Ethylene and Polyethylene Global Overview

Howard Rappaport

Global Business Director, Plastics

SPI Film & Bag

May, 2011

CMAI = Over 180 Employees In 8 Offices

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CMAI: Enhancing Our Country & Industry Forecasting Capability for the Chemical & Petrochemical Industry

Country & Industry Forecasting

Our Country & Industry Forecasting capability provides consistently accurate forecasts and analysis of the economic, business and investment climates in over 200 countries and over 170 industries to support strategic planning and decision making.

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CMAI: Enhancing Our Consulting Capability for the Chemical & Petrochemical Industry

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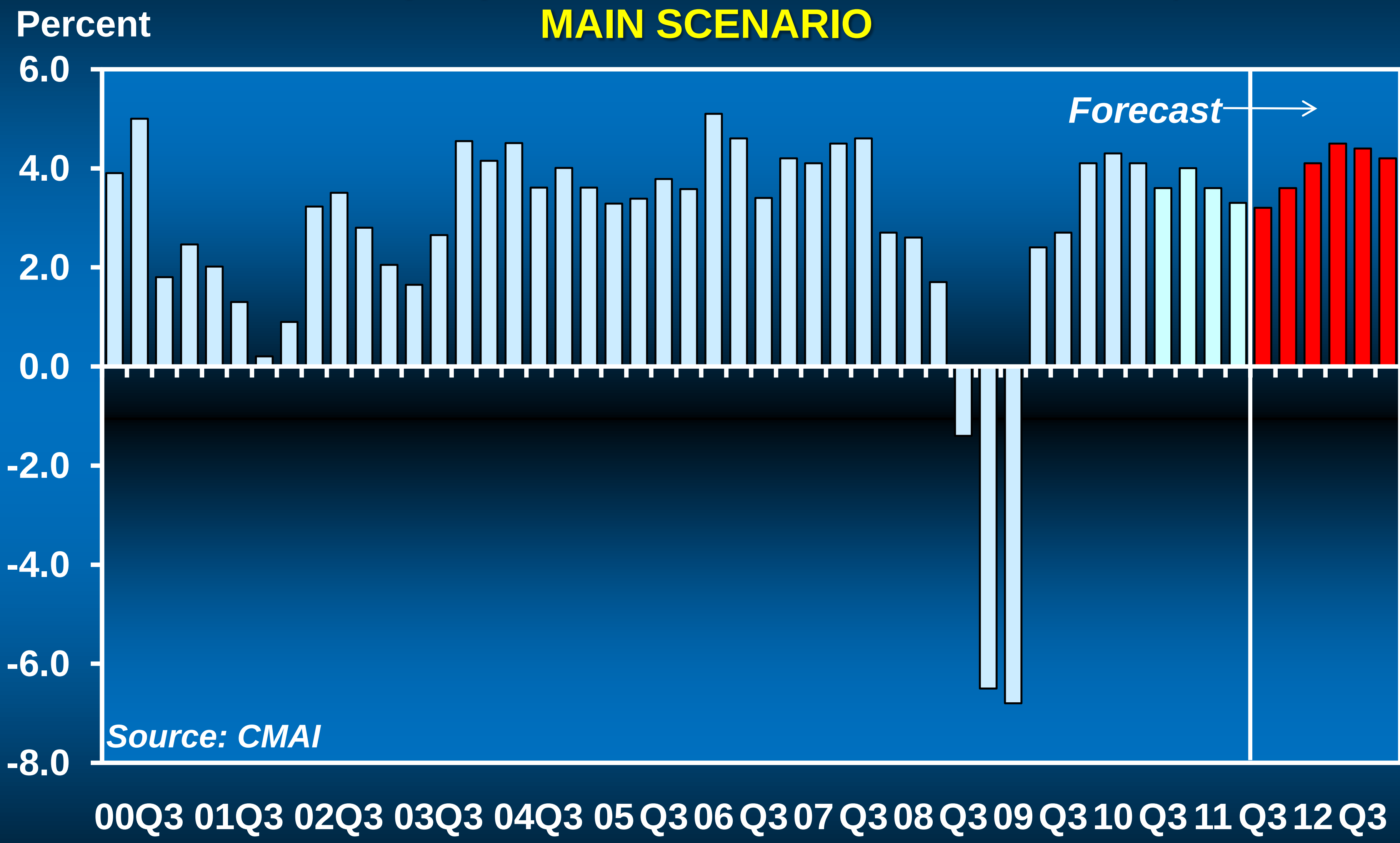
At IHS, we leverage an unmatched combination of information, insight, and expertise to effect the powerful transformation of data into knowledge and value. Our combined capabilities empower you to solve your greatest strategic and operational challenges. It's what distinguishes IHS Consulting in the global marketplace and provides a greater, lasting value to your organization.

The combined products and services of the successful acquisitions of Cambridge Energy Research Associates, Global Insight, SRI Consulting, Jane's, Lloyd's Register Fairplay and now, CMAI, enhance this capability – giving customers access to solutions to navigate the complex business challenges they face every day, all from a single source: IHS.

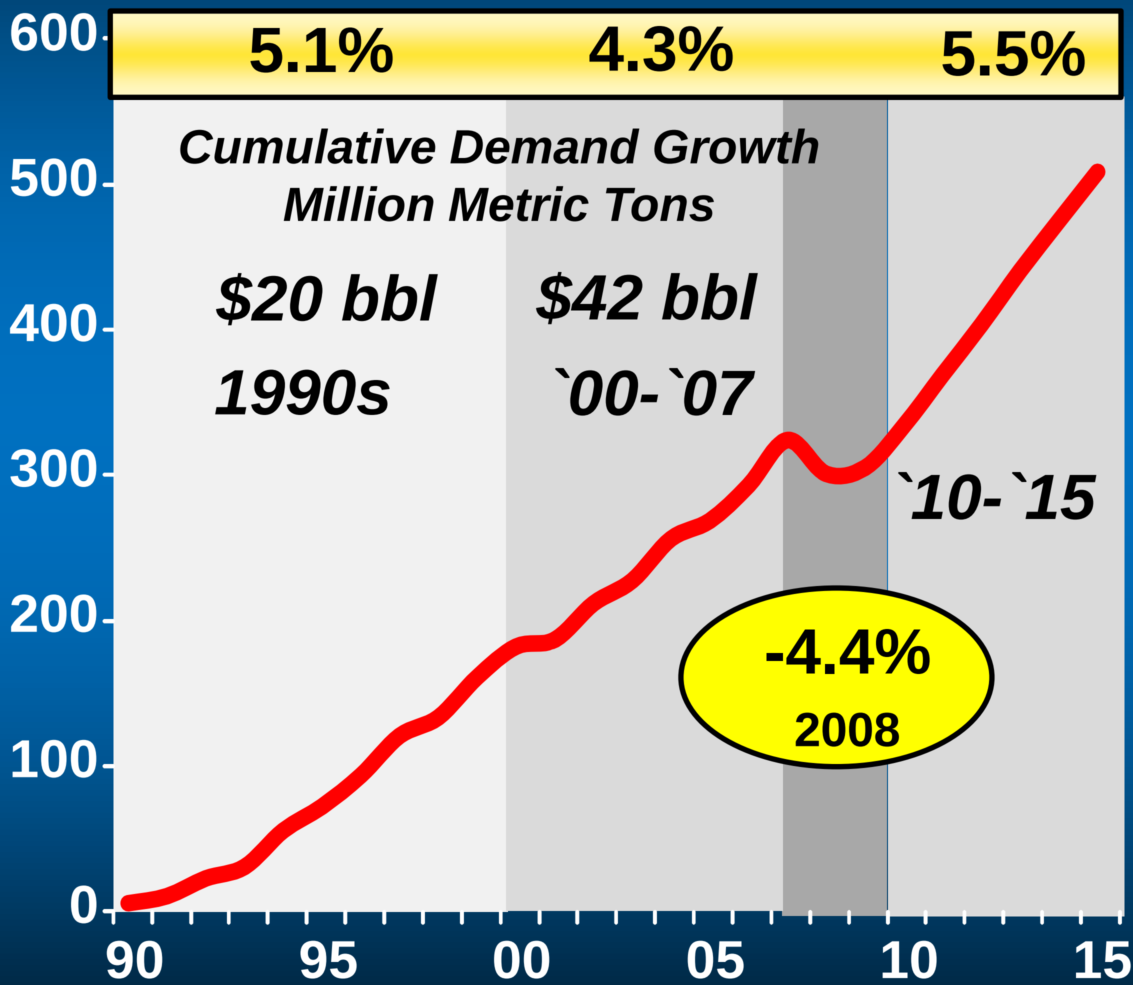
World Economic Growth

(World Gross Domestic Product Quarter to Quarter Growth Seasonally Adjusted Annual Rates in Constant Terms)

MAIN SCENARIO



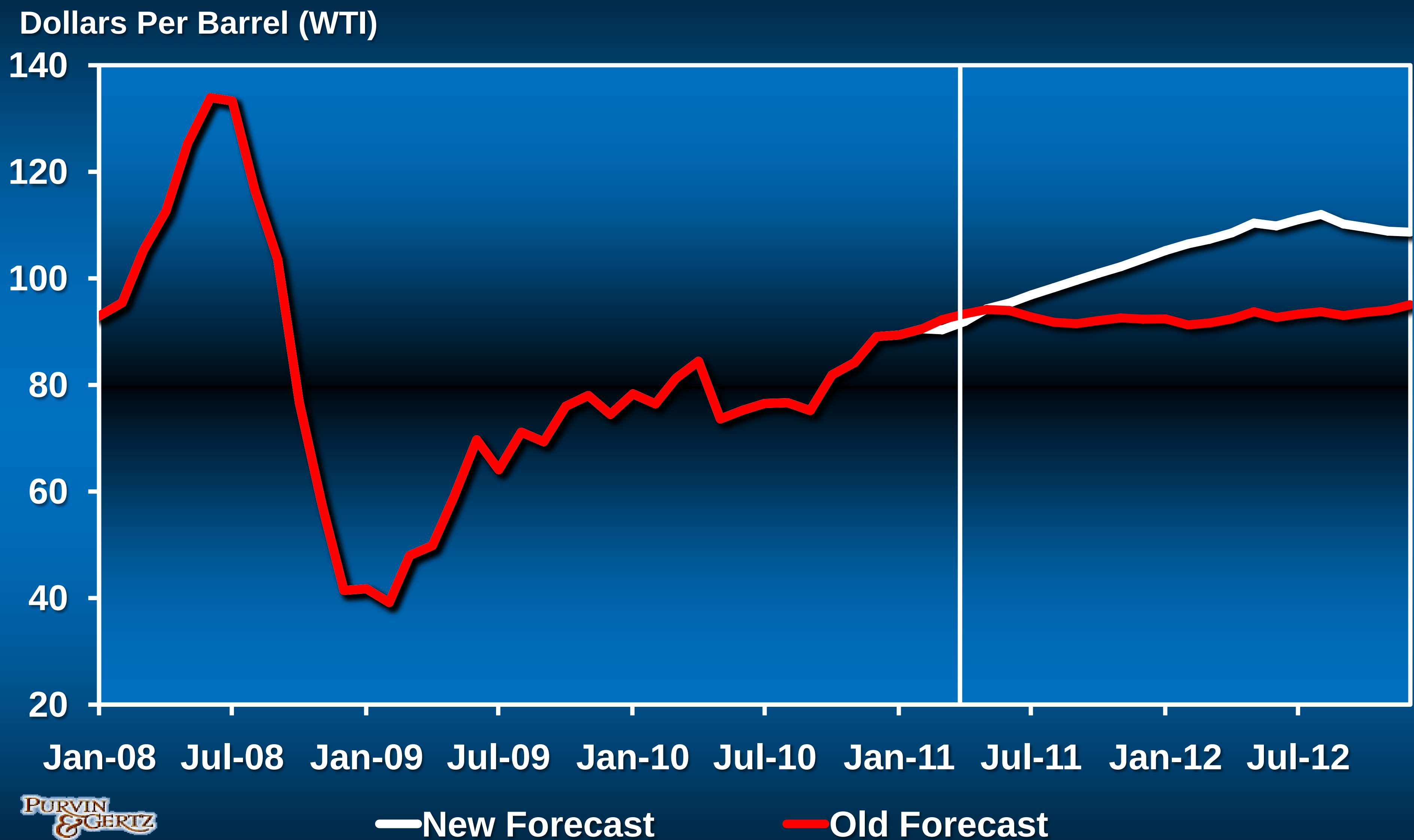
Global Demand for Basic Chemicals & Plastics is Back on Historical Growth Path…



