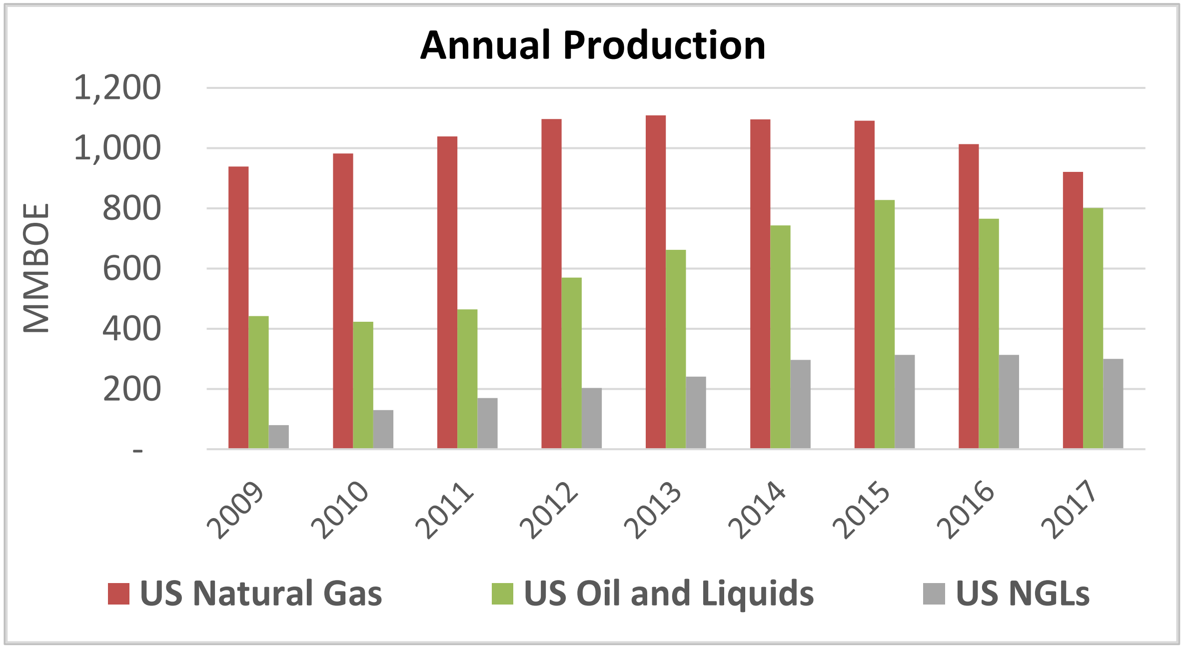
Upstream matters!

2017 Update & Preview

In keeping with prevailing industry trends, our best-in-class companies sustained and/or grew volumes while adjusting portfolios to emphasize liquids production.

All content CEE analysis based on company annual reports.



To better understand upstream economics in the U.S., we benchmark a sample of producers who are unconventional play leaders. Our sample represents the top tier of U.S. producers including leading shale players from **2009 to 2017** (rolling 3-year finding & development and capex beginning 2007).

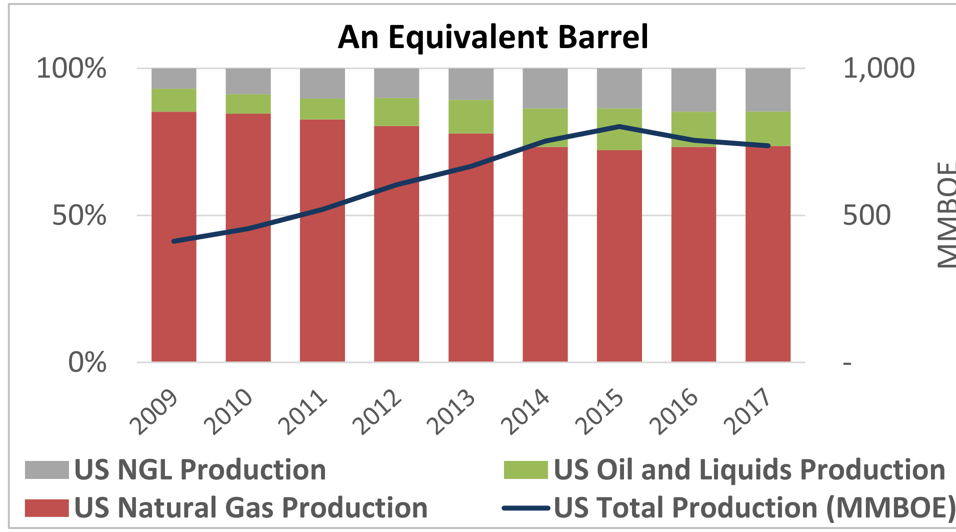
- The 16 publicly traded companies we examine comprise about **19%** of U.S. total natural gas production and **23%** of U.S. oil production.
- As usual, we state results mainly in barrel of oil equivalent terms.

