

Global Markets Developments

by Jeet Bindra, February 2018

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Global market developments

GDP

Crude

Natural Gas

Electric Vehicles

Petroleum Products

Petrochemicals

Petroleum Coke

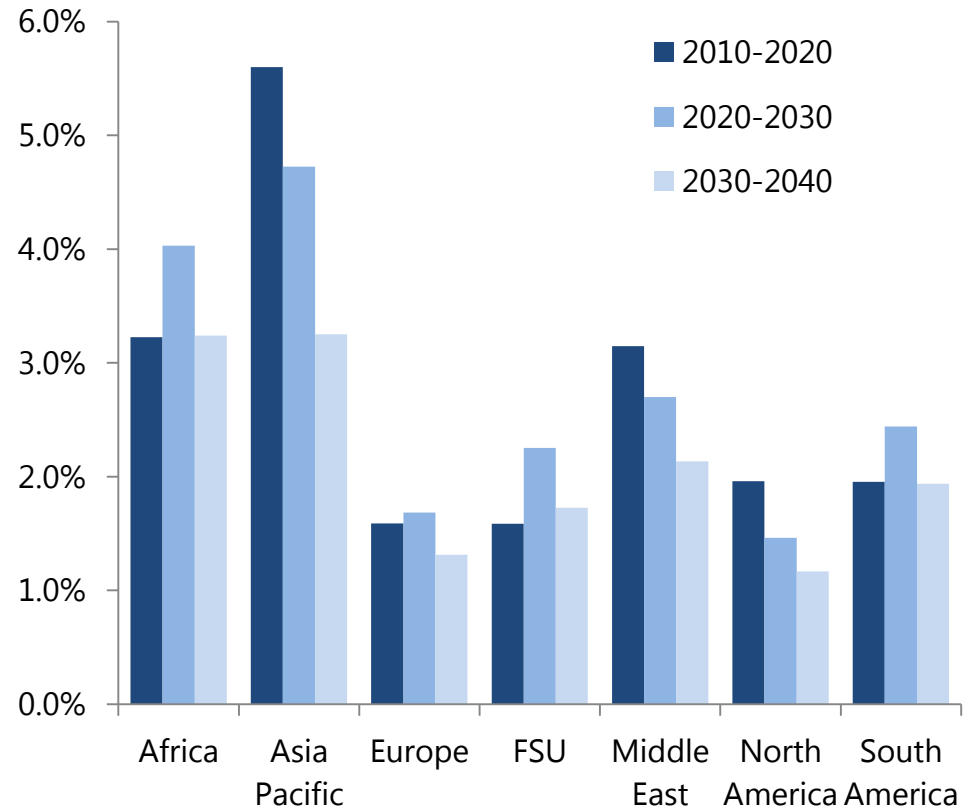
LPG

Vision

Global growth underpinned by Asia-Pacific

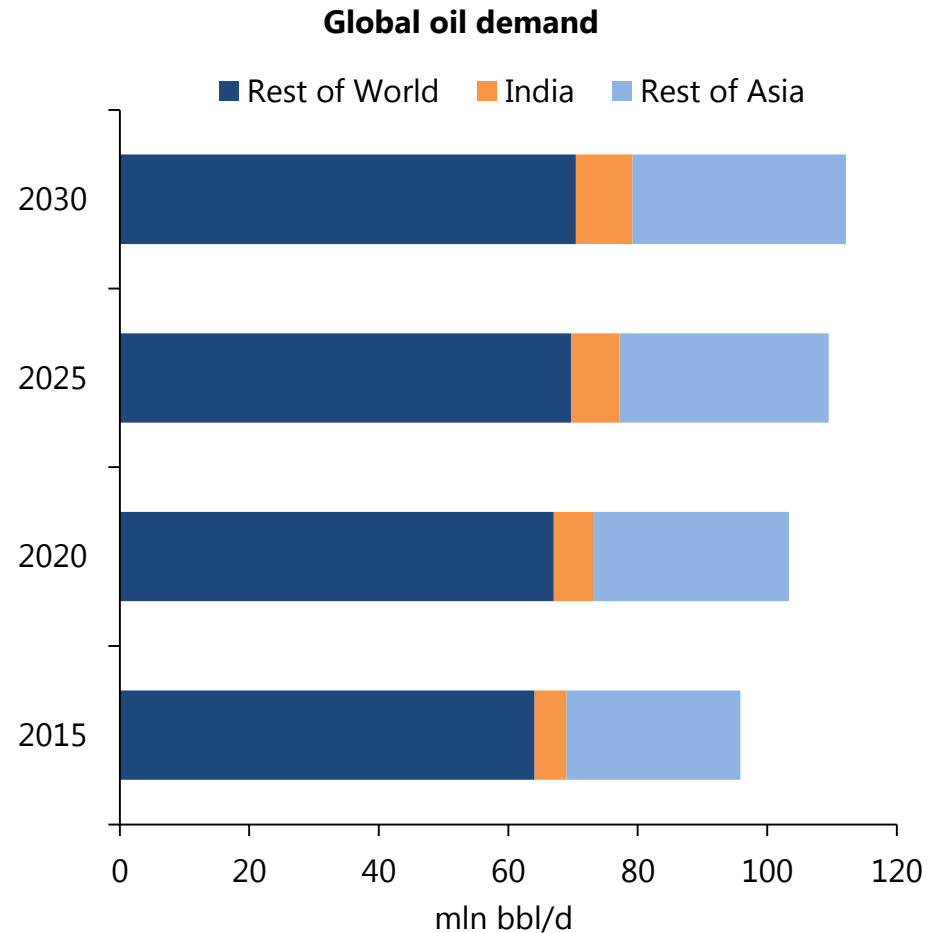
- Synchronized global activity boosting near term prospects for most countries
- Chinese GDP growth trending lower as drivers of growth transition
- India to underpin longer term growth

Global GDP growth projections – 10 year CAGR



Global Crude demand

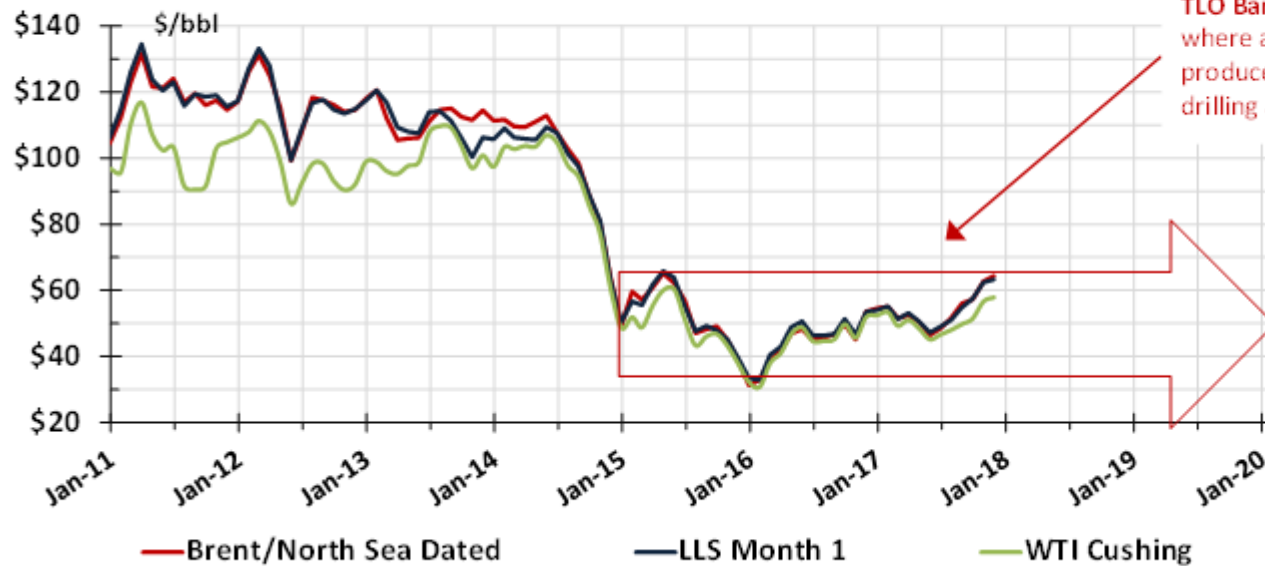
- Crude demand growth to remain strong until the latter stages of 2020's
- Consistent growth in Indian oil demand to become the main driver of growth



Crude prices

Light Crude Oil Price History

(\$2017 basis, monthly average prices, through December, 2017)



TLO Band: This is the price range where a majority of US TLO producers will start or stop new rig drilling and completion activity.

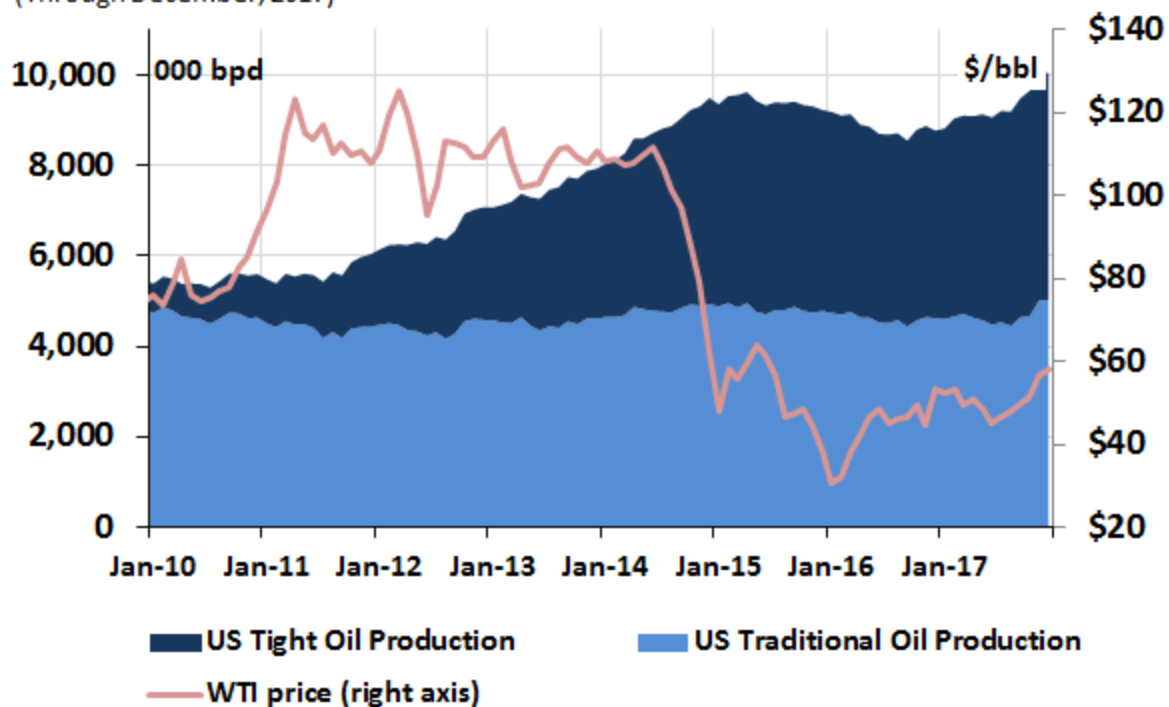
- Strong US supply response should help keep prices within the Tight-light oil (TLO) band in the medium term

Main sources of US oil production

- US tight light oil (TLO) has become the major US oil product.
- Production has surpassed 5,100 thousand bpd in December, 2017.
- Over the past 6 months, US TLO production has been growing at a rate of 2% per month.
- Most UD TLO – today - is being produced in the Permian basin.