- Global rebound being led by the developing world *(BRIC's)*
- Local consumption supports renewed growth

Industrial Production

Rising Crude Oil Forecast



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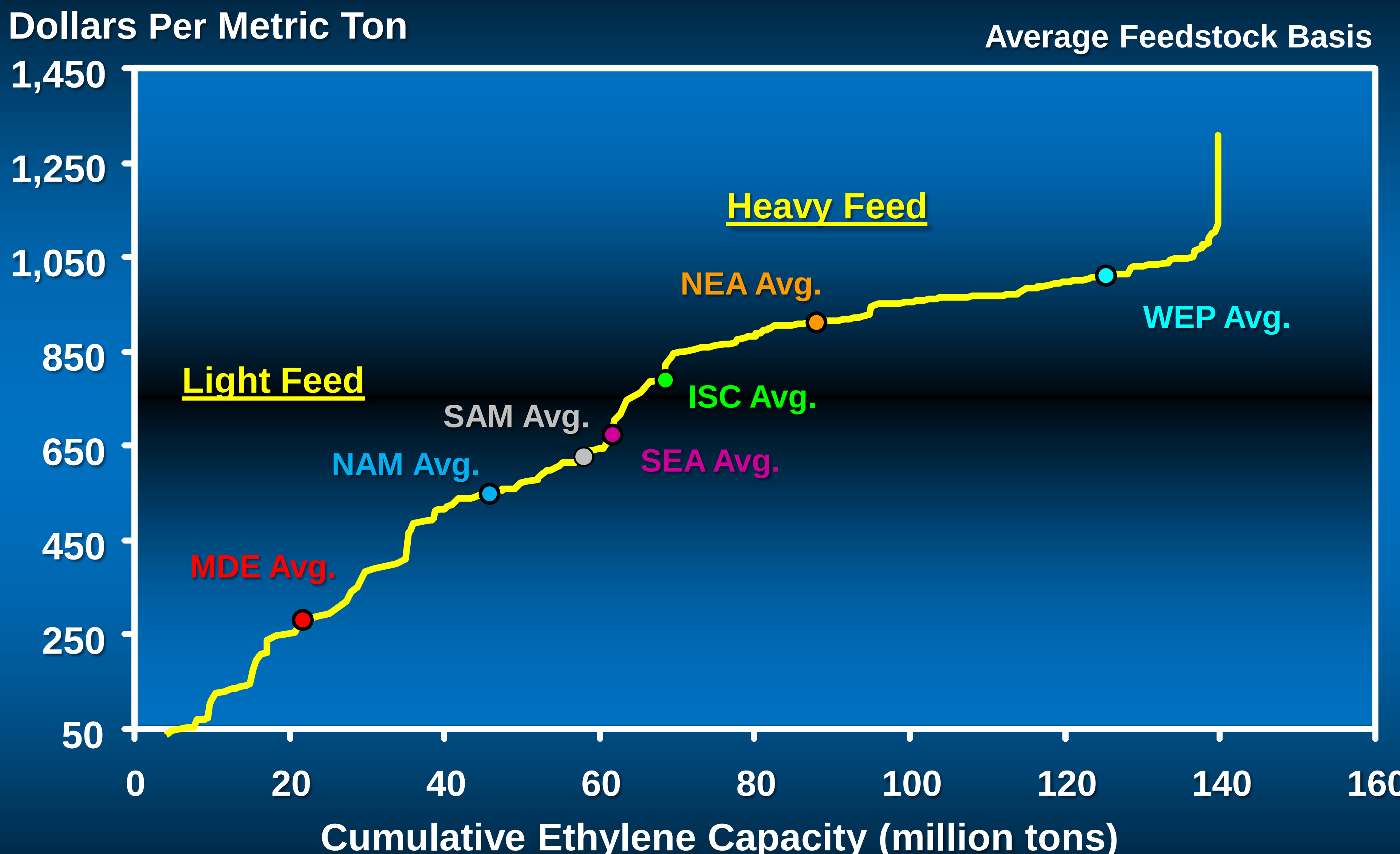
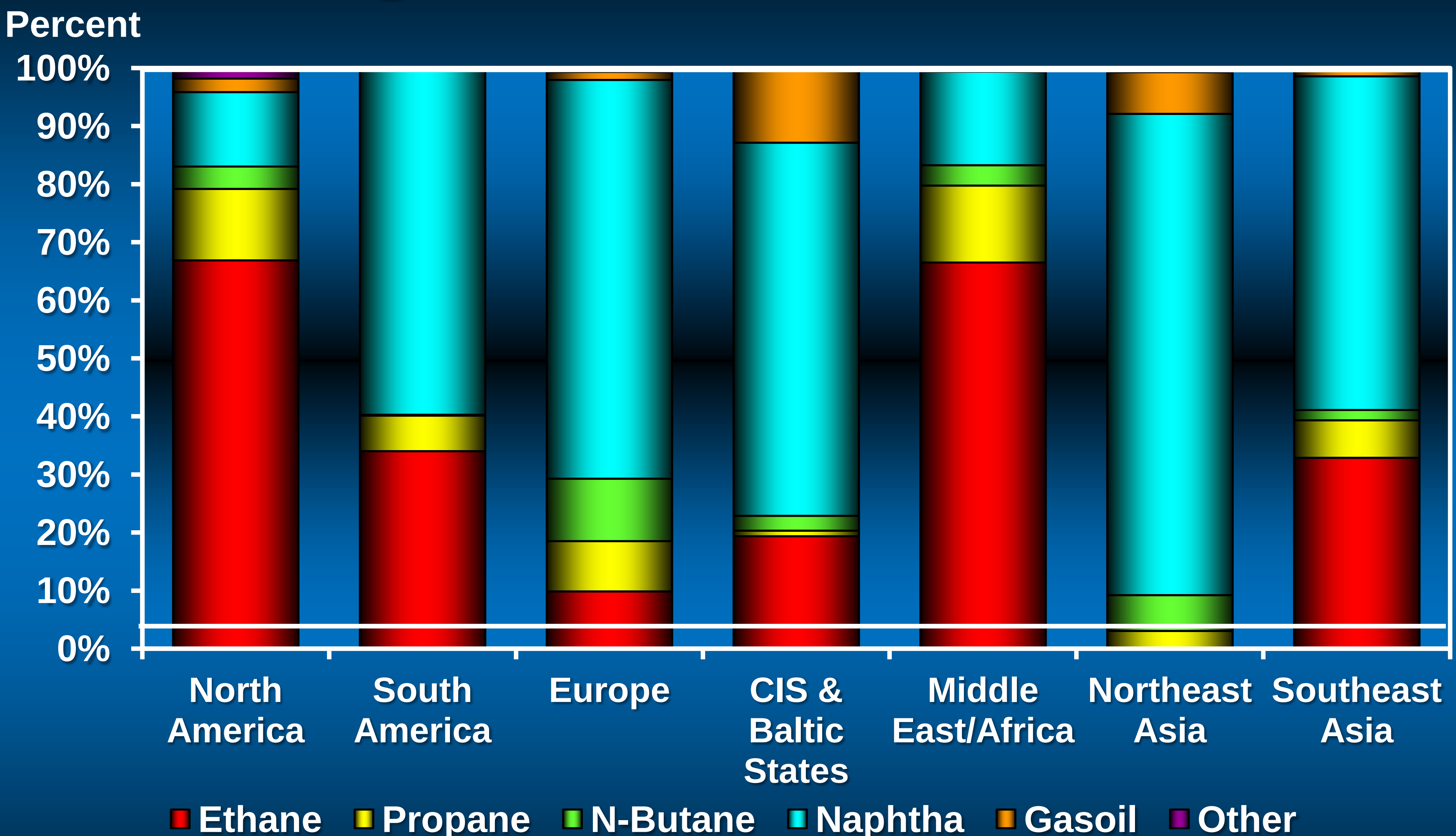
2011 Global Ethylene Cash Costs



Average 2010 Feedstock Slates



Source: CMAI 2011 World Ethylene Cost Study

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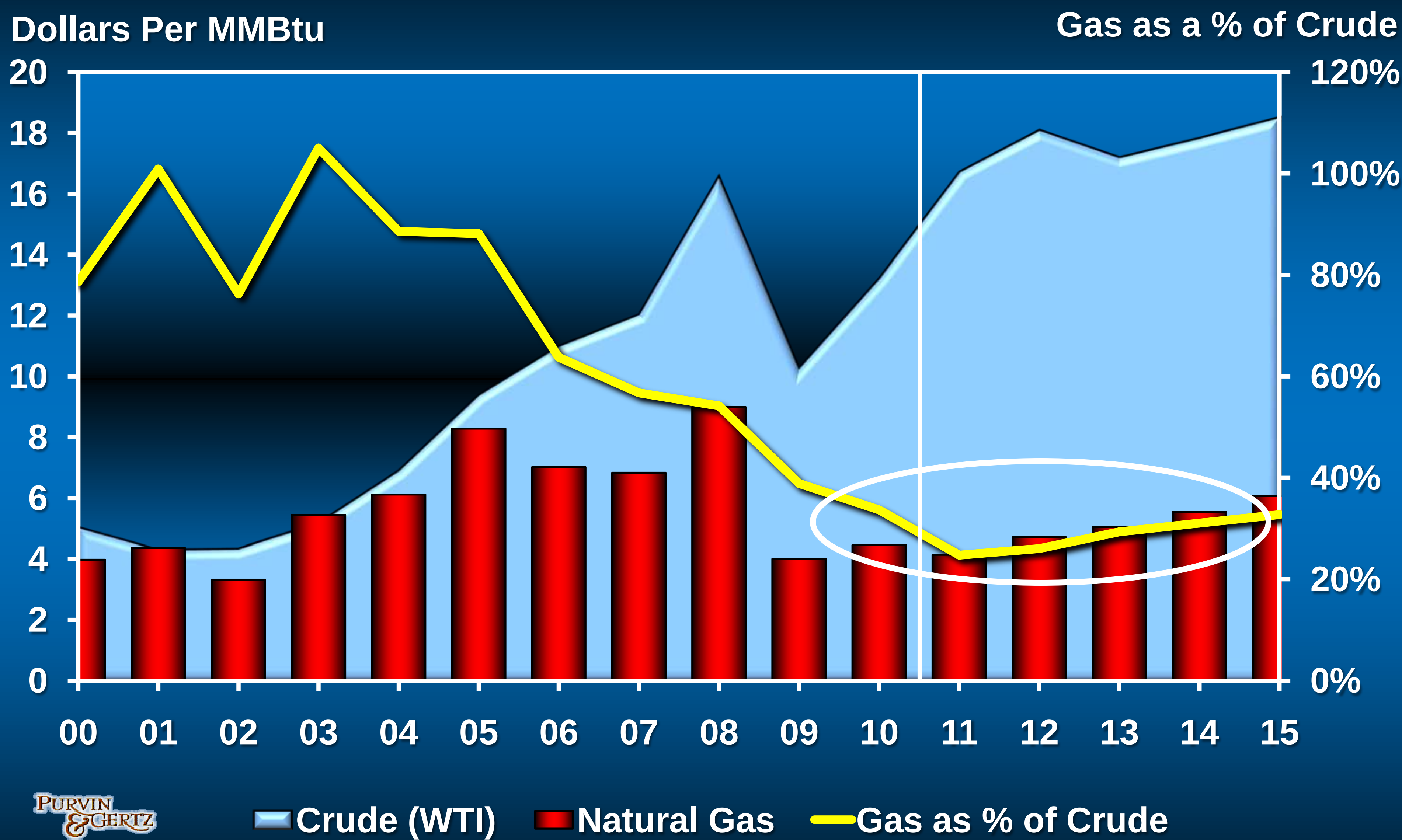
North America Energy Trend Prices



