argus DeWitt

argusmedia.com

Energy Pricing and Petrochemicals

Presentation for Perstorp

Andy Nicholson

Stenungsund

19 May 2015

London
Houston
Washington
New York
Portland
Calgary
Santiago
Bogota
Rio de Janeiro
Singapore
Beijing
Tokyo
Sydney
Dubai
Moscow
Astana
Kiev
Porto
Johannesburg
Riga

Market Reporting

Consulting

Events

illuminating the markets

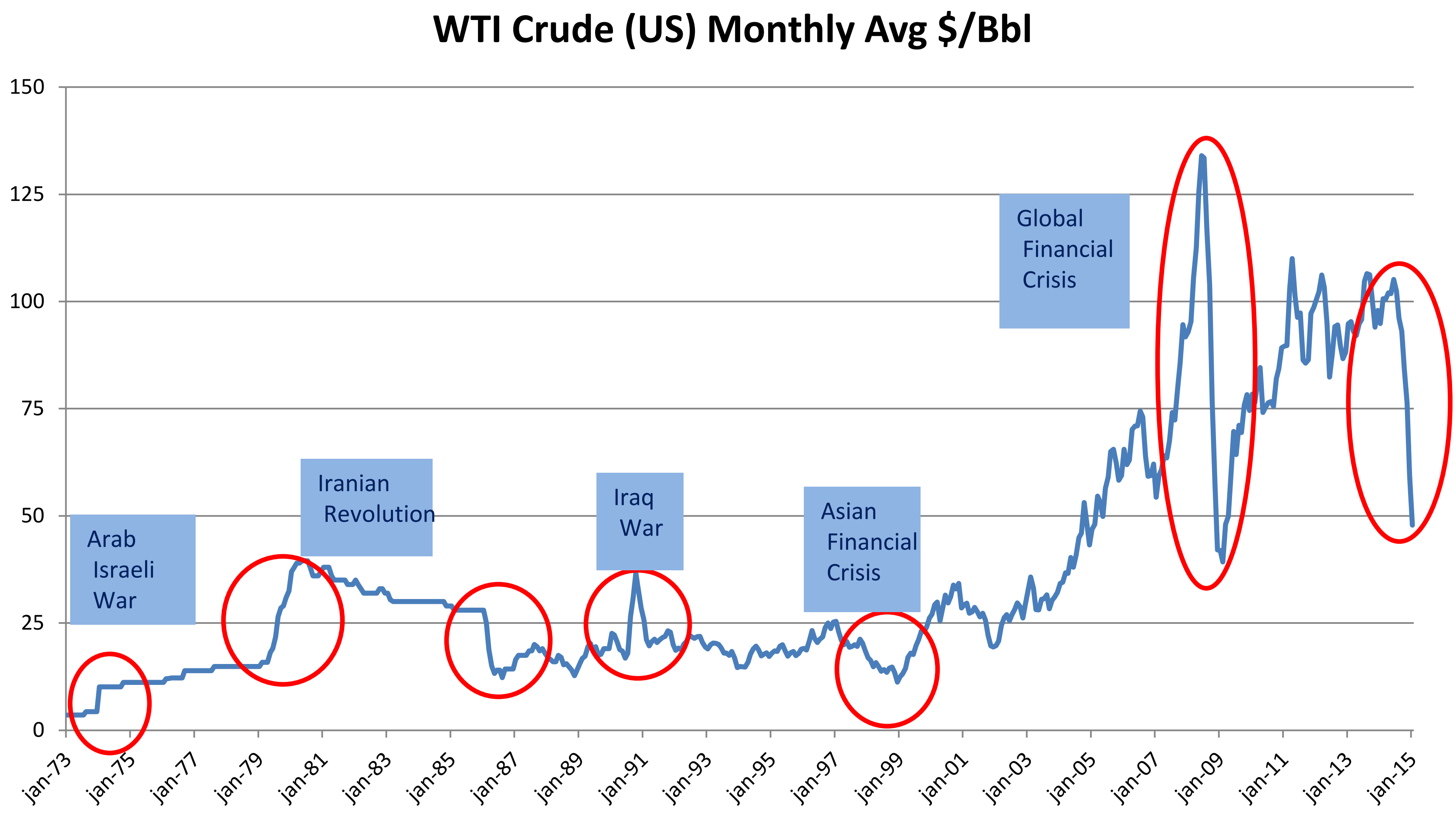
Agenda

Energy and the Economy
Refining
Cracker Developments

Market Reporting
Consulting
Events

illuminating the markets

Crude Oil Pricing 1973-2015



illuminating the markets

argus DeWitt

argusmedia.com

Non-OPEC supply growth hit stagnant global demand…

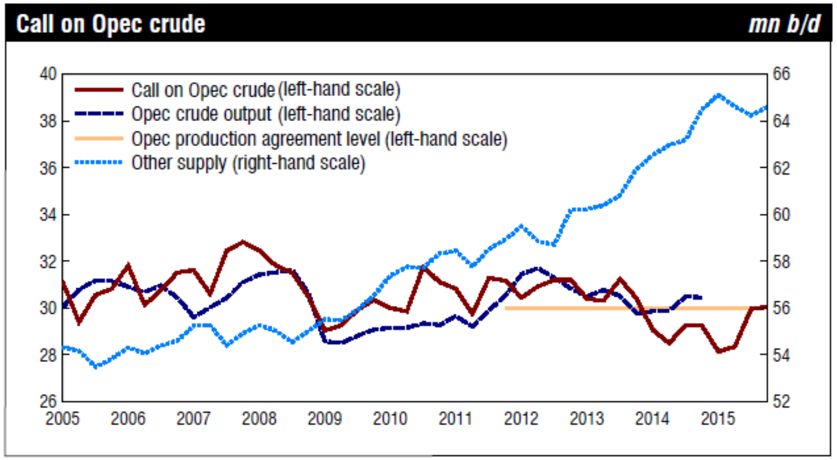
Data lag meant we could not see the fundamental shift as it happened

In retrospect we know that:

- Oil supply rose 3x as fast as oil demand in 2H14
  - Production up 2.7mn b/d of which 900kbd OPEC; 2.2mn b/d non OPEC
- Shift in stocks balance:
  - 2H 2013 – drew 700kbd
  - 2H 2014 – added 1mn b/d
- Market fundamentals demanded a correction
- Prices were telling us this beginning in July!

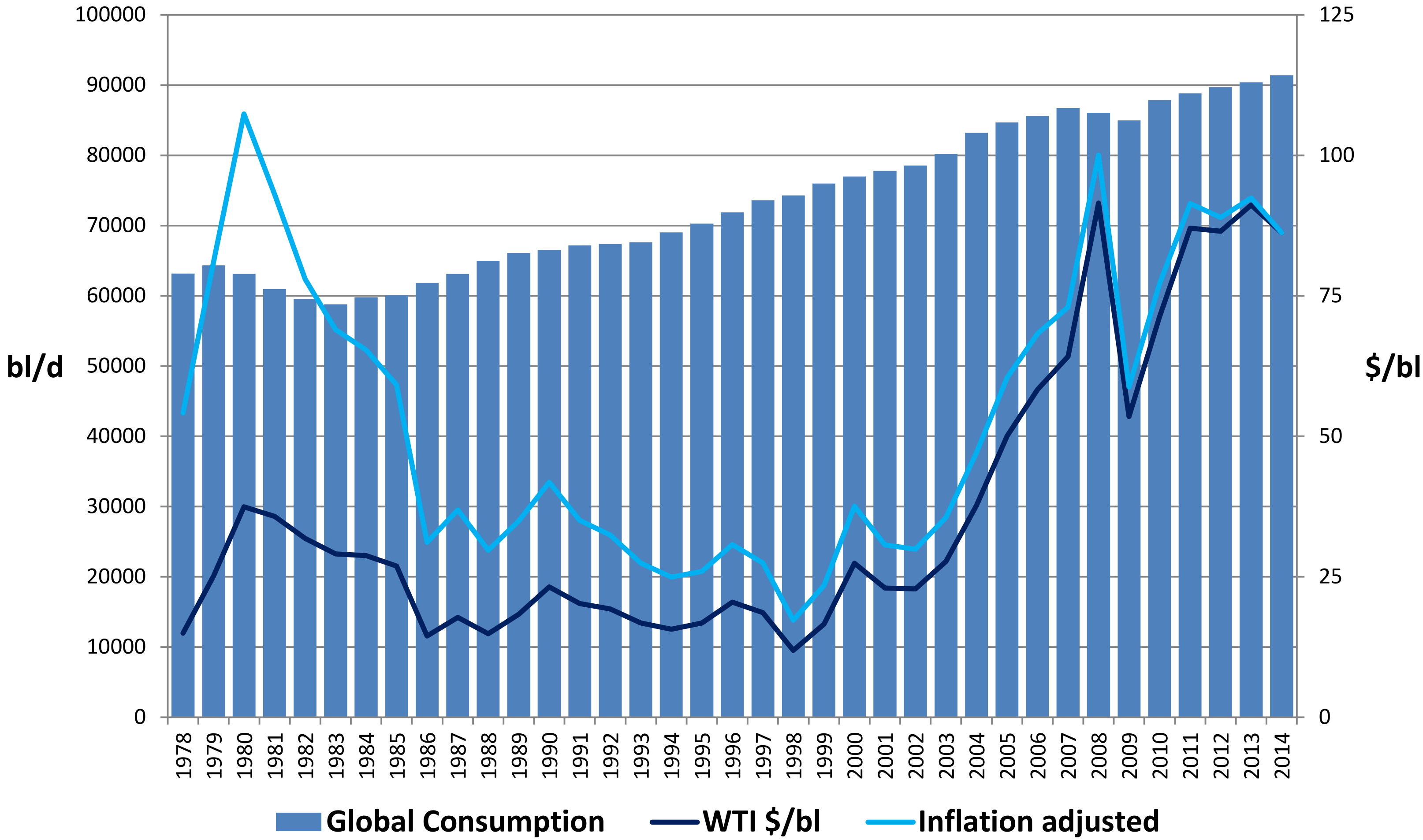
Final straw: Nov 2014 – OPEC stops defending oil price

- Can't cut enough to support price
- OPEC market share 39%, lowest since 2002
- Strategy is to "sweat out" the highest-cost producer
  - Deepwater offshore
  - Canadian oil sands
  - Shale

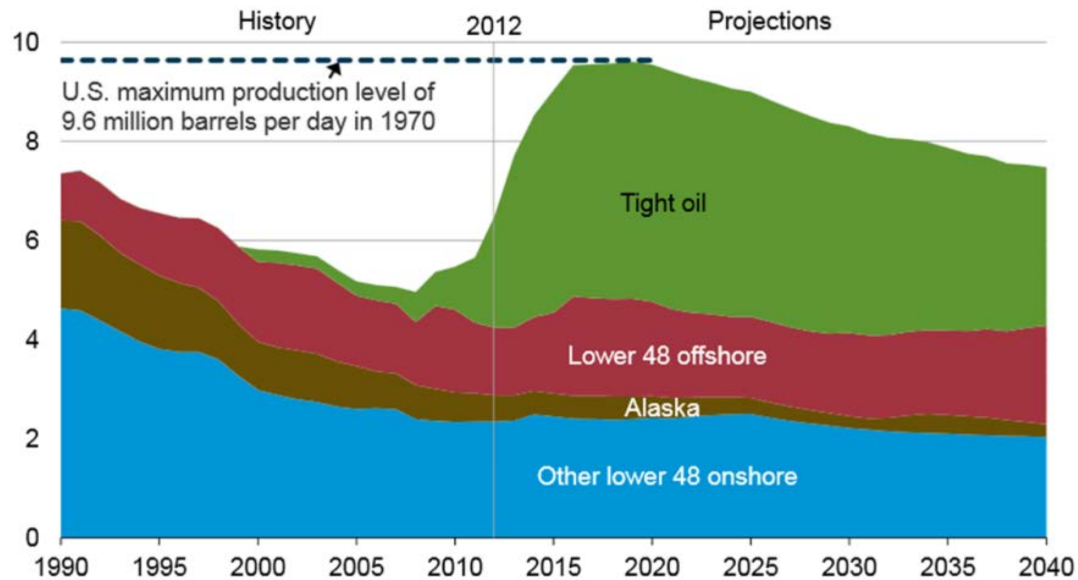


Source: Argus Fundamentals, March 2015

Oil Consumption (EIA) & pricing



Technological leap – huge resource now accessible

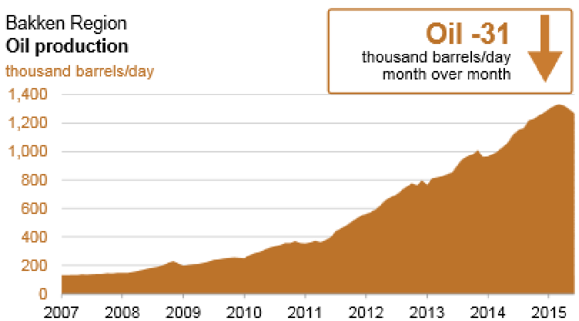


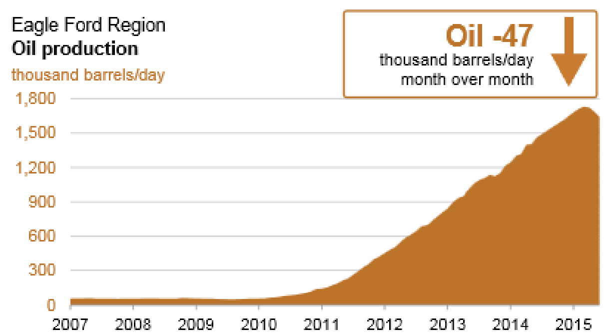
US oil output (EIA)*
5.6mn b/d – 2011
8.7mn b/d – 2014
9.3mn b/d – 2015
9.5mn b/d – 2016

