US Chemical Manufacturing and Supply Chains

Opportunities for the Delmarva Peninsula

3rd Annual Delmarva Freight Summit
New Castle County Chamber of Commerce
June 26, 2013

Agenda

- Project overview
- Chemical industry trends
- Chemical manufacturing and the Delmarva Peninsula
- Supply chain implications

IHS Consulting: An Integrated Approach

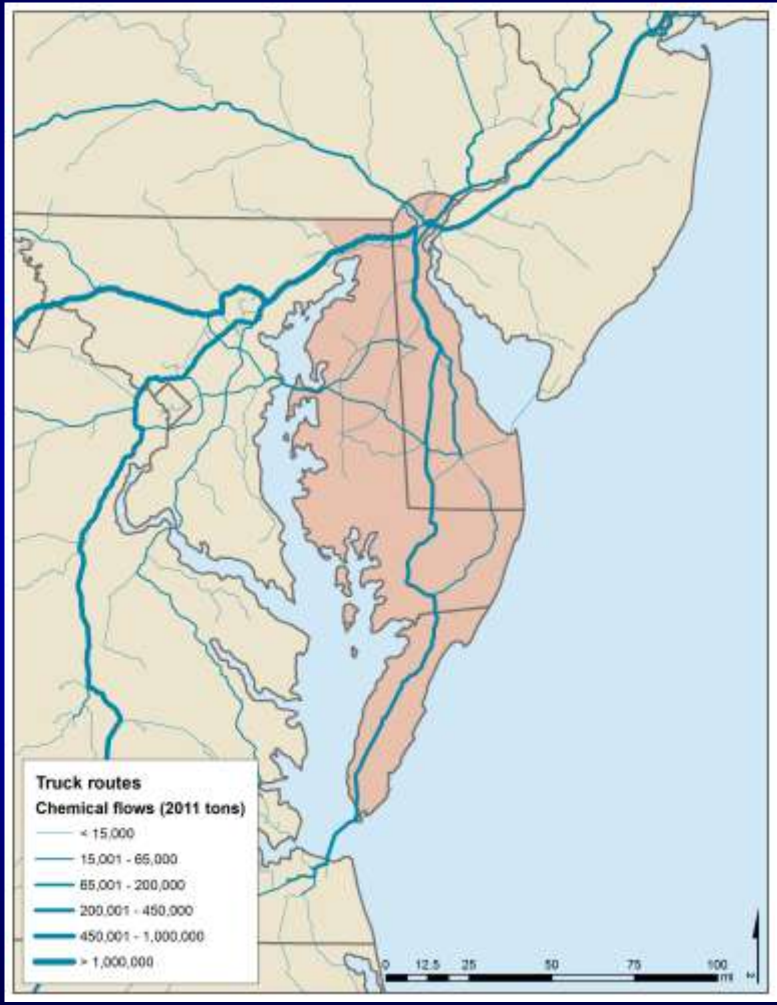
- Supply Chain
- Chemicals Insight
- Energy Insight
- Transportation & Trade
- Macroeconomics
- Industry Forecasts
- Safety and Security
- Sustainability

Macroeconomic and Industry Context

Research

- Chemicals market study
  - Key commodities
  - Relevance to Delaware and the Delmarva Peninsula
- Delaware primary research
  - Chemicals industry leaders
  - Distribution and logistics firms
  - Transportation agencies and companies

Chemicals Supply Chains



- **Analyze key multi-modal infrastructure (including pipelines)**
- **Analyze regional and wider supply chains**
- **Chemical flows analysis and forecasts**

