Clear as Mud(Rocks): A Forward View of Natural Gas

ERCOT BOD April 10, 2018

Michelle Michot Foss, Ph.D., UT BEG/CEE

Overview: U.S. and Texas Natural Gas Supply

- **What a success story! The only considerations are…**
- **…downward pressure on natural gas prices…**
  - *How much? How long? With what consequences (more on that later)?*
- **…because of tight rock dynamics…**
  - *The "bidness" and how to think about it*
- **…and the need to re-plumb the gas system…**
  - *"Primer" on Texas/ERCOT gas infrastructure and flows*
- **…in an extended period of consumer sovereignty.**
  - *Plenty of ideas. Will they all work?*

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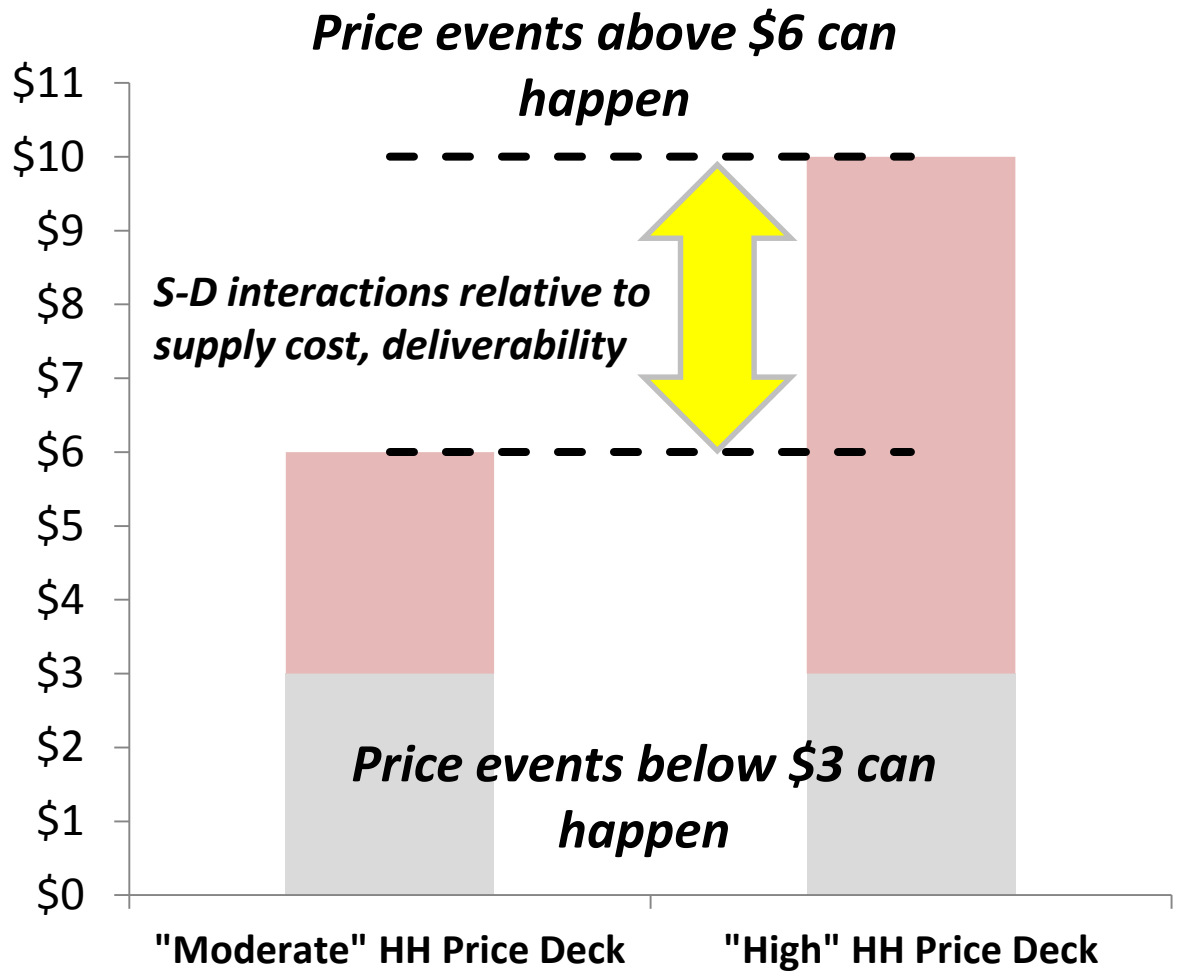
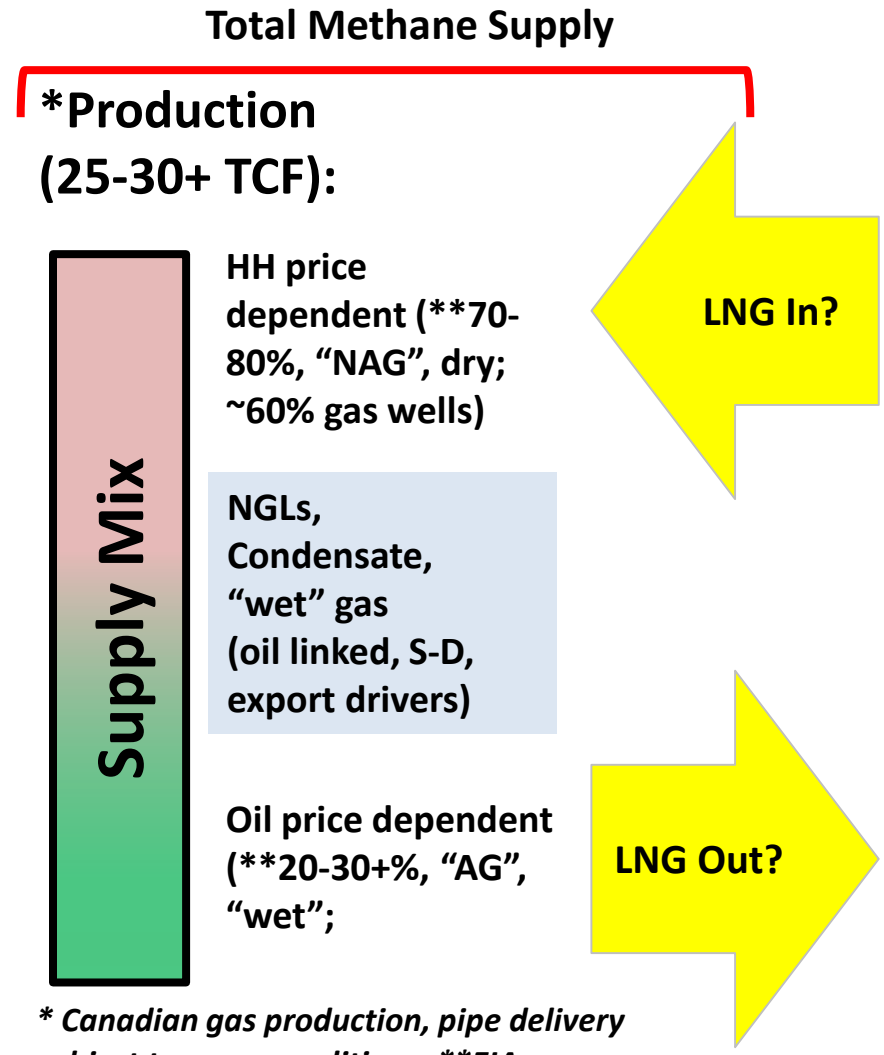
Gas Price Economics (2030)

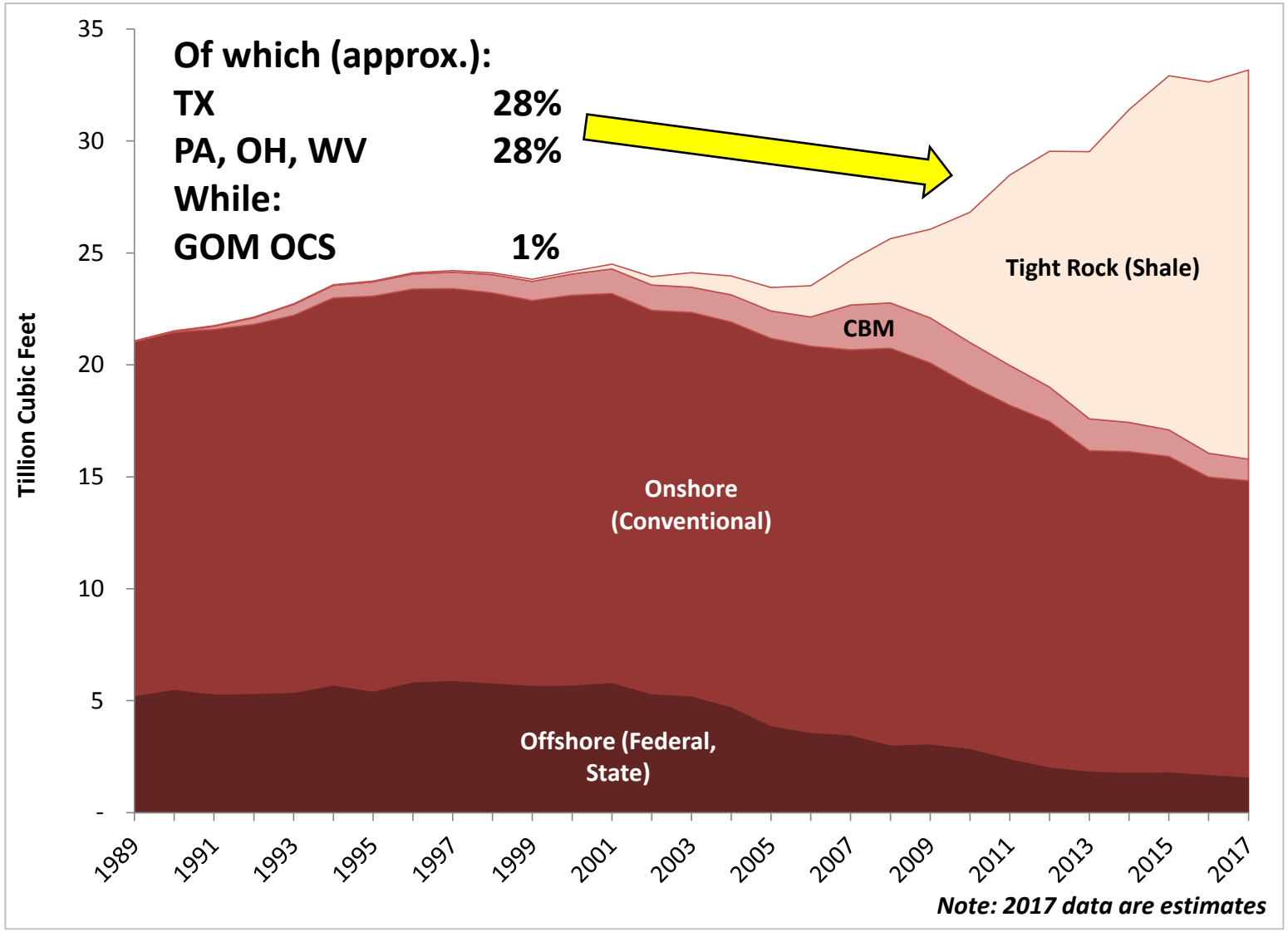


Annual average, real price; Michot Foss, OIES NG 18 (2007) and NG 58 (2011); www.oxfordenergy.org



** Canadian gas production, pipe delivery subject to same conditions; **EIA reserves reporting.*

Ever More Reliance on "Mud Rocks"