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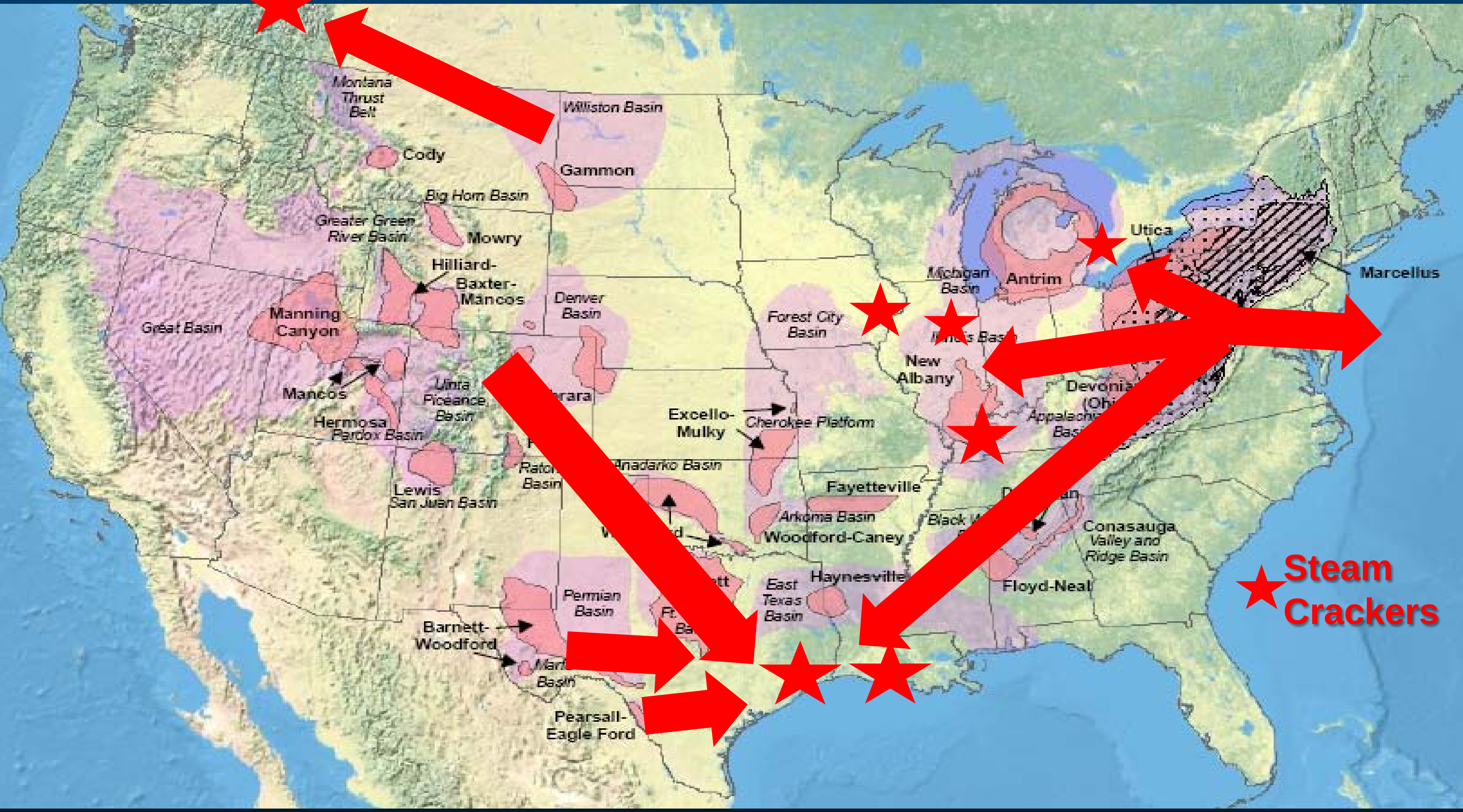
The "Shale Gas" Story

- "Shale gas" is a rapidly increasing source of natural gas
- Development of shale resources have led to major increases in US natural gas reserves
- Led by improved applications of "hydraulic fracturing" technology and increased use of horizontal drilling.
- Some environmental concerns associated with chemicals that are added to water to facilitate the underground "fracing" process

The Shale Gas Revolution Changes Underlying Relative Energy Values

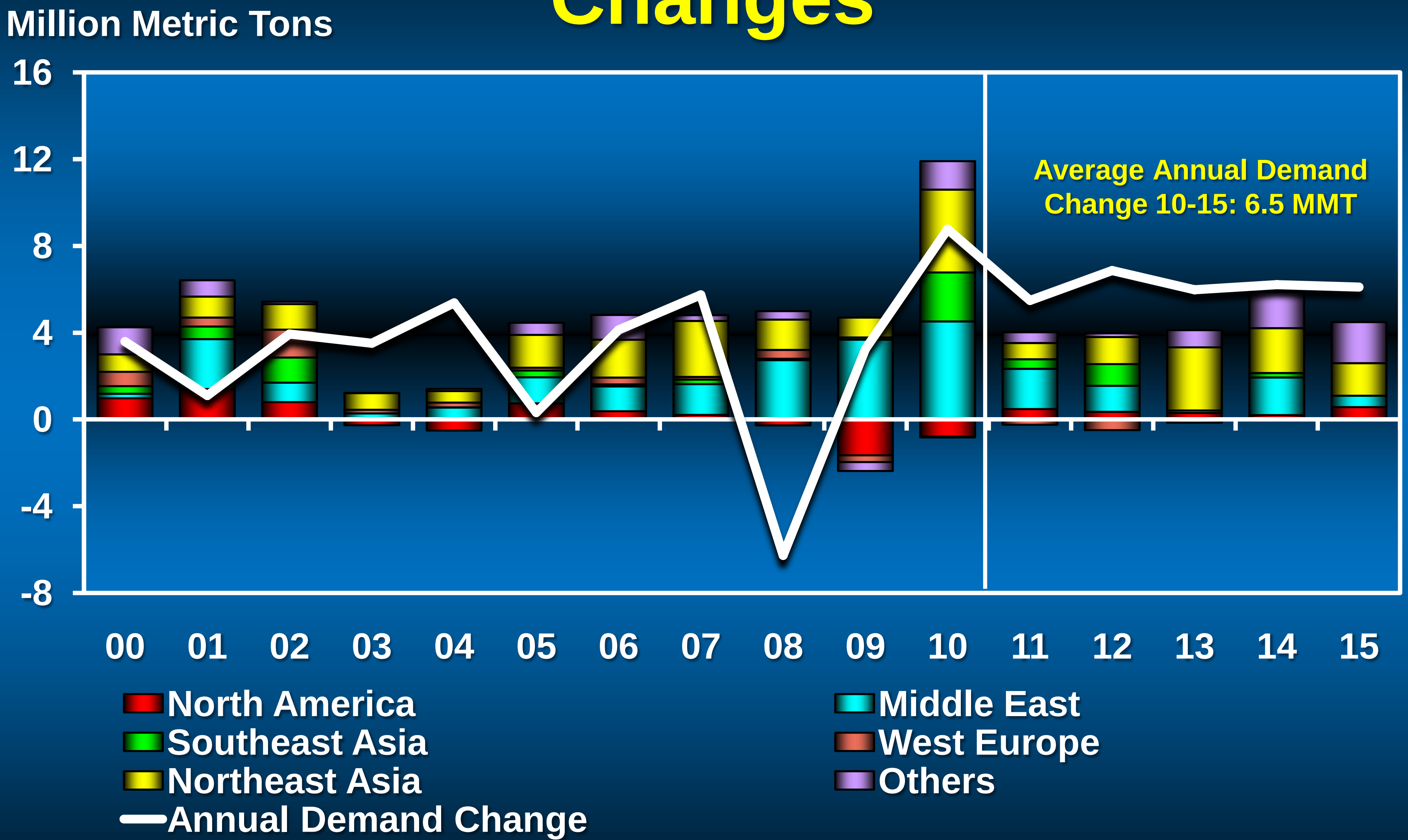


Shale Gas Advantage does not benefit all…

Relative Petrochemical Cost Advantage that may be gained from Shale Gas developments vs. Crude Oil based production routes.

Highly Advantaged	Moderate Advantage	No Advantage	Potential Disaster
Ethylene	Chlorine & Caustic Soda	Refinery Products	Butadiene
Polyethylene	Vinyls EDC /VCM	BTX	Butylenes
Ethylene Oxide Derivatives	Styrenics	Propylene	Rubber
Alpha Olefins		(Methanol)	Latex
Amines			

