



The impact of a changing energy landscape on petrochemical industry

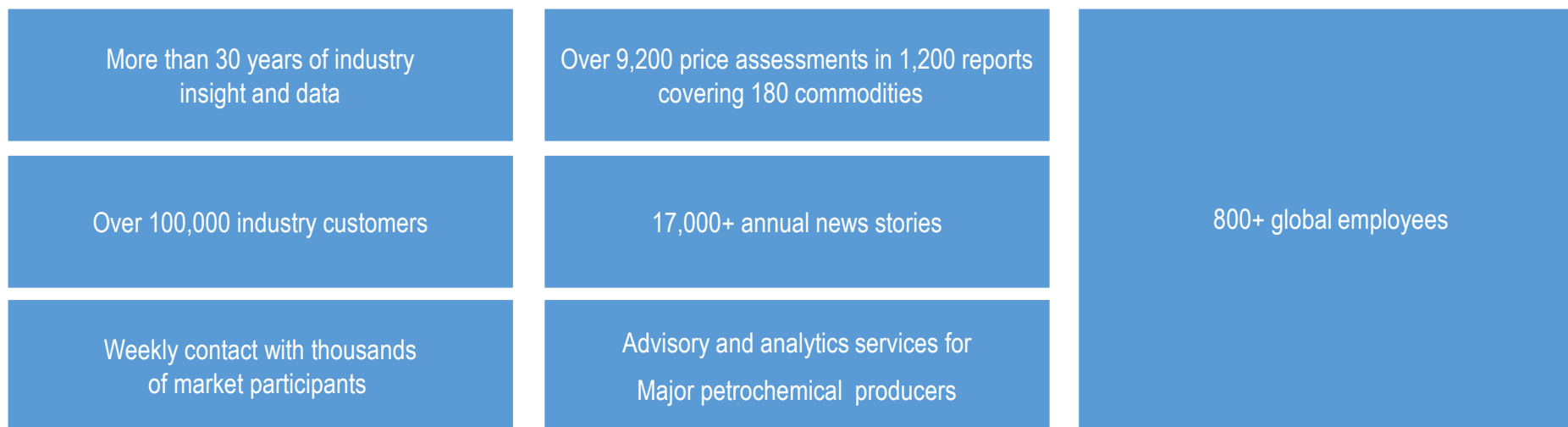
26 February 2017

Muhamad Fadhil
Head of Middle East Markets
ICIS



About ICIS

ICIS provides price benchmarks, fundamentals data, analytics and advisory services for the global petrochemical, energy and fertilizer markets.



Our Customers



Key customers are buyers, sellers, traders, brokers, analysts and senior commercial management in companies who participate in these markets.



Key use cases:

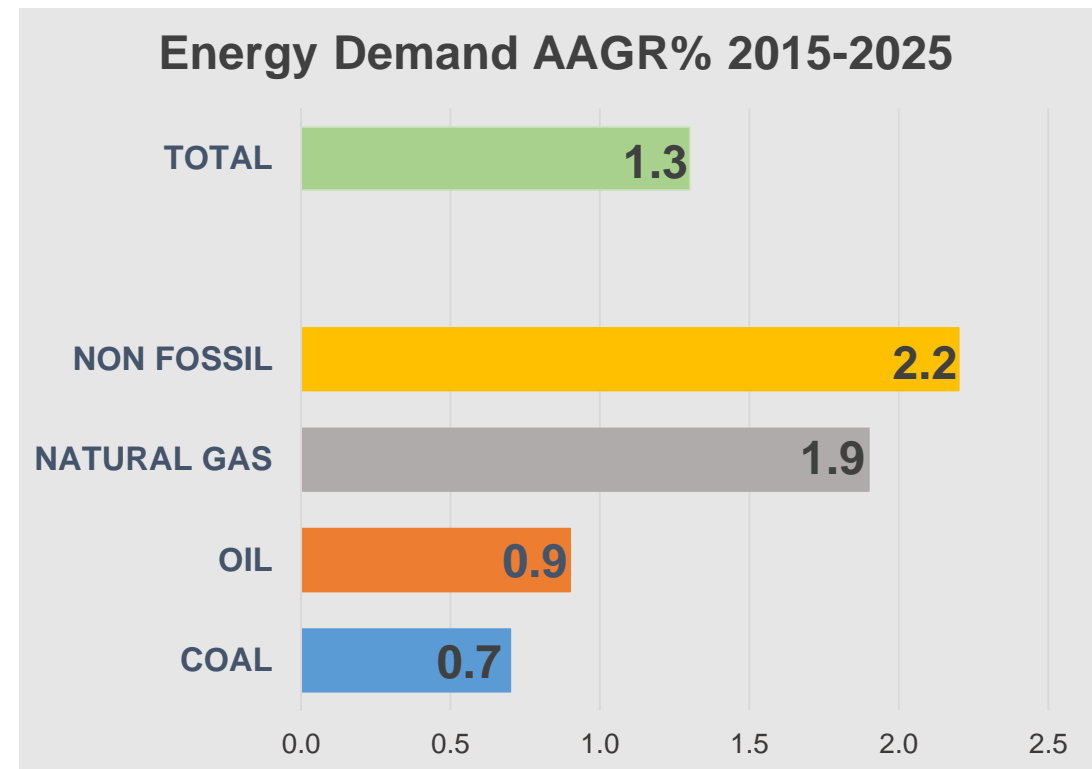
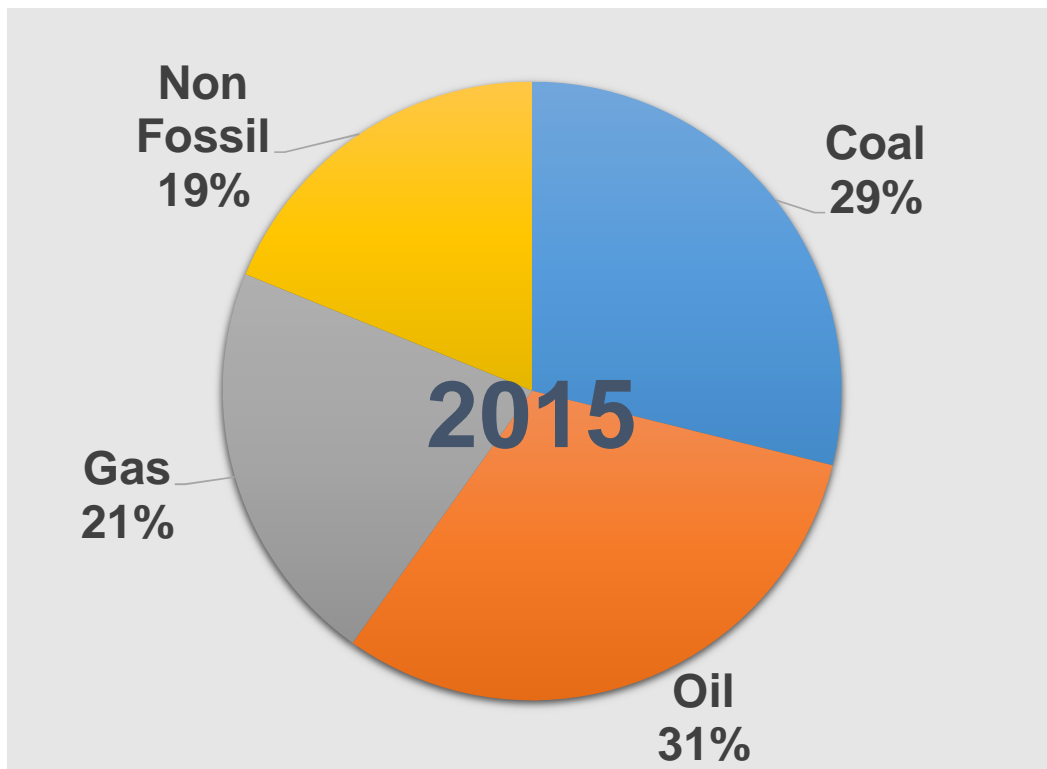
- Pricing transactions – writing long-term contracts
- Setting short-term trading strategy
- Planning long-term market entry, project feasibility

Global Presence, Local Insight



Energy

Global energy demand is growing, but not very fast



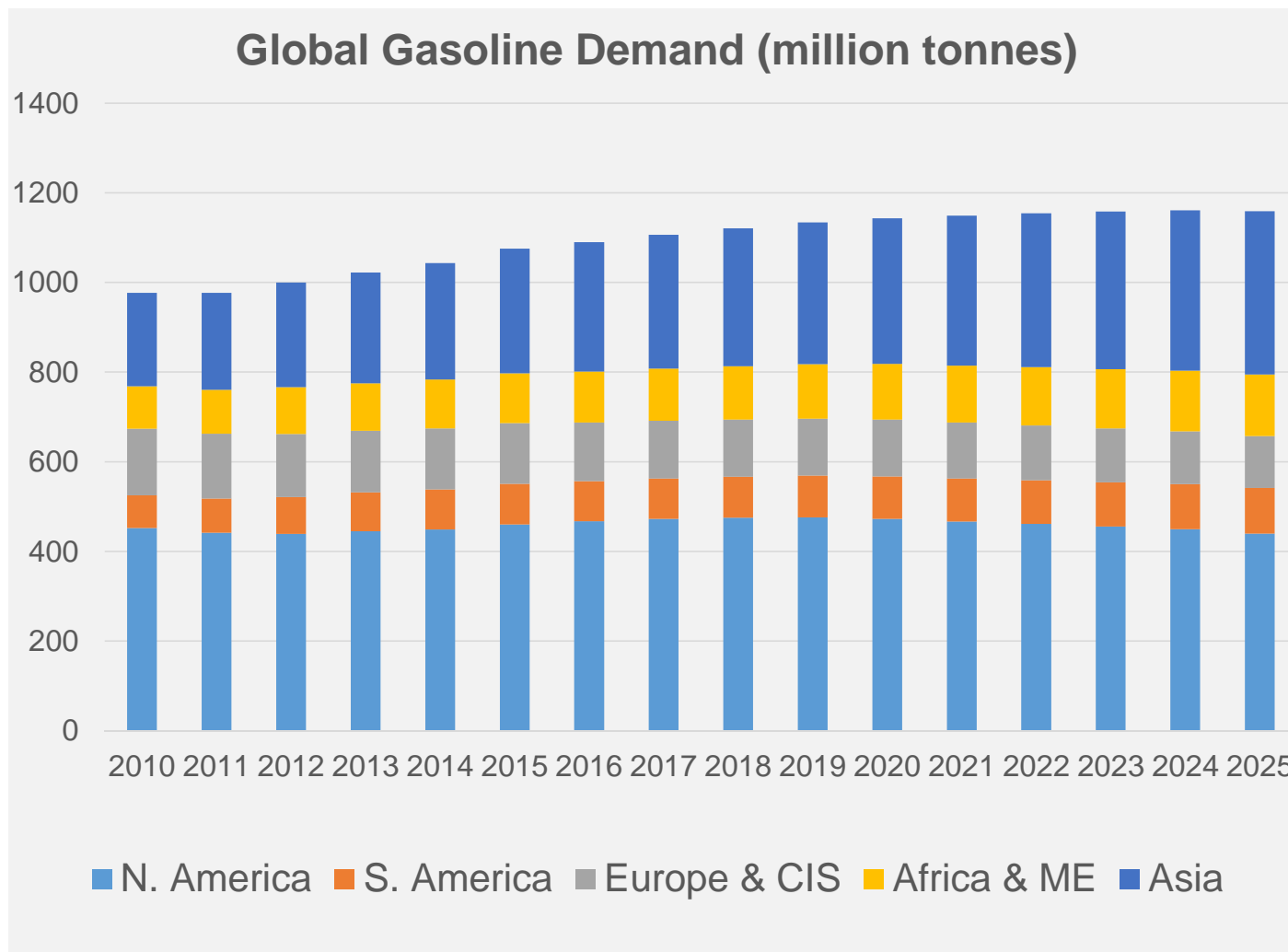
Clean energy

- ▶ A greater push toward clean and renewable energy
- ▶ Will clean energy impact hydrocarbon consumption?
- ▶ In the automotive space, a push for clean energy cars
- ▶ Autonomous driving could lead to fewer cars through “shared driving”

