

## ASIA CHEMICAL CONFERENCE

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Presentation

# Global Petrochemical Market Outlook

*Planning For Growth Given Heightened Uncertainty In  
Market Fundamentals*

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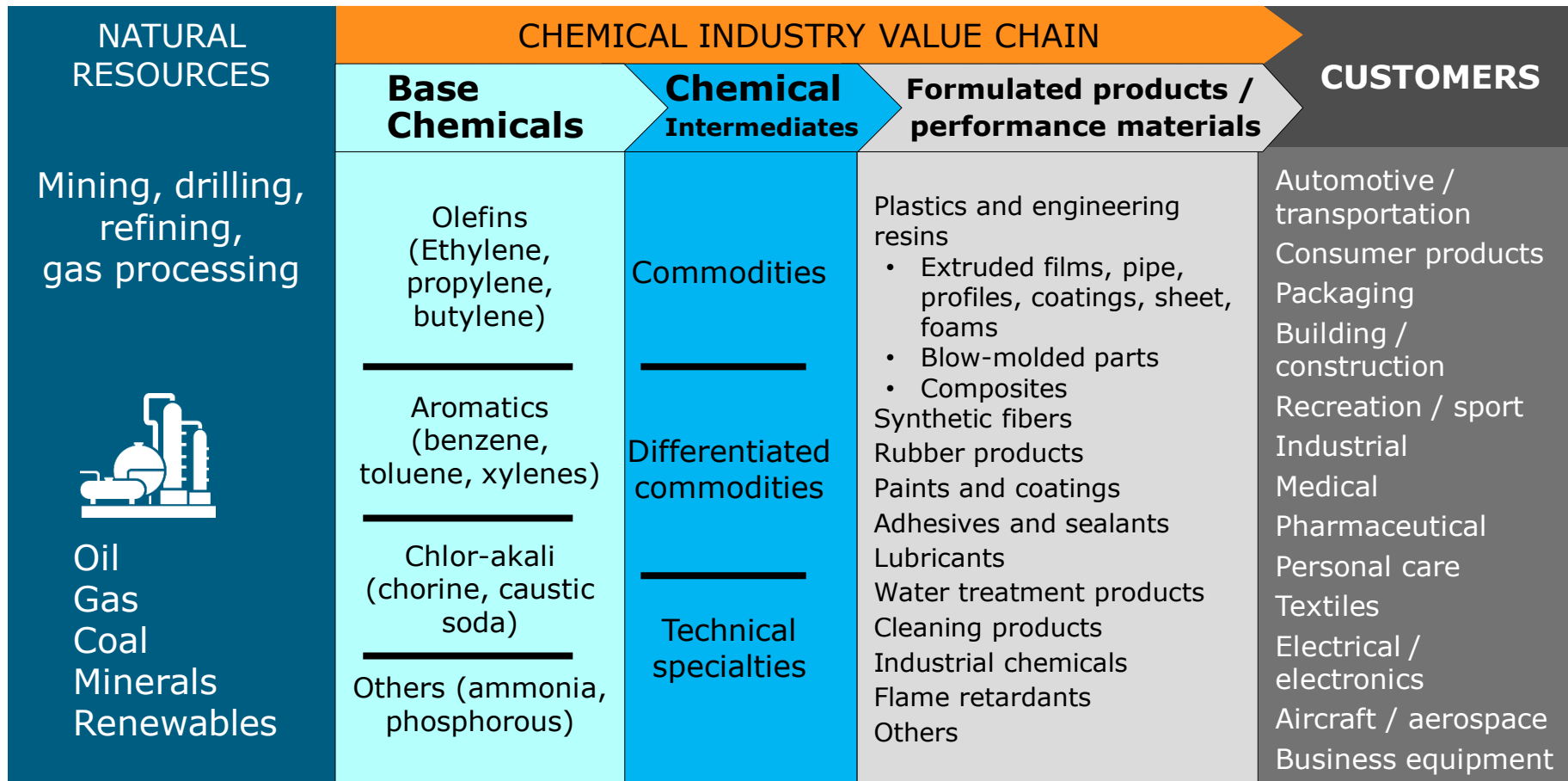
November 2016, Singapore

ihsmarkit.com

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# GLOBAL CHEMICAL INDUSTRY.... ENABLING MODERN LIVING



## *Planning For Growth Given Heightened Uncertainty*

### **AGENDA**



- Impact of Energy on Chemical Investment Decisions.
- Where are the major investments in new capacity?
- Energy extremes enabling non-conventional capacity.
- Declining CAPEX and rising Mergers & Acquisitions
- Strategic Considerations

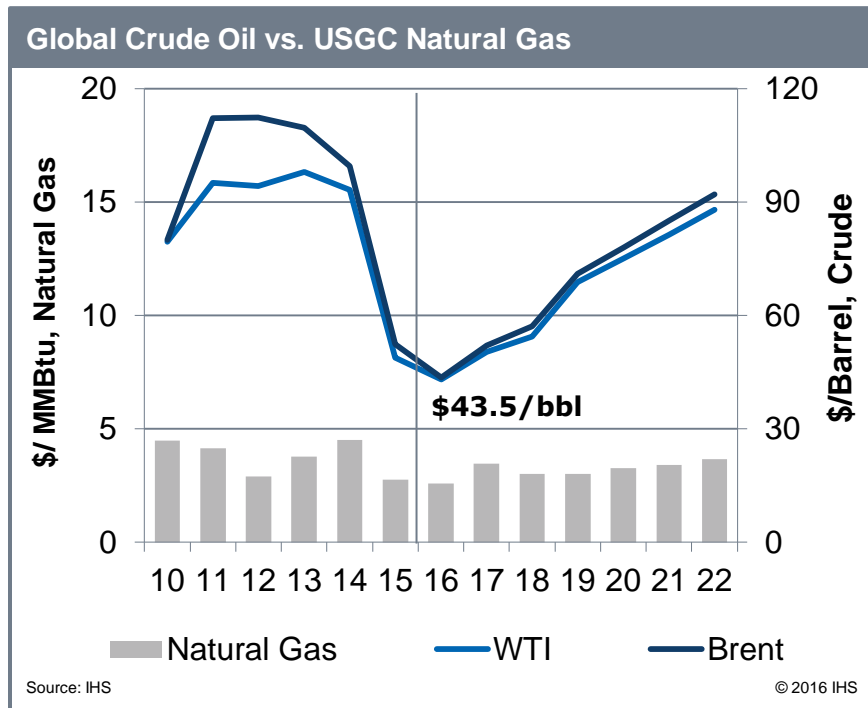
# Energy & Economic Fundamentals Impact Investment Decisions

- **Energy trends** impact regional competitiveness and profitability
- Advantaged investments in North America and China, see **lower margins in low crude oil** market.
- Economy and energy assumptions **drive key decisions** of location, feedstock, technology, scale...
- Uncertainty results in **delayed approvals**; when combined with steady growth leads to tighter market conditions in basic chemical value-chains
- **Crude oil (energy) “at the extremes”** impacts demand for chemicals and plastics. On the high end, it can “destroy” demand and on the low end it can stimulate demand.