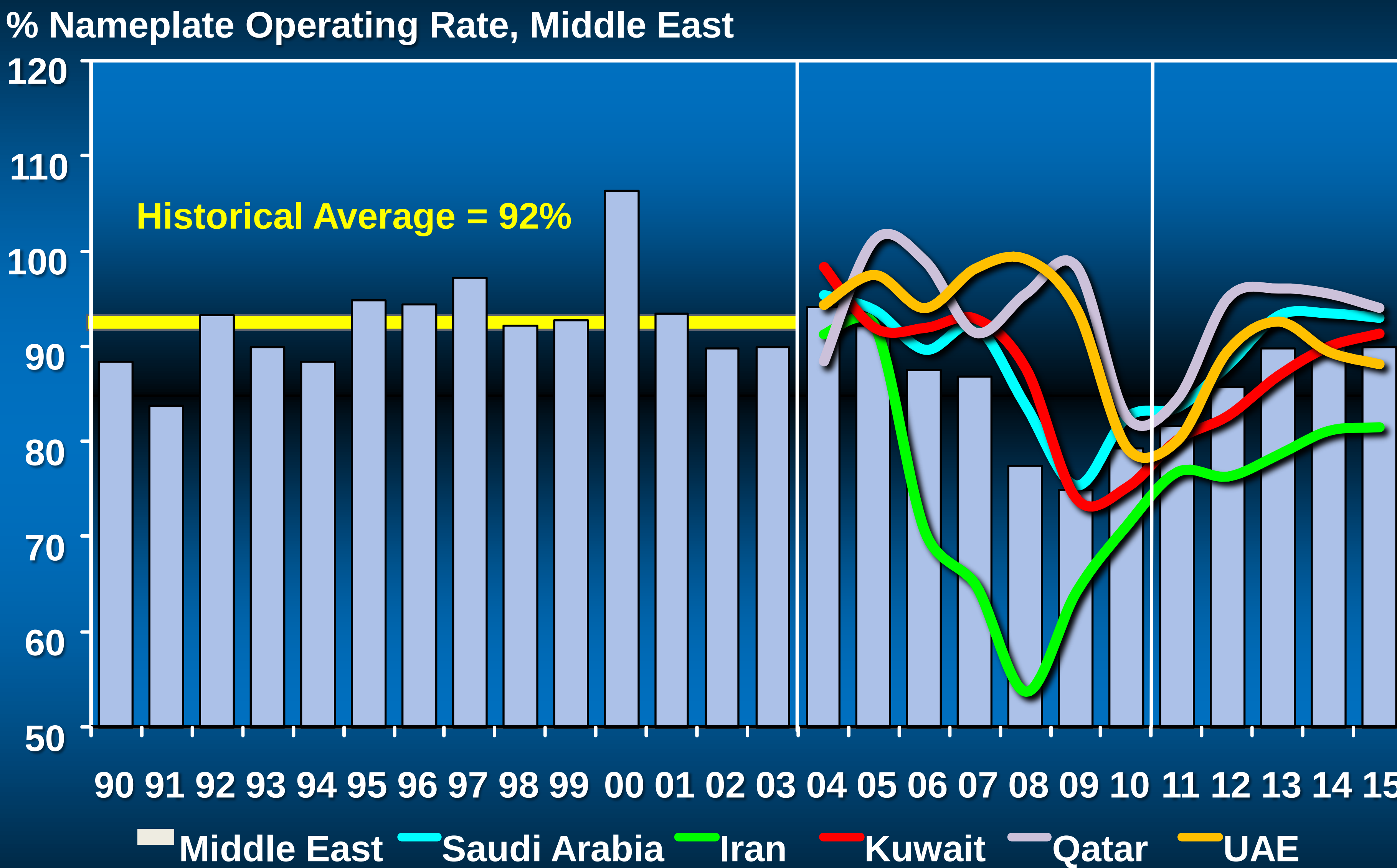
Ethylene Capacity and Demand Changes



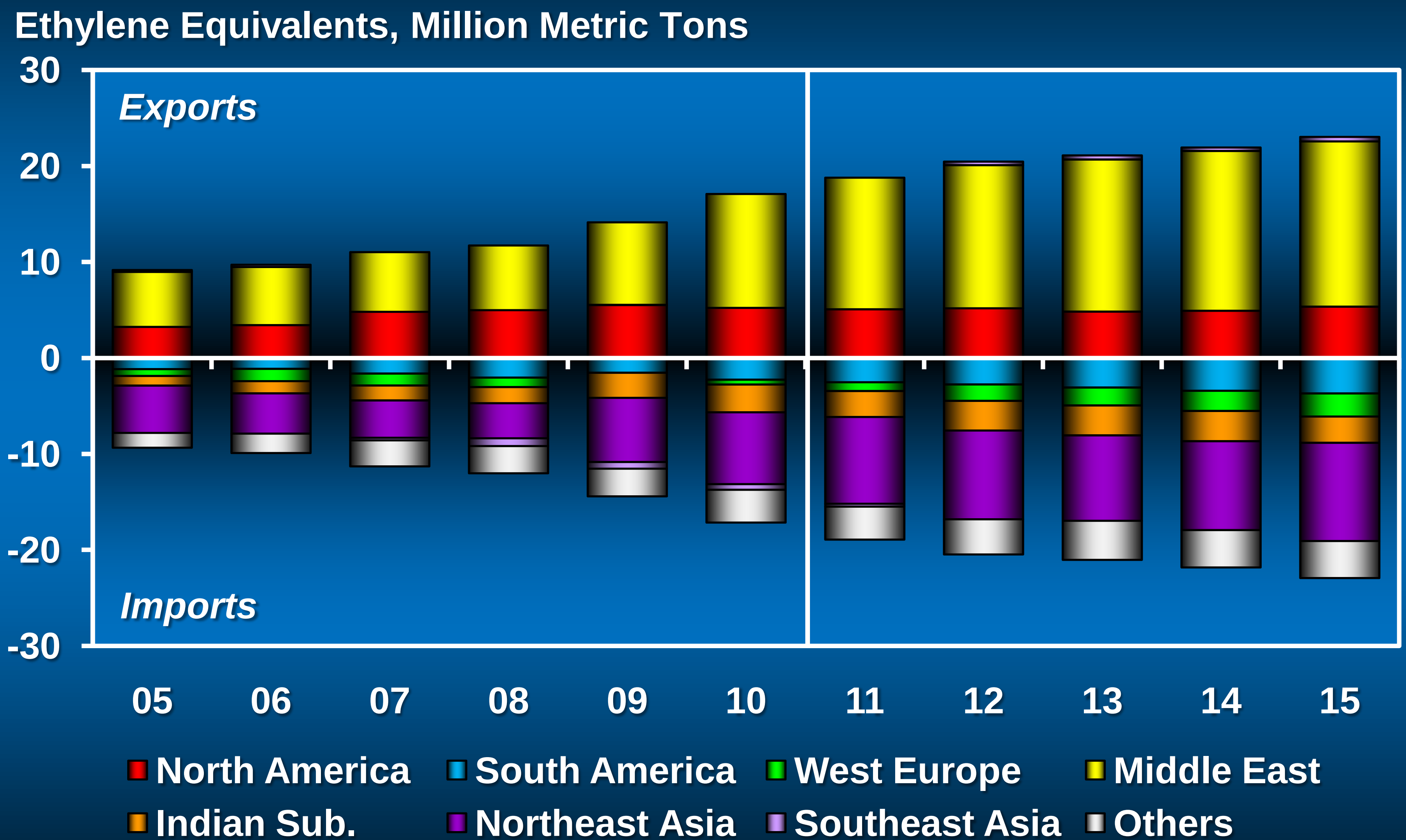
...So Why Aren't We Swimming In Middle East Olefin Derivatives?

- Project delays, especially derivative capacity
- Strong demand, led by China
- Capacity closures in North America and West Europe reduce supply-demand imbalance

Poor Middle East Operating Rates

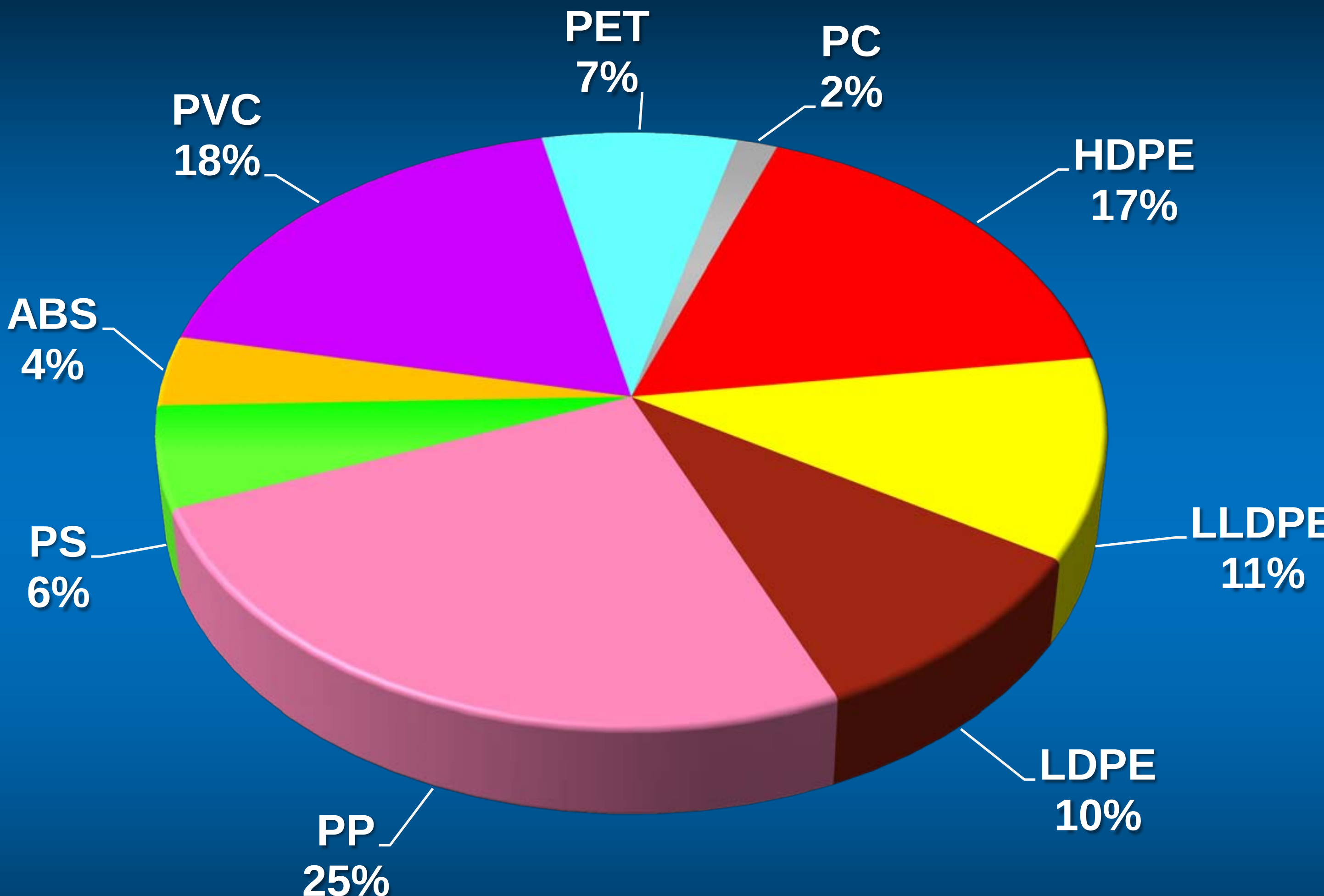


World Ethylene Net Equivalent Trade



Polyethylene

Global Plastics Consumption 2010



2010 World Polymer Demand = 190 Million Metric Tons

PE Industry "Game Changers"

* Energy costs shift (natural gas / crude): now greatly favoring light feedstocks (ethane) in the US

* US producers announcing intent to invest

* New MDE capacity: plagued by start-up problems

* China: Economic stimulus, strong imports

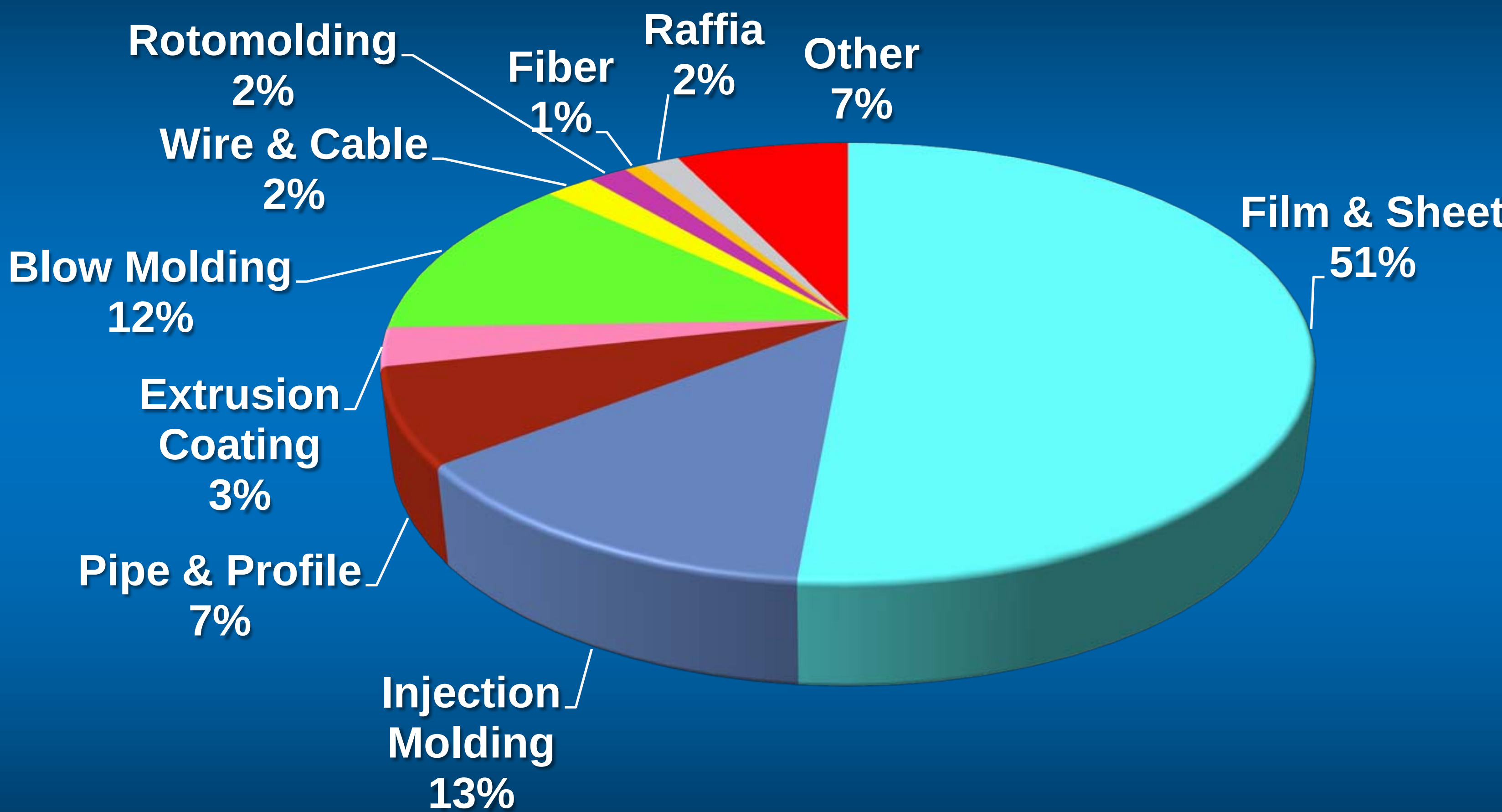
* Export market became attractive and viable

