

North American Fundamentals Update

November 2016
Fundamentals Analysis

IST **Trading**
analytics

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Key Insights: Medium term energy markets

Gas

- Supply has already begun to respond, as rigs are higher in key oil plays and the Marcellus
 - Offset to this is that oil inventories remain high, so further price/drilling recovery may be delayed
 - Northeast expected to be infrastructure constrained in 2017
- **Gas balances likely to be tightest in 2017; expect choppiness as supply and demand attempt to catch up with each other 2018 onward**
- LNG export forecast is generally higher, as global demand outlook is more bullish
- **We continue to see upside to 2017 HH forwards, but the outlook is more neutral 2018-2020**

NGLs

- Supply expected to grow almost 2 MMbpd between 2016-2022, but growth is dependent on oil drilling recovery (2017) and ethane balances
- Ethane rejection expected to end in 2018 for non-Northeast, driven by new cracker and export demand
 - Frac spread would need to be over \$4/MMBtu to incent full Northeast recovery
- Downside risk to C3+ frac spread forecast 2018 onward, as oil overhang and changing drilling elasticity could impact oil price forecast

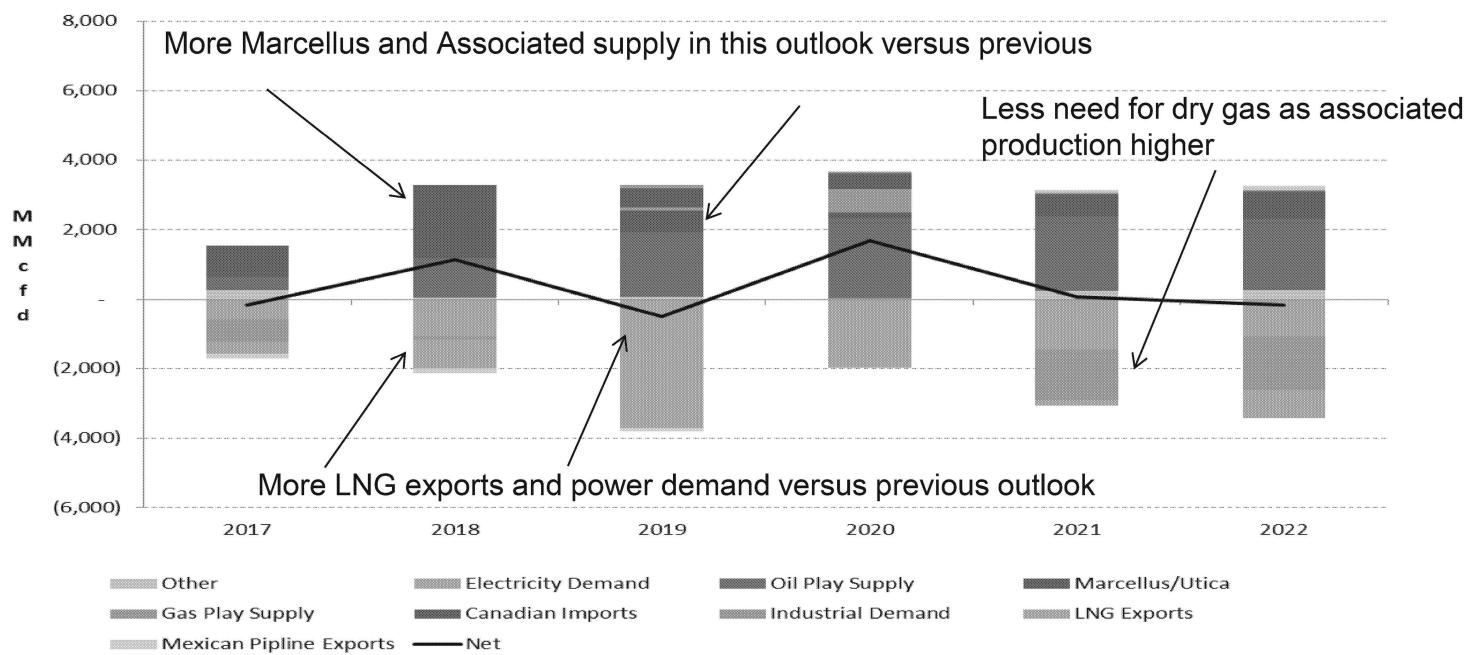
Key Risks & possible impacts:

- *Faster than expected ramp up in oil and gas drilling as commodity prices increase: Higher supply*
- *Weakening of the global economy, led by China: Less energy demand and exports*
- *Nuclear retirements: More gas demand*
- *ITC/PTC extension driving a rush to build renewables before 2020: More intermittent gas demand, weaker power prices*



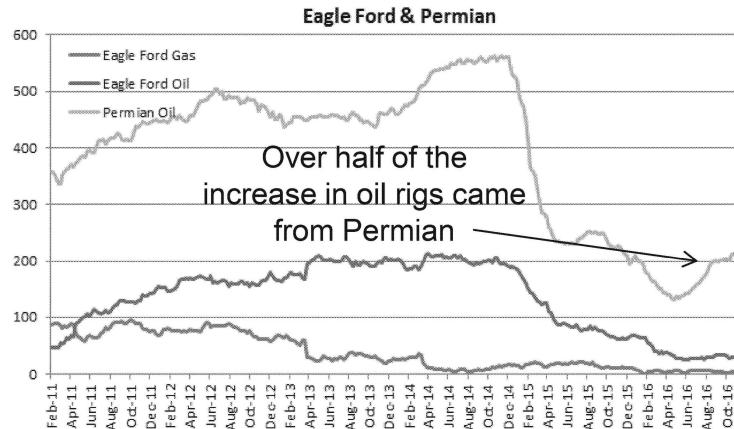
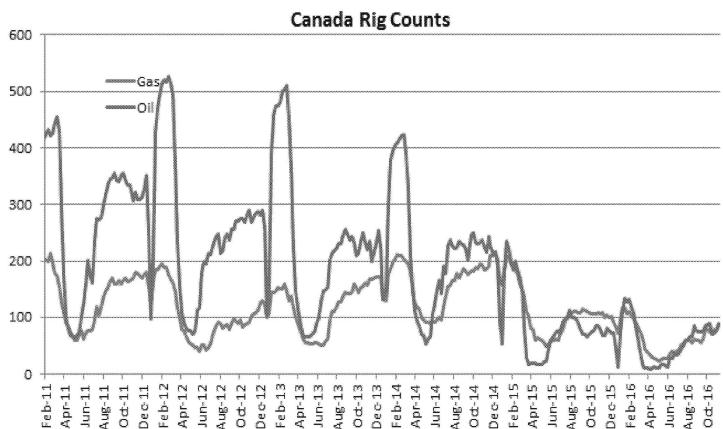
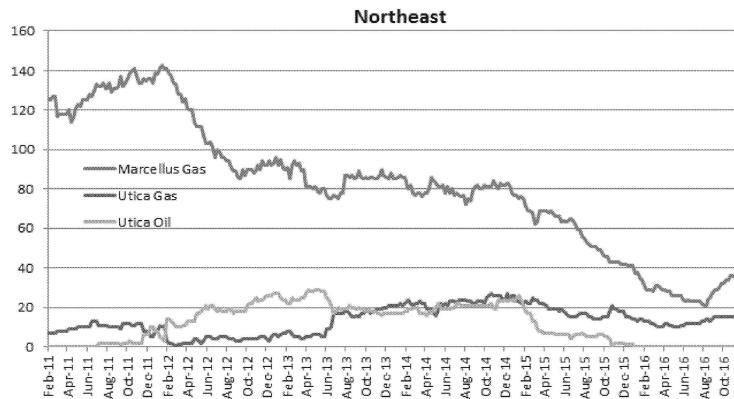
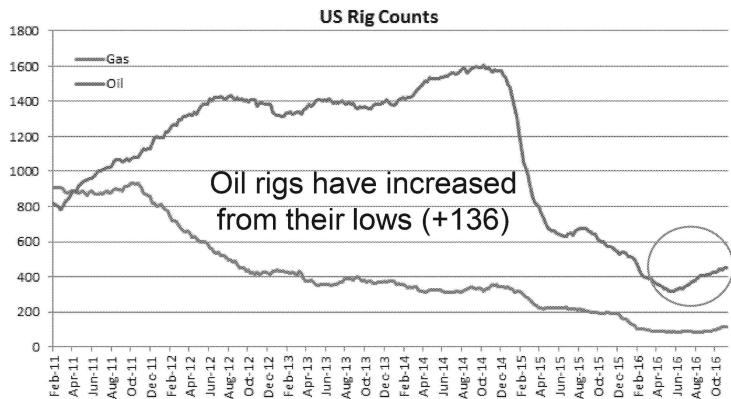
A closer look: US gas balance changes for the 4Q16 outlook

- Gas supply from oil plays higher, as rigs rebounded in key plays earlier than expected
- Higher Marcellus/Utica once the region debottlenecks (2018)
- Increased LNG exports due to revision of global demand higher
- Higher power burns based on +2GW of coal retirements and lower flat price view than previous outlook





As prices moved higher, oil rig counts stabilized and posted gains since the end of May



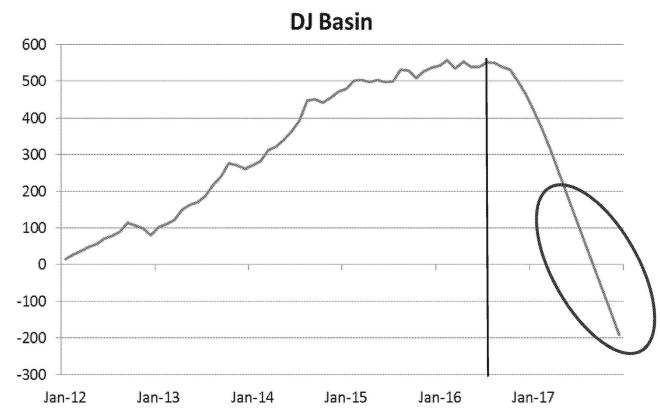
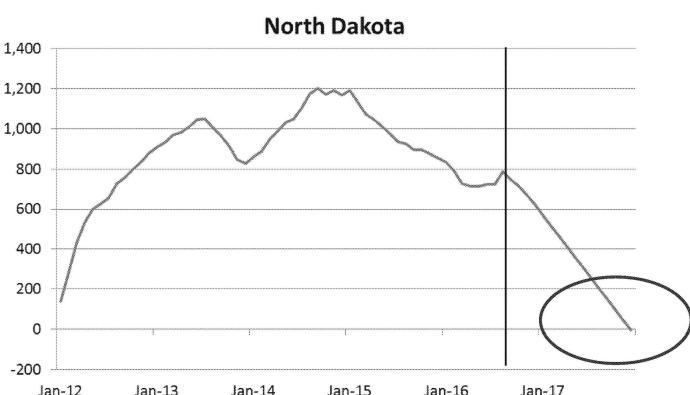
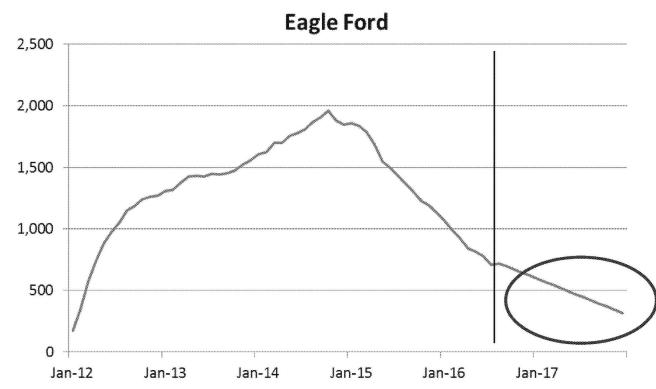
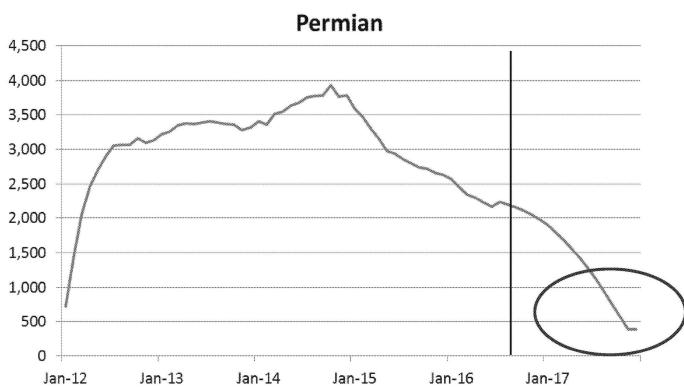
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Source: Baker Hughes 11/11/2016