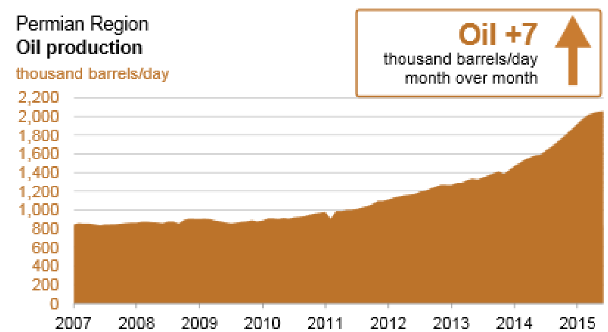
10.0mn b/d – 2017**
10.6mn b/d – 2018**

*crude + field condensate
**EIA 2015 Annual Energy Outlook, reference case

Source: *EIA, Annual Energy Outlook 2014 Early Release*





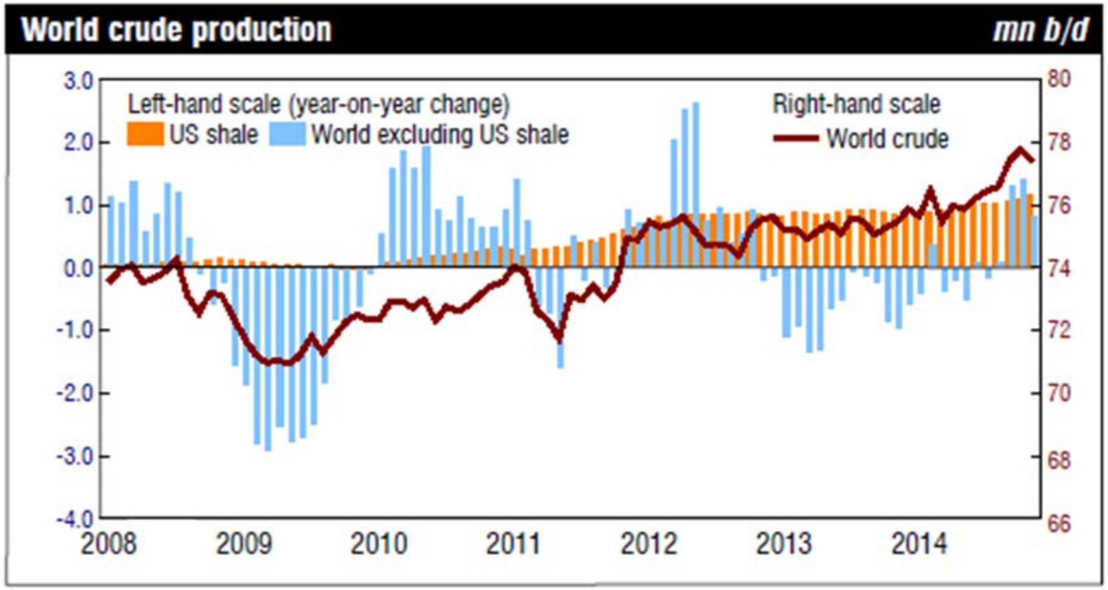


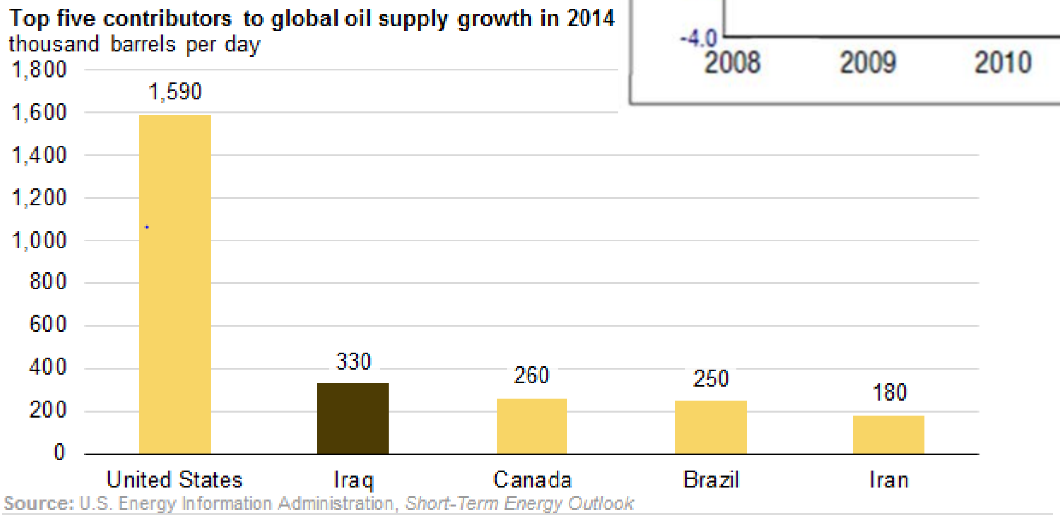
Source: EIA Drilling Productivity Report, May 2015

argus DeWitt
argusmedia.com

US, Canada & Brazil in top 4 contributors to oil growth

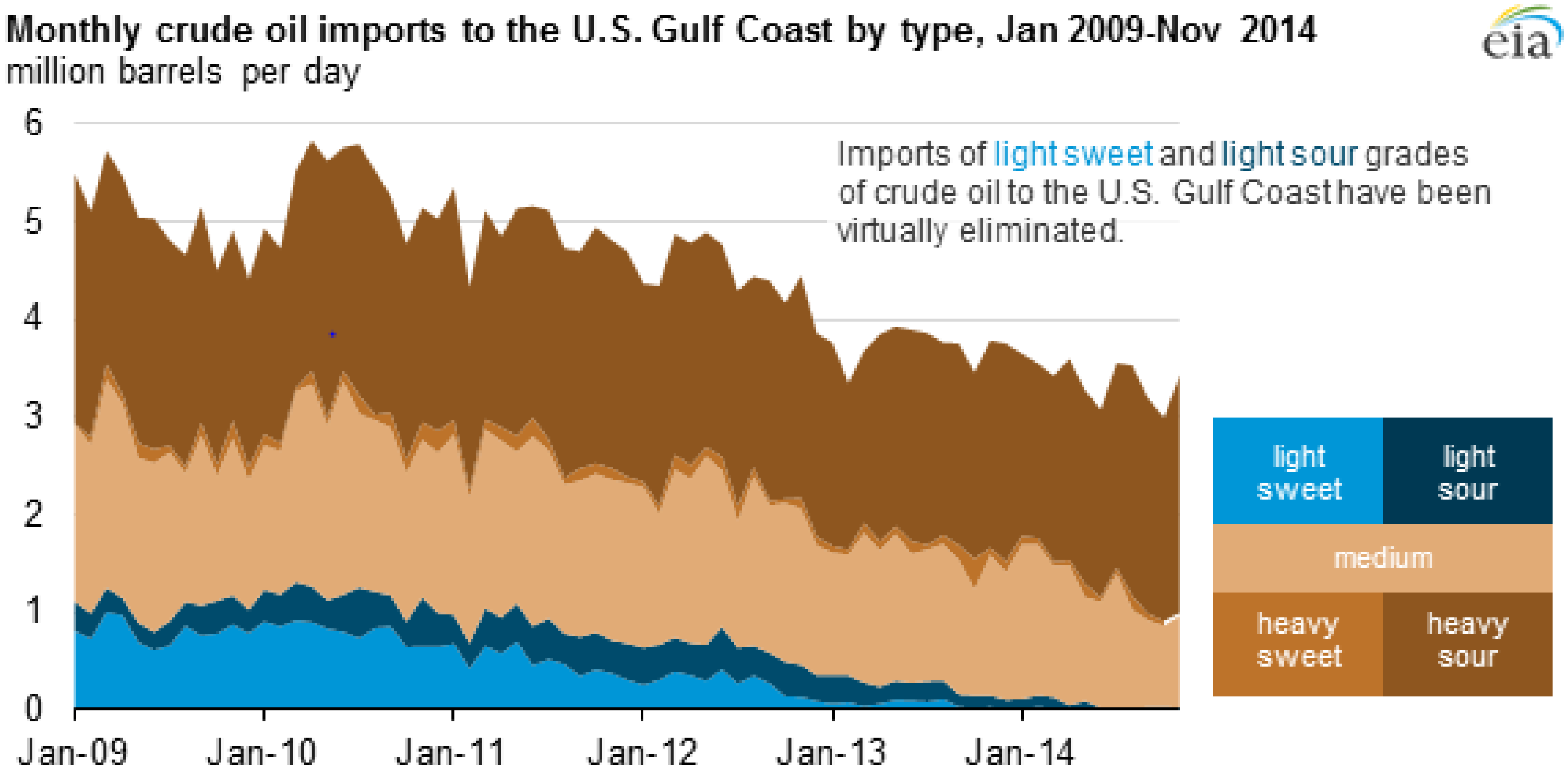
Non-US output was down (yoy) until late 2014; Compensated for US rise





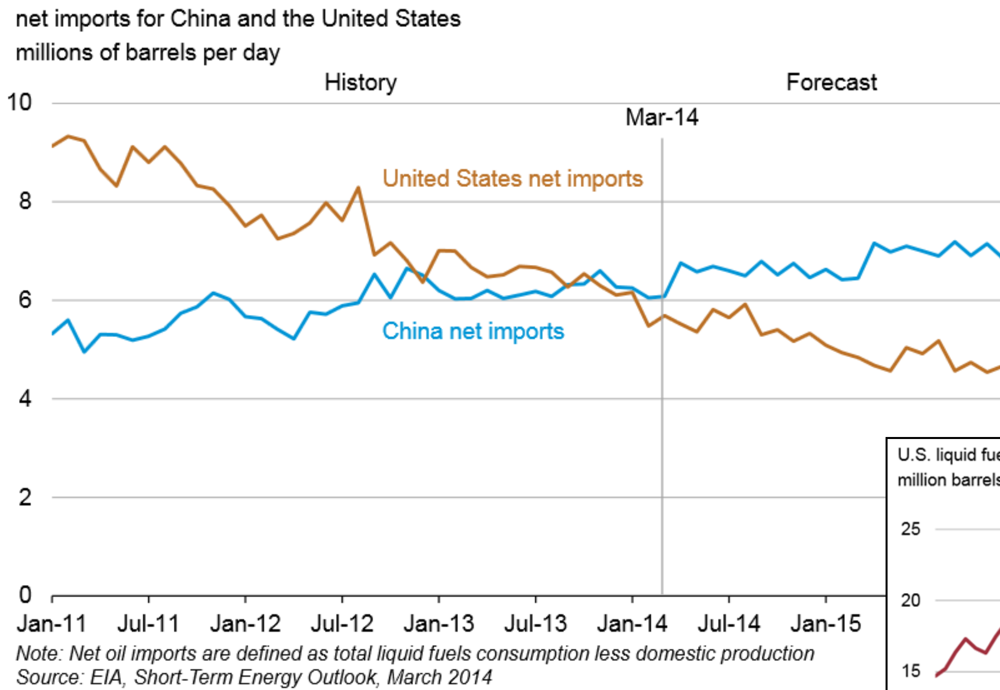
argus DeWitt
argusmedia.com

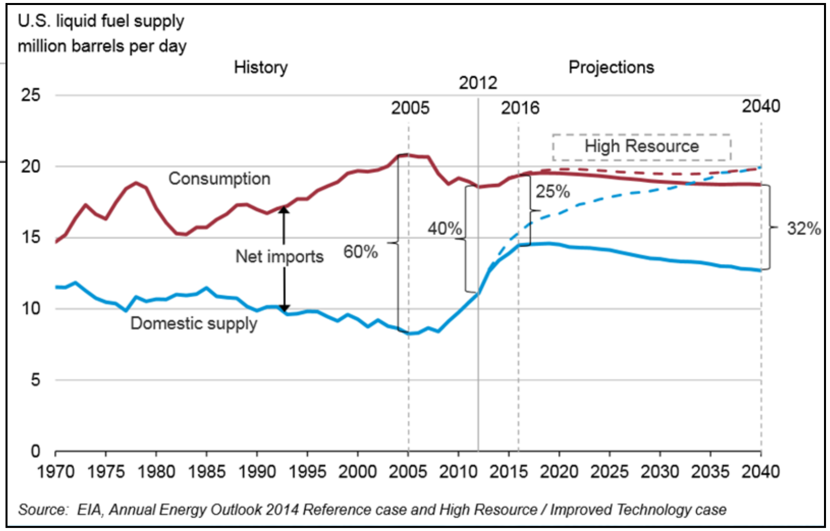
Result of shale: US imports lowest since 1995;



Source: U.S. Energy Information Administration, Crude Import Tracking Tool
Note: Heavy crude has an API gravity <= 27. Light crude has an API gravity >= 35. Medium crude has an API gravity between 27 and 35. Sweet crude has 0.5% sulfur content or less. Sour crude has more than 0.5% sulfur content.