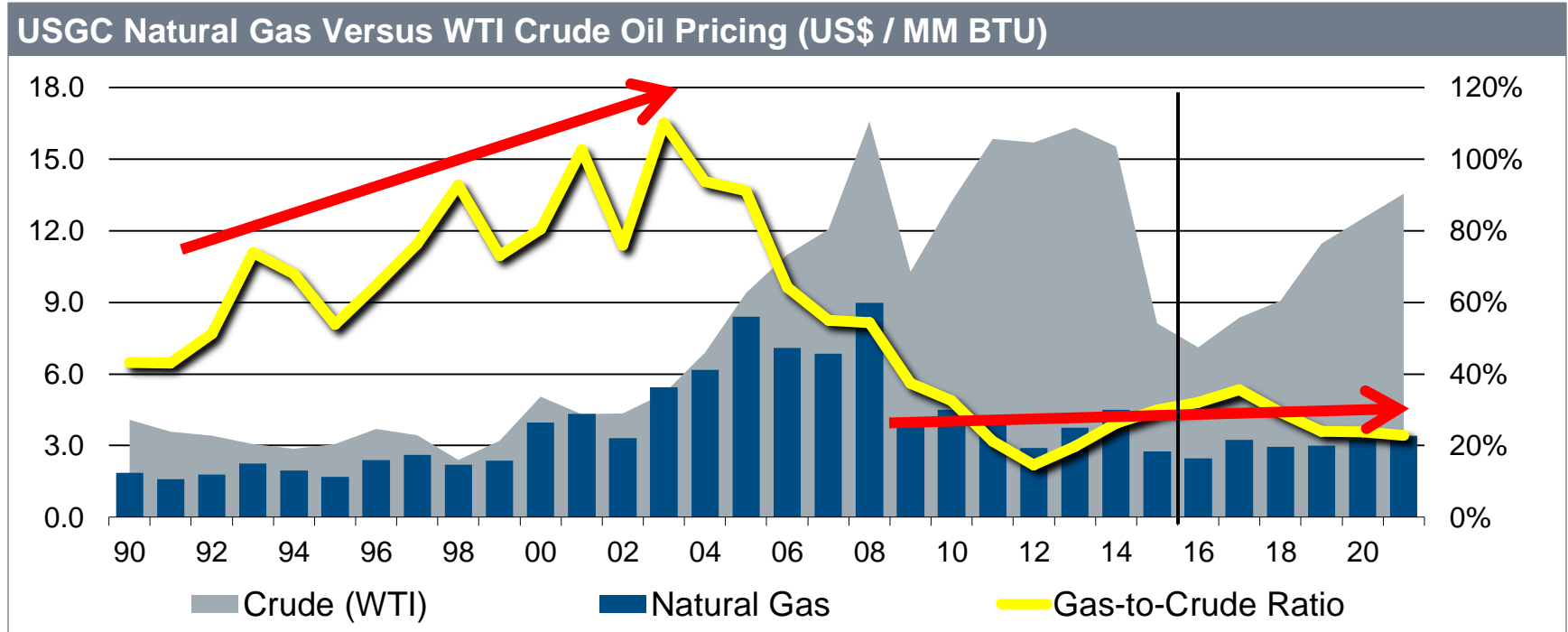
# BASE CASE PLANNING SCENARIO:

## Steady Increase In Crude Oil Price; Stable/Low Natural Gas In North America; Moderate Global Economic Growth



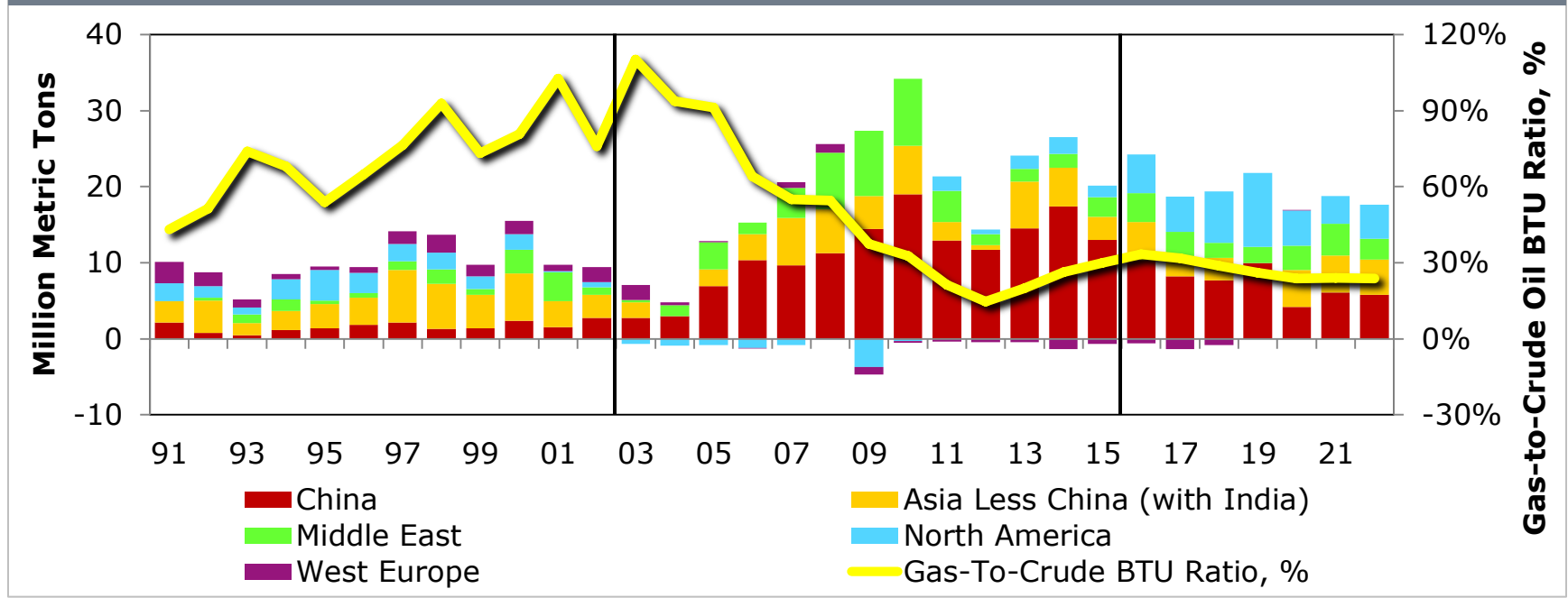
	% Change, GDP				
	2014	2015	2016	2017	2018
<b>World</b>	<b>2.7</b>	<b>2.7</b>	<b>2.4</b>	<b>2.8</b>	<b>3.1</b>
<b>United States</b>	<b>2.4</b>	<b>2.6</b>	<b>1.4</b>	<b>2.2</b>	<b>2.2</b>
Canada	2.5	1.1	1.2	2.2	2.3
Eurozone	1.1	1.9	1.6	1.4	1.6
United Kingdom	3.1	2.2	2.0	1.0	1.3
<b>China</b>	<b>7.3</b>	<b>6.9</b>	<b>6.6</b>	<b>6.3</b>	<b>6.4</b>
Japan	-0.1	0.6	0.6	0.7	1.0
India	7.2	7.5	7.5	7.4	7.7
<b>Brazil</b>	<b>0.1</b>	<b>-3.9</b>	<b>-3.2</b>	<b>0.6</b>	<b>2.2</b>
Russia	0.7	-3.7	-0.7	0.8	1.6