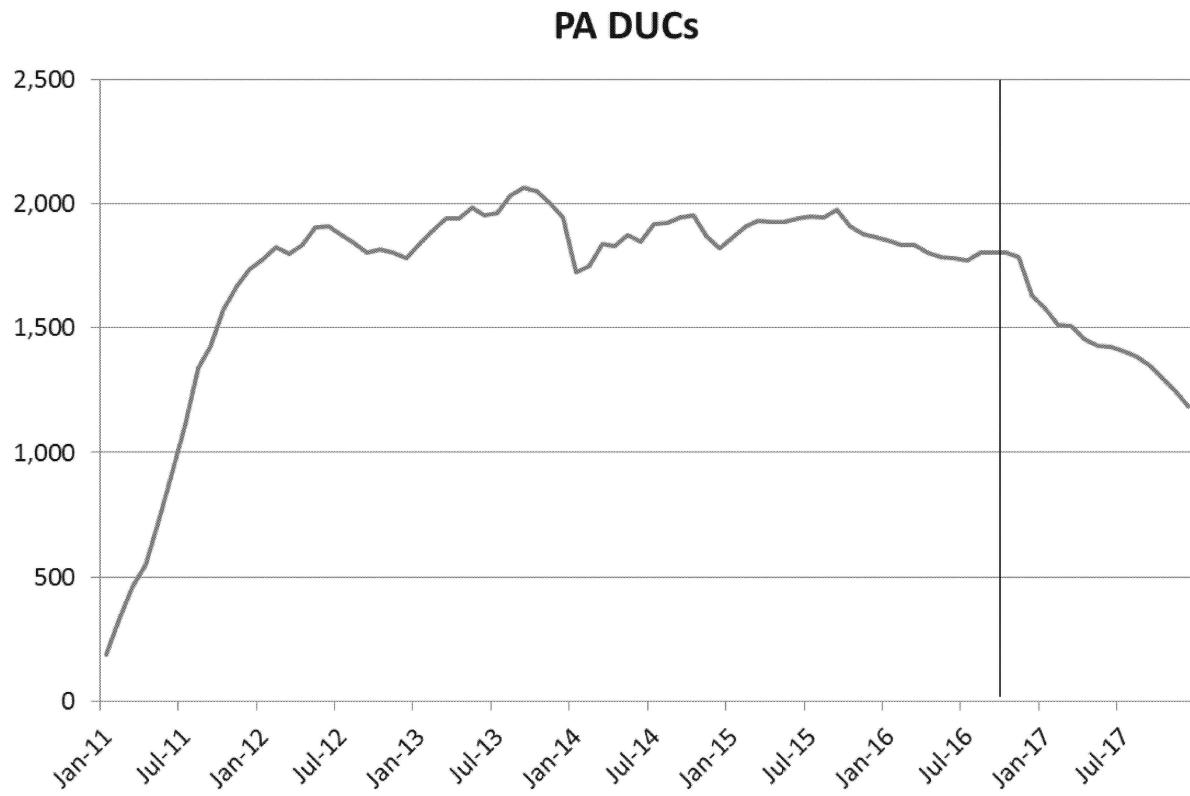
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Oil DUC well count in decline; 200-300 additional oil rigs will be required to meet our growth profile once DUCs are exhausted



PA DUCs beginning to decline but levels remain high; inventory draw down speed will be driven by pipeline capacity additions



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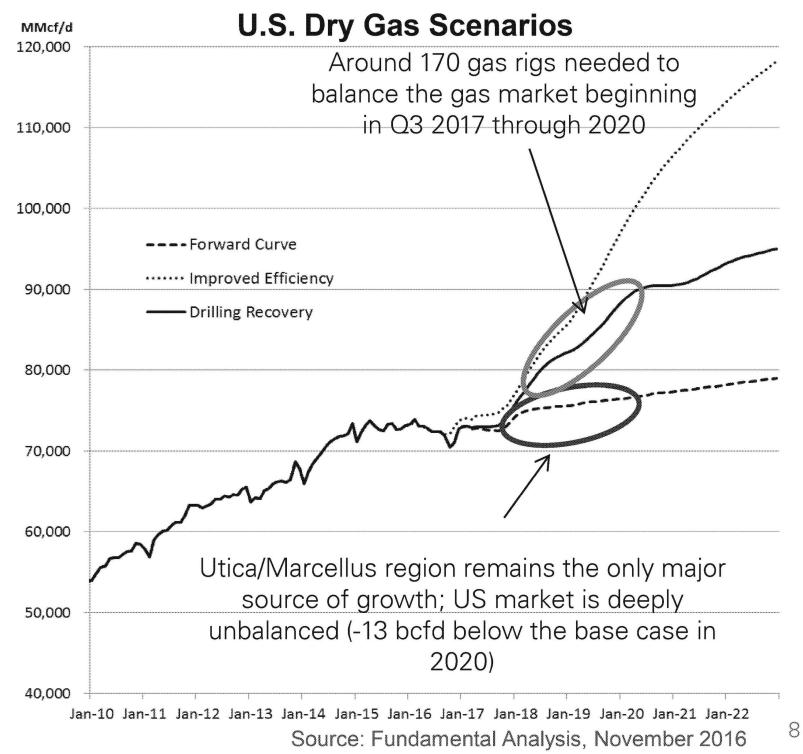
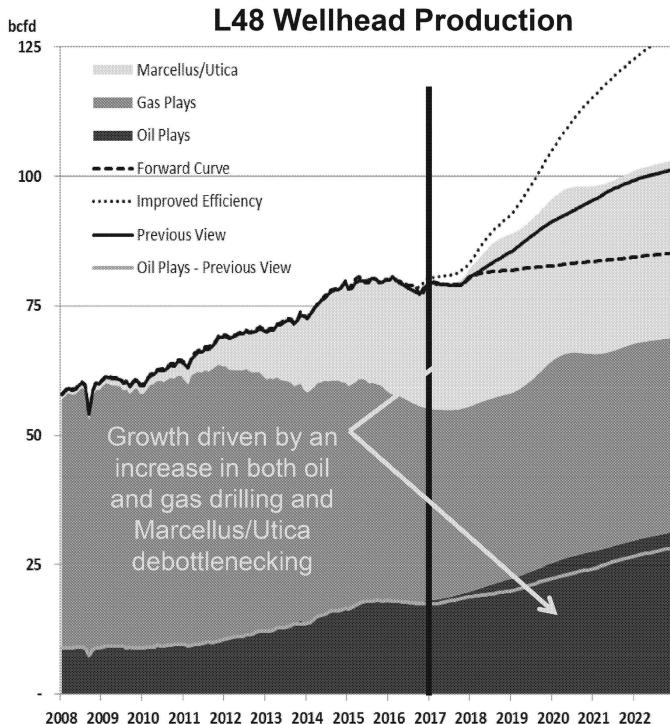
Gas and Power Outlook: Details





L48 gas production: Declining in the short term; higher oil drilling due to a more aggressive Permian activity; NE remains constrained until 2018.

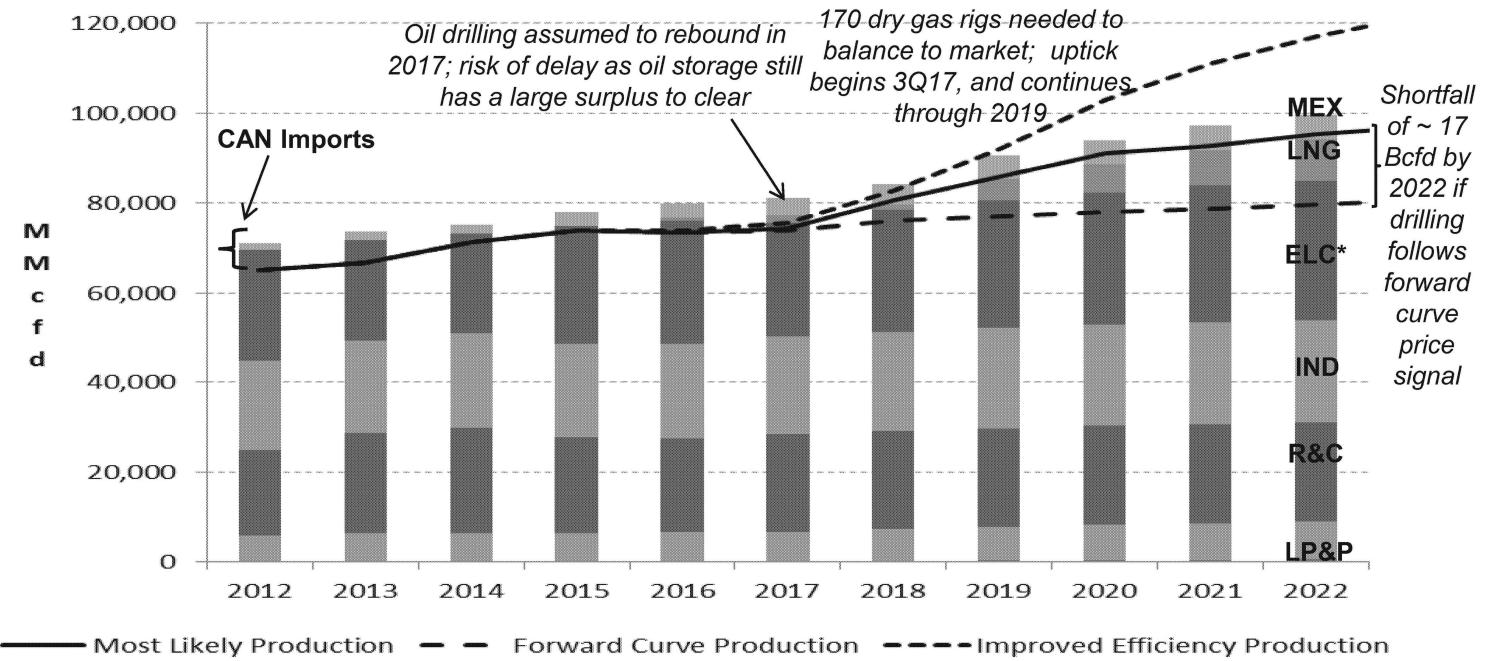
- L48 gas production is in line with our previous outlook in 2017, as lower production levels in the Marcellus/Utica are offset by a stronger rebound in oil drilling activity; 2020 associated production is 3 bcf/d higher than previous forecast
- 200-300 additional oil rigs required to increase oil production by 588 kbd each year between 2017 and 2022; initial rig additions could be lower due to high DUC inventory
- 170 dry gas rigs required to balance the US; ramp up modeled to begin in Q3 2017 and last through 2020
- Wild cards: Producer ability to ramp up activity in a short time period, E&P financial health/decision to pay down debt, continued efficiency improvements





Most Likely view: Gas market tightest in 2017; expect choppiness as supply and demand overshoot each other 2018+

- ~ 18 Bcf/d of core gas demand growth 2016 to 2022, driven by industrial, electric generation and export sectors
- Key risk: Producer financial health and speed of response to price signals; incremental shut in of US LNG exports; renewables muting power sector growth



Source: Fundamentals Analysis, November 2016

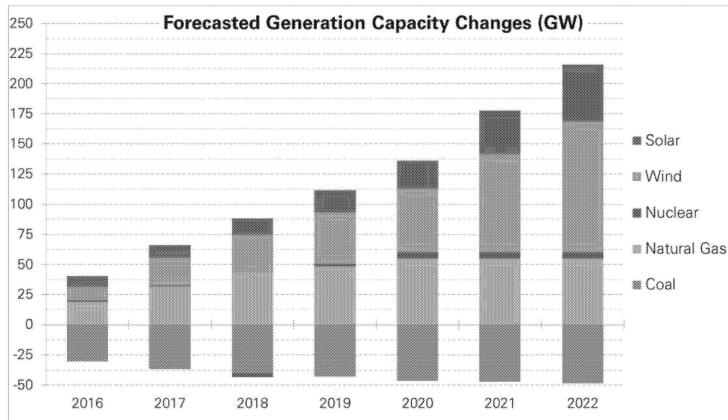
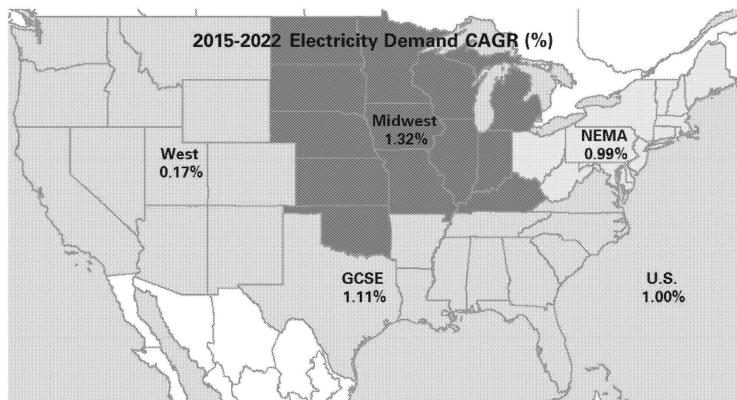
* Electric / power sector

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Electricity load growth and generating capacity change drives power sector natural gas demand