U.S. Energy Information Administration; Michot Foss analysis

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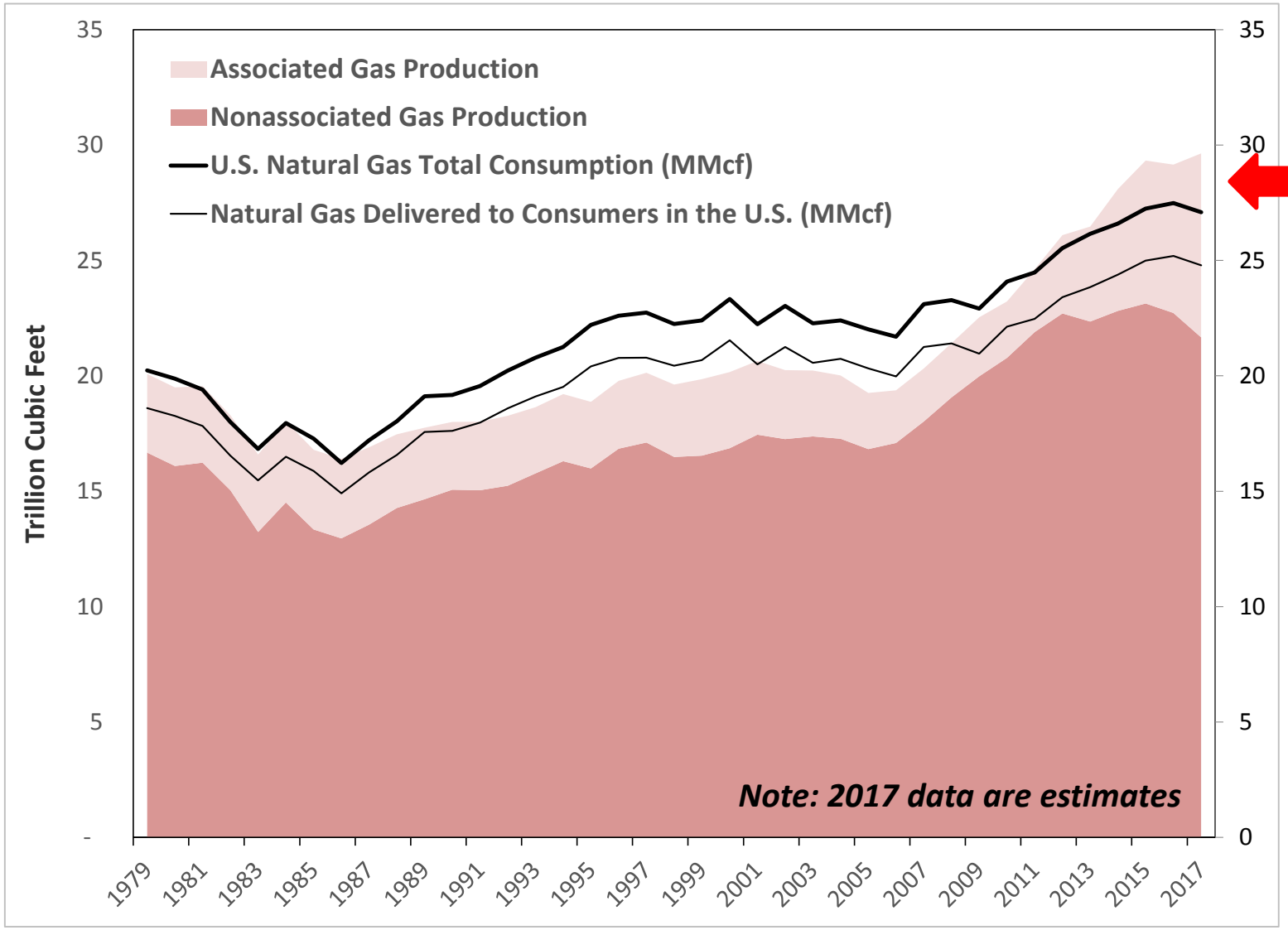
Ever More Reliance on Associated Gas



"Free" gas. Yay!

Byproduct of

- **Hunt for liquids, especially Permian black oil;**
- **Over-pressured tight rock;**
- **Enormous gas drive "engines".**

How much? How long?

U.S. Energy Information Administration; Michot Foss analysis

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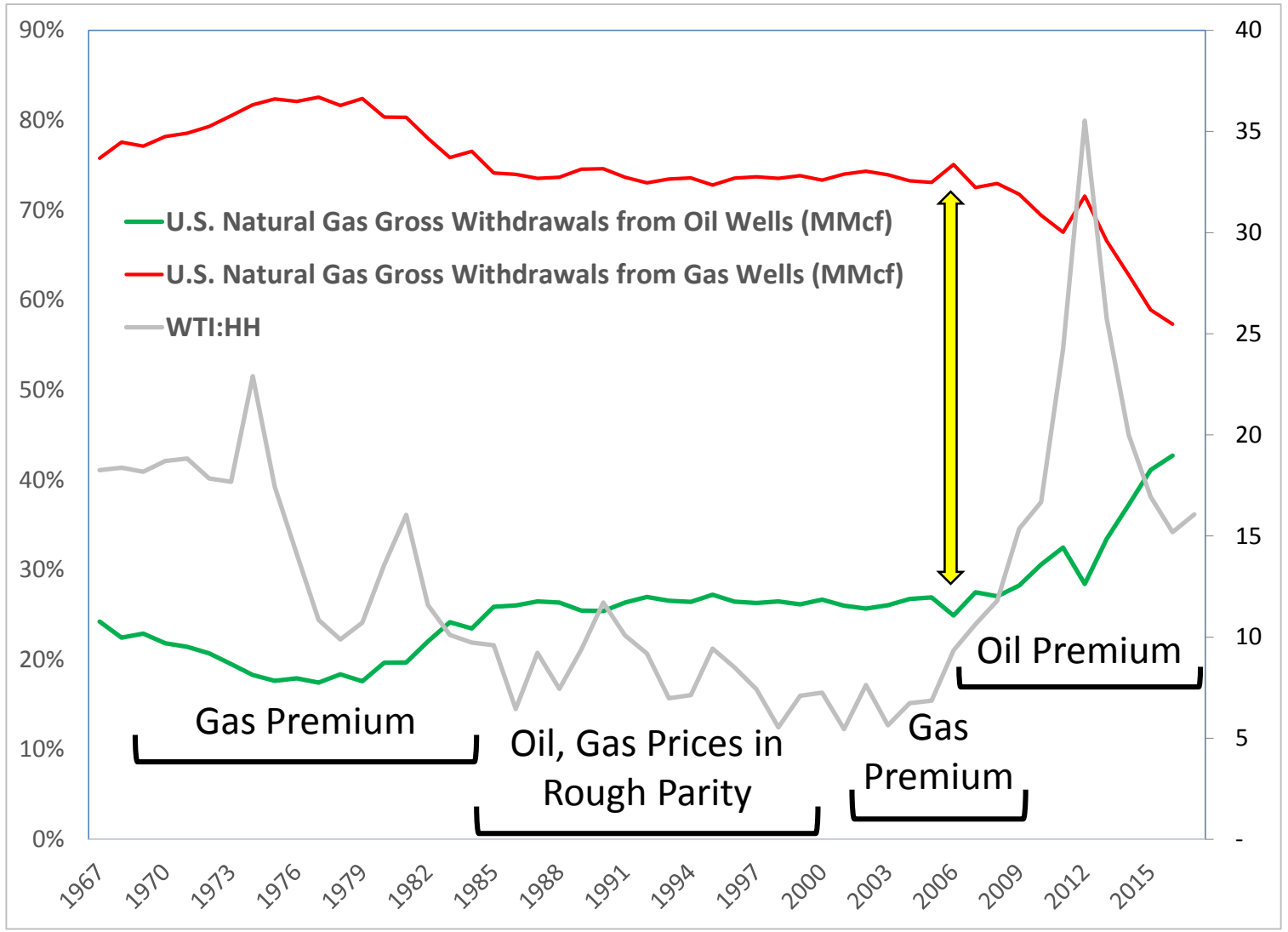
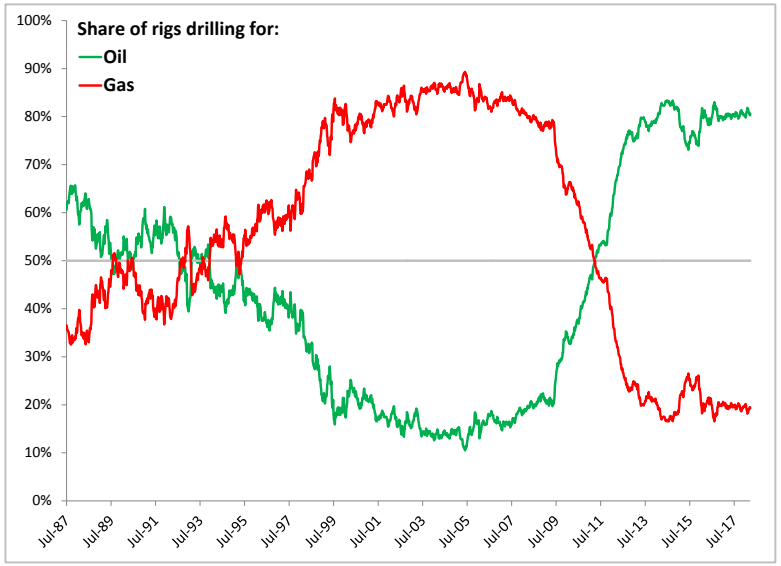
Oil, Liquids Drive Decisions

Relative to Opportunities





Drilling targets reflect relative premiums and expectations

U.S. Energy Information Administration; Michot Foss analysis

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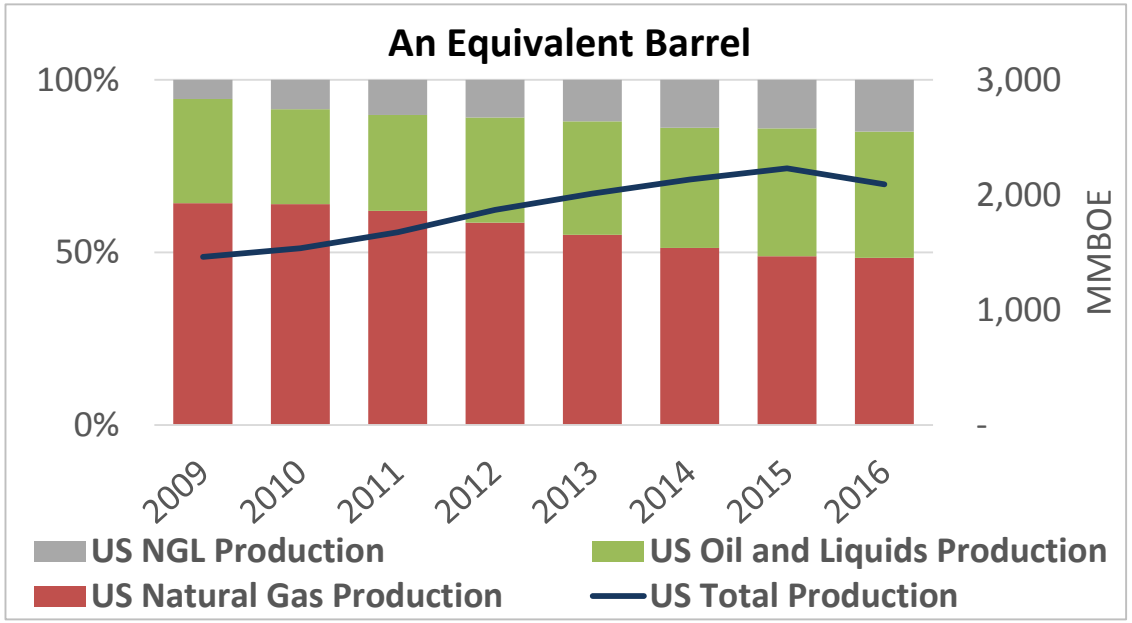
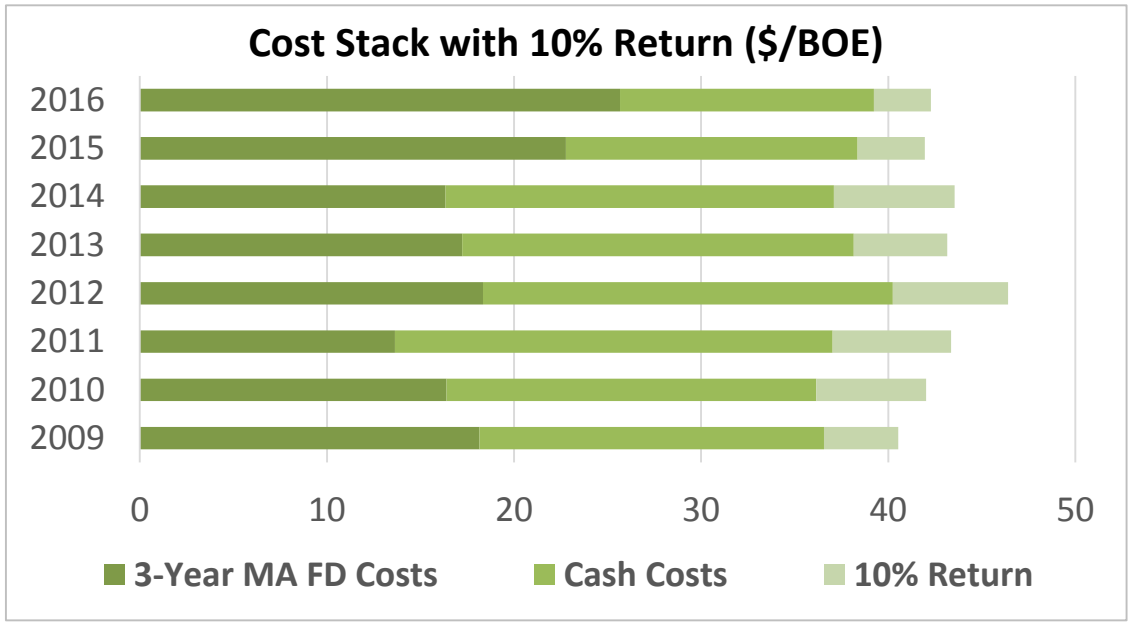
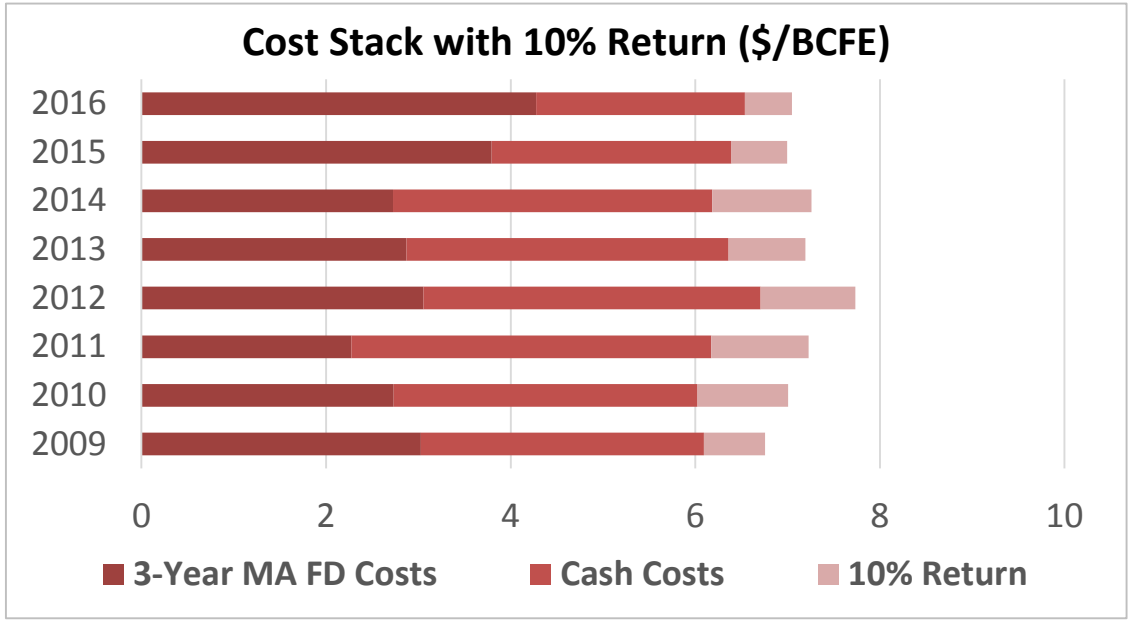
Consequences for Producers