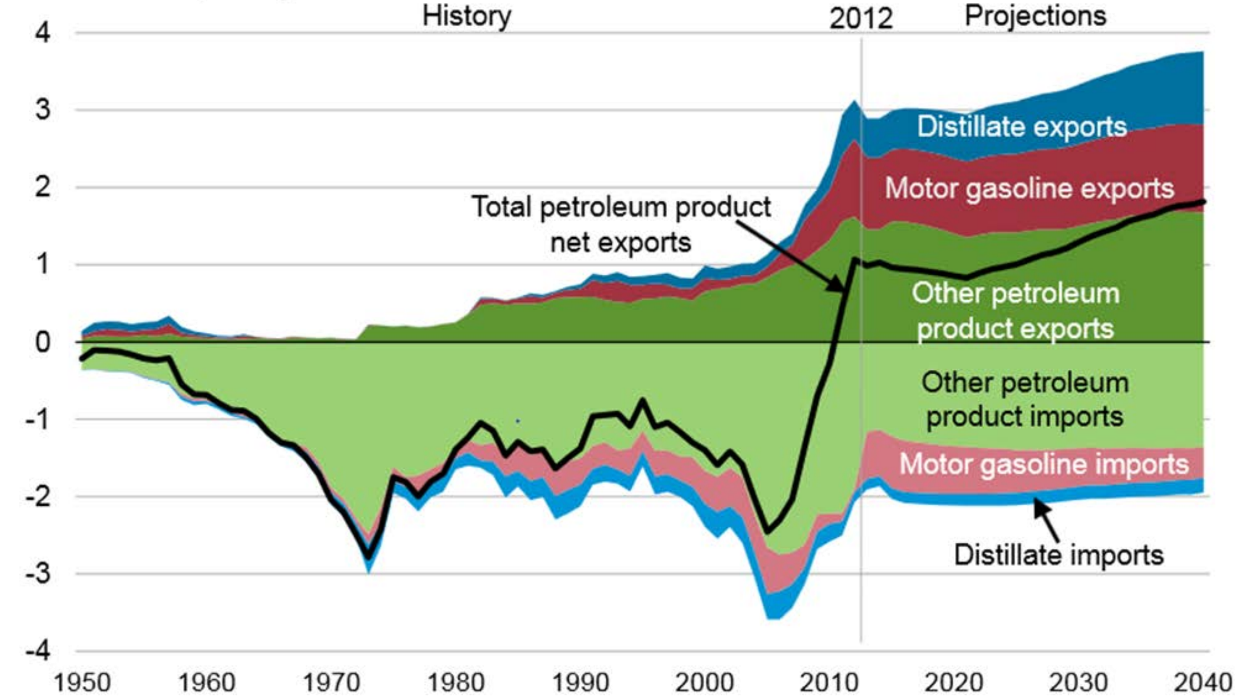
China now world's largest net importer





Another shale oil effect: US products escape valve

- US bans crude exports, but allows products exports
- US merchant refineries export to Latam, Asia, Europe
- Shale crude makes feed cost low
- Low nat gas price gives US refiners an edge



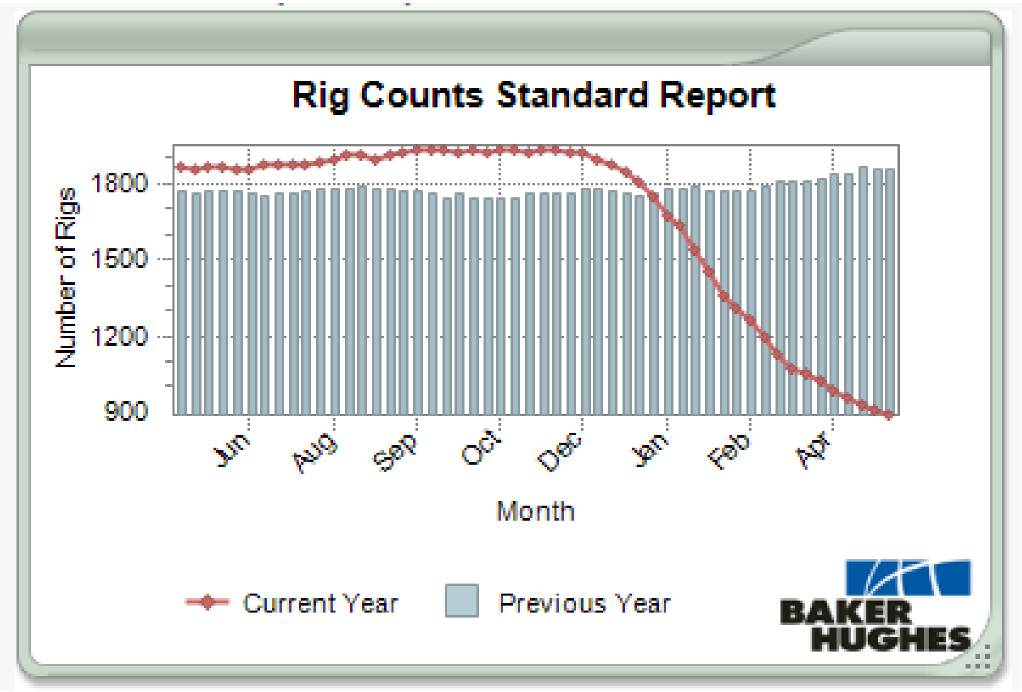
Source: *EIA, Annual Energy Outlook 2014 Early Release*

illuminating the markets

argus DeWitt
argusmedia.com

Brakes on supply starting to work

Baker Hughes rig count from 8 May 2015



Steep cuts in capex: 20-60pc

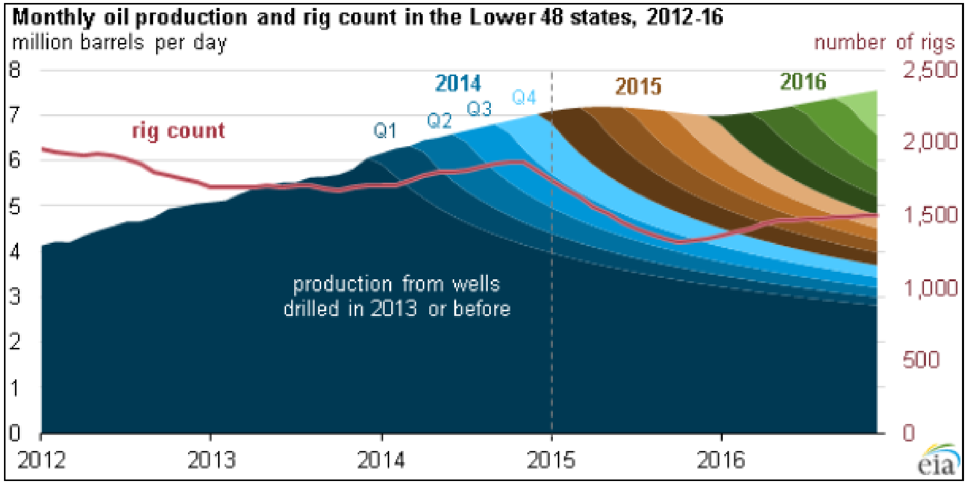
Upstream independents' capex		
$mn	2015	±% 15/14
ConocoPhillips	13,500	-20
Devon	5,200*	nc
Marathon Oil	4,400*	-20
Apache	4,000	-25
Continental	2,700	-41
Concho	2,000	-23
Oasis	800*	-44
Linn	730	-53
Rosetta	750*	-22
Matador	350*	-20
Denbury	550	-50
Laredo	525	-48
Comstock	307	-32
Approach	180	-55

**mid-point of capex range*

EIA: Steep decline rate + rig layoffs get US to balance

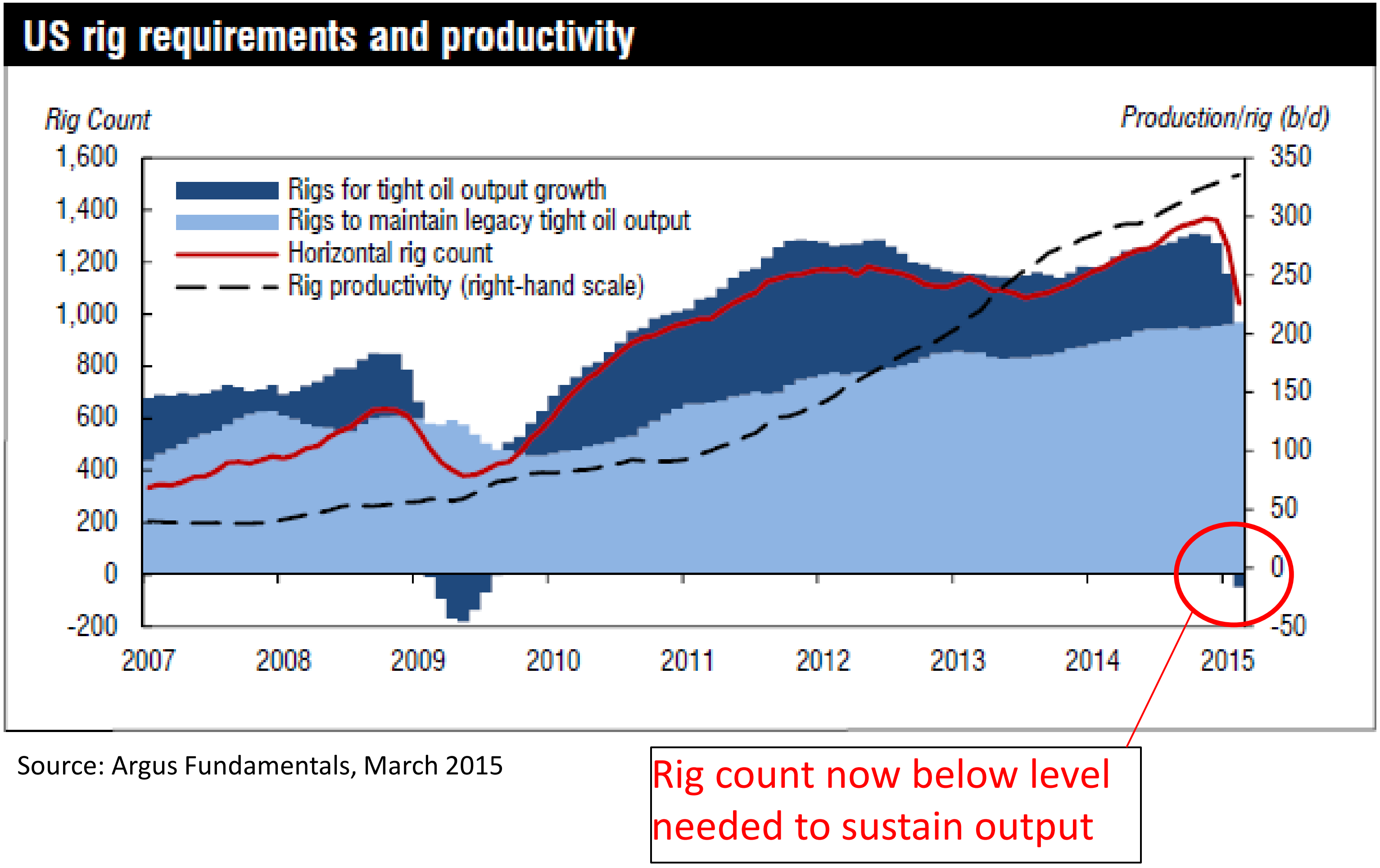
Why shale can switch off quickly:

- Decline rates – downward diagonal
- Small producers drill cash flow
- No danger of losing oil to a neighbor – locked in
- Completion is 60pc of cost of a well; can defer
- Shale oil is higher cost than most OPEC oil



