

Petrochemical Market Outlook

Prepared for:
LSU Energy Summit
October 2007

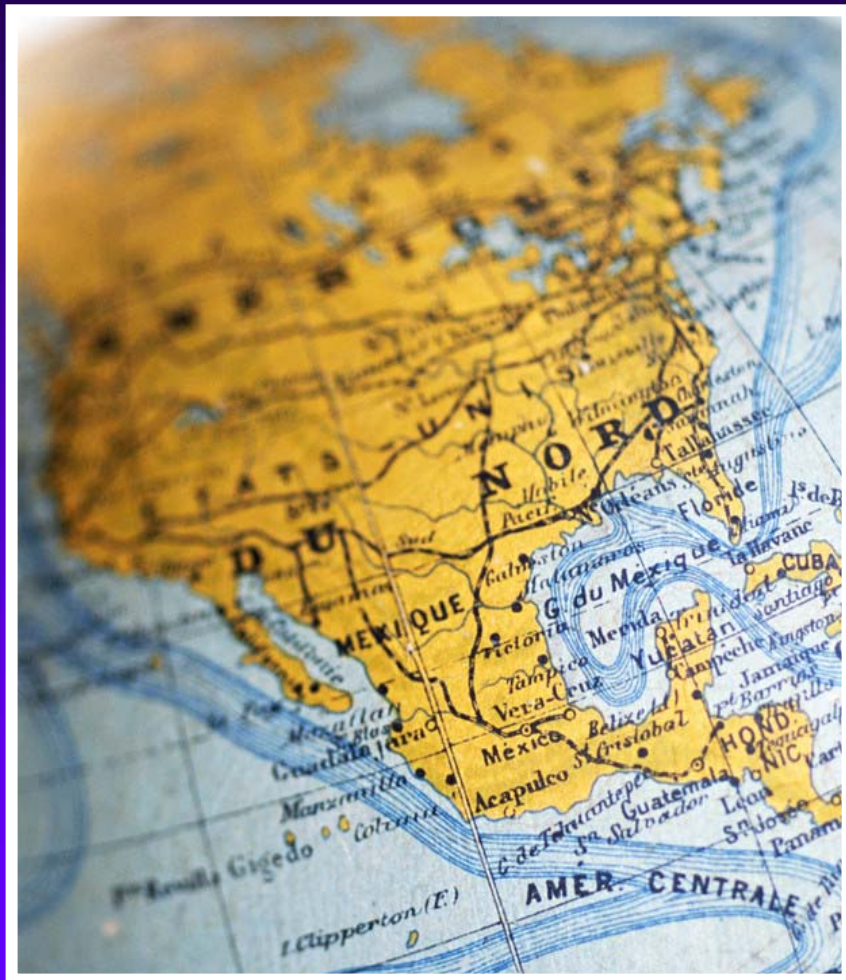
Chuck Carr
Director
Propylene Studies
ccarr@cmaiglobal.com



Singapore ♦ Shanghai ♦ Houston ♦ New York ♦ London ♦ Düsseldorf ♦ Dubai

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Petrochemical Outlook

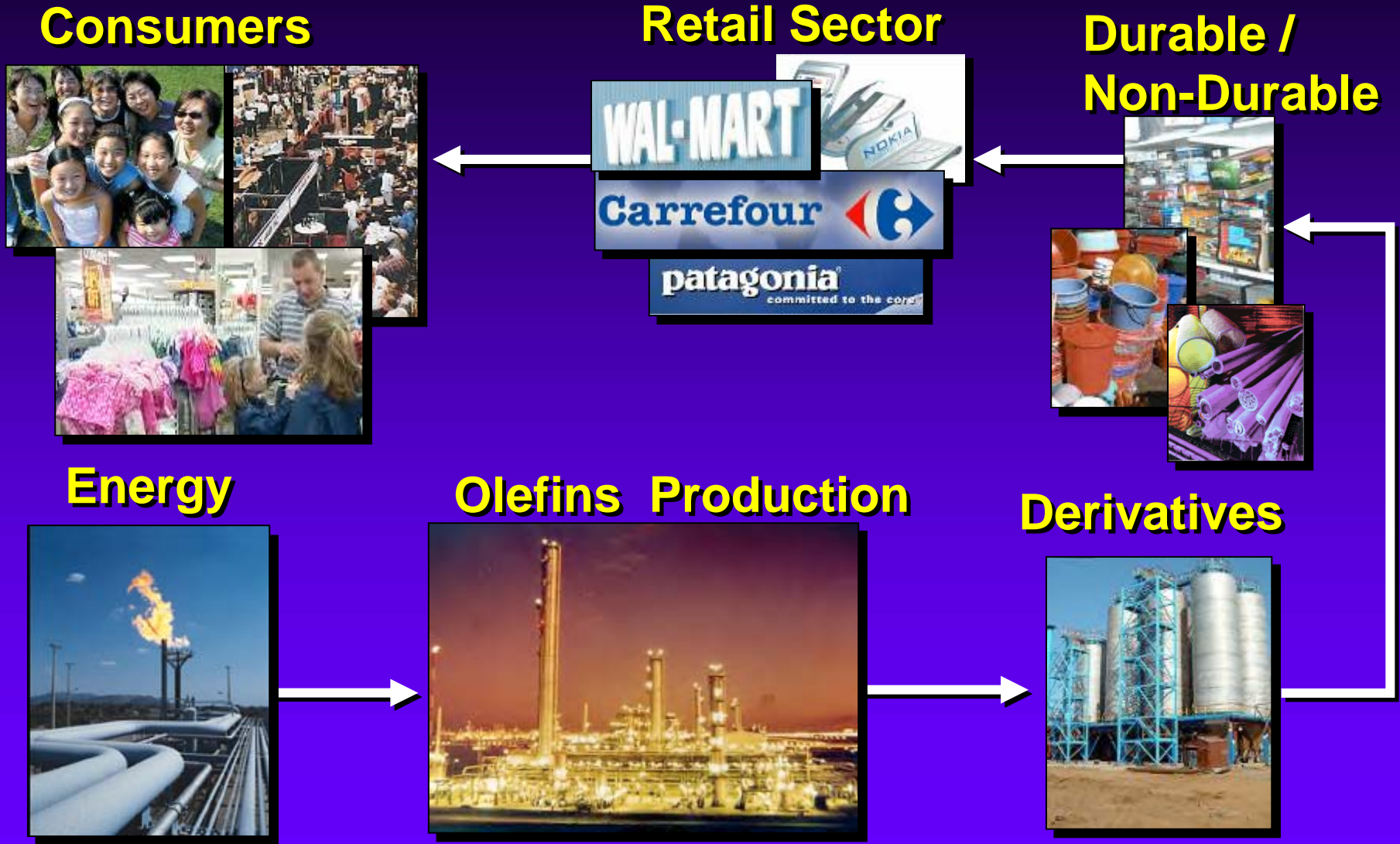


- Petrochemical Basics
- Economy & Energy
Impact On Regional Cost
Positions
- Capacity Additions,
Demand, and Trade
- Conclusion

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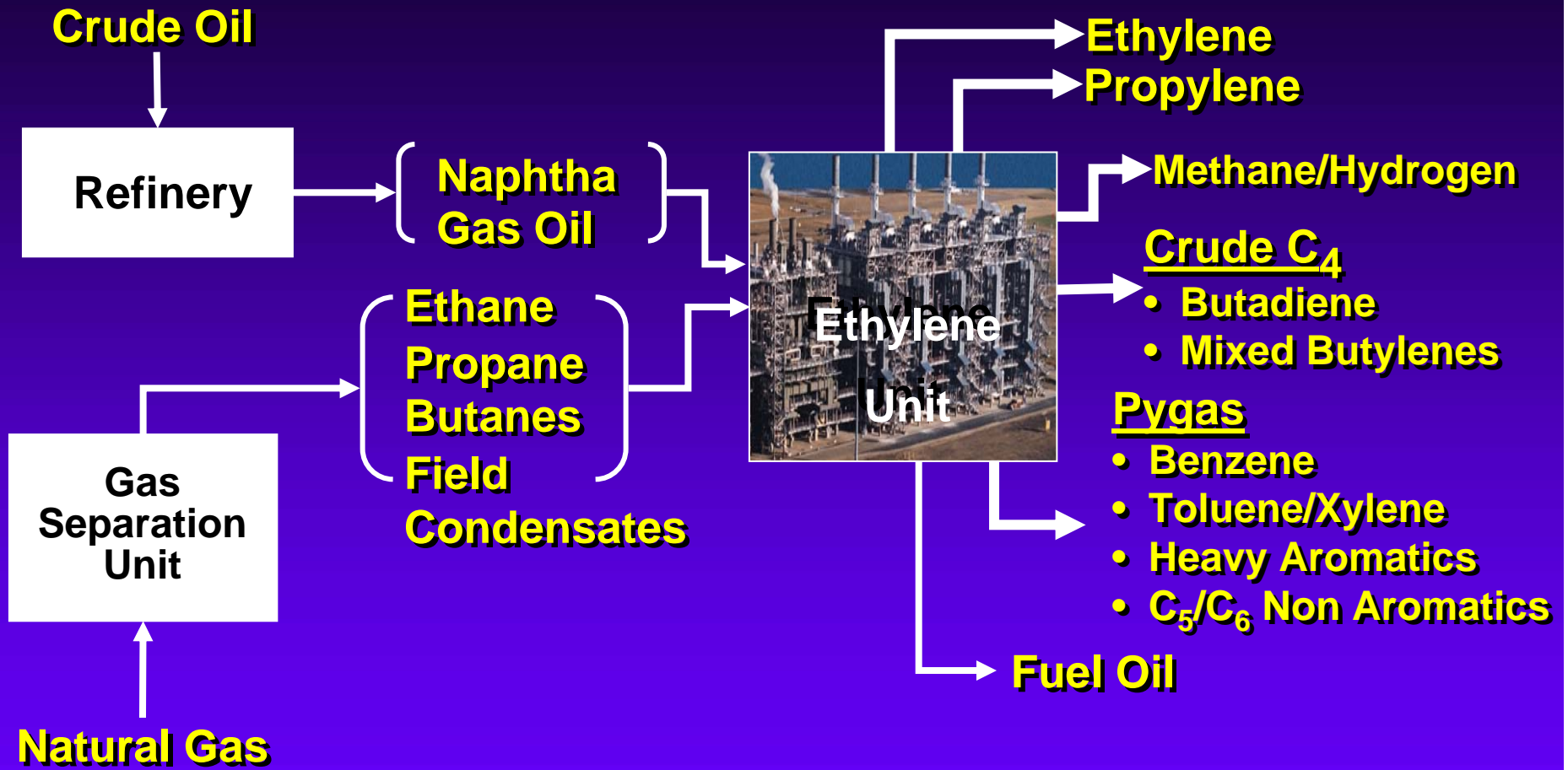
Olefins Supply-Chain Dynamics