* Unplanned outages for monomer and polymer producers

* Producer discipline continues

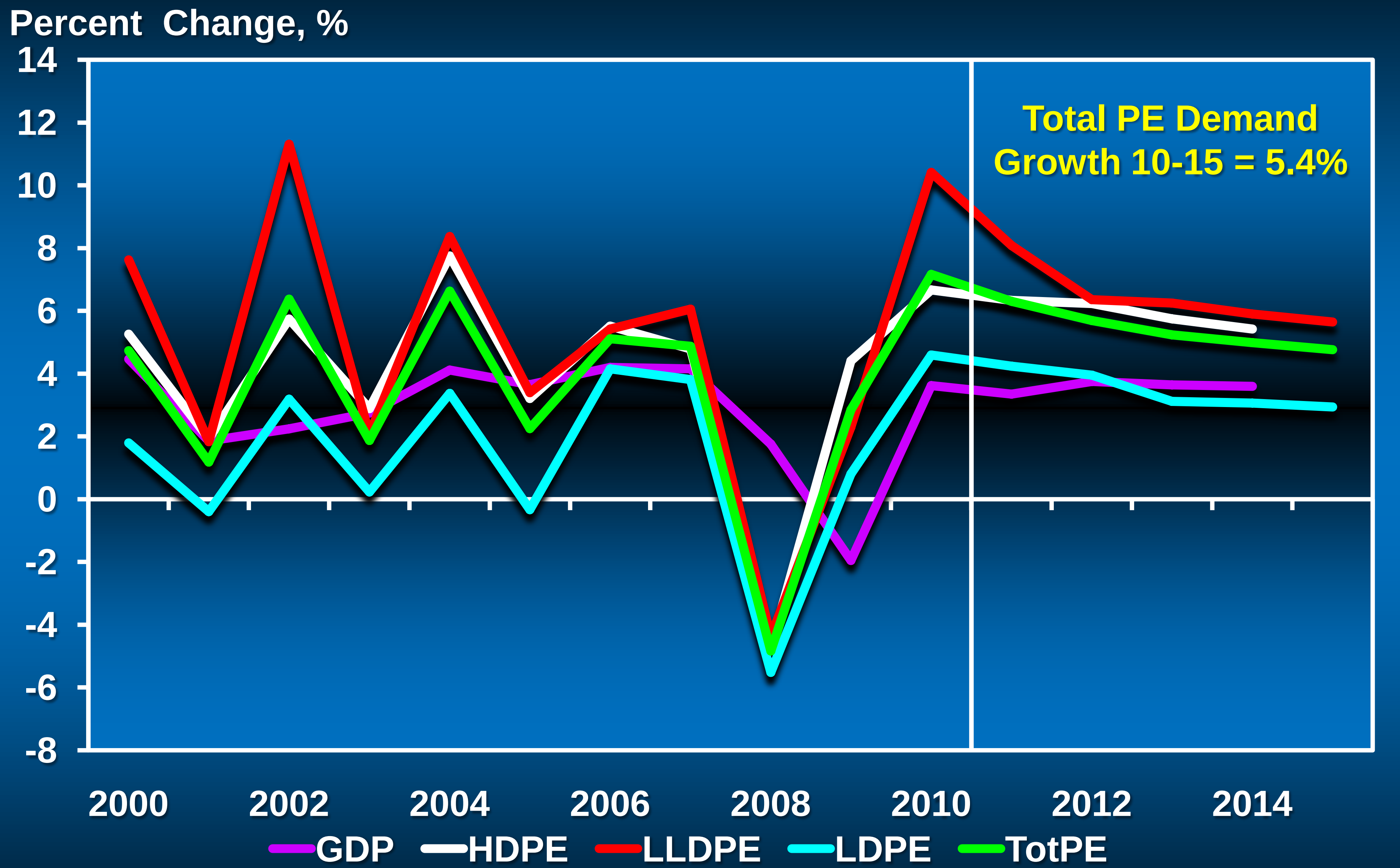
World

2010 Total PE Demand by End Use



Domestic Demand = 70.9 Million MT

Global Total PE Growth vs. GDP



World PE Demand Year Over Year

World Polyethylene Demand							
	Percent Change, Year over Year					%AAGR	%AAGR
End Use	06	07	08	09	10	'05-'10	'10-'15
Film & Sheet	5.1	6.0	-3.9	2.8	5.8	3.1	5.3
Injection Molding	4.2	6.0	-4.8	5.0	5.6	3.2	5.6
Pipe & Profile	8.8	4.6	-2.7	0.8	6.1	3.5	5.8
Extrusion Coating	1.3	0.9	-2.0	-3.7	7.1	0.8	3.8
Blow Molding	3.5	3.4	-5.4	4.0	6.0	2.2	5.4
Wire & Cable	4.5	2.2	-0.6	0.5	5.6	2.5	3.5
Rotomolding	5.7	1.7	0.8	-0.9	6.4	2.9	5.8
Demand	5.1	4.9	- 4.8	2.3	5.6	2.5	5.4

Top Global Polyethylene Producers/Marketers

(Based on Estimate of Marketed Capacity)

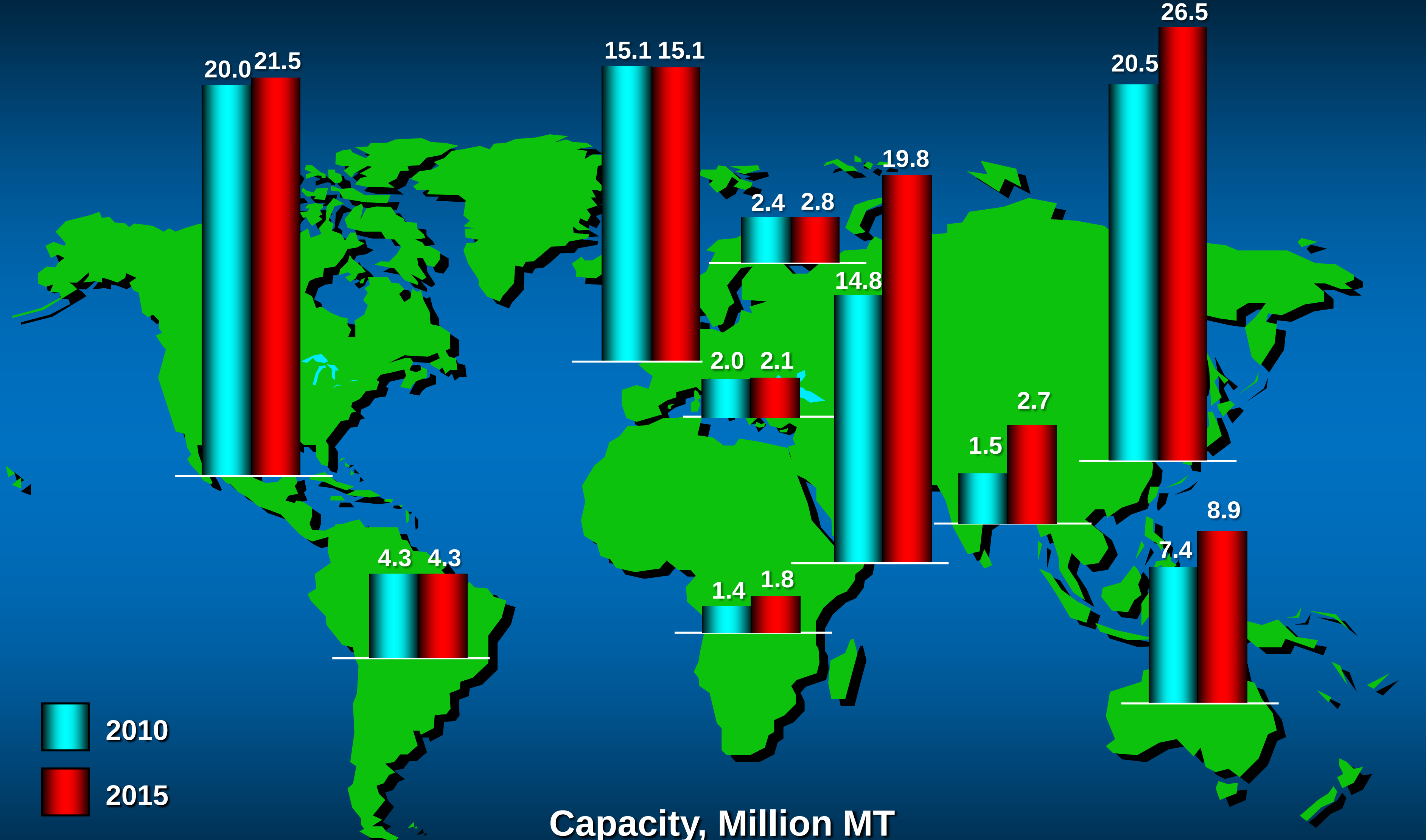
2002

	Capacity -000- MT	% Capacity Share
ExxonMobil	7025	11.33
Dow Chemical	6958	11.22
Chevron Phillips	2760	4.45
Equistar	2608	4.21
Basell	2330	3.76
Borealis	2316	3.73
BP Chemical	1883	3.04
Sinopec	1853	2.99
ATOFINA	1745	2.81
SABIC	1708	2.75
Total	31,186	50.29
Total Capacity		65,674

2015

	Capacity -000- MT	% Capacity Share
ExxonMobil	9112	8.65
Dow Chemical	8126	7.72
SABIC	6628	6.30
Sinopec	5644	5.36
LyondellBasell	5520	5.24
PetroChina	5160	4.90
Chevron Phillips	4630	4.40
Borealis/Borouge	4420	4.20
Ineos	3066	2.91
Braskem	3055	2.90
Total	55,361	52.58
Total Capacity		105,286

Global PE Capacity Growth



*including hypothetical capacities +18 Million Metric Tons

Polyethylene Capacity Changes

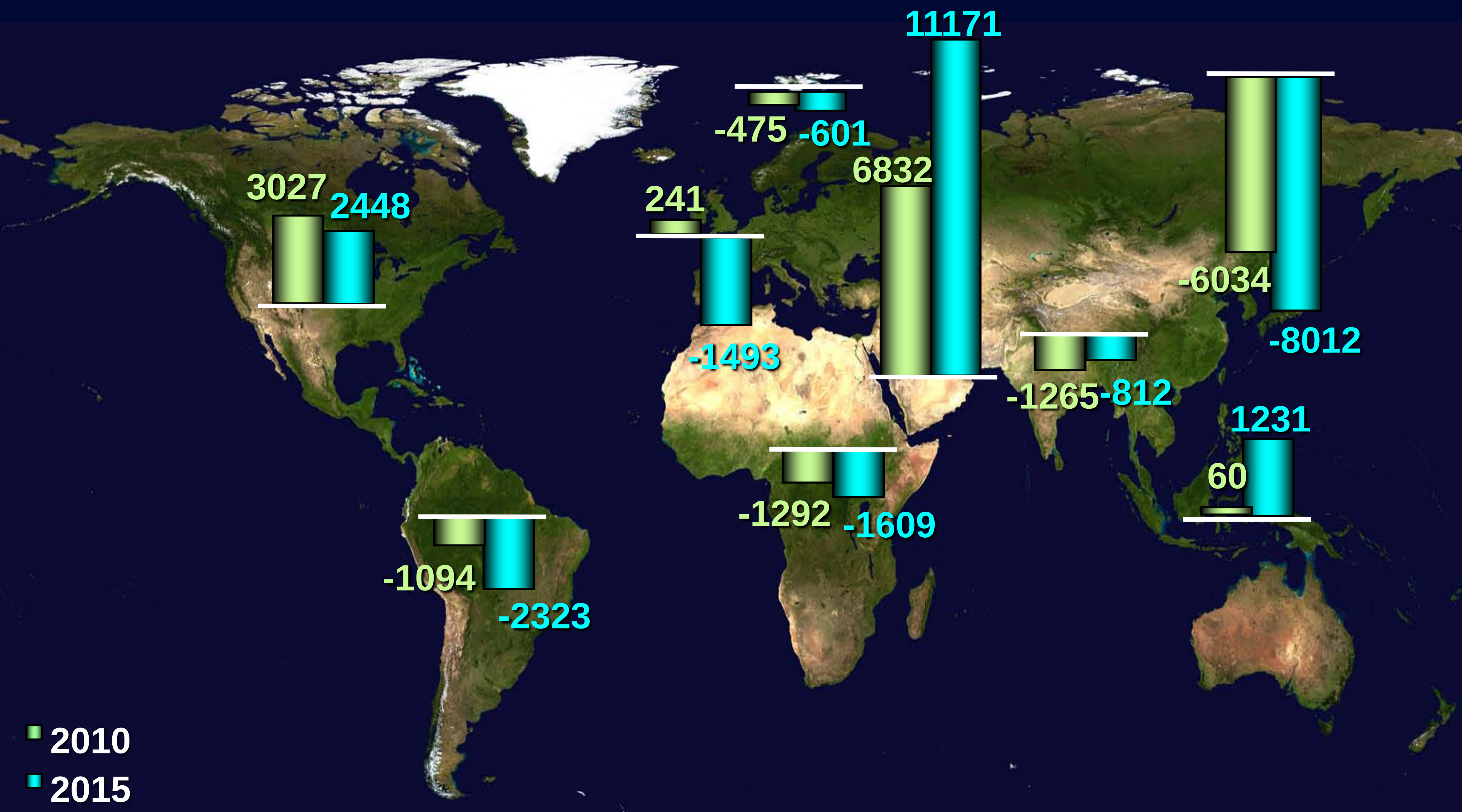
	NAM		WEP		MDE		NEA / SEA / ISC		Net Increase
	Company	kta	Company	kta	Company	kta	Company	kta	
1Q-10			Borealis BEL HD	(200)	Yansab KSA HD	400	Sinopec/SABIC JV CHI HD/LL	600	
			Borealis SWE HD/LL	(90)	Sharq KSA HD	400	PTT Chem THA LD	300	
			SABIC UK LD	400	Qatofin QAT LL	450	Bangkok PE THA HD	250	
							Panjin Eth. CHI HD	300	
							Haldia IND HD/LL x	125	2,935
2Q-10			LBI GFR HD	250			Zhenghai Ref. CC CHI LL	450	
			Borealis SWE LD	350			MOC THA LL	300	
			SABIC NET LD	(120)			TPE THA HD	400	
							CNOOC & Shell CHI LD	75	
							Indian Oil IND HD	300	
							Indian Oil IND HD/LL	350	2,355
3Q-10					Borouge UAE HD/LL	600	Baotou Shenhua CHI HD/LL	300	
							CNOOC & Shell CHI HD	75	
							Gail IND LL	50	
							LG Chem KOS HD	40	1,065
4Q-10	Nova CAN LD x	60	Polimeri Eur. FRA LD	260	Q-Chem II QAT HD	350			
					Amir Kabir IRN LD	300			970