- Extraordinary hunt for liquids rich (black oil) acreage as producers continue to shift portfolios
- Rapid accumulation of debt (now, deleveraging)
- "Gassy" producers are lower cost but…
- …if all of the cost burden was placed on methane, would need a supporting gas price

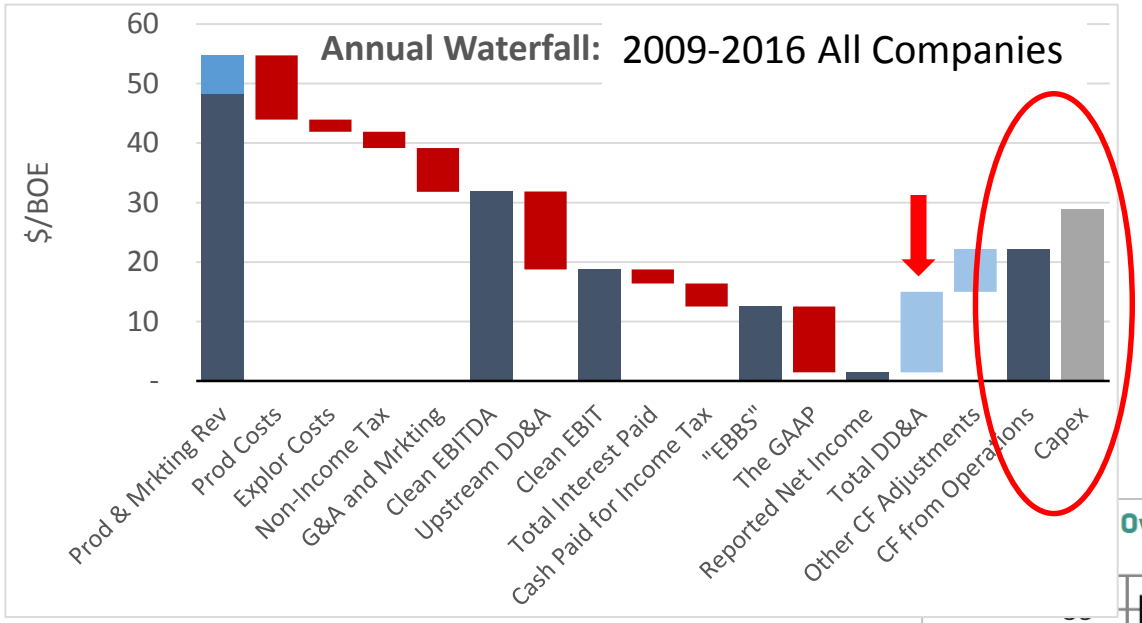


***Note:** CEE 2017 results expected to be broadly equivalent.*
CEE producer benchmarking, 16 companies, annual reports; Michot Foss analysis





Consequences for Producers

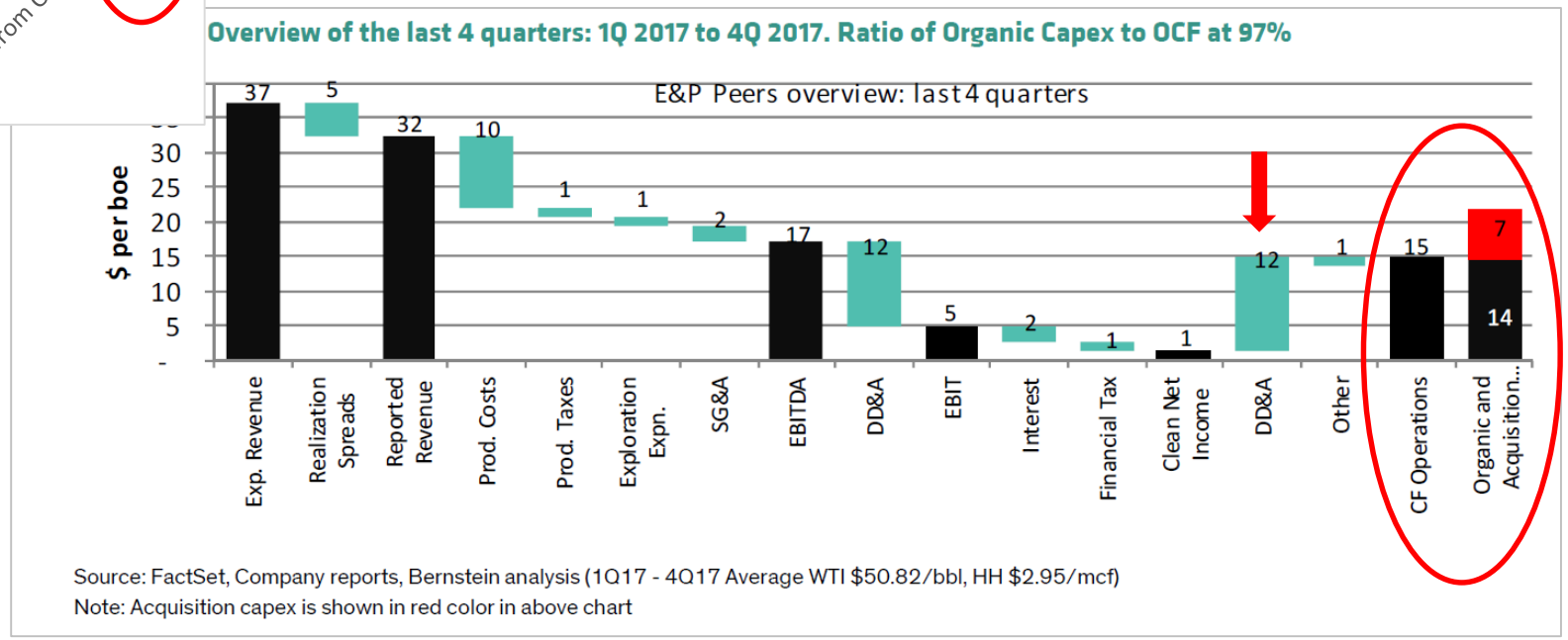


- **Challenges keeping spending in line with cash flow (better)**
- **Large contribution of depreciation to cash flow funded spending (too much)**
- **Reliance on external capital markets, especially for organic capex (M&A, property dispositions)**

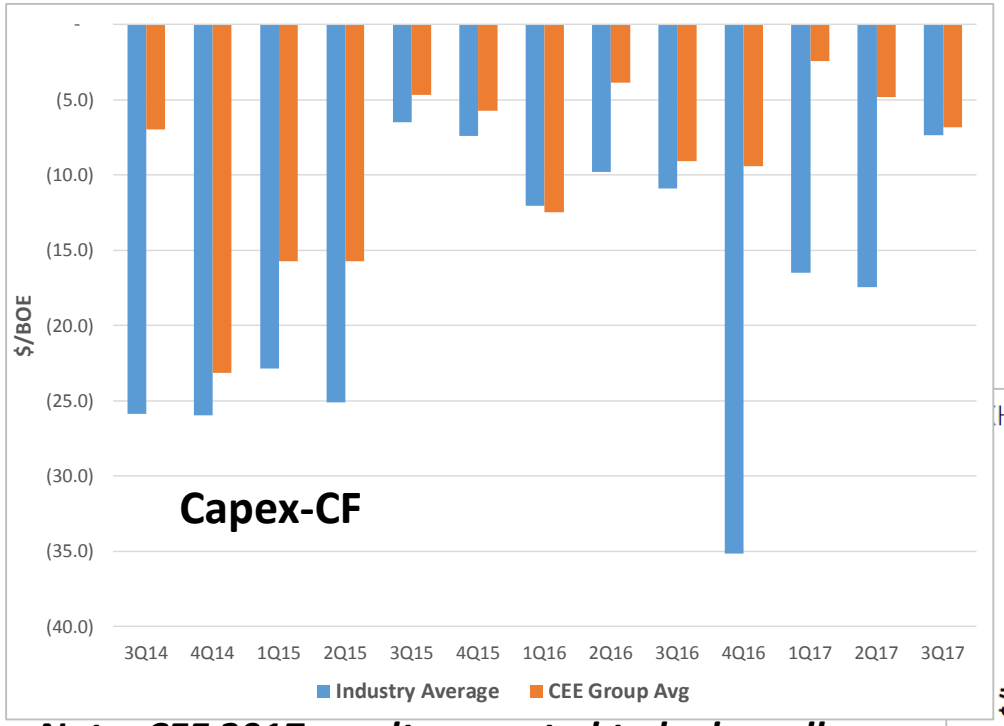
<u>Note:</u> CEE 2017 results expected to be broadly equivalent; slight improvement in net income, more capital discipline

CEE producer benchmarking, 16 companies, annual reports; Michot Foss analysis

Bernstein Research (right), used with permission



Long Term Spending and Cash Flow



Capex-CF

The "treadmill" shows up in the need for continuous outlays of capex, largely funded by accumulated depreciation and external capital

Note: ***CEE 2017 results expected to be broadly equivalent; slight improvement in net income, more capital discipline***

