

# Developments in Global Energy Markets

**Chris Main** <sup>AC</sup>

European Energy Strategist

[chris.main@citi.com](mailto:chris.main@citi.com)

+44 (0) 203 569 4309

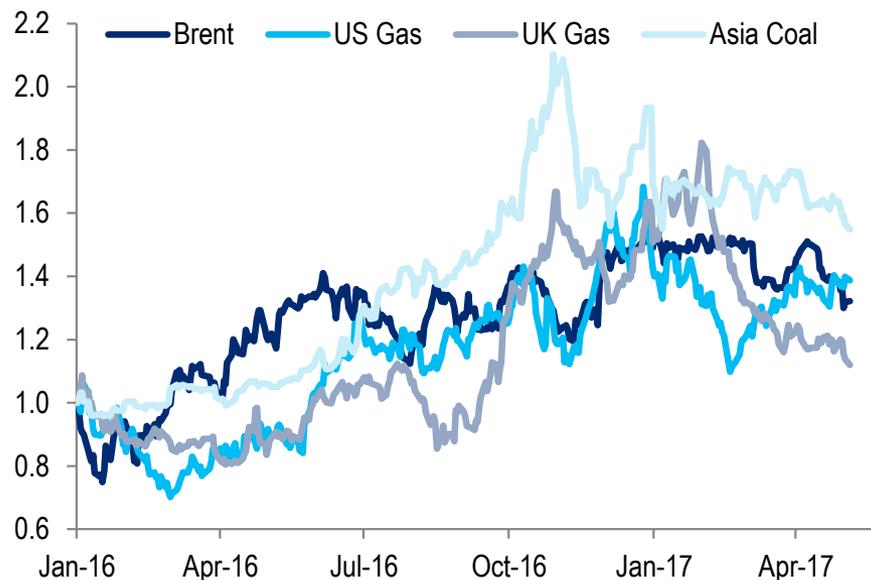
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# An Increasingly Integrated Energy Complex Despite Price Paths

Indexed Energy Prices (Jan 1<sup>st</sup> 2016 = 1)



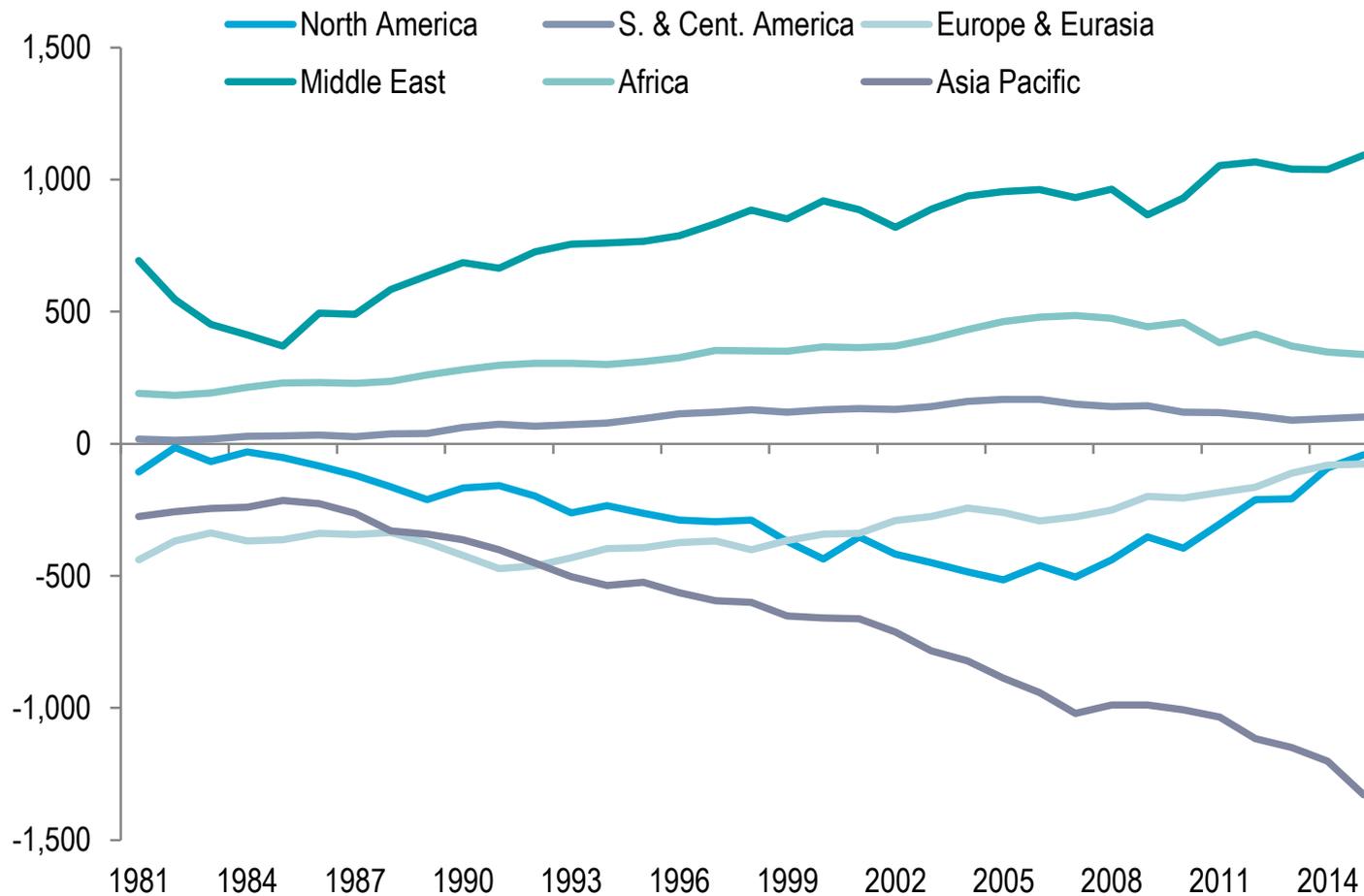
Citi Energy Market Forecasts

		Spot	4Q'17 Futures	Citi 4Q'17 Forecast	View
Brent	\$/bbl	49.0	50.3	65.0	Bullish
WTI	\$/bbl	46.1	47.8	62.0	Bullish
US Gas	\$/MMBtu	3.2	3.4	3.5	Neutral
UK Gas	\$/MMBtu	4.8	5.7	5.2	Bearish
Asia Coal	\$/Metric Tonne	75.4	73.8	71.0	Bearish