Clean Energy
Renewable
Solar
Geothermal
Wind

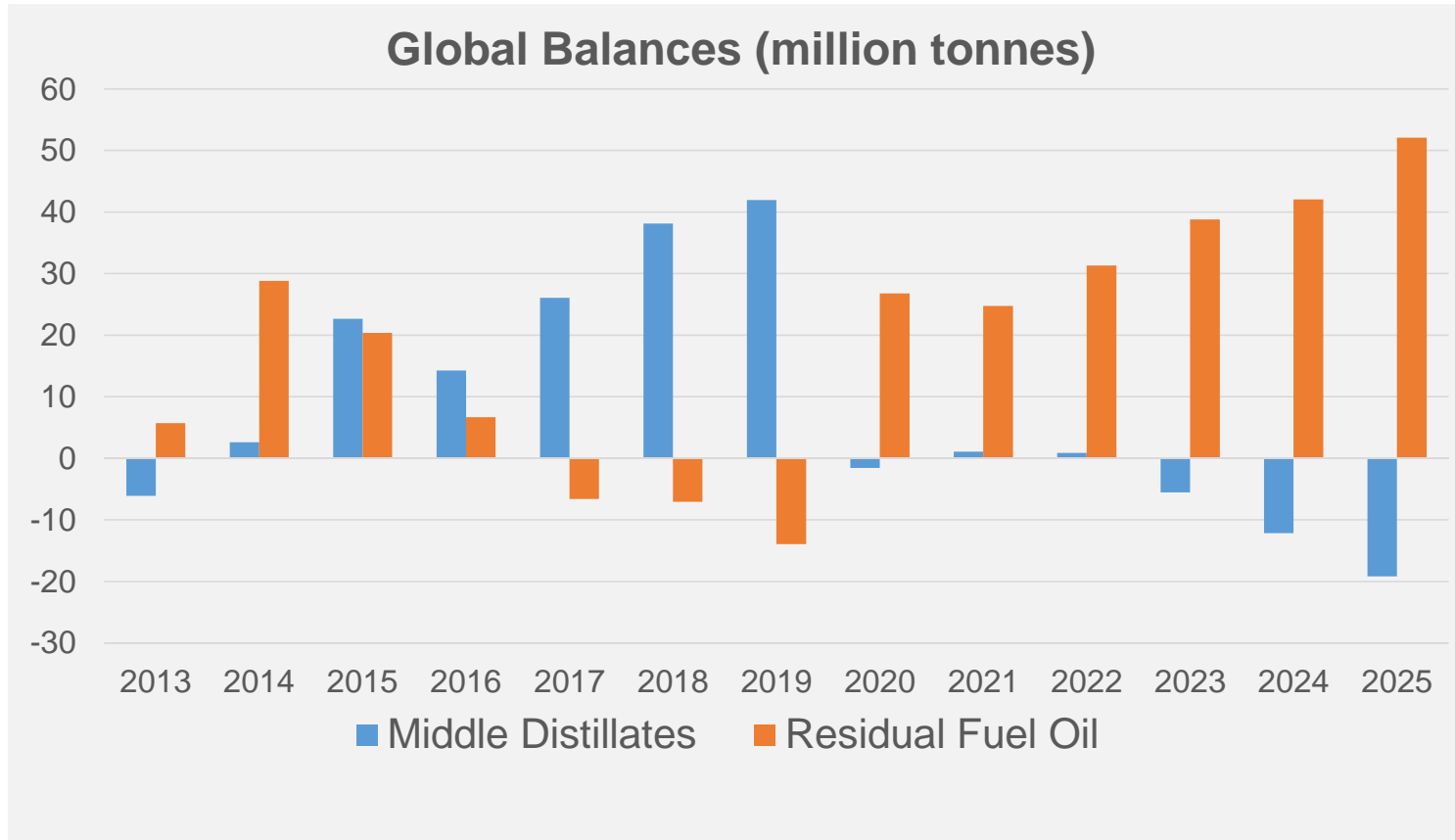
Gasoline Demand

- ▶ Gasoline demand will gradually flatten
- ▶ Sensitivities are for a decline
- ▶ Not a welcome development for refiners



Source: ICIS Supply and Demand Database

New IMO regulations may hit fuel oil market



- ▶ Implementation of IMO regulations for lower sulphur bunker fuels could be anticipated to 2020
- ▶ The global refining industry could suddenly move from a surplus of conversion capacity to a surplus of fuel oil

Source: ICIS Supply and Demand Database

www.icis.com 8

Challenges

- ▶ Limit global warming to 1.5 degrees Celsius by the end of the century
- ▶ How do you encourage investment in clean energy projects?
- ▶ 2015 Paris Agreement and Keystone Pipeline
- ▶ Resistance for move towards renewable sources of energy such as solar and wind



US



New US administration

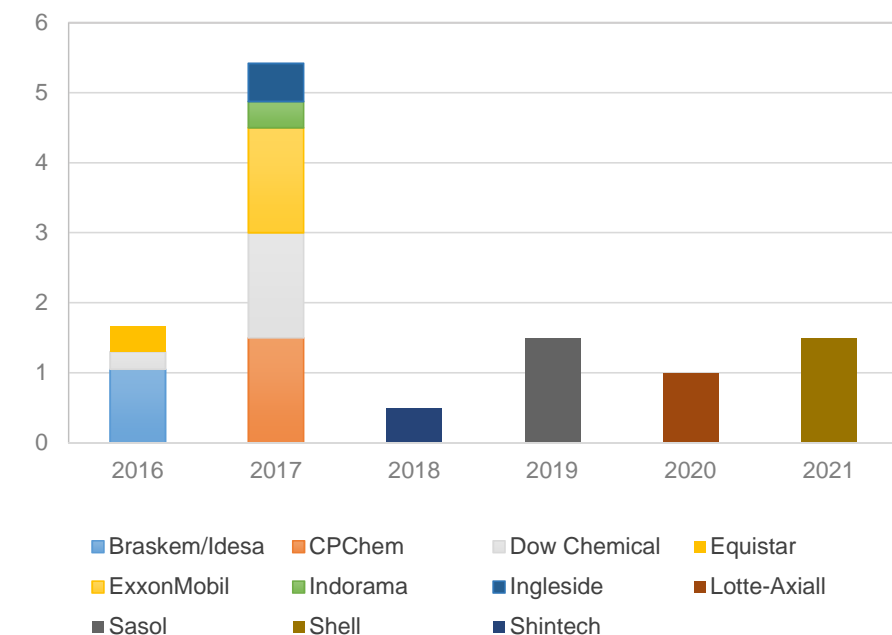
- ▶ Global trade – redrawing the map
 - ▶ Withdrawal from NAFTA
 - ▶ Tariffs on China?
- ▶ Infrastructure boost
 - ▶ Invest \$550m directly in roads, bridges, ports, airports and transit systems
 - ▶ Plus spur \$1 trillion in private investment, financed by tax credits
- ▶ Energy deregulation
 - ▶ ‘Lift the restrictions’ on American energy
 - ▶ Streamline permitting process for all energy projects

North America

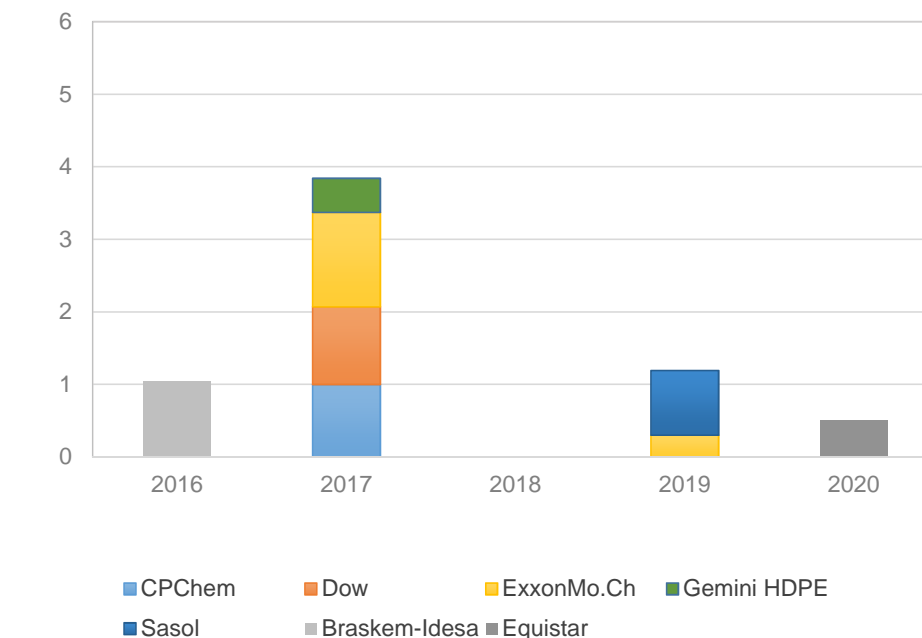


Shale resources fuelled unprecedented investments

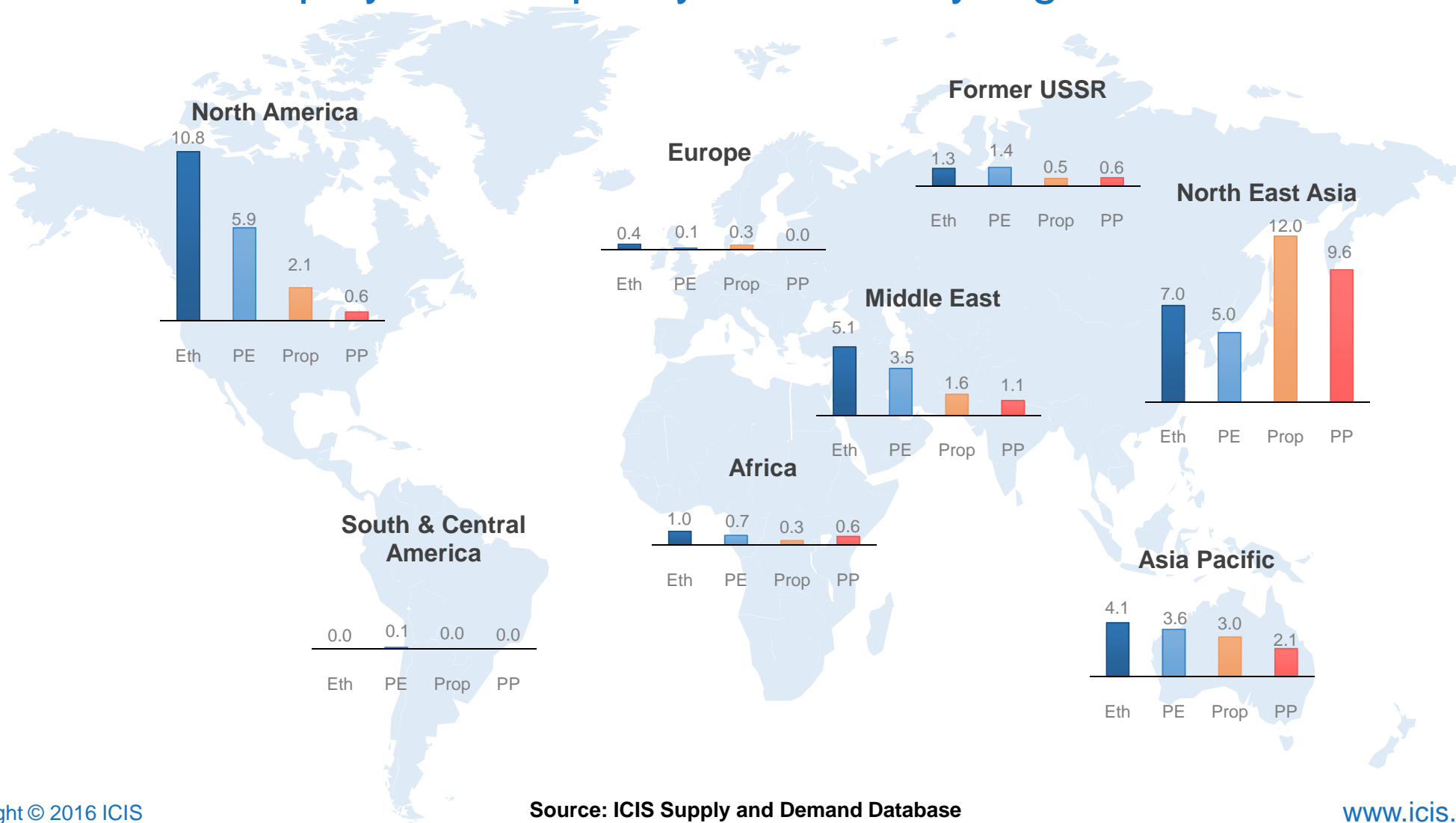
Mt/y North America Ethylene major capacity developments 2016-2020, by company



