advantages Will Vary By Region Or By Country



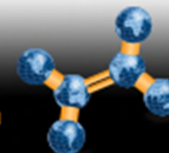
- Brazil
 - Surge in demand near term as Brazil prepares for World Cup and Olympic Games
 - Pause in the COMPERJ investment as they assess Americas landscape
- Europe
 - Defensive assessment of assets and future position.
 - Seeking to add competitive feedstocks, idle high-cost capacity
- India
 - Domestic focus, with investments at Jamnagar. High energy is an issue.
 - Remain short of key products like PVC



Consistent And Strong Growth In Asia Seen In Ethylene Investments

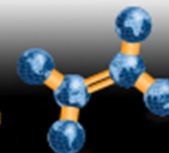
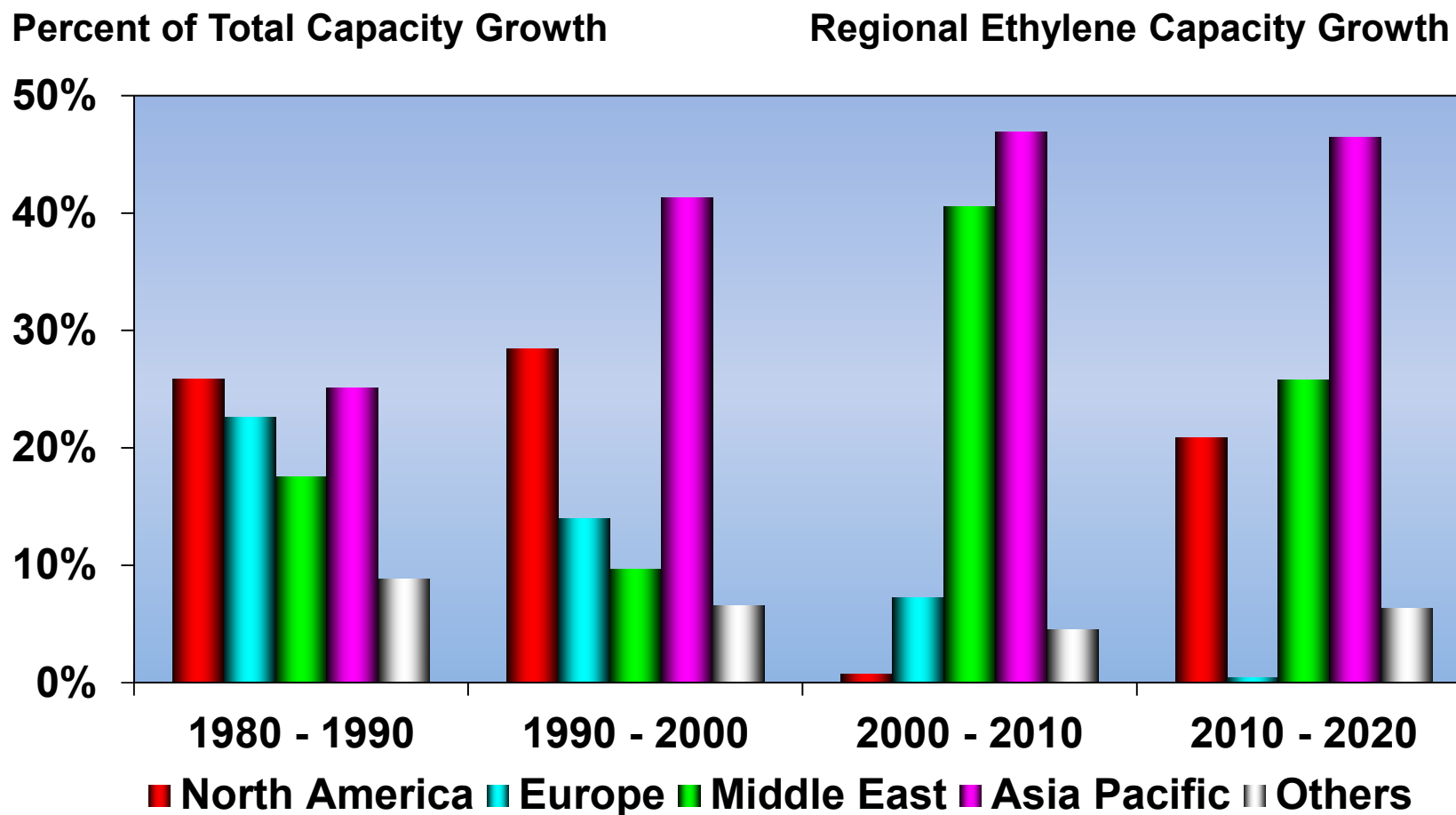


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Consistent And Strong Growth In Asia Seen in Ethylene Investments



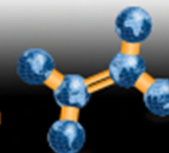
North America Ethylene Capacity Expansions From 2012 through 2020