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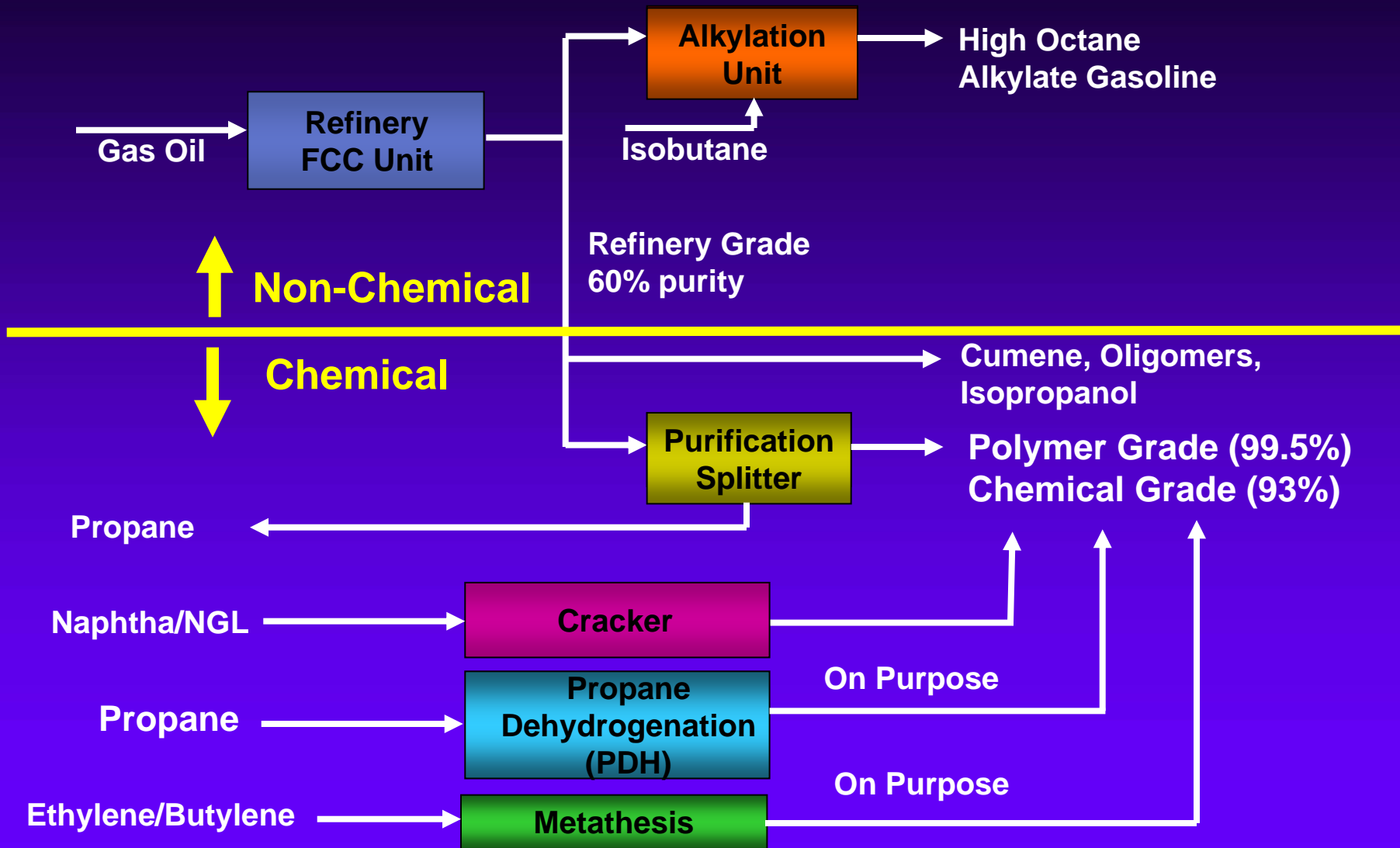
Energy → Feedstocks → Petrochemicals



Olefins Flow Diagram

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Propylene Has Multiple Sources

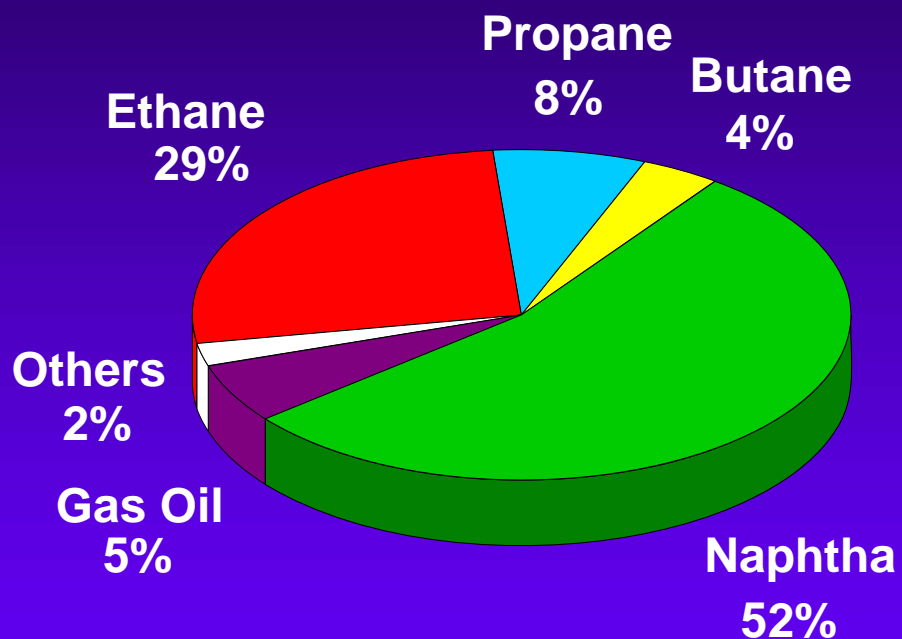


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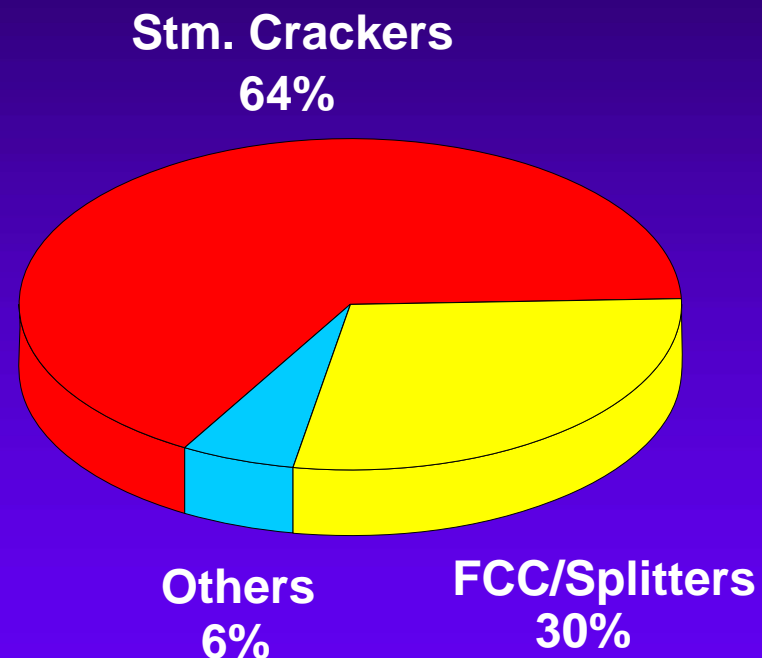
2007 World Light Olefins Supply Profile

Ethylene



115 Million Metric Tons

Propylene



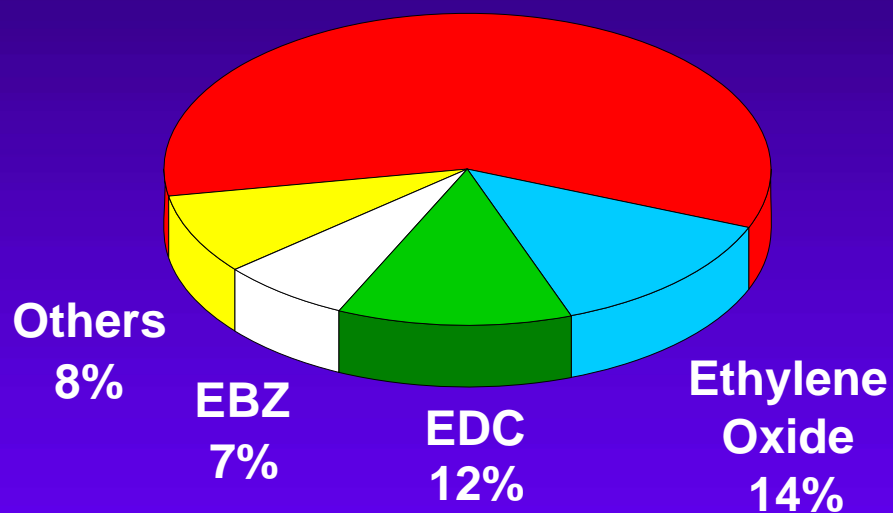
69 Million Metric Tons

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2007 World Light Olefins Demand Profile