US Oil Production History

(Through December, 2017)

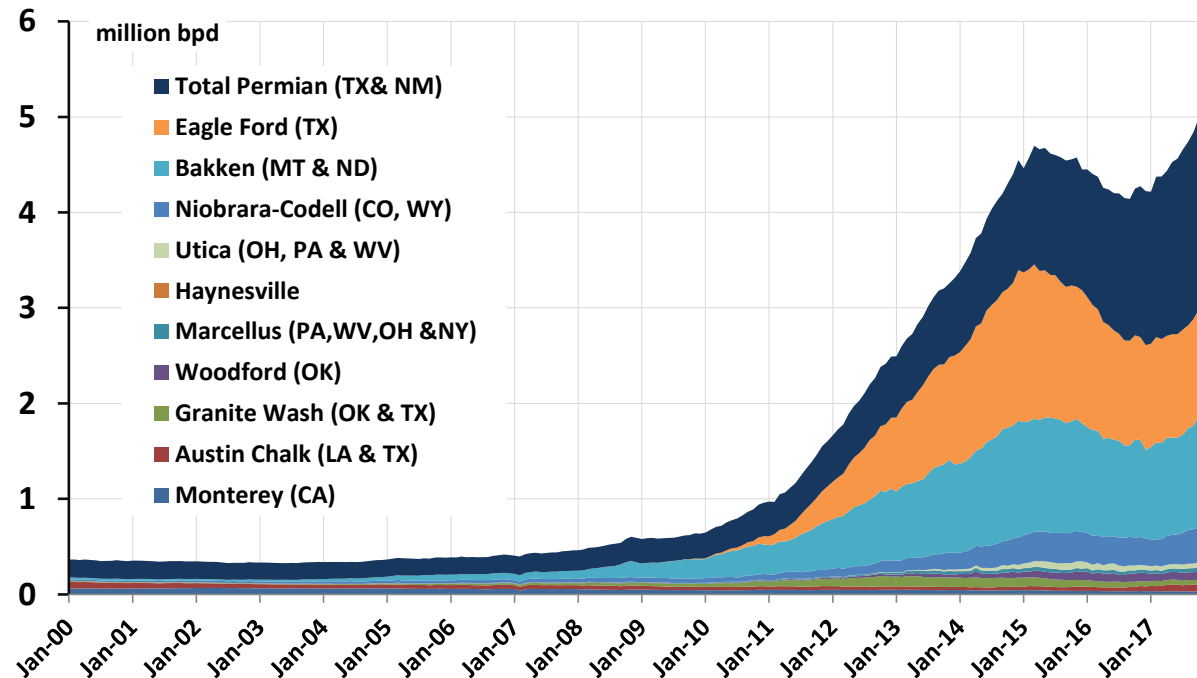


The Permian basin is the largest producer

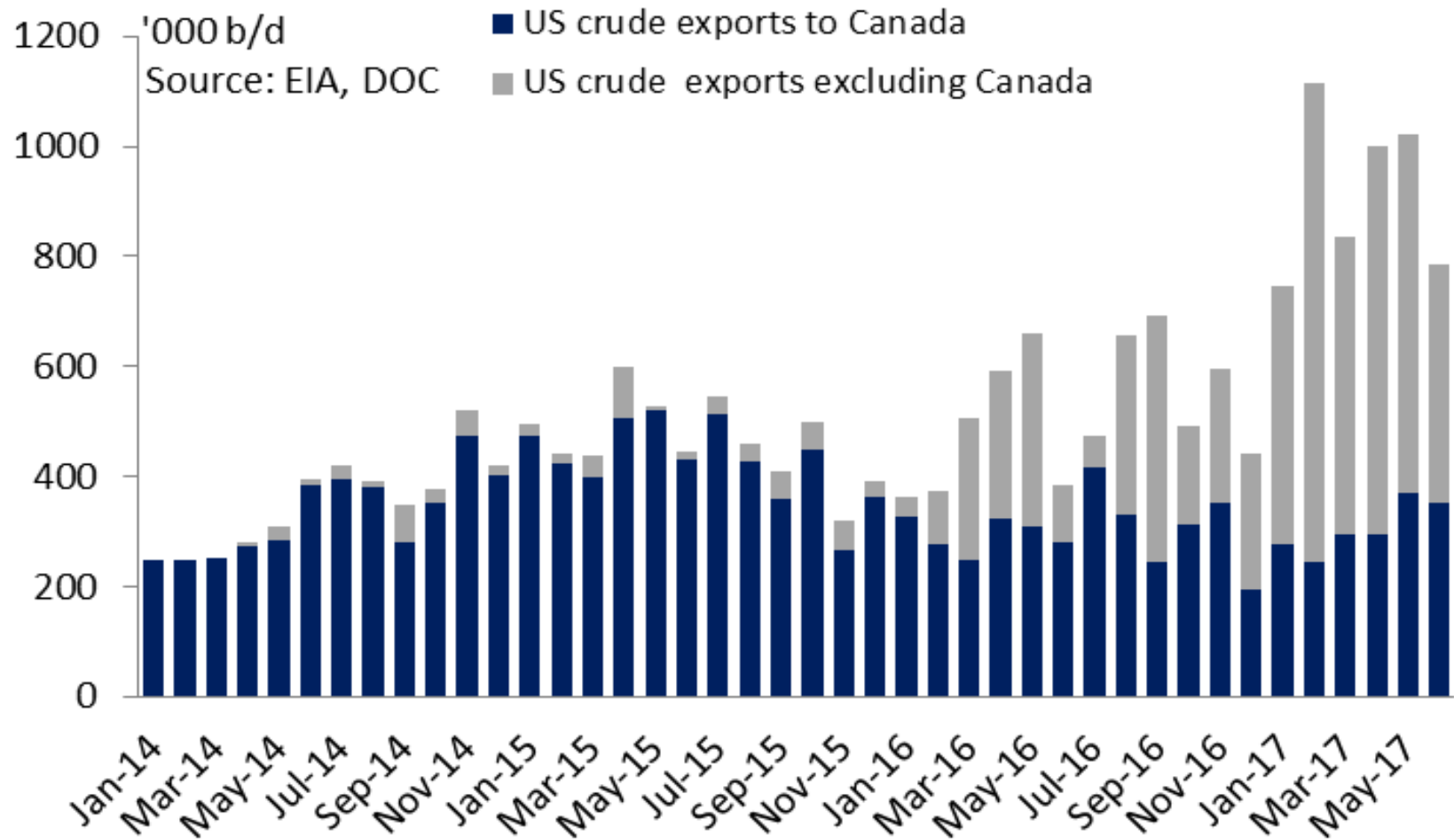
- Bakken and Niobrara production has also been growing.
- We expect continued growth in US TLO production as long as monthly average oil prices remain above ~ \$55/bbl.

US Tight Oil Production History

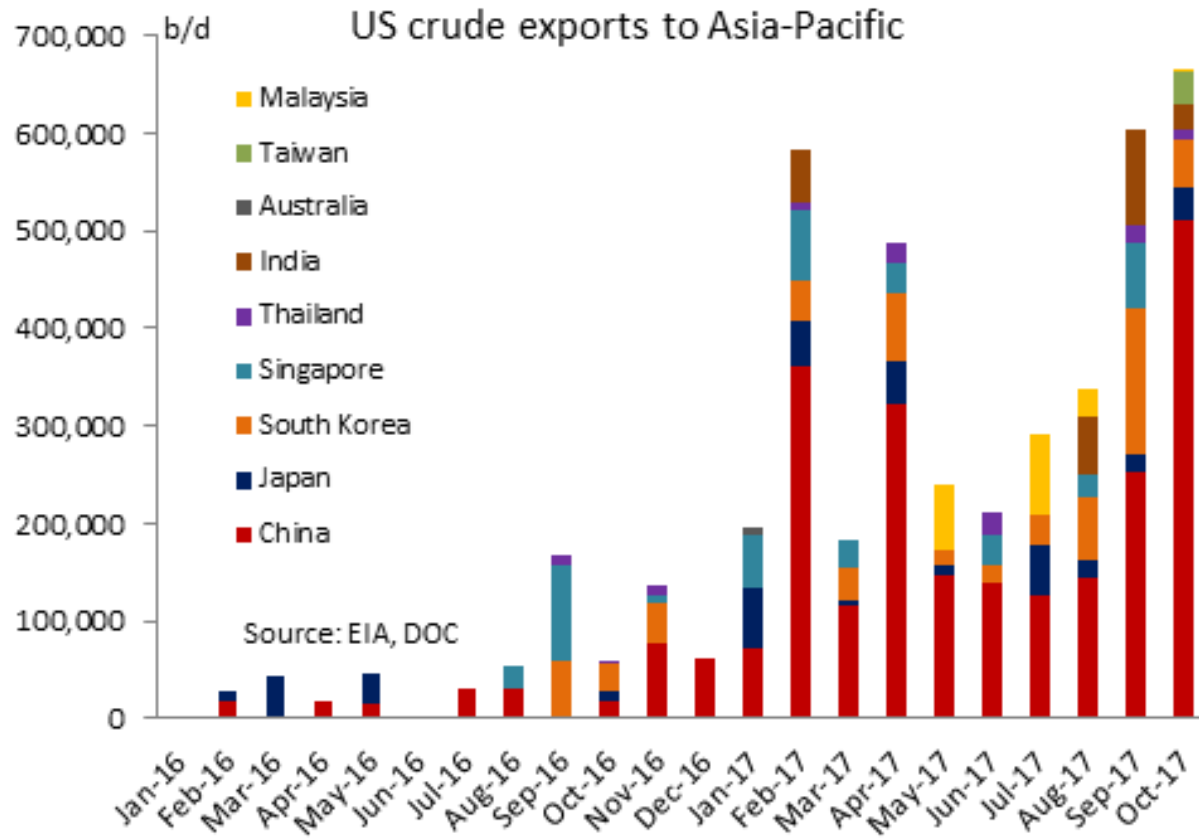
(through December, 2017)