<u>Company</u>	<u>Location</u>	<u>-000- Metric Tons</u>
BASF/Total	Port Arthur. TX	170
ChevronPhillips	Cedar Bayou, TX	1,500
Dow Chemical	Taft & Freeport	1886
Equistar	All Locations	862
ExxonMobil	Baytown, TX	1,500
Formosa	Point Comfort, TX	1,150
Ineos	Chocolate Bayou	120
Sasol	Lake Charles, LA	1,400
Westlake	All Locations	280
Williams	Geismar, LA	300
Braskem Idesa	Mexico	1,000
Nova	Sarnia	250
OxyChem	Ingleside, TX	550
Shell Chemical	Monaca, PA	1,000

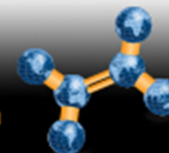
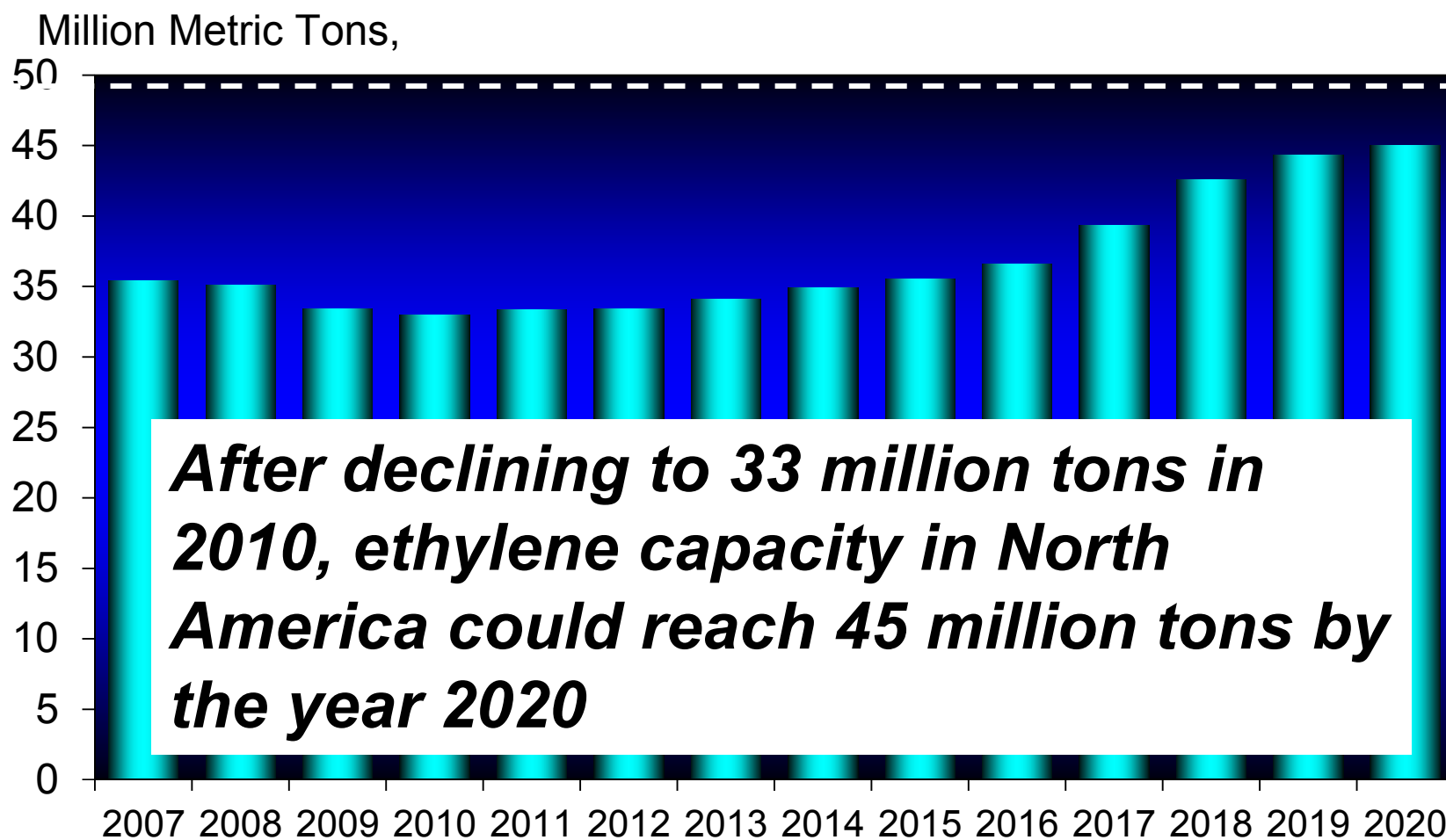
Announced but not firm