# Gas-to-Crude Ratio Favors North America Investments Since 2010



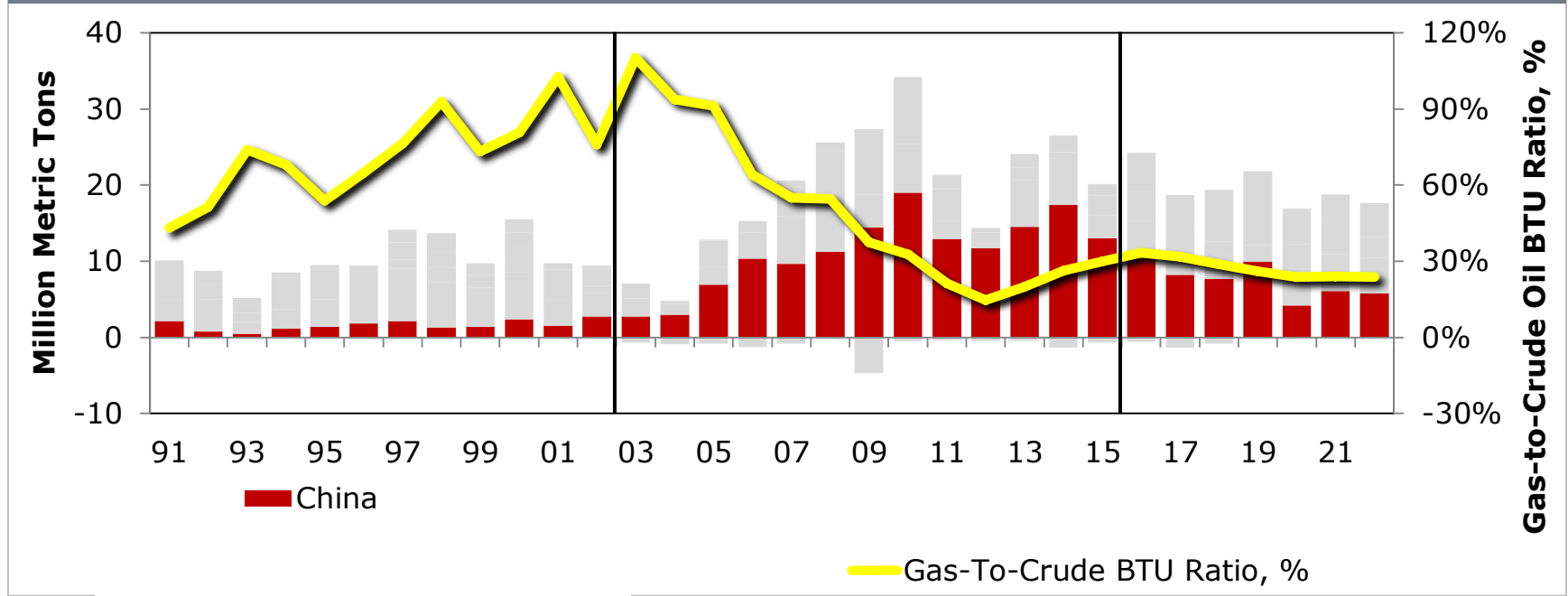
# Impact of Changing Energy Dynamics On Regional Chemical Capacity Additions

Annual Change - Total Basic Chemicals Capacity:  
Ethylene, Propylene, Methanol, Benzene, Paraxylene, Chlorine