Mt/y North America PE new plants 2016-2020, by company



World olefins & polyolefin capacity additions by region 2015-2020



New US crackers under construction

Company	C2 capacity (kt/year)	Downstream (kt/year)	Location	Start-Up
Chevron Phillips Chemical	1,500	Bimodal HDPE (500), mLLDPE (400) at Sweeny	Cedar Bayou, Texas	Mid-2017
Dow Chemical	1,500	ELITE PE (400), LDPE (350), EPDM (200), elastomers (320)	Freeport, Texas	Q2 2017
ExxonMobil Chemical	1,500	mLLDPE plus LLDPE (650 x2) at Mont Belvieu	Baytown, Texas	H2 2017
Occidental/ Mexichem	544	Feed existing VCM plant of 1,050	Ingleside, Texas	Q1 2017
Formosa Plastics	1,250	PE (525), LDPE (625.5), MEG (1,000), plus DEG, TEG, PEG	Point Comfort, Texas	H1 2018
Sasol	1,500	LDPE (450), LLDPE (450), EO/EG (300), ethoxylates, detergent alcohols (300)	Lake Charles, Louisiana	H2 2018 LDPE early 2019 Others H2 2019
Westlake (Axiall)/Lotte	1,000	MEG (700) by Lotte, feed into existing PVC for Westlake	St Charles, Louisiana	Q4 2018
Shintech	500	VCM (300), PVC (300), caustic soda (200)	Plaquemine, Louisiana	2018
Shell	1,500	HDPE/LLDPE (550 x2), HDPE (500)	Monaca, Pennsylvania	Early 2020s

9 new crackers = 10.8m tonnes/year
Through 2018 = 9.3m tonnes/year

Expansions of existing US crackers, plus 1 restart

Company	Capacity (kt/year)	Location	Status/Start-Up
Westlake Chemical	113	Lake Charles, Louisiana	Started up late July 2016
LyondellBasell	363	Corpus Christi, Texas	Nov 2016
Dow Chemical	250	Plaquemine, Louisiana	Late 2016
Westlake Chemical	32	Calvert City, Kentucky	H1 2017
Indorama (restart)	370	Lake Charles, Louisiana	End 2017
LyondellBasell	250	Channelview, Texas	On hold for early 2020s

**Expansions about 1m tonnes/year +
new crackers 9.3m = 10.3m, or 36% of existing US capacity by 2018**

The 2nd wave?

Company	Capacity (kt/year)	Downstream (kt/year)	Location	Start-up	Status
Total	1,000	None – to meet derivative needs	US Gulf Coast	NA	Feasibility
PTT Global Chemicals	1,000	HDPE (700), MEG (500), EO (100)	Belmont County, Ohio	2021	Feasibility, FID Q1 2017
Formosa Plastics	1,200	LDPE, HDPE, EG	Louisiana	NA	Feasibility
Odebrecht/Braskem	1,050	PE (3 units)	Wood County, West Virginia	NA	On hold
SABIC/ExxonMobil	1,800	NA	US Gulf Coast	NA	In talks



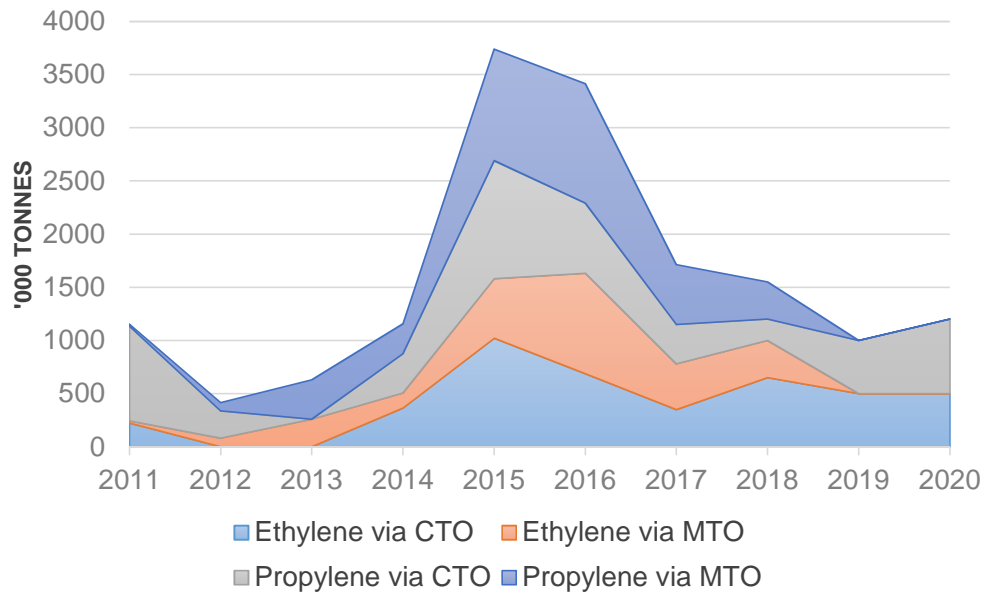
China



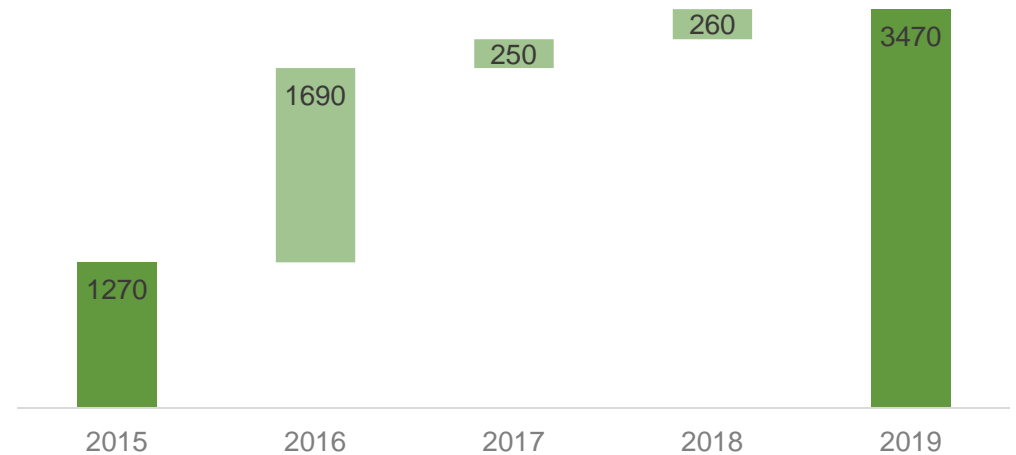
China

Huge investments in CTO/MTO technologies, and PDH, but delays emerge

Estimated CTO/MTO Additions in China



New propylene capacity ex PDH (thousand metric tonnes/year)



*Capacity is pro-rated according to the plant start up date

China CTO/MTO ethylene less than expected

Company	Location	Facility	C2 capacity ('000 tonnes/yr)	C2 downstream capacity ('000 tonnes/yr)	Start-up schedule
Shenhua Coal to Liquid and Chemical Co	Urumqi, Xinjiang	CTO	300	270 LDPE	Started - Sep 2016
Zhong Tian He Chuang Energy	Erdos, Inner Mongolia	CTO	670	370 LDPE, 300 HDPE/LLDPE	Started - Oct 2016
Qinghai Salt Lake Industry	Golmud, Qinghai	CTO	160	300 PVC	End 2016
Jiangsu Sailboat Petrochemical	Lianyungang, Jiangsu	MTO	370	300 EVA/LDPE, 180 EO, 20 MEG	End 2016/Q1 2017
Fund (Changzhou) Energy & Chemical	Changzhou, Jiangsu	MTO	165	None	No firm date, could be end 2016/2017
Jiutai Energy Inner Mongolia Co	Erdos, Inner Mongolia	CTO	250	250 HDPE/LLDPE	2017
Zhong'an Lianhe Coal Chemical	Huainan, Anhui	CTO	350	350 HDPE/LLDPE	2017
Shanxi Coking (Group) Co	Hongdong, Shanxi	CTO	300	300 HDPE/LLDPE	2017
Qinghai Damei Coal Industry Co	Xining, Qinghai	CTO	300	300 HDPE/LLDPE	2017
Qinghai Mining	Haixi, Qinghai	CTO	300	300 HDPE/LLDPE, 100kt/yr OCU	2017

Total new C2 supply: 3,165

Changing Scenes of Asian Petrochemical World

India

- ▶ Among the fastest growing Asian petrochemical markets
- ▶ Surplus naphtha but high import dependency for petrochemicals mainly due to “lack of olefins feedstock”
- ▶ “Make In India” intended to drive investment, however is marred by inward looking fiscal policies

Japan and South Korea (ex-China)

- ▶ Matured markets with majors looking for growth in overseas markets
- ▶ Domestic capacities continue on their consolidation path
- ▶ Price setting region due higher cost of production

Southeast Asia

- ▶ Growth initiatives impeded by domestic issues
- ▶ Relatively small market size with most, if not, all capacities requiring export markets to optimize cost of production
- ▶ Buzz at Indonesia continues

Three China scenarios for the next 12-18 months

A likely slowdown in petrochemical consumption growth



Base case – Delayed Reforms

- ▶ The government postpones reforms and the real estate bubble continues. There are plenty of people who still want this to happen