Source: Bloomberg, Citi Research Estimates

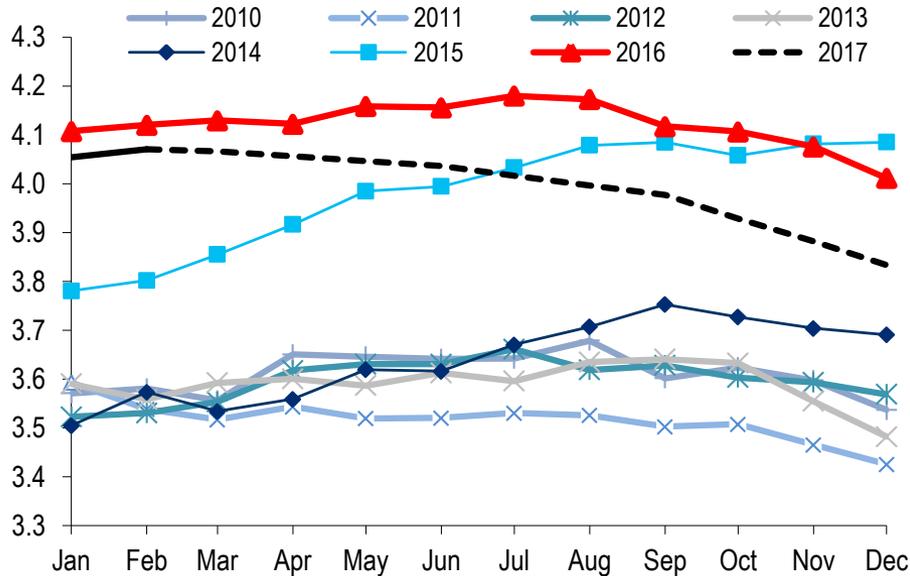
# Energy Markets Everywhere Adapting to the New Role of the US

Global Energy Net Balance (Oil, Gas and Coal in MTOE)

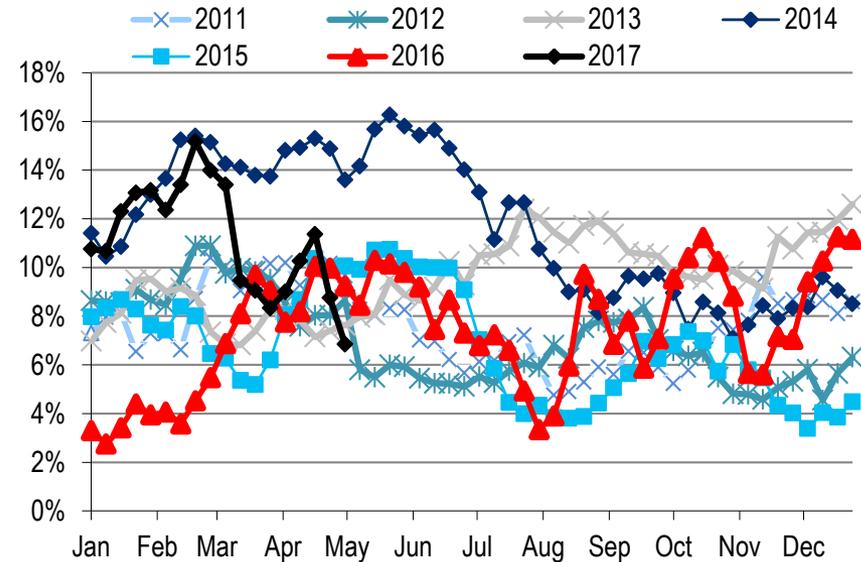


# Oil: Inventories to Re-balance but it will be a Bumpy Ride

Global Oil Inventories (bln bbls)



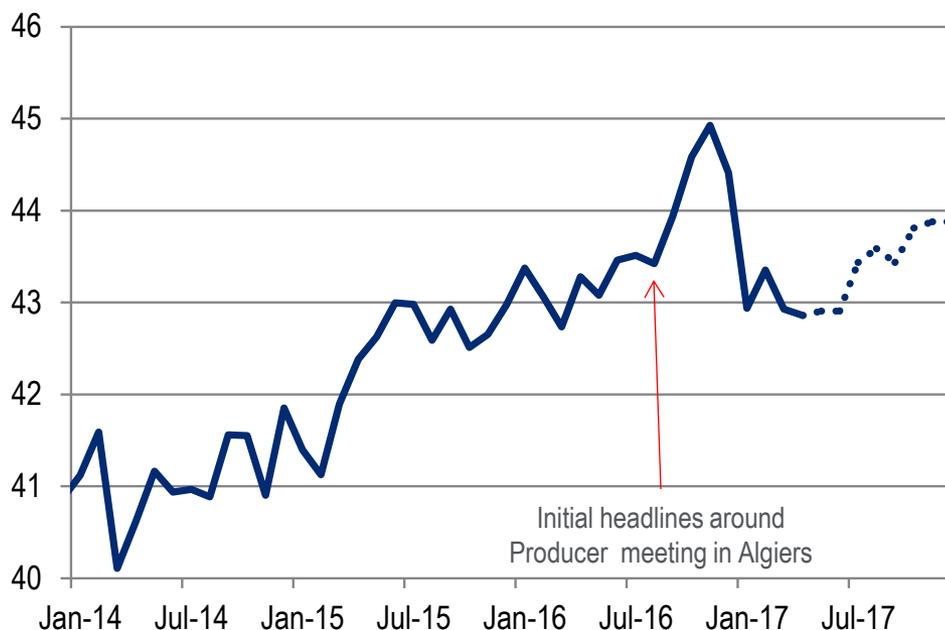
Investor Net Positioning on WTI (Adjusted for OI)