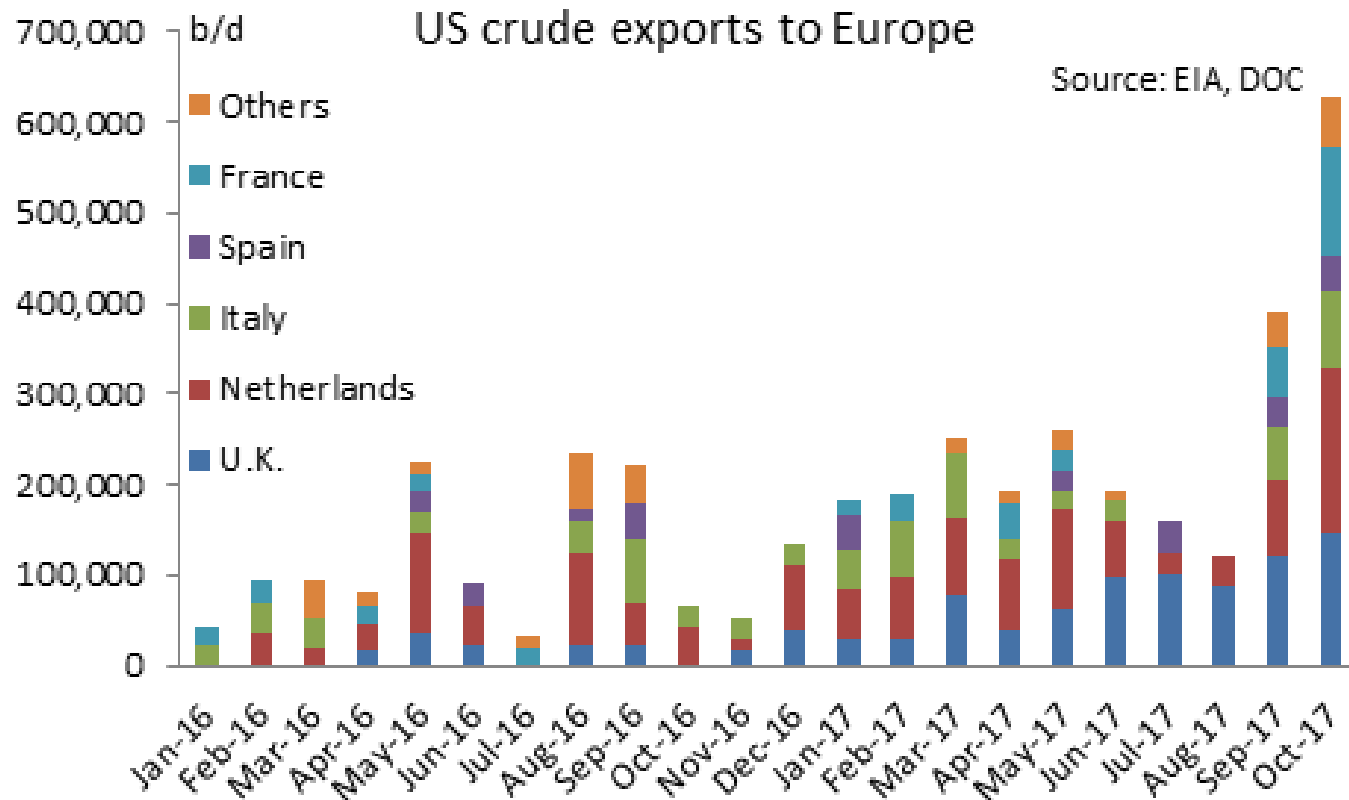
US crude exports beyond Canada soar after ban lifted



China buying about two-thirds of US exports to Asia

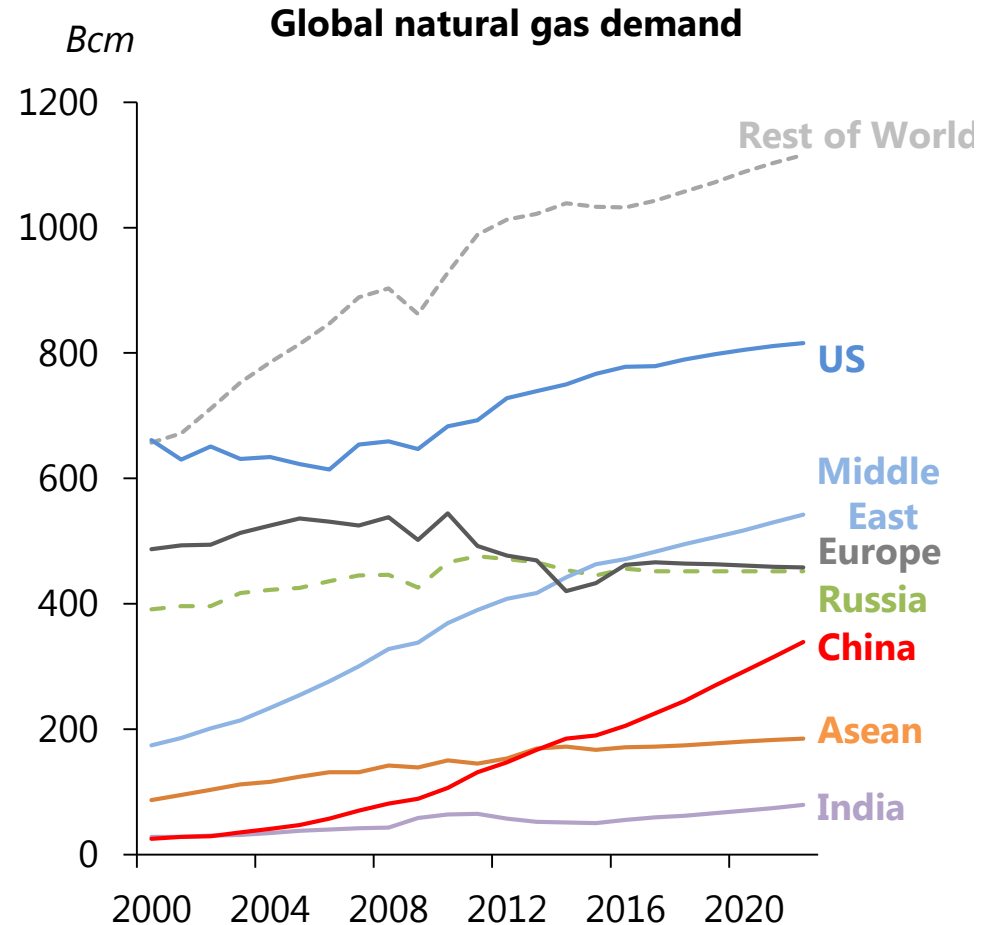


US shipments to Europe also rising substantially

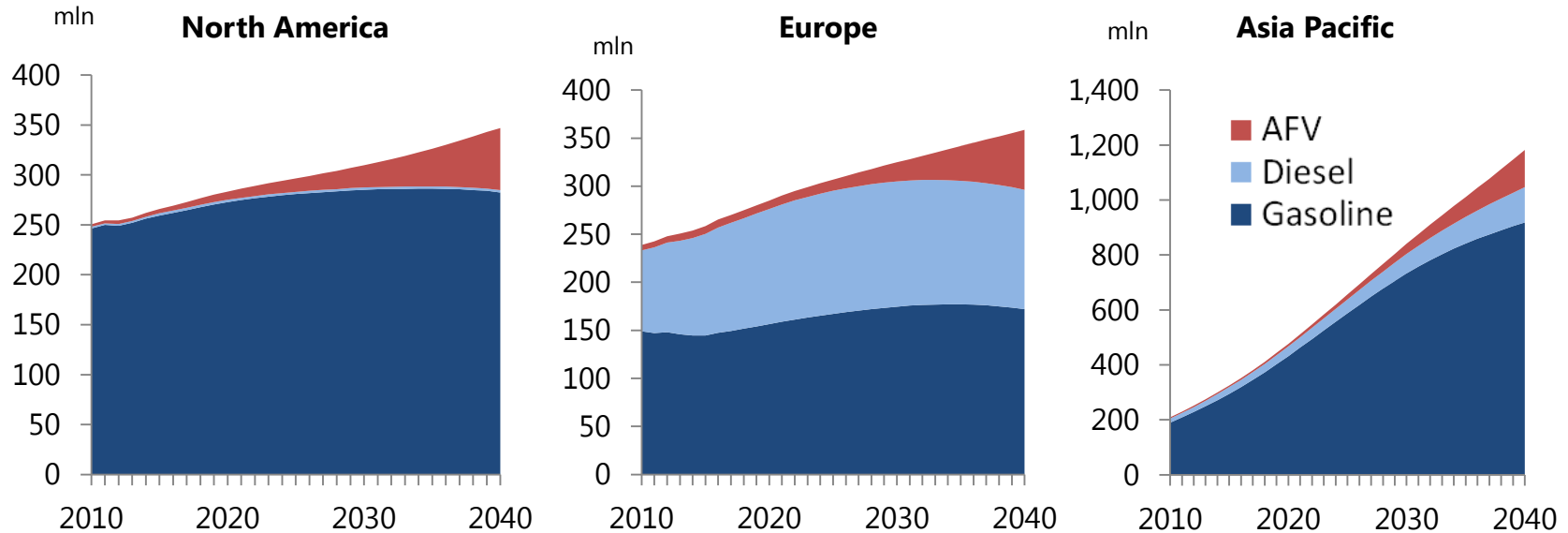


Natural Gas Demand growth

- Lower prices have spurred greater demand in the US and elsewhere
- Rapid growth in China is absorbing fresh LNG supply



Electric Vehicles

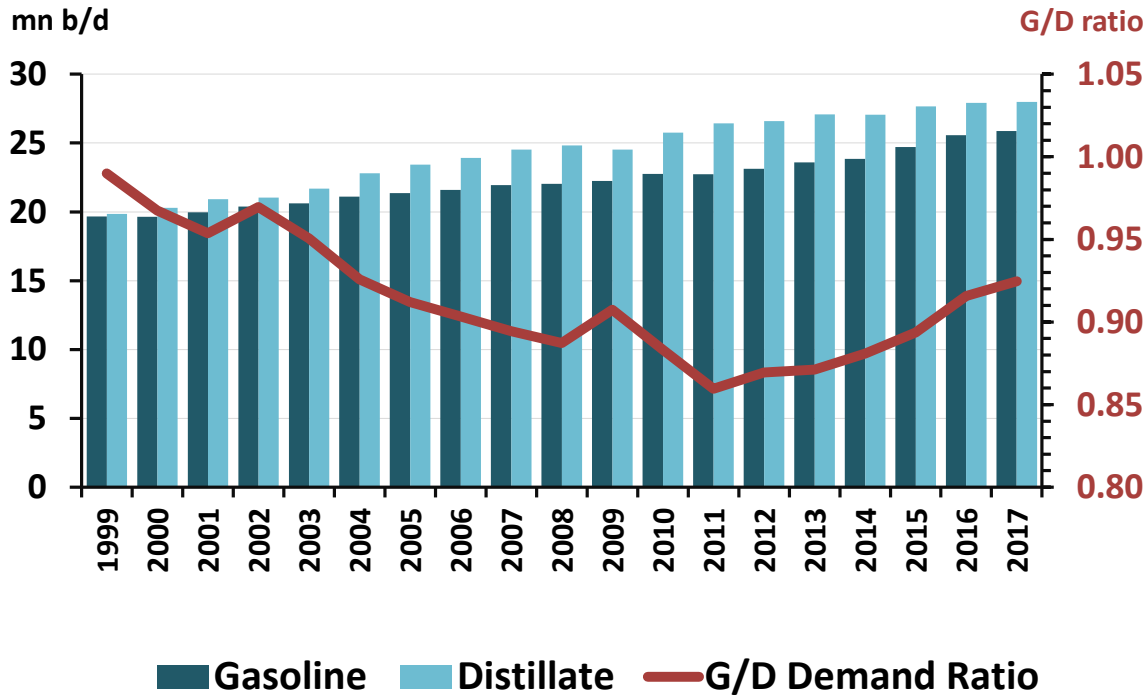


- EV's set to account for all of long term increase in fleet in North America and Europe
- Growing share of EV's in Asia, but strong growth in total fleet
- India looking to phase out sales of gas and diesel vehicles by 2030, but strong growth projected in the interim