CEE producer benchmarking, 16 companies, annual reports; Michot Foss analysis

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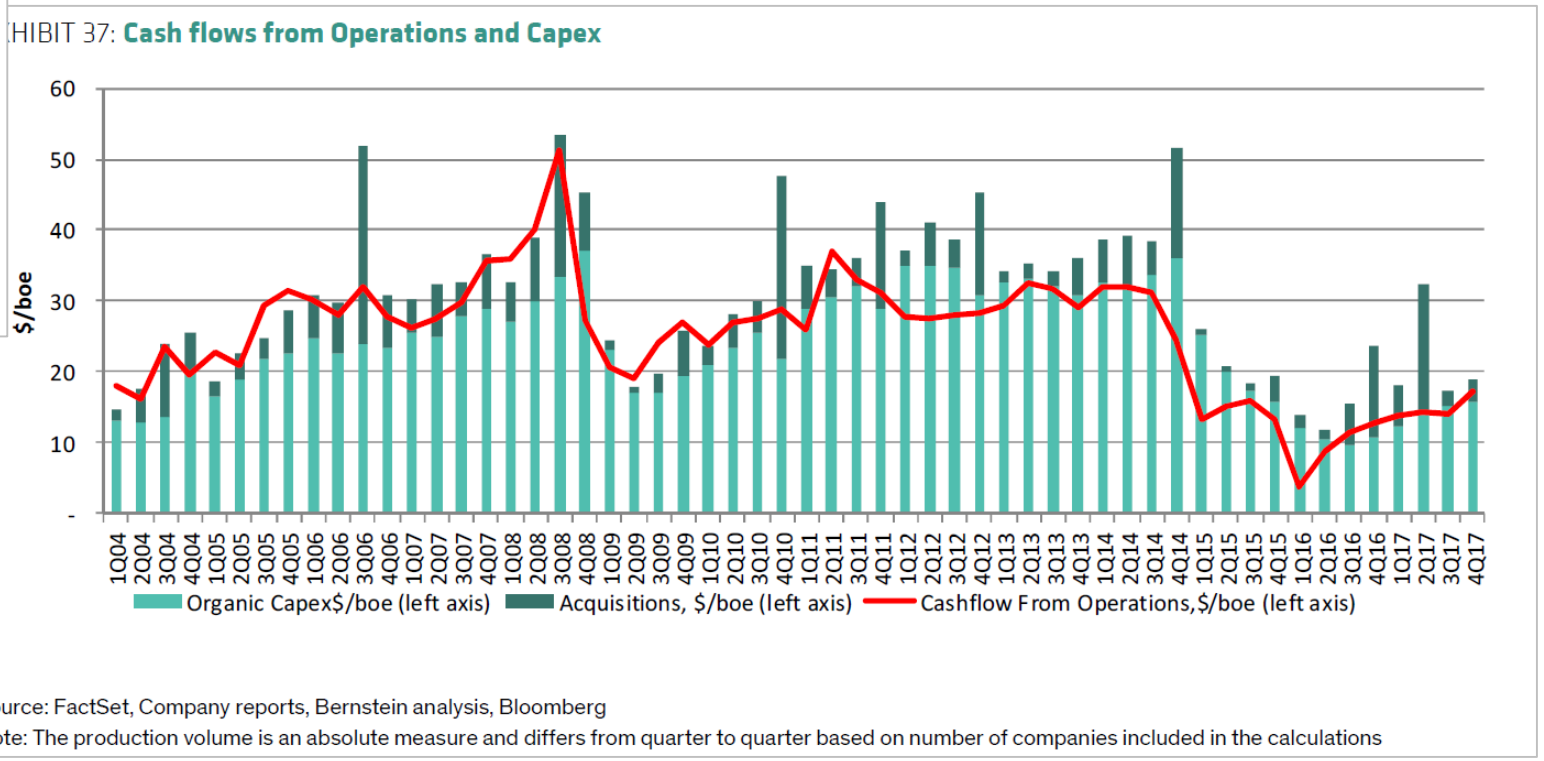
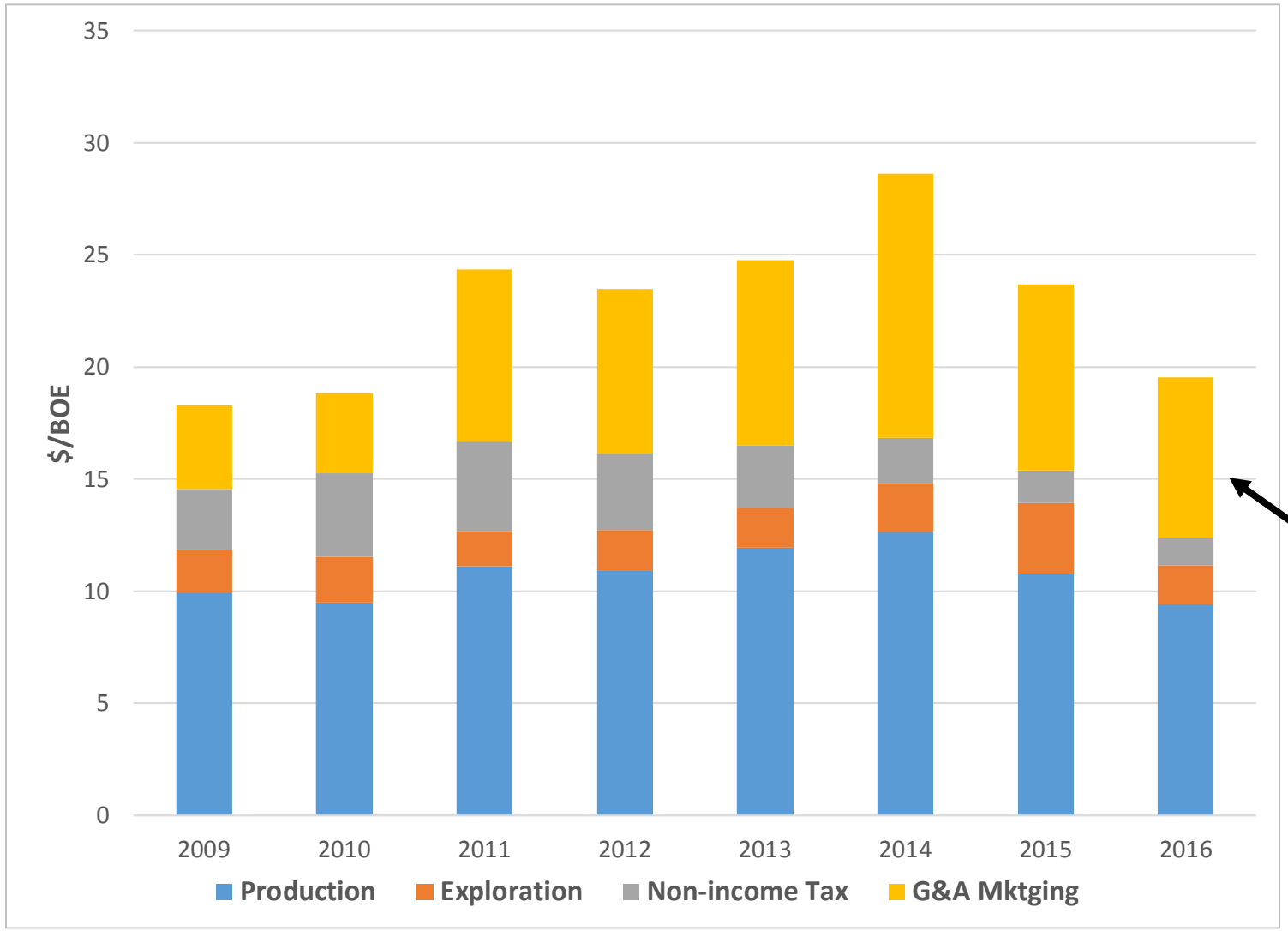


Source: FactSet, Company reports, Bernstein analysis, Bloomberg
Note: The production volume is an absolute measure and differs from quarter to quarter based on number of companies included in the calculations

Midstream, the Giant Sucking Sound



"Producer push" as opposed to "demand pull" for midstream investment

- ***Producers now much more constrained***

Expected total cash cost 2017

Expect increase in G&A Marketing

Note: *CEE 2017 results expected to be broadly equivalent; slight improvement in net income, more capital discipline. CEE producer benchmarking, 16 companies, annual reports; Michot Foss analysis*

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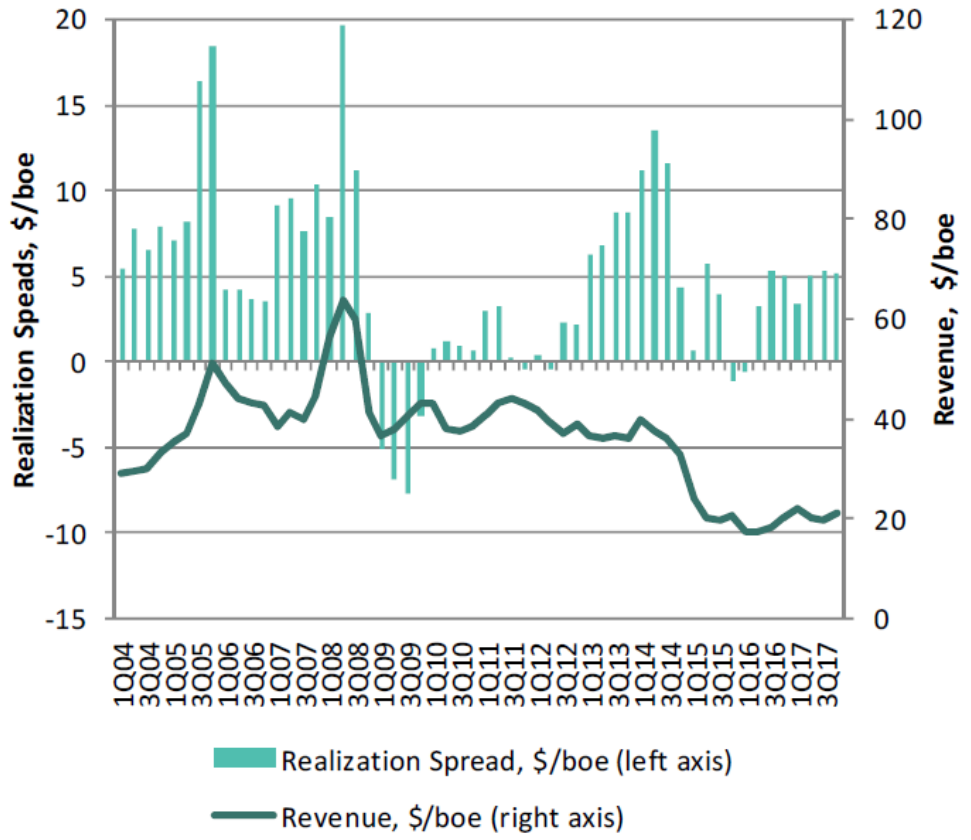
Realizations: Expected vs Reported Revenue

Positive = Realized < Expected

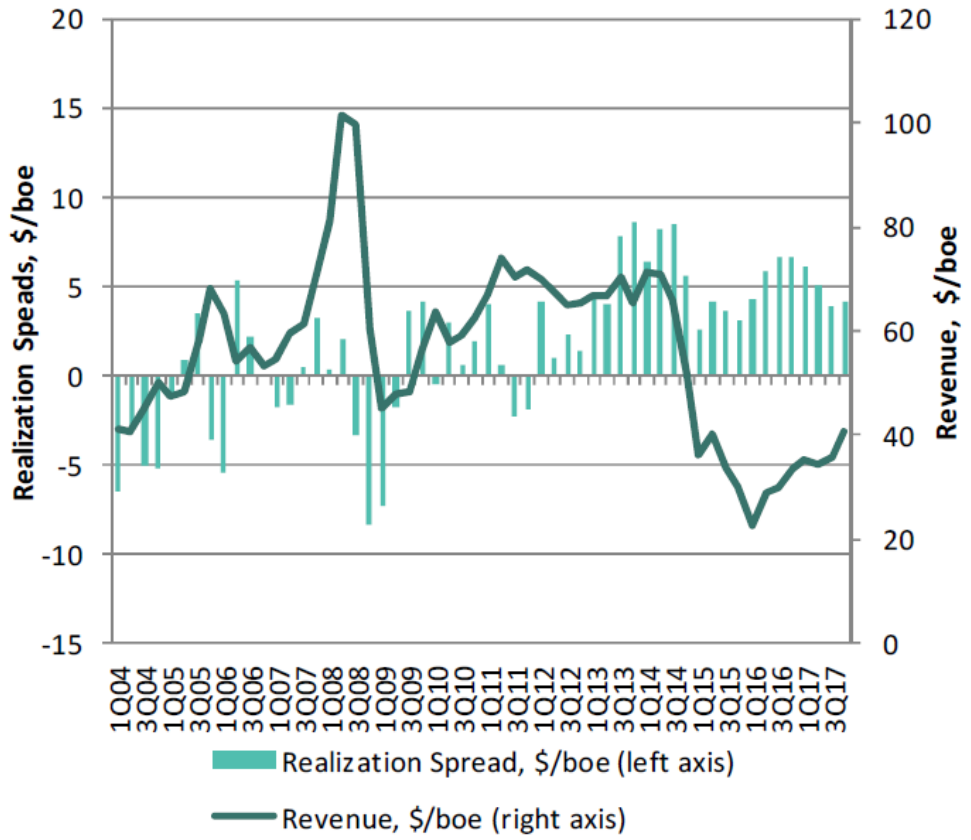
Gassy companies have greater difficulty meeting realized revenue targets

EXHIBIT 13: **Realization Spreads – Gassy companies**



Source: FactSet, Company reports, Bernstein analysis, Bloomberg

EXHIBIT 14: **Realization Spreads – Oily companies**



Source: FactSet, Company reports, Bernstein analysis, Bloomberg

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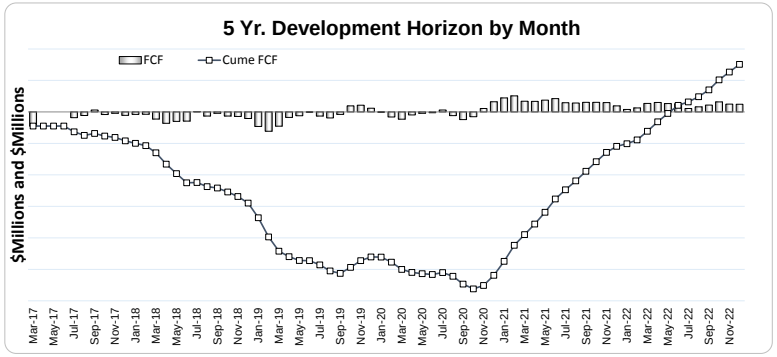
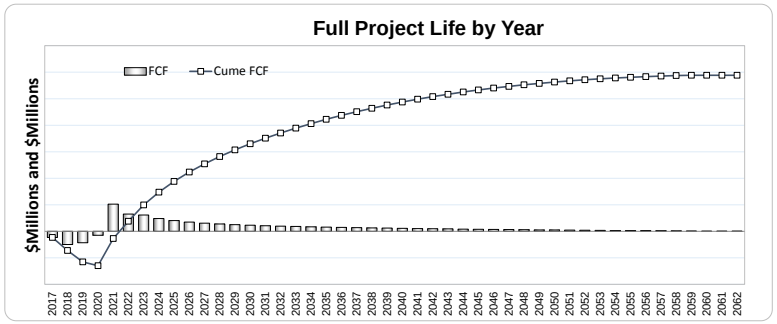
In Sum: State of the Industry

- Improvements in cost management, so far, but
  - Midstream continues to burden producers
  - Capex will grow again as companies try to reposition
    - Acreage consolidation to pursue drilling patterns
    - *The "cube" strategy of "wine rack" near simultaneous completions as companies work to manage "parent-child" well interference* ***(charts on right, proprietary project)***
- The need to drill to sustain upstream businesses is quite real
  - "Prove up" to retain, attract new capital
  - Volumes to produce sufficient funding for operations
- Given these realities + predominant "gas drive" reservoirs + midstream bottlenecks + offtake = impact on prices and spreads