First new unit to start-up

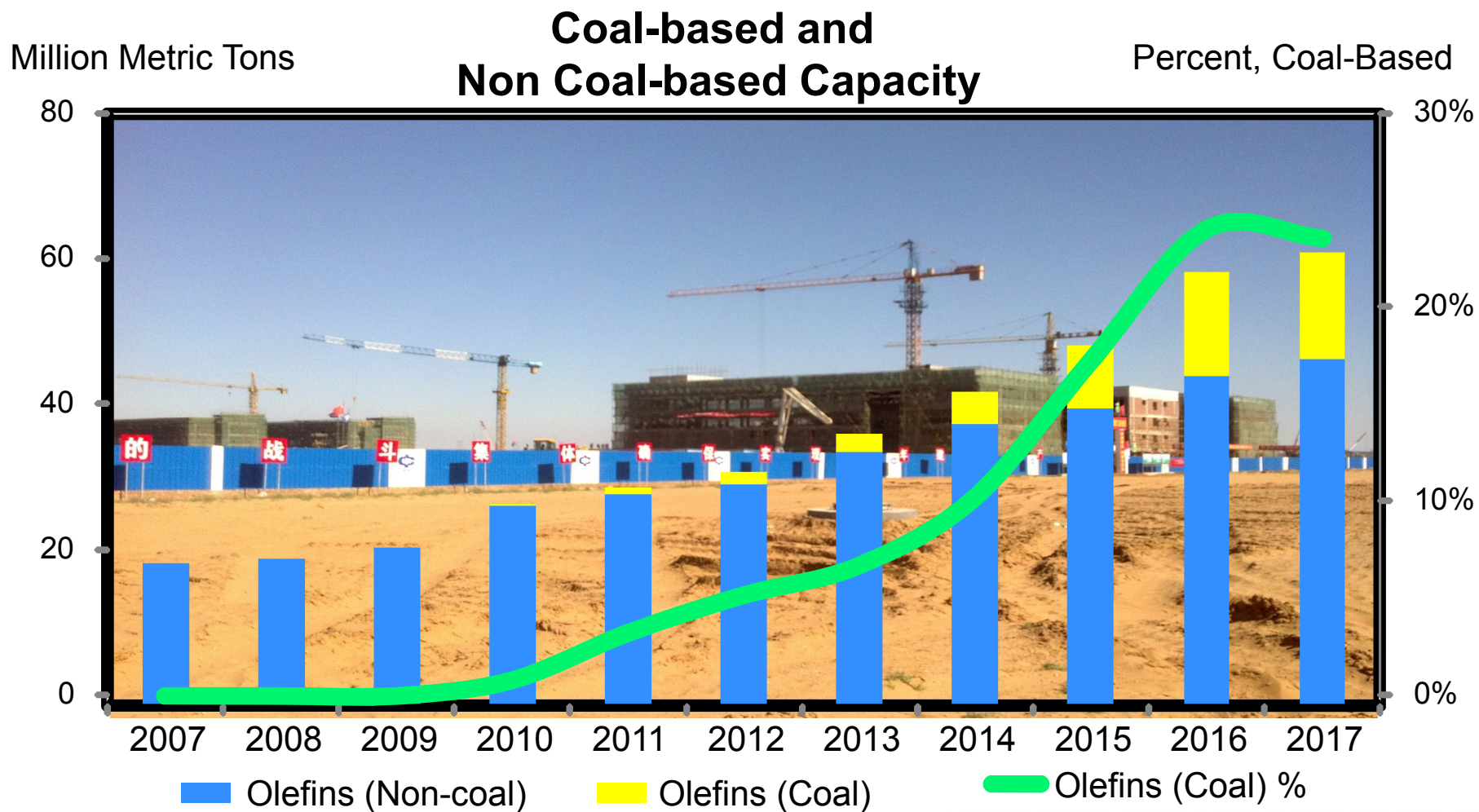
Total ~ 12,000



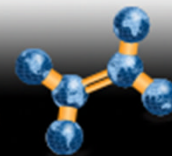
North America Ethylene Capacity Forecast To Reach 45 Million Metric Tons



Coal Chemicals Will Play A Bigger Roles in China's Chemical Supply



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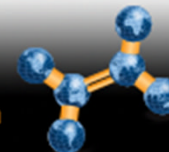


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Investment In Capacity Away From Demand Centers Will Drive Exports Higher