Worldwide, both distillate and gasoline growth are robust

Worldwide Gasoline & Distillate Demand History

(2017 data are averages through 3Q 2017)



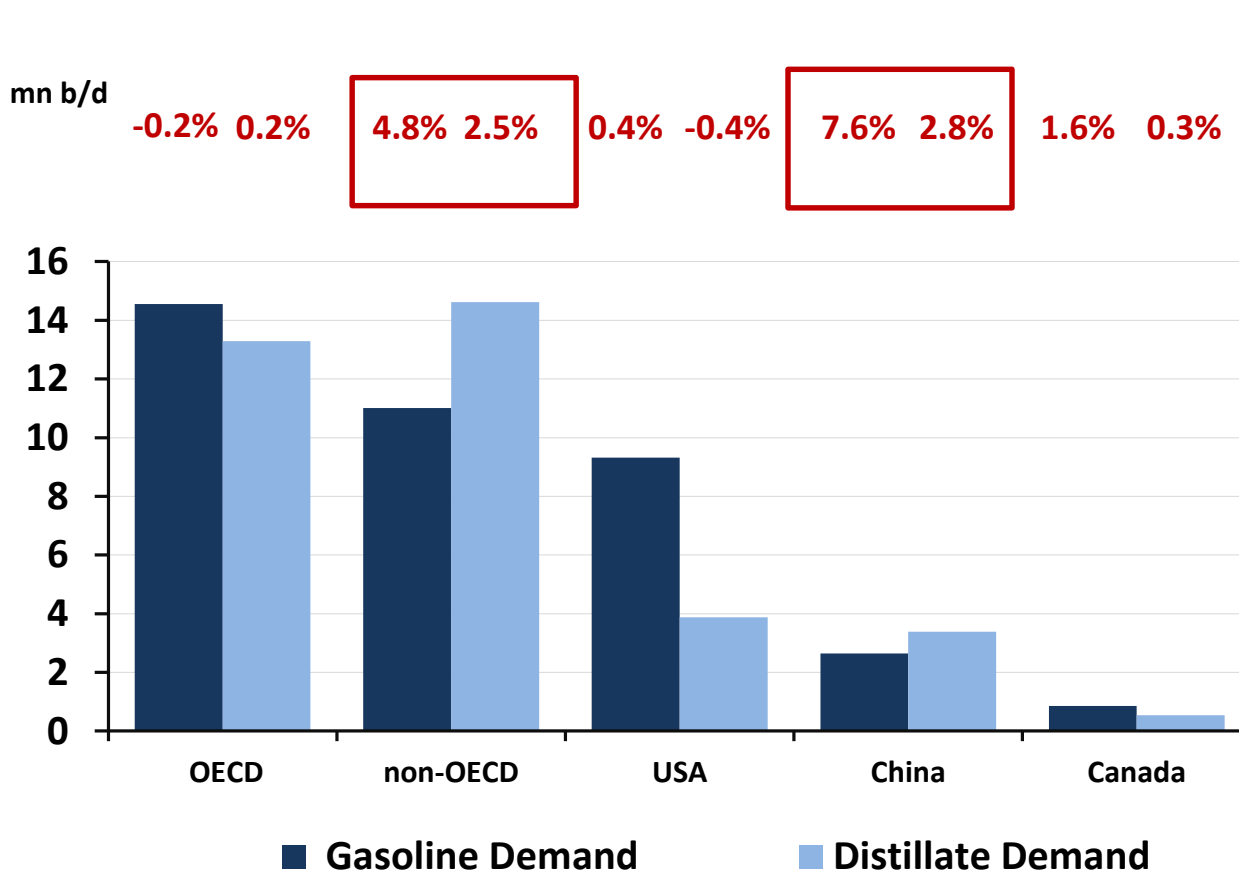
CAGRs	2000 to 2008	2009 to 2017
Gasoline	2.61%	1.80%
Distillate	0.29%	1.34%

CAGR – compound annual growth rate

- Data from IEA, EIA and Argus

Major growth has been in non-OECD countries

Comparison of Year 2016 Demand Levels



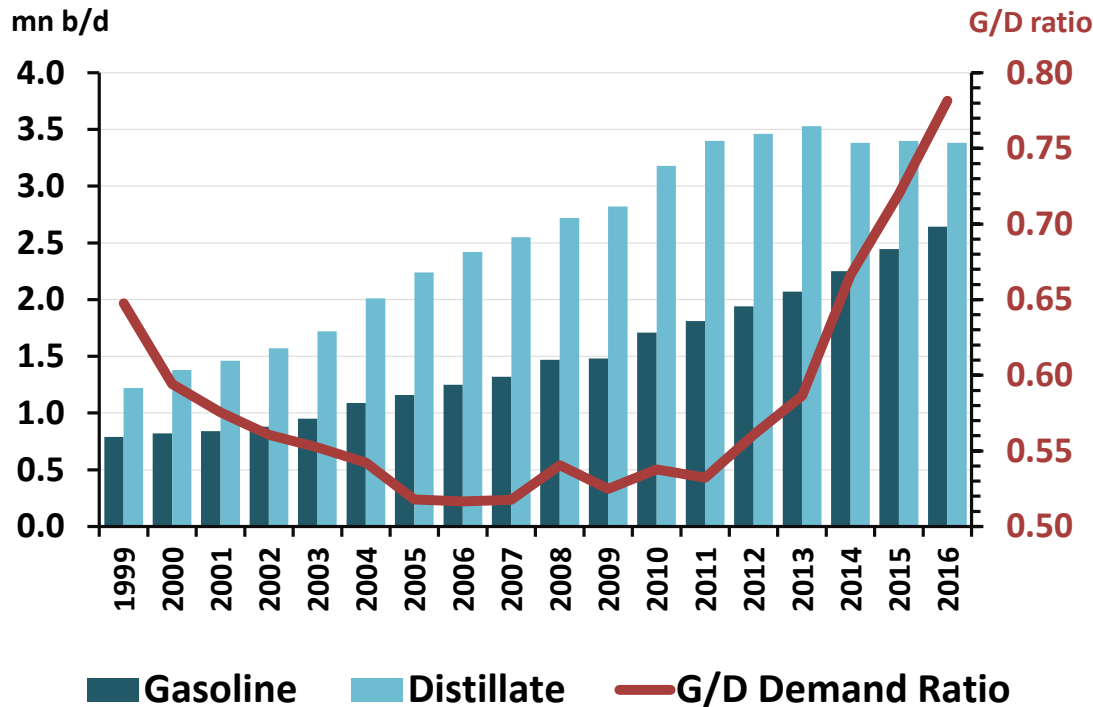
2009 – 2017
CAGRs

The non-OECD, and especially Chinese growth rates, will gradually drive significant changes in product and crude oil flows.

- Data from IEA, EIA and Argus

Chinese gasoline demand is growing at high rates

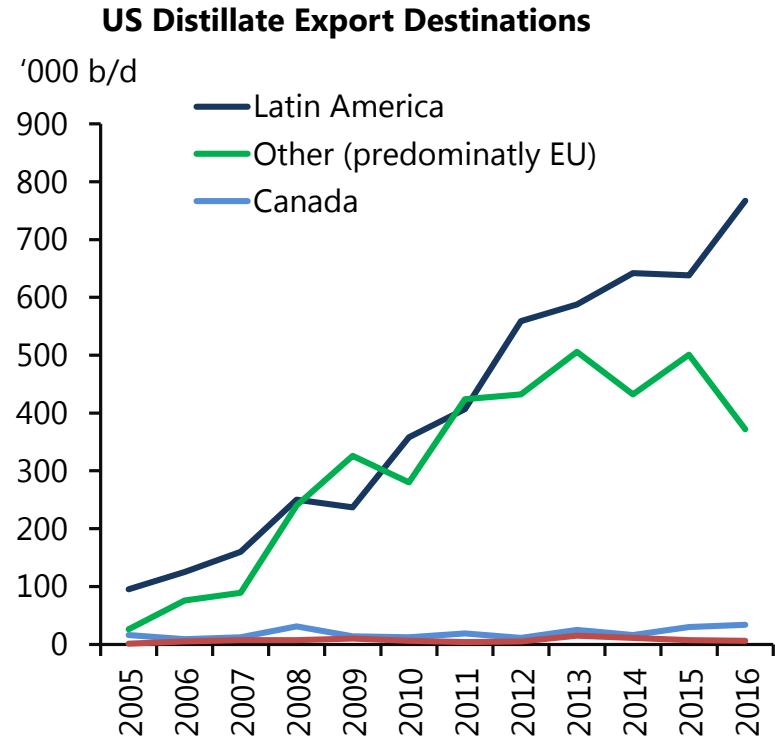
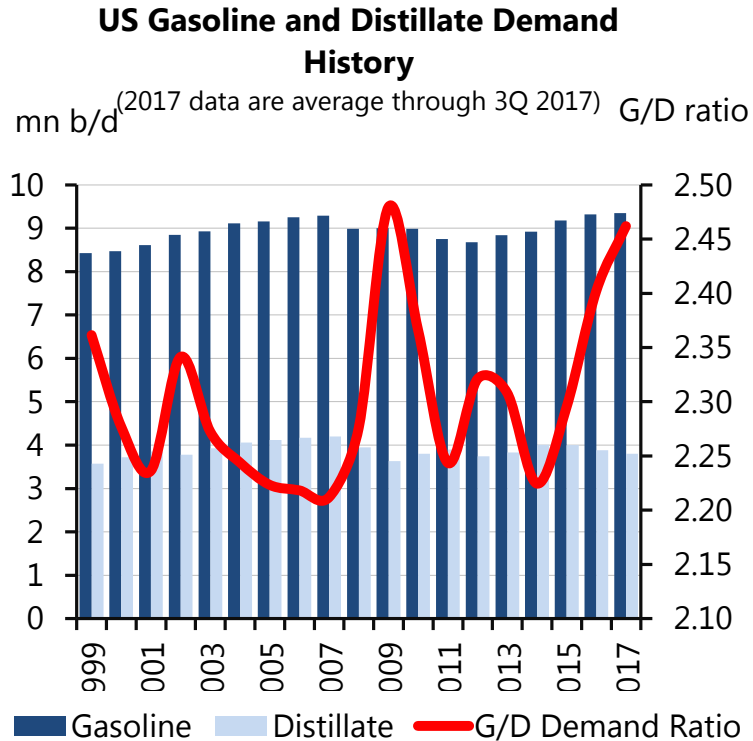
China Gasoline and Distillate Demand History