Objectives and Deliverables

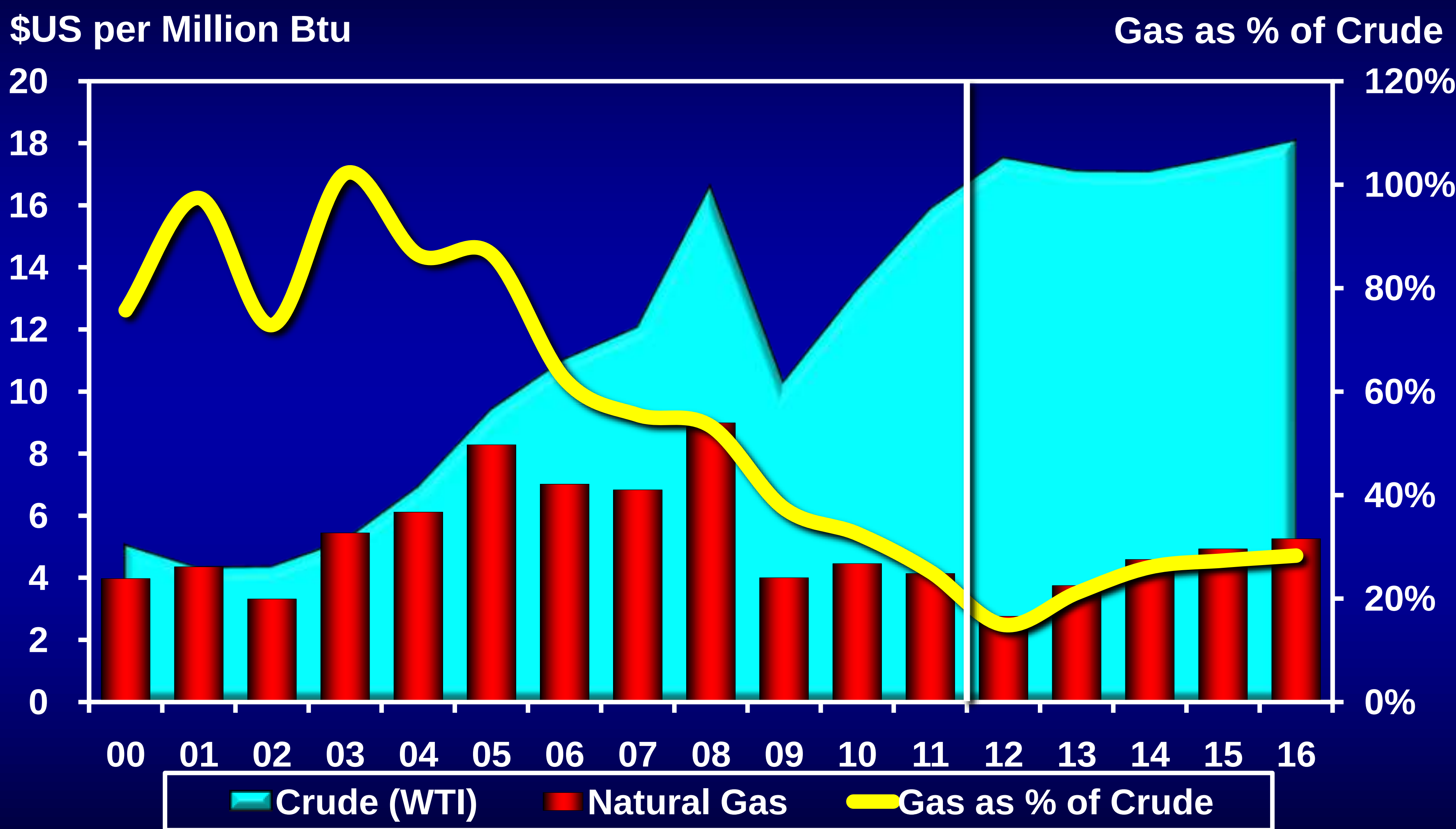
- Identify economic opportunities
- Analyze infrastructure investment opportunities
- Conduct SWOT analysis

5 Years Ago... The North American Chemical Industry Was Looking Ugly!

- Canada was starting to see natural gas and ethylene plant feedstock production declines