Gradual. Well-Managed Reform

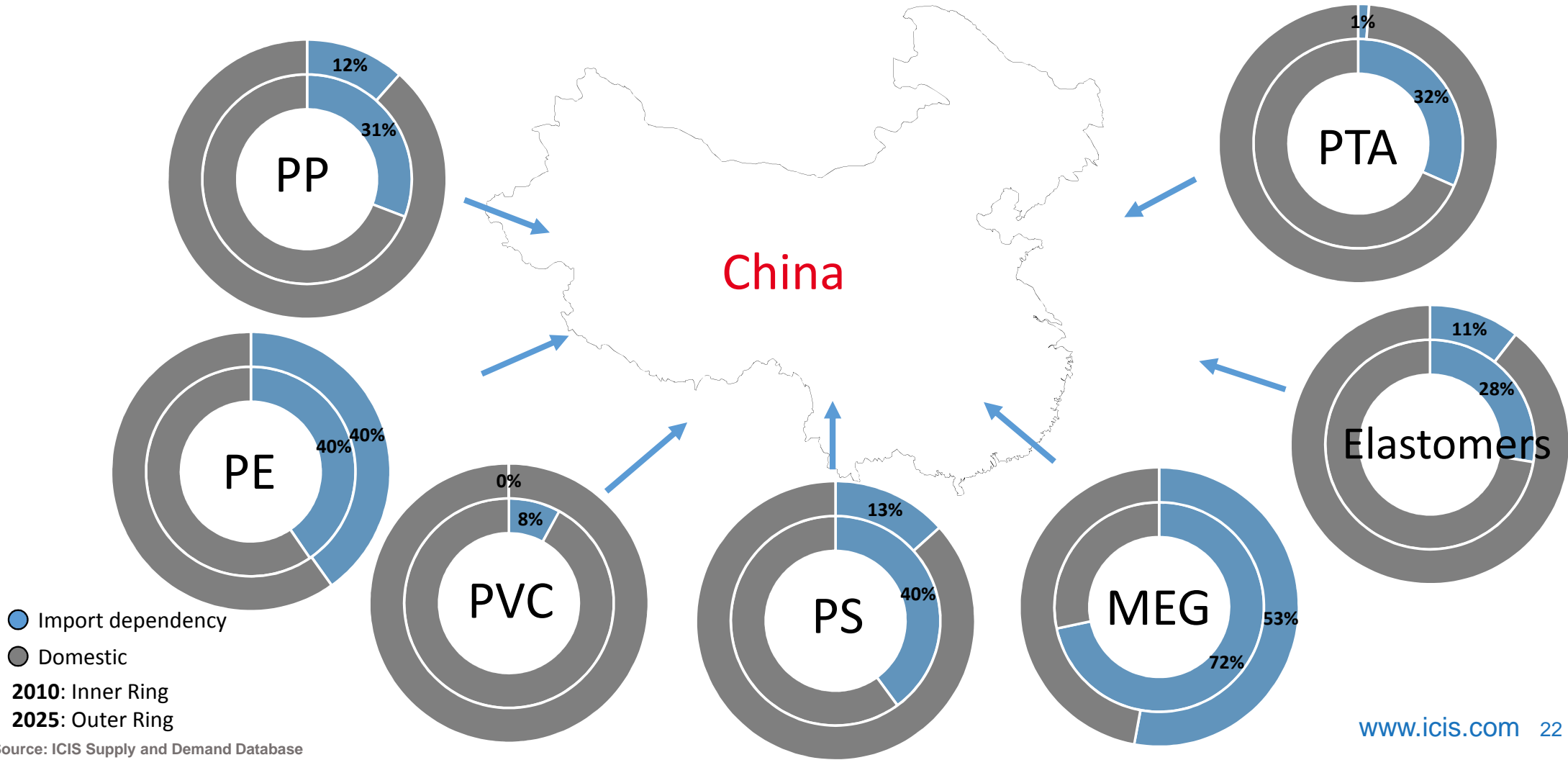
- ▶ Reforms gather pace and we see a slight reduction in crude prices, chemicals prices and chemicals demand as the air is gradually taken out of the bubble

A Collapse In Demand

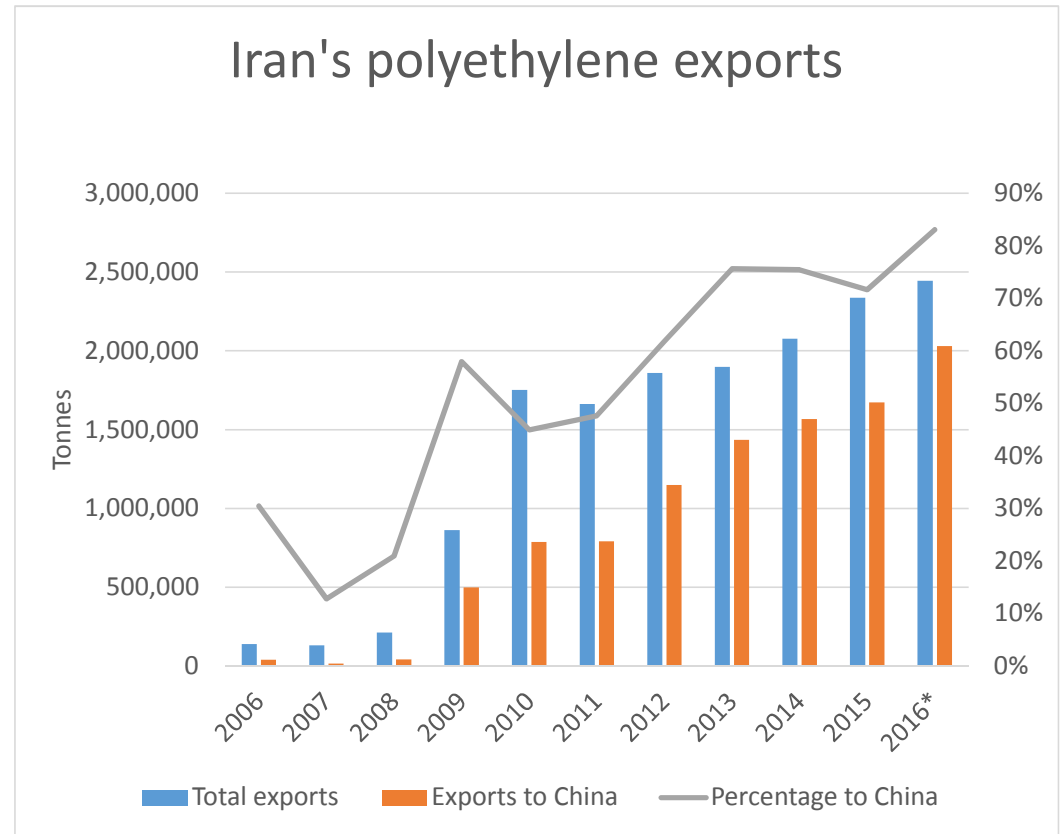
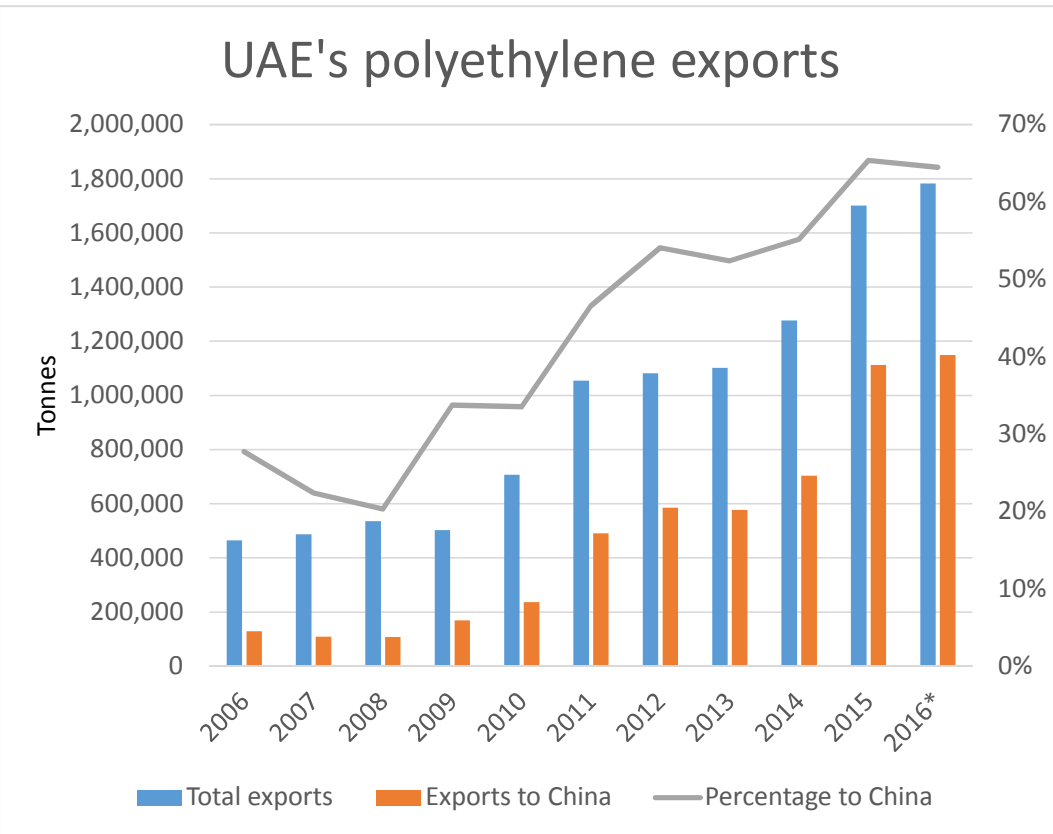
- ▶ A collapse in crude, chemicals prices and demand occurs. Several factors could trigger this, including a financial sector crisis in China and greater global trade tensions on a weaker Yuan

www.icis.com 21

Increasing domestic production moves **China** towards less imports dependent, at least for some products



For some Middle East countries the dependence on China is increasing



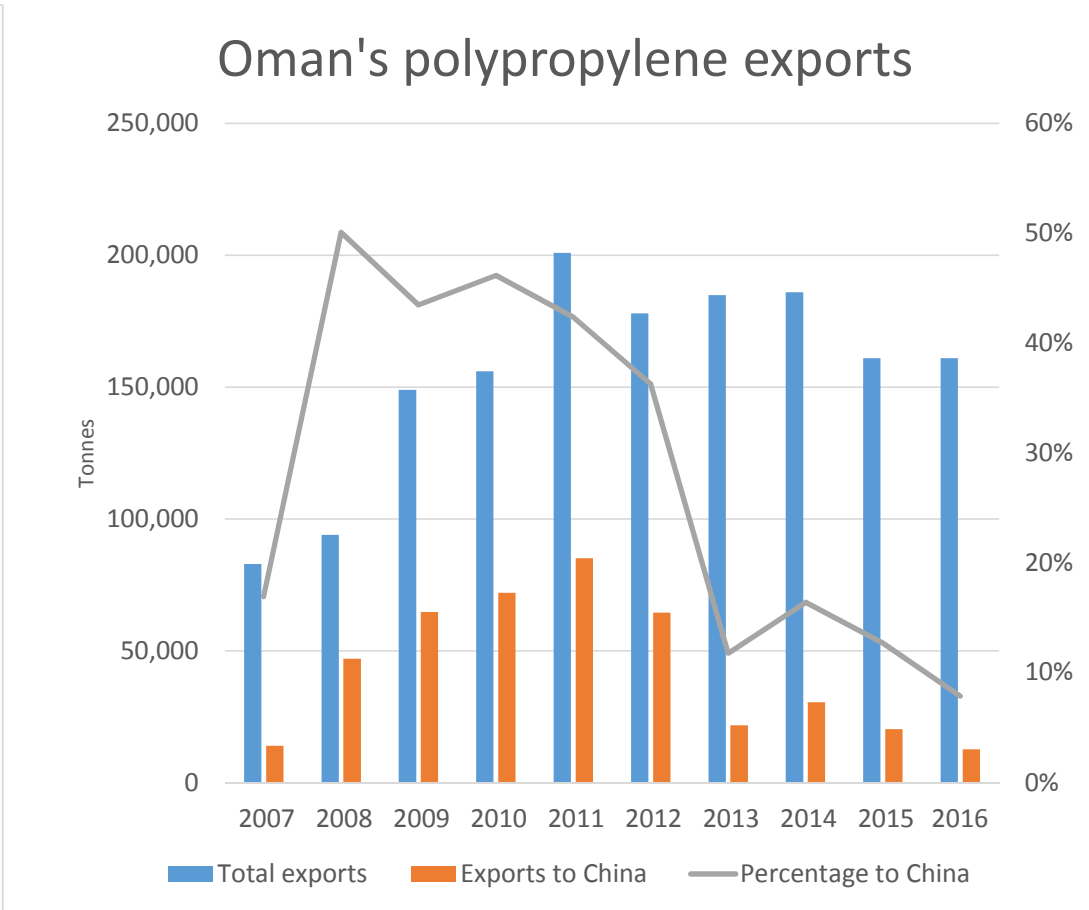
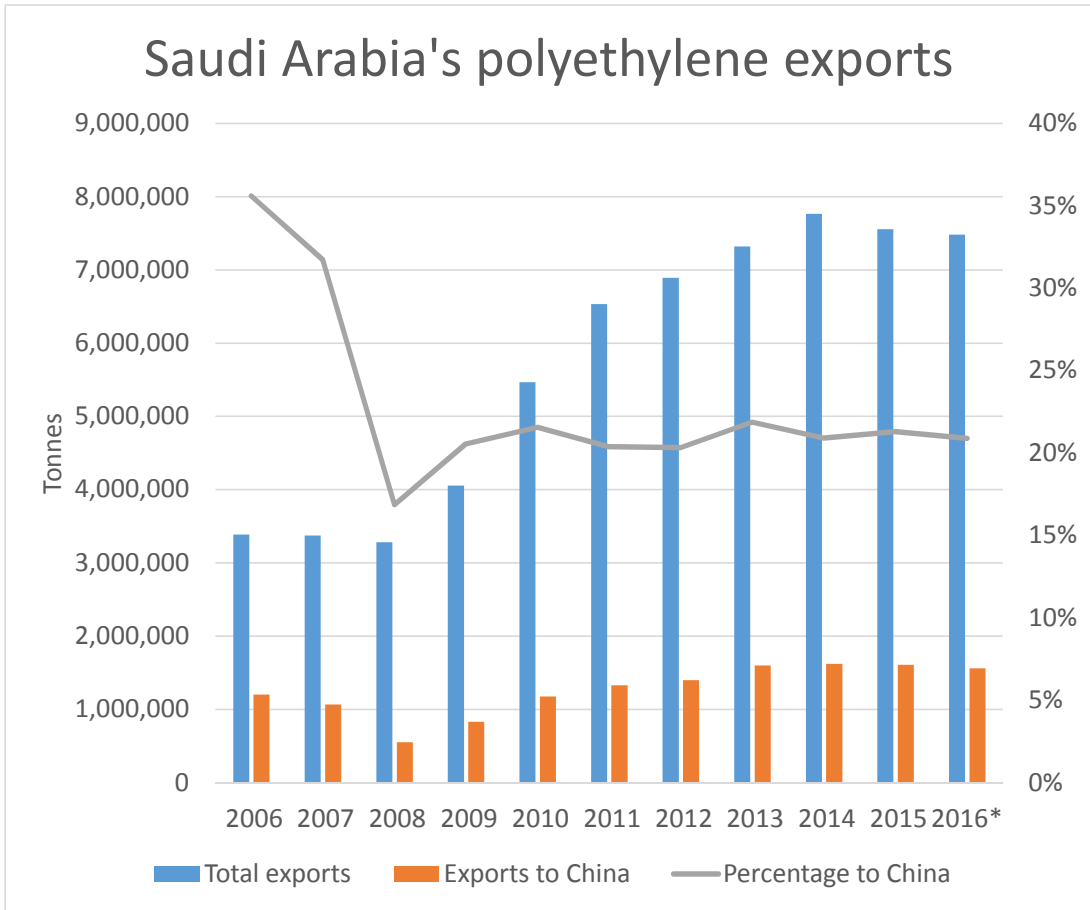
Source: ICIS Supply and Demand Database