Polyethylene Capacity Changes

	MDE Company			kta	NEA / SEA / ISC Company			kta	Net Increase
1Q-11	Kayan	SAR	HD	400					400
2Q-11									0
3Q-11					ExxonMobil ExxonMobil	SIN SIN	HD/LL LL	650 650	1,300
4Q-11					Zhongyuan Evolue Japan	CHI JAP	LL LL	60 50	110

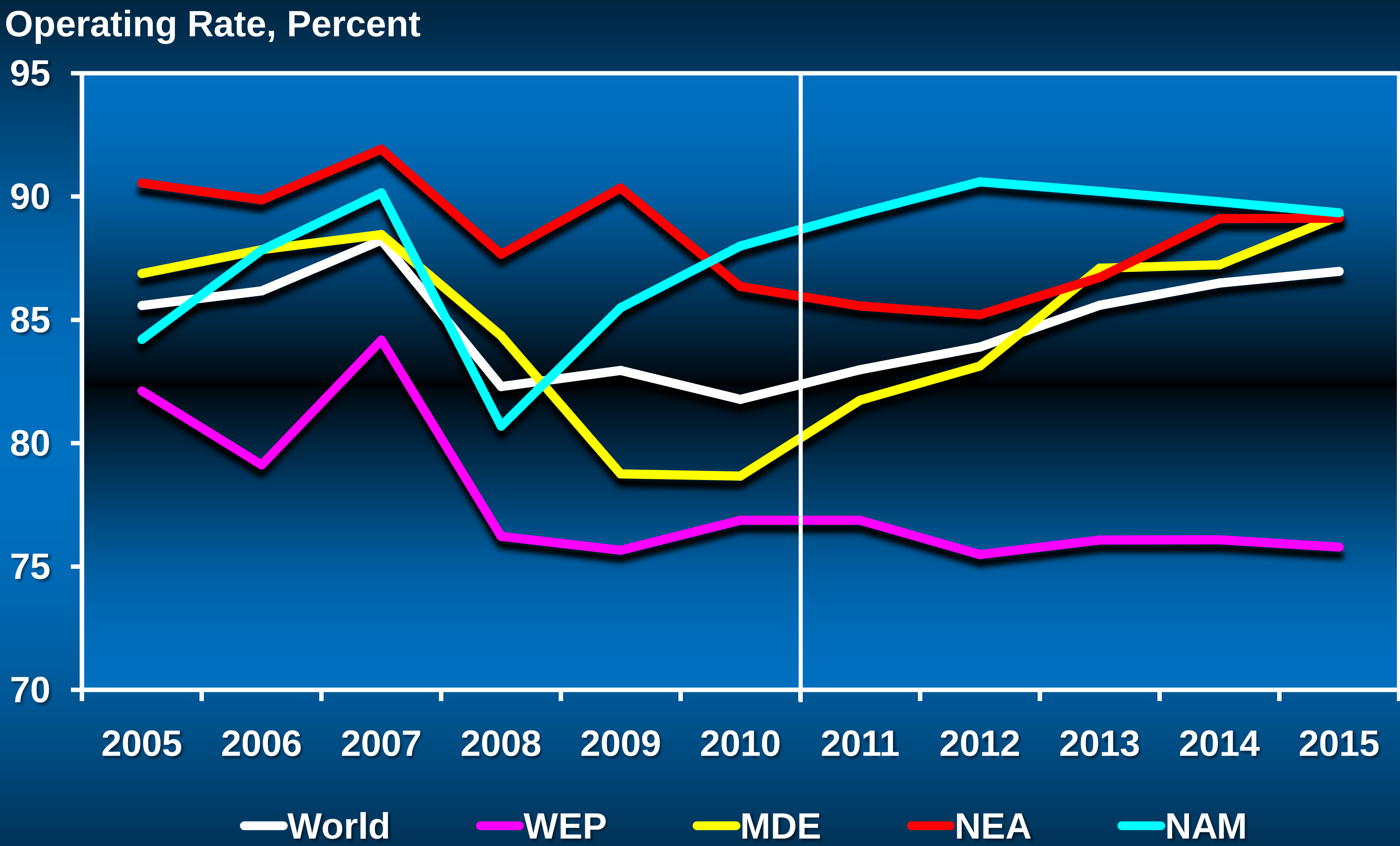
	MDE Company			kta	NEA / SEA / ISC Company			kta	Net Increase
1Q-12	QAPCO Llam PC Saudi Polymers	QAT IRN SAR	LD HD HD	250 300 1100	Hanwa Chem. Sichuan PC Qilu PC	KOS CHI CHI	LD HD/LL HD	30 600 250	2,530
2Q-12					Fushun PC Fushun PC	CHI CHI	HD/LL HD	450 350	800
3Q-12					Honam PC	KOS	HD	210	210
4Q-12									0

Polyethylene Imports & Exports



Thousand Metric Tons

Global Total PE Operating Rates



LDPE = New Life

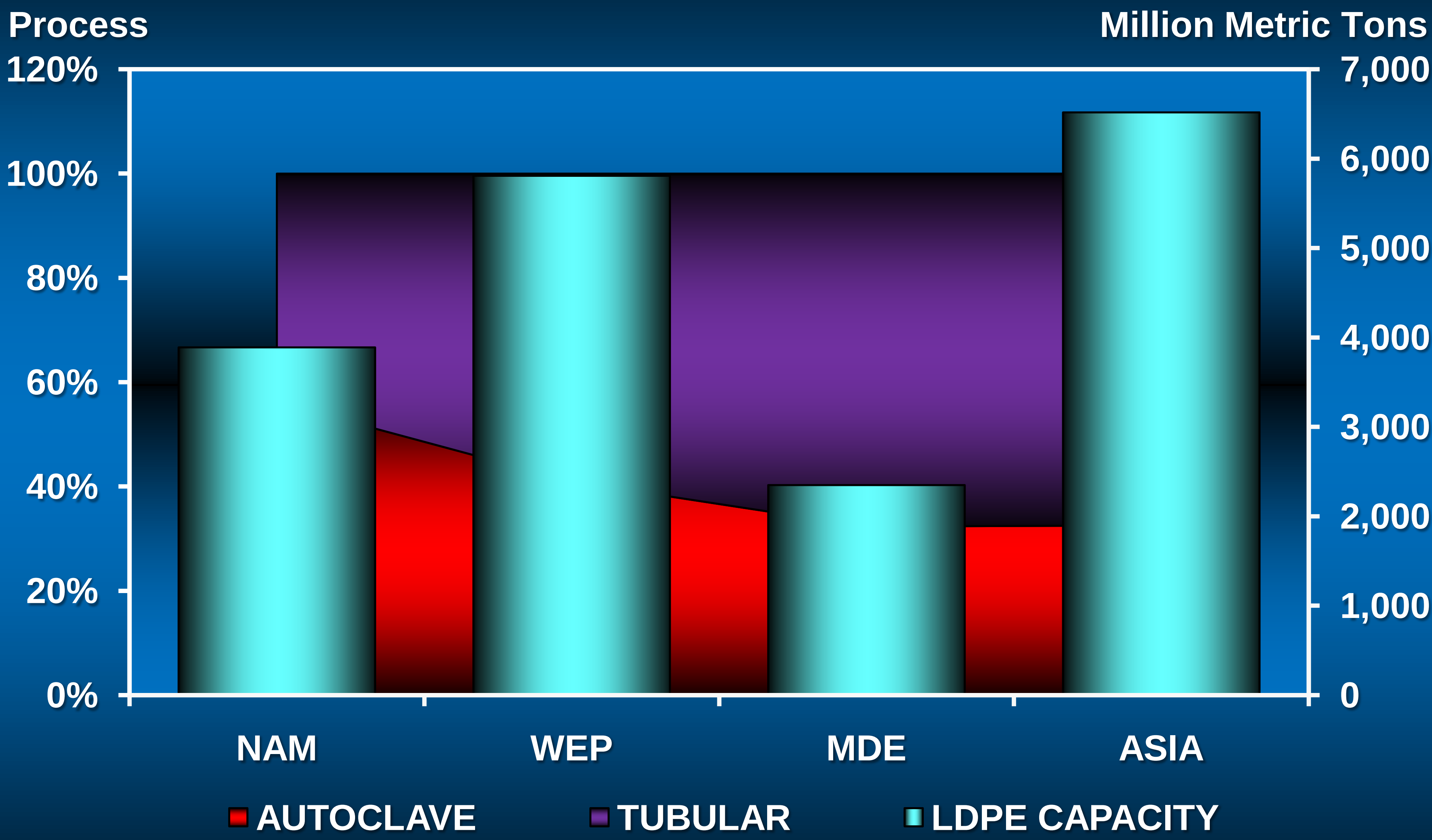
Then

- Obsolete, will be replaced by LLDPE
- High cost, low volume plants
- Minimal investment in new capacity

Now

- "Specialty status"
- Tight Supply globally
- Expanding margins
- EVA driving demand
- Limited capacity build