CAGRs	2000 to 2008	2009 to 2016
Gasoline	8.07%	7.61%
Distillate	10.54%	2.76%

- Data from IEA, EIA and Argus

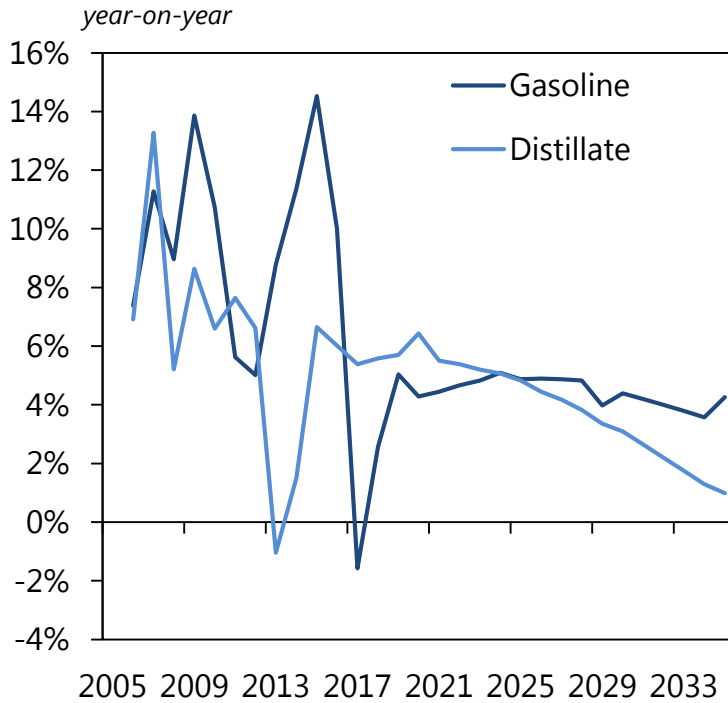
US products demand has plateaued, exports are surging



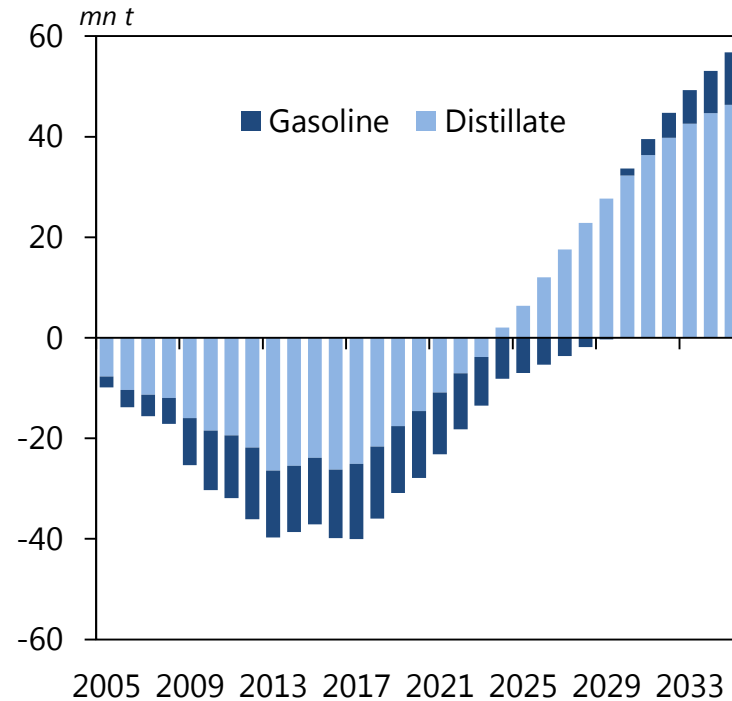
- US refiners will need to serve export markets to sustain output levels

Transportation fuel - India

Long term growth in demand



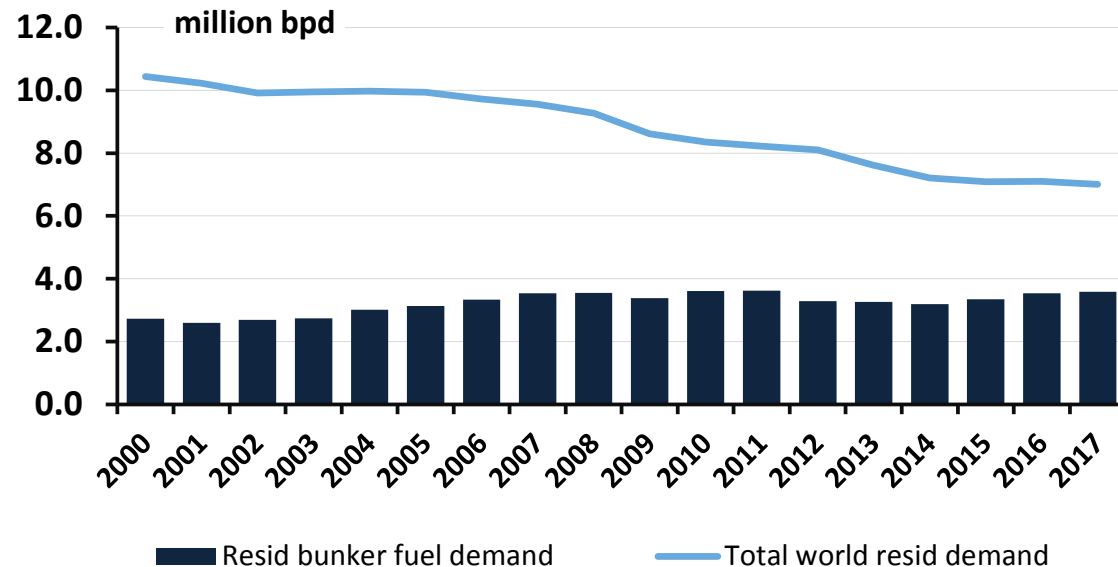
Net Import balance for products



- Sustained growth in products demand will see India become a large net importer

MARPOL VI set to destroy high S bunker demand

World Bunker Fuel & Resid Demand

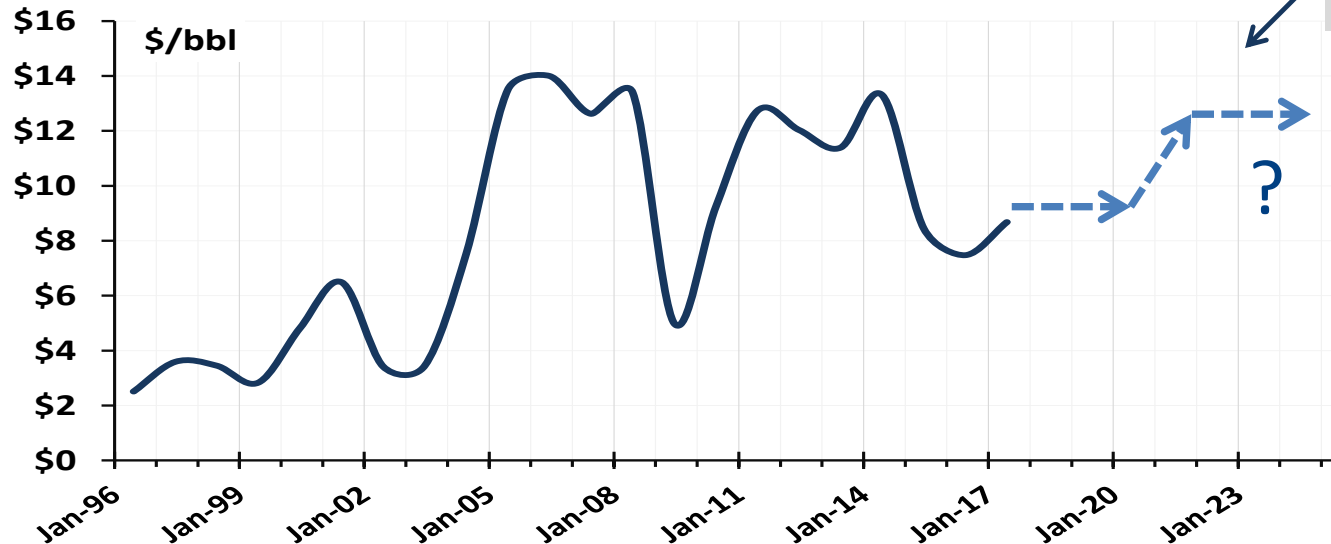


- Marine fuel standard of 0.5pc sulphur in 2020
- High proportion of 3mn bpd of resid will need to find a new home or be converted to low-sulphur material

Wider light-heavy crude spreads

Light-Heavy Crude Price Differential

[Brent/North Sea Dated vs. Maya (USGC). Yearly avg. prices. 2017 data through May 22, 2017]

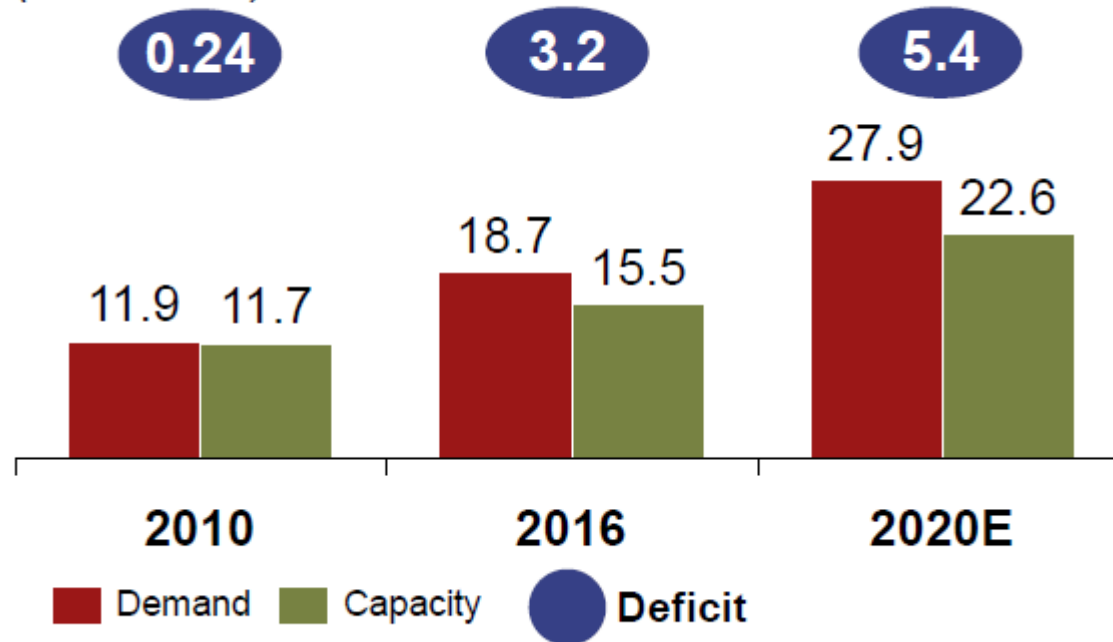


1 Argus Scenario from Argus MARPOL VI effects model

- Wider crude spreads should benefit refineries with plans for heavy crude processing, although little new capacity announced on the back of MARPOL VI