*2016 data are estimates

Copyright © 2015 ICIS – Private & Confidential

www.icis.com 23

Progress made to lower the China dependence

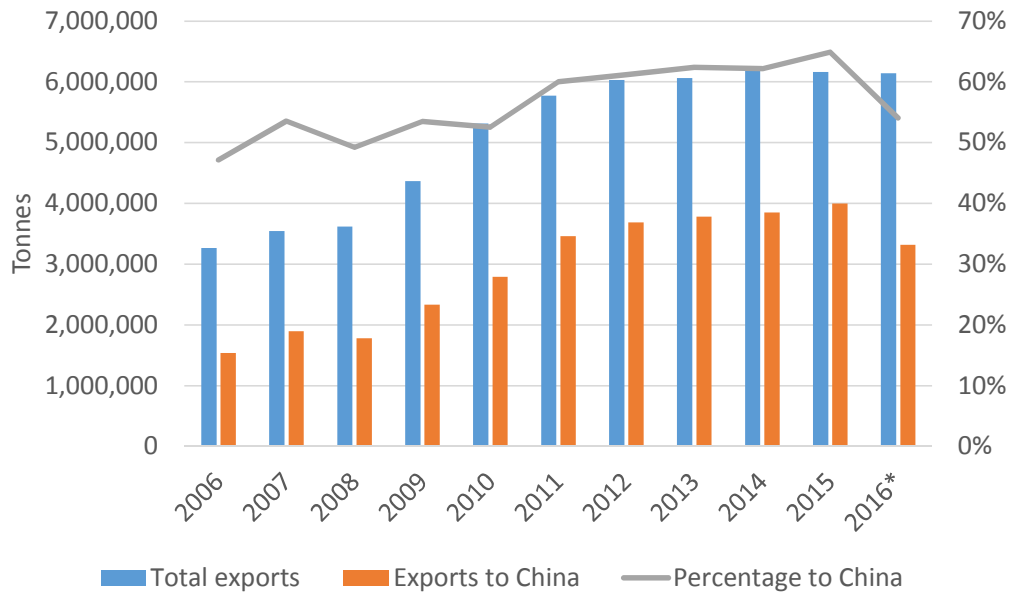


Source: ICIS Supply and Demand Database

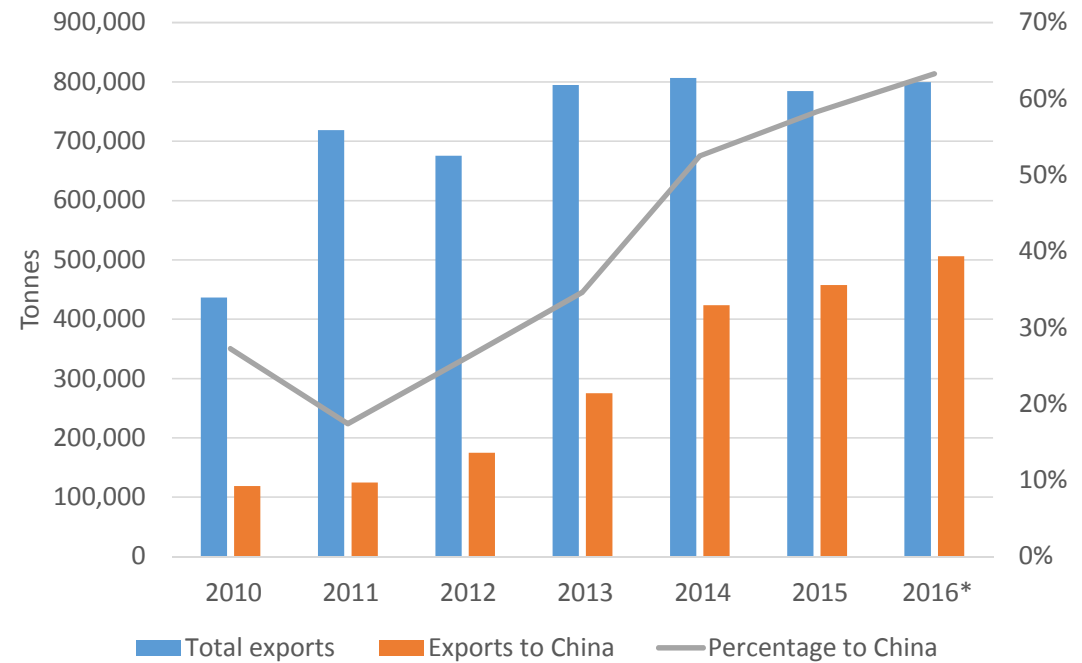
*2016 data are estimates

But in some value chains there are few alternatives to China

Saudi Arabia ethylene glycols exports



Oman paraxylene exports



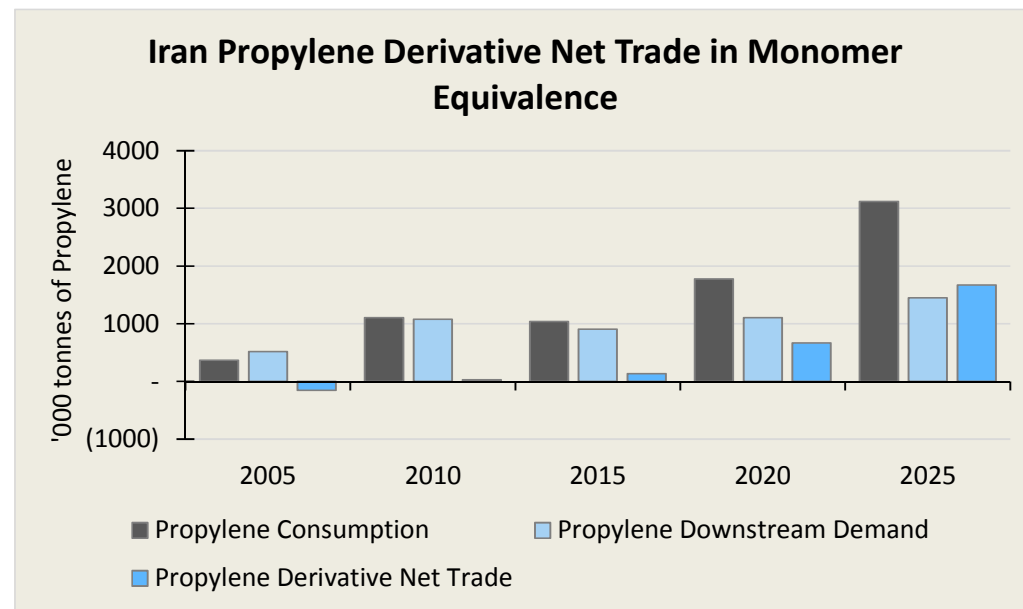
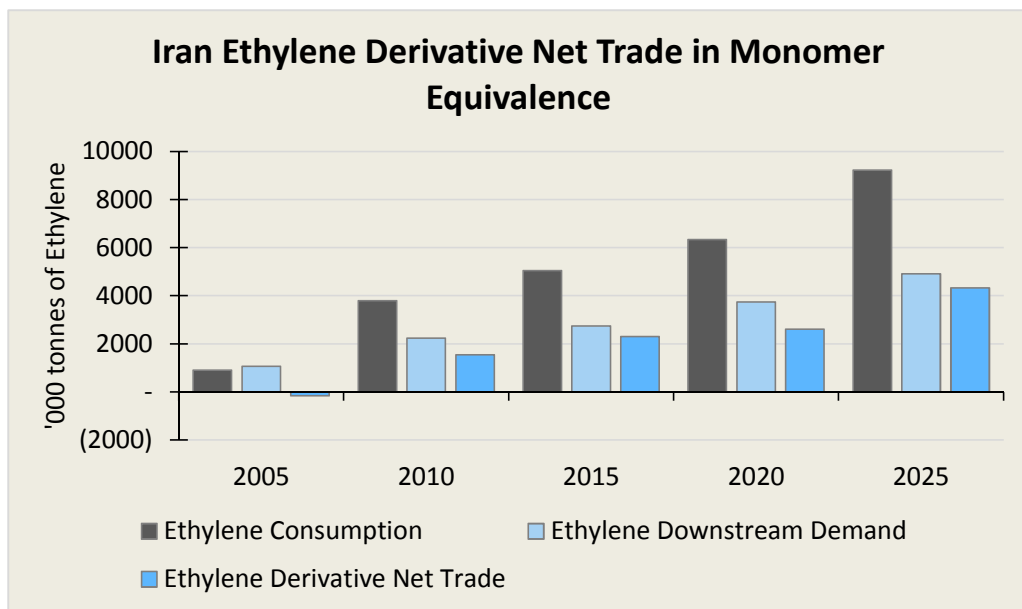
Source: ICIS Supply and Demand Database