Assumptions: Avg realized crude price $55; Avg realized gas price $3.20

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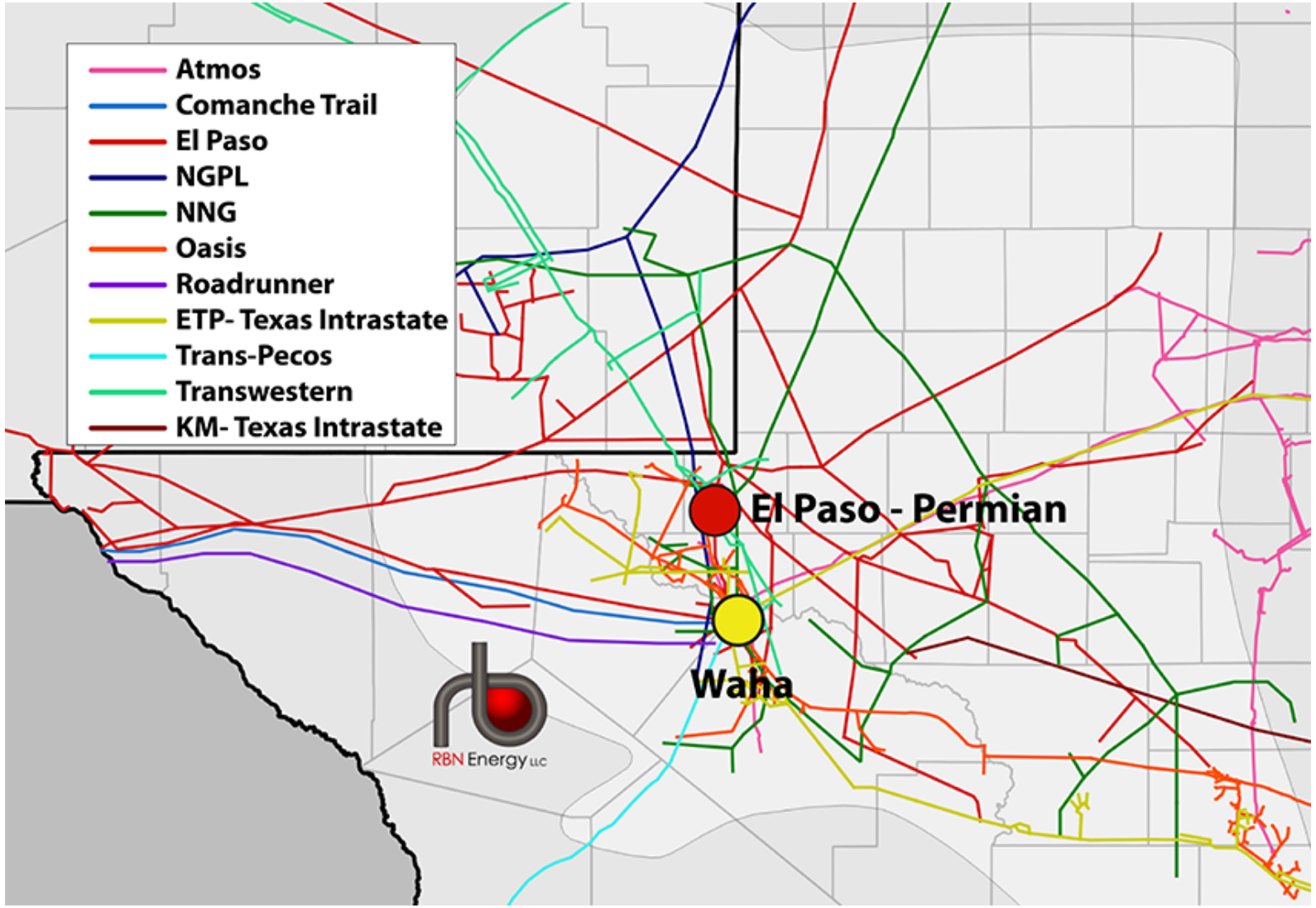
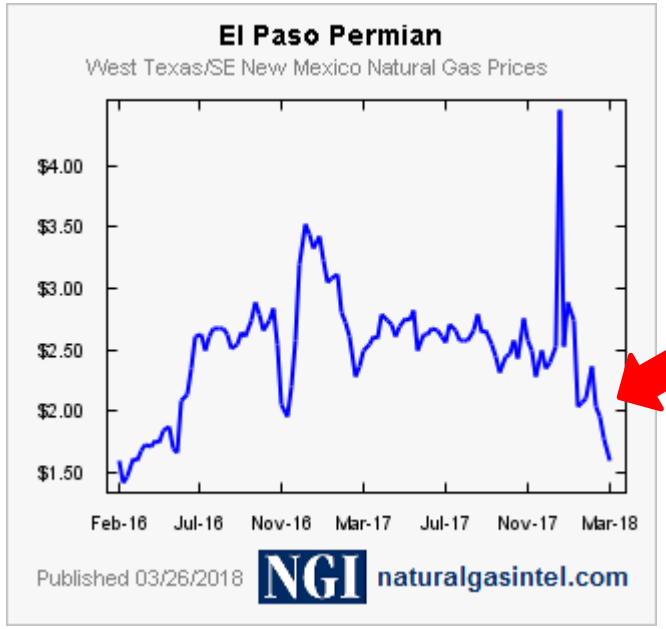
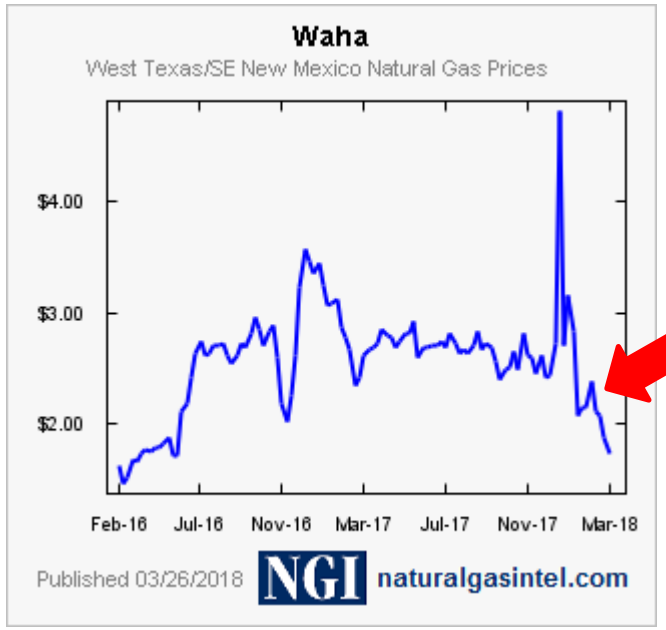
Waha and EP-P



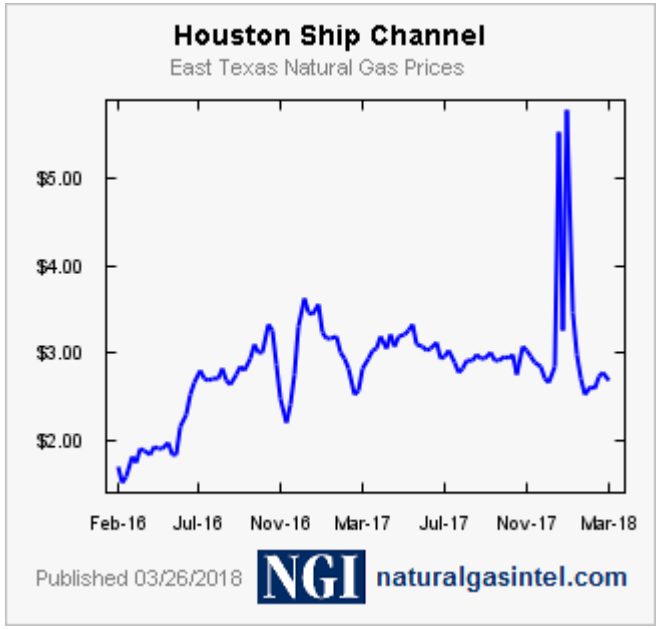
https://rbnenergy.com/

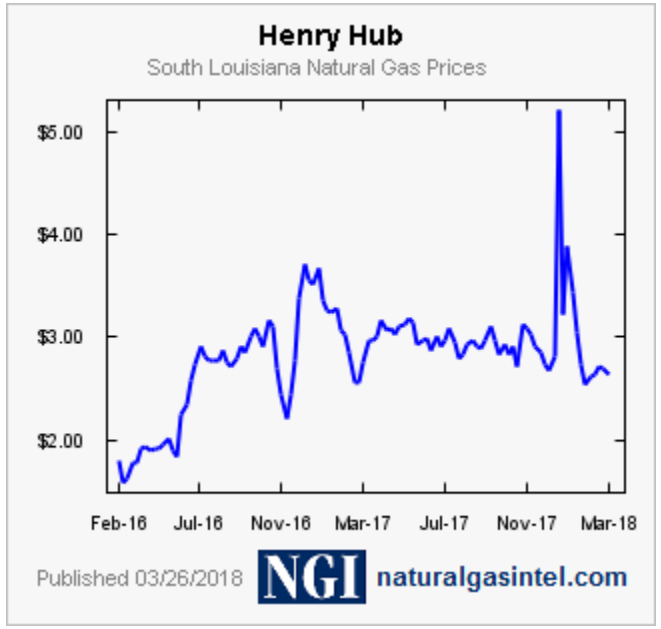
Weekly





Deterioration of spreads





http://www.naturalgasintel.com/data/data_products/weekly?location_id=SLAHH&region_id=south-louisiana

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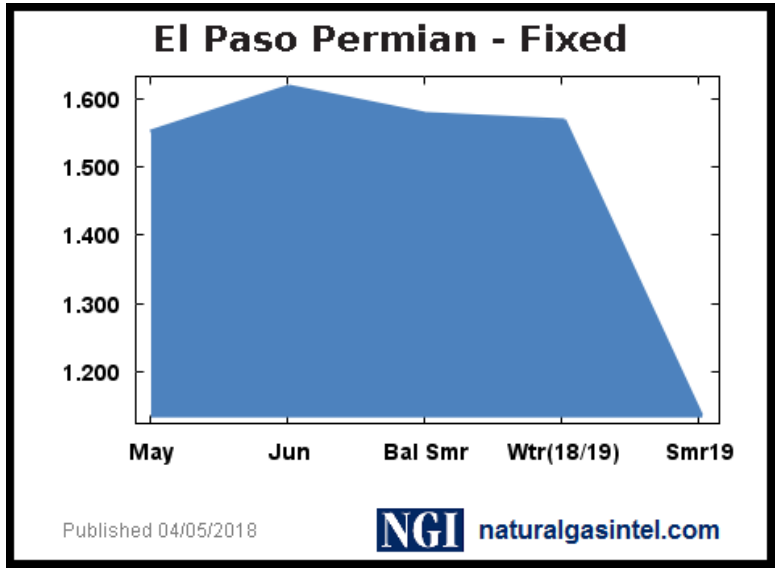
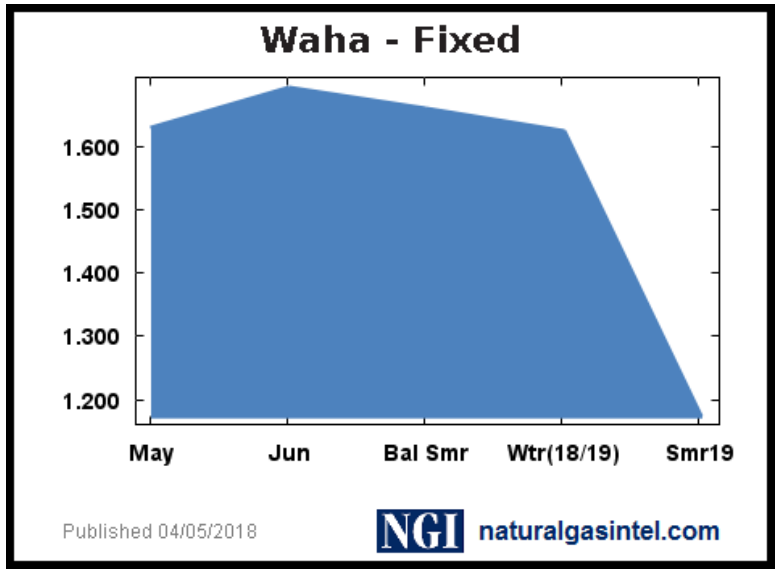
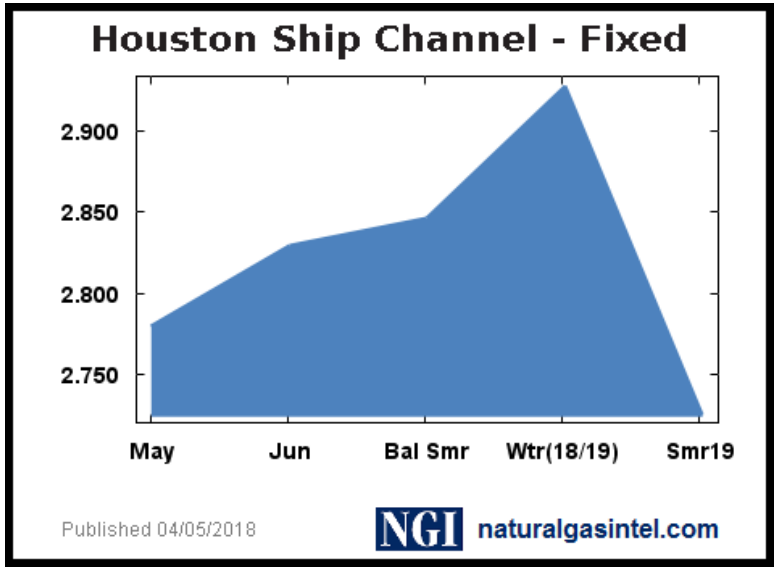
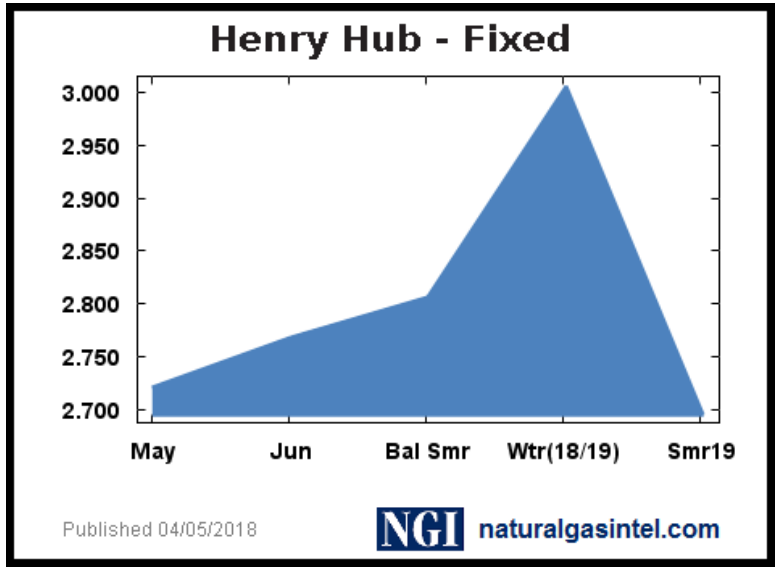
Forward - Fixed