Ethylene

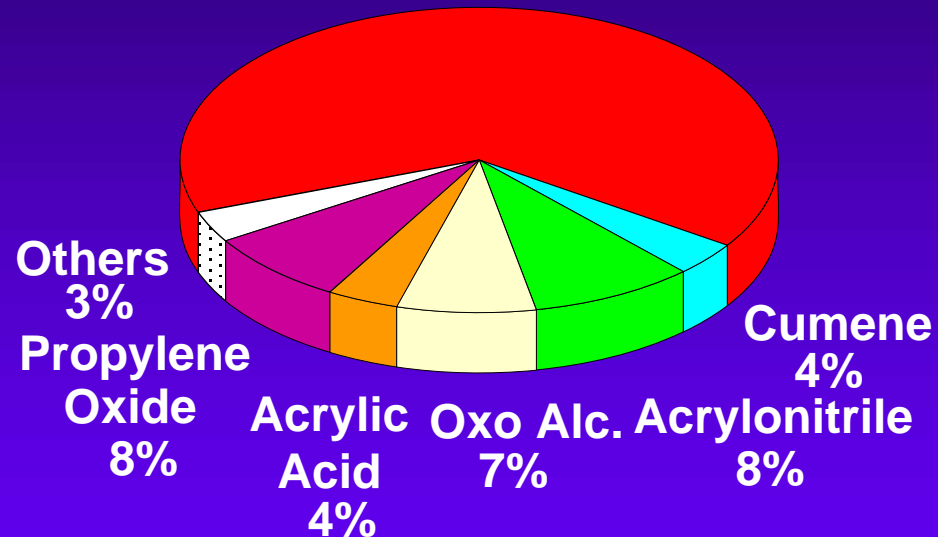
PE
59%



114 Million Metric Tons

Propylene

PP
66%



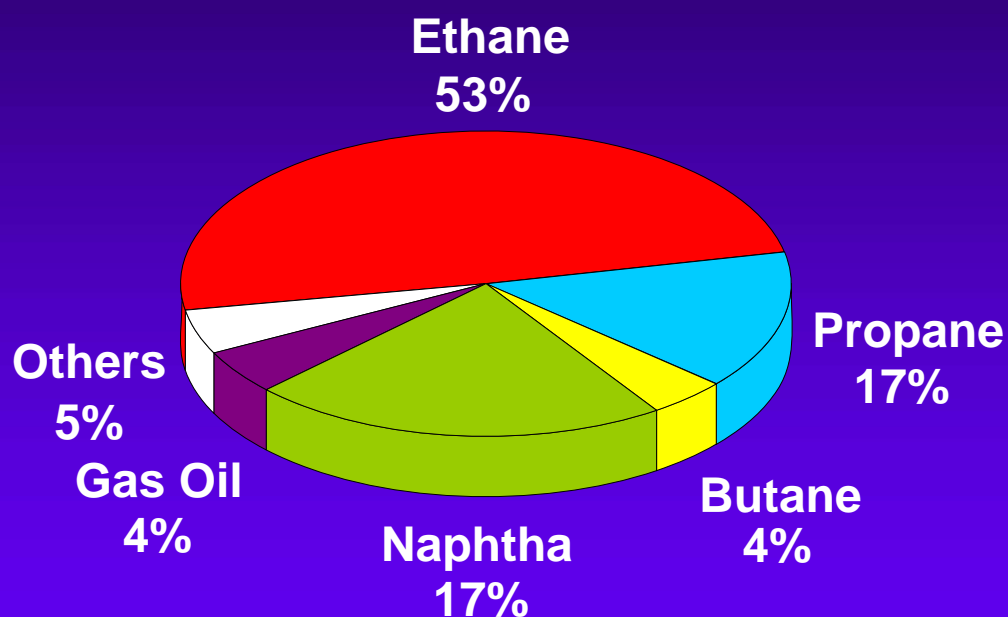
69 Million Metric Tons

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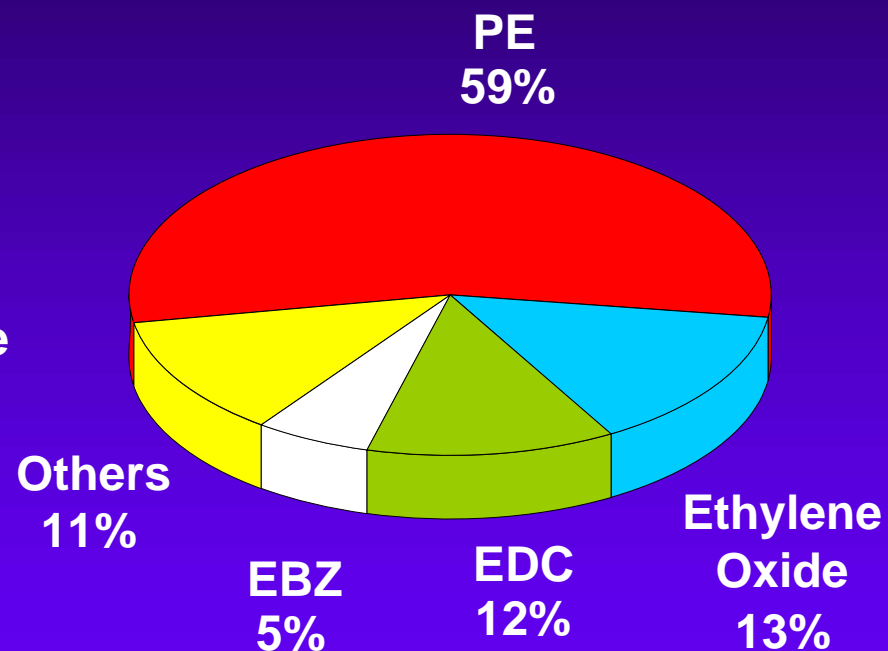
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North America 2007 Ethylene Supply/Demand

Production by Feedstock



Demand by End-Use

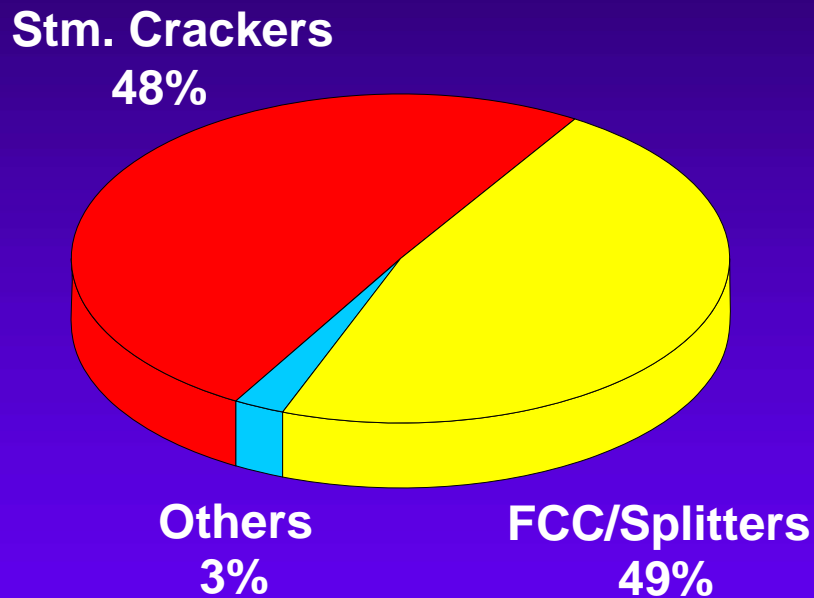


Domestic Demand = 31 Million Metric Tons

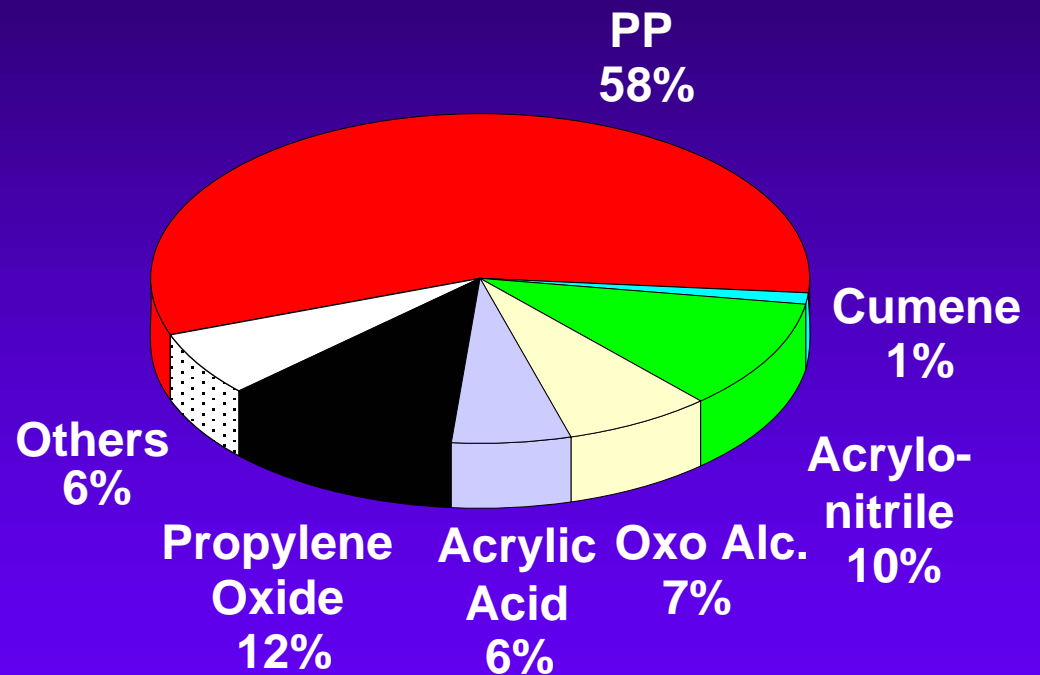
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North America 2007 PG/CG Propylene Supply/Demand