Source: IEA, EIA, JODI, METI, APEX, Chinese Customs, Bloomberg, Citi Research estimates

# Oil: The OPEC/non-OPEC Group Created its own Big Problem

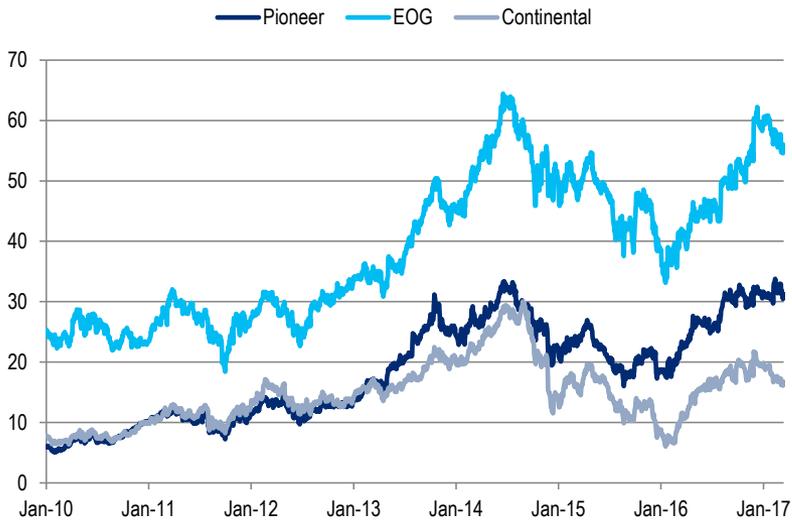
OPEC and Russian Crude Production (m b/d)



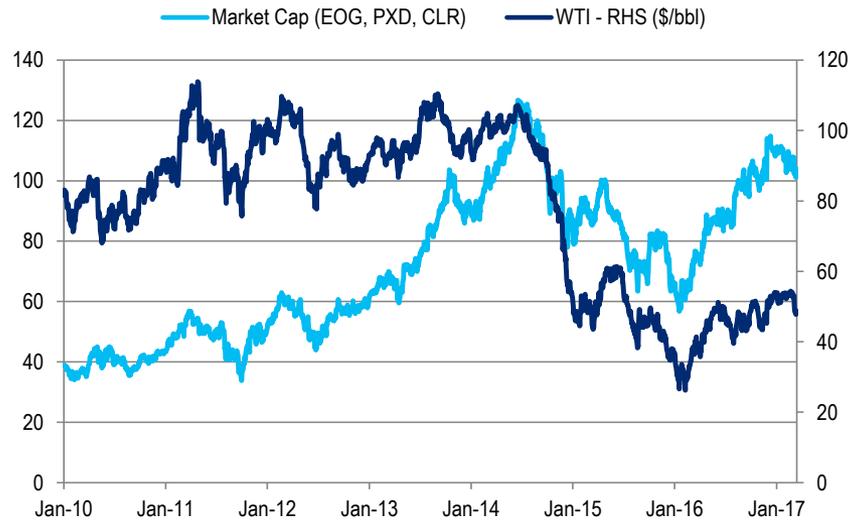
- **Initially the output deal was beneficial for struggling OPEC and non-OPEC producers as prompt prices were lifted by ~\$10/bbl, which increased producer revenues by 25-35%.**
- **OPEC and Russia now have a major issue: the incremental ~1.5-m b/d of crude production that countries pushed onto markets in 4Q'16 is now a dark cloud hanging over the market.** If the group doesn't extend its existing production deal then the impending threat of an incremental 1.-m+ b/d of oil on the market should send oil prices precipitously lower. This is something that no member of the group can afford and hence they have effectively backed themselves into a corner.
- **Increasing the pain is the wave of US producer hedging that was completed in Dec-16** that will lock-in 2H'17 shale barrels even if oil prices move lower. In addition, investor net-length would likely reduce sharply, as it still remains above 5-YR average levels, and this could push spot oil prices to \$40-45/bbl, or even below.

# Oil: A Lesson For the Saudis, the Market Values Market Share

Market Cap of US Shale Producers (\$bln)



Oil Price vs. Shale Producer Market Cap (\$bln)



Source: Bloomberg, Citi Research

# US Gas: Prices to Evolve in 3 Stages in the next 12 to 18 months

## Base Case (50% Likelihood):

- 2017 prices at \$3.3: Prices to stay supported through 3Q** in order to bring end-Oct storage levels to a safe range of 3.6-3.7-Tcf. Going into 4Q, expectations for strong production growth in 2018 could start to weigh on prices, particularly as the evidence of a rebound begins to materialize in the data.
- 2018 prices at \$3.0:** Although Mar'2018 inventories look low in the low 1-Tcf range which could give 2018 prices a lift, the aforementioned **production momentum, which should carry over to 2019, could moderate prices in 2018.** The market would likely expect strong production growth in 2019 to reduce the need to fill up storage ahead of winter 2018-2019. The market may be able to tolerate a rather low end-Oct'18 storage of 3.4-Tcf., similar to in 2014, when prices sold off despite a low end-October storage level after a polar vortex sharply reduced gas inventories in the previous winter. Note that organic production growth should be 7.0-Bcf/d y/y, but the reduction in ethane rejection due to startups of petchem facilities and ethane exports should reduce gas production by ~1-Bcf/d, thereby bringing the net production growth in 2018 to ~6-Bcf/d.
- 2019 prices at \$3.0:** Given current oil price projections anticipating a decline in 2019, **associated gas production growth should moderate, bringing end-Oct'19 storage back to the low-end of the normal range** between 3.8 and 4.0-Tcf. Exports should rise by ~2.9-Bcf/d y/y in 2019 to help balance the market.