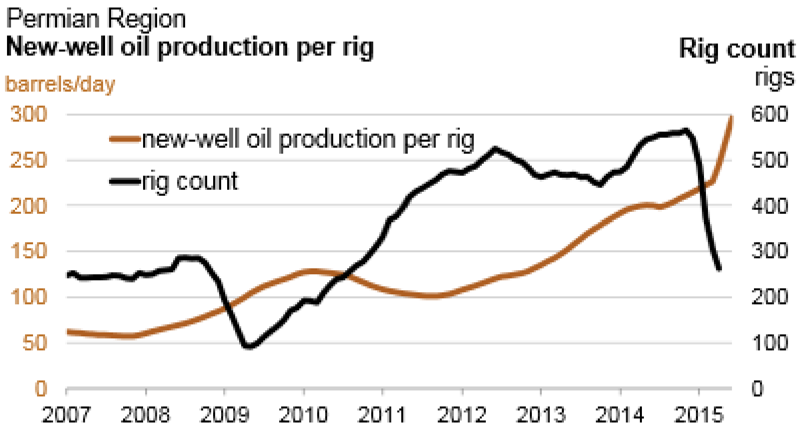
EIA Today in Energy, Jan 26, 2015

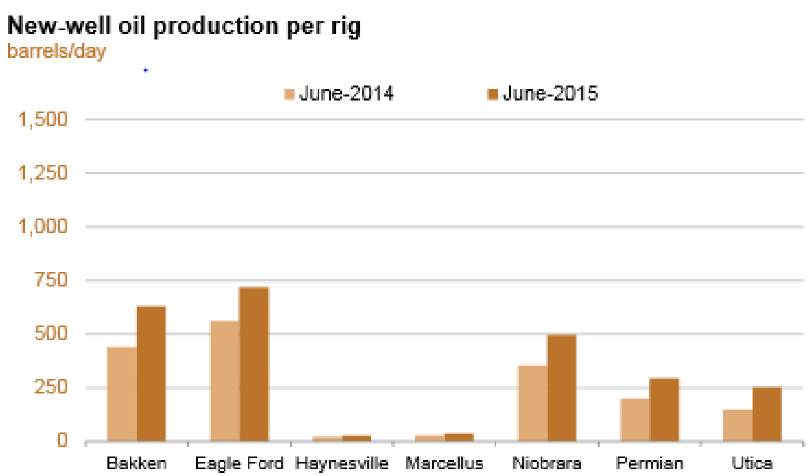
Rig count fall finally overcomes productivity gains



Source: Argus Fundamentals, March 2015

US shale resilient; productivity + deep pockets

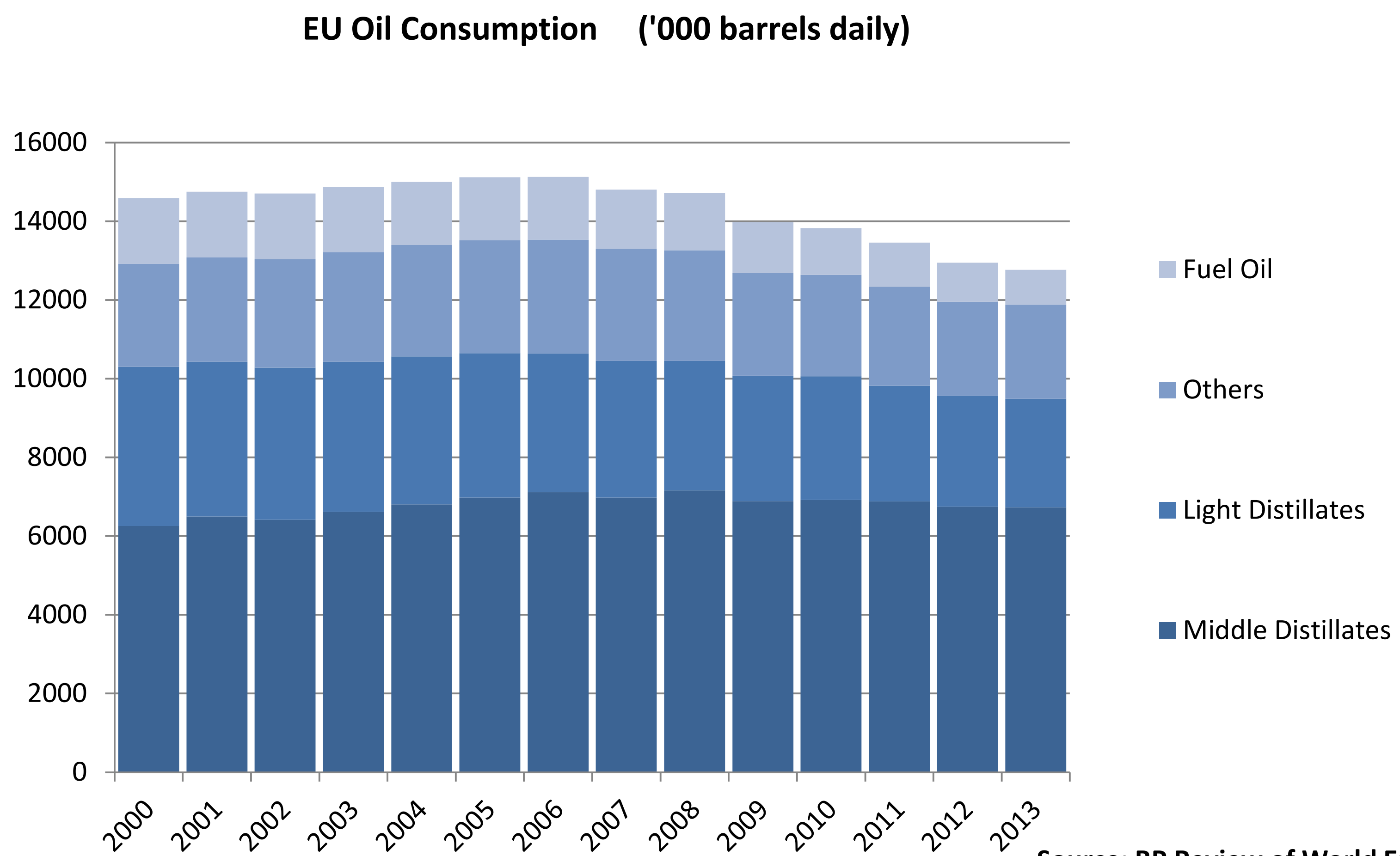




- Productivity still climbing – drilling just the best prospects
- Oil service costs falling 20-30pc, labor costs leveled out, states cutting taxes
- As many as 3,000 (1mn b/d?) uncompleted wells already drilled
- US operators have raised $20bn in equity & debt
- EOG expects to return to “double-digit growth” in 2016 if price is $65 or above
- Hamm says $70 is needed for Bakken growth to recover

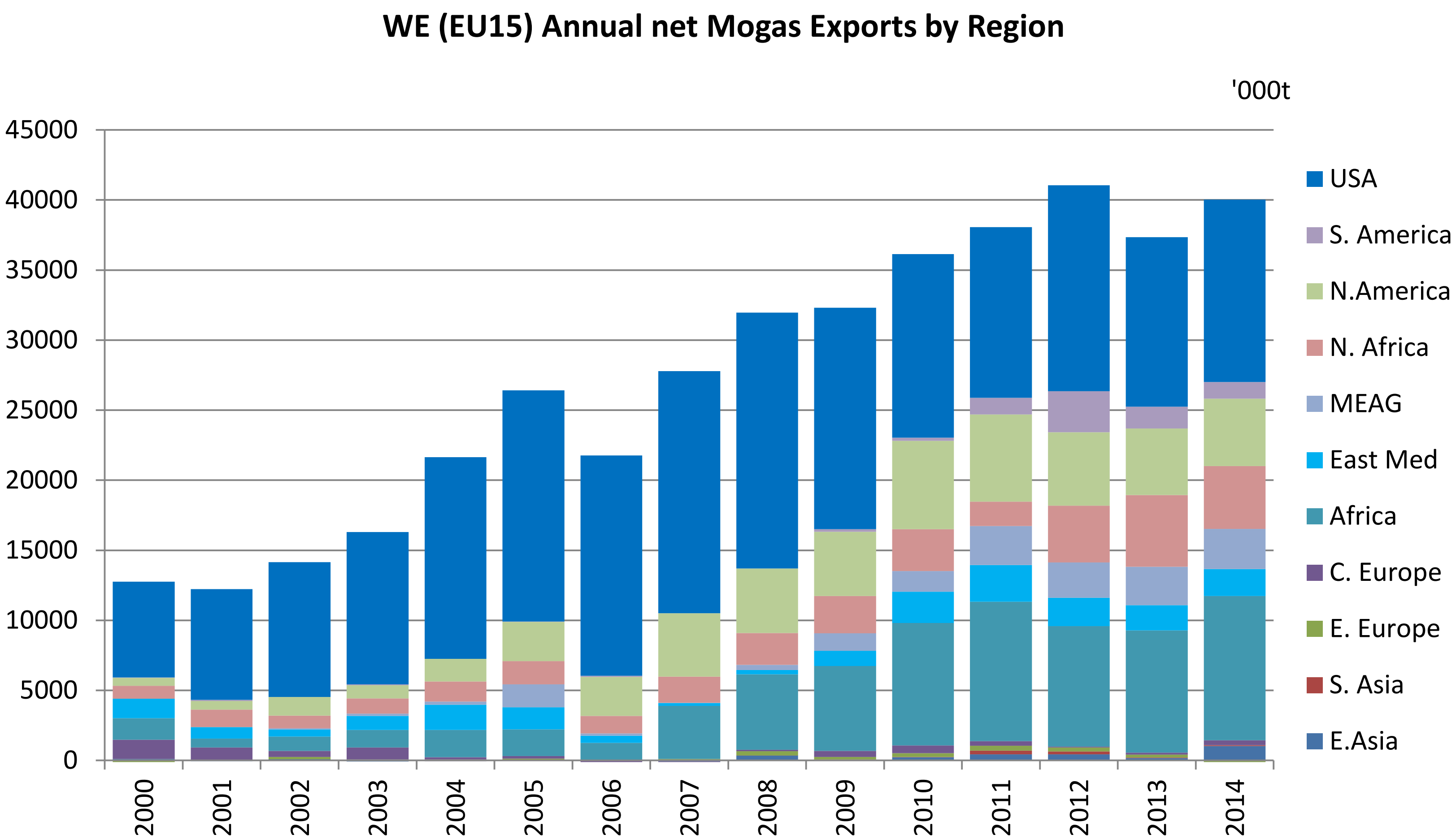
Source: EIA Drilling Productivity report, May 2015

EU Oil Consumption has declined 20% in 10 Years



Source: BP Review of World Energy

Western Europe exports 1/3 of Gasoline produced



Source: Eurostat

EU Refining Closures since 2009 ('000 b/d)

Year	Company	Location	Capacity	Comments
2009	Petroplus	Teesside, UK	117	Permanent Closure
2009	ConocoPhillips	Wilhelmshaven, Germany	260	Now Hestya Energy; not operational
2010	Arpechim	Romania	65	Permanent Closure
2010	Total	Dunkirk, France	141	Permanent Closure
2010	Petroplus	Reichstett, France	78	Permanent Closure
2011	Tamoil	Cremona, Italy	101	Permanent Closure
2011	LBI	Berre, France	82	Permanent Closure
2012	Total/ERG	Rome, Italy	86	Permanent Closure
2012	Petroplus	Coryton, UK	220	Permanent Closure
2012	Petroplus	Petit-Couronne, France	162	Closed - staff laid off from April 2013
2013	Shell	Harburg, Germany	100	Permanent Closure from March
2013	MOL	Mantova, Italy	69	Conversion to logistics' hub Jan from 2014
2013	Cepsa	Tenerife, Spain	85	last ran Aug 2013
2014	ENI	Porto Marghera, Italy	80	Conversion to 300kt/yr biorefinery June 2014
2014	Murco	Milford Haven, Wales	105	Conversion to logistics' hub announced Nov 2014
2015	Total	La Mede, France	160	Crude refining to end 2016
	total		1911	

Japan Refining Rationalisation since 2009 ('000 b/d)