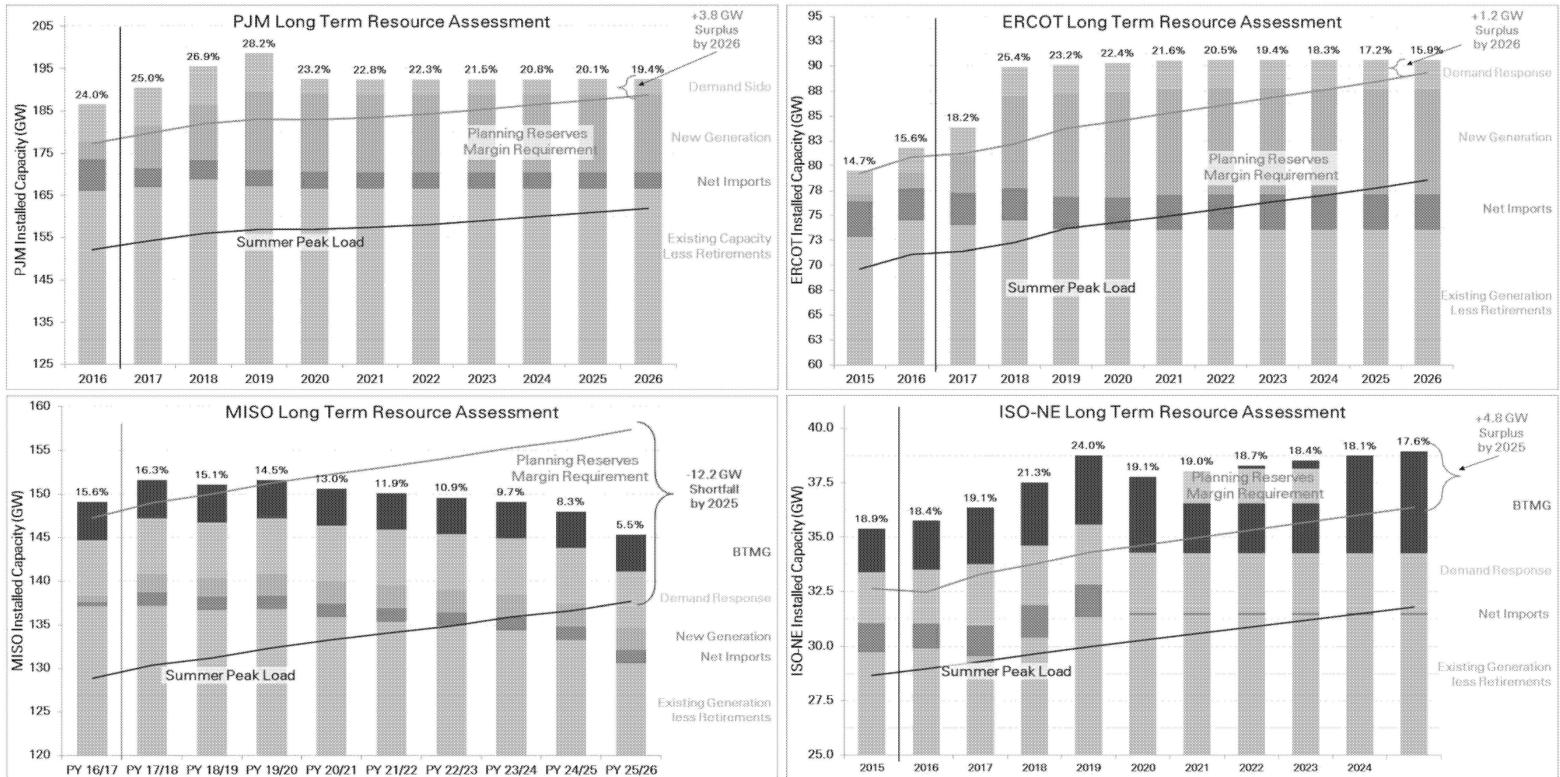
- The national electricity growth rate of ~1.00% CAGR from 2015-2022
 - Demand growth is partially muted by embedded assumptions for Demand Response and Energy Efficiency
- Natural gas increases by 45 GW by 2022
 - Lower 4Q2016 gas capacity from more CPP driven renewables
 - Renewables grow by 50 GW by 2022, higher now from tax extenders package and CPP compliance
- Natural gas generation accounts for approximately 36.4% of total electricity output by 2022.
 - Coal generation retains a ~26.6% share of total generation despite significant incremental capacity retirements.

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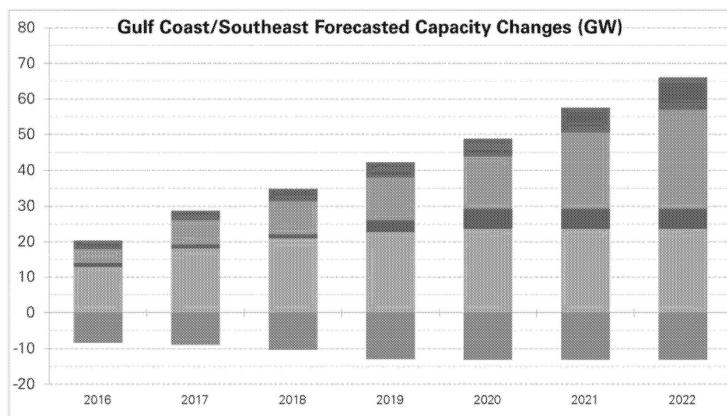
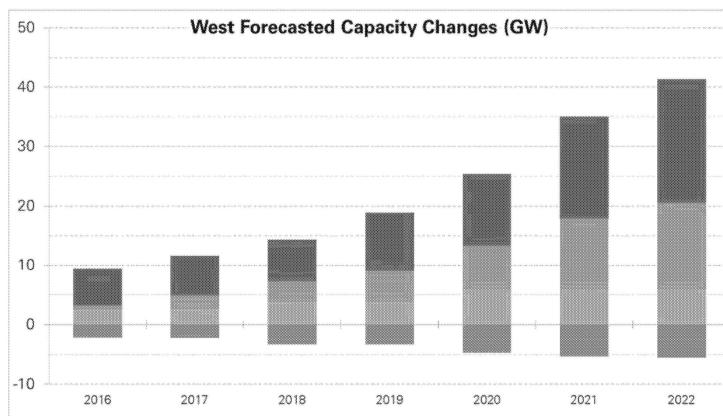
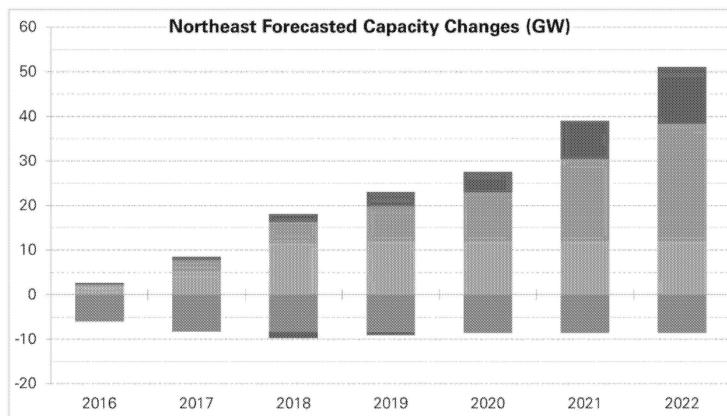
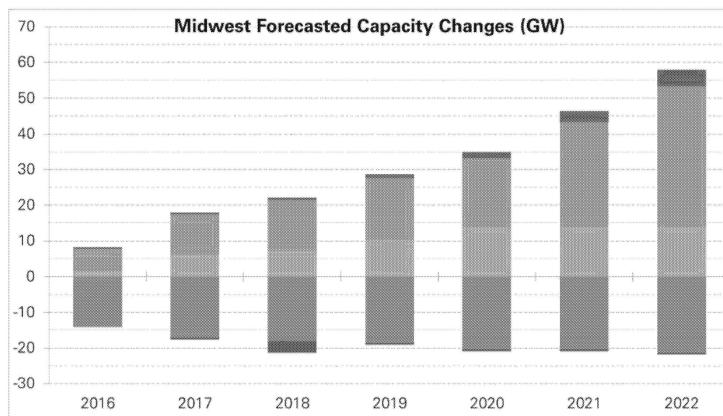
Reserve margin outlooks mostly healthy thru 2025: MISO North will be short capacity as soon as 2020



- PJM's and ISO-NE's capacity markets have 3 years of surpluses locked in to MISO's one. MISO could stop exporting capacity to PJM to stave off a capacity shortfall. O&G demand growth is the unknown in ERCOT.

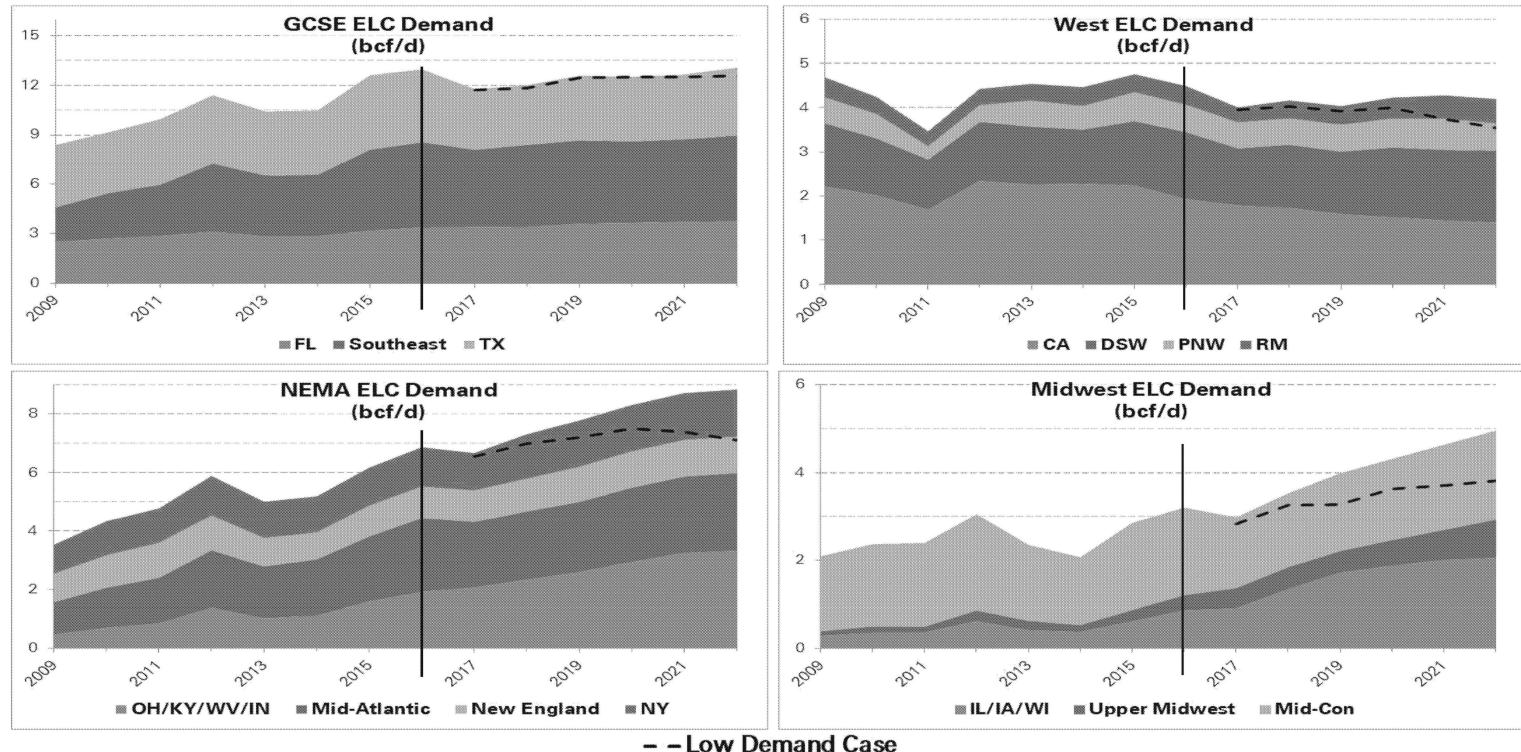


Coal retirements focused in the Eastern Grid; natural gas dominates new electricity generation builds





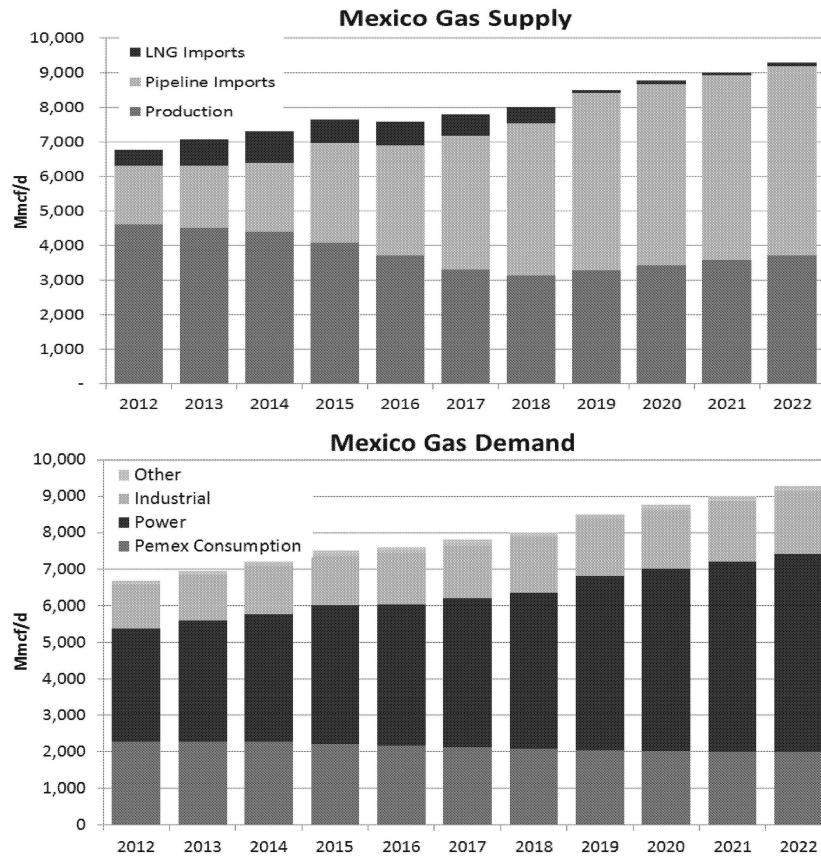
U.S. power sector gas demand: Coal to gas displacement continues; Low Demand Case driven by renewables