**Bull Case (15% Likelihood): Prices should average ~\$3.70 in 2018 and 2019.** Low oil prices are slowing associated gas production in 2018, so y/y production growth at ~5.4-Bcf/d vs. 6.0-Bcf/d in the base case. Gas demand for power generation could rise more strongly because the electricity demand with a growth rate of 0.4% pa as seen in the last 6 months could remain in place in years to come.

**Bear Case (35% Likelihood) : Prices should average \$2.8 in 2018 and \$2.5 in 2019. Production growth in 2018 could be very strong,** perhaps reaching 6.4-Bcf/d y/y due to outperformance in dry gas production. Meanwhile, global LNG demand growth could disappoint and thus growth in LNG exports could be weaker than expected, and gas demand for power generation could see drags too as electricity demand growth seen in the last six months could be transient and rising renewable generation and energy efficiency could lower electricity demand by ~0.4% pa.

## US Natural Gas Prices Forecasts (\$/MMBtu)

Prices	2017	2018	2019	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19	3Q19	4Q19
<b>Base</b>	3.3	3.0	3.0	2.9	3.4	3.5	3.5	3.2	3.0	2.9	3.0	3.1	3.0	2.9	2.9
<b>High</b>	3.4	3.7	3.7	2.9	3.4	3.5	3.6	3.5	3.6	3.8	3.9	3.9	3.7	3.6	3.5
<b>Low</b>	3.3	2.8	2.5	2.9	3.4	3.5	3.3	2.9	2.8	2.7	2.7	2.5	2.3	2.4	2.6

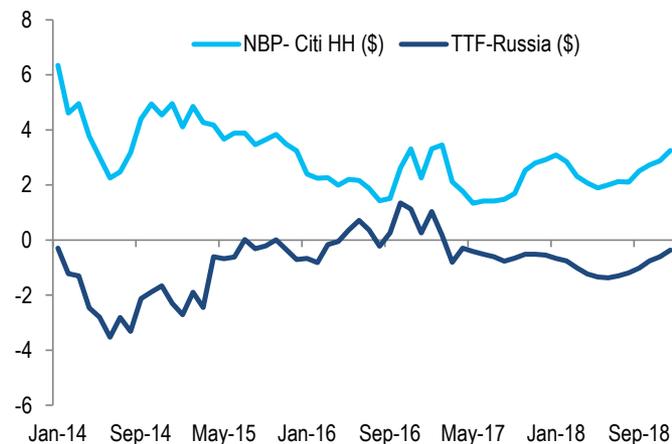
# EU/Global Gas: Increasing LNG to Europe to test Russian resolve

Citi is bearish European gas prices as the much anticipated “wave of LNG” is expected to arrive on European shores this summer, which along with strong pipeline imports should inflate gas inventories above historical average levels unless European gas futures price lower to stimulate demand or reduce supply.

European Gas Pricing Dynamics (\$/MMBtu)

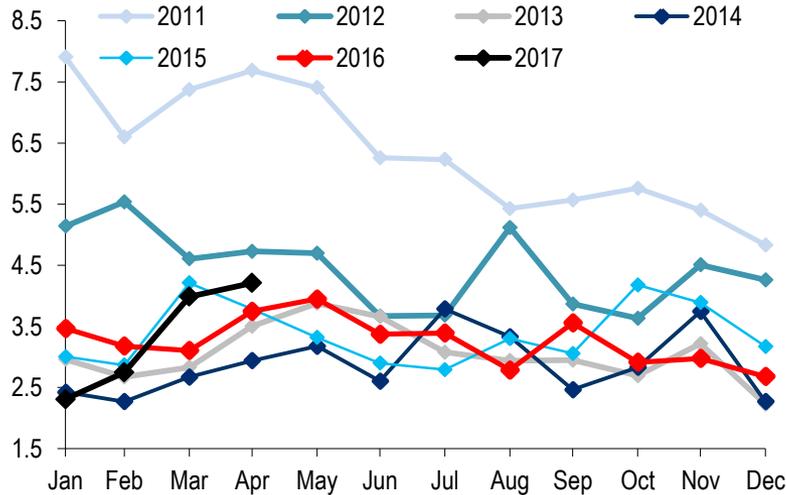
	NBP Forecast	NBP Month Ahead	TTF Month Ahead	Russia OLP	US LNG	UK Coal Switch	EU Coal Switch
1Q16	4.7	4.3	4.1	4.7	3.1	4.8	3.1
2Q16	4.3	4.4	4.4	4.0	3.4	5.0	3.3
3Q16	4.4	4.4	4.3	4.2	4.0	5.6	4.0
4Q16	6.1	5.9	5.5	4.6	4.5	6.7	5.1
1Q17	6.0	6.0	5.7	5.6	4.3	6.5	4.9
2Q17	4.7	4.8	5.0	5.4	4.6	6.3	4.6
3Q17	4.8	5.0	5.0	5.7	4.8	6.2	4.5
4Q17	5.2	5.9	5.5	6.0	4.5	6.1	4.5
1Q18	5.2	5.9	5.4	6.2	4.4	6.0	4.3
2Q18	4.5	5.0	5.0	6.4	4.3	5.8	4.2
3Q18	4.7	5.1	5.1	6.3	4.1	5.7	4.1
4Q18	5.4	6.0	5.7	6.2	4.3	5.7	4.0

European Gas Price Arbs (\$/MMBtu)