Forward prices of natural gas delivered for each reference period at the various locations/hubs.

http://www.naturalgasintel.com/data/data_products/forward-contracts?location_id=SLAHH&region_id=south-louisiana

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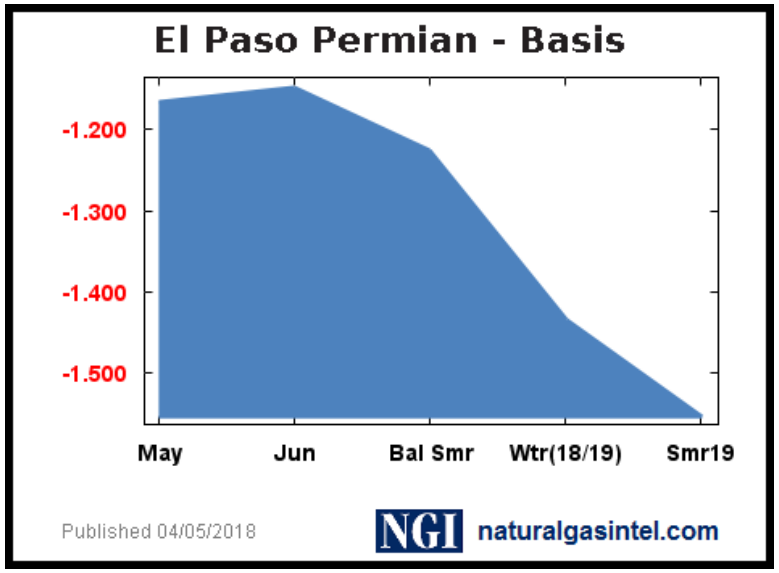
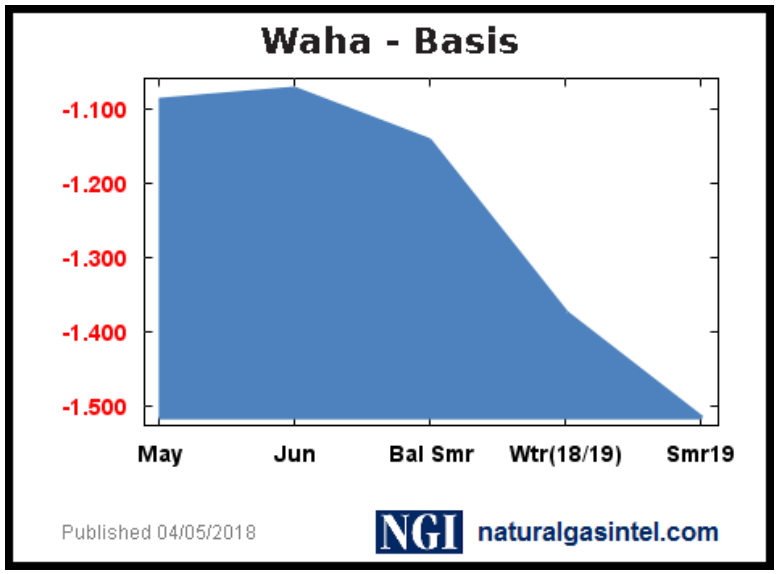
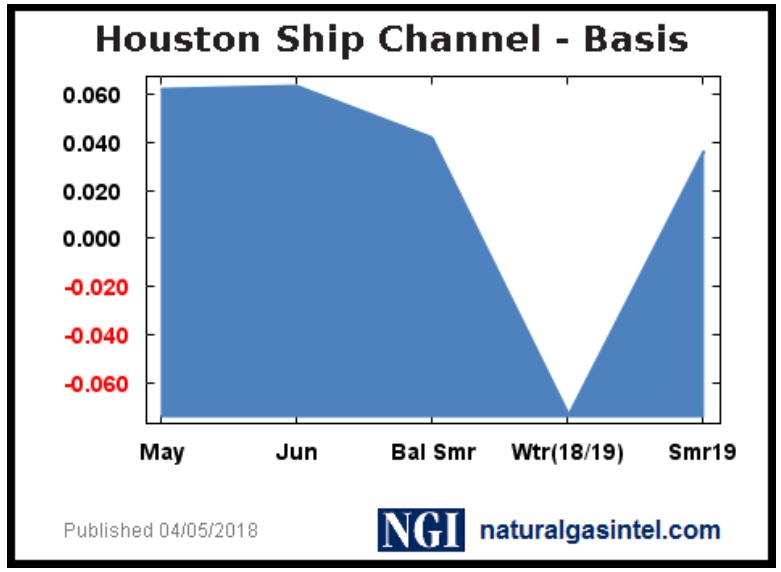
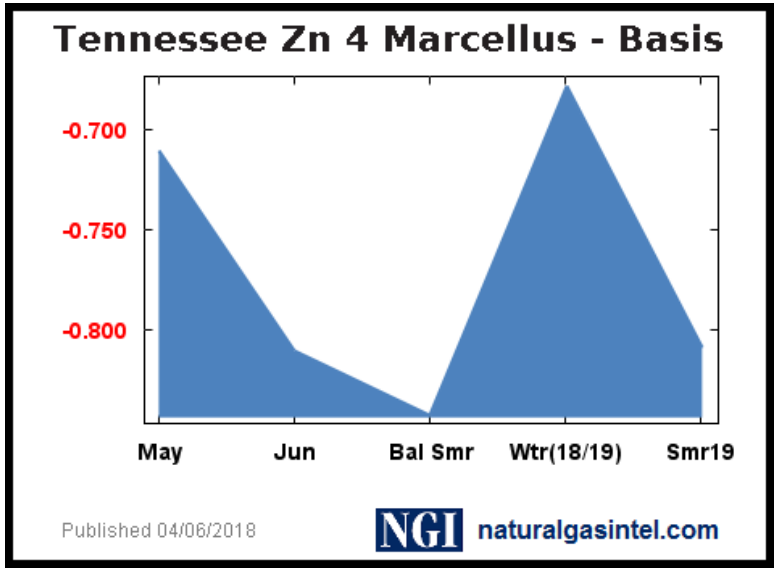
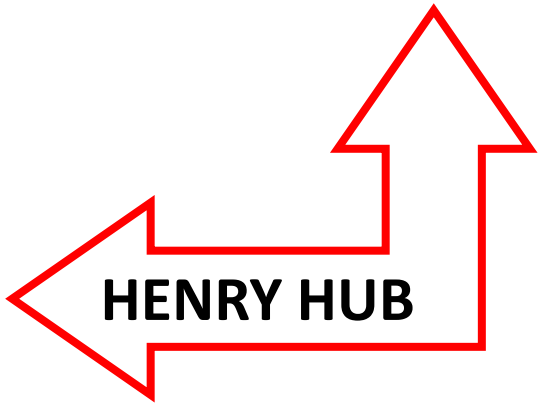
Forward - Basis











"Basis price" represent the differential, for each reference period, between the Henry Hub and various locations/hubs.

http://www.naturalgasintel.com/data/data_products/forward-contracts?location_id=SLAHH&region_id=south-louisiana

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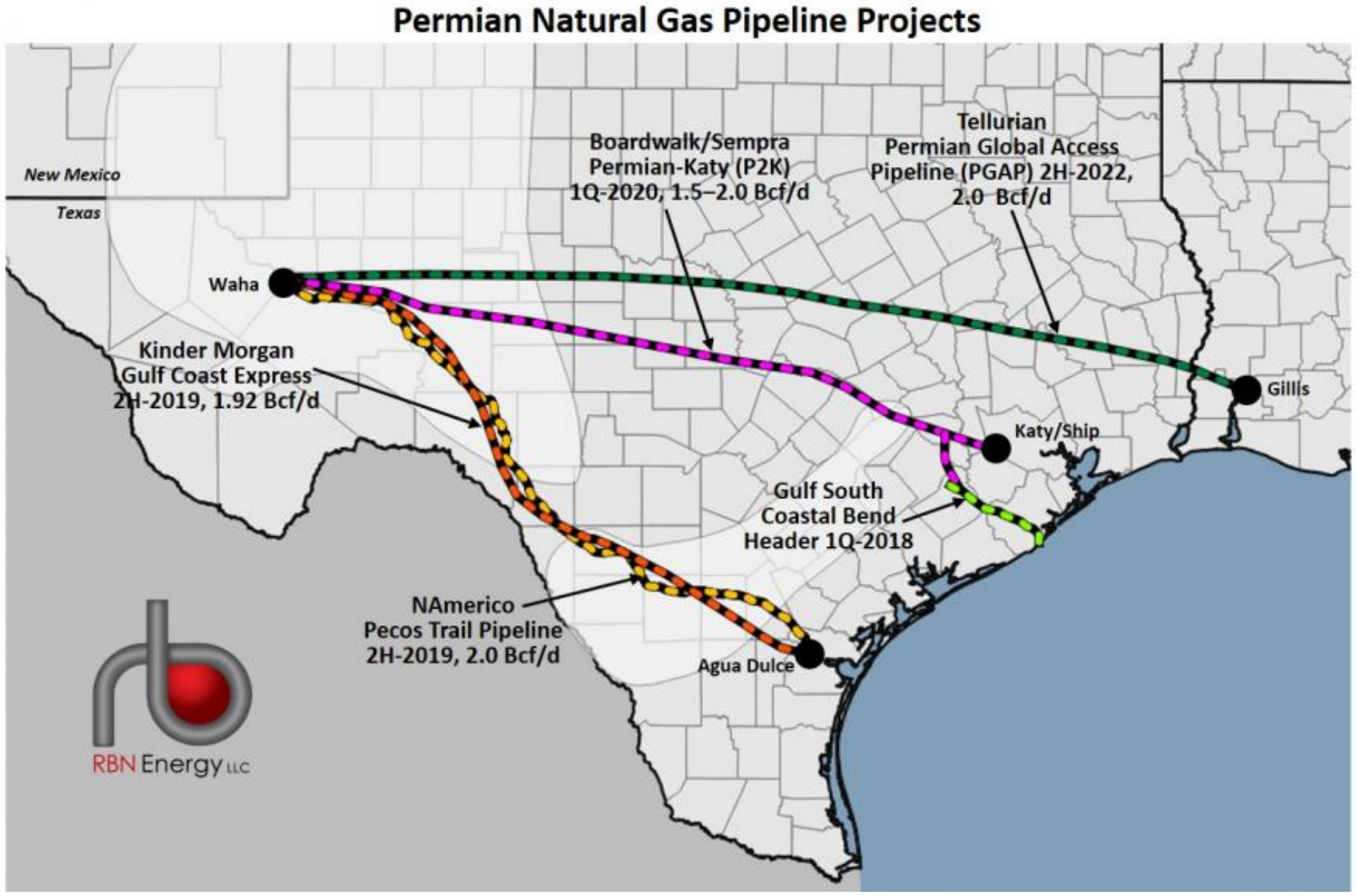
A fix?