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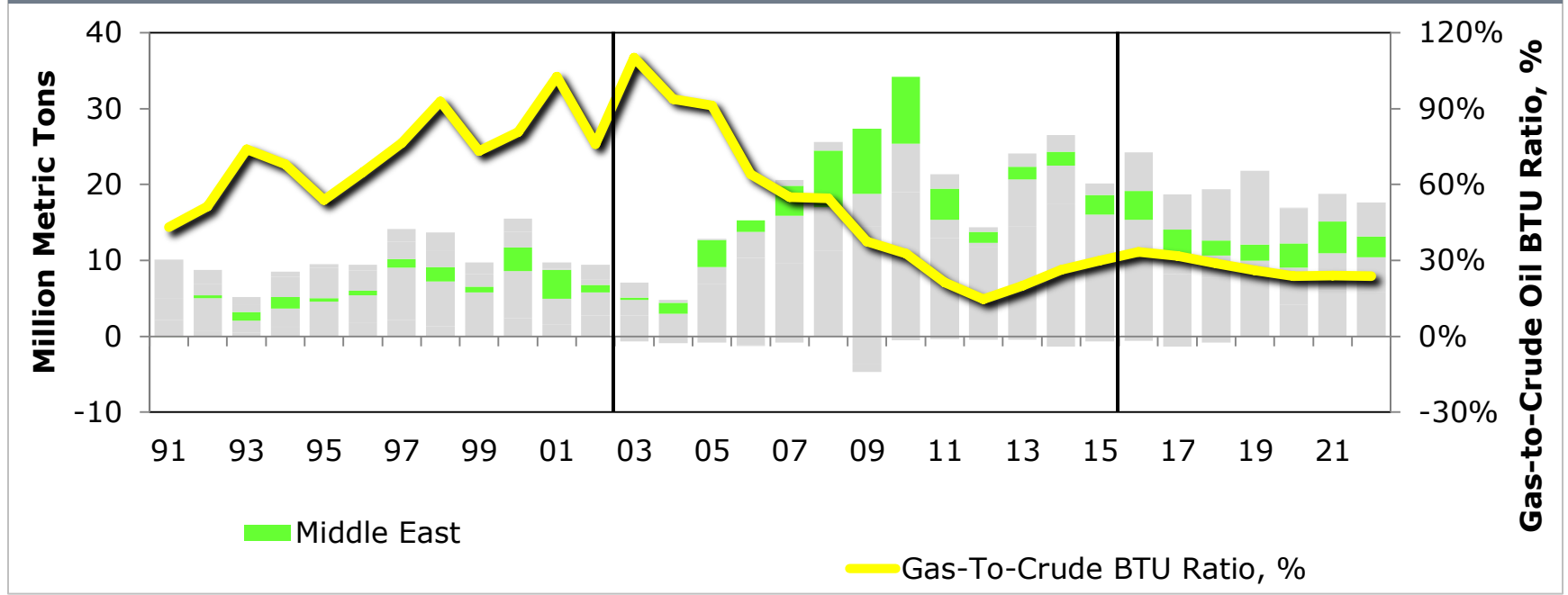
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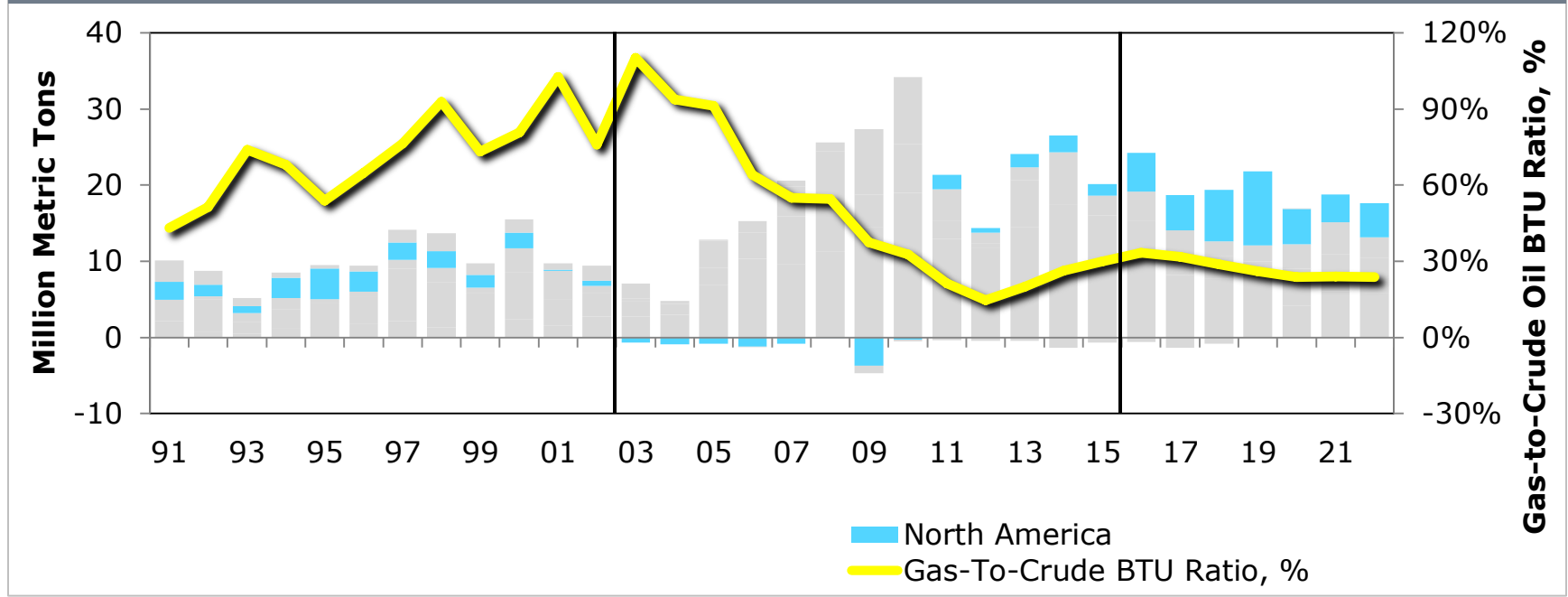
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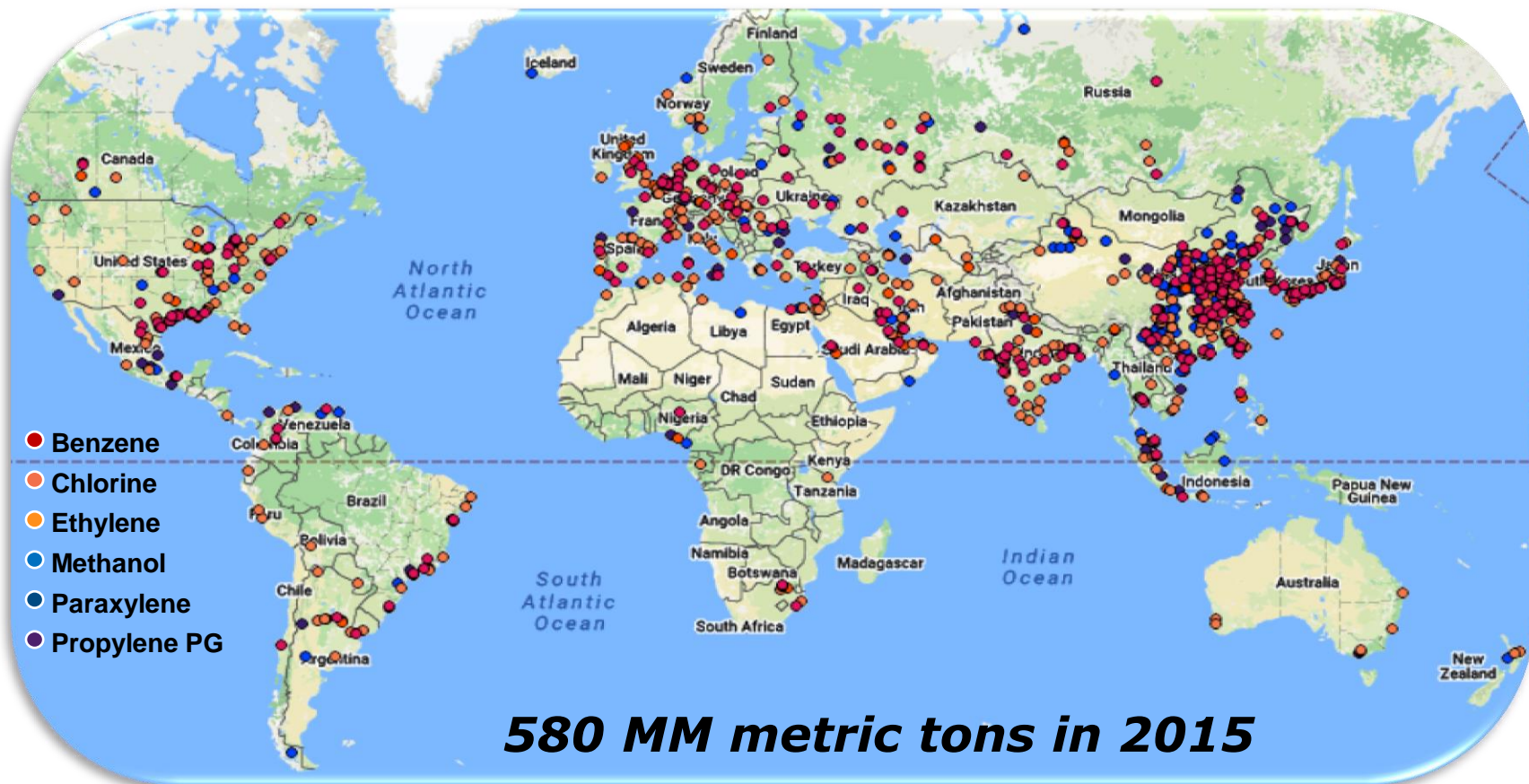
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# GLOBAL BASE CHEMICAL ASSETS BY LOCATION



## Investment Decisions Must Evaluate Many Factors Beyond Energy & Economy



**Braskem-Idesa Ethylene/PE Plant  
Nanchital, Veracruz, Mexico  
Start-Up: June 2016**

### Investment Assumptions:

- Global crude oil price scenarios
- Global economic growth outlook
- **Geo-political considerations**
- **North American energy market**
- Current state of the profit cycle
- **China structural changes**
- Non-conventional technology
- **Sustainability**
- Levels of integration
- **Regional CAPEX differentials**
- Logistics investments