Production by Source



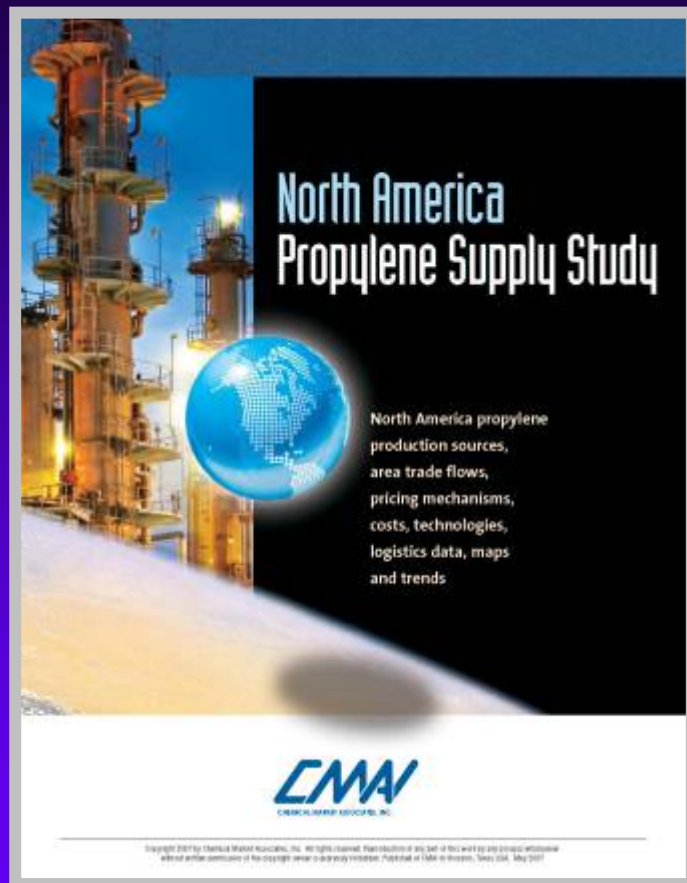
Demand by End-Use



Domestic Demand = 15 Million Metric Tons

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Future Propylene Supply In North America



- **Future supply to meet continued growth in North America propylene demand will come from:**
 - ✓ **Capacity creep on existing units**
 - ✓ **Increased operating rates at on-purpose metathesis units.**
 - ✓ **Debottlenecks, and increased feed flexibility at refinery's and steam crackers**
 - ✓ **Canadian tar sands production**

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Economy and Energy Impact on Regional Ethylene Economics

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Positive economic factors still outweigh growing negatives. Balance is at risk of tipping...

Positive Factors

Monetary Policy

Fiscal Policies

Corporate Profits

Oil \$ Re-Investment

High Productivity

Consumer Spending

“China”

Emerging Countries

The Risks

High Energy Prices

Over-zealous Lending

Government Deficits

Consumer Indebtedness

Credit Crunch

Currency Disparity

Rising Inflation

Geopolitical Instability



2007-2010

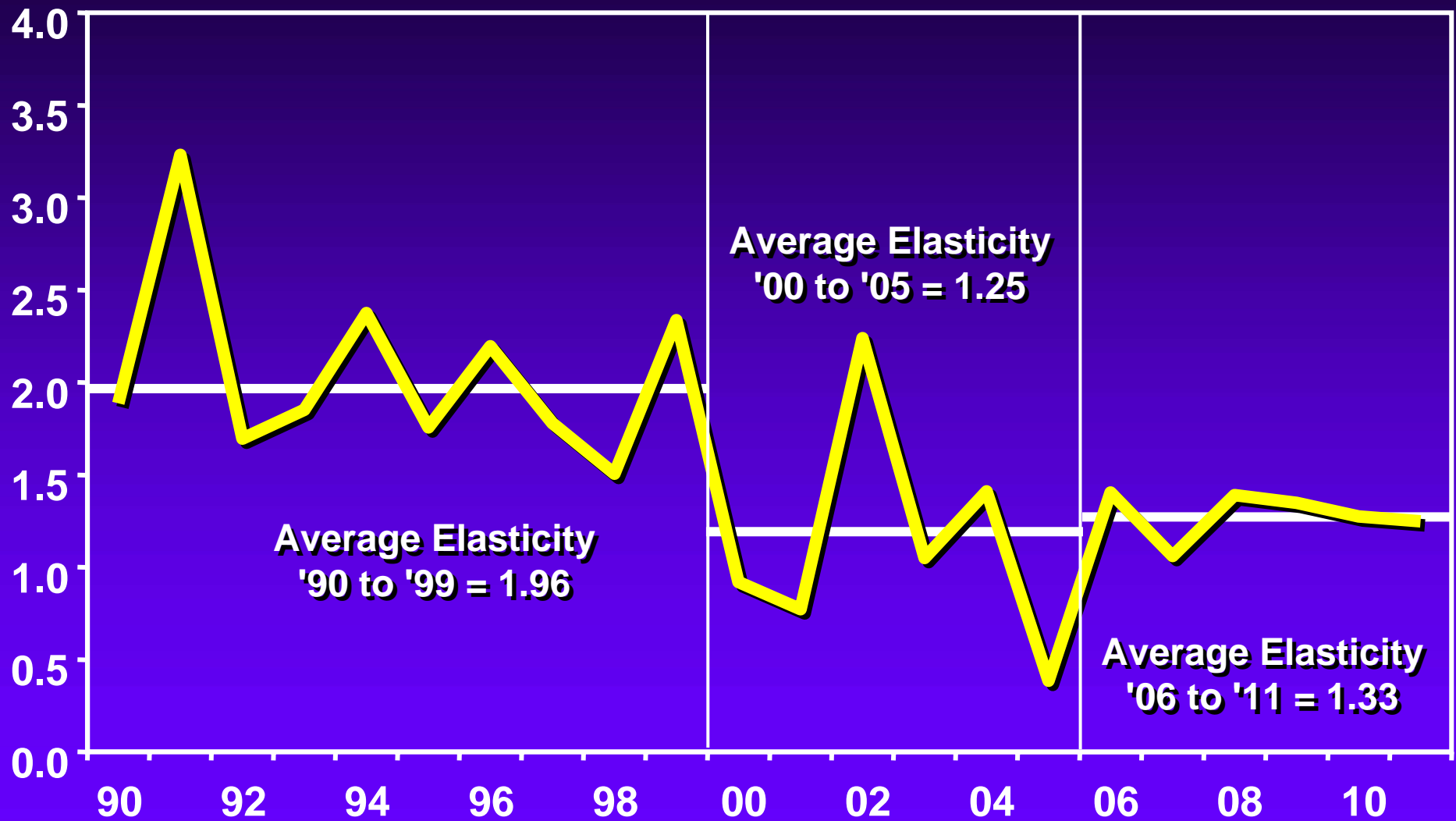
3.0% – 3.3%

Global GDP Growth

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World Ethylene GDP Elasticity

Elasticity



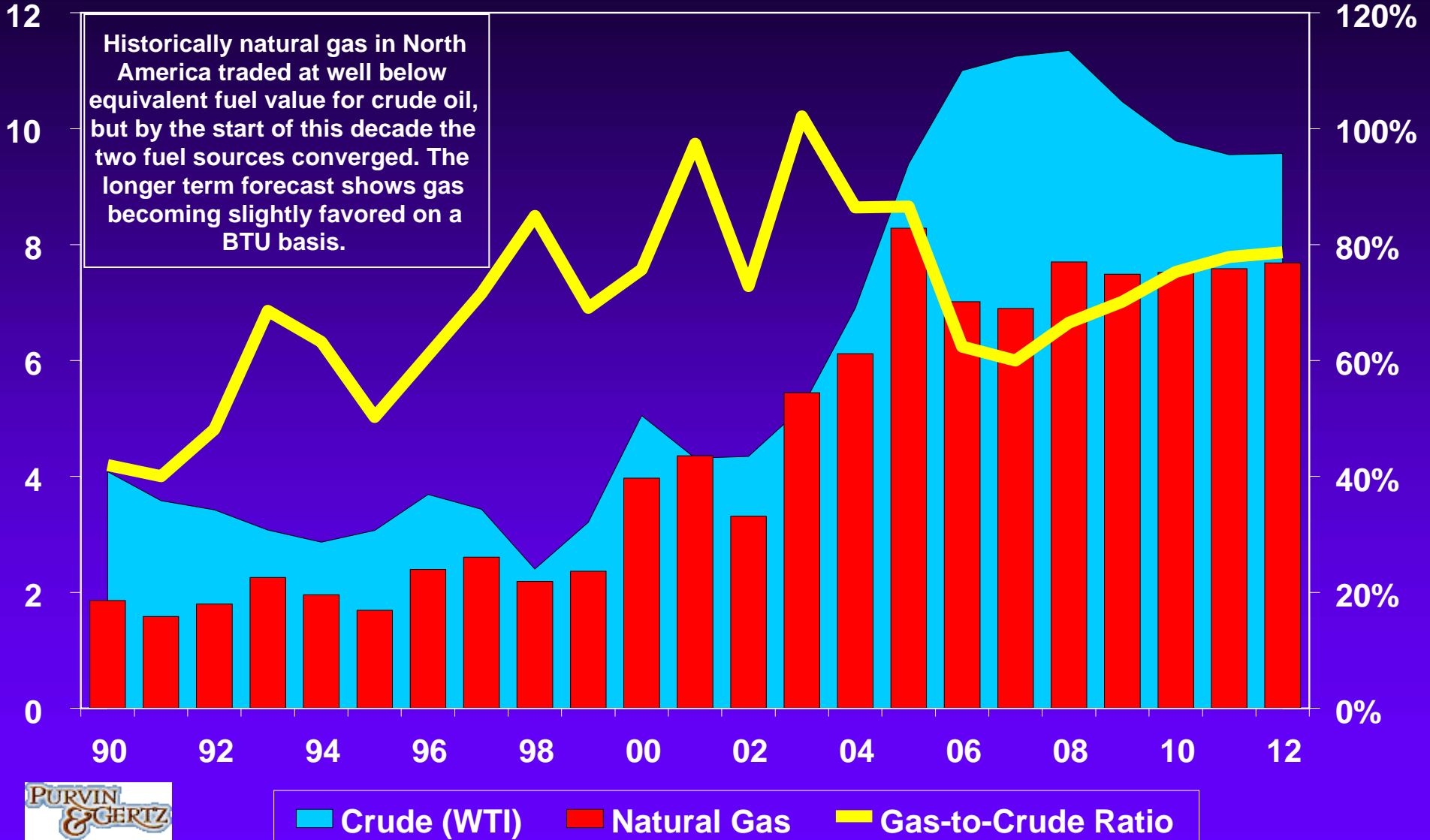
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North America Energy Price Trends

\$ / MM Btu

Gas-to-Crude Ratio



Crude (WTI) Natural Gas Gas-to-Crude Ratio

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Ratio of Natural Gas to Crude Oil Price

Higher “worry premiums” regarding perceived threats or real constraints to international crude oil supplies favor gas based petchem units.