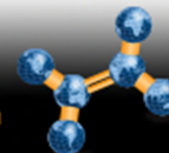
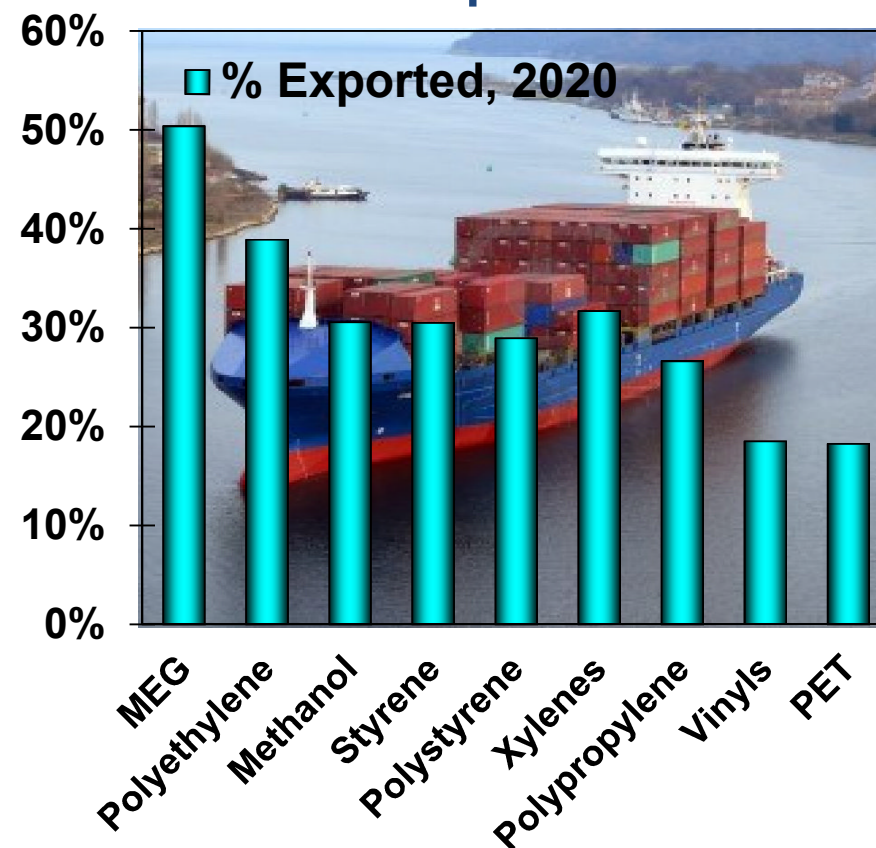
- North America returns as a competitive supplier with increasing capacity
- Accelerating demand growth in developing regions outpace capacity growth requiring increasing imports
- Assume low cost Middle East and North America suppliers grow market share
- Logistics infrastructure investment must keep pace to support expanding trade patterns



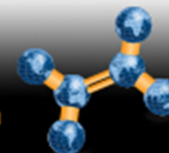
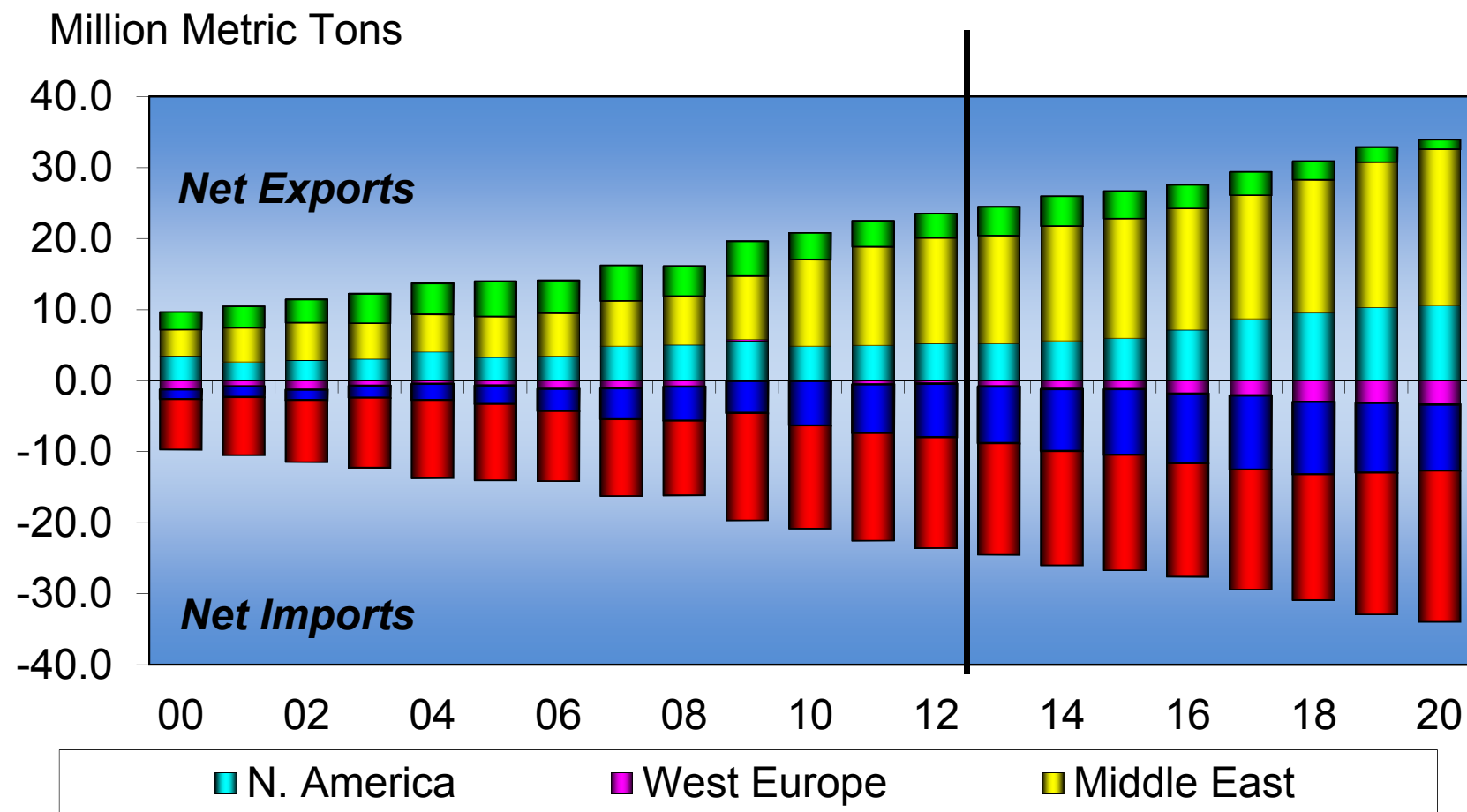
Tomorrow's Global Chemical Market is more Globally Interconnected