- Mexico had not had a major chemical investment in 20 years and project Phoenix died
- The United States had oversupply of high cost chemical assets
  - no feedstock advantage
  - domestic demand was shrinking
  - trend in off-shoring of manufacturing

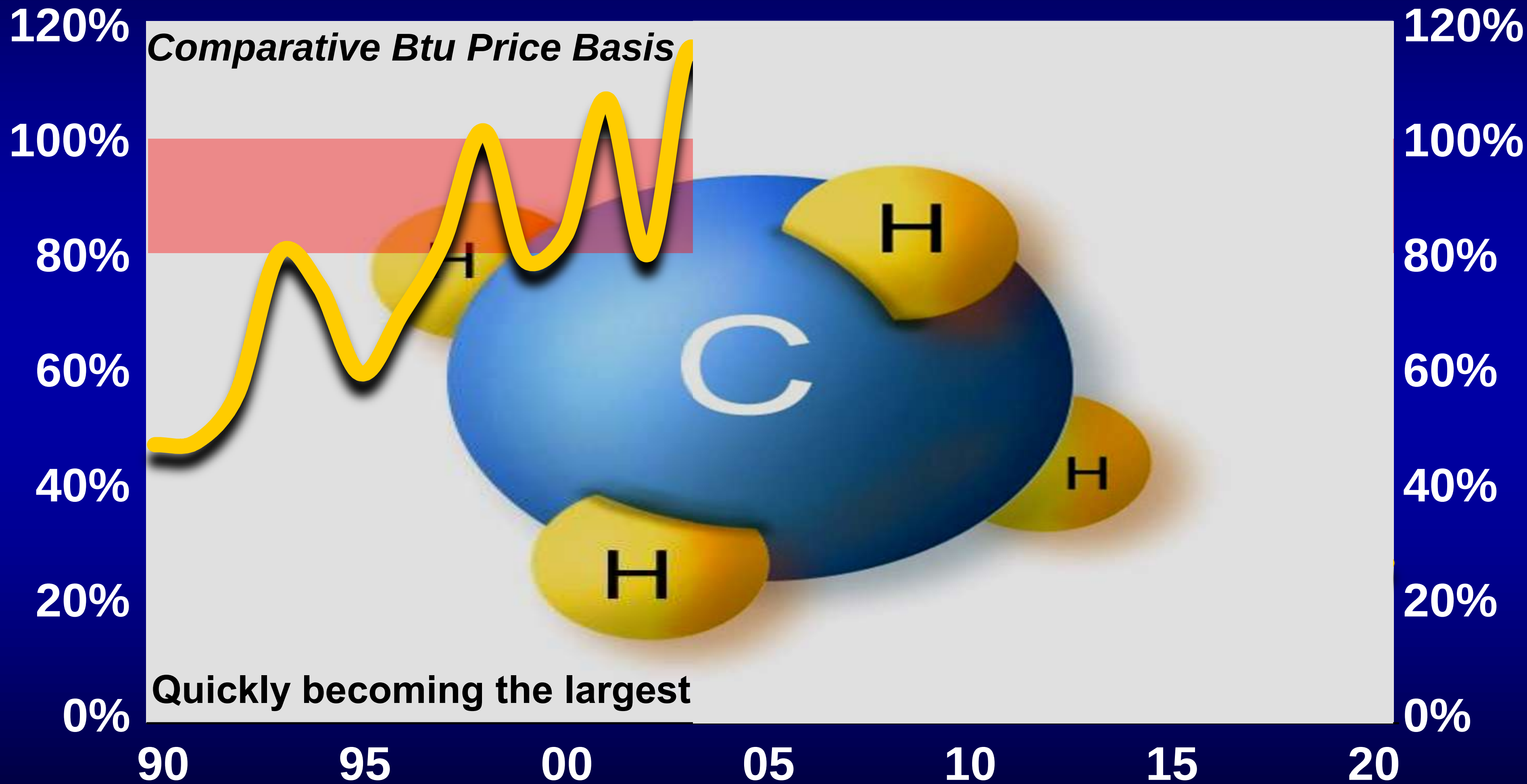
Global Investment Focus was on Asia & Middle East
Capacity Rationalizations in North America