- The **Low Demand Case**, driven by the North American Climate, Clean Energy, and Environment Partnership Action Plan resulted in 3.6 bcf/d net less U.S. gas demand from increased renewables (-4.5 bcf/d), and fewer nuclear retirements (-0.9 bcf/d); partially offset by lower coal utilization (+1.8 bcf/d)



Mexico: Domestic supply view revised lower 2017-2020; offset by more pipeline imports and LNG



Supply

- Production view derived from new supply model
 - Differences reach a trough of -360 MMcf/d by 2018
 - Relatively flat to previous view by 2021
- Pipeline imports ~ 100 to 150 MMcf/d higher 2017-2019 in response to lower Mexican production
- Infrastructure will be key to LNG imports ending; currently assuming this mostly happens by EOY 2018, but cool-down cargos continue (+100 MMcf/d)

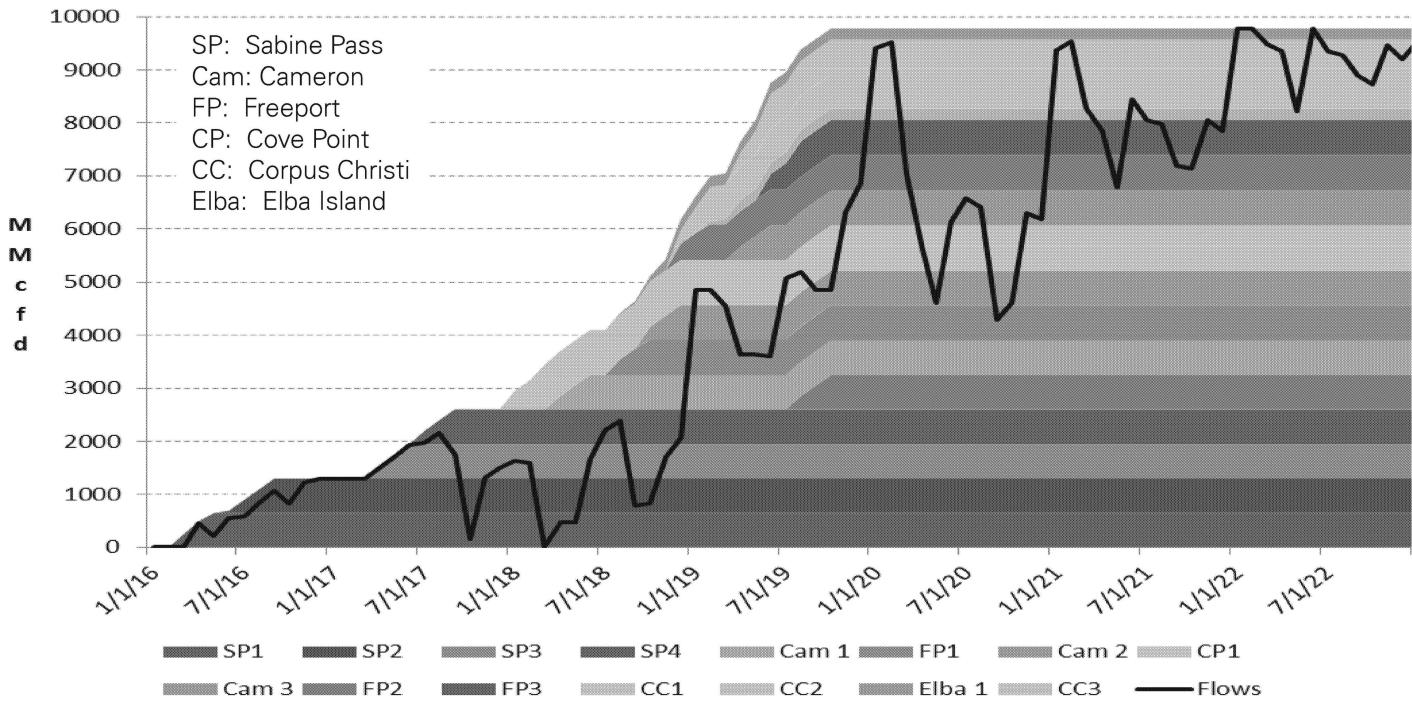
Demand

- Power demand still expected to be the key demand driver, reaching 5.4 Bcf/d by 2022 (1.5 Bcf of growth from 2016)



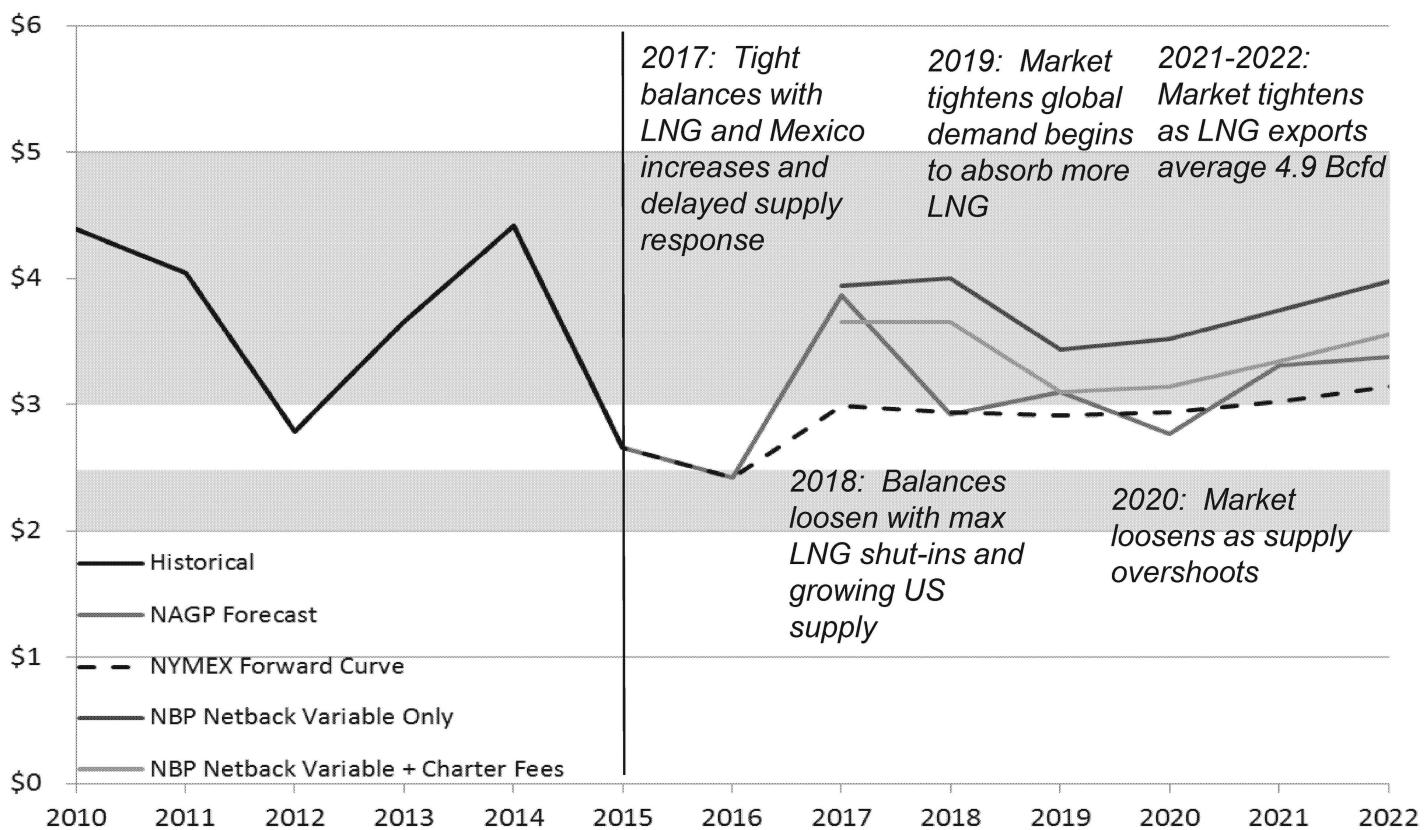
LNG Exports: Export forecast generally revised higher as global demand view evolves

- Utilization still troughs in 2018, coinciding with new Australian supply and Russia defending market share; big seasonal swings likely to create volatility, could increase GC storage value
- Key risks: Delays in project completion, collapse of export arb due to global oversupply (especially during seasonal demand weakness)





HH price outlook: Expect prices to oscillate around the startup of NE pipe expansions and LNG export facilities

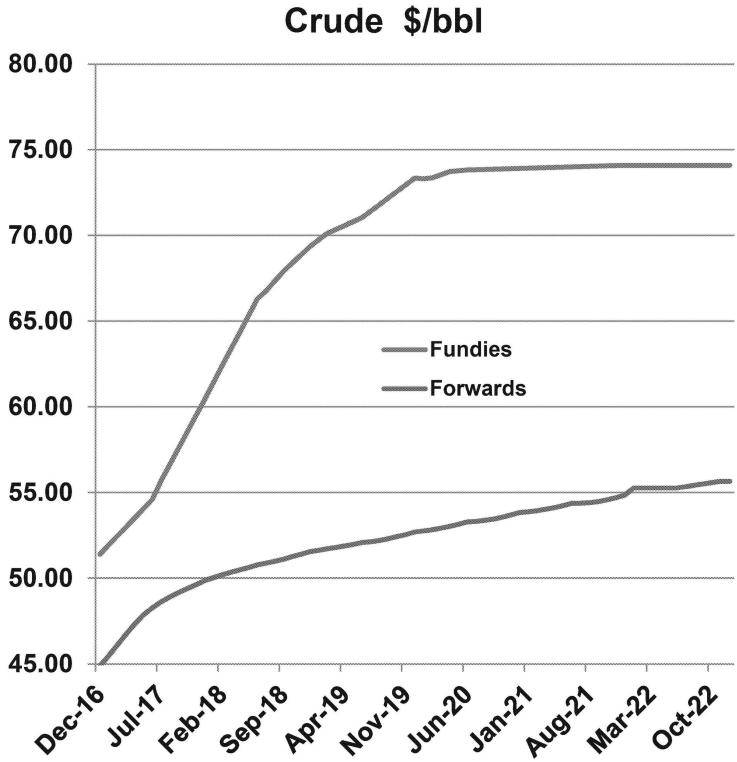
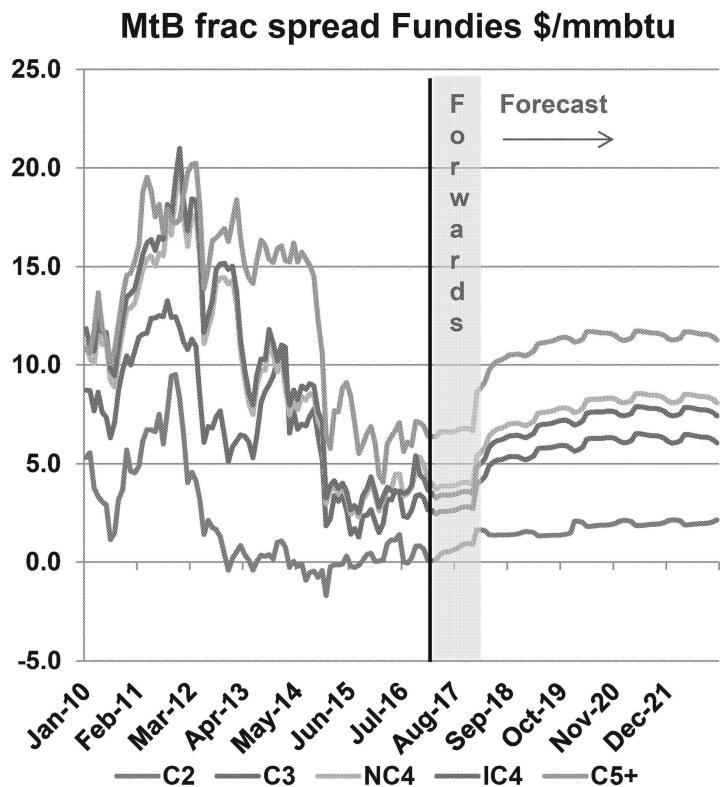