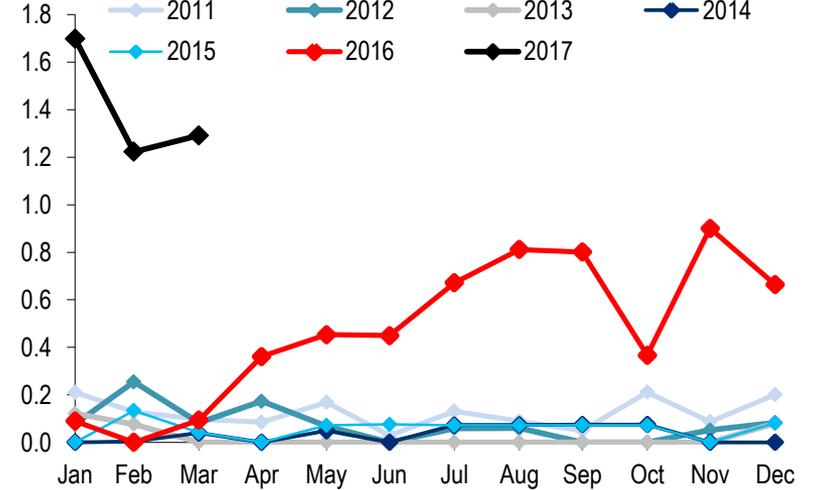


# EU/Global Gas: LNG Arrivals are Already Ramping Up Strongly

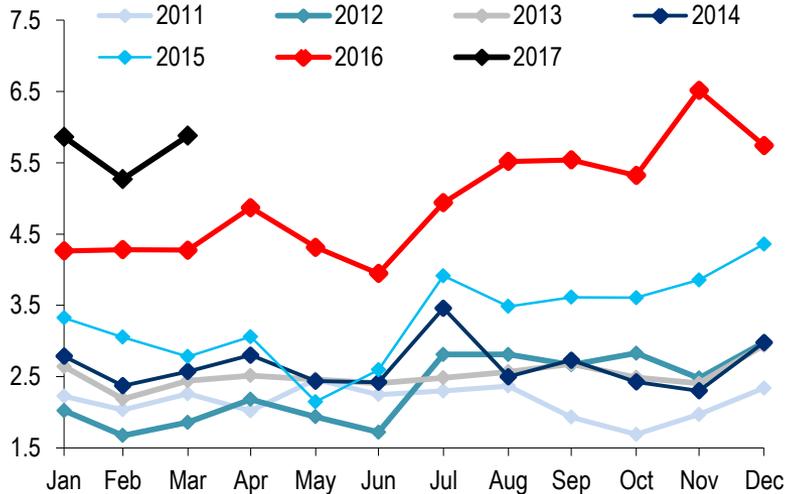
## LNG Imports into Western Europe (bcm/month)



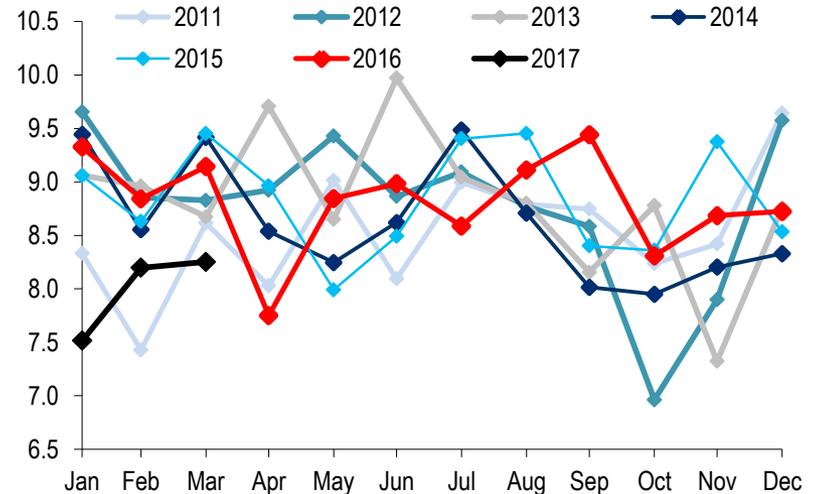
## US LNG Exports (bcm/month)