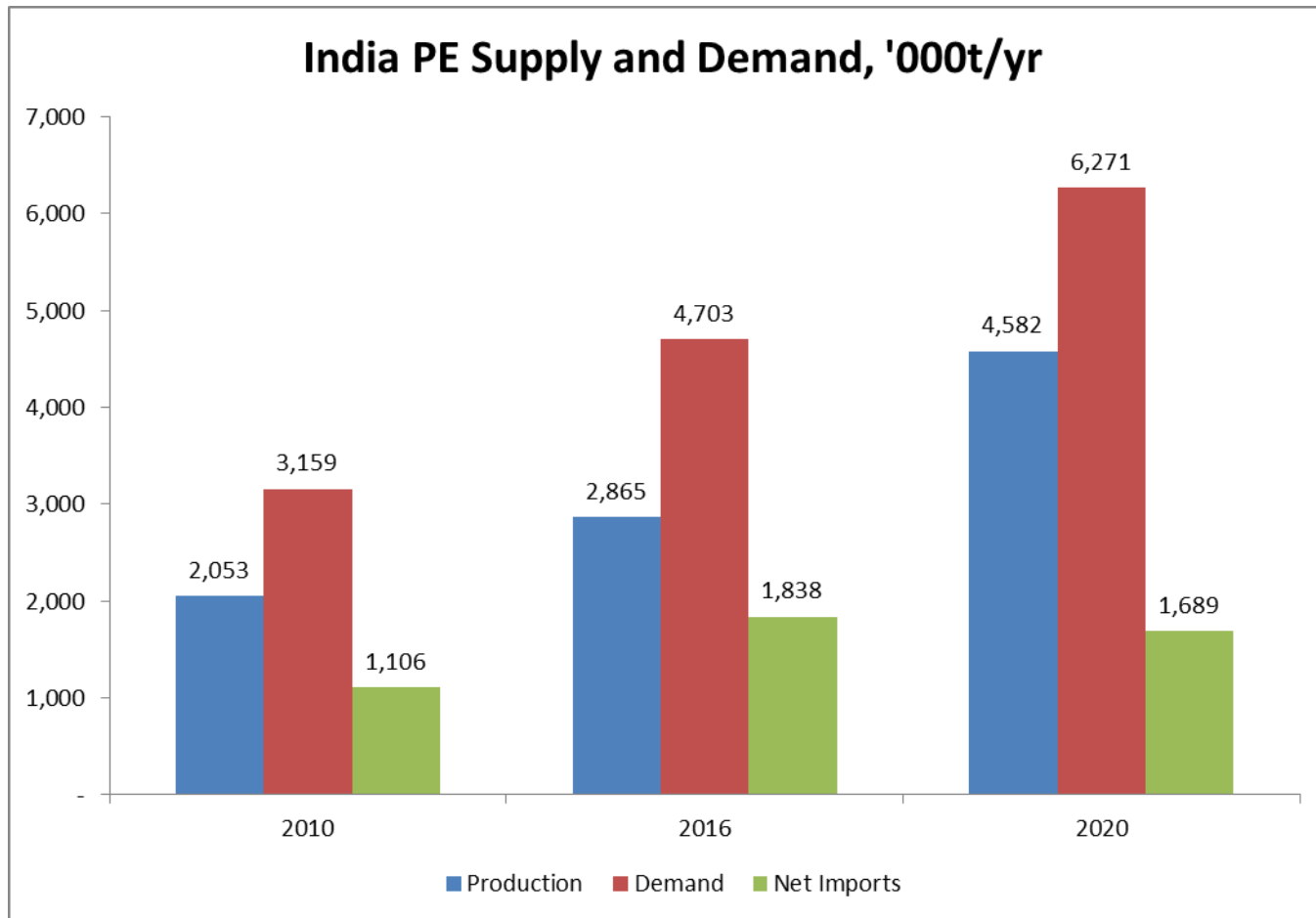
India's deficit of petrochemicals is growing

*Petrochemicals¹ supply demand in India
(in MM MT)*



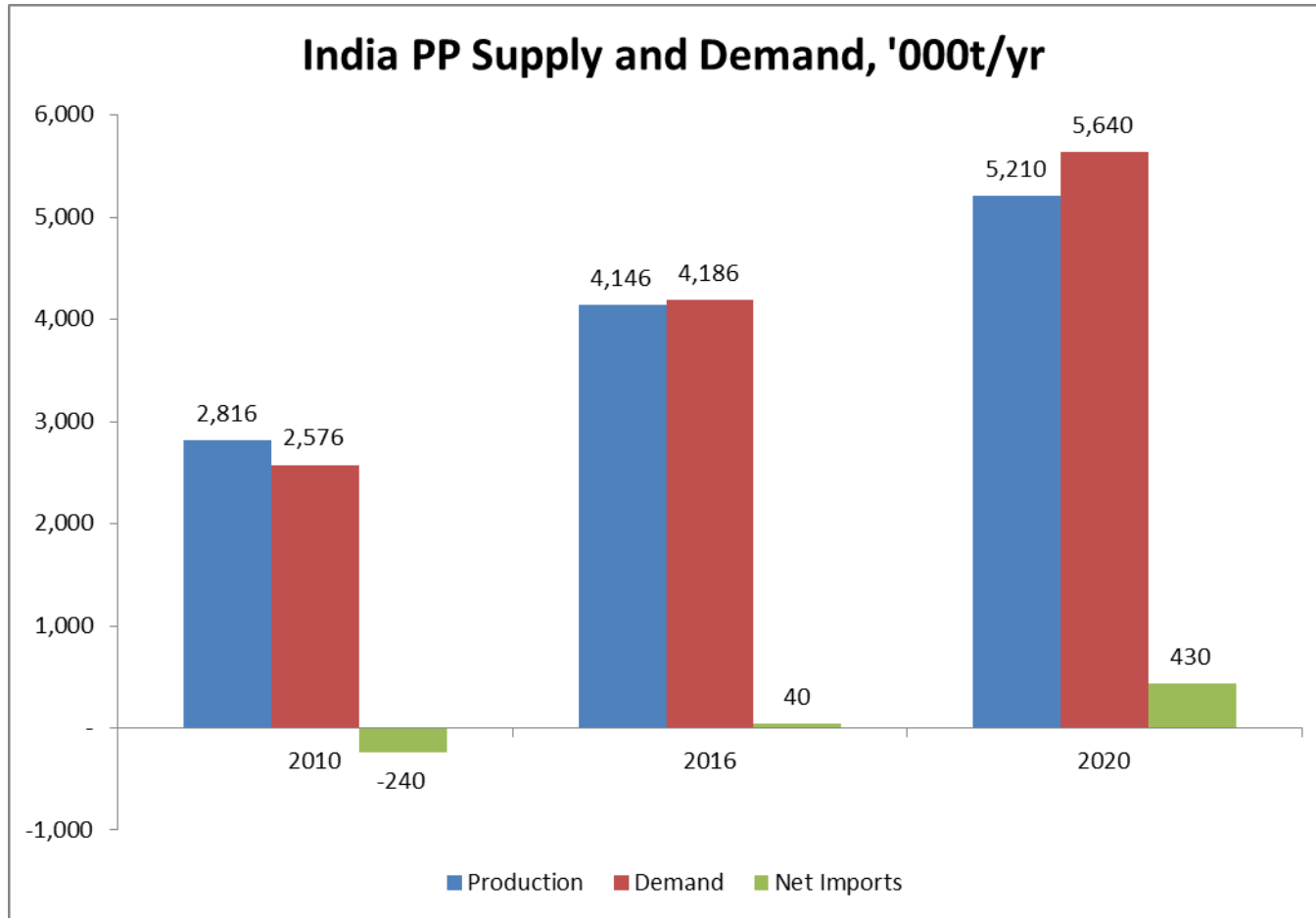
Footnote: 1 Petrochemicals includes olefins, aromatics, and polymers

India Polyethylene (PE) Outlook



India is adding capacity for PE production, but will still import more than 25 pc of domestic demand; Growth in demand near 10 pc per year

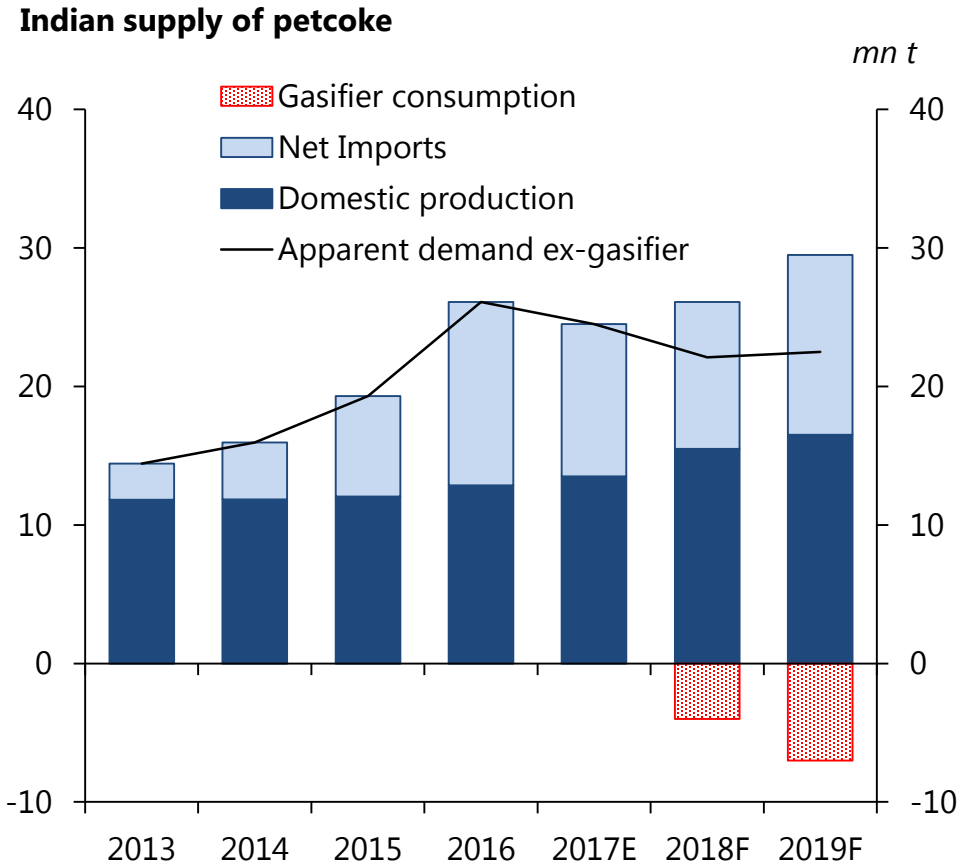
India Polypropylene (PP) Outlook



After becoming balanced in 2016, India is forecast to be importing 400+kt/yr to supply domestic demand in 2020; Demand is growing more than 10 pc/yr