NGLs Outlook: Details



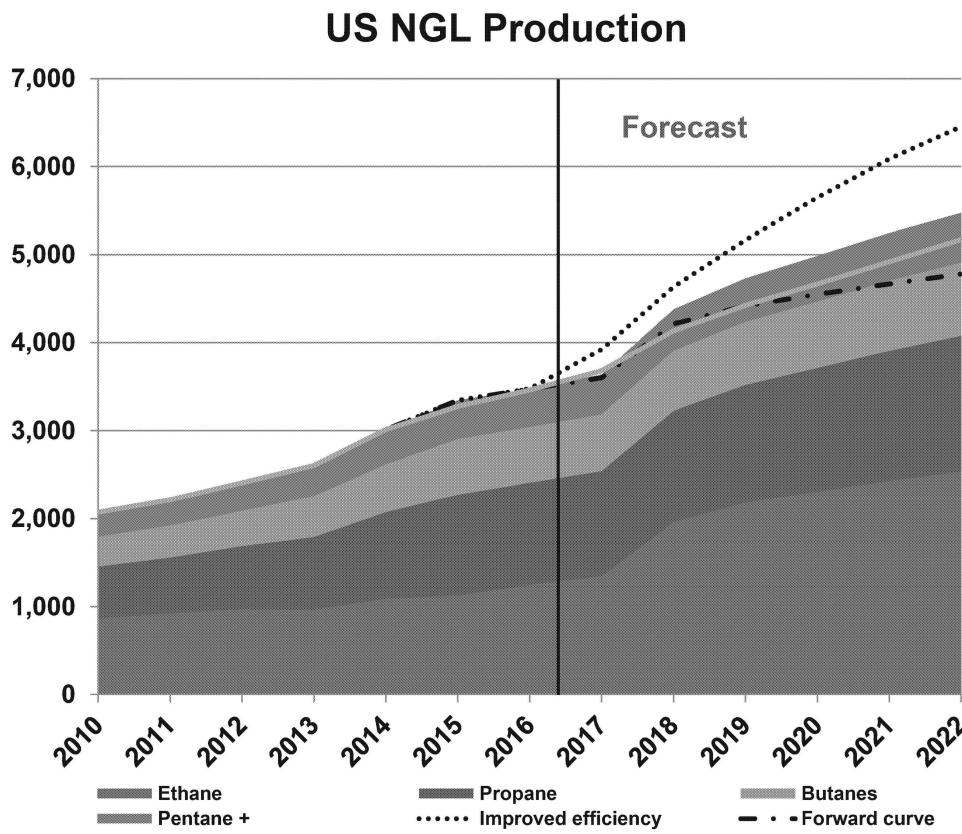


Fundies Frac spread outlook: Upside risk to 2017 due to C2/C3 tightness; downside risk for C3+ 2018 onward if crude price materializes lower than current call





US NGL gas plant production: ~5,450 kbd by 2022, driven by a rebound in oil drilling activity

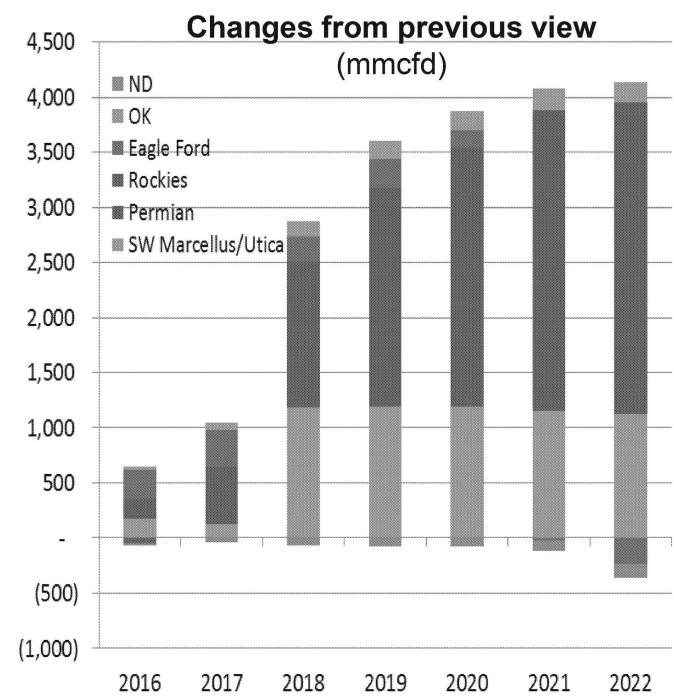
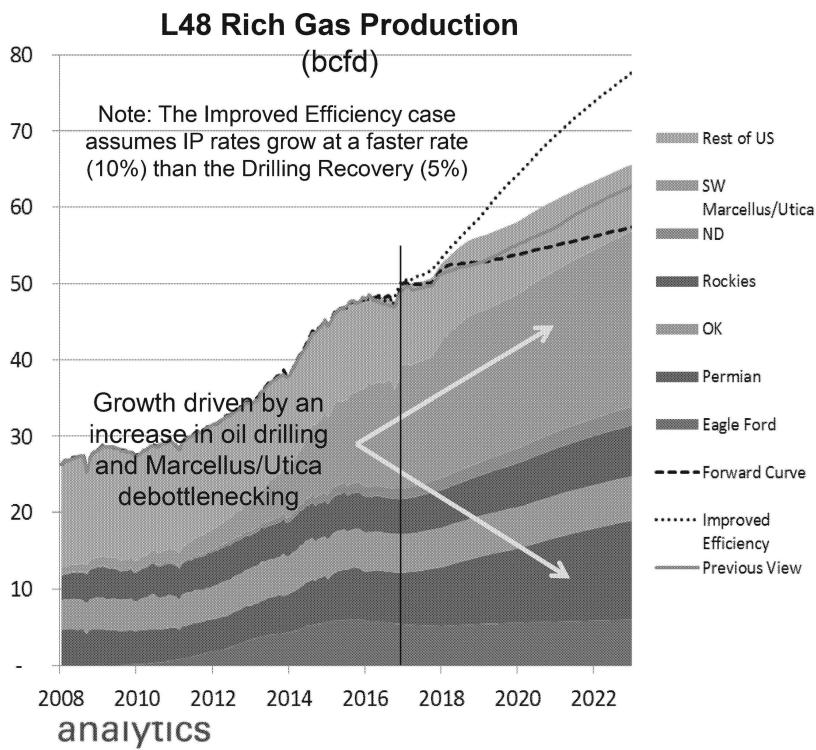


- Rebound in oil drilling activity (particularly in Permian +5.8 bcf/d, Rockies +1.9 bcf/d, ND +1 bcf/d by 2022) driving NGLs production growth of 2.0 mmbd between now and 2022
- 300 kbd higher than previous view
- Ethane is ~150 kbd higher by 2022, almost 5% more than previous
- Propane higher by ~70 kbd by 2022, only 2% higher than previous forecast

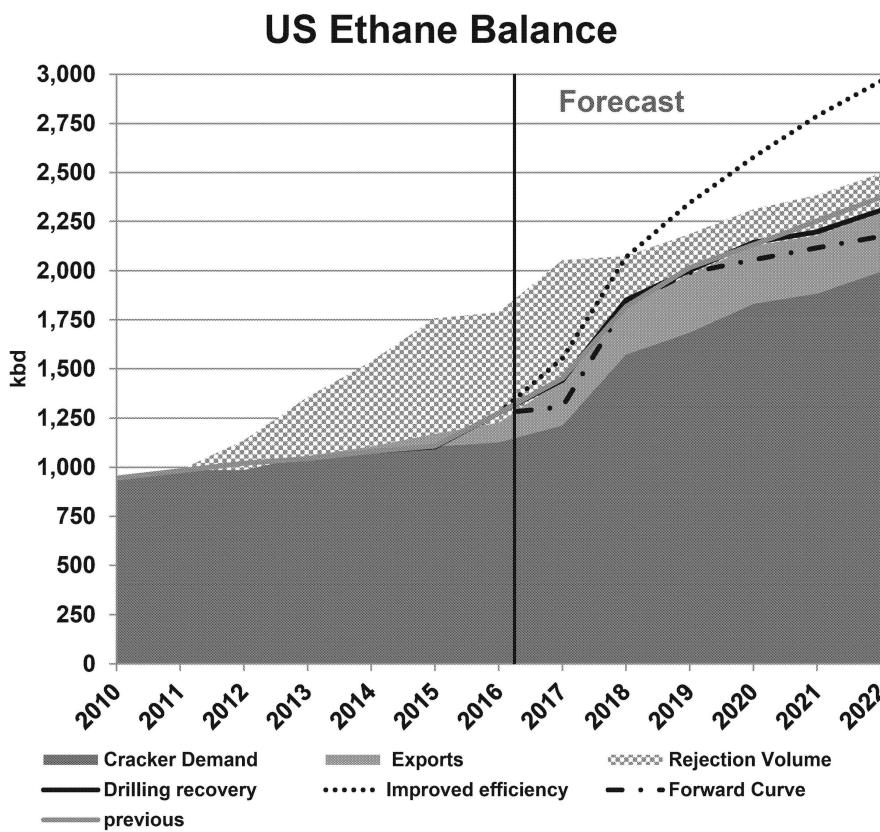


L48 rich gas production: NE continues to support production as pipe capacity comes online, oil drilling augments growth post 2016

- L48 rich gas production is 0.8 bcf/d higher than previous view in 2017, due to stronger rebound in oil drilling activity and higher Marcellus/Utica production; **by 2022, rich production is 3 bcf/d higher than previous forecast.**
- SW Marcellus/Utica, Permian and Rockies are the main drivers behind the increases in production since our last update; Eagle Ford and Oklahoma higher on higher IP rates; ND is slightly lower
- Wild cards: OPEC cuts, producer ability to grow production in a short period of time, producer financial health



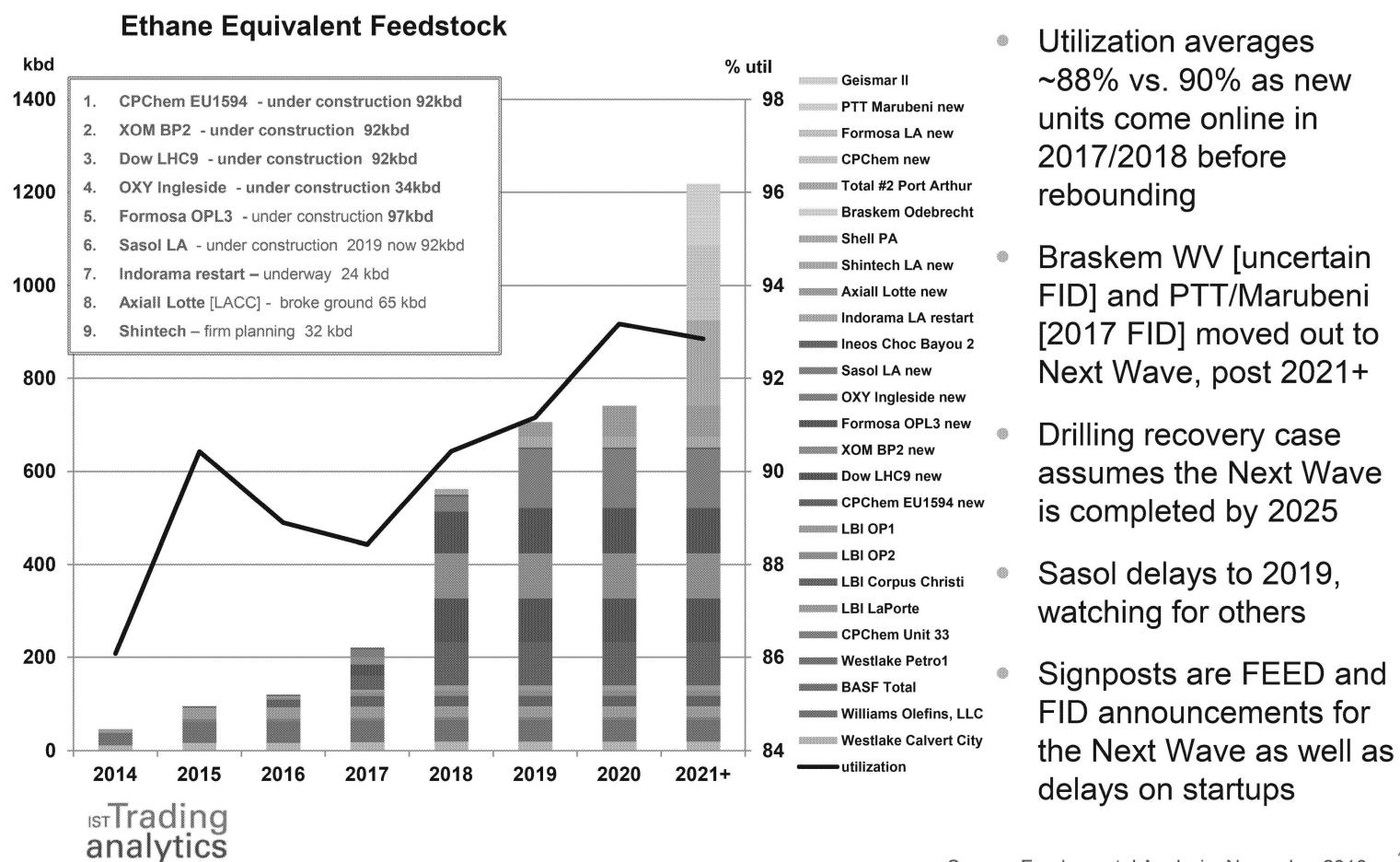
US ethane balances: Non-Northeast rejection ends by 4Q18; Northeast rejection continues due to high transport costs to MB