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Usefulness of Spreads

- Lure investment to bottlenecks and…
- …attract monetization options…
  - *Gains from trade*
  - *End users*
- …so long as business conditions support “optionality”.
  - *And it can be paid for.*

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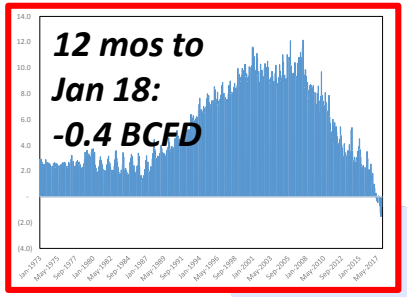
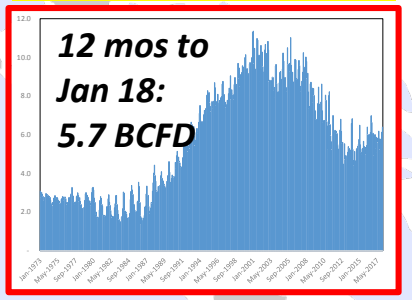
US/NAM Gas Trade

Net Imports

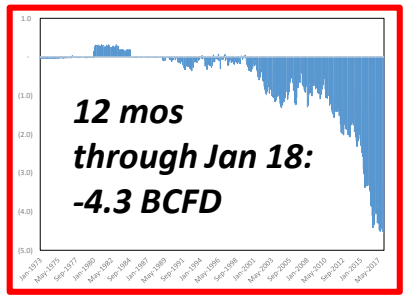
2013: ~2x current NA exports by 2020 to ~9+ BCFD?
As of Jan 18 ~9 BCFD

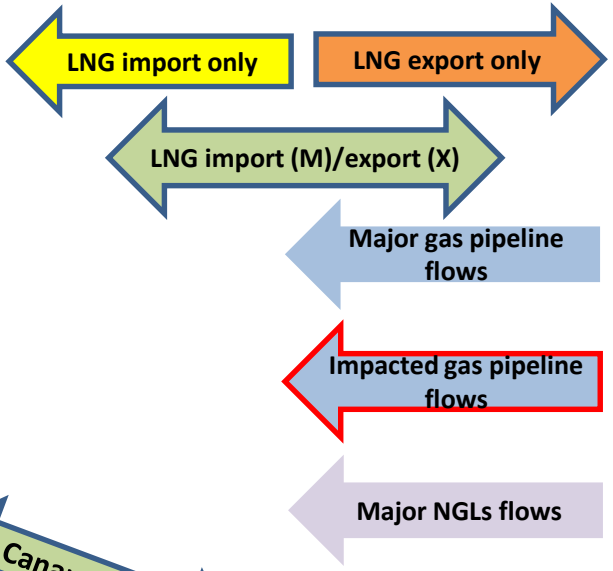


U.S. is about 24% of Canadian consumption (2016)

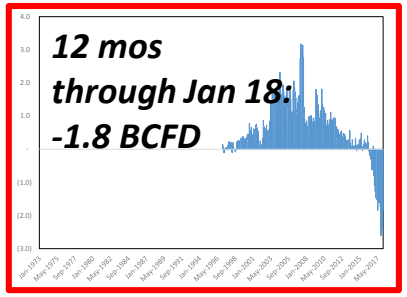


U.S. is about 47% of Mexican consumption (2016)





U.S. LNG



Michot Foss, Chapter 3, Pricing of Internationally Traded Gas, www.oxfordenergy.org; EIA; FERC

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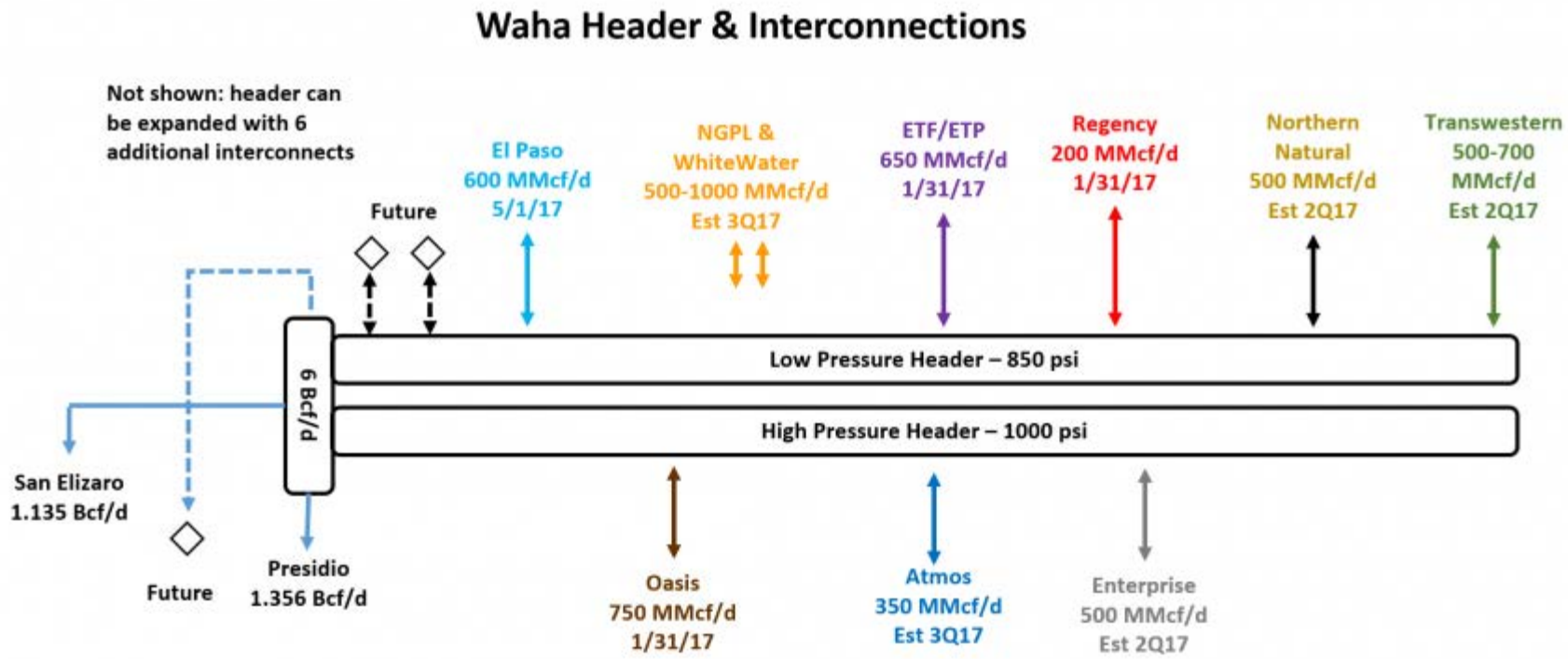
Waha Infrastructure



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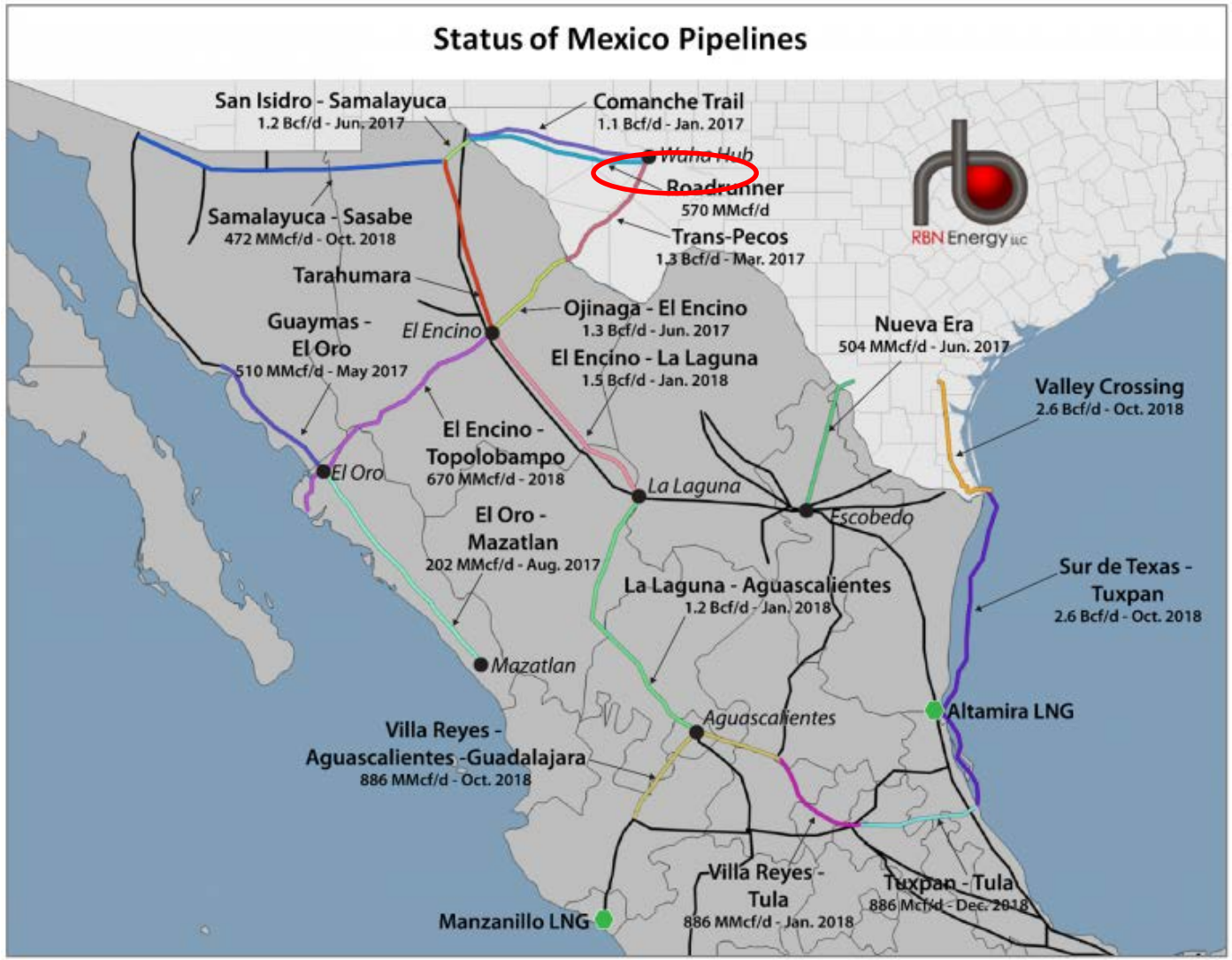
Big Bets



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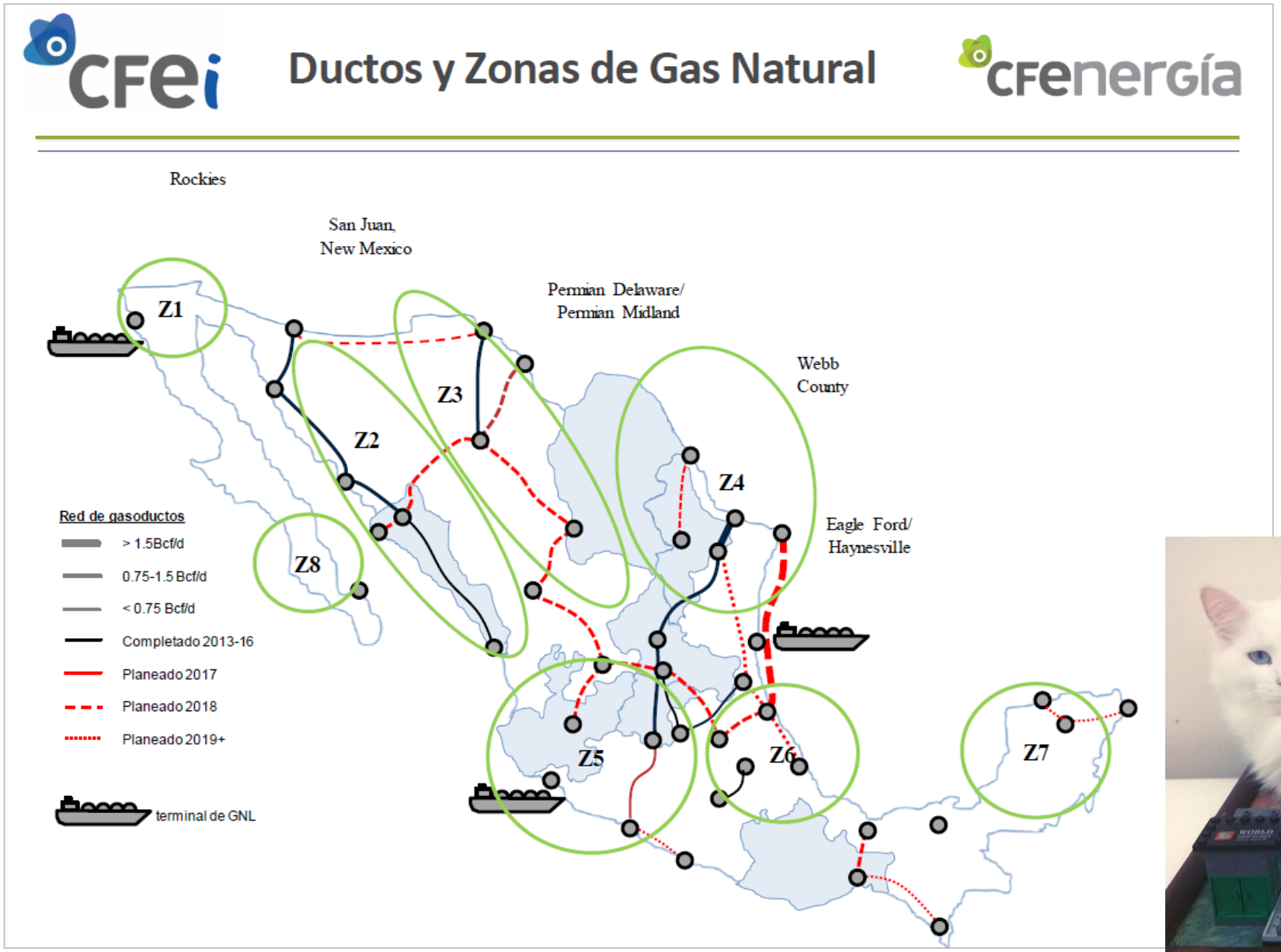

CFE's zonal pricing strategy intended to:

- **Improve signaling for internal de-bottlenecking and expansions**
- **Improve price signals for imports**
- ***Provide price signals for domestic production***

Guillermo Turrent, CFE, Energy Mexico 2018, Jan 30, used with permission

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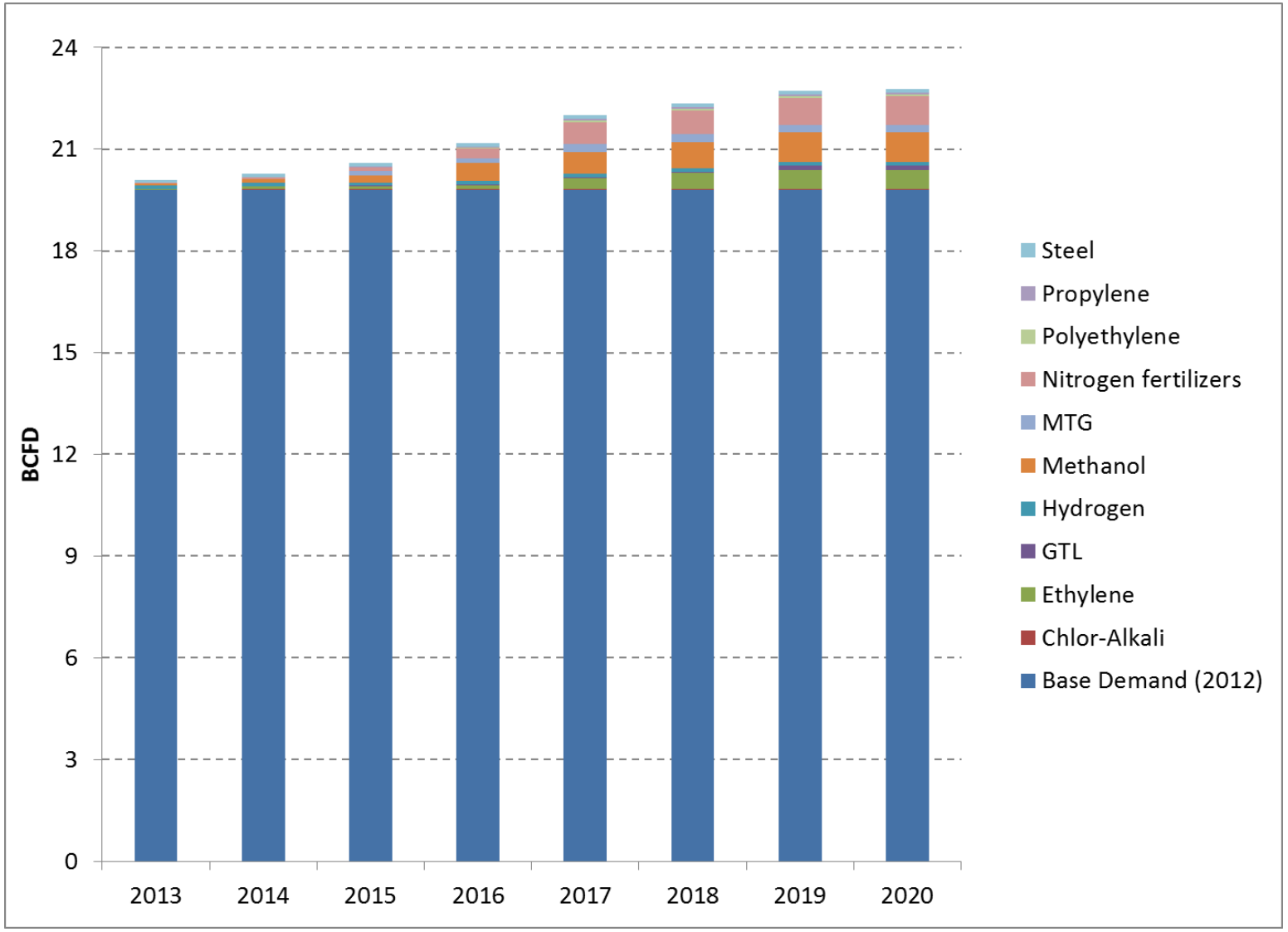
Our Renaissance



- ***About 100 Projects***
- ***About $90 billion***
- ***Incremental NG demand of ~3 BCFD***

CEE industrial database

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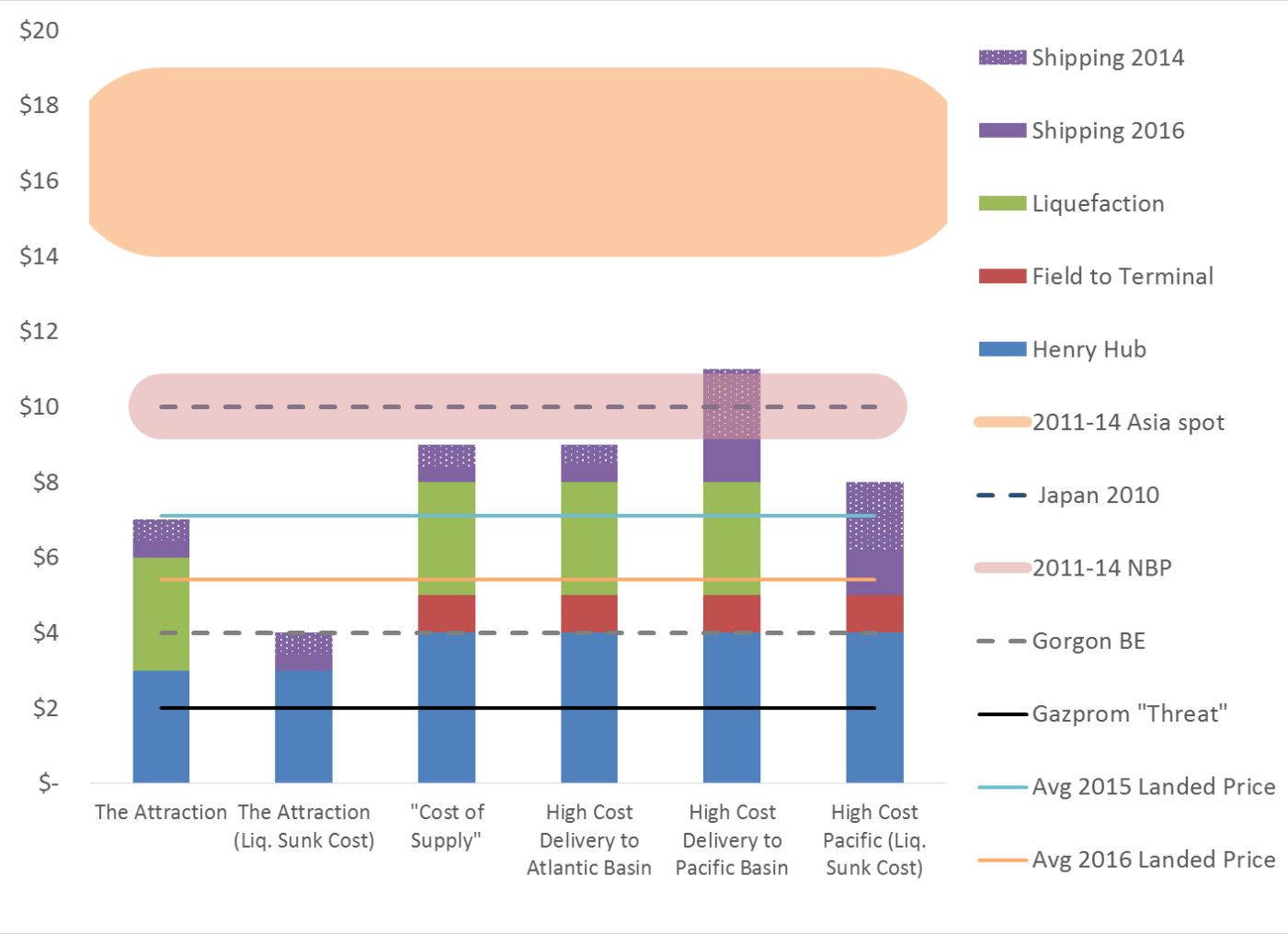
Global LNG complexities…



- **"Low" demand growth (China, India, Japan, and others):**
  - Coal, nuclear, renewables have priority - energy security
  - Not enough gas infrastructure (especially storage)
  - Low gas market readiness
  - Sluggish economic growth
  - Japanese energy policy: nuclear, renewables, efficiency
- **"Surging" global LNG supply ➔ excess supply until the mid 2020s**
  - Unsubscribed U.S. liquefaction capacity
  - Parts of contracted volumes not tied to specific destinations

http://www.beg.utexas.edu/energyecon/template/IAEE%20Energy%20Forum_062116.pdf
http://www.beg.utexas.edu/energyecon/thinkcorner/CEE_Advisor_Research_Note-Andy_Flower_LNG_Supply_Outlook-Aug16.pdf
http://www.beg.utexas.edu/energyecon/thinkcorner/CEE_Research_Paper-China_and_India_Current_Future_Natural_Gas_Demand-Apr17.pdf

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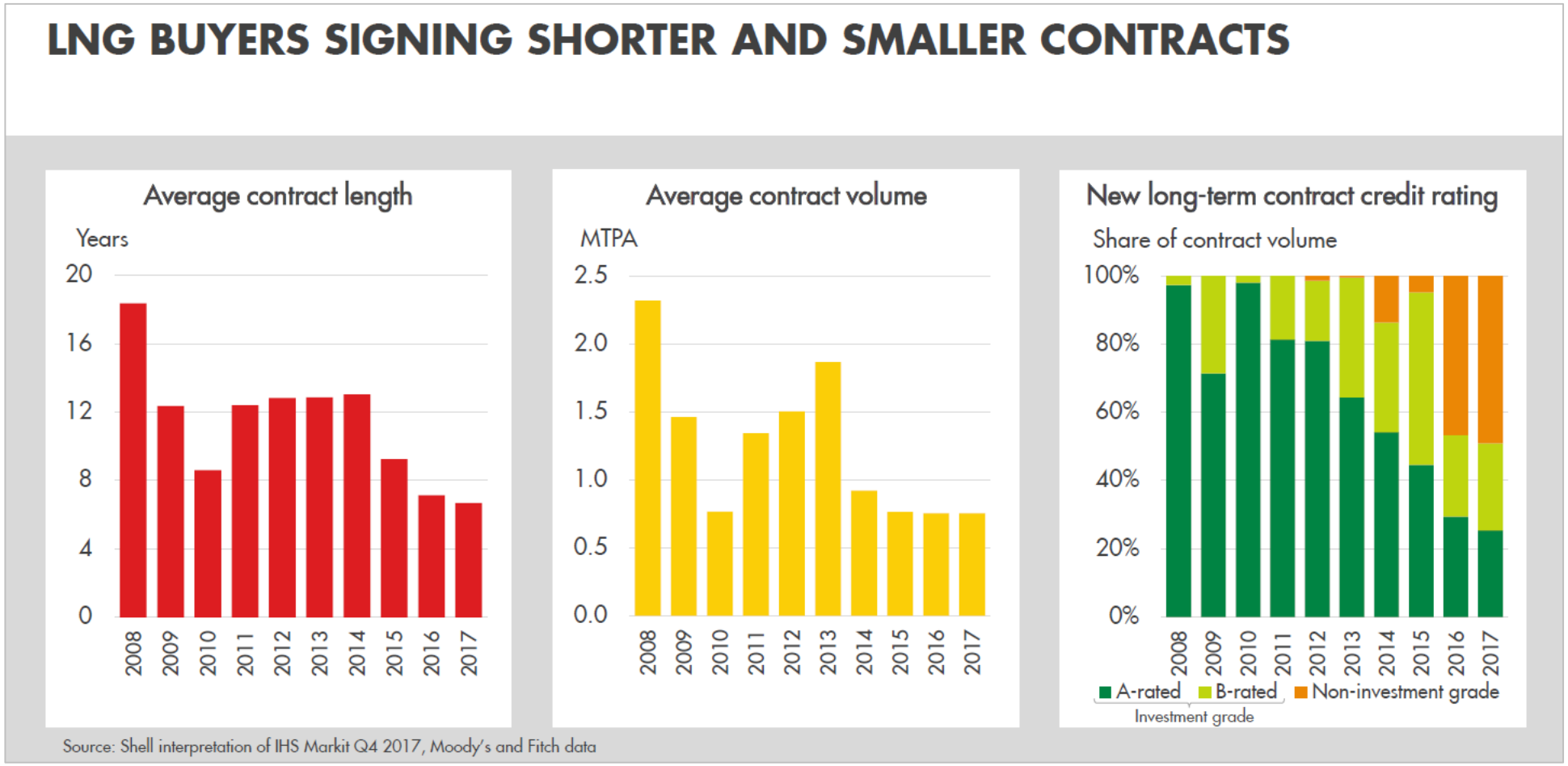
…and rapidly shifting terrain.



Creditworthiness of buyers is a substantial risk to global LNG trade growth.

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Closing Thoughts

- How to keep the success story going
  - *First, do no harm*
- Ultimately, market will set pathway…
  - Cost of capital
  - Attraction of oil and gas for investment portfolios
  - Ability of producers to consolidate acreage positions in order to sustain, improve efficiencies and get off the treadmill (???)
  - Trade, petrochemicals do not provide enough "oompf"
  - Gas competitiveness for electric power is key
- **…perceptions will dictate**