North America Energy Advantage Emerges…Is It Sustainable?



Changes in Global Energy Markets have a profound impact on Petrochemicals…

U.S. Natural Gas as a Percentage of Brent Crude Oil



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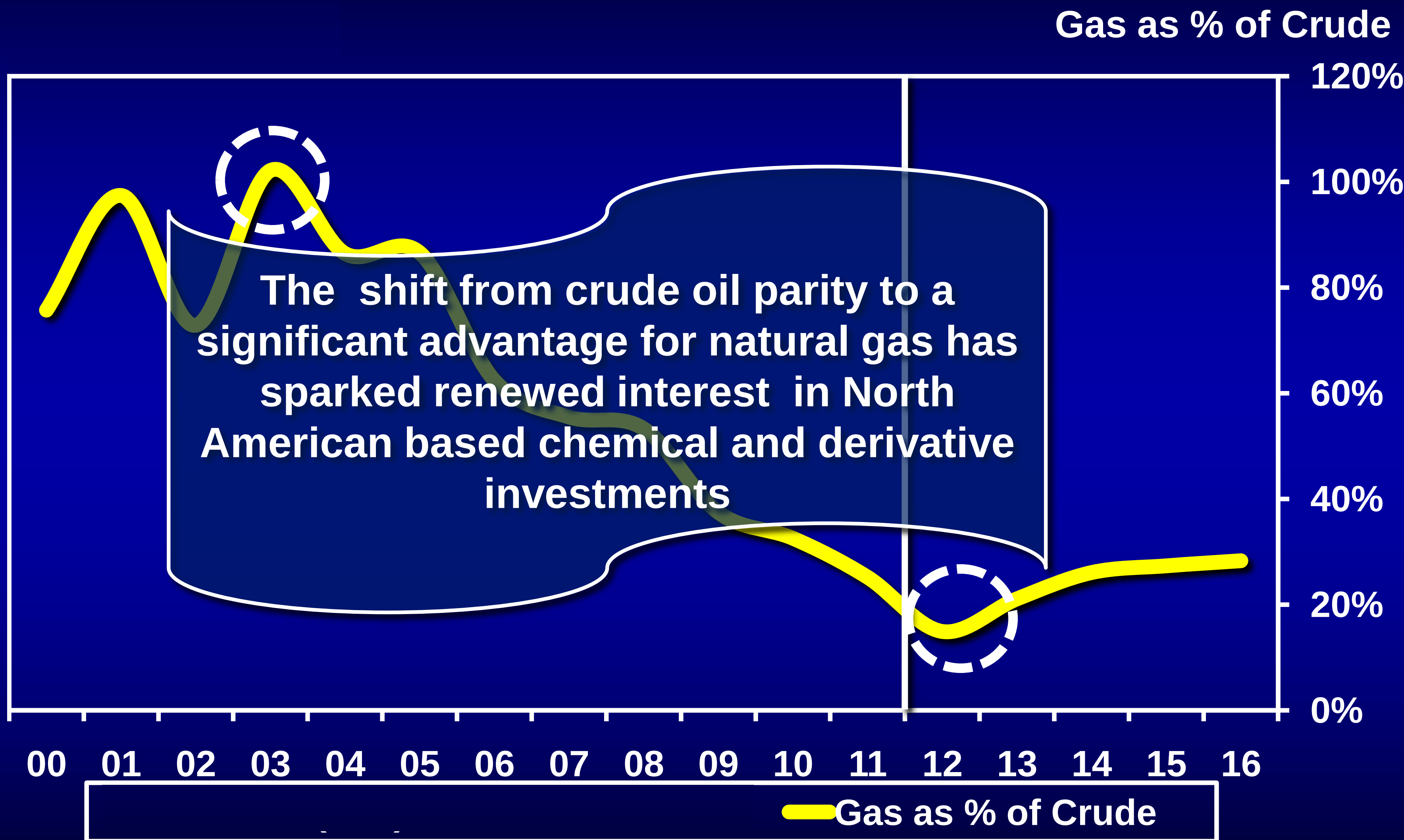
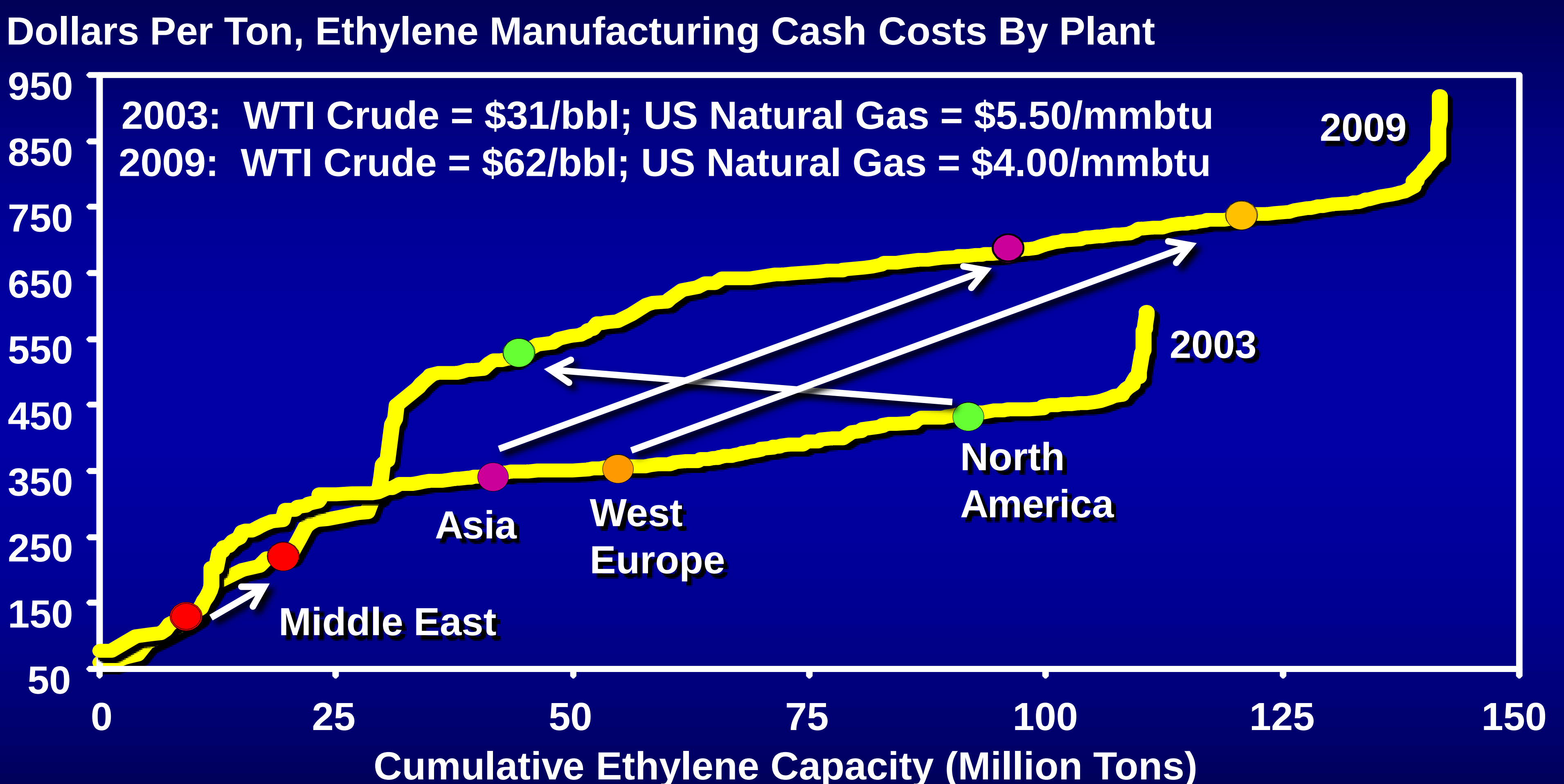