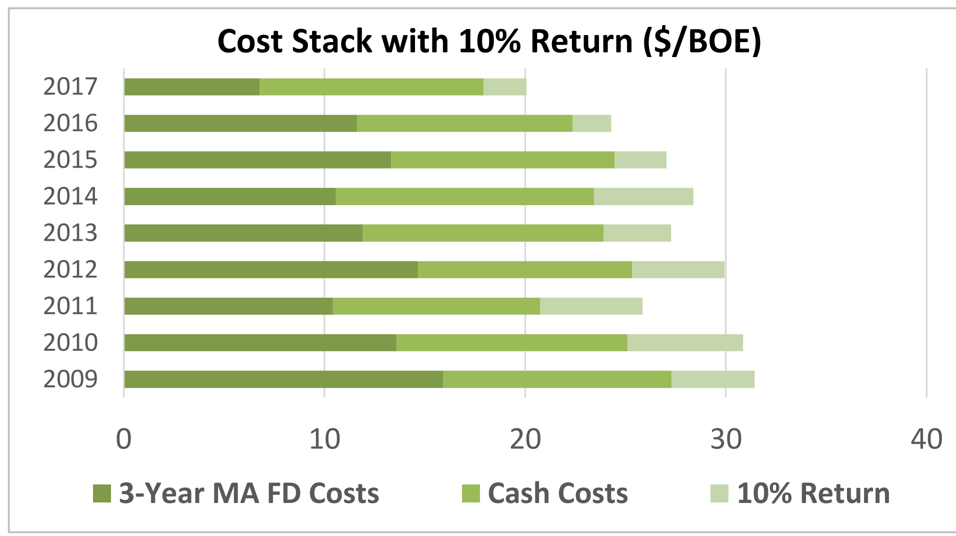
We add 2017 reporting data and affirm key assumptions going forward. <u>In 2016 we added four companies to our sample and restated historical results in order to focus our analysis on U.S independents and key basins.</u>

Computing costs:
Gassier is cheaper…

- Land holdings for this "cut" of our producer sample are mainly in the Appalachians (Marcellus-Utica).
- In natural gas terms, the lowest cost producer averaged **less than $2 in billion cubic feet equivalent (BCFE)** for 2017 (total costs without return).
- More typical performance was **$2.20-2.40**, roughly equivalent to the regional average discounted from Henry Hub.

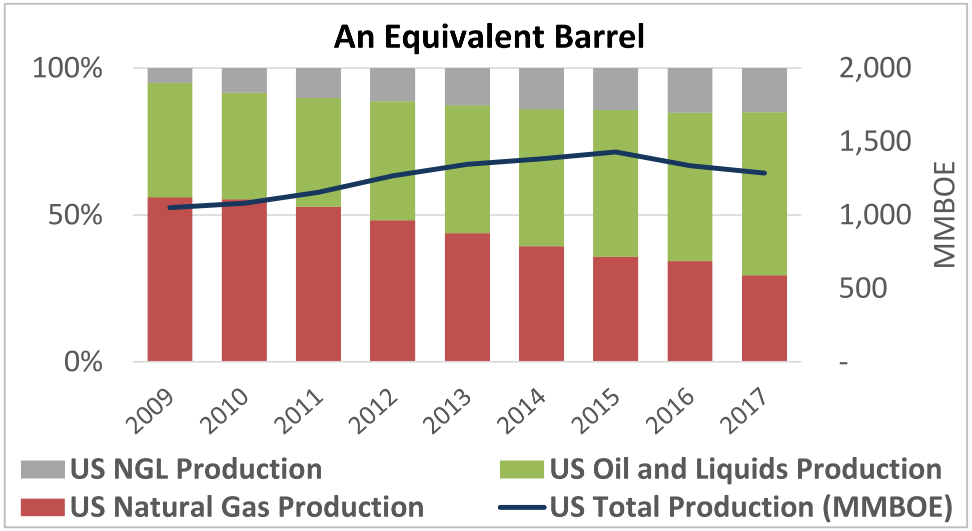
Our definitions:
FD cost = capital spending for finding (exploration) and development, calculated on a 3-year basis and applied to 3-year reserve additions as a moving average (MA).
Cash cost = current year lease operating expense, production costs, general and administrative, marketing, income taxes, non-income (state production) taxes and interest on debt, applied to current year production.