Iran



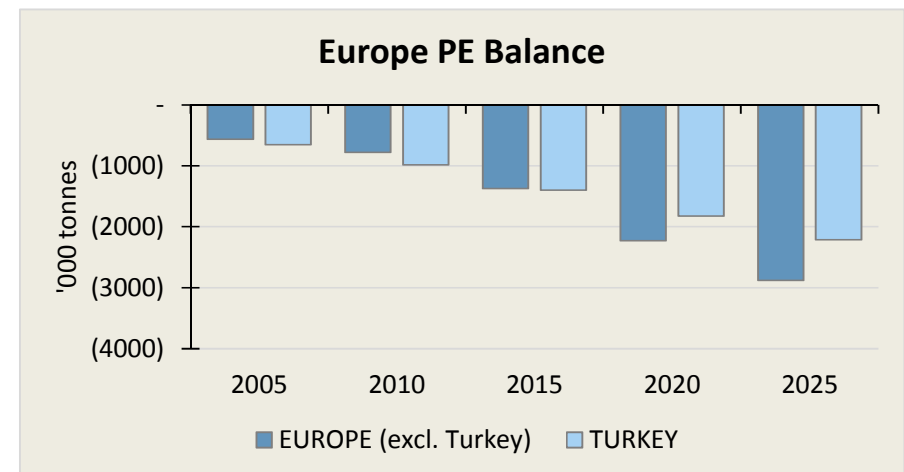
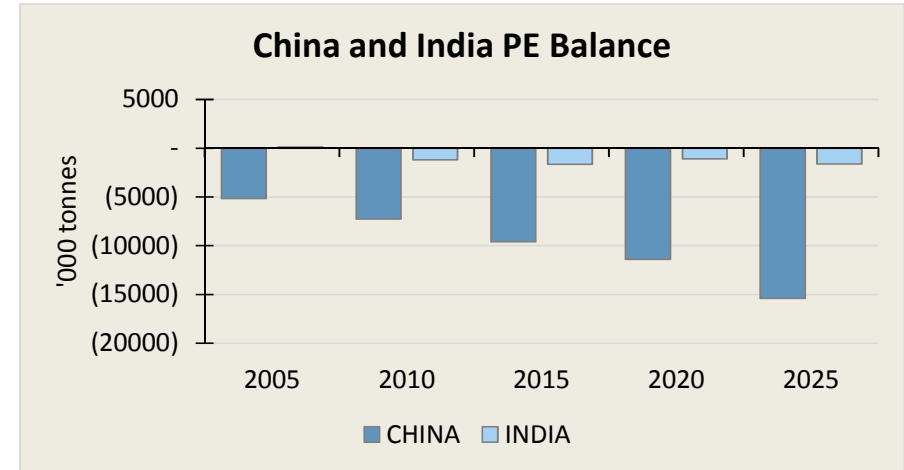
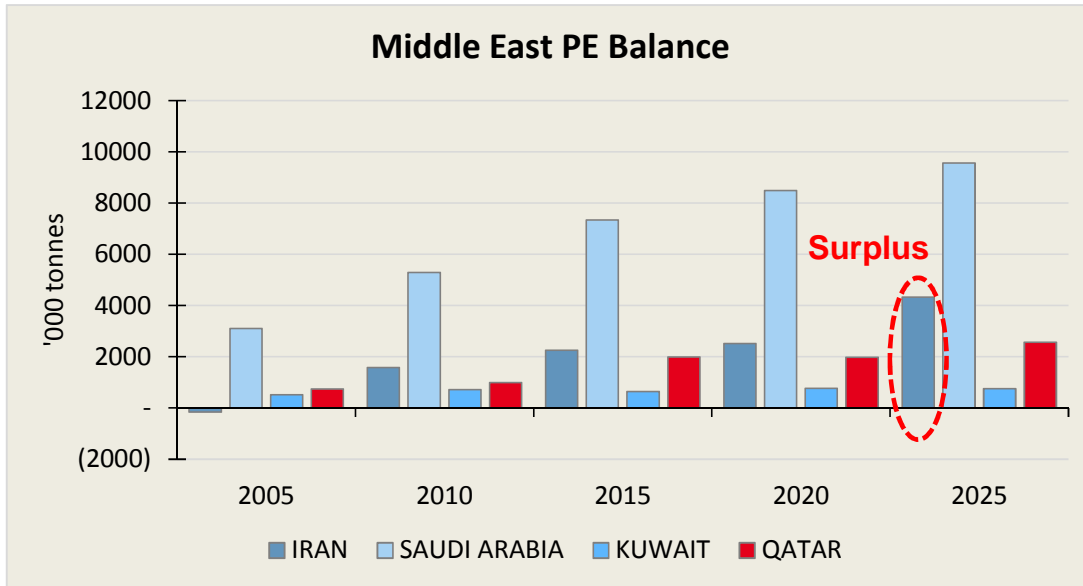
Iran has more than sufficient olefins for its domestic downstream demand



NOTE: Derivative net trade = Monomer Consumption – Downstream Demand

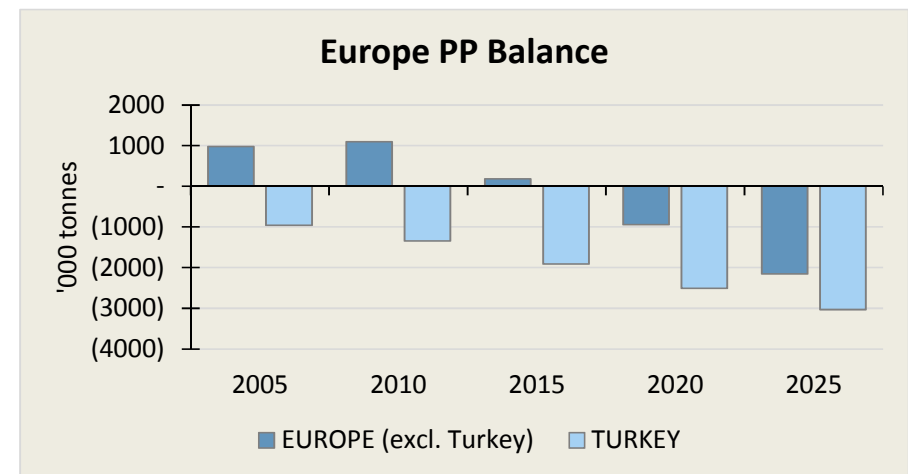
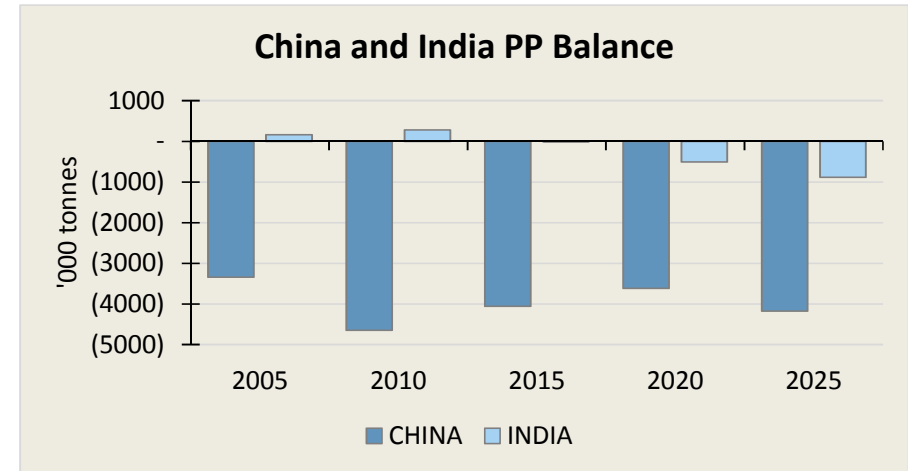
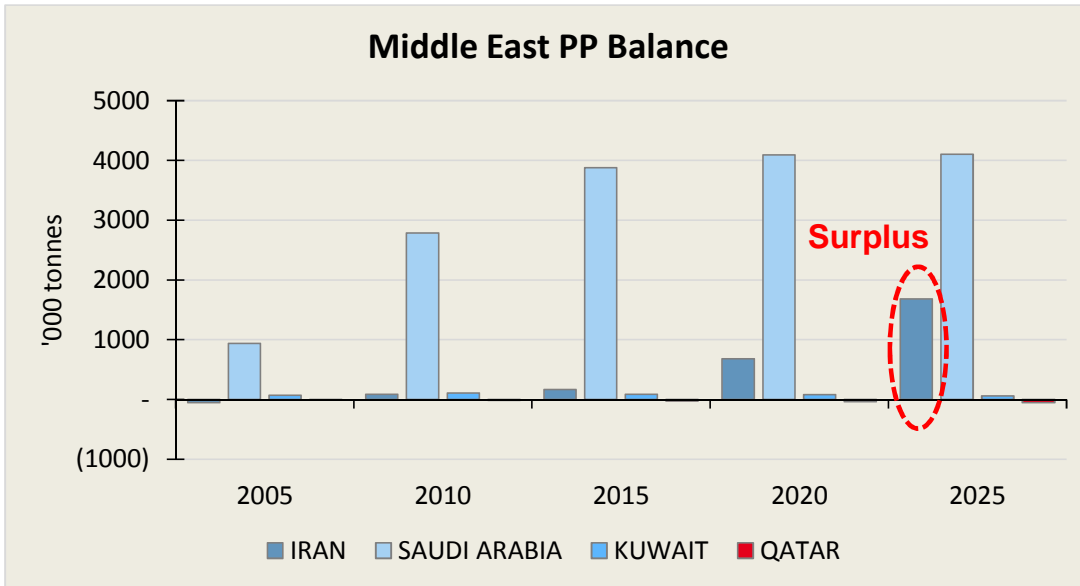
- ▶ Domestically, Iran requires only about half of the derivatives (in monomer equivalence) it produces
- ▶ The surplus would be export bound – *Where are Iran's opportunities?*