Exports from Canada and U.S. to Europe and Asia are possible as long as this advantage prevails. In the longer term, cost parity and severe surpluses could limit export opportunities – but for now...

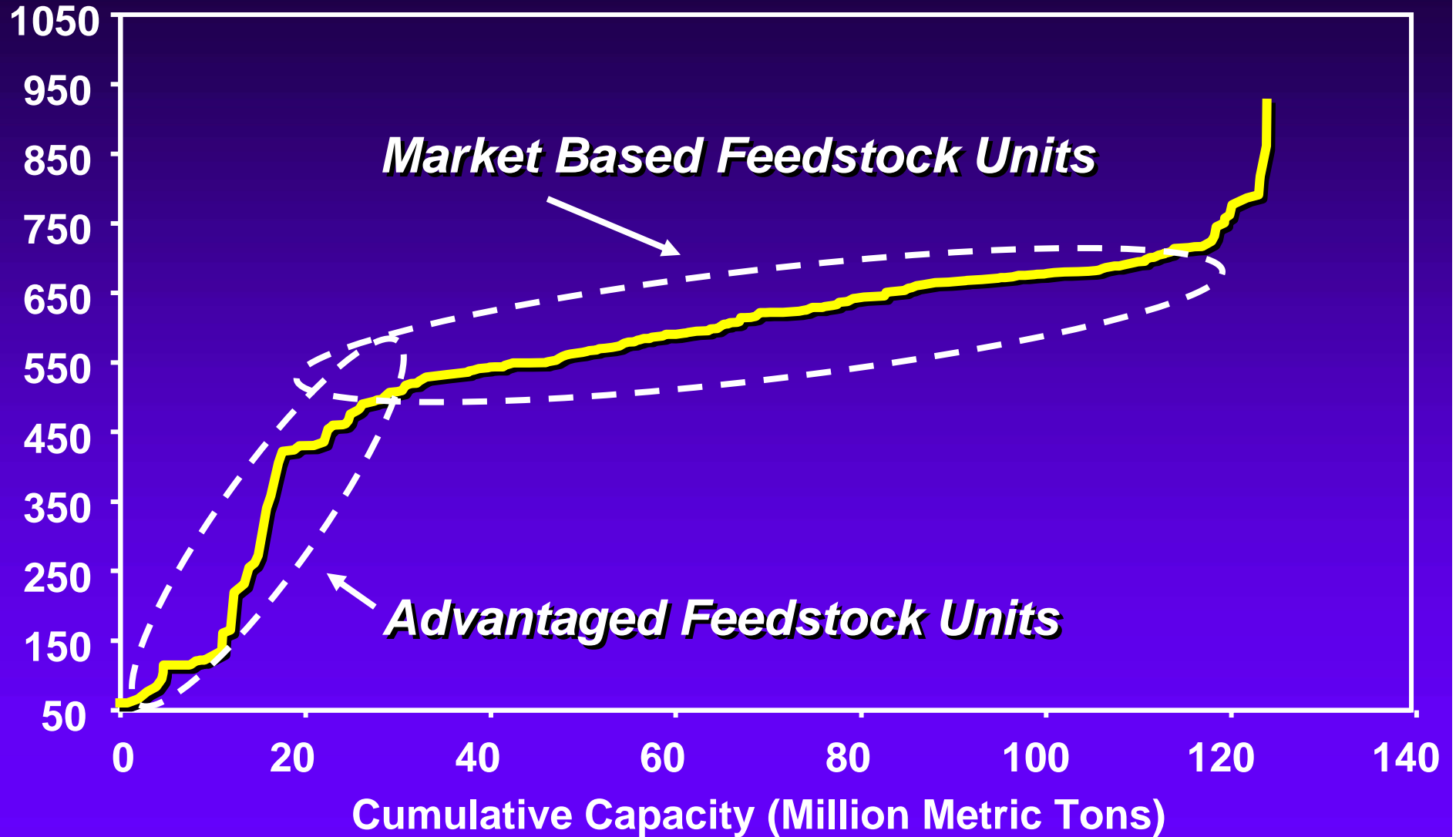
Export Markets Are Very Attractive

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2006 Global Ethylene Cost Curve

Dollars Per Metric Ton



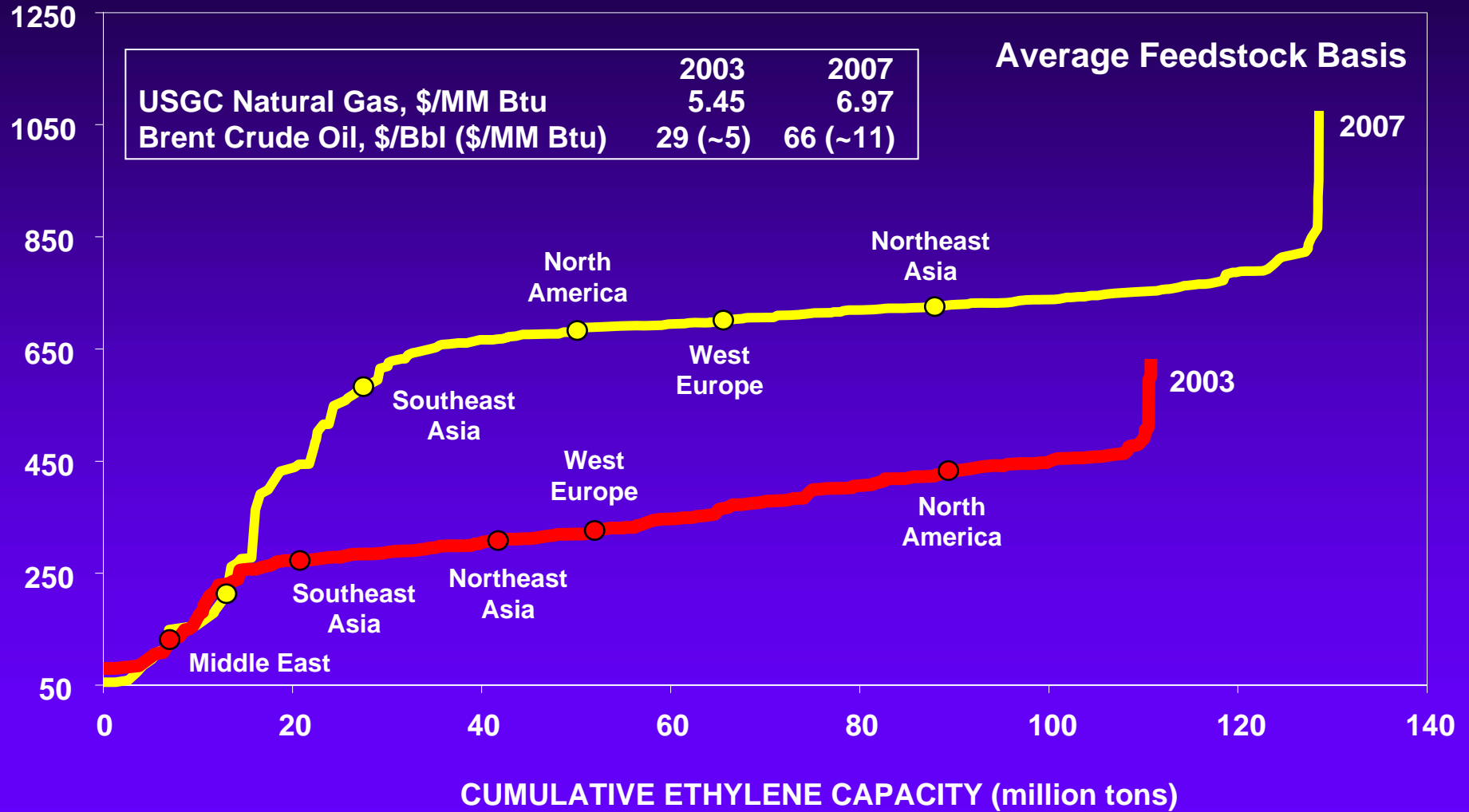
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Global Ethylene Cash Costs By Site