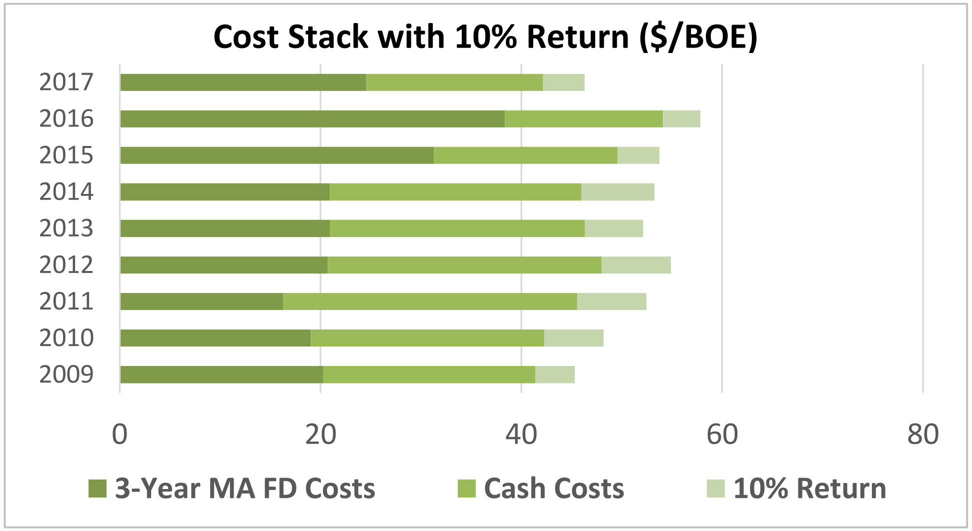




Computing costs:
…oilier is more expensive, but…

- Land holdings for our oilier producers are mainly in West Texas (Permian) and North Dakota (Bakken). There is some Alaska production in the sample.
- The lowest cost producer, a Permian "specialist", averaged **less than $29** per barrel of oil equivalent (BOE) for 2017 (total costs without return).
- Oilier companies demonstrate much more variability in cost, mainly a function of land positions and geology. **Costs range from $28-54/BOE with a median of $43, consistent with larger industry samples.**