- Trade will continue to accelerate, connecting resource-rich geographies with high growth markets
- Supply-chain expertise and well-crafted go-to-market strategies will increase in importance
- Pressure on high-cost producers servicing high-growth markets will be especially intense

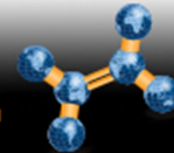
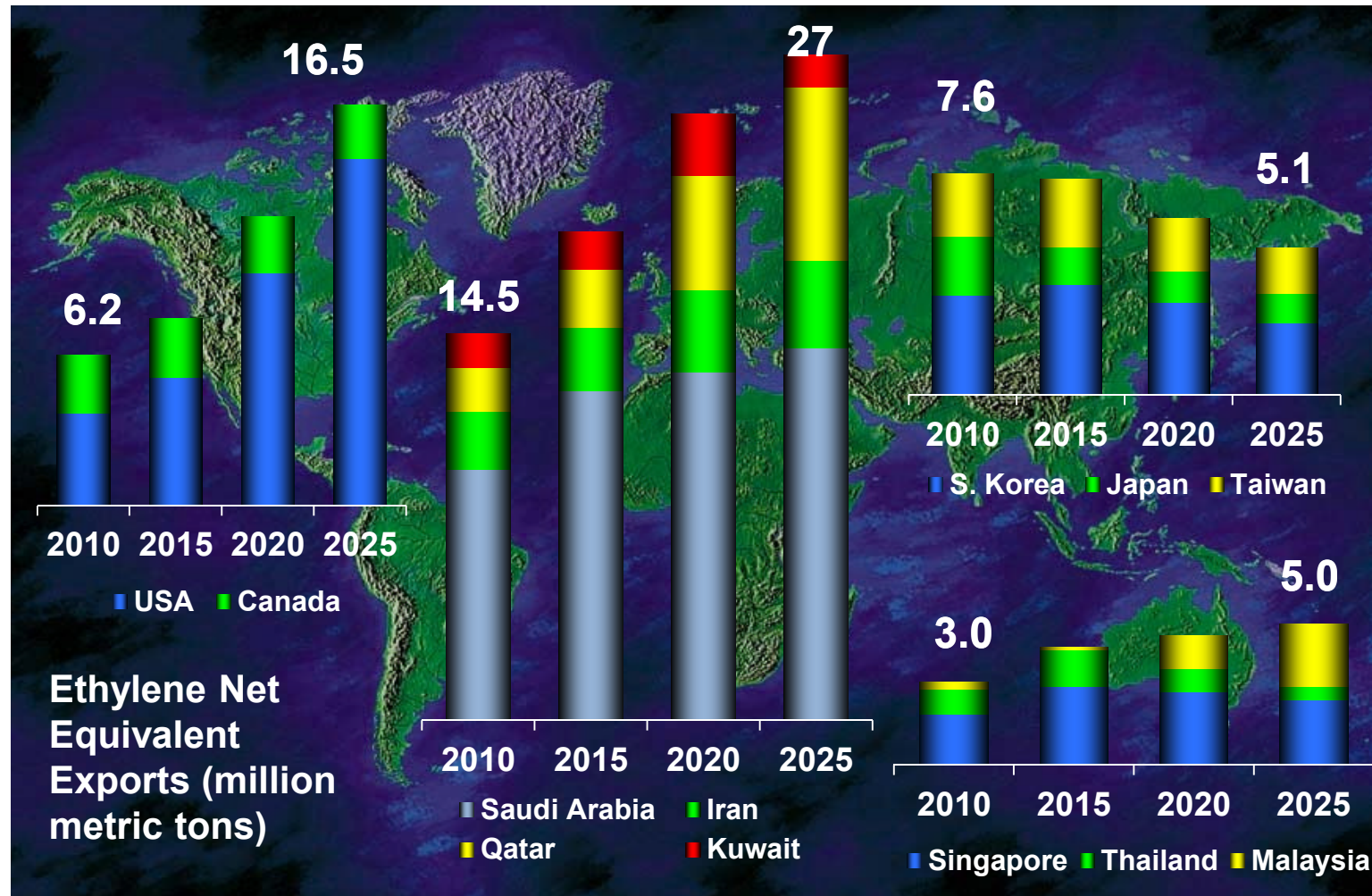
2020 % of Global Production as Exports