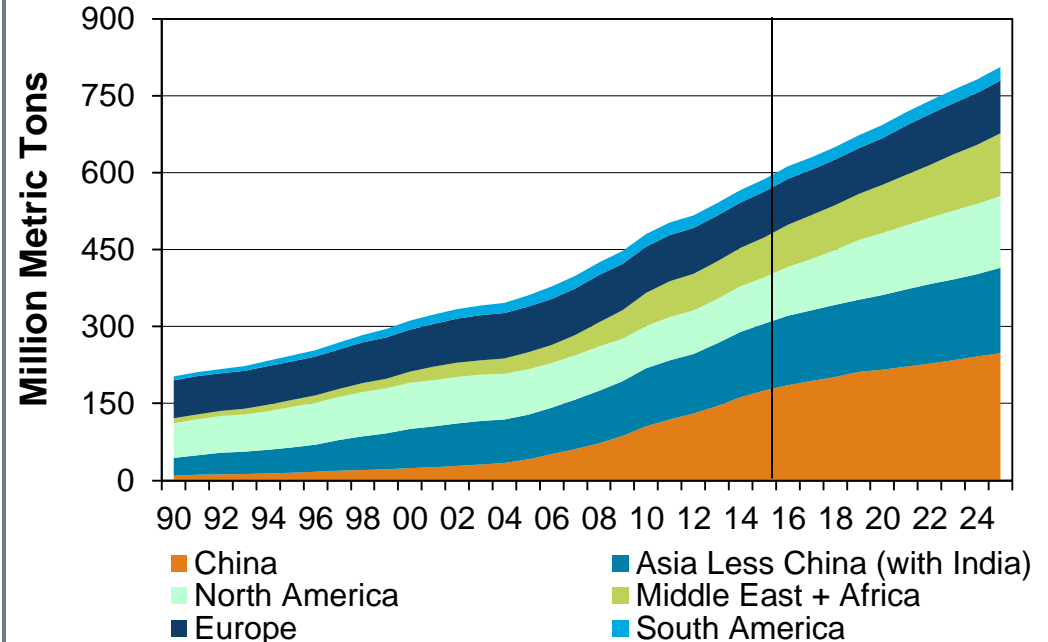
# Base Chemical Capacity To Exceed 750 MM Metric Tons By 2025

## Chemical Investment "Drivers"

- Secure an energy & feedstock advantage.
- Leverage current technology and build world-scale.
- Invest with proximity to local markets and/or access to trade routes.
- Build to leverage an upstream and/or downstream integrated position.

### Base Chemicals – Total Capacity By Region

Ethylene, Propylene, Methanol, Benzene, Paraxylene, Chlorine



Source: IHS

© 2016 IHS

# Beyond 2020...Where Will The Next Wave Of Capacity Be Built?



## Total Basic Chemical\* Capacity (Million Metric Tons)

Region	2015	2025	Delta
North America	90	137	47
South America	24	26	2
Europe	89	101	12
Middle East / Africa	77	119	42
Asia/India (less China)	130	163	33
China	172	241	69
<b>Total</b>	<b>582</b>	<b>787</b>	<b>205</b>

\* Ethylene, Propylene, Methanol, Benzene, Paraxylene, Chlorine

## China: Slower Pace Of New Capacity & Increased Focus On:

- > Industry Competitiveness
- > Safety & Pollution control
- > Segment Consolidation

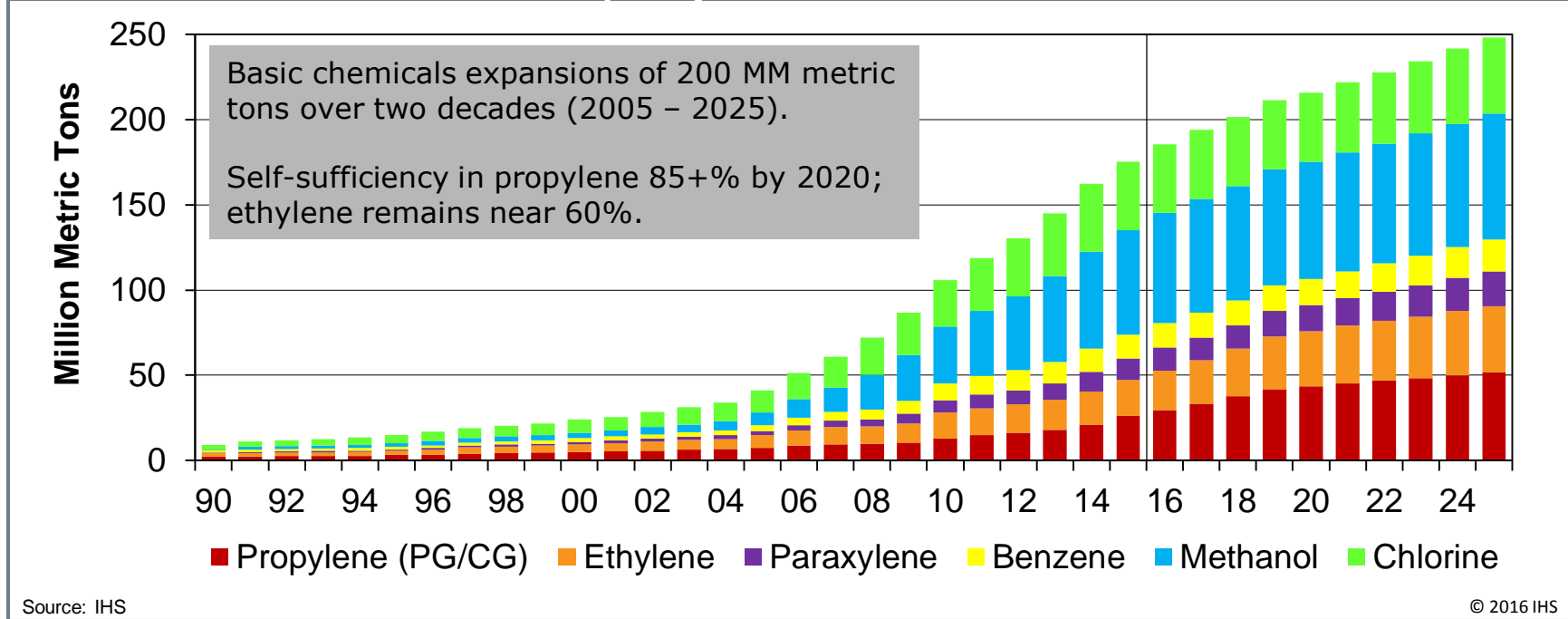


- Tighten pollution control; industry safety performance; rationalize inefficient/non-competitive assets.
- Develop modern coal chemicals asset base.
- Consolidation of 100+ chemical industry parks into seven national chemical industrial zones.
- Rapid growth in private investment potentially changes future behavior.
- Overseas investment activity.