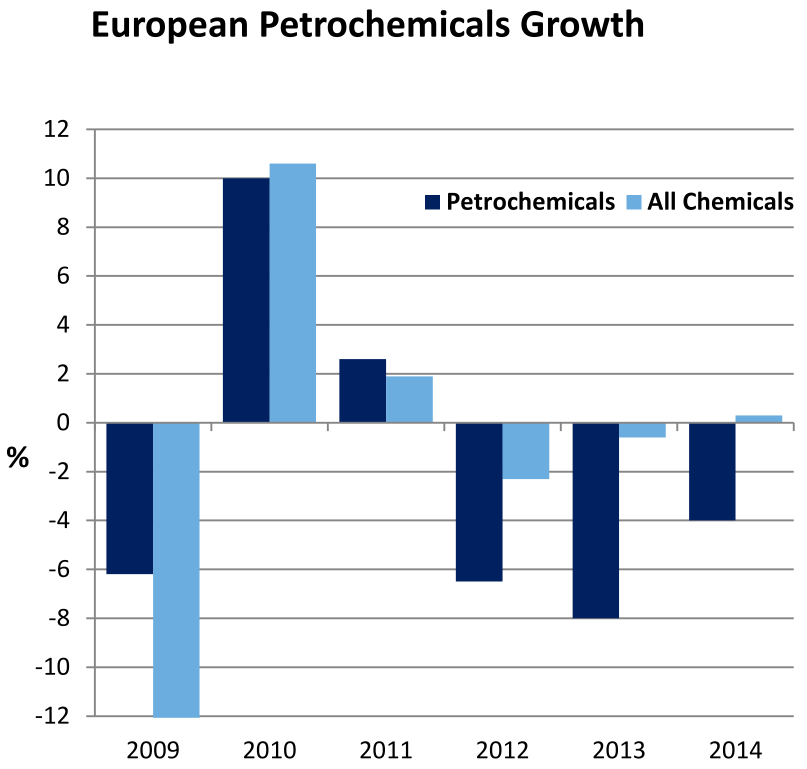
	Company	Location	Capacity	Comments
2009	JX	Toyama	60,000	Permanent closure
2010	Cosmo	Chiba	20,000	Cut down from 240,000b/d to 220,000b/d
2010	Cosmo	Sakaide	30,000	Cut down from 140,000b/d to 111,000 b/d.
2011	Show Shell (Toa)	Keihin	120,000	Cut down from 185,000b/d to 65,000b/d
2011	JX	Kashima	21,000	Cut down from 273,500b/d to 252,500b/d
2011	JX	Negishi	70,000	Cud down from 340,000b/d to 270,000b/d
2011	JX	Oita	24,000	Cut down from 160,000b/d to 136,000b/d
2011	JX	Mizushima	90,200	Cut down from 490,200b/d to 400,000b/d
2011	Fuji	Sodegaura	49,000	Cut down from 192,000b/d to 143,000b/d
2012	JX	Mizushima	19,800	Cut down from 400,000b/d to 380,200b/d
2012	Teikoku	Kubiki	4,724	Permanent closure
2013	Cosmo	Yokkaichi	20,000	Cut down from 175,000b/d to 155,000b/d
2013	Cosmo	Sakaide	140,000	Permanent closure
2014	TonenGeneral	Kawasaki	67,000	Cut down from 335,000b/d to 268,000b/d
2014	TonenGeneral	Wakayama	38,000	Cut down from 170,000b/d to 132,000b/d
2014	Taiyo	Shikoku	2,000	Cut down from 120,000b/d to 118,000b/d
2014	Kyokuto	Chiba	23,000	Cut down from 175,000b/d to 152,000b/d
2014	JX	Muroran	180,000	Permanent closure
2014	Idemitsu	Tokuyama	120,000	Permanent closure
2014	Cosmo	Yokkaichi	43,000	Cut down from 155,000b/d to 112,000b/d
	Total		1,141,724	More than 20% of Japanese capacity

Middle East Refinery Investments

Location	Country	Operator	Capacity ('000b/d)	Start-up
Al Jubail SATORP	Saudi Arabia	Aramco / Total	400	2014
Yanbu "Red Sea"	Saudi Arabia	Aramco / Sinopec	400	2014
Ruwais	UAE	Takreer (ADNOC)	400	2014
Rabigh	Saudi Arabia	Aramco	400	2015
Ras Tanura	Saudi Arabia	Aramco	550	2015
Ras Laffan expansion	Qatar	Qatar Petroleum	146	2016
Fujairah	UAE	IPIC	200	2016
Duqm	Oman	Oman Oil/IPIC	230	2019
Jazan	Saudi Arabia	Aramco	400	2019
Al Zour	Kuwait	KNPC	615	2018/2022
total			3741	

European Petrochemicals

- 2010-11 output showed a recovery from the collapse of 2008 -09
- 2012-14 has seen an average decline of 6% per year in petrochemical output
- The rate of decline should slow in 2015/16



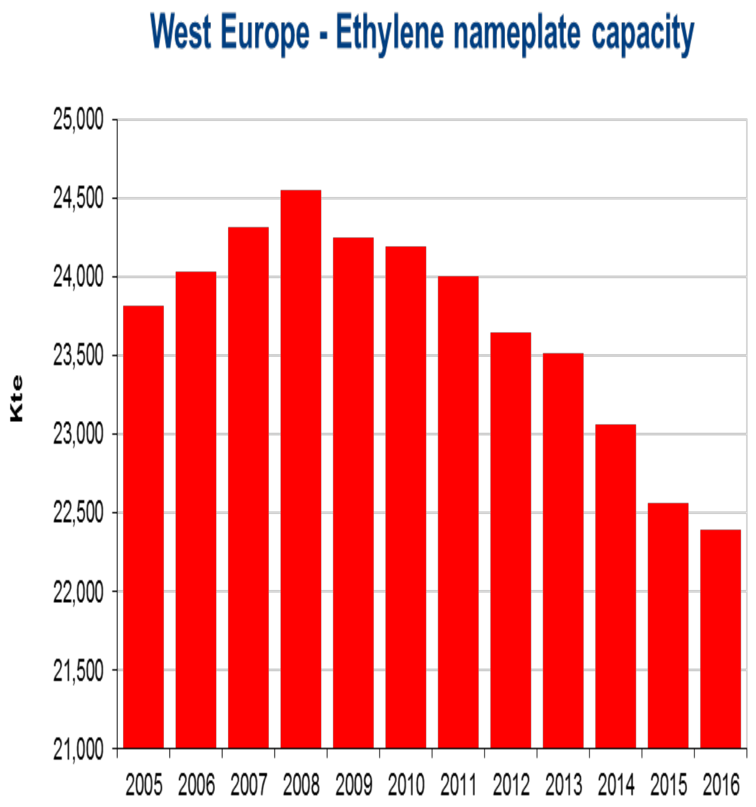
Source: CEFIC

illuminating the markets

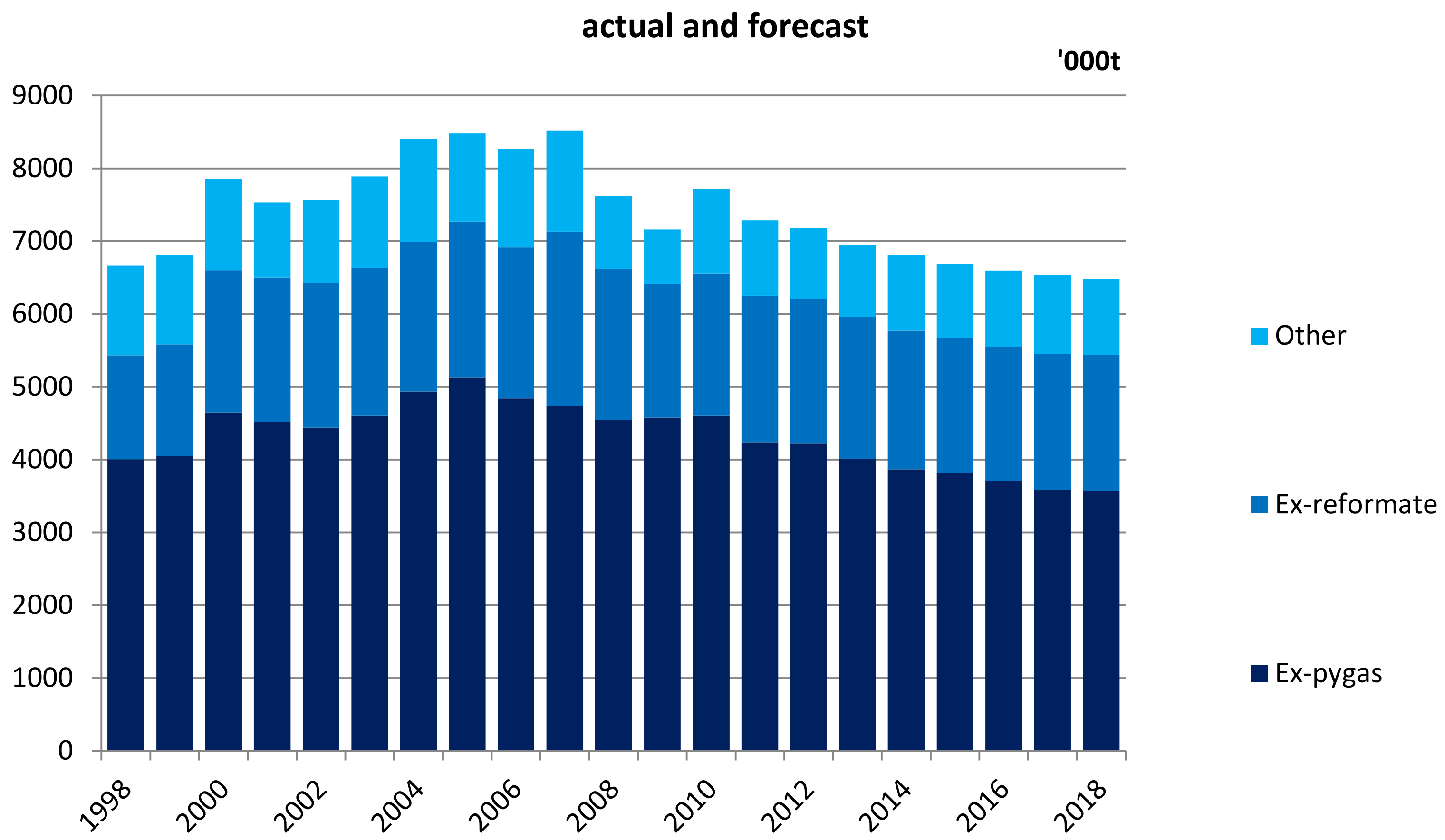
argus DeWitt
argusmedia.com

Ethylene Cracker Closures in Europe and N.Africa

- Over 2m t of cracker closures have been announced in Western Europe
- A further 1m t capacity has been idled in N. Africa and Eastern Europe.
- Over 1m t of commodity HDPE will close by 2015.
- Possible further cracker closures by 2020.



EU15 Benzene Production ('000t)



CEFIC/ArgusDeWitt

argus DeWitt
argusmedia.com

Conclusions

- Geopolitical and financial issues disrupt economic development, supply/demand balances and pricing
- Within this context, there are cyclical forces at play
- High prices affect demand growth
- High margins encourage over-production
- Low prices tend to promote growth
- Lower margins limit investment
- Corrections are painful (stocks are devalued), but necessary
- Lower prices cannot eliminate the effects of over-investment, but
- Prospects for petrochemical growth and profitability are better today than 12 months ago, particularly for naphtha based producers.