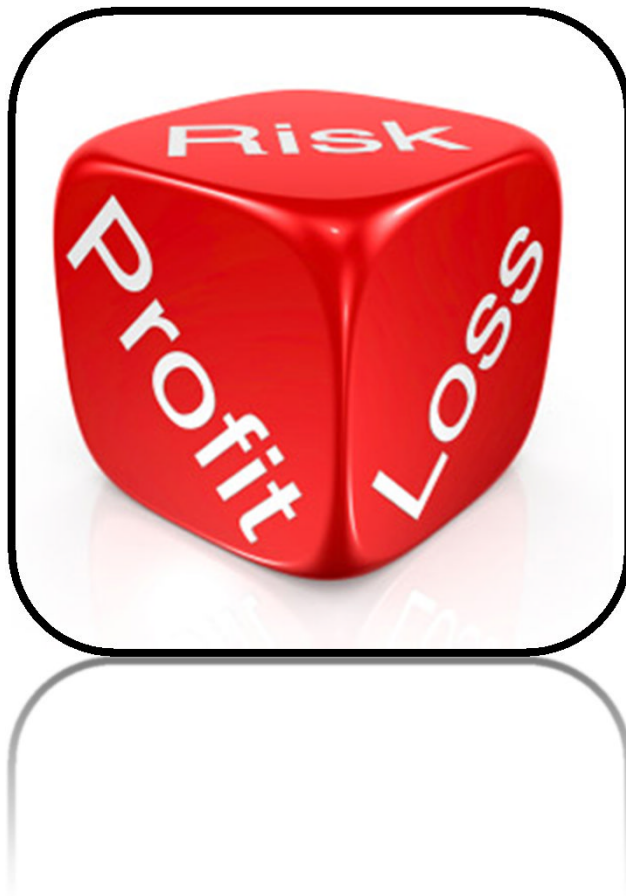
World Ethylene Equivalent Trade



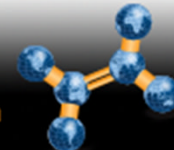
Ethylene Derivatives From Ethane Cracking Will Dominate International Trade



Profit Cycle Dynamics Vary By Feedstock & Region



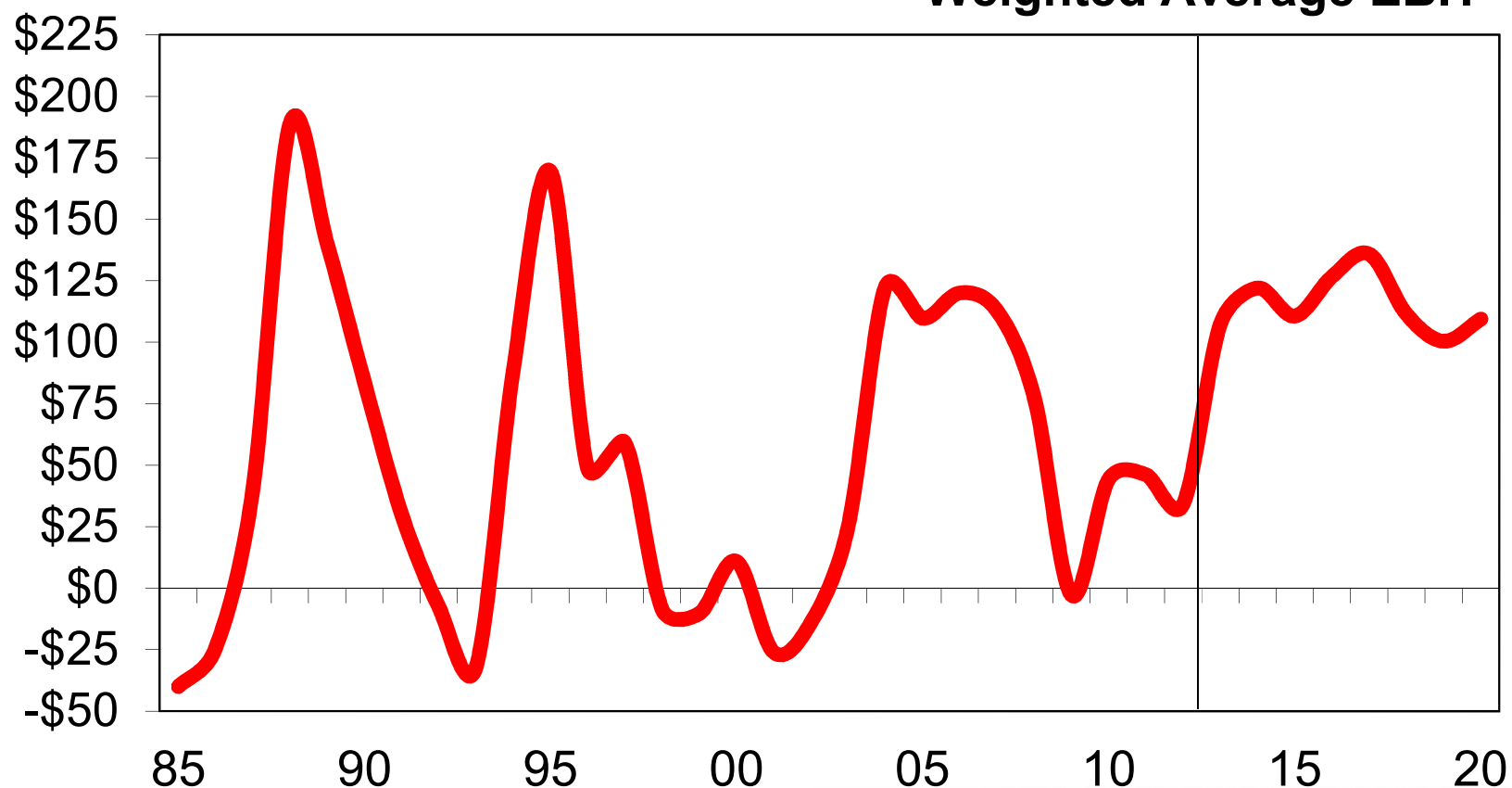
- Overall market recovery delayed on slower demand and acceleration of capacity
- “Gas-based” producers see steady high margins and no “downturn”
- Market fundamentals suggest high-cost producer margins will struggle; shutdowns likely
- Capacity additions likely to be moderated versus current forecast; influenced by capital costs, resource limitations