## Australian LNG Exports (bcm/month)

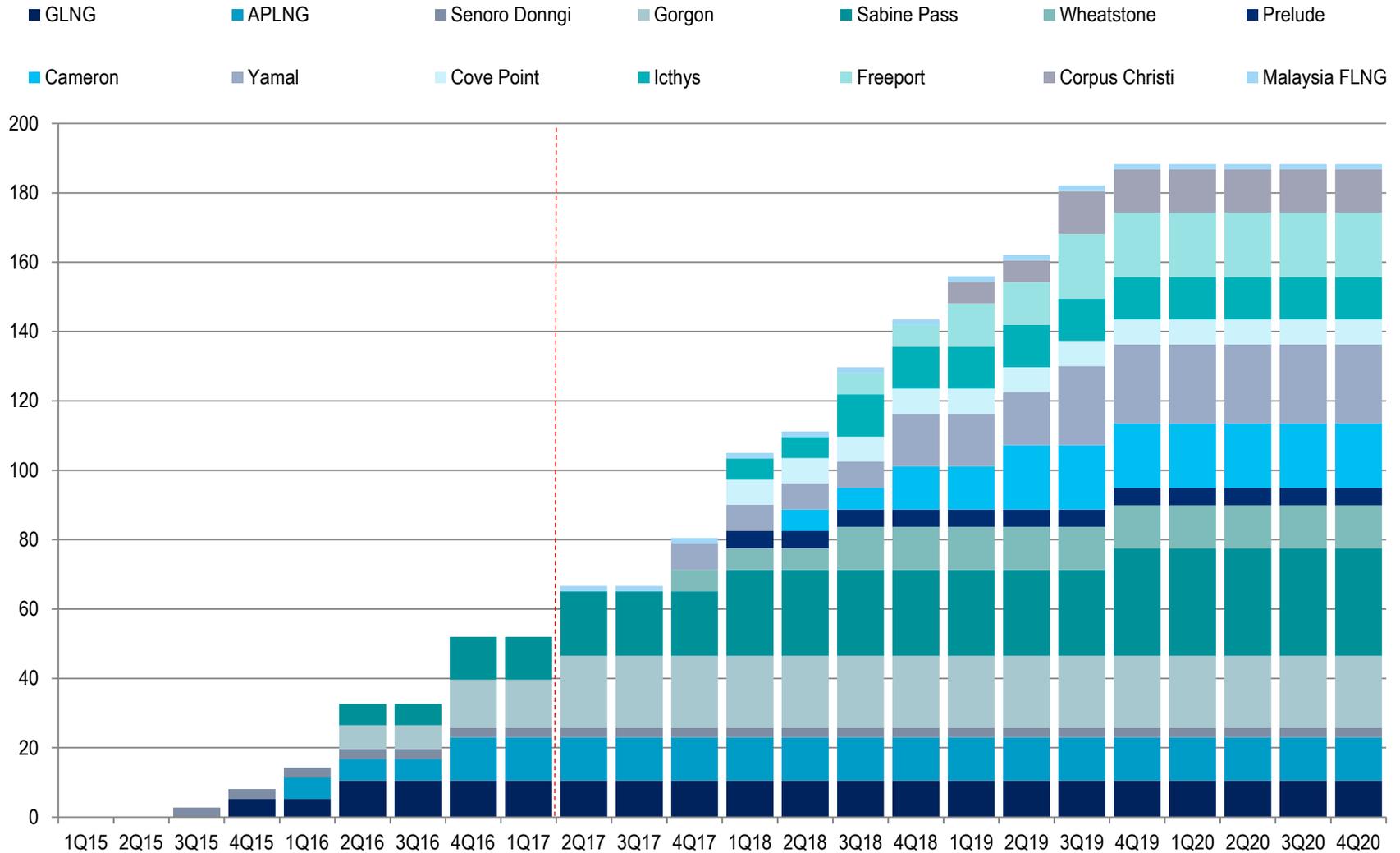


## Qatari LNG Exports (bcm/month)



# EU/Global Gas: The Wave of LNG Supply is Just Beginning

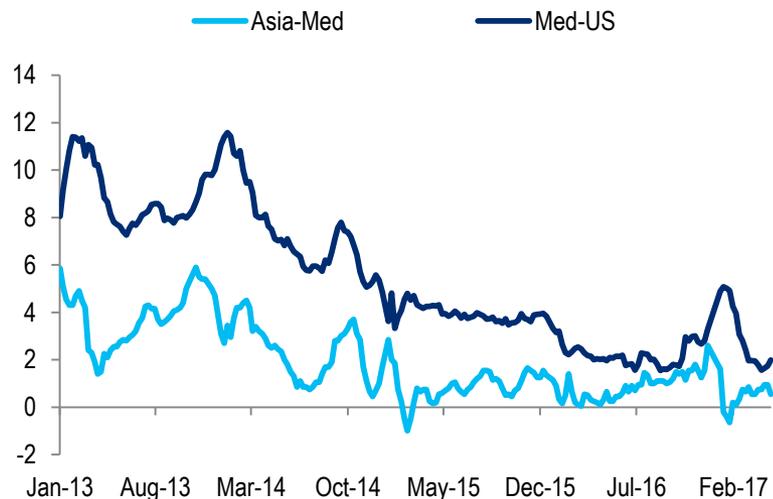
Incremental LNG Supplies (bcm/year)



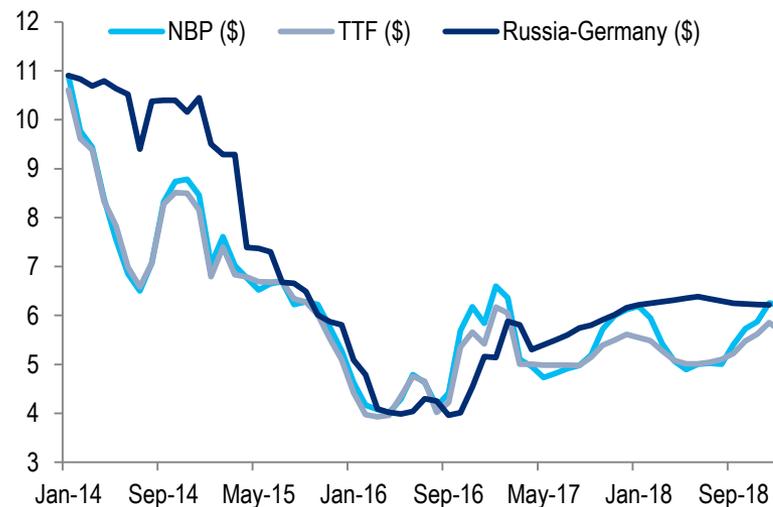
Source: Woodmackenzie, Timera Energy, Citi Research