Ethane Based Competitive Advantage Develops



North American Ethylene Capacity Increases To Leverage Advantaged Ethane

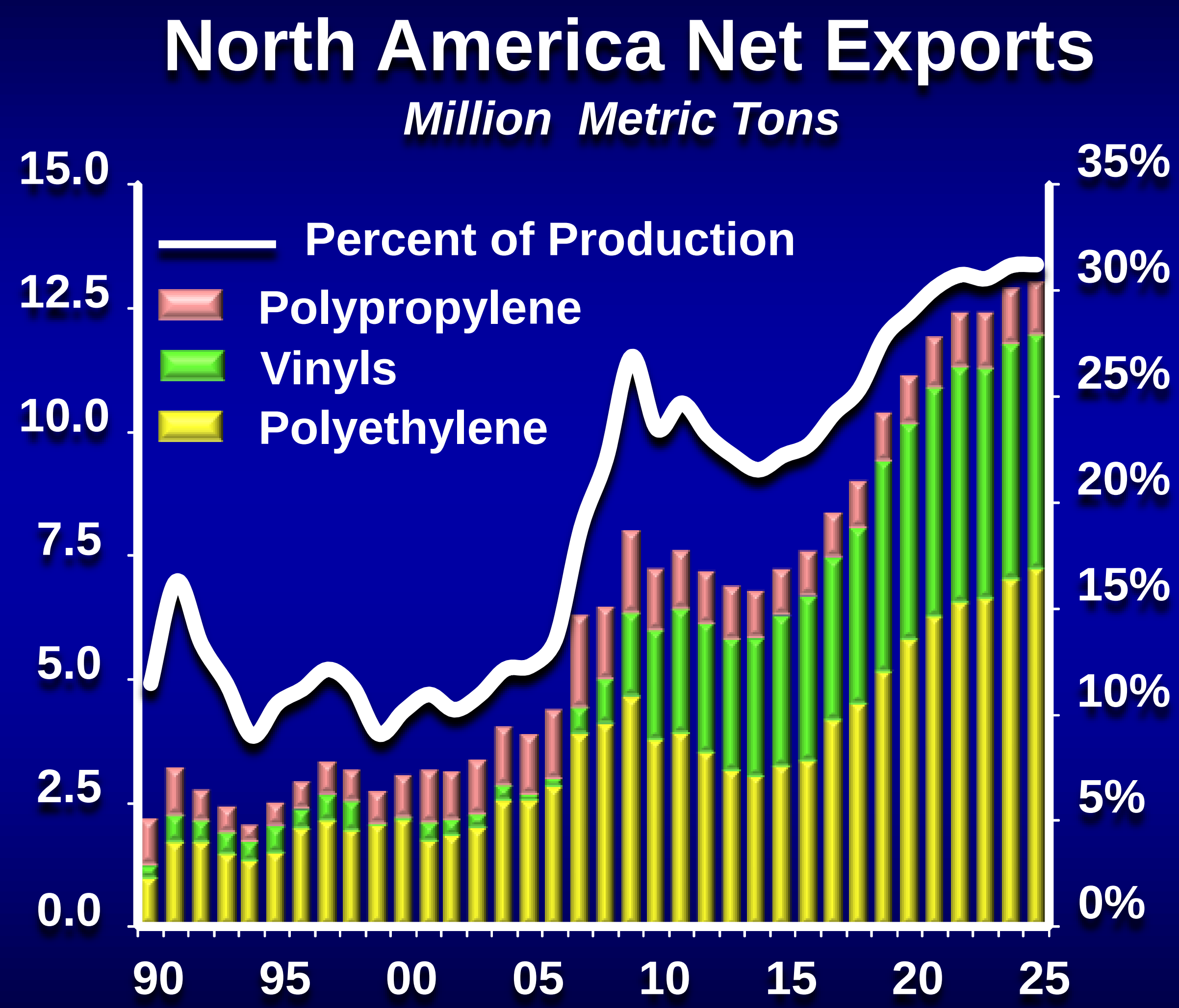
Announced (-000- MT)	2012-2014	2016-2020
BASF/Fina (Port Arthur)	180	
Chevron Phillips (Cedar Bayou)		1500
Dow (Taft / Freeport)	386	1500*
Eastman	90	
Equistar (All locations)	521	
Exxon (Baytown)		1500
Formosa (Point Comfort)		800
Ineos (Chocolate Bayou)	107	
Oxy (Ingleside)		550*
Sasol (Lake Charles)		1400
Shell (Northeast)		1000*
Westlake (Lake Charles/Calvert City)	310	
Williams (Geismar)	300	
Nova (Sarnia)		250*
Braskem/Idesa (Mexico)		1000
Total	1,894	9,500
Cumulative Total		11,394

** Dow, Shell, NOVA, and Oxy capacity additions shown are IHS estimates*

•Dow, Shell, NOVA, and Oxy capacity additions shown are CMAI estimates

Ethylene: Domestic Producers Will Be Increasingly Export Focused

- Naphtha cracking economics remain the Global Price Setter
- Business plans for new capacity include significant exports
- Exports to be 50% of future production – ethane cost position is critical