# China 13<sup>th</sup> 5-Year Plan Slows Pace Of Investment; Focus On Competitive Position, Safety & Pollution, Consolidation

## China - Base Chemical Total Capacity



## Middle East Rate Of Investment Slows;

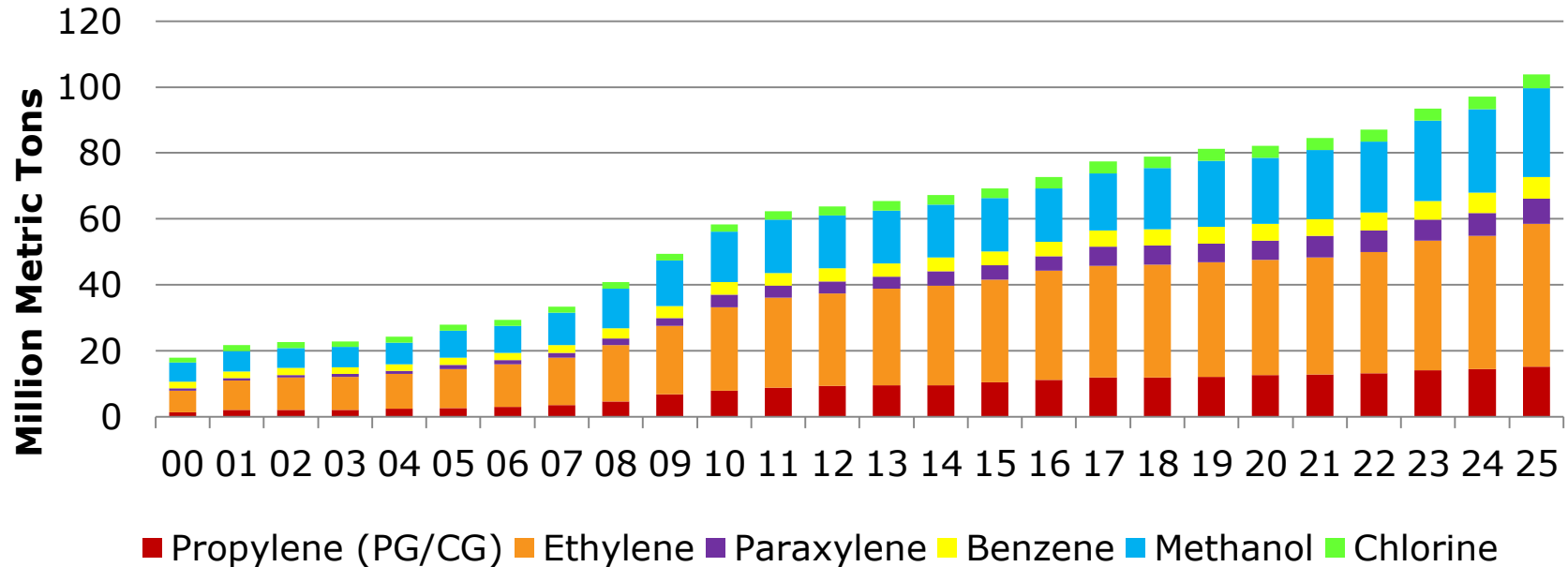
- > Adding Diverse Feedstocks;
- > Focused On Operational Efficiencies



- Ethane prices in Saudi Arabia raised to reflect transition in strategy for future investments.
- Low crude prices sharpen focus on operational costs.
- Sadara project in Saudi Arabia represents measured approach to diversify businesses.
- Lifting of nuclear sanctions on Iran has re-opened plans to expand the chemical space.
- Significant dependence on exports continues well into the future.

# Middle East Focus Shifting To Feed-slate Diversity And Improving Operational Efficiencies

## Middle East Base Chemical Capacity



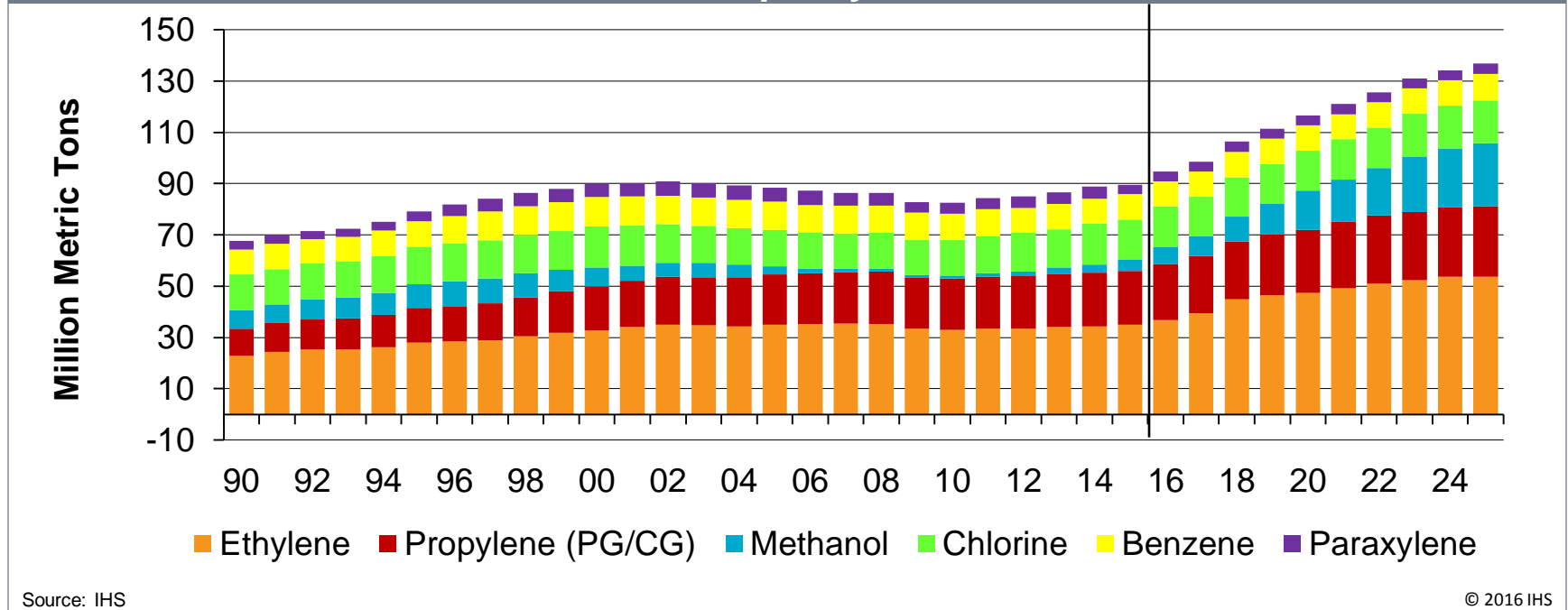
## North America: An Attractive Place For Chemicals Investments Once Again



- Low cost energy and natural gas liquids provide sustainable advantage.
- Advantaged feedstock will enable an additional wave beyond 2020, assuming crude oil price recovery (near \$80/bbl) and low natural gas pricing (near \$4/MM BTU).
- Domestic and International companies seek to invest; leveraging the low-cost opportunities. New entrants to create increased competition in domestic markets
- Logistics & port infrastructure investment needed to support higher level of exports.