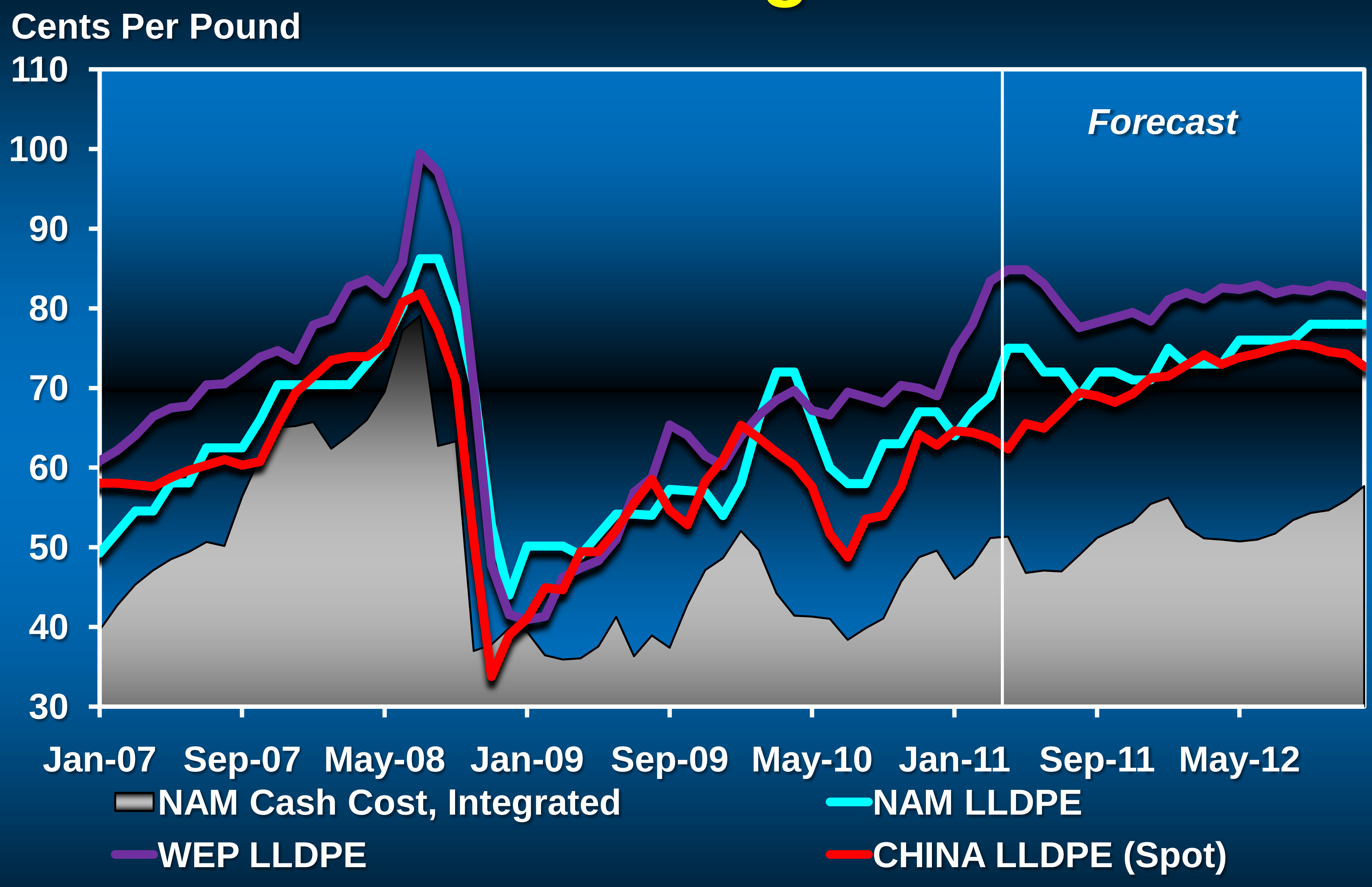
LDPE Capacity: Autoclave vs. Tubular



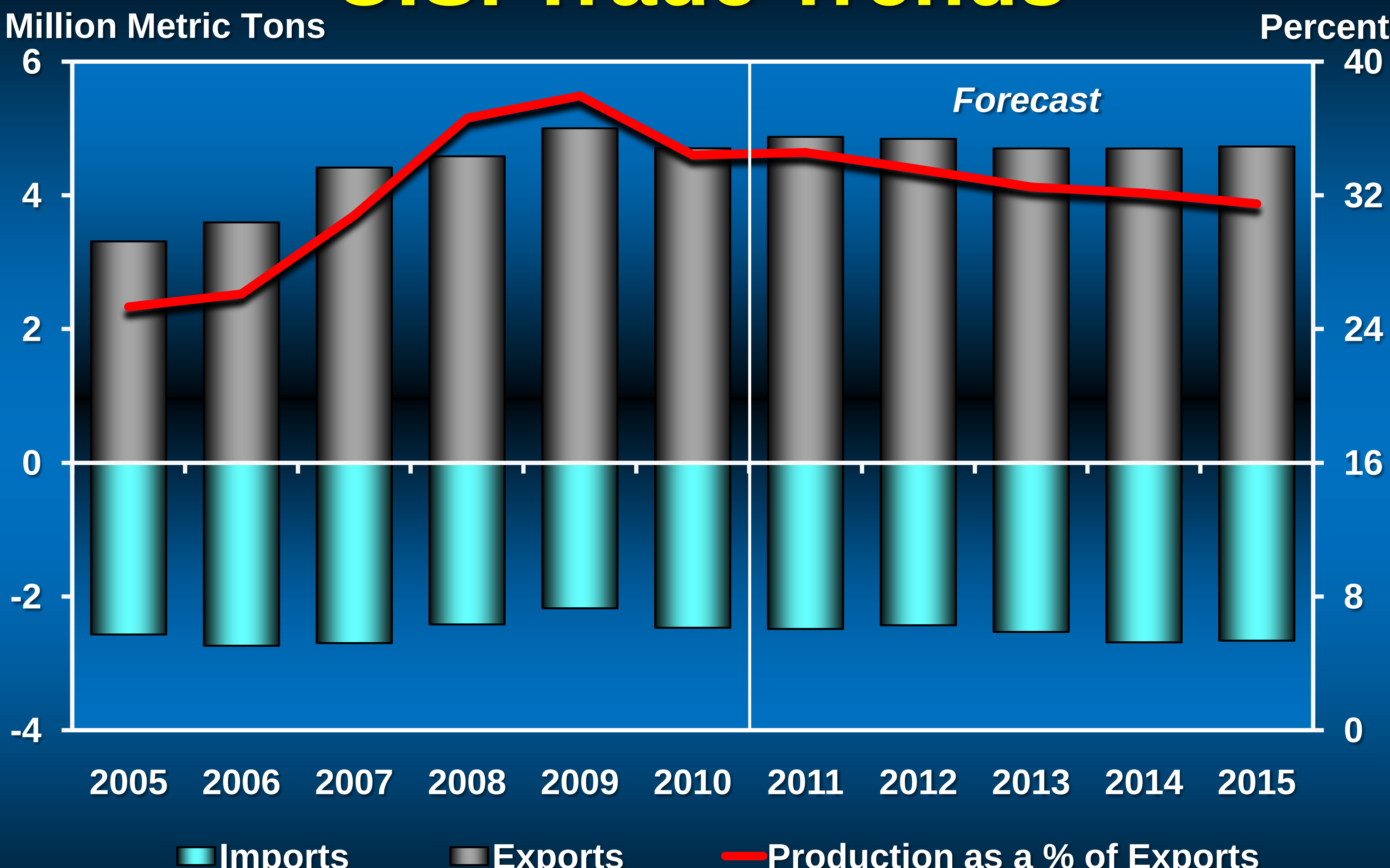
PE Demand Year Over Year

U.S./Canada Polyethylene Demand							
	Percent Change, Year over Year					%AAGR	%AAGR
End Use	06	07	08	09	10	'05-'10	'10-'15
Film & Sheet	-1.0	4.1	-11.4	-0.5	6.2	-1.4	2.7
Injection Molding	-1.4	-4.0	-12.0	-4.4	7.5	-4.0	2.6
Pipe & Profile	15.8	-6.7	-8.6	-17.2	19.1	-3.1	3.7
Extrusion Coating	-6.9	-2.6	-8.3	-11.0	17.5	-4.9	3.1
Blow Molding	0.3	-2.8	-11.5	-0.8	6.9	-2.0	2.9
Wire & Cable	9.1	-0.3	-3.0	-2.3	4.3	1.4	2.1
Rotomolding	4.9	-5.0	-3.8	-6.0	18.0	-1.2	3.9
Domestic Demand	3.8	-1.0	-12.5	-5.0	8.5	-2.7	2.9