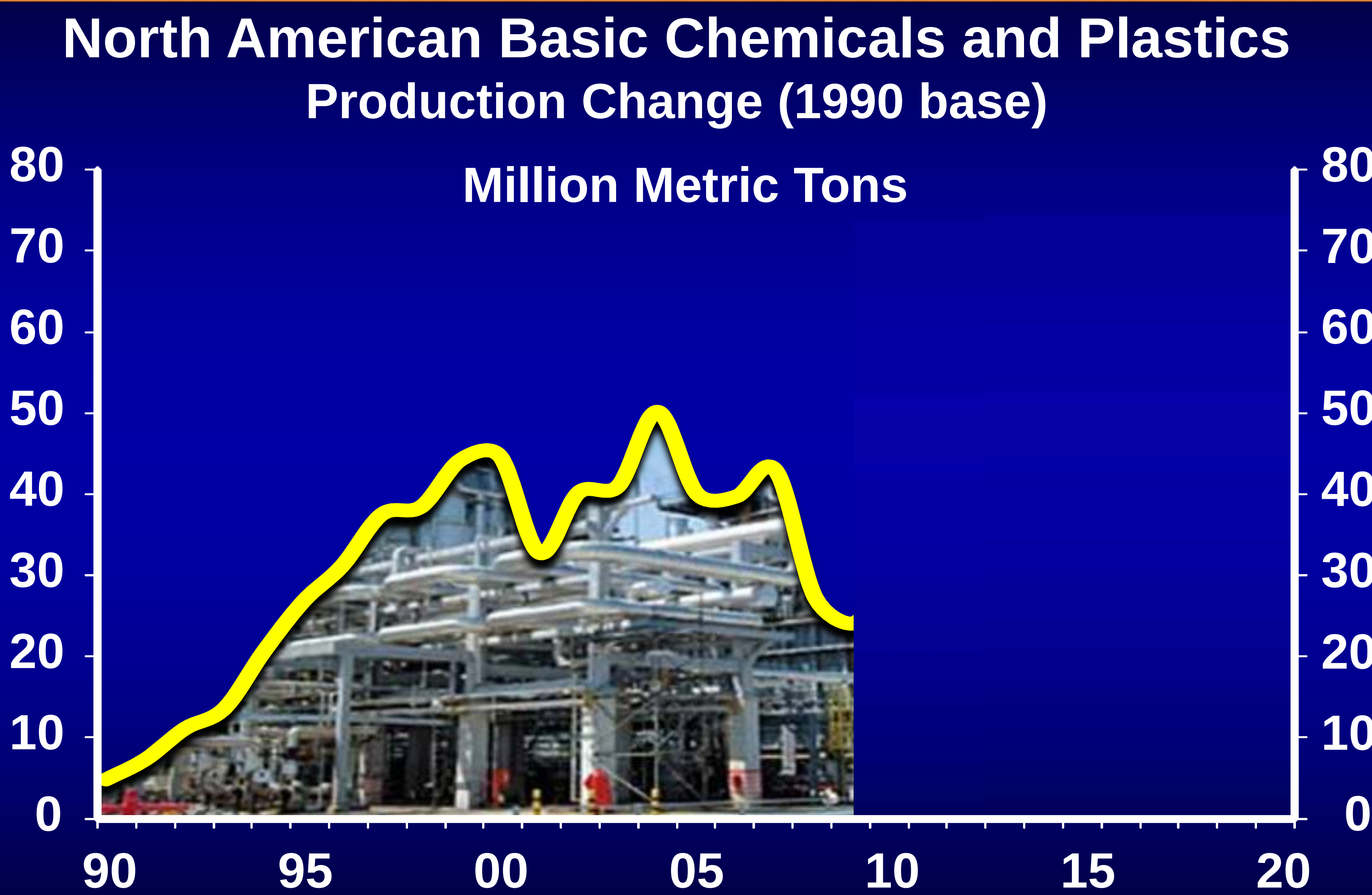
The Shale Influence…..More

- More natural gas and oil production
- More investment in plants, equipment, and logistics
- More domestic ethylene production
  - More ethylene and derivatives,
  - Eventually more propylene and butadiene
- More chemical production based on natural gas
  - Methanol, ammonia, fertilizers
- More NGL production
  - Rapidly expanding pipeline logistics capability
  - New fields are being developed continually
- More exports of hydrocarbons and chemicals
- More countries look to develop their shale