Ethylene Production Basis

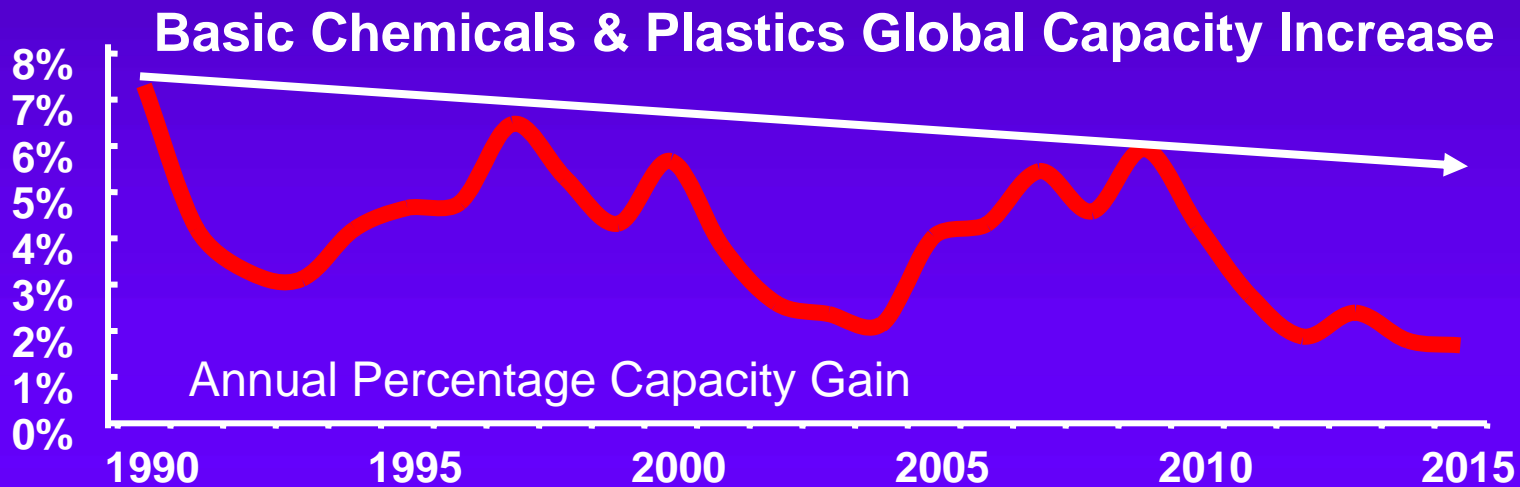
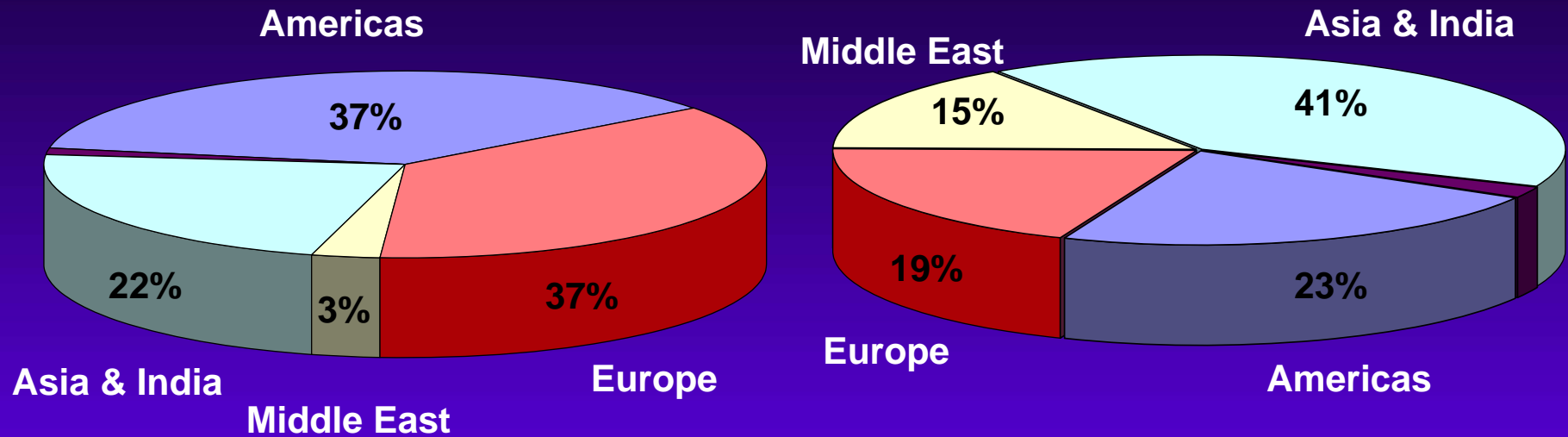
Dollars Per Ton



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Basic Chemicals & Plastics Capacity Distribution 1990 vs. 2015



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Global Ethylene Capacity Growth (-000- Metric Tons)

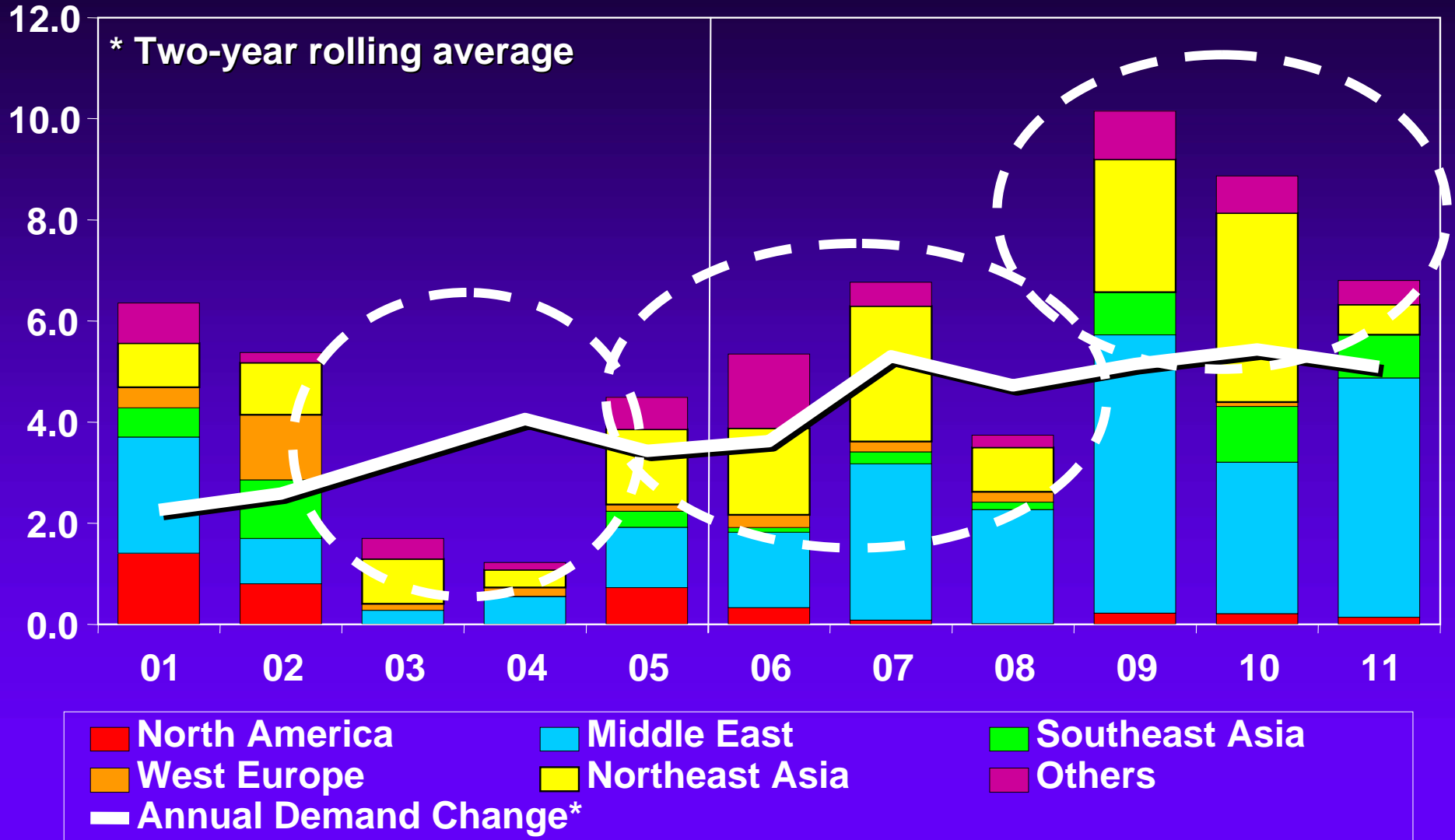
<u>Major Region</u>	<u>2006 Capacity</u>	<u>2011 Capacity</u>	<u>'06 to '11 Delta</u>
Middle East / Africa	14,843	34,146	19,303
Asia Pacific	35,225	49,687	14,462
America's	40,293	41,315	1,022
Europe	30,860	31,735	875
World Total	121,221	156,883	35,662

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Regional Ethylene Capacity Additions