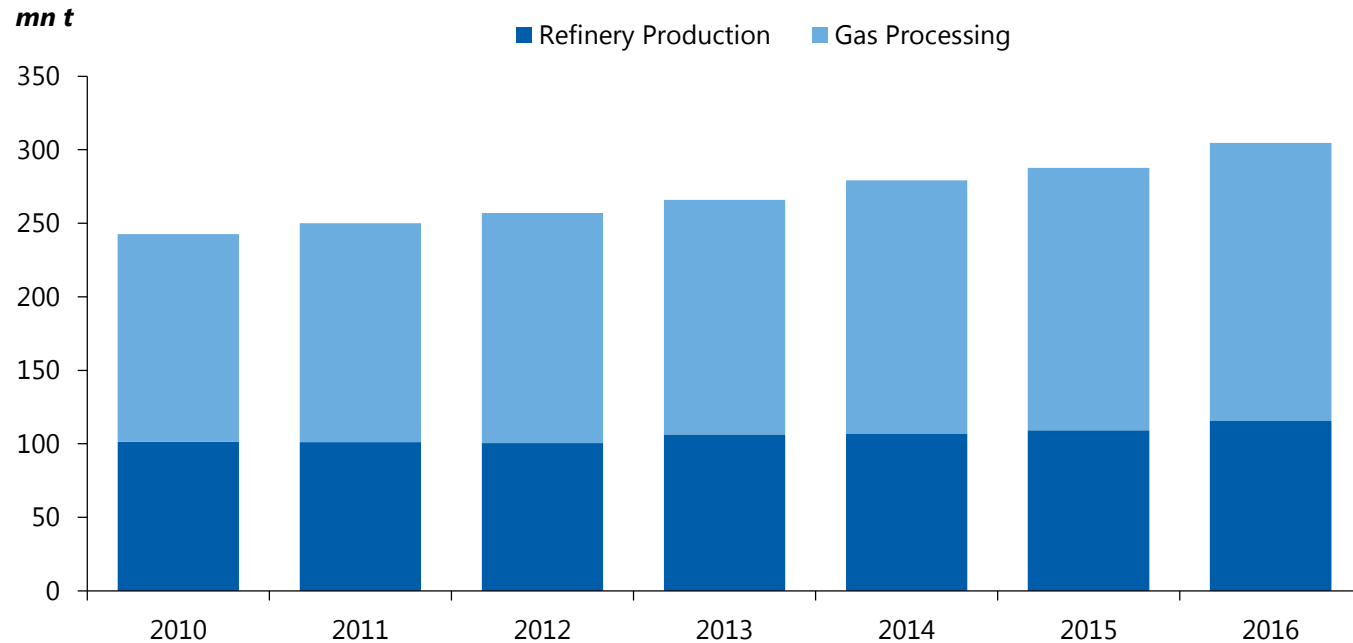
India petroleum coke market balance

- RIL gasifier coming on stream over next 12 months
- Regional curbs on usage in some industries likely to impact imports
- Domestic output continues to expand, more refiners considering gasification technology