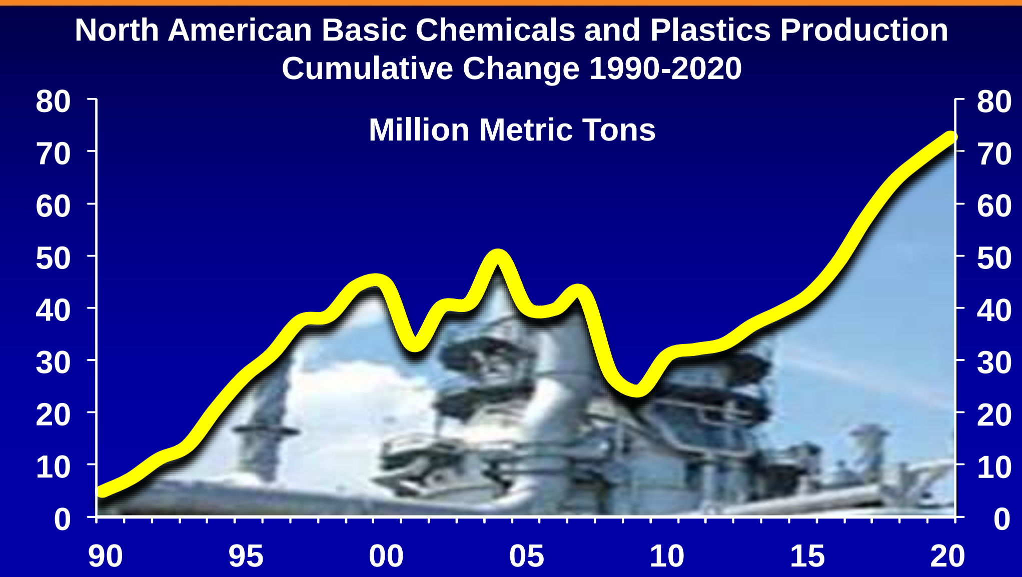
The Shale Influence…..Less

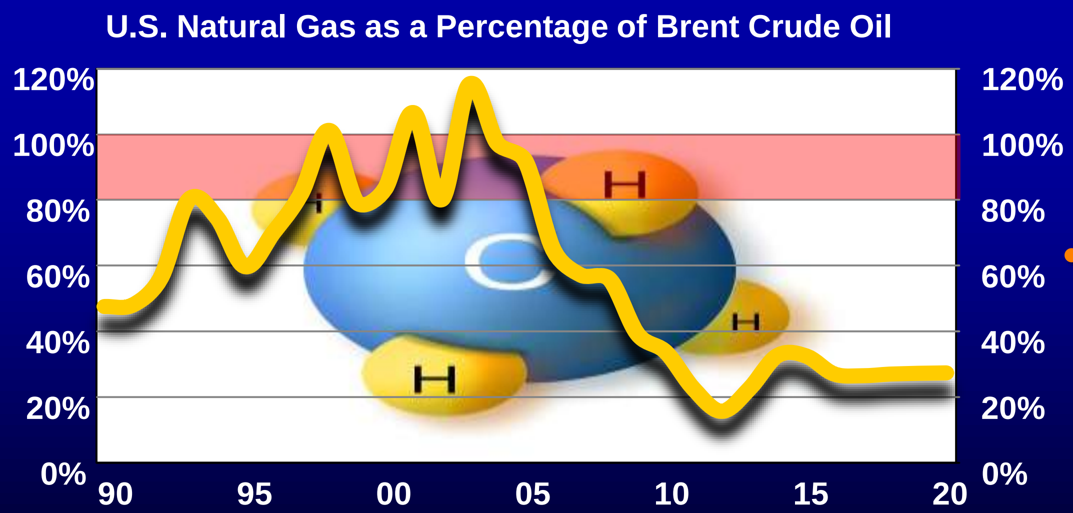
- **Less polyethylene export to Mexico**
  - **As domestic production starts in 2016**
- **Less co-product production**
  - **Pygas, propylene, and butadiene**
- **Less NGL Rail shipments as pipeline infrastructure is developed**
  - **Logistics investments catch up with increasing production**
- **Less polyethylene shipments to the Northeast**
  - **If and when the Northeast Shell cracker project proceeds**
- **Less coal shipments**
  - **As coal fired power plants are retired**
- **Less costly energy**

New capacity is necessary to return N. America to historical production levels…



Pace of growth in North American production will depend on ability to sustain advantage…