Polyethylene – Iran in contrast to other major regions



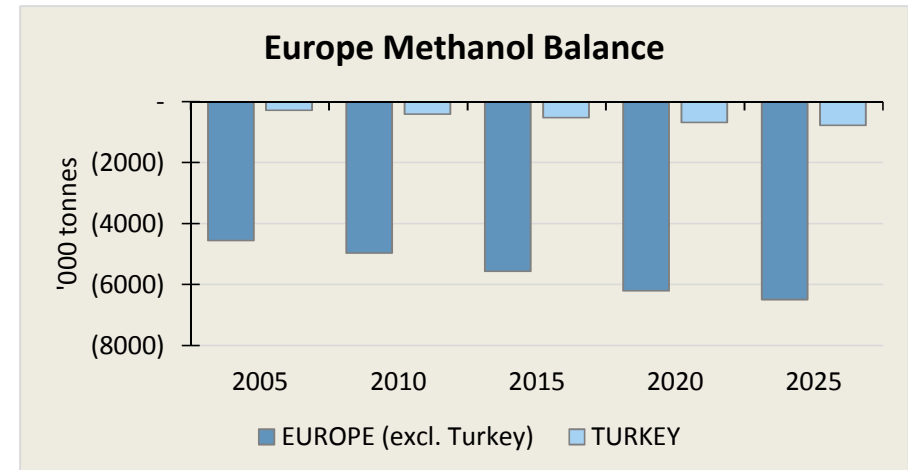
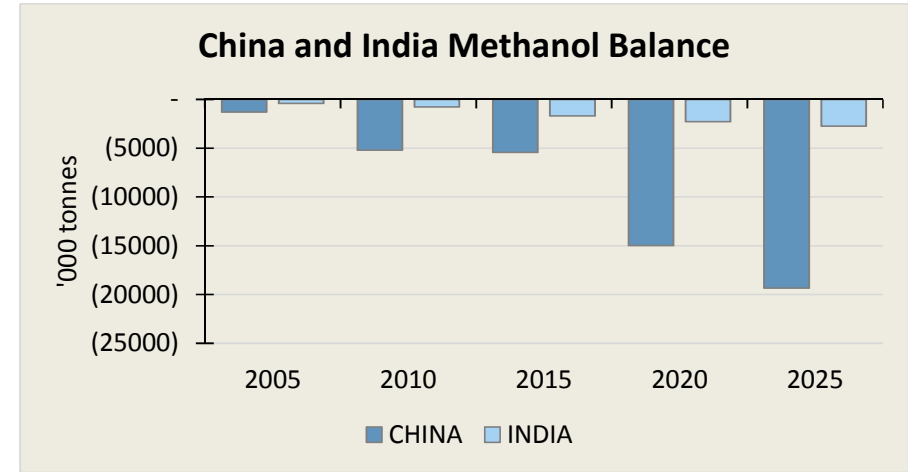
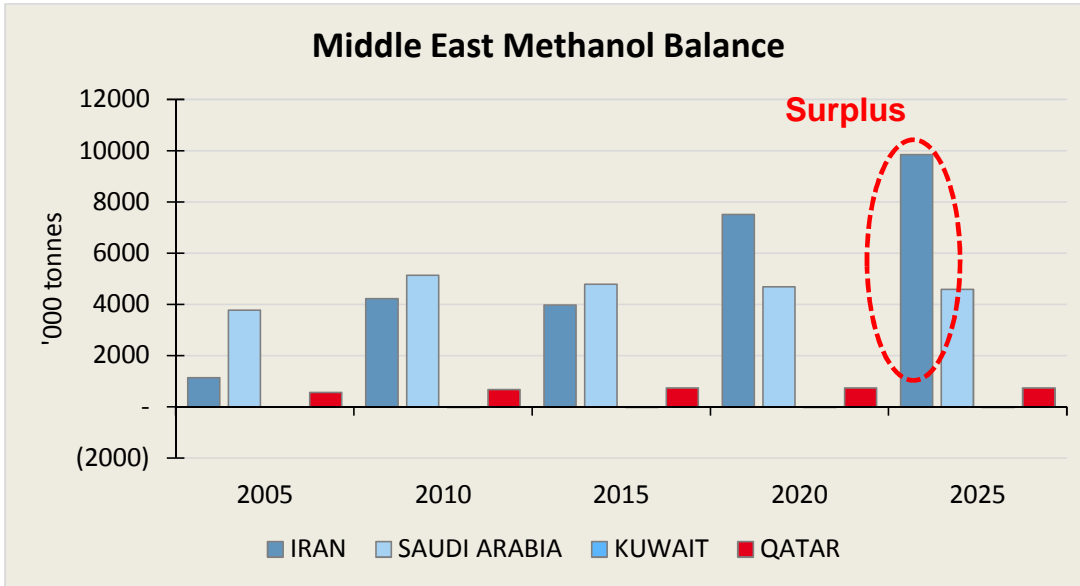
- ▶ Iran's PE surplus is 2nd only to Saudi Arabia in the Middle East, with its surplus reaching more than 4 million tonnes by 2025
- ▶ China would be one major market opportunity for Iranian's exports, as the deficit in China is expected to continue to grow, reaching above 15 million tonnes.
- ▶ Europe, in particular Turkey, also presents a potential for Iran.

Polypropylene – Iran in contrast to other major regions



- ▶ Iran is expected to see growing surplus of PP, albeit being at a moderate volume of around 1.7 million tonnes
- ▶ China remains a key market for PP exports despite its capacity development, while India has turned into net deficit, and it is expected to widen in the foreseeable future
- ▶ Europe would also see a growing deficit, with Turkey being one key growth engine.

Methanol – Iran in contrast to other major regions



- ▶ Iran's methanol surplus is currently second only to Saudi Arabia in the Middle East. Recent developments planned point to Iran emerging as the largest surplus in the region.
- ▶ This positions Iran well with the rising deficits of China, India, as well as Europe that would present a good opportunity for increase in exports.



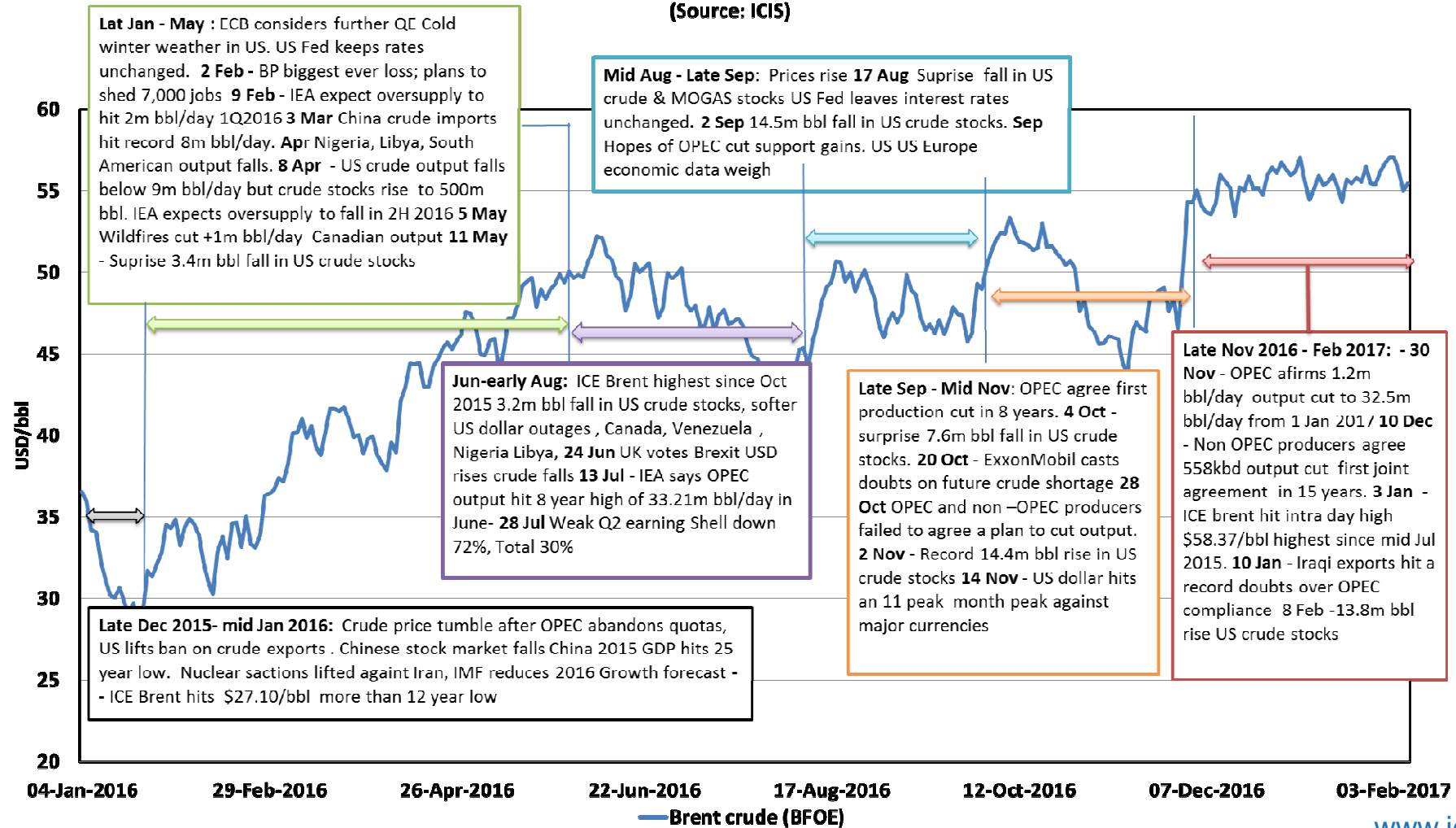
Crude



OPEC led production cuts drive a recovery in crude prices

Benchmark Crude Prices 2016-2017

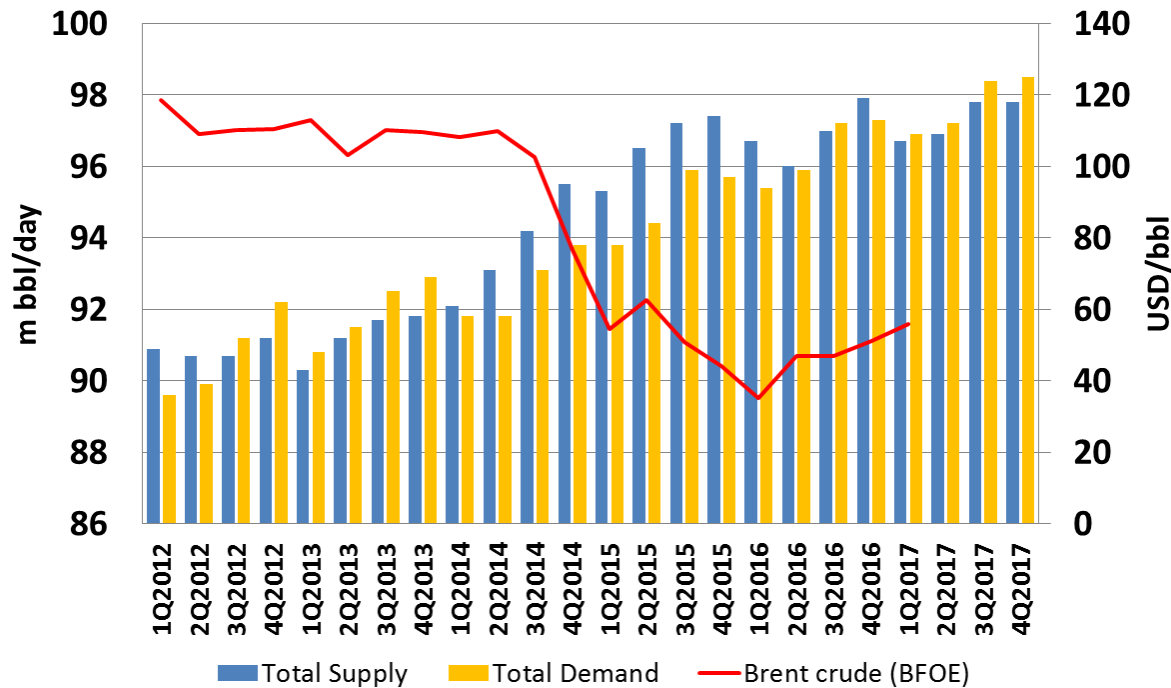
(Source: ICIS)



Demand outpacing supply in first half of 2017

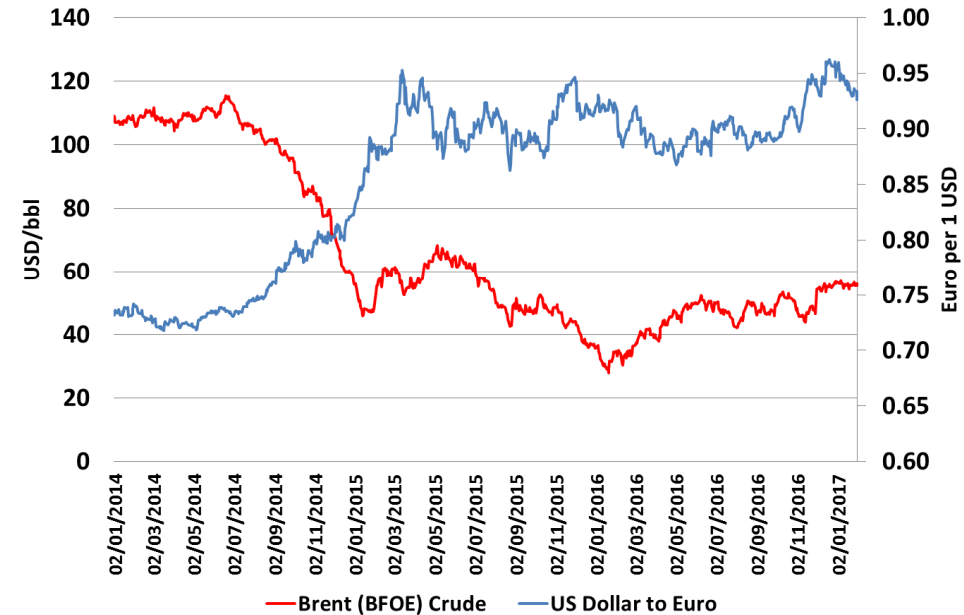
Supply and Demand vs crude price

(Source: IEA, ICIS)