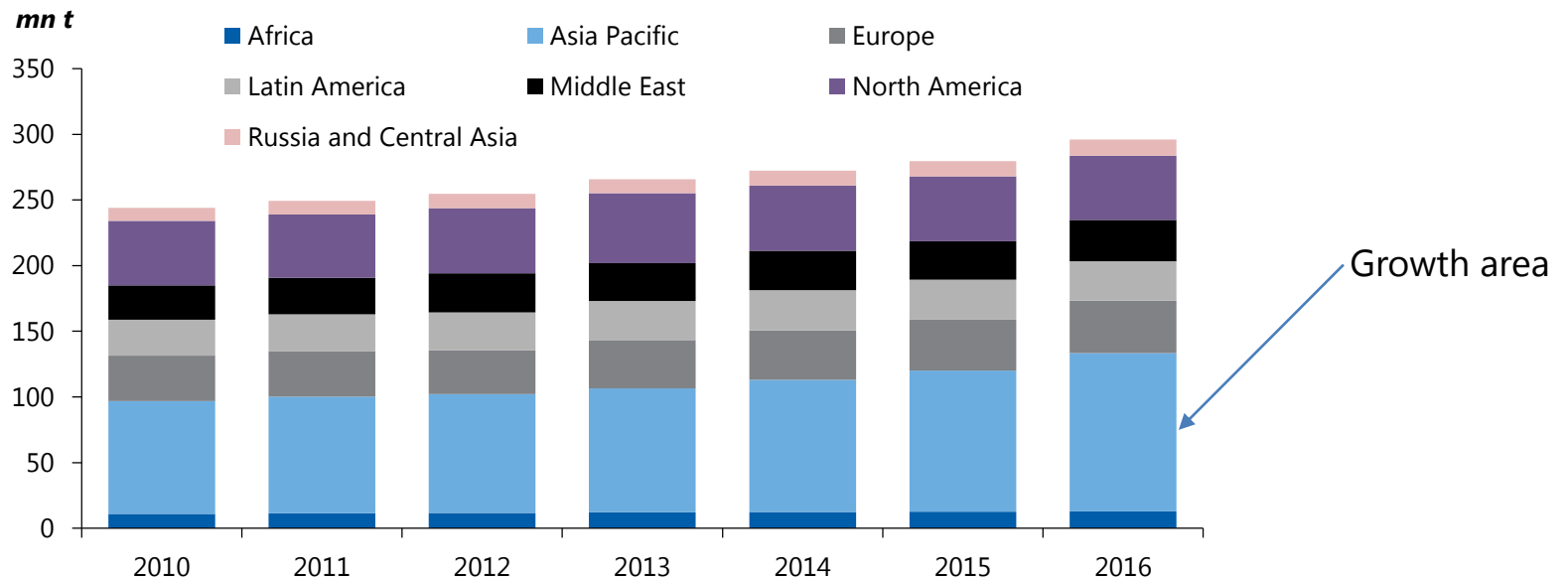
Source: Argus estimates

Global LPG production by source

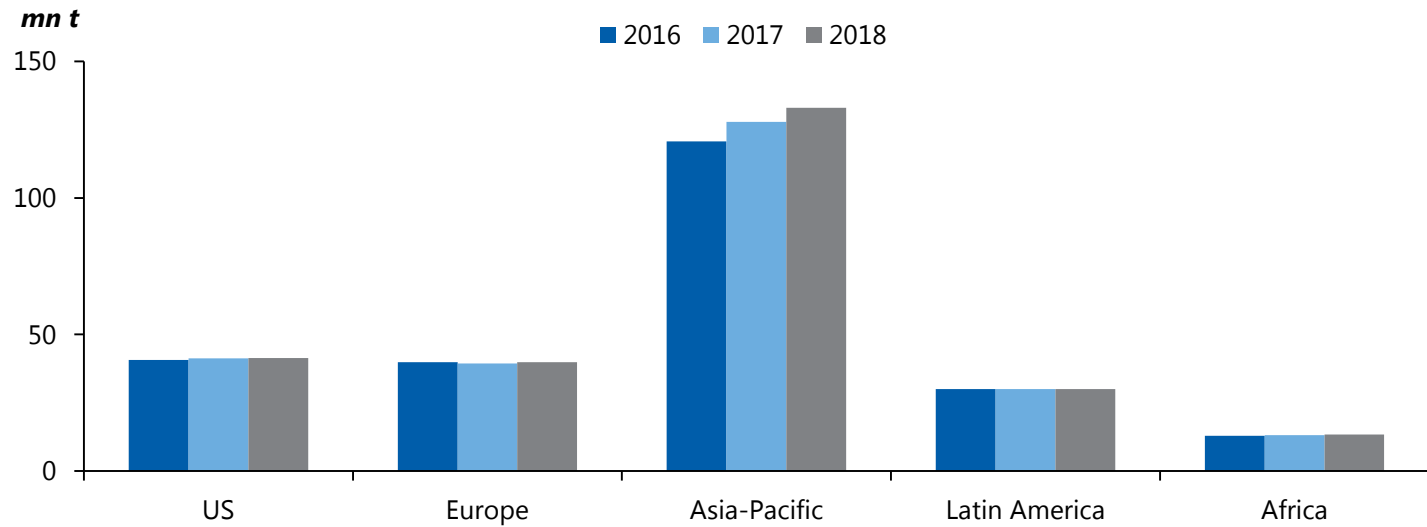


— Argus Consulting
Notes: 2016 data is provisional

Global LPG consumption

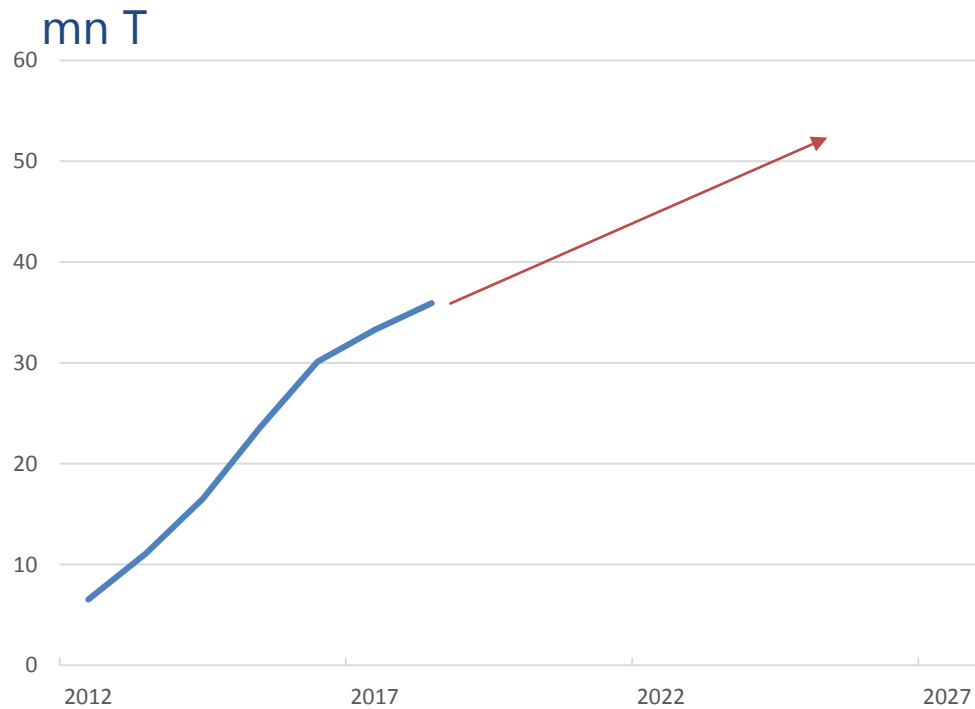


Asia is the key center of incremental demand

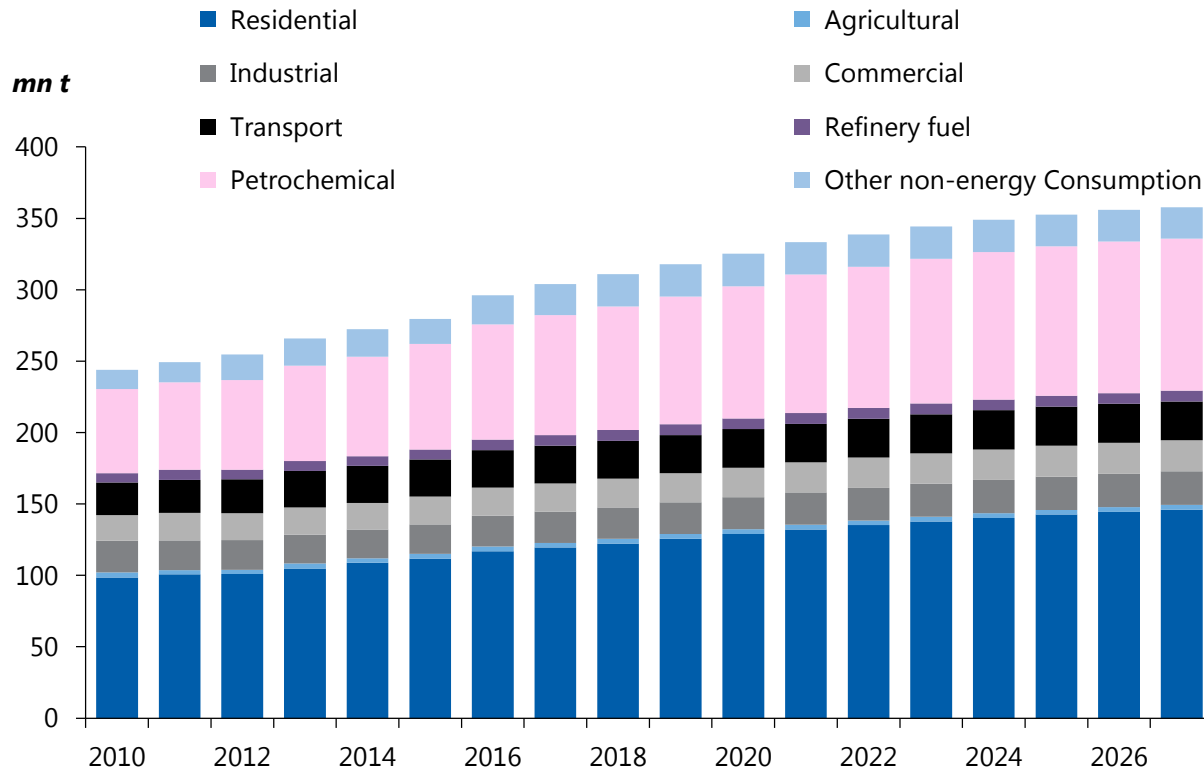


— Argus Consulting, 2017

US LPG export market

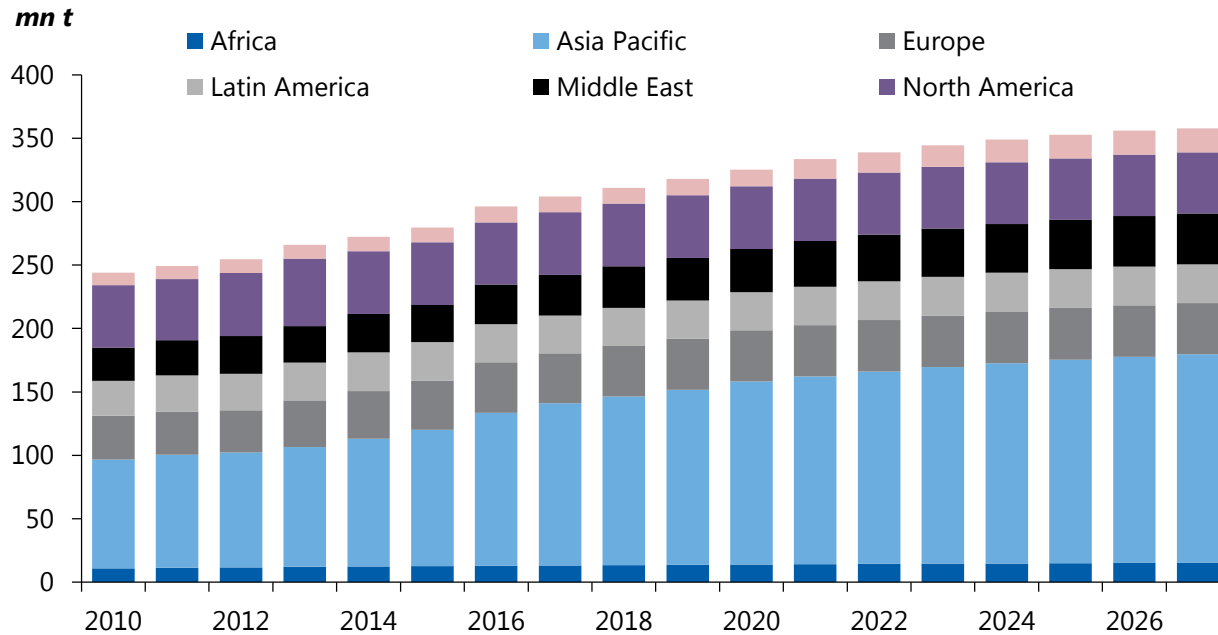


Global outlook for LPG consumption by sector



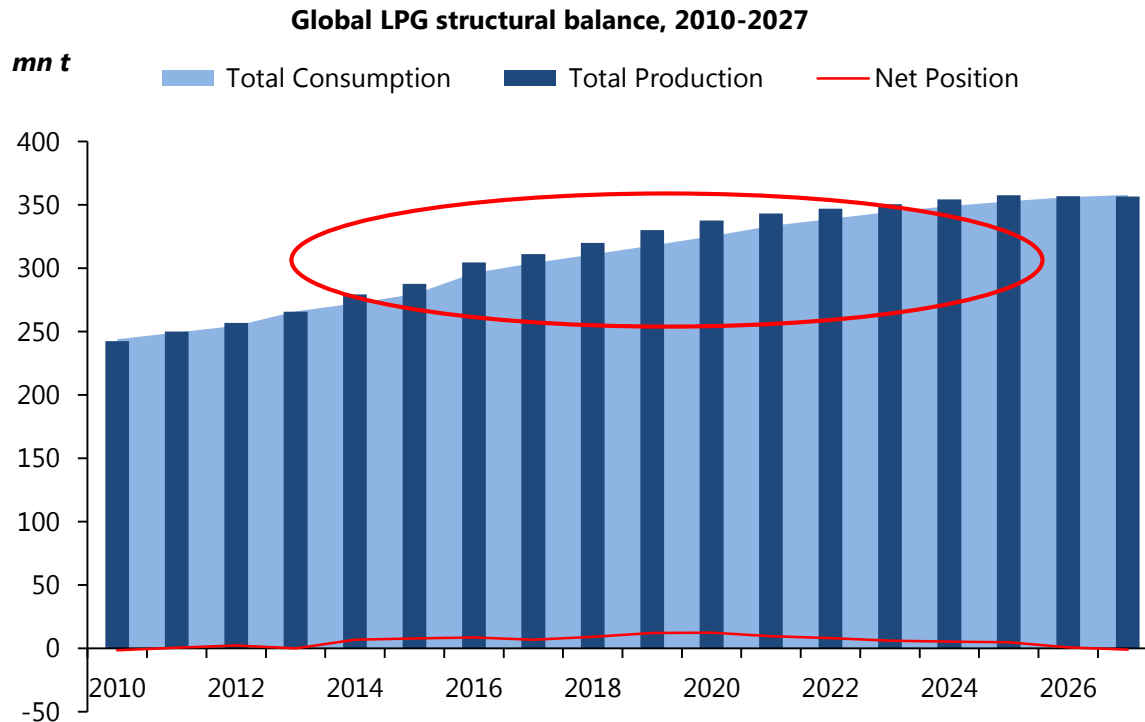
— Argus Consulting, 2017

Global regional LPG consumption outlook



— Argus Consulting, 2017

The next decade will be long LPG



— Argus Consulting, 2017

Some Random Thoughts

Near Term Priorities

Successful Completion of:

1. West Coast Refinery Project
2. Rajasthan Refinery Project
3. Kakinada Petrochemical Complex
4. HMEL Bathinda Petrochemical Project
5. BS VI Projects

Upstream

- Continue aggressive pursuit of Hydrocarbon Exploration & Licensing Policy (HELP) in line with OALP
- Identify & participate in promising exploration blocks outside India
- Encourage participation in blocks outside India that offer NGLs (feedstock for petrochemicals)

Focus: Reduce Crude Oil Imports!

Midstream

- Rationalize pipeline network
- Consider establishing a National Pipeline Company on a Common Carrier basis to maximize asset utilization
- Encourage Undivided Joint Interest (UJI) concept for new pipeline projects
- Streamline & expedite permitting of LNG/LPG/Naphtha Import Terminals
- Encourage Shared Terminal Facilities

Downstream

- Successfully implement BS VI
- MARPOL, consider Condo Desulfurizers/Take advantage of light/heavy differential
- Maximize use of opportunity crudes
- Benchmark, gap analysis with focus on net cash margin
- Establish “Safe Operating Envelop” for each process unit & maximize asset utilization
- Implement Energy Conservation (Stoichiometric firing of furnaces, steam leaks/usage, flare, etc.)
- Higher Octane – explore Ionic Alkylation, a Chevron Technology
- Identify projects to integrate petrochemicals/fertilizers
- Crack diesel, kerosene and move as feed to petchem
- Explore Waste to Biofuels

Operational Excellence

- Reliability Centered Maintenance
- Technology to Predict Failures/Condition Monitoring
- Advance Process Controls/AI

Safety & the Environment

- Treat everyone with dignity & respect
- Implement Incident & Injury Free initiatives (Behavior Based Safety, Reinforcement Based Leadership, etc.)
- Any human being who enters our premises MUST enjoy the fundamental GOD given right to go back to their families injury free at the end of each shift, every day.
- Protect Water Aquifer
 - All Hydrocarbon tanks (including Petrol pumps) to be inspected periodically for leaks
 - All new hydrocarbon tanks must have double bottom with leak detection
- Consider a National Drug & Alcohol Policy
 - Pre-employment screening for all at Hydrocarbon facilities, including tank truck drivers
 - Random tests using “Single Barrel” data process

Technology

- Centre for High Technology should leverage talent at IITs & other institutions
- Champion Waste to Fuels, Cellulose to Fuels and other renewable energy sources
- Technologies to reduce Carbon Footprint

Thank you

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