# North America Low Cost Brings Back Base Chemical & Associated Derivative Investments

## North America - Base Chemical Total Capacity



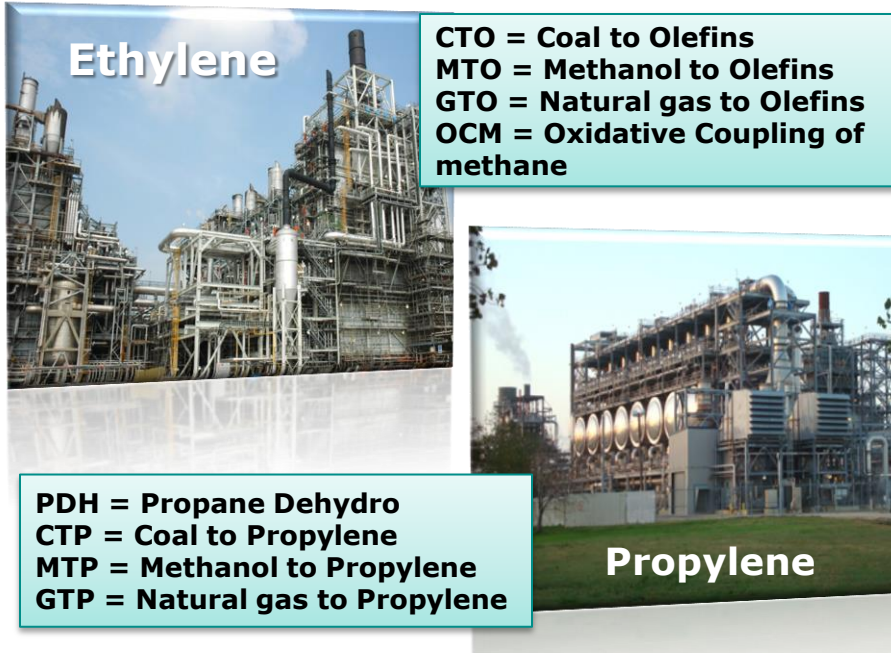
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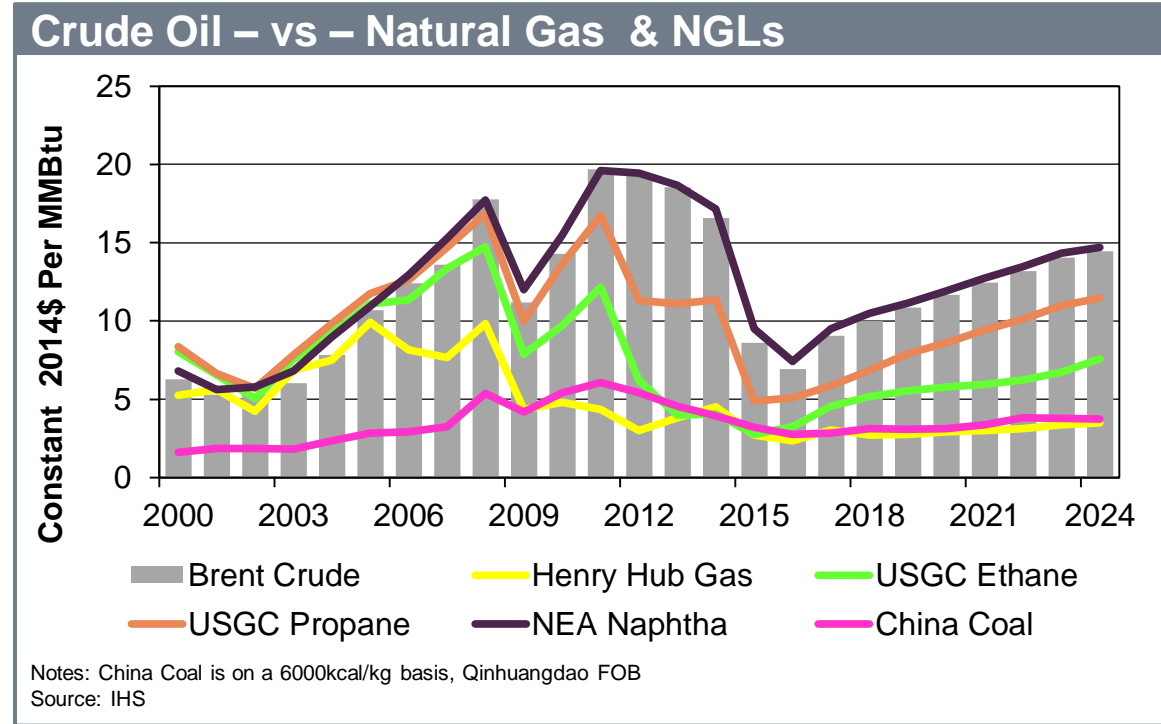
## Energy At The Extremes Has Catalyzed A “New Era” In Light Olefins Production



- For decades, light olefins supply based on refinery & naphtha cracker integrated sites
- Ethane crackers emerged where ethane was advantaged; USGC, Mexico, Alberta, Middle East; other areas where liquids rich gas was “trapped”.
- Propylene was a byproduct of refining and heavy or flexible steam cracking.
- Today light olefins are being made on purpose via a variety of technologies beyond refining and steam cracking: PDH, CTO/P, MTO/P, Metathesis, GTO/P, OCM

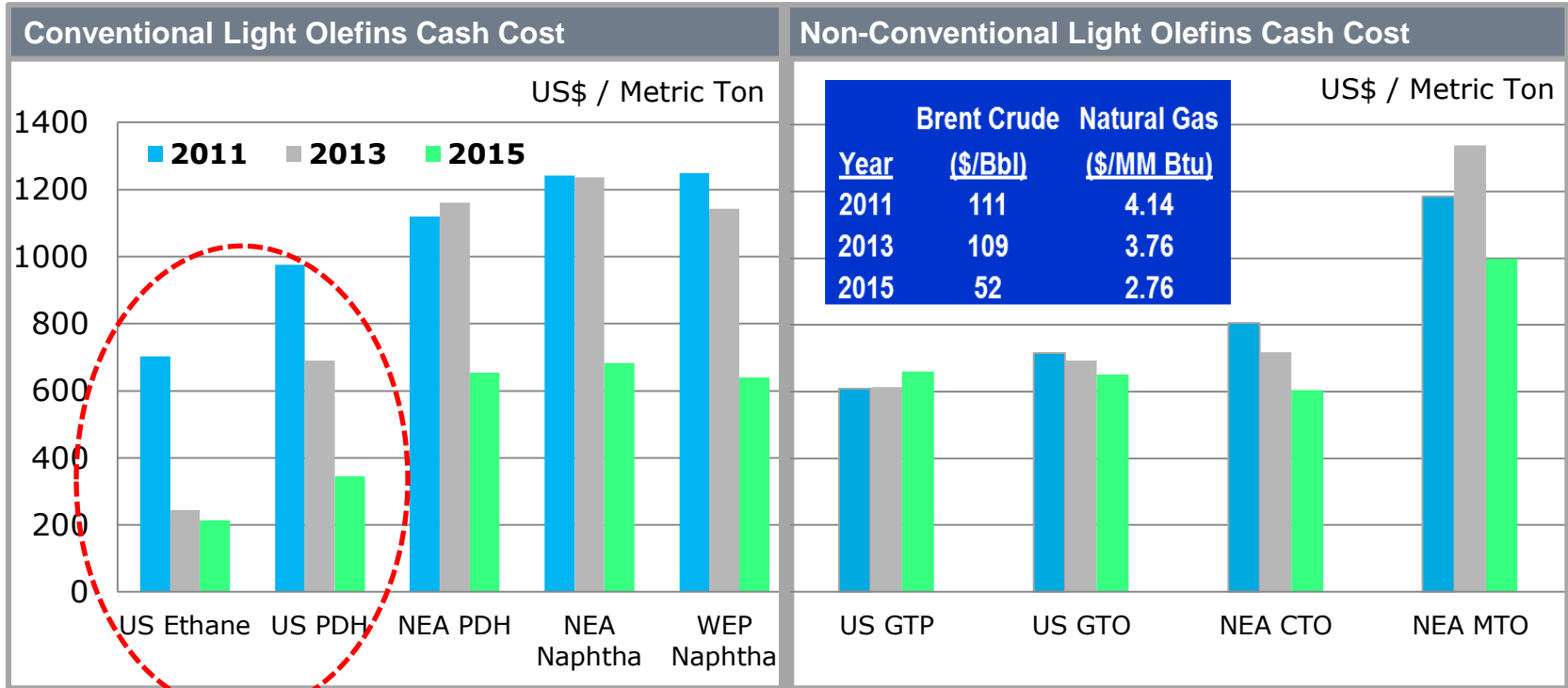
# Energy & Feedstocks Influence Location & Technology For New Capacity Decisions