Million Metric Tons



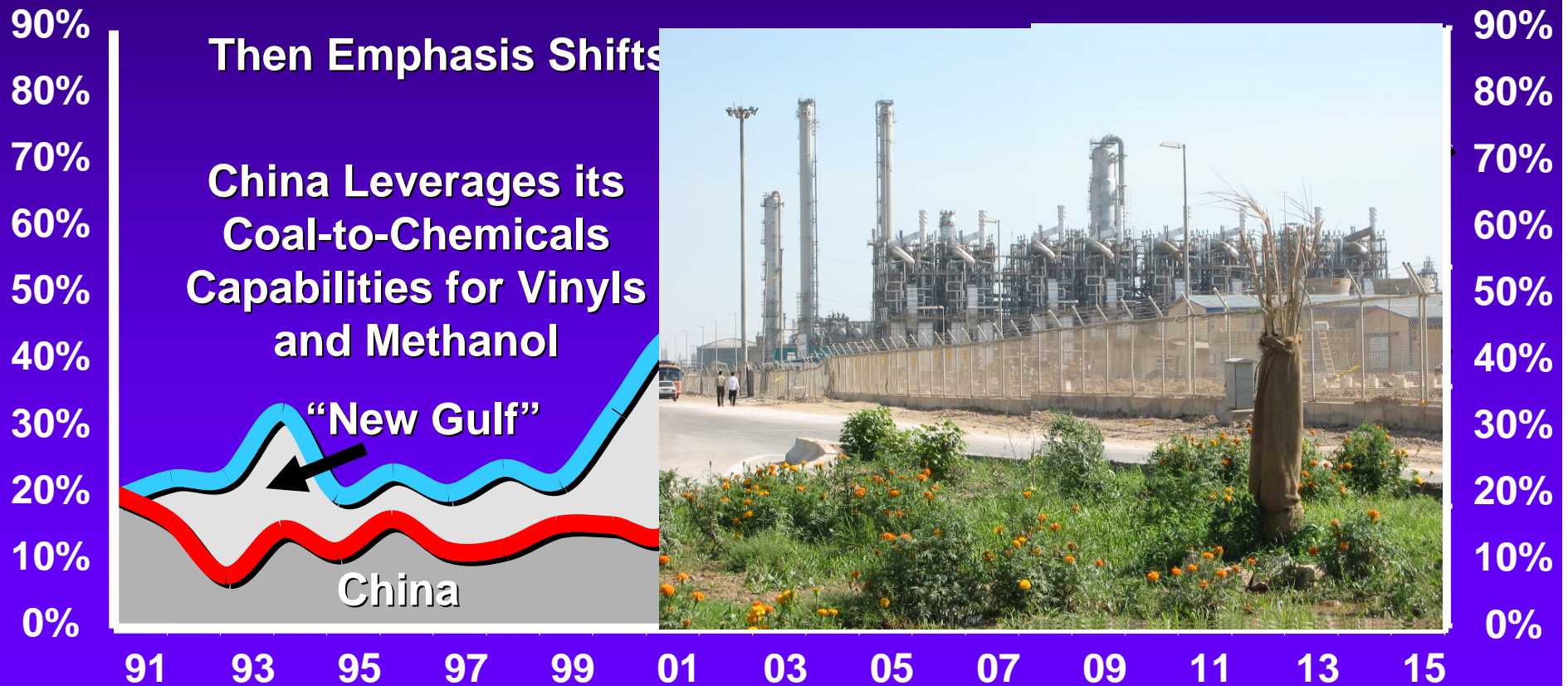
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Revolutionary shift in new capacity emphasis is altering value chain patterns...

Global Basic Chemicals and Plastics

Percent of World Total being added by New Gulf & China



Then Emphasis Shifts

China Leverages its Coal-to-Chemicals Capabilities for Vinyls and Methanol

"New Gulf"

China

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Ethylene Investments In The Americas



- Western **Canada** limited by ethane availability. Olefins supply based on oil sands development under study
- **U.S. Gulf Coast** priority shifts to feed flexibility, energy efficiency and domestic market focus
- **Mexico** looking to leverage upstream and downstream integration
- **Trinidad and Venezuela** offer “advantaged feedstock” based investments
- **Brazil** driven by upstream and downstream integration, focused on MERCOSUR

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Olefins Demand Growth Remains Steady With The Economy

- A strong and resilient global economy continues to drive demand growth for light olefins
- Ethylene demand growth forecast at ~4% per year
 - **Strongest Growth In PE and EO/EG**
- Propylene demand growth forecast at ~5% per year
 - **Strongest growth in PP and Cumene**



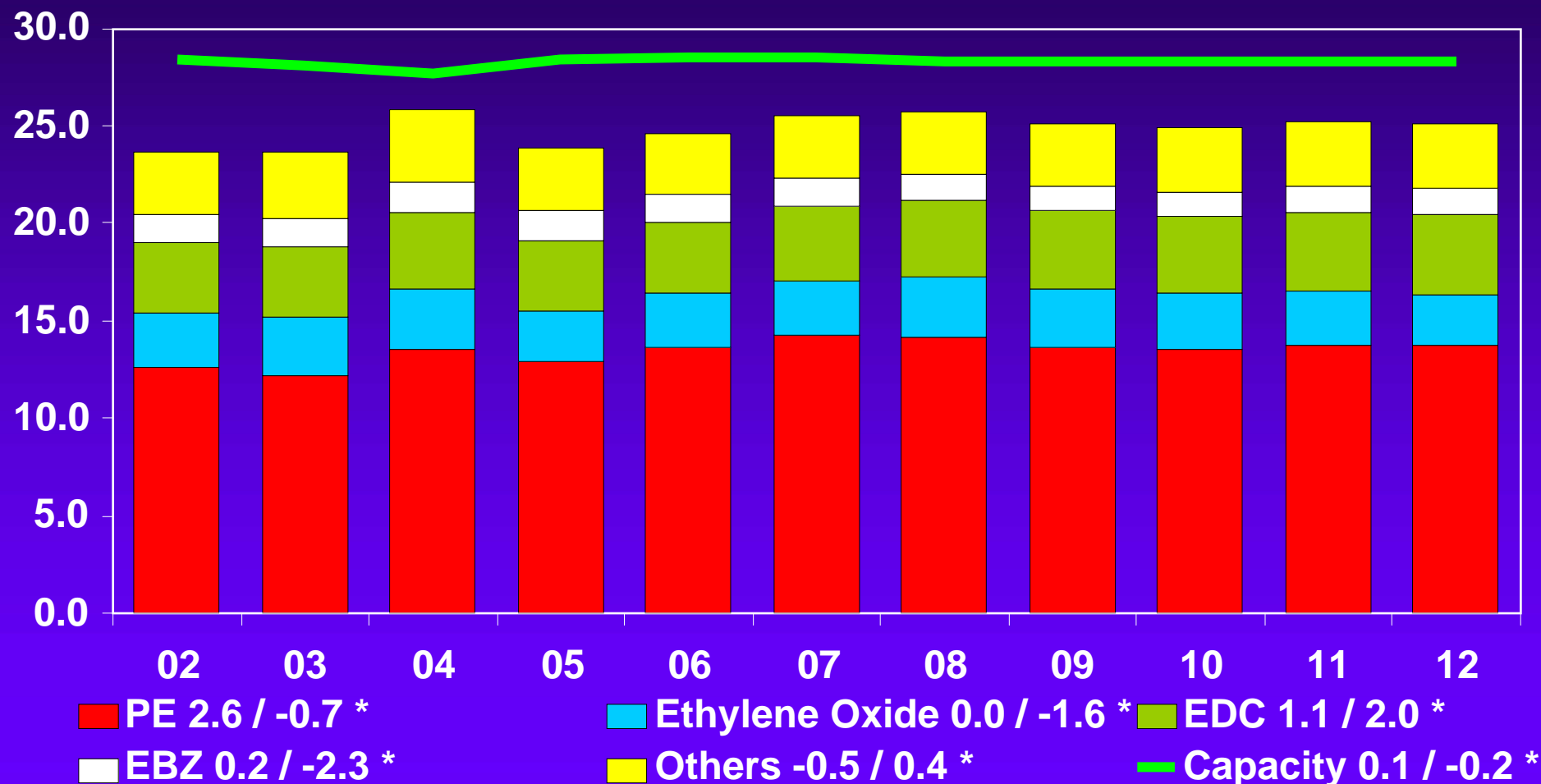
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United States Ethylene Demand Forecast