# EU/Global Gas: Global Gas Prices Should Converge Further

### Global Gas Price Spreads (\$/MMBtu)

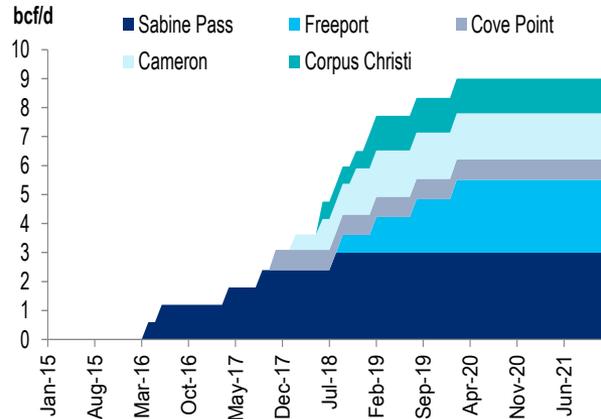


### European Spot and Oil-Indexed Pricing (\$/MMBtu)



# EU/Global Gas: Are Gas Markets the New Oil Market?

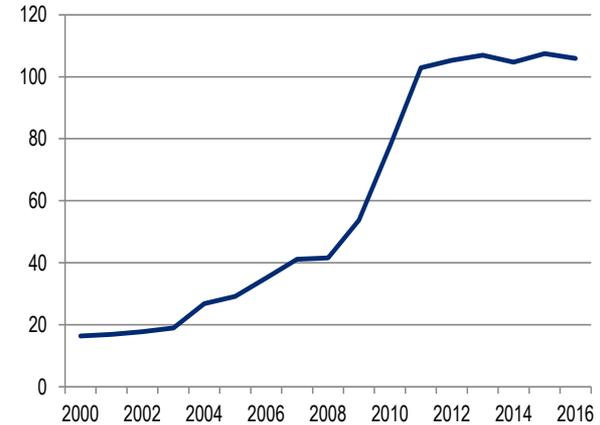
US LNG Exports (bcf/d)



Russian Gas Flows to Europe (mcm/d)

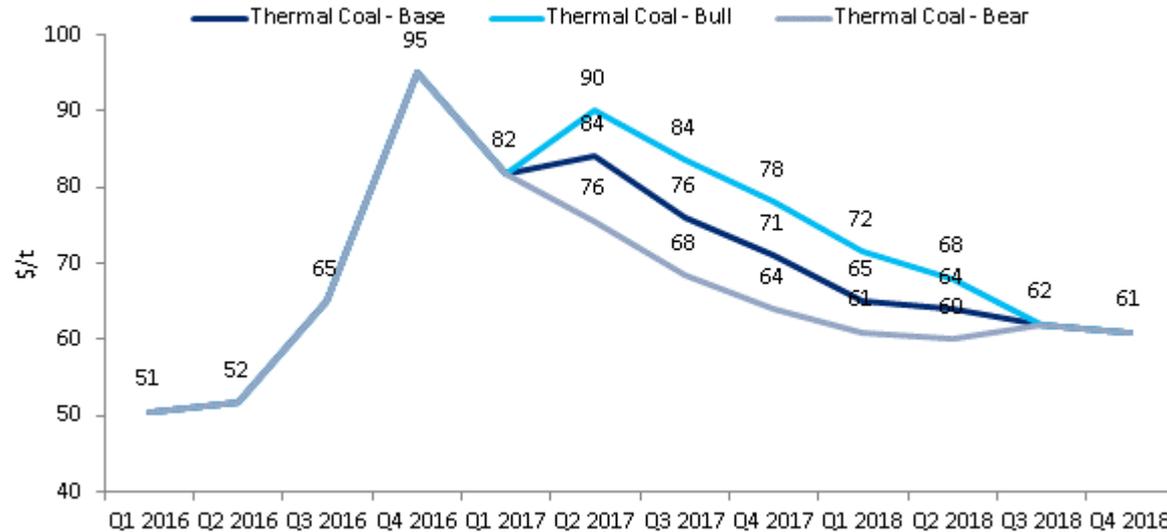


Qatari LNG Supply (bcm/year)



- Is their room in the new global gas order for Russia, Australia, Qatar and the US?
- Will Gazprom defend its increased market share in Europe?
- Will Qatari volumes be crowded out of Asia and Europe or is their lifted moratorium and step in the other direction?
- Will gas market dynamics follow that of oil with surging US production creating a big problem for Russian and Middle Eastern suppliers?

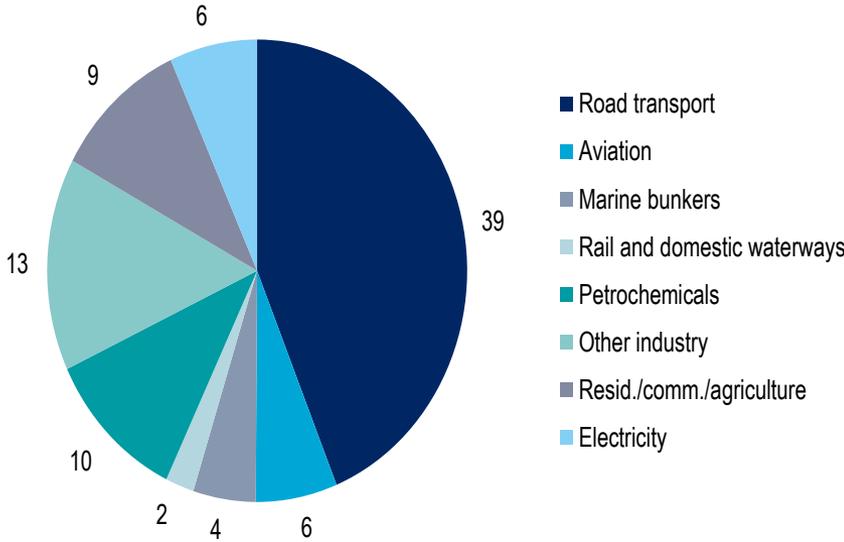
# Coal: Beyond recent supply issues, China is central to thermal price setting