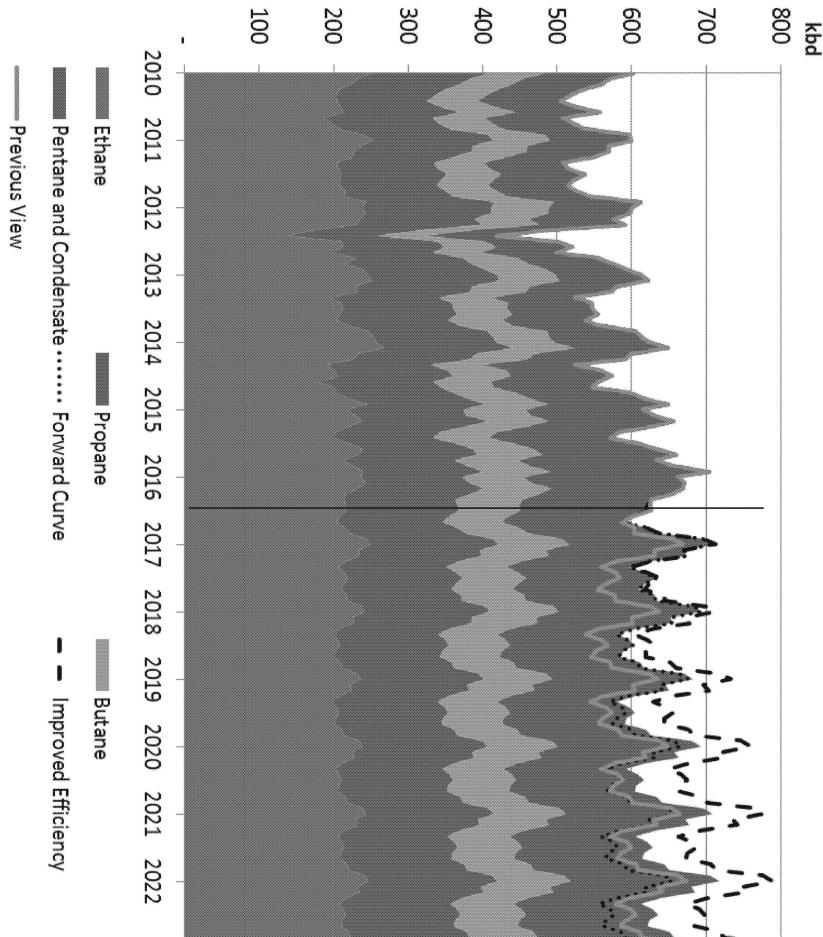
- Ethane remains in rejection through 2020, later than previous, the reason is the Northeast
 - NE stranded ethane stays until Shell startup in 2H 2022, PTT/Marubeni or Braskem crackers FID'd, or new transport out of region
 - Ethane on ATEX, [marginal barrel] needing ~\$4.0+ MtB ethane frac spreads 2018 onward to be able to flow
- Sasol delays their cracker project completion by at least one year to 2Q 2019 startup
- Shell FID'd the PA cracker, modeling a mid year 2022 startup



US New Build Crackers: Slippage from 1H17 to mostly late 2H 2017 for XOM, CPChem, Dow, Oxy



Canadian NGL Production: Slight decline in the short term, but rebounding post 2017 with oil prices



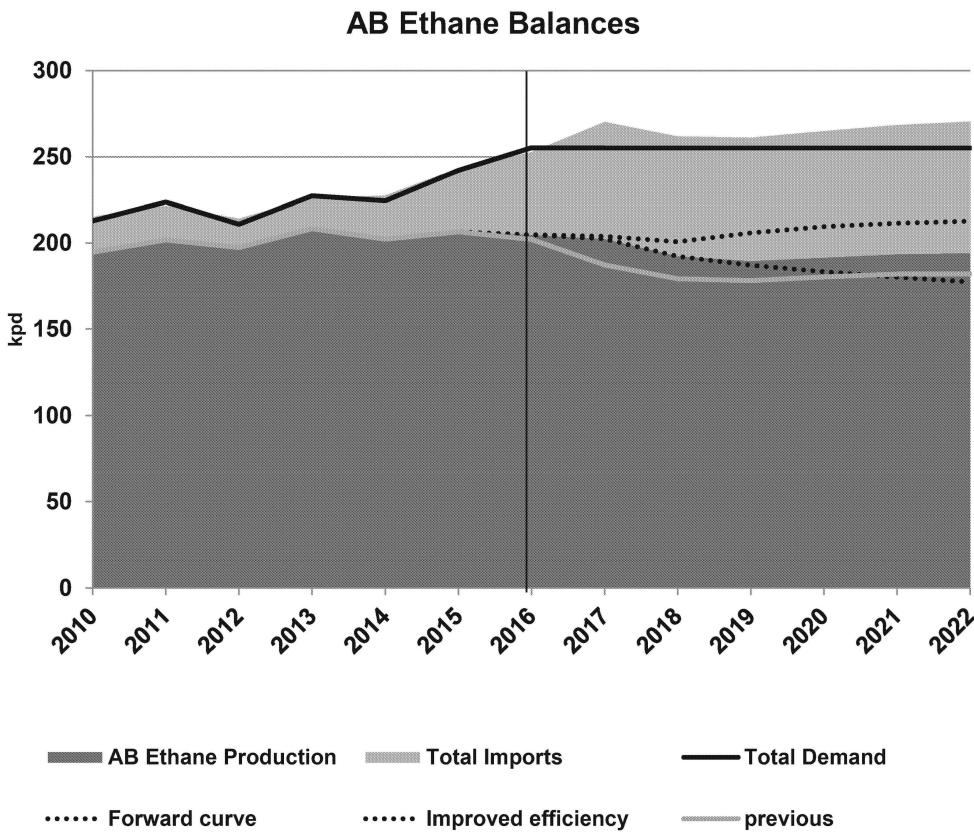
- Wedges represent the Drilling Recovery case, ~ 656 kbd by 2020 [vs 616 kbd previous]
- Production declines less in the front due to elevated drilling activity
- Improved Efficiency – efficiency gains push production to 721 kbd by 2022
- Forward Curve – weak completion activity leaves production declining to 593 kbd by 2022
- **Wildcards:** Lean vs. rich gas break-evens; MB and Conway differential; oil producer financial strength; USD/CAD exchange rate

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Source: Fundamental Analysis, November 2016
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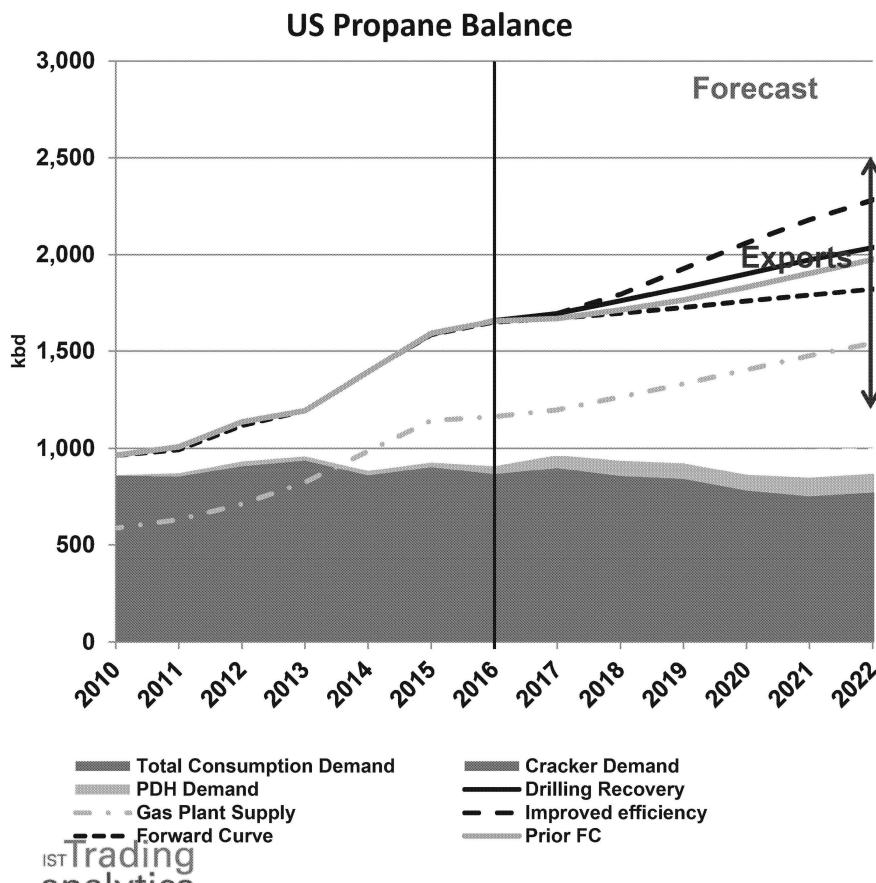
AB ethane outlook: Ethane oversupplied in 2017 with the start up of Vantage, but relatively balanced in the longer term



- Imports balance the demand within Alberta; Vantage looks to make balances long in 2017
- Timing on the startup of the Stateline De-ethanizer should be 4Q 2016, has not shown up yet
- Improved efficiency case would suggest excess ethane when coupled with imports



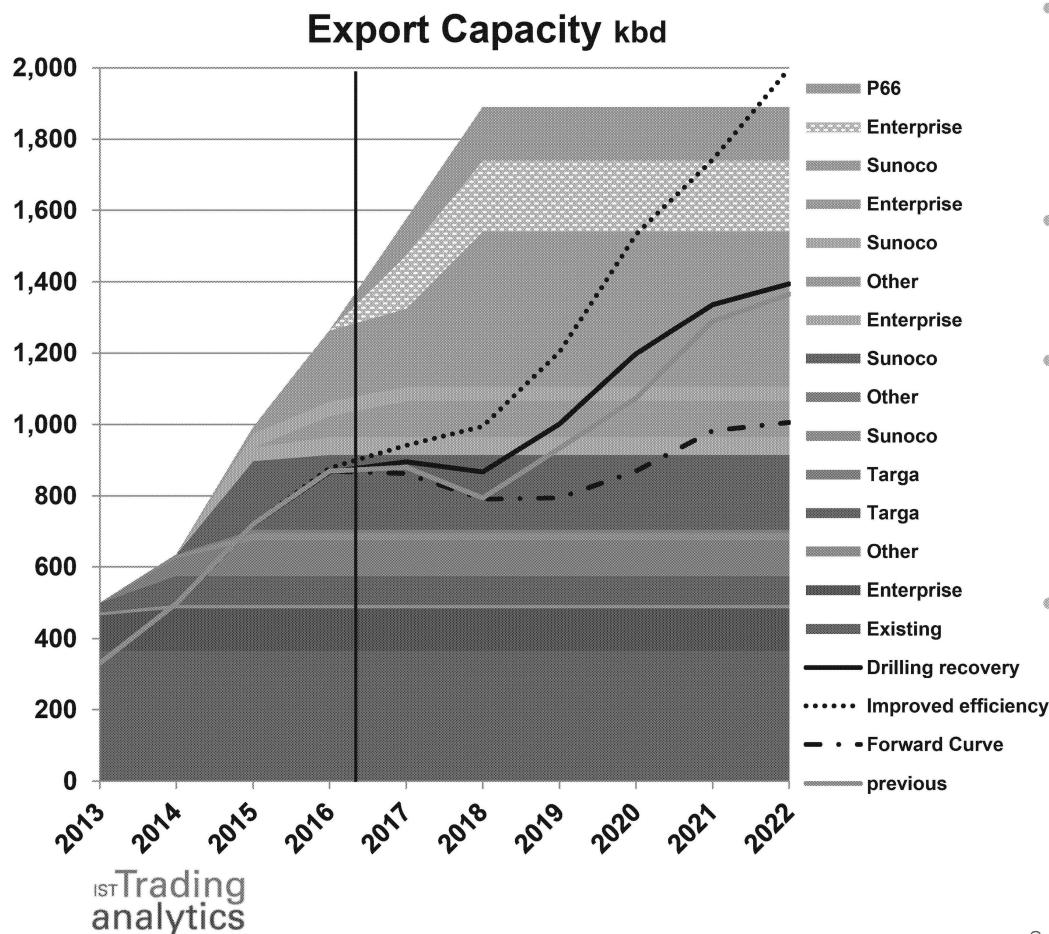
US C3 outlook : Higher supply view leads to more exports