Total Demand Growth = -0.4% AAGR 2007-12

Million Metric Tons



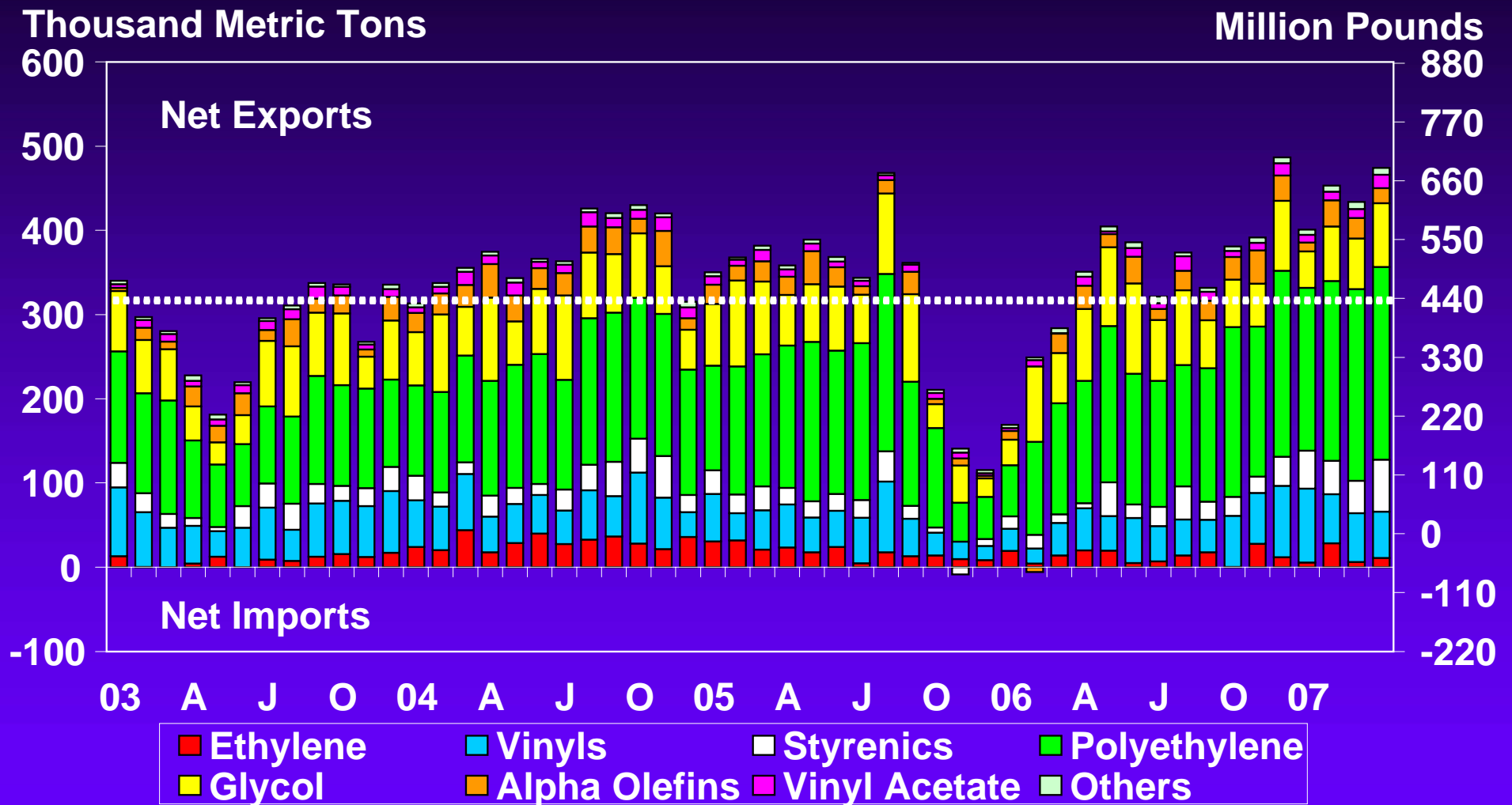
*%AAGR 02-07 / %AAGR 07-12

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North America

Monthly Ethylene Net Equivalent Trade



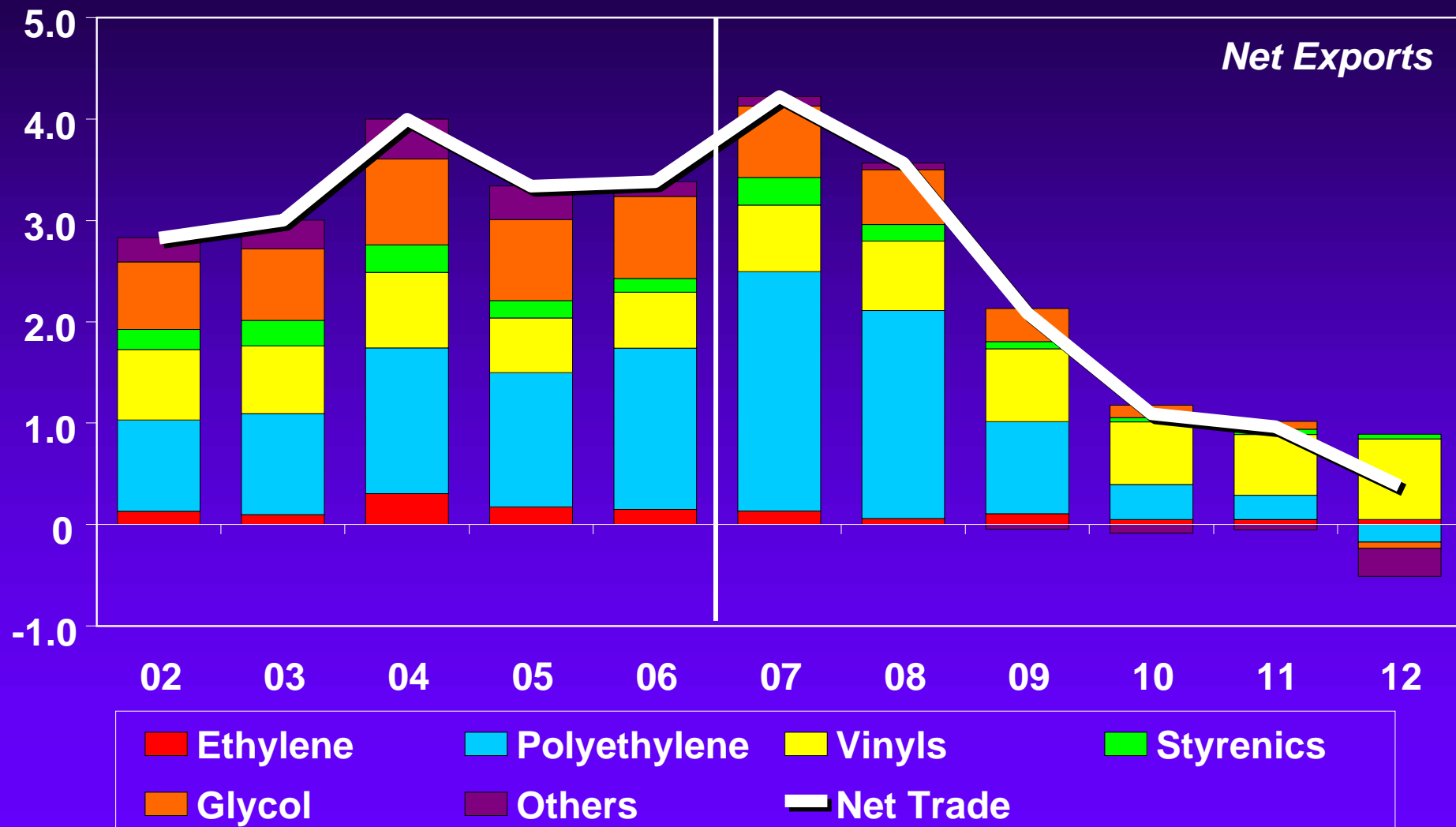
Others - consists of Acetaldehyde and Ethylene Propylene Rubber

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North America Ethylene Net Equivalent Trade

Million Metric Tons



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Olefins Derivative Trade Dominated By The Middle East



- By 2009, ethylene net trade is dominated by the Middle East Region
- North America net trade moderates
- Asia imports, mainly China, remain the largest

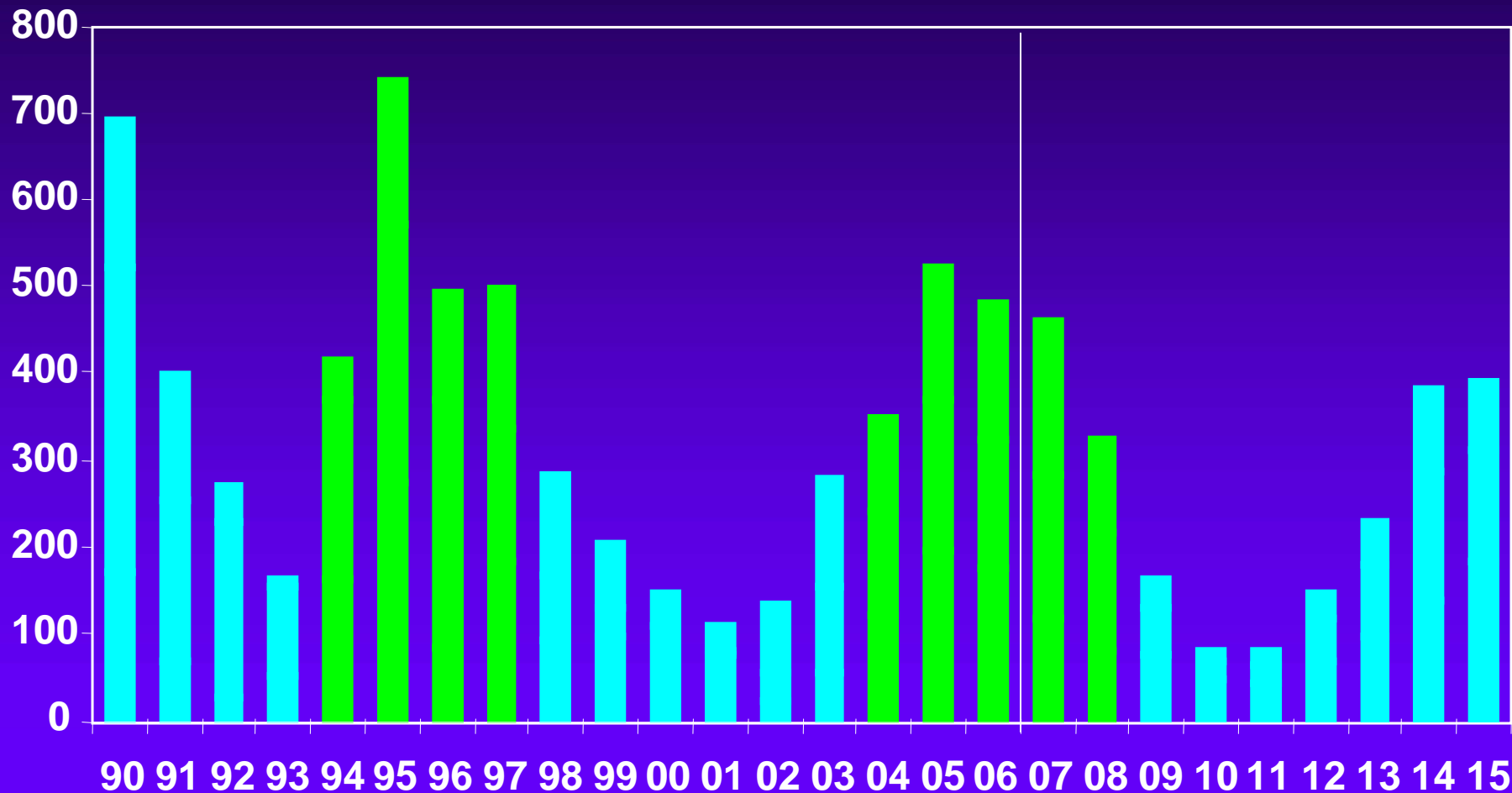
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The Olefins Business Cycle Continues...

U.S. Integrated Olefins/Polyolefins Cash Margins

Dollars Per Metric Ton



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Our vision of the next five years...



- Global Demand Remains Robust
- New Capacity somewhat delayed but market impact unavoidable
- North America loses many “export opportunities” while imports of finished goods accelerate
- By late 2008, evident markets are softening – *emotional then physical*
- Consolidations and closures occur; recovery signs appear by 2012

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THANK YOU !

***Contact any CMAI location to assist in your
petrochemicals market analysis***

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London

Duesseldorf

Houston

Shanghai

Dubai

Singapore

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CHEMICAL MARKET ASSOCIATES, INC.

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