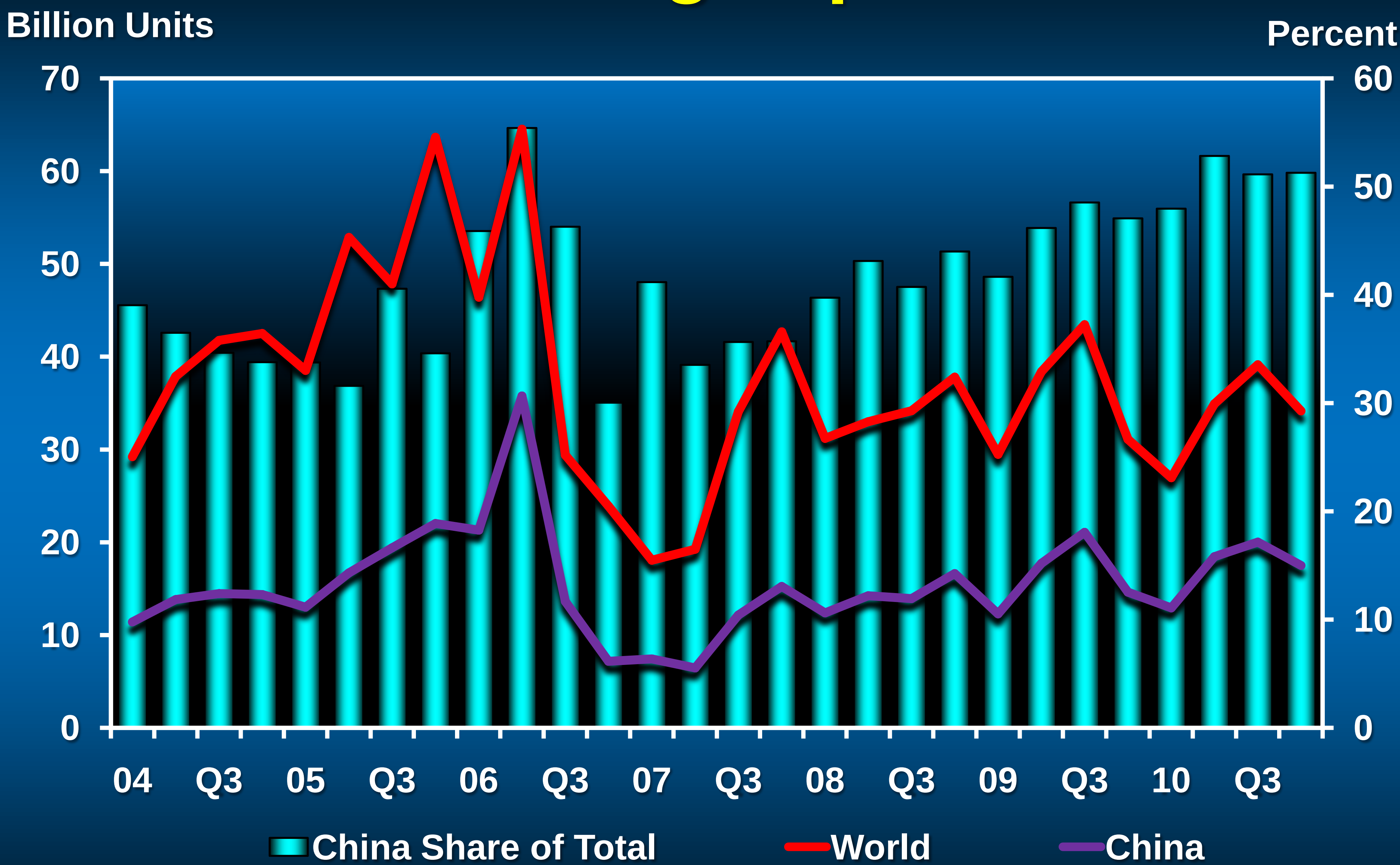
U S Cost vs. Regional Prices



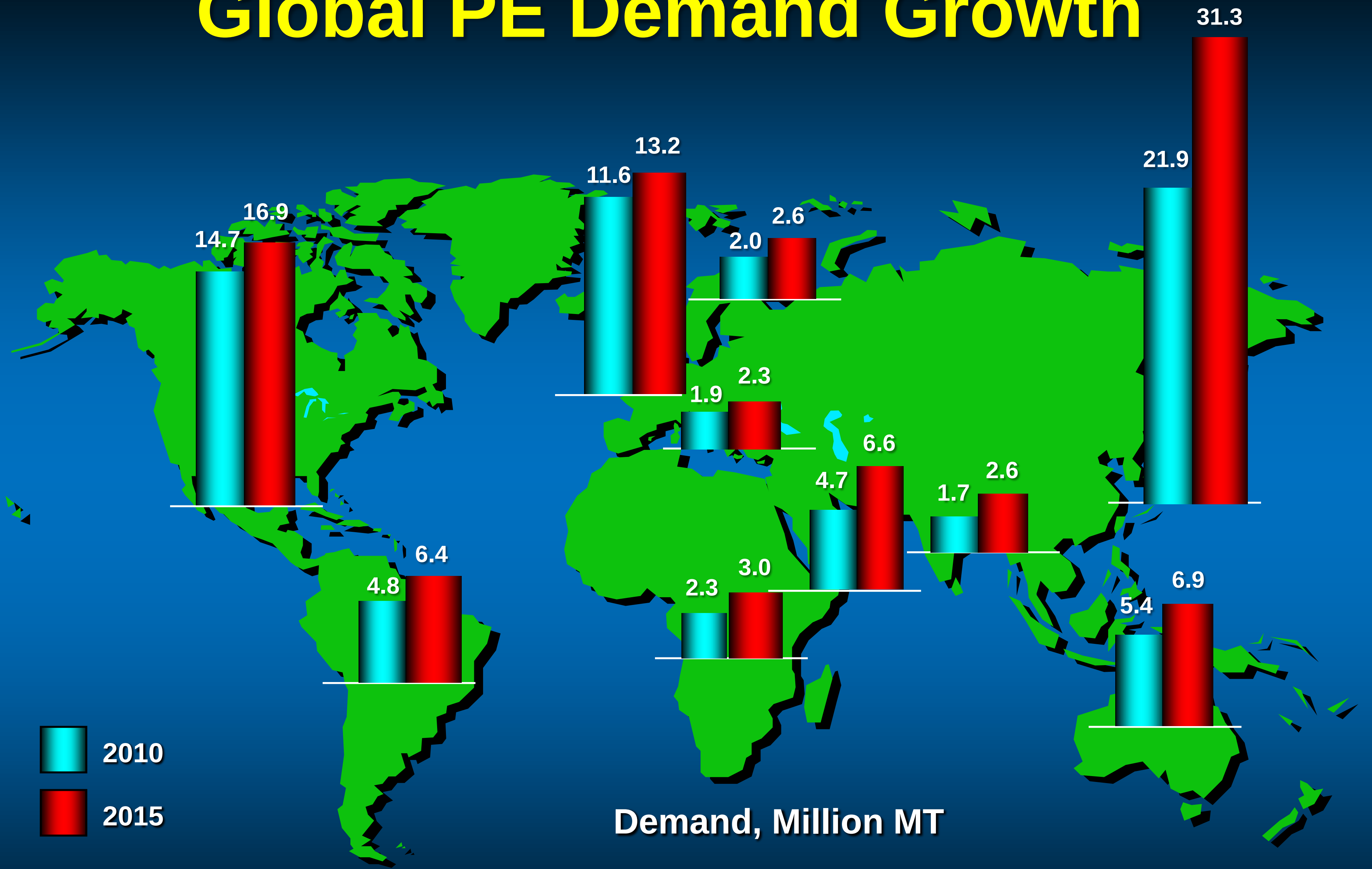
U.S. Trade Trends



U.S. Bag Imports

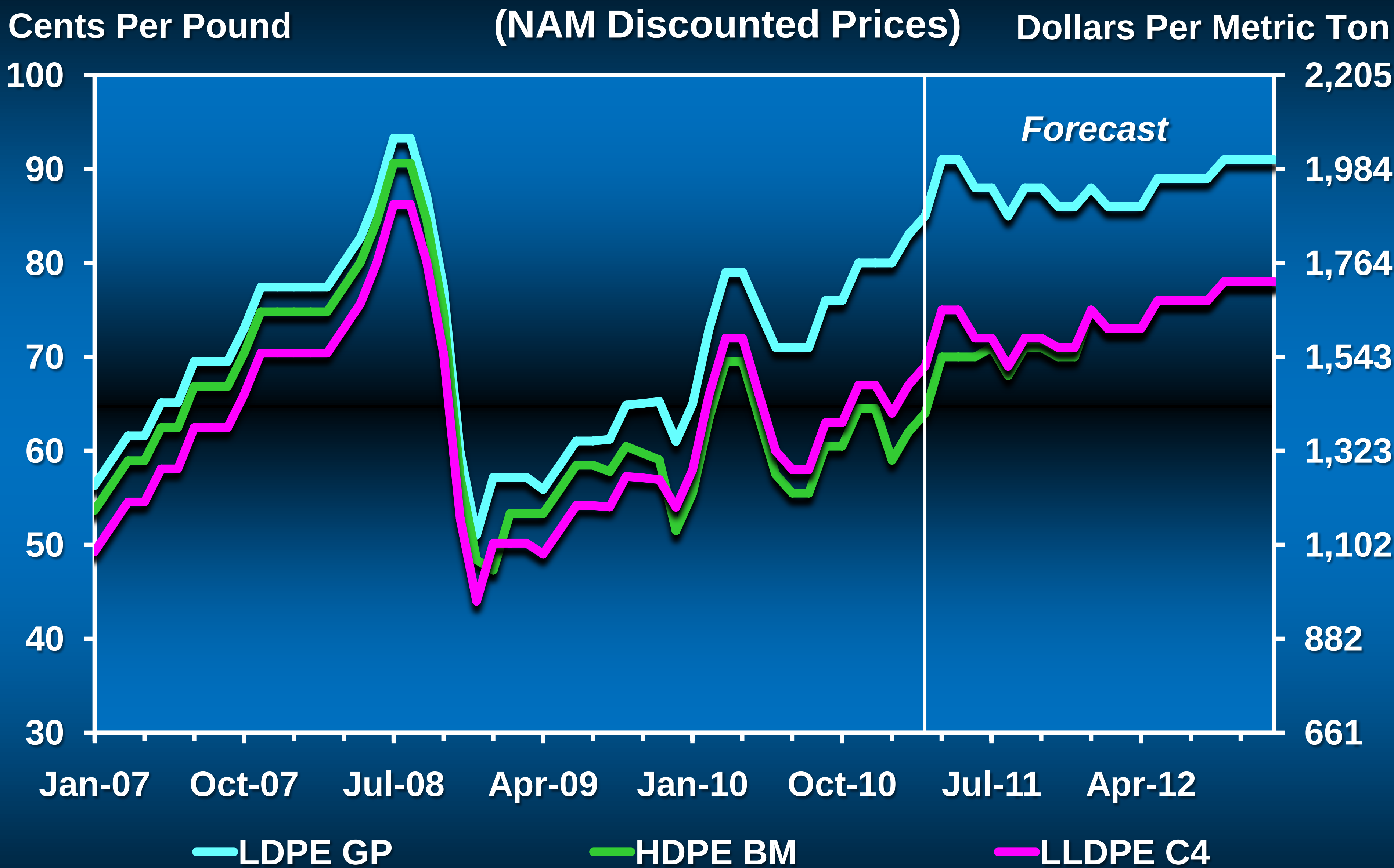


Global PE Demand Growth

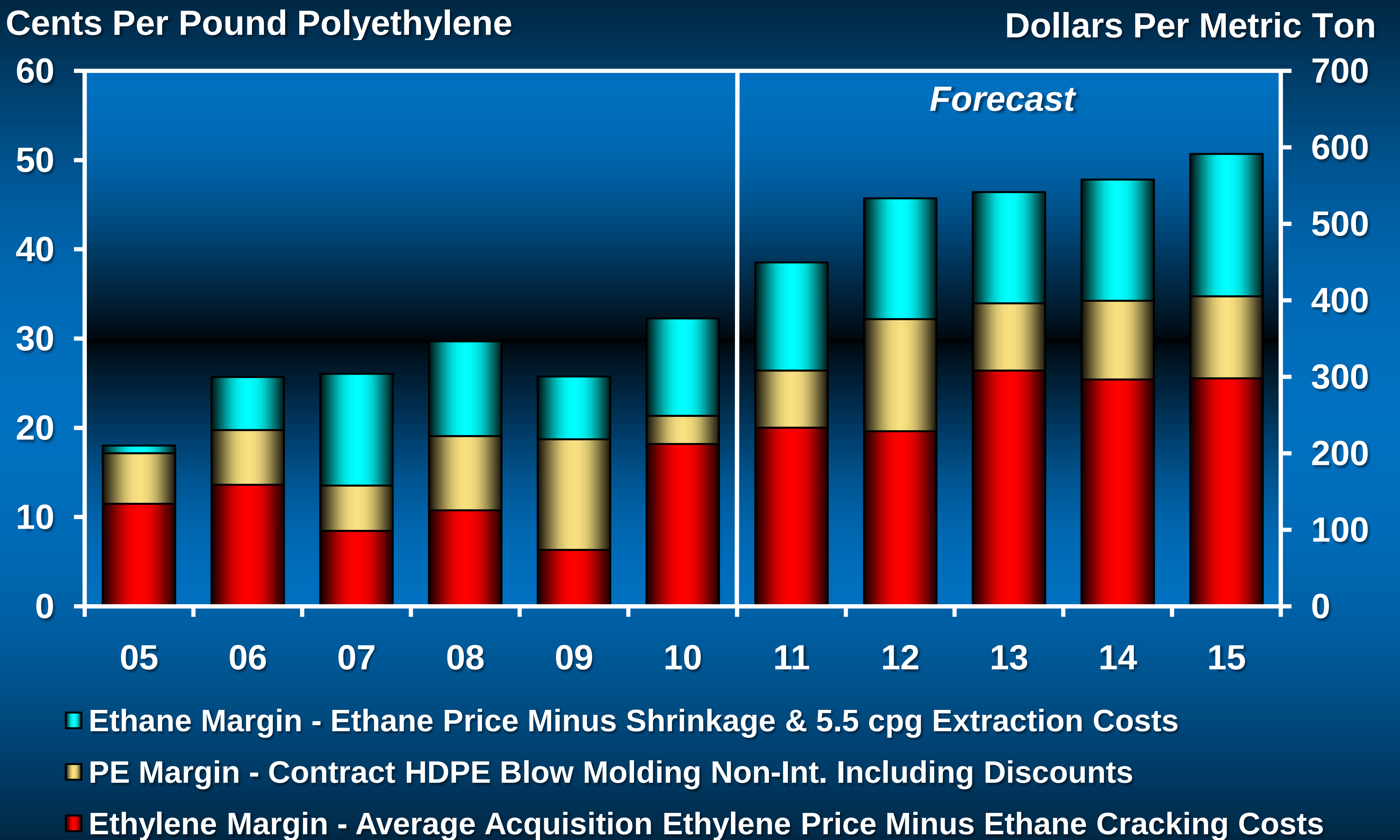


CAGR % increase by type: LD = 3.5%, LL = 6.4%, HD = 5.6%

Price Differentiation



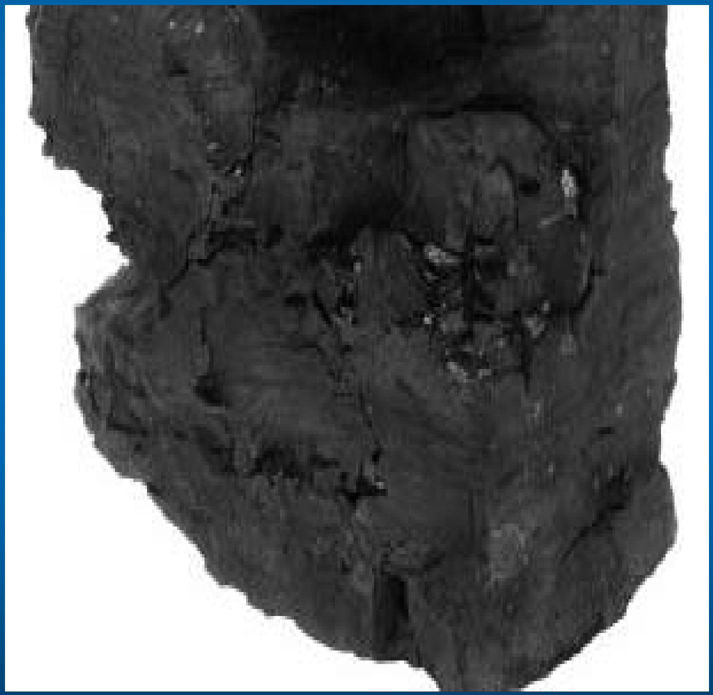
U.S. Polyethylene Chain Margins



CTO Projects in China

PE/PP resin from coal

(Photo taken September, 2010)



Shenhua Group

Braskem's "green" ethylene plant already operating at 90% capacity - *Brazil*

Published: Monday, September 27, 2010 17:43 (GMT-0400)

PE Take-Away's

- **Hindsight:** Energy shift, start up delays, export options, and unplanned outages transform would-be trough to record profits for US resin producers – expansions likely
- **Price:** increasingly tied to global naphtha price trends, and spot Asia export options
  - *unplanned outages remain the wildcard*
- **New capacity:** in MDE and China will be absorbed – less dramatic impact on pricing and margins
- **Packaging and film markets:** largest markets continue recovery although at moderating pace
- **Caution:** Rapid increases in crude oil price could kill demand and resin prices could fall as in 2008

Upcoming CMAI Events

Plastics Processors Conference
September 19-21, 2011 (Chicago)

Plastics Processors Conference
October 19-20, 2011 (Dusseldorf)