- Exports expected to remain the key driver to balance C3 market
- PDH Update:
 - Dow has experienced a number of unplanned events and Enterprise remains a 2017 startup story [suing EPC contractor over delays]
 - Formosa remains somewhere in the 2018 window no other units in queue
 - Reliability of these units is a key risk both in the US and globally



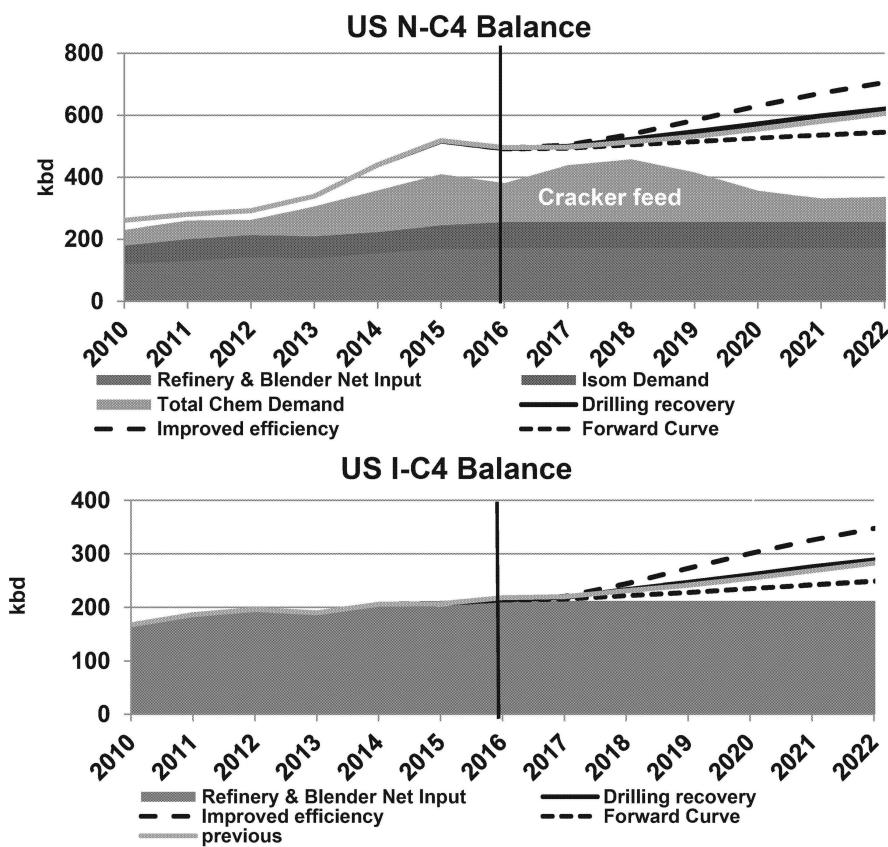
LPG Exports: Exports increase with growing LPG supply; long term arbs remain linked to variable cost with underutilized US terminals



- Arbs will open and close periodically as global balances shift, but generally remain linked to variable costs due to capacity overbuild
- Utilization approaches 74% by 2022, assuming no new builds in US or Canada
- Overbuilding in VLGC fleet creating soft market with Baltic Rates near \$26 per MT as of publication
 - Fleet rationalization?
- Risks: Low oil prices reducing incentive to add LPGs to cracker in Asia and Europe; Higher than expected oil drilling increasing US supply/exports



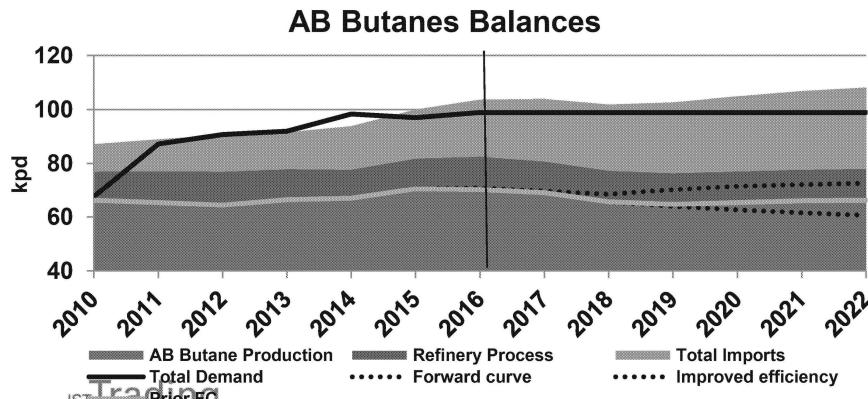
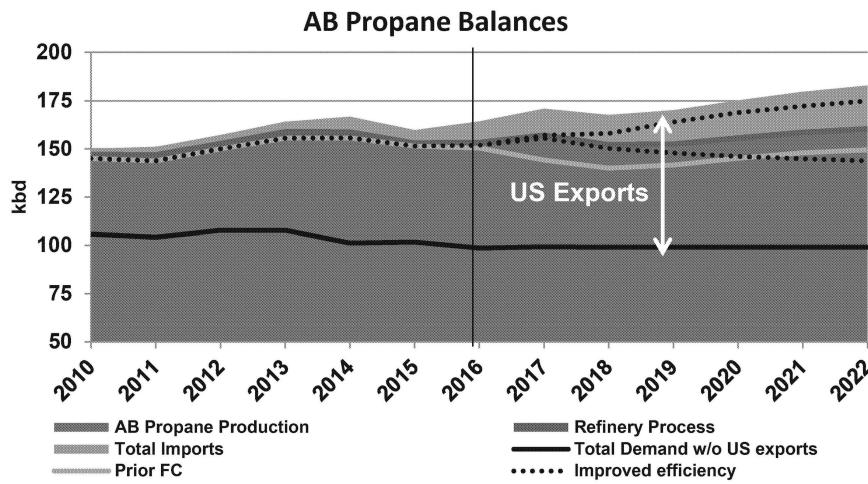
US C4 balances: Near term C4 in crackers to compensate for new startups in 2017



- C4's increase in the cracker feedslate as new units come online by 2018
- As rejection of ethane ends some of the cracker fleet can shift away from LPGs post 2020
- Minimal identified growth in alkylation seen to date in refining, keeping refinery demand stagnant
- Monitoring the gasoline demand story as that remains a key home for NC4 and IC4



AB LPG outlook: Propane still looking South for home

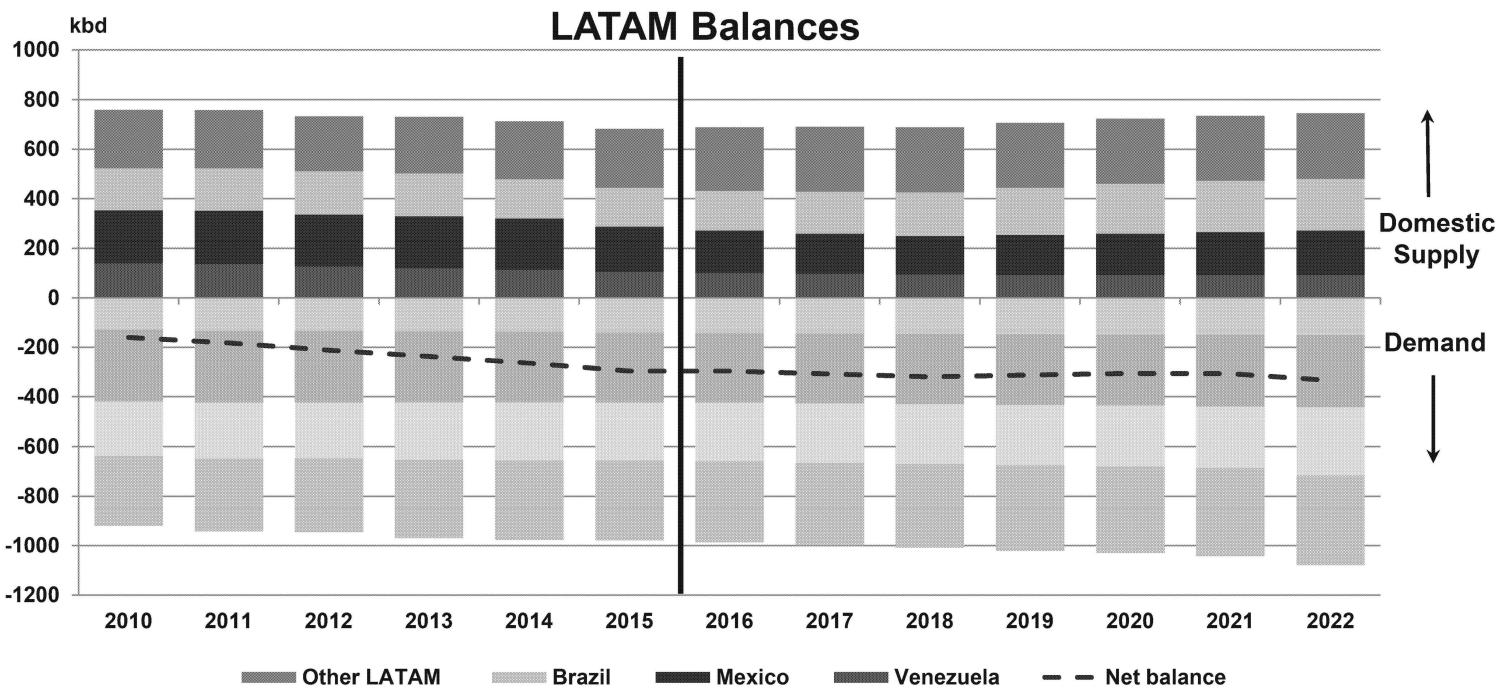


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- Adequate rail capacity in service > 75 kbd capacity
- Prices firmed up this year over last year as barrels were moved out of AB; expect prices to soften as the only outlet remains L-48 or Mexico via rail
- Williams sold Canadian assets to Inter Pipeline, who indicate EOY 2016 for PDH FID:
 - Proposed facility would consume ~22,000 b/d of propane; in service date estimated at 2020 [likely late 4Q 2020]
- Butane looks fairly balanced with no issues evident



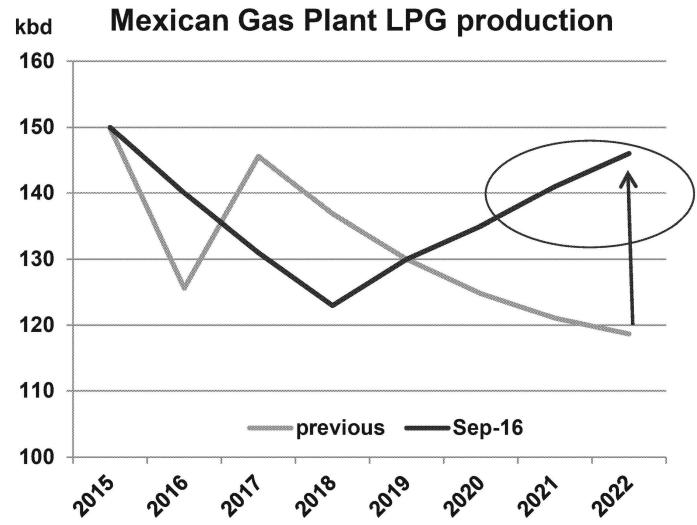
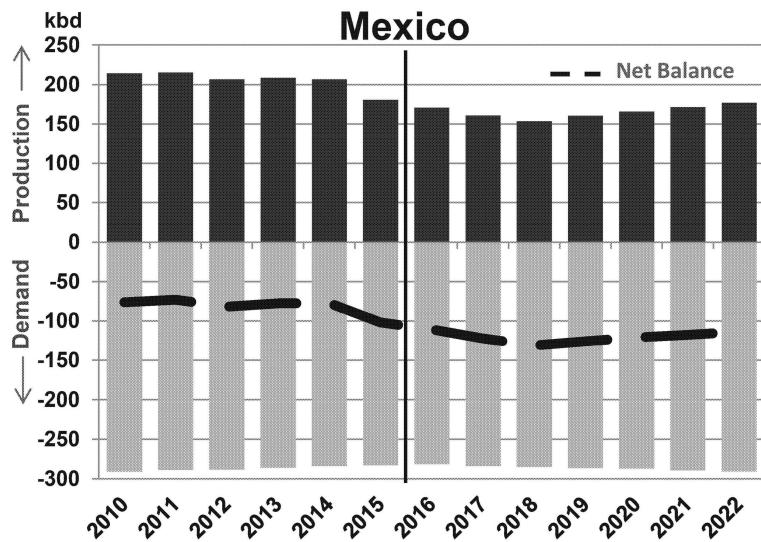
LATAM balances: Continued shortage, but only a modest shift in balance expected



- Demand slightly increasing in Mexico; with reduced supply in most other countries LatAm remains short
- **Risks:** Slow down in demand growth from weak economic outlook; oil price recovery stalls



New Mexican production model indicating decline then recovery of gas plant volumes