- Energy and feedstock deltas emerged in 2009 as part of the North America shale developments.
- These spreads supported “on-purpose” capacity to be viable as an incremental supply option.
- The spreads remained high through 2014, attracting a new investment wave.
- 2015 collapse in crude pricing has created a pause in new approvals.





# Non-conventional Technology Providing Options For Future Investments In Olefins Production



PDH = Propane Denhydro; GTP = Gas to Propylene; GTO = Gas to Olefins; CTO = Coal to Olefins; MTO = Methanol to Olefins

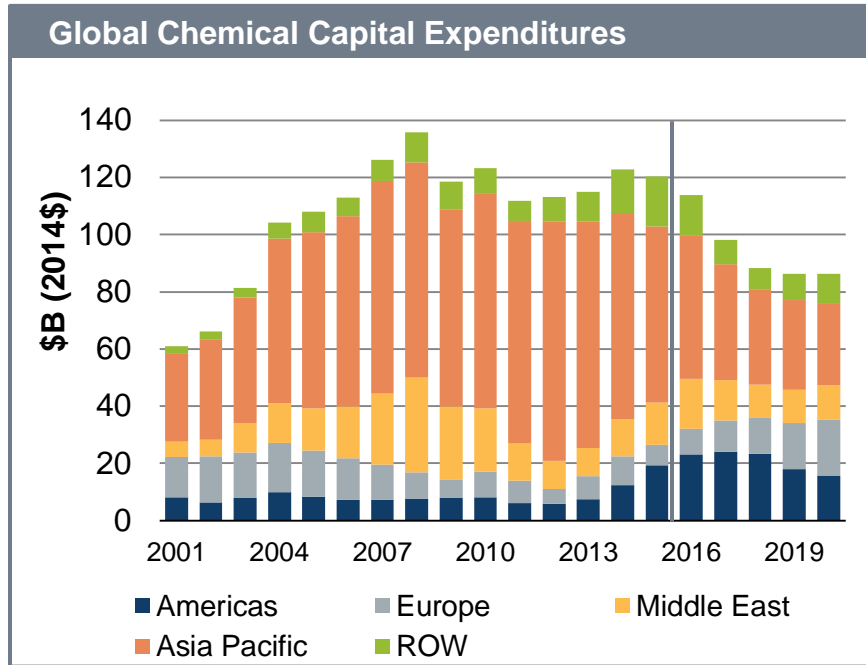
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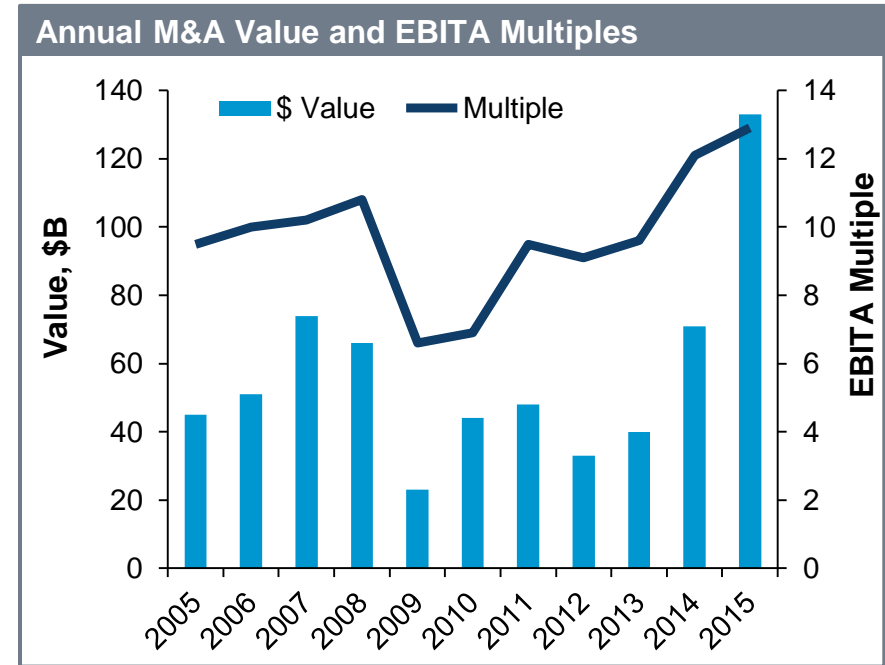


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# As CAPEX Declines, M&A Activity Increases As Means To Achieve Growth

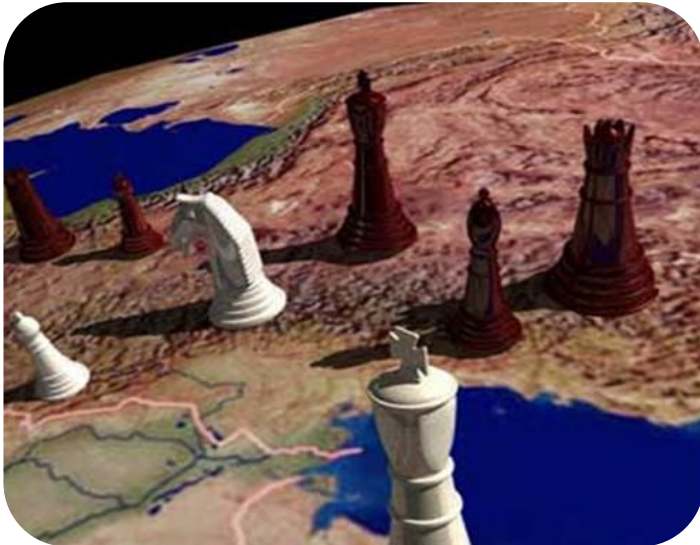


Source: IHS



# Planning For Growth Given Uncertain Fundamentals

## Strategic Implications



- **Higher level of uncertainty** (in market fundamentals) presents difficulty in planning best options for future growth.
- **Board level decisions delayed**; non-conventional technology being considered; higher CAPEX; higher risk premiums; increased M&A
- Investment decisions delays in 2015/16 could lead to **supply limitations in the 2020+**.
- **On-purpose supply options** are viable given “extreme energy”; will be key drivers of market dynamics in the future.

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