Graph of Oil price and USD vs Euro XE rate

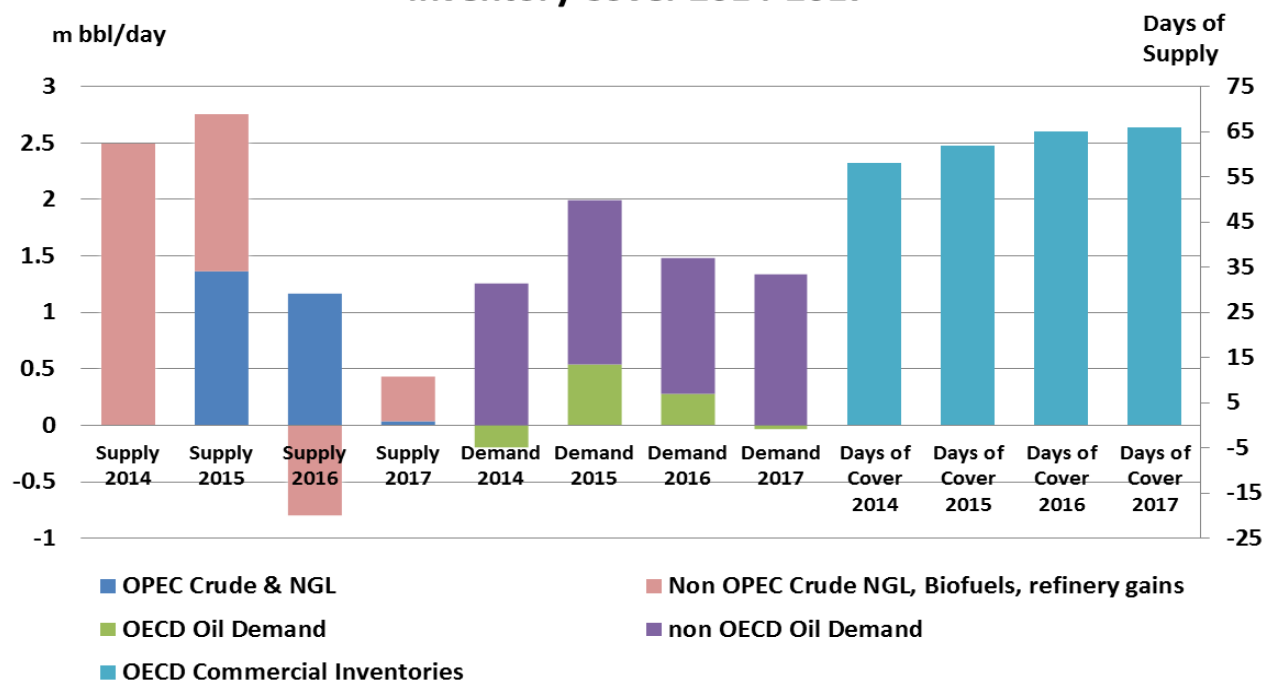
(Source: ICIS, Exchange Rates UK)



- ▶ Global demand expected to exceed supply in H1 2017 between 200-600,000 bbl/day
- ▶ OPEC and non-OPEC production cuts reducing supply by around 1.758m bbl/day

2017 - Demand exceeding Supply but stocks remain high

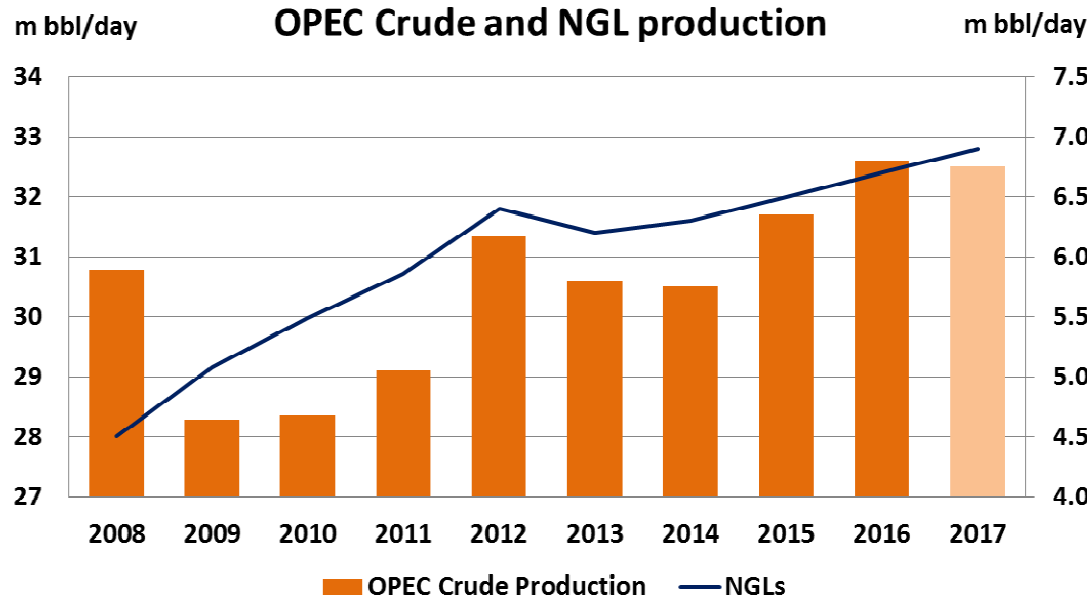
Supply and Demand Growth and Inventory Cover 2014-2017



(Source: IEA, EIA)

- ▶ Non-OPEC production up in 2017 mostly in US – higher oil prices, enhanced productivity
- ▶ Global demand growth lower in 2017 - higher oil product prices and fuel efficiencies
- ▶ Demand growth all in developing economies – Asia accounting 70% of growth
- ▶ Global inventories expected to remain high. OECD stocks 300m bbl above five year average

OPEC and non OPEC agree production cuts



(Source: IEA)

OPEC Production Cuts

(Source: OPEC)

Member Country	Supply Adjustment m bbl/day
Algeria	-0.05
Angola	-0.078
Ecuador	-0.026
Gabon	-0.009
IR Iran	0.09
Iraq	-0.21
Kuwait	-0.131
Libya	0
Nigeria	0
Qatar	-0.03
Saudi Arabia	-0.486
UAE	-0.139
Venezuela	-0.095
Total OPEC Cut	-1.164

non-OPEC Production Cuts

(Source: IEA)

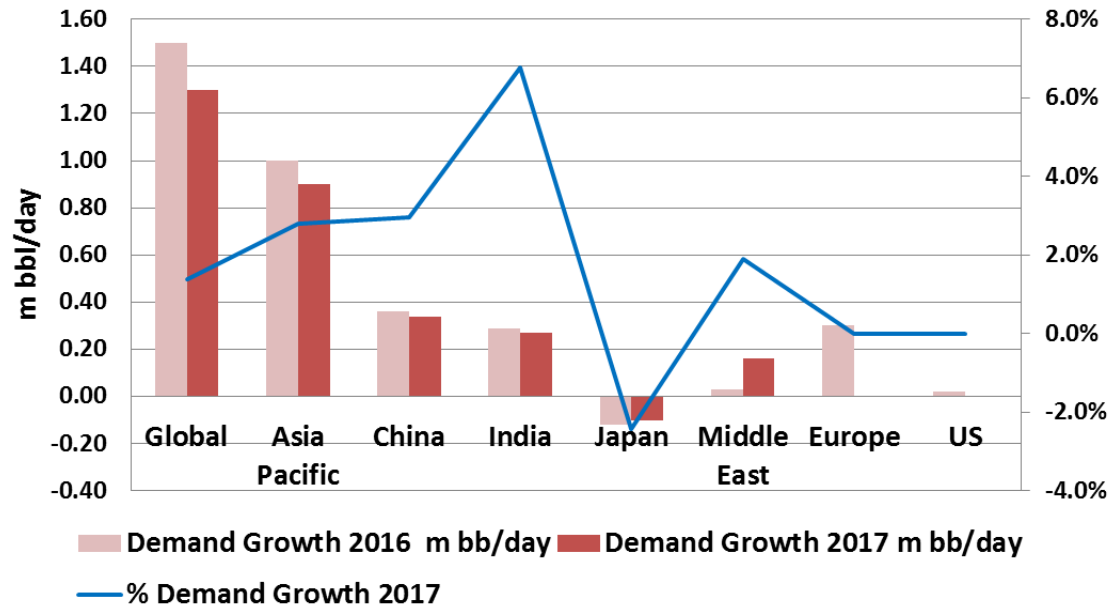
Country	Supply Adjustment m bbl/day
Azerbaijan	-0.035
Kazakhstan	-0.02
Mexico	-0.1
Oman	-0.045
Russia	-0.3
Others	-0.058
Total Non OPEC cut	-0.558

- ▶ First joint OPEC, non-OPEC production cut agreement in 15 years
- ▶ OPEC 1.2m bbl/day output cut new ceiling 32.5m bbl/day effective from 1 January 2017
- ▶ Agreement only for six months may not be extended – Saudi Oil Minister

Oil demand growth in 2016 -2017 in Asia

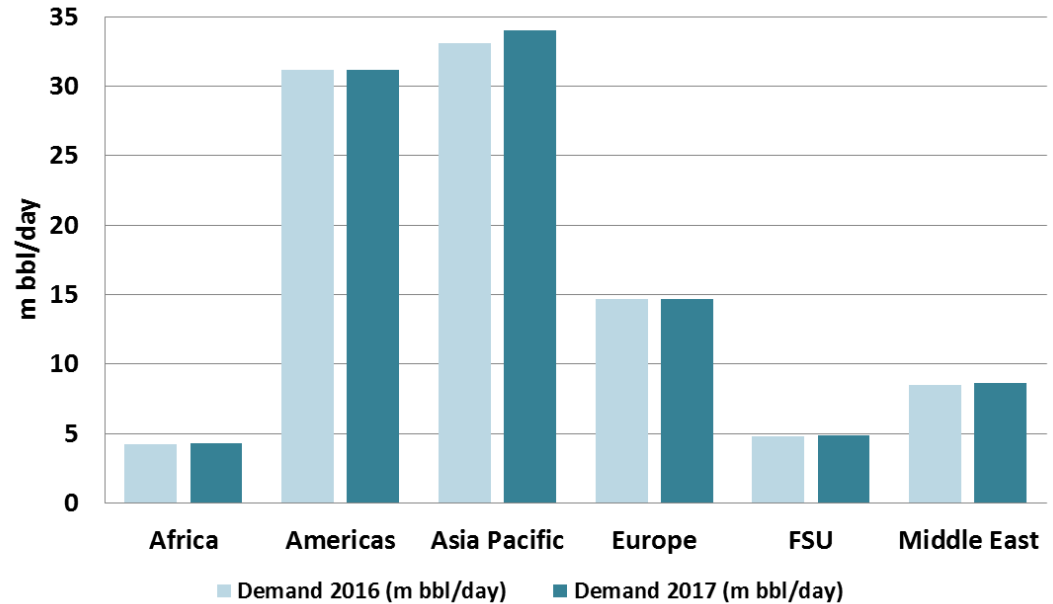
Global Oil Demand Growth 2016-2017

(Source IEA)



Global Oil Demand 2016-2017

(Source: IEA)



- ▶ Global oil demand is expected to hit 97.8m bbl/day in 2017, up 1.3m bbl/day – lower than 1.5m bbl/day in 2016
- ▶ Indian demand expected to grow 6.8% in 2017 slightly lower than 2016 –currency concerns expected higher product prices
- ▶ China demand growing 2.8% in 2017 slight down on 2016 , lower economic growth , higher oil product prices.

Thank You

Muhamad Fadhil
Head of Middle East Markets, ICIS

muhamad.fadhil@icis.com

+971 56 333 8265