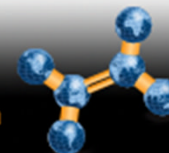
Cyclicalty In The Market Makes Investment Timing Critical To Sustainable Returns

Dollars Per Metric Ton

Global Base Chemicals & Plastics
Weighted Average EBIT

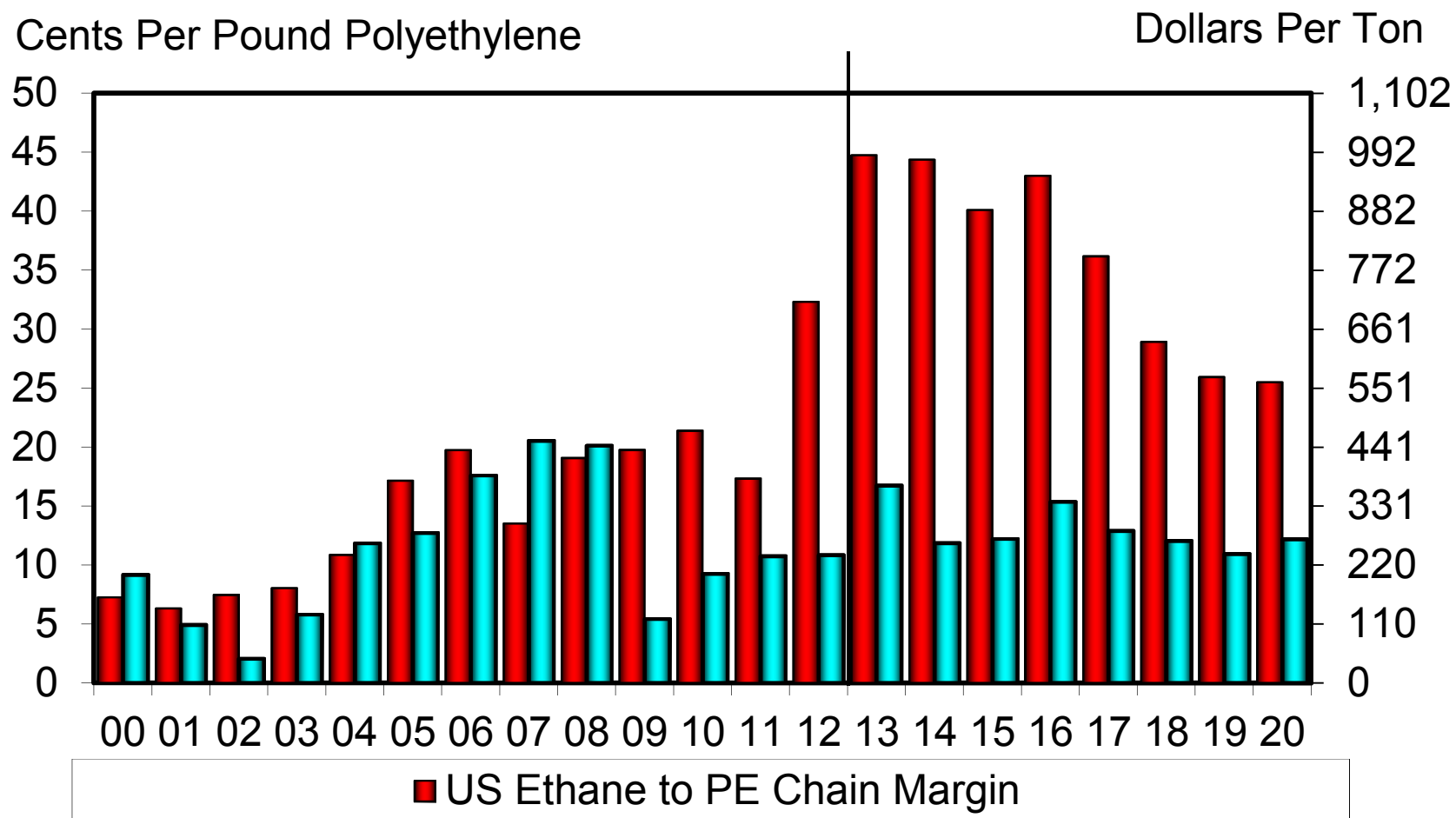


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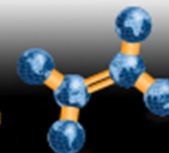