Andy Nicholson

VP Aromatics EMEI

Email: andy.nicholson@argusmedia.com
Phone: +33 1 34 66 55 91
Office: London
Web: www.argusmedia.com

argusmedia.com

argus DeWitt

argusmedia.com

Energy Pricing and Petrochemicals

Presentation for Perstorp

Sarah Rae

Stenungsund

19 May 2015

London
Houston
Washington
New York
Portland
Calgary
Santiago
Bogota
Rio de Janeiro
Singapore
Beijing
Tokyo
Sydney
Dubai
Moscow
Astana
Kiev
Porto
Johannesburg
Riga

Market Reporting

Consulting

Events

illuminating the markets

Changing feedstock slates and impact on global olefins supplies

Presentation for Perstorp

Sarah Rae
Stenungsund
19 May 2015

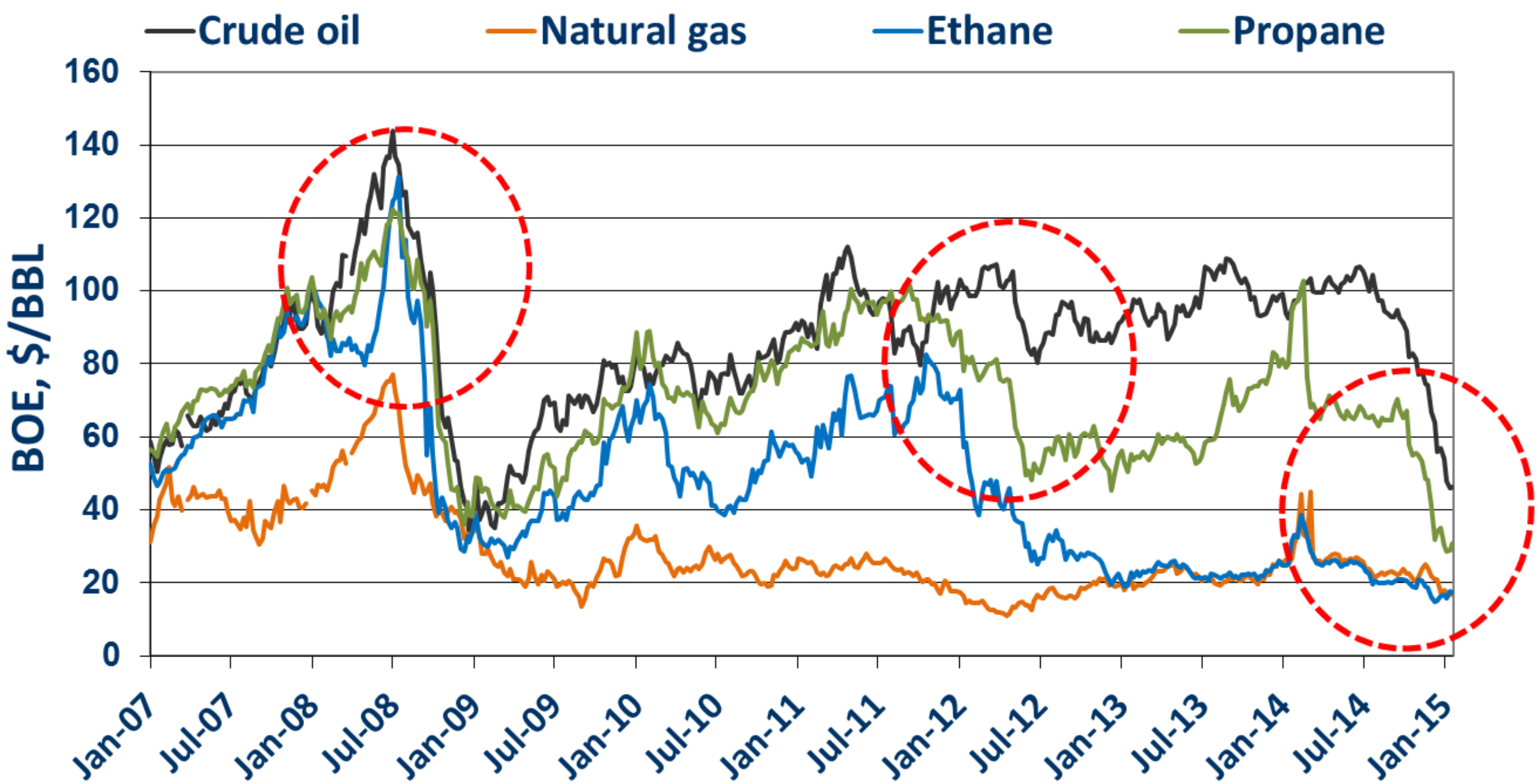
Market Reporting

Consulting

Events

illuminating the markets

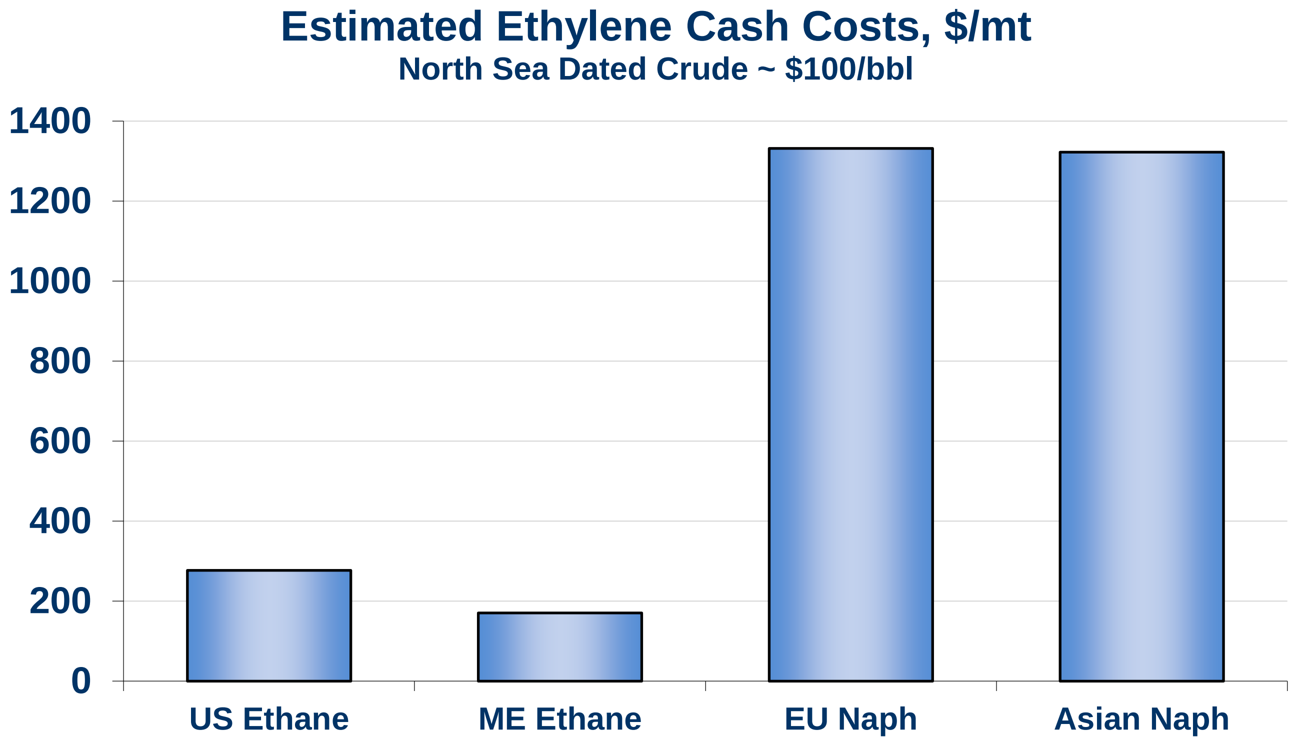
The collapse of natural gas, ethane and then crude oil pricing is driving major changes in the global olefin market



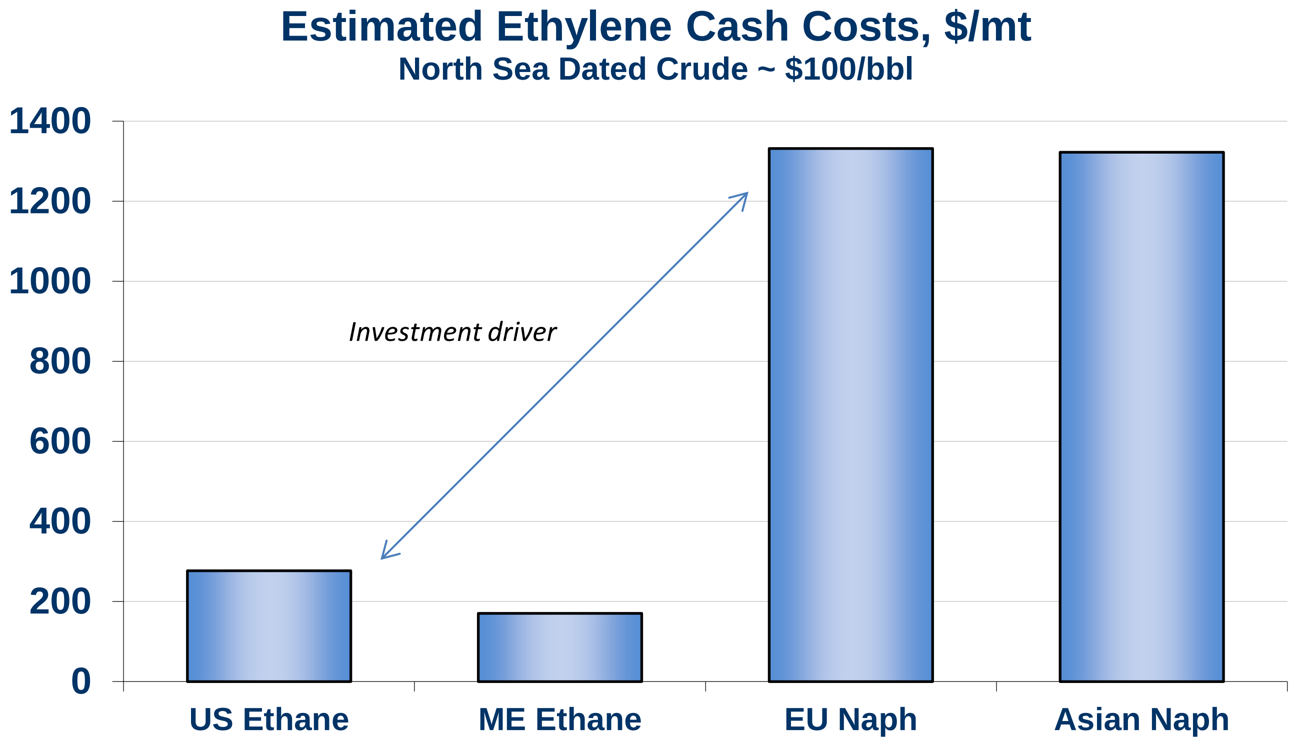
illuminating the markets

argus

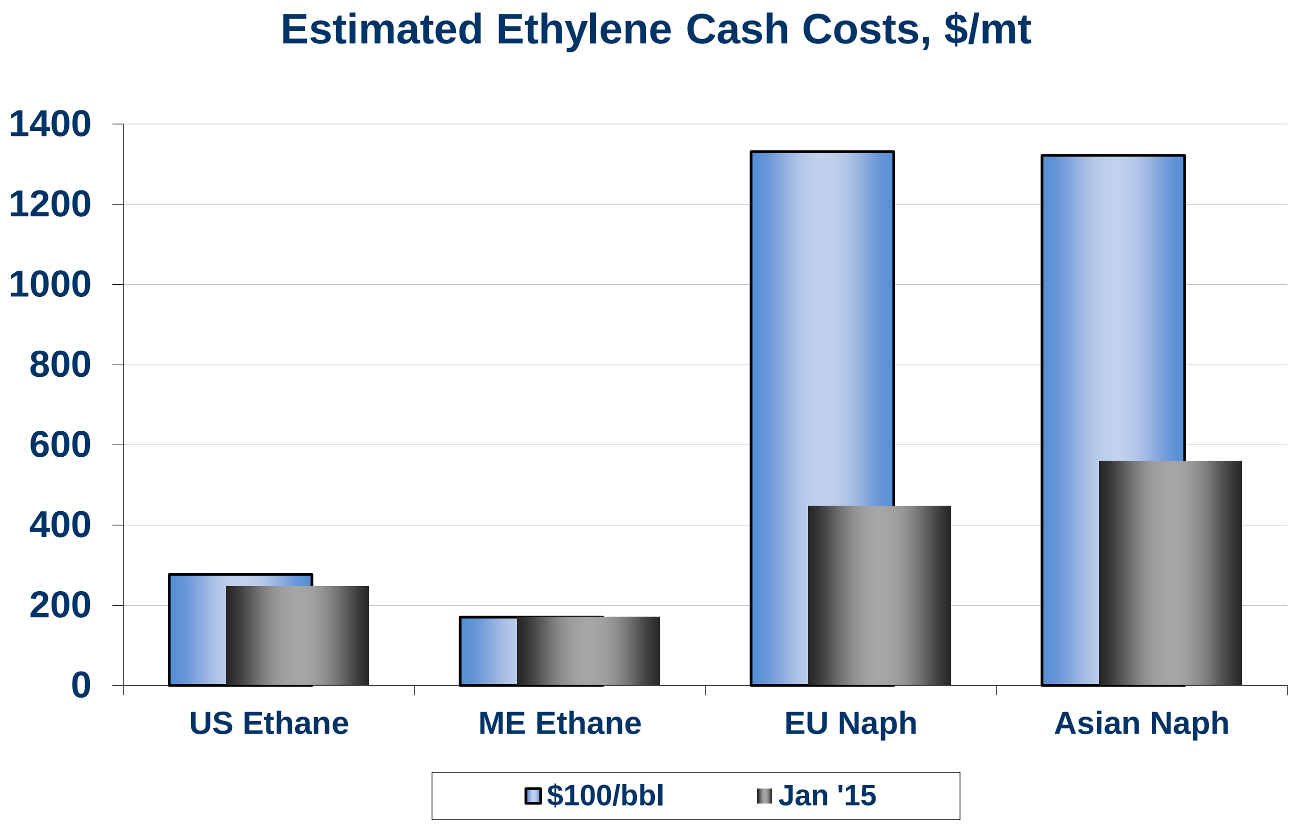
US ethane very competitive with ROW at $100/bbl