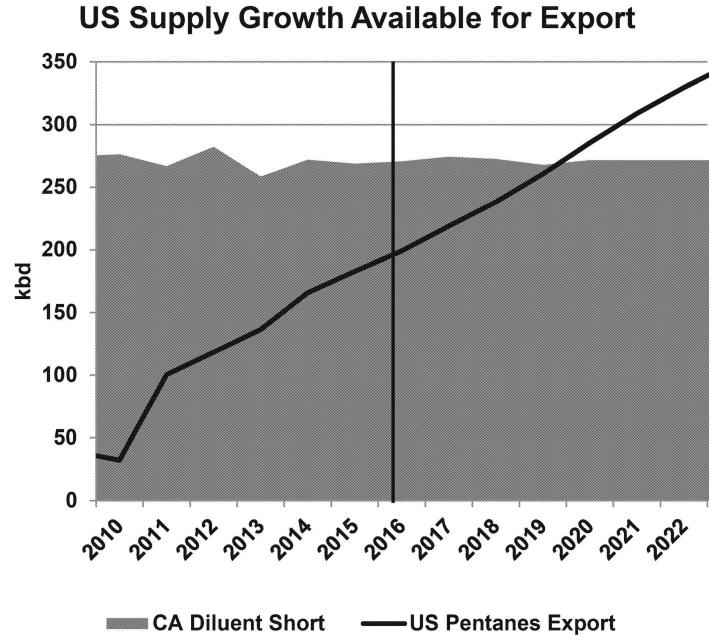
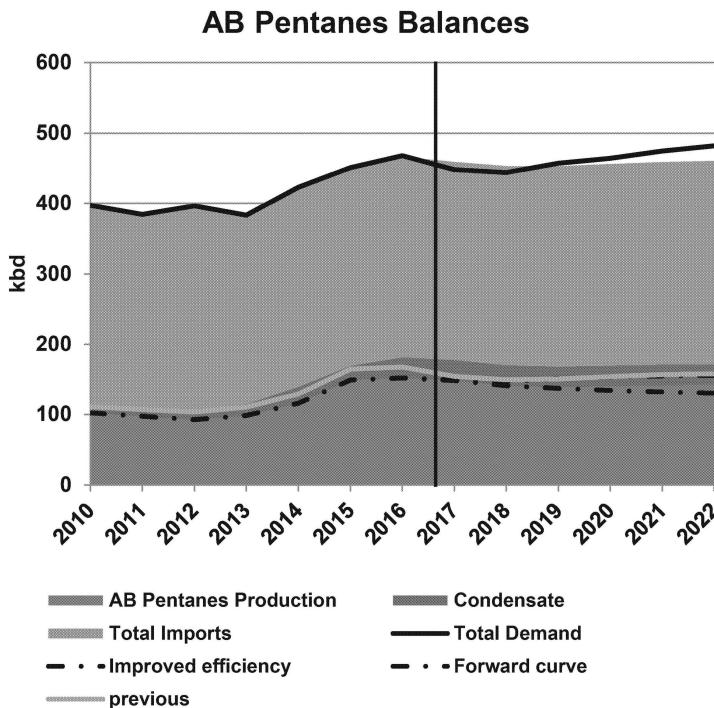


- Mexican production model now deployed, results in a trajectory that matches expectations around ramp up of E&P activity
- Mexico demand was set to 0.5% increase per annum 2016 onward to represent likely demand growth in res/com
 - They are also short ethane so cracker demand could have upside

C5 Balances: US C5 growth expected to outpace AB demand; risk that diluent demand is lower than forecasted due to oil sands slowdown



- US C5 will need to clear via mogas blending and/or exports if diluent demand growth isn't enough to absorb growing supply
- Canadian condensate production could also surprise to the upside, further shrinking the short needed to fill in AB
- **Risks:** Oil price path will ultimately determine diluent demand

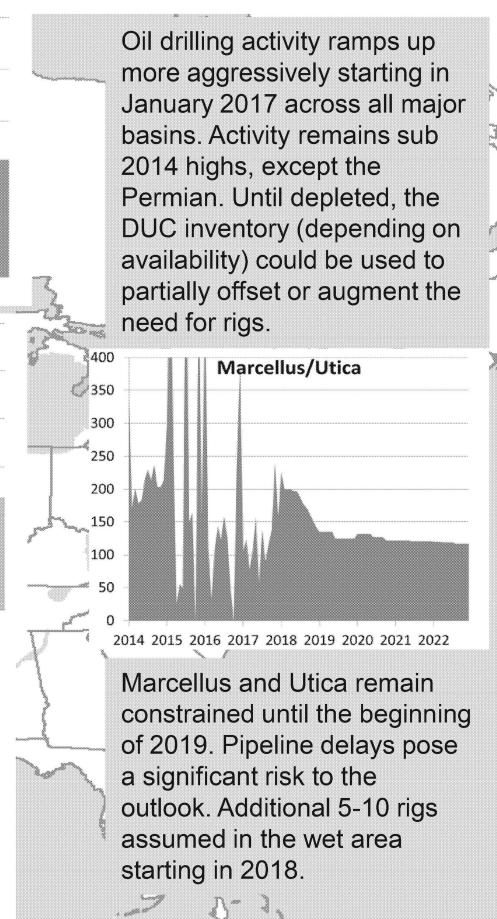
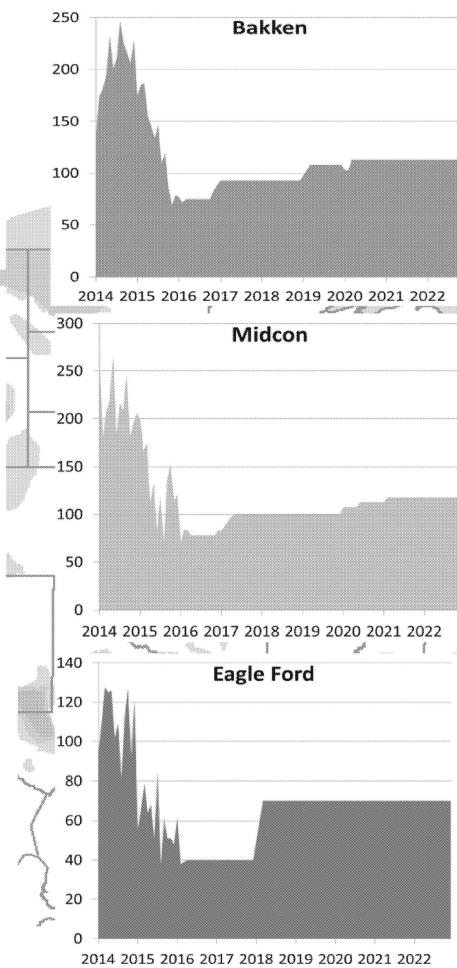
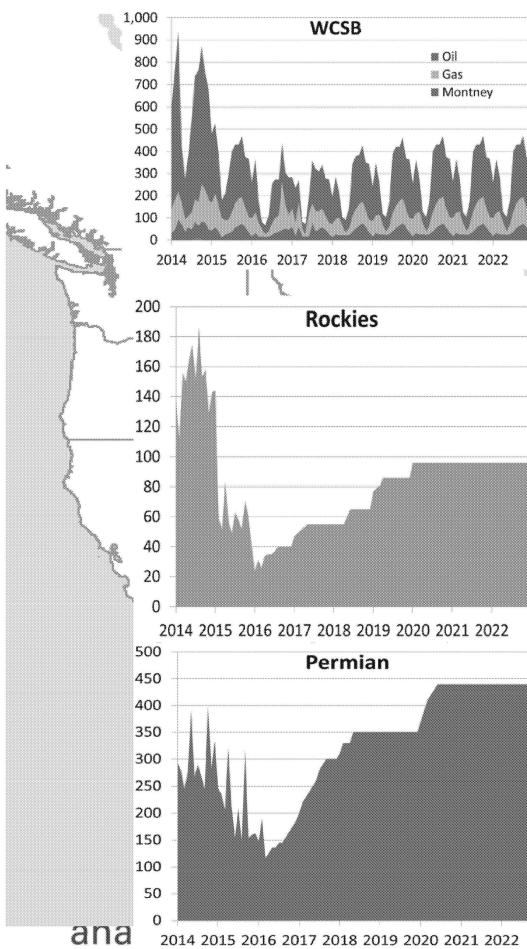


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Appendix



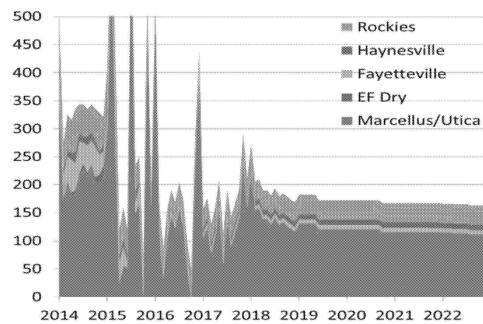
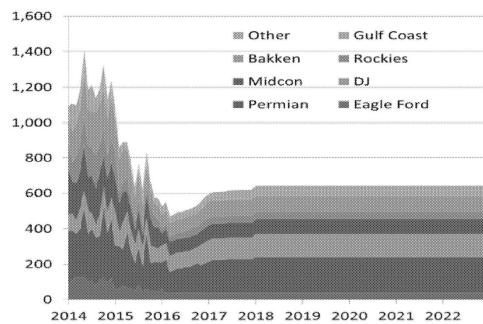
Drilling recovery scenario well counts: Rebound in activity needed to balance the oil market beginning in 2017





Supply Scenario Assumptions

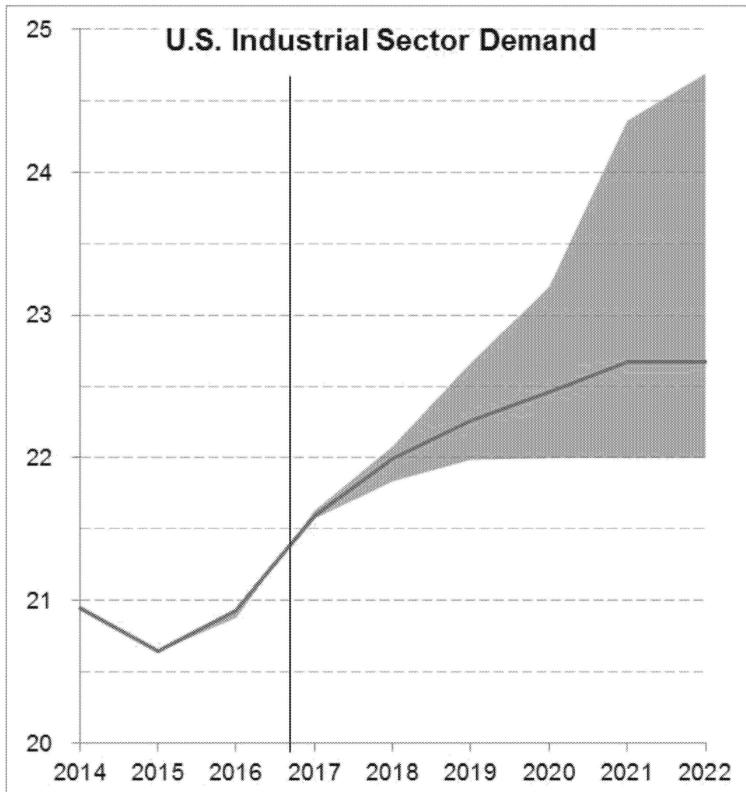
- **Drilling Recovery:** Oil drilling ramp up assumed to begin in early 2017. Oil drilling reaches 80% of 2014 highs by the end of 2020, in aggregate. However, Permian activity ramps to 10% higher than 2014 peak completions. A total of 170 gas rigs in Haynesville, Fayetteville, Rockies and NE are required to balance the gas market beginning in Q3 2017 (NE rig additions expected in 2018 as more pipeline comes online). We model efficiency gains in IP rates of about 5-10% per year through 2019, as producers focus on their best acreage. We assume around 1,200 DUCs in the Northeast (split between the dry and wet windows) will be completed between now and the end of 2018.
- **Forward Curve:** Assumes a slight ramp up in oil drilling in 2017. Marcellus and Utica rich gas production is identical to the Drilling Response case; NE PA assumed to grow less than the Drilling Recovery case post 2018 (-1 bcf/d by 2020) due to pipeline delays and weaker HH/basis prices.



- **Improved Efficiency:** Assumes a similar ramp up in oil drilling activity as the base case. Continued technology gains improve IP rates by 10-15% per year through 2020. The same dry gas ramp up is assumed for 2017-2019.



Industrial demand projected to be up by ~2.0 Bcf/d by the end of the decade



- LA and TX account for two-thirds of industrial gas demand growth
 - MN and WA are the runners up
- Methanol, ethylene, and fertilizer are the leading industries
- The High-Demand Case adds ~2.1 bcf/d more in the same states and industries by 2022 by assuming less likely projects proceed
 - LA adds 1.3 bcf/d by 2021
- The Low-Demand Case poses ~0.7 bcf/d of risk by 2022, mostly in LA (0.29 bcf/d) and IN (0.09 bcf/d), by assuming only the highest probability projects are completed

ISOs/Balancing Authorities Forecast Small Electricity Demand Growth