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U.S. & West Europe Integrated Polyethylene Cash Margins



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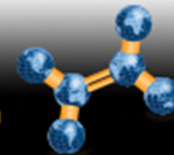


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Trends In Ethylene Are Impacting The Propylene Supply Scenario

Propylene

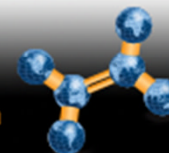
- On-Purpose production will continue to rise
 - Technology related to region and feedstock
 - Propane Dehydro increasing
- Steam cracker and FCC supply trends also vary by region
- Demand growth trending towards ethylene (GDP) due to higher price relative to ethylene



BTX Supply In Transition And Impacted By Many Factors

Benzene

- Supply trends complicated by ethylene, gasoline, and paraxylene and shifting environmental regulation
- Refinery operations and renewable fuel trends are critical to supply
- Shale crude oil results in lower benzene yield
- Growth in demand and capacity migrating to Asia

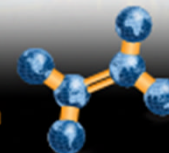


Conclusions

- Improving economic fundamentals are expected to enhance pace of demand growth
- Economic Megatrends shift demand to developing world at an ever-increasing pace
- Unconventional feedstocks play a larger role in shaping the global industry
- High-cost supply reacts to more competitive pressure by stepping up rationalization/conversion



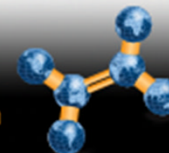
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Conclusions

- Supply & demand dislocation increases need for sound supply-chain strategies
- New competitors slowly emerge as markets expand west in China in distinct products
- Unconventional resource owners enter the stage for certain product offerings
- Level of success defined by right cost for the right product for the right market strategies



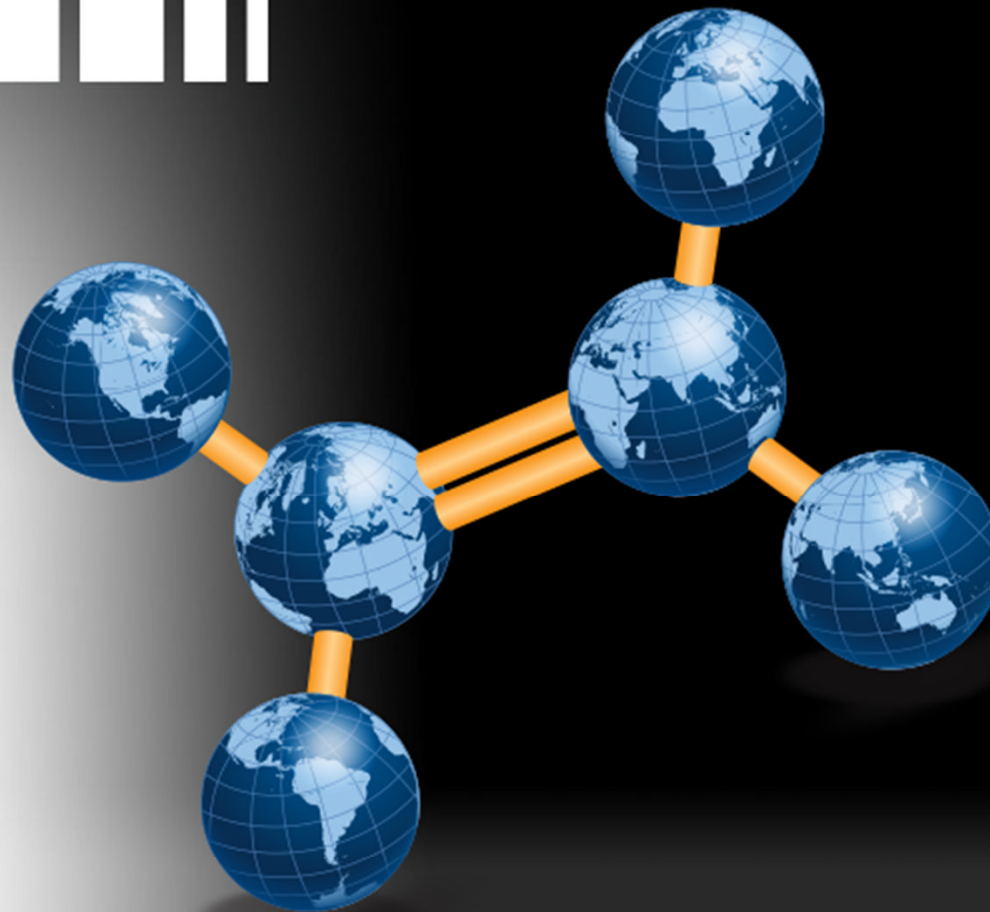
Inaugural Ethylene Forum

Thank you!

Mark Eramo

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Insights

IHS Chemical



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