US ethane very competitive with ROW at $100/bbl



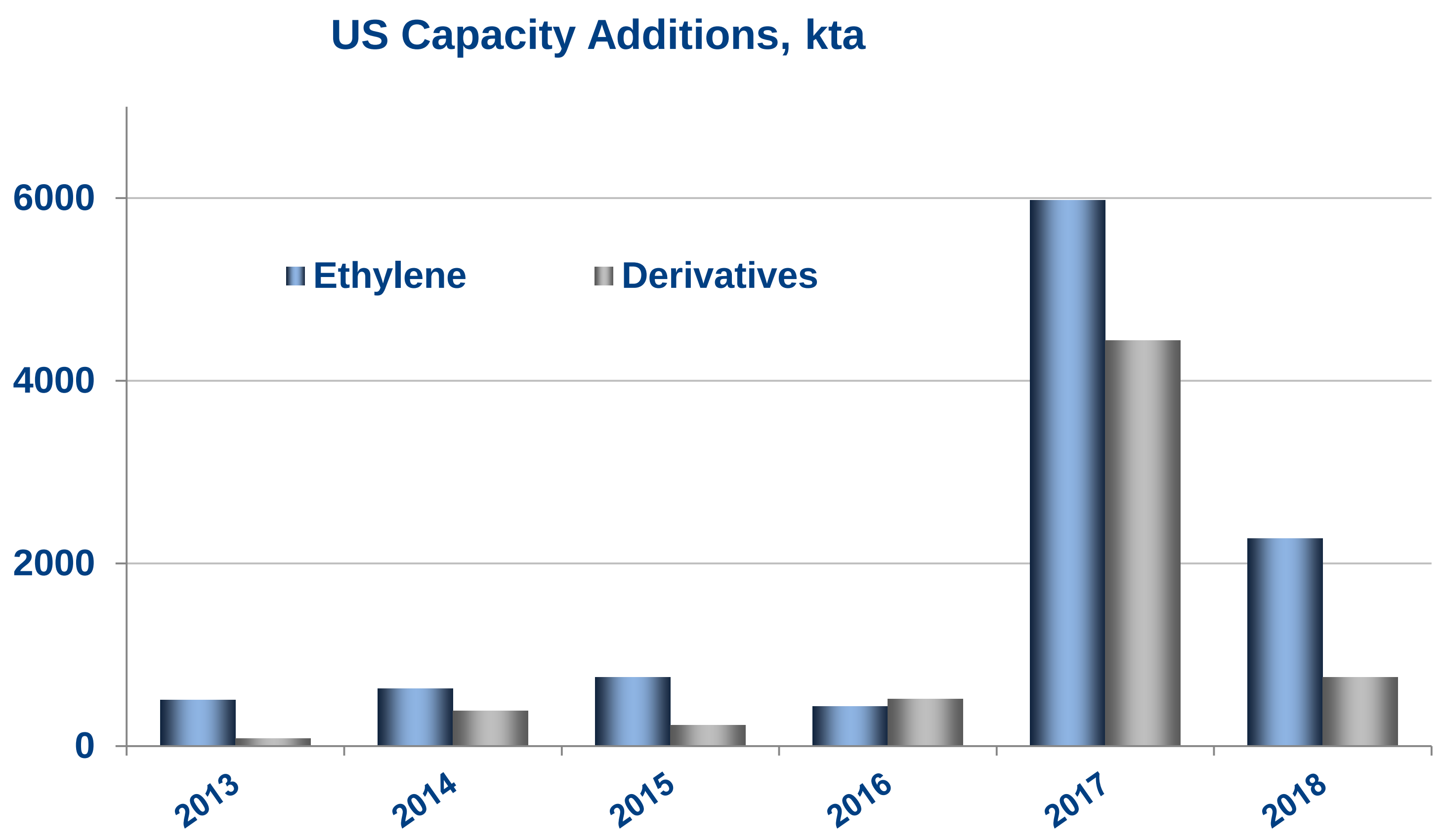
Ethane advantage squeezed at $50/bbl



A few cracker expansions remain...then new builds

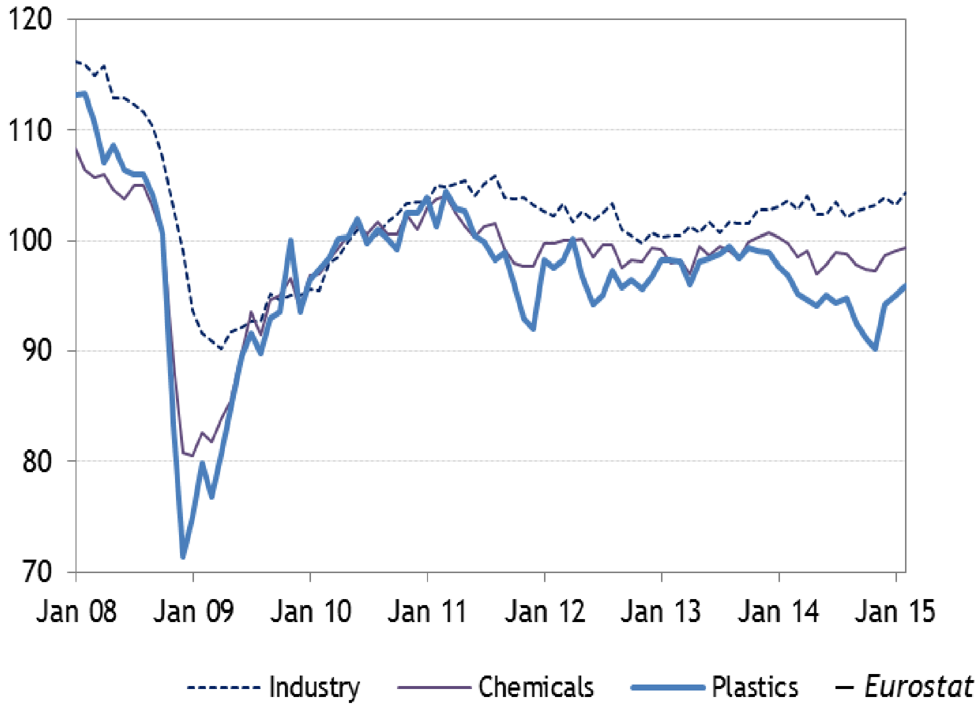
Company	Site	2013	2014	2015	2016	2017-2018	2018 +
Dow	Hahnville, LA	360					
Westlake	Lake Charles, LA	110			114		Shell
Westlake	Calvert City, KY		90				Aither
Ineos	Chocolate Bayou, TX		115				Appalachian Resins
Williams	Geismar, LA		270				Formosa
LyondellBasell	LaPorte, TX		380				Axiall + Lotte
LyondellBasell	Channelview, TX			113		250	IVL
LyondellBasell	Corpus Christi, TX				363		Sabic
BFLP	Port Arthur, TX		190				Odebrecht/Braskem
CP Chem	Cedar Bayou, TX			100		1500	Siluria
CP Chem	Sweeny, TX (#33)		90				Hanwha
Formosa	Point Comfort, TX					1500	TOTAL
ExxonMobil	Baytown, TX					1500	Badlands
Dow	Freeport, TX					1500	PTTGC/Marubeni
Sasol	Lake Charles, LA					1500	
Oxy/Mexichem	Ingelside, TX					500	
Shin-etsu	Plaquemine, LA					500	
New Capacity, Year		470	1135	213	477	8750	
Cumulative	KTA	470	1605	1818	2295	11045	
	Bill lb/yr	*1.0*	*3.5*	*4.9*	*5.1*	*24.4*	
	Ethane MB/D Incremental	28	68	13	29	495	
	Ethane MB/D Cumulative	28	96	109	138	628	

Derivatives expansions lag cracker expansions



In Europe ethylene demand remains below the pre-crisis levels

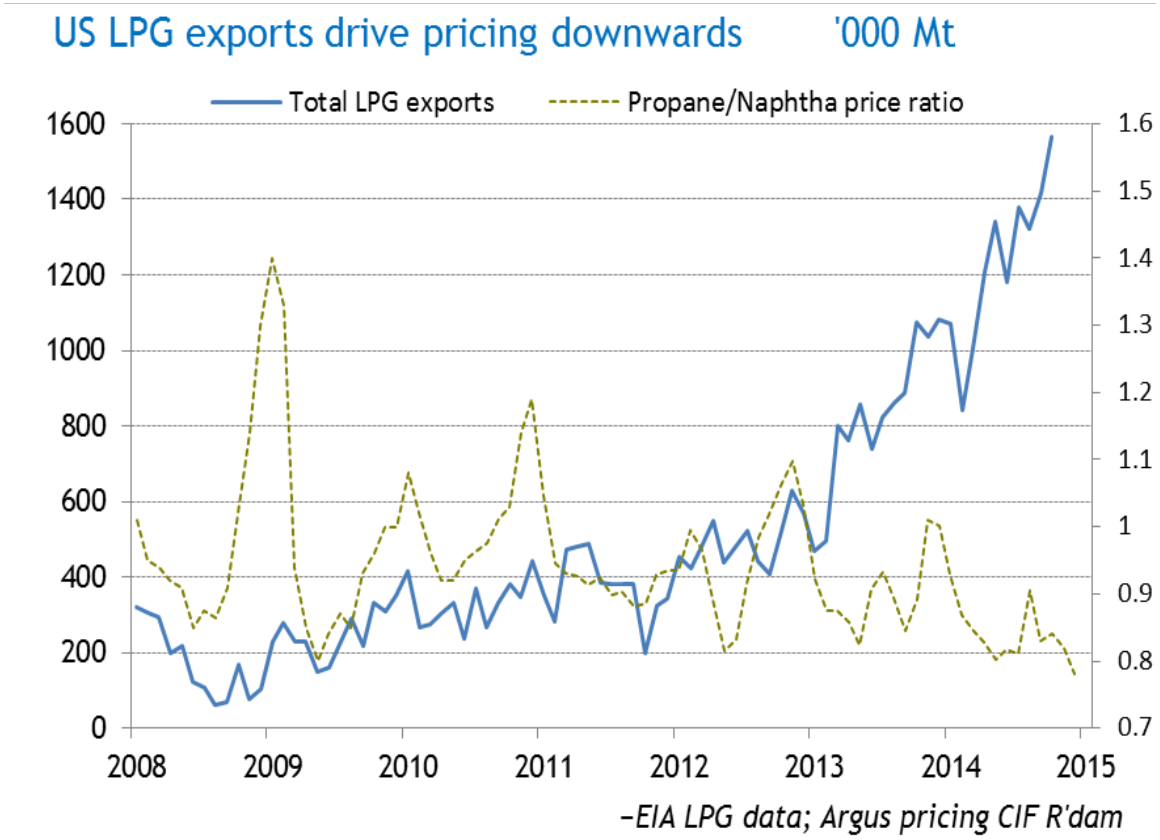
EU17 Production index for chemicals and plastics



- Industrial production lags 10pc behind pre-crisis peak.
- Plastics output lags further behind – vulnerable to price volatility
- Construction slowly recovering
- Automotive is showing 6pc yr-on-yr growth but remains 14pc behind 2008.
- Average cracker operating rates 2014 – 85/90pc - although higher in 2015.

argus DeWitt
argusmedia.com

But the abundance of shale gas exports is also creating opportunities in Europe and in Asia to share in the benefits



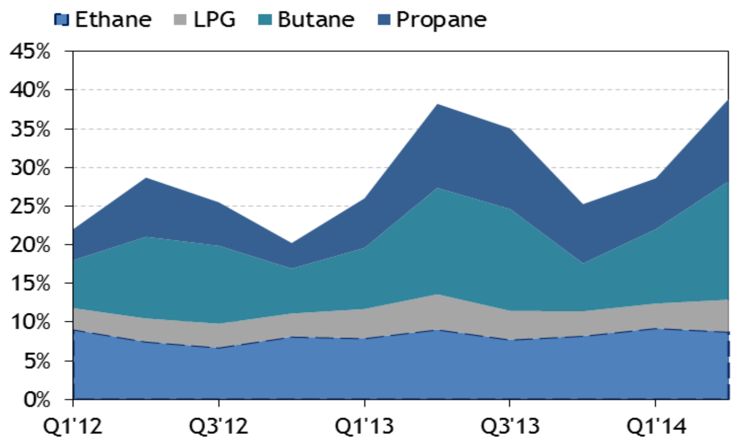
- US LPG exports have grown 3-fold since the start of 2012
- Large cargo propane pricing has fallen sharply as exports grow.
- Large cargo butane prices are also highly competitive

Allowing European producers to invest in flexibility - maximizing light feeds

- 40pc of European ethylene made from “light feeds”
  - Growth coming from propane and butane

- Ethane set to grow
  - Ineos, Borealis and Sabic have US supply deals
    - others still reviewing options
  - 12 on purpose ethane carriers (27,500-36,000cbm) on order
  - Operational late 2015 – 2016.
  - In total, over 70Mbbl/d of ethane going to Europe