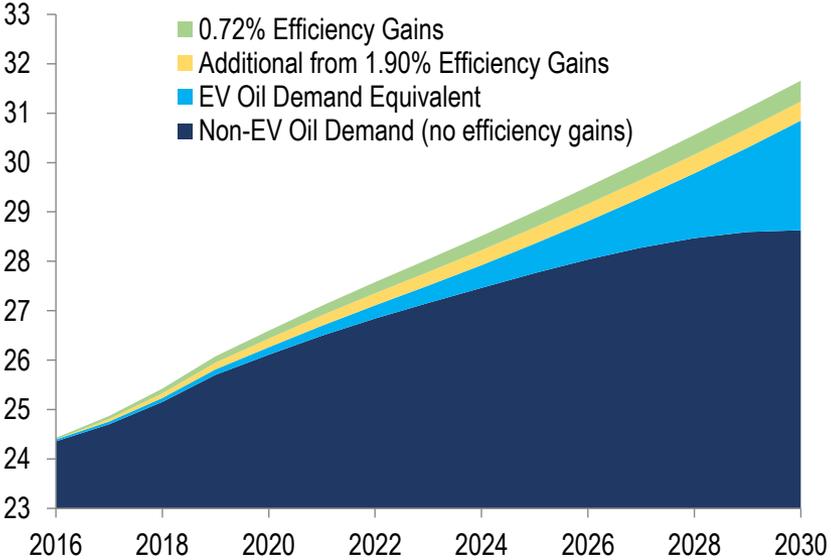
- **Base (60%): Shipping losses from Cyclone Debbie is limited to 3Mt in thermal coal and 0.7Mt in soft coking coal, which could be substituted by high-rank thermal coal.** China's market remains tight in the near term but should start to ease in May-June after completion of the overhaul at Daqing railway. It is likely that domestic thermal coal prices remain above governmental guidance of RMB 500-570/t for half of the time in 2016 if not longer, which in turn lifts our seaborne thermal coal projection.
- **Bull (15%): Queensland rail disruptions are sustained for longer than expected and further push up thermal coal prices.** Chinese thermal power generation sees positive growth for another year, supporting Chinese thermal coal prices at above RMB570/t. Indonesian supply growth continues to be hit by adverse weather and logistics bottlenecks.
- **Bear (25%): Chinese supply ramps up more rapidly than expected.** Actual Indonesian output gets closer to the government's tentative target of 397Mt for 2017 compared with 327Mt likely achieved in 2016. Falling natural gas prices continue to incentivize coal-to-gas switching in Europe, Korea and Japan.

# There Are Numerous Threats to Oil Demand Growth

2015 Oil Demand by End Usage (m b/d)



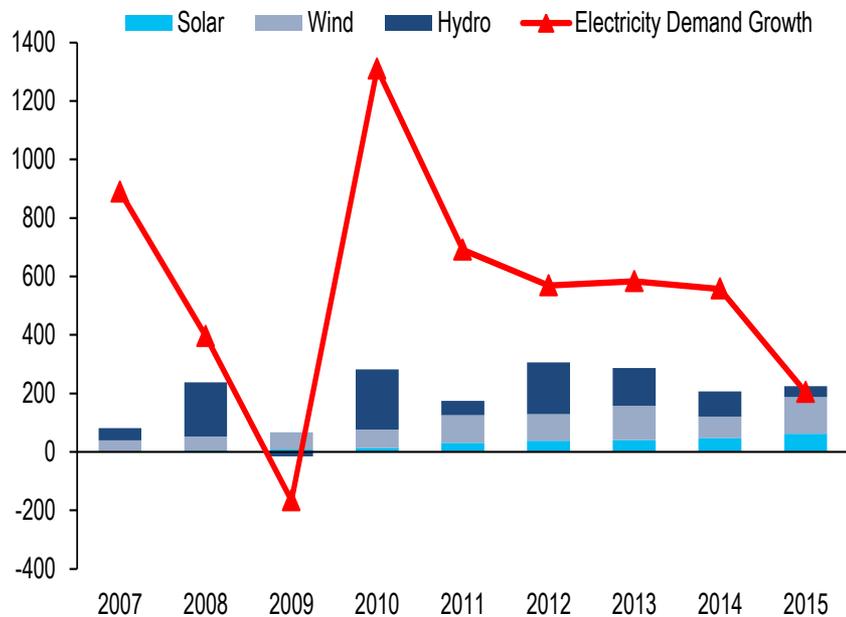
Passenger Vehicle Oil Demand (m b/d)



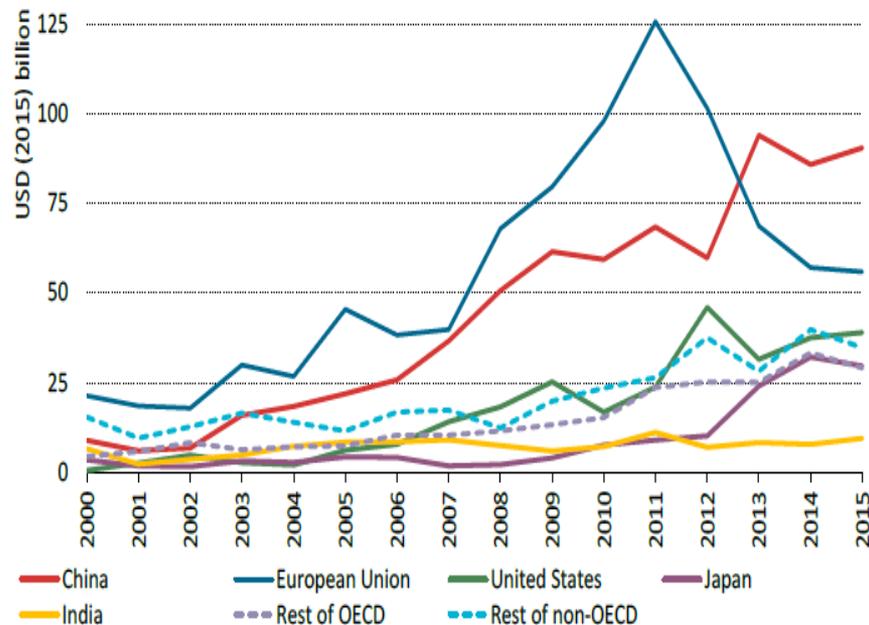
Source: OPEC, IEA, OICA, Citi Research Estimates

# Renewables Met All of 2015 Electricity Demand Growth

## Global Electricity Demand Growth vs. Renewables Generation Growth (TWh)



## Renewables Investment by Country/Region (\$bIn)



# Appendix A-1

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