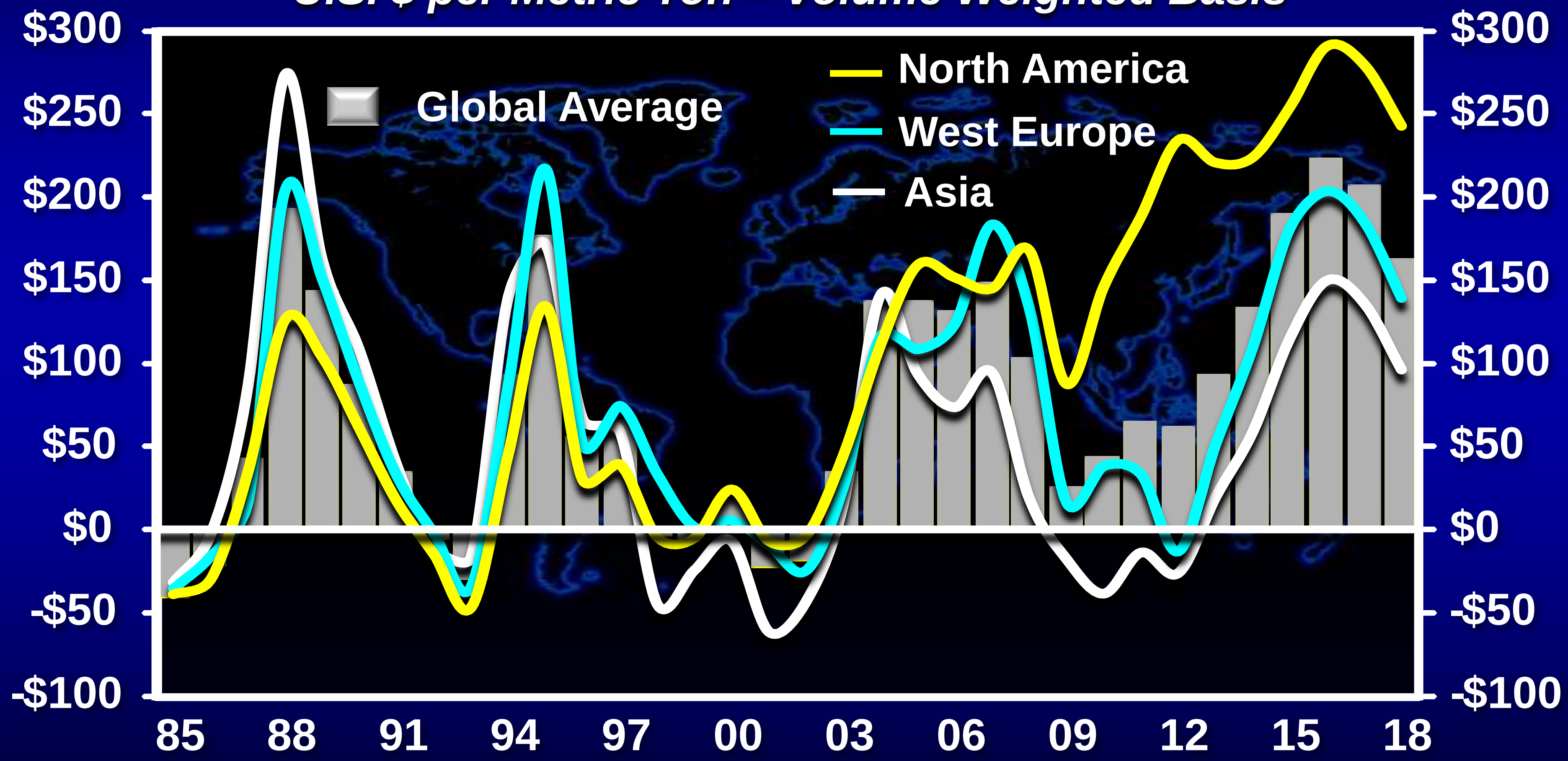


- Wide divergence between oil and natural gas prices attracts $100 Billion in investment
- Moving product into international markets has been critical to recovery and will be key to future growth
- A portion of the new capacity will relate to units funded by foreign direct investment

Profit Continues to Cycle

Global Earnings Before Interest and Taxes

U.S. $ per Metric Ton – Volume Weighted Basis



Significant Regional Differences

Chemical Industry Trends

- After a weak 2012, improving economic fundamentals are expected to enhance future growth prospects
- Chemical demand continues to migrate to the developing world
- Unconventional feedstocks will play an increasing role in shaping the global industry

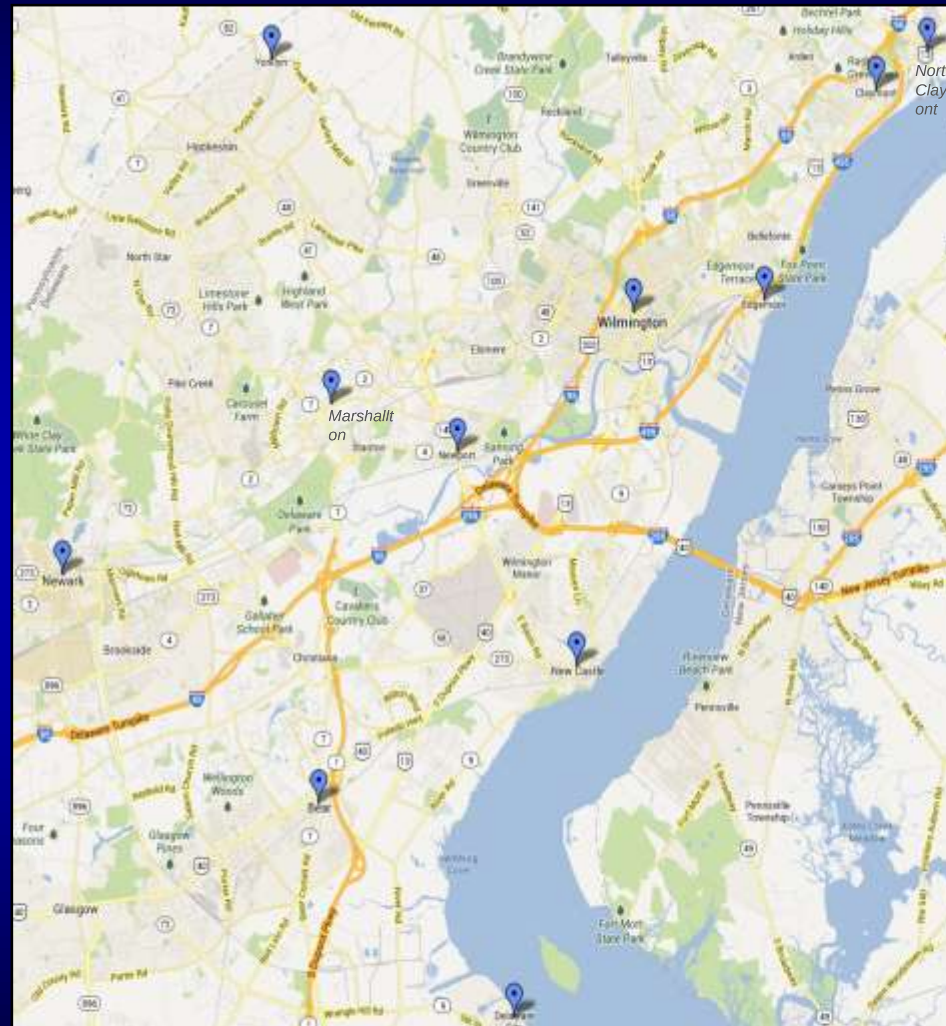
Chemical Industry Trends (cont'd)

- **High-cost regions need strategies to offset increasing competitive pressure**

- **Dislocation of supply and demand increase need for sound supply-chain and go-to-market strategies**

- **New competitors emerge as markets expand West in China and unconventional resource owners enter the stage**

Chemicals Manufacturing and the Delmarva Peninsula



Supply Chain Implications

- Regional competitive advantages/disadvantages
  - Infrastructure and connectivity
  - Proximity to markets
  - Existing assets, economies of scale, labor pool, etc.
  - Regulatory environment
- Export markets, competition, and logistics
- Transportation and supply chain costs and global risks

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