Quarterly west European ethylene make from light feeds

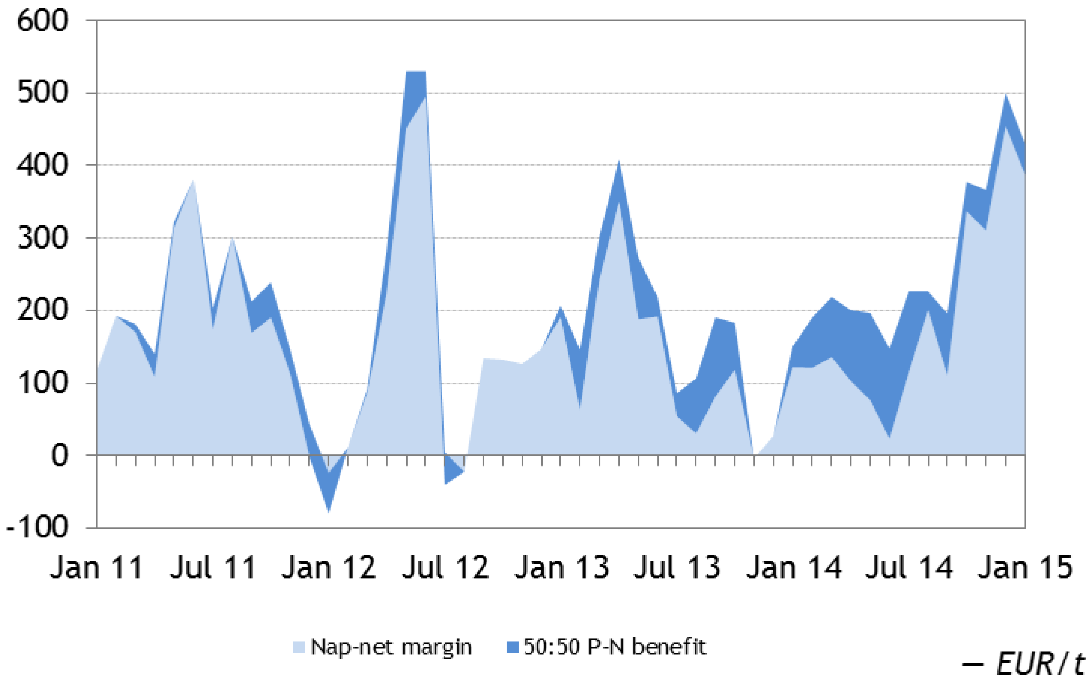


— *Petrochemicals Europe / Argus DeWitt*

argus DeWitt
argusmedia.com

Leading to a significant uplift in margin at flexible crackers.

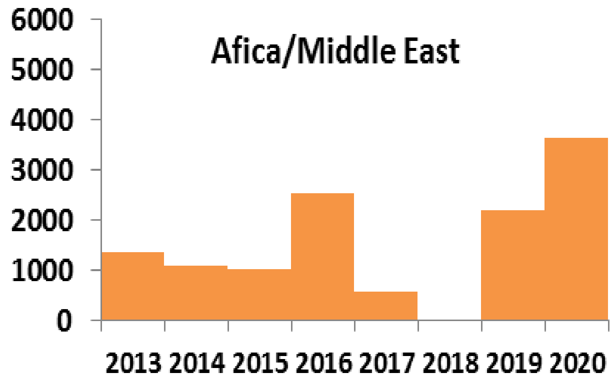
Propane benefit to NWE naphtha cracker margin



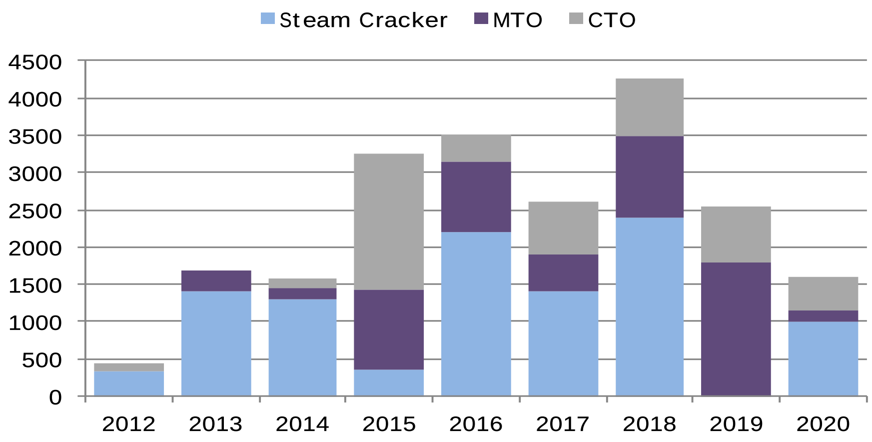
— EUR/t

- Net-naphtha margins based on a fully integrated pipeline unit.
- Significant benefit in recent months if there is flexibility to optimally crack 50pc propane
- Even greater benefit for those who can push to 70pc propane.

Middle-Eastern olefins producers face margin compression in export sales due to new low-cost US competition



Chinese ethylene capacity expansions ….MT

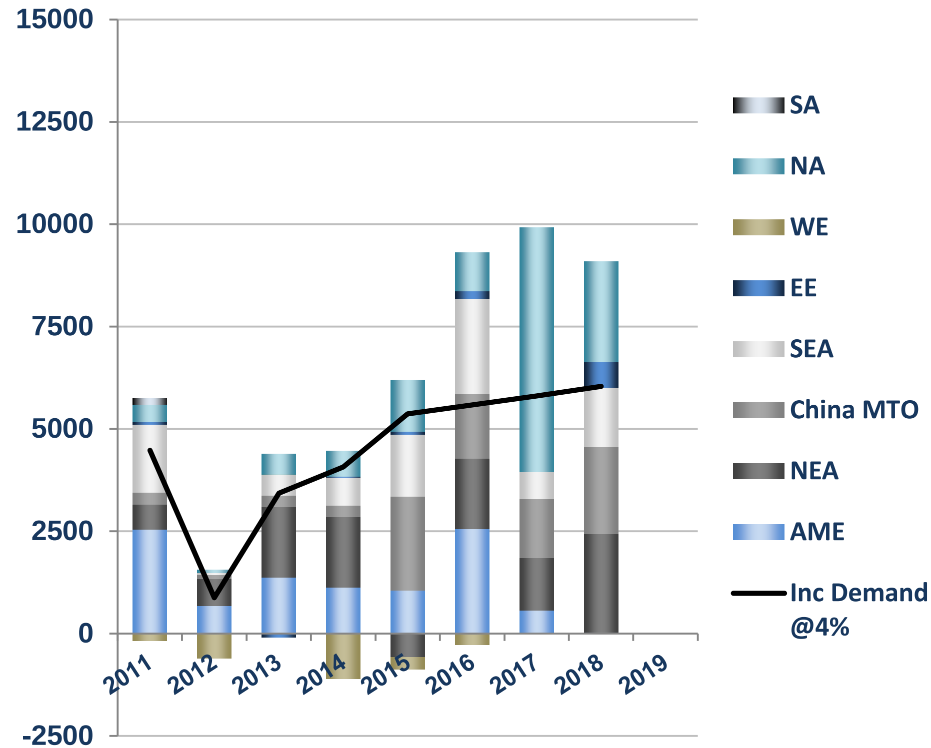


- While in the key Chinese market, competitive advantage will also be eroded by new domestic CTO/MTO production.
- Along with major expansions of PE capacity
- Leaving the ME with a relatively small capacity expansion program compared to the past

Global capacity set to outpace demand

- AME activity slows
- China cracker building slows but MTO/CTO major factor
  - o 2 crackers in 2016
  - o More than 2mil tons from methanol and coal in 2015
- India adds 3 crackers in 2015 another in 2016
- WE contraction continuing
- EE planning for 2018 (2)
- NA
  - o Mexico in 2015
  - o US wave in 2017/2018
  - o Possible expansions in Canada

Global Annual Incremental Capacity and Demand, kta

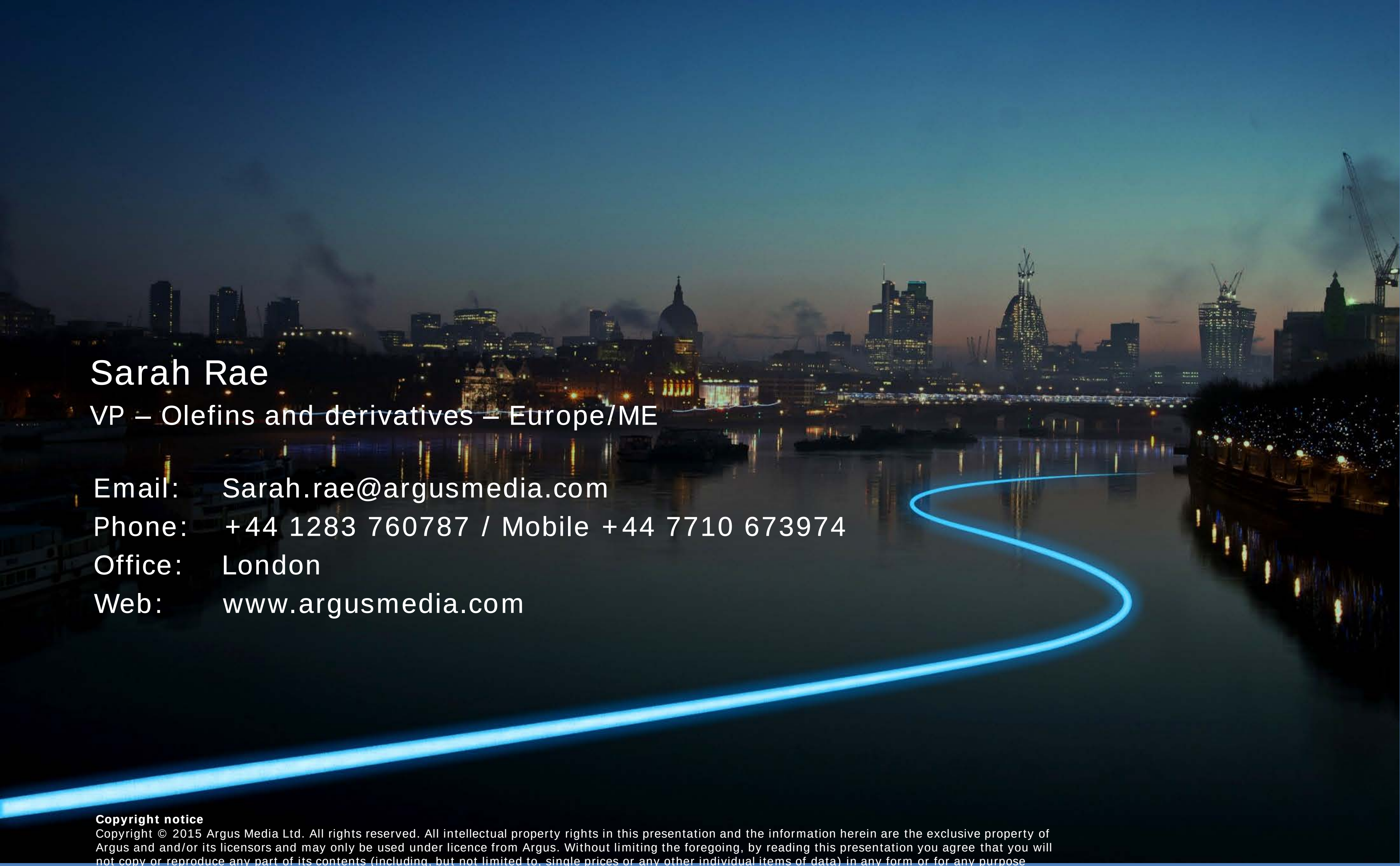


Conclusions

- The USA - even with lower oil prices – has a major cost advantage due to abundant supplies of shale – gas
  - Capacity expansion plans go beyond local needs and producers are targeting international markets for derivative exports
  - Projects could be delayed or threatened by low oil prices

- Europe is responding to global competition by rationalising older capacity and investing in alternative feedstock
  - A slow economic recovery will hold-back domestic demand but the weak Euro will open export opportunities for pet-chems

- Middle-East producers are facing up to the twin threats from USA and China by
  - Focusing on full chain integration from crude to petrochemicals
  - Diversifying from bulk commodities to higher value products
  - Driving the development of a domestic downstream market
- Asia
  - Supply additions will exceed demand growth, forcing lower operating rates reducing and China's reliance on import; this will put pressure initially onto other Asian producers and then the Middle-East



Sarah Rae

VP – Olefins and derivatives – Europe/ME

Email: Sarah.rae@argusmedia.com

Phone: +44 1283 760787 / Mobile +44 7710 673974

Office: London

Web: www.argusmedia.com

argus DeWitt

argusmedia.com