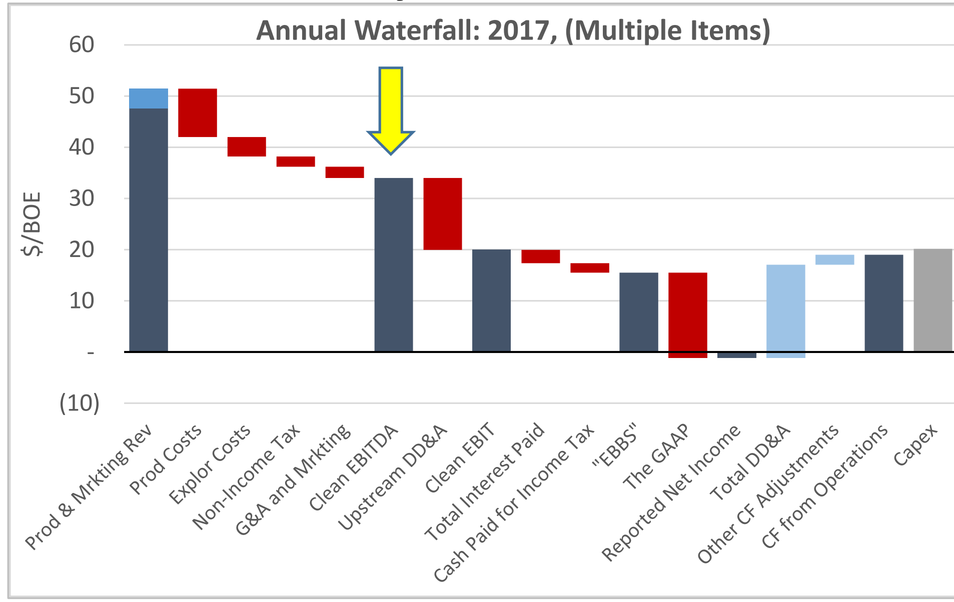




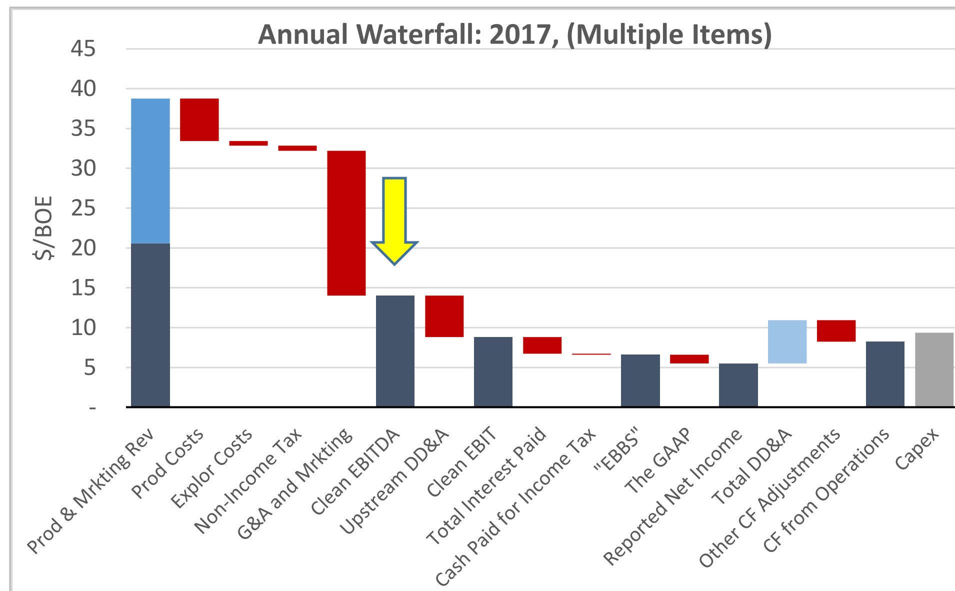
Computing profitability: *…oilier companies are more profitable.*

- **EBITDA (earnings before interest, taxes and depreciation and amortization, yellow arrows) for oily companies was about $34/BOE in 2017, vs about $14/BOE for gassy companies.**
- For oily companies, 2017 EBITDA improved by about **$20/BOE** over 2016 results.
- For gassy companies, the improvement in EBITDA 2016 to 2017 was about **$9/BOE**.
- Several producers generate **revenues associated with midstream assets**. This income source is shown as marketing revenue (light blue portion of revenue stack in our waterfalls).
- **Costs also are associated with midstream (gathering, transportation, storage), mainly pipeline capacity to transport production to markets.**

"Oily" Producers

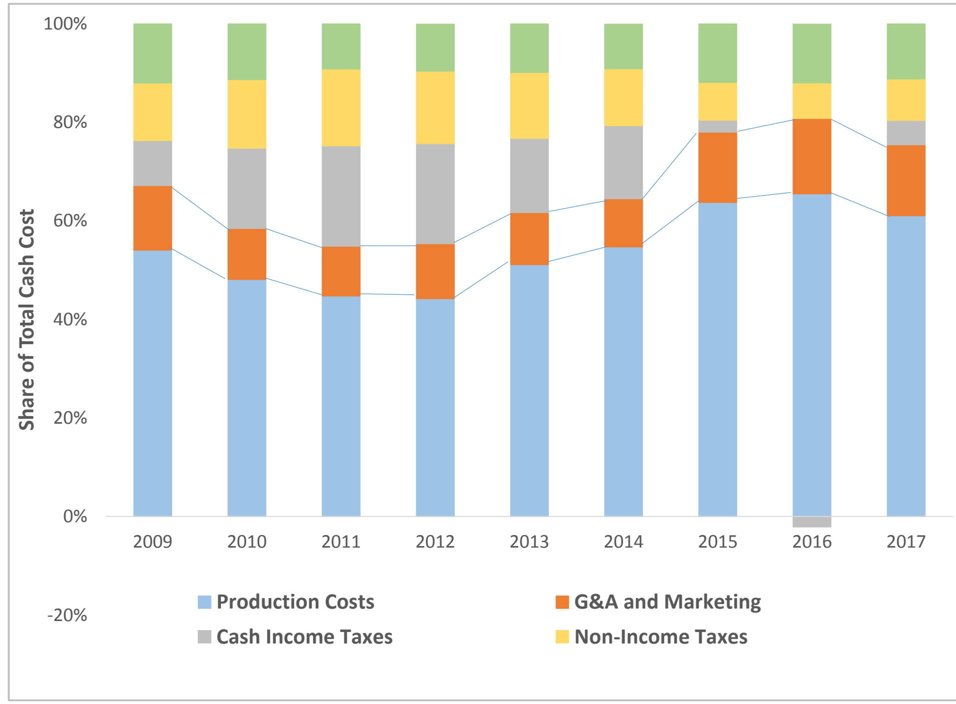


"Gassy" Producers



Producers must "back" midstream

- General & Administrative (G&A) and Marketing (orange segment) has been a **growing component** of total operating cost.
- Companies have incurred/will continue to incur, costs to back investment in midstream, field-to-market connections as they strive to "monetize" production.
- ***Producer commitments for new pipeline capacity have become essential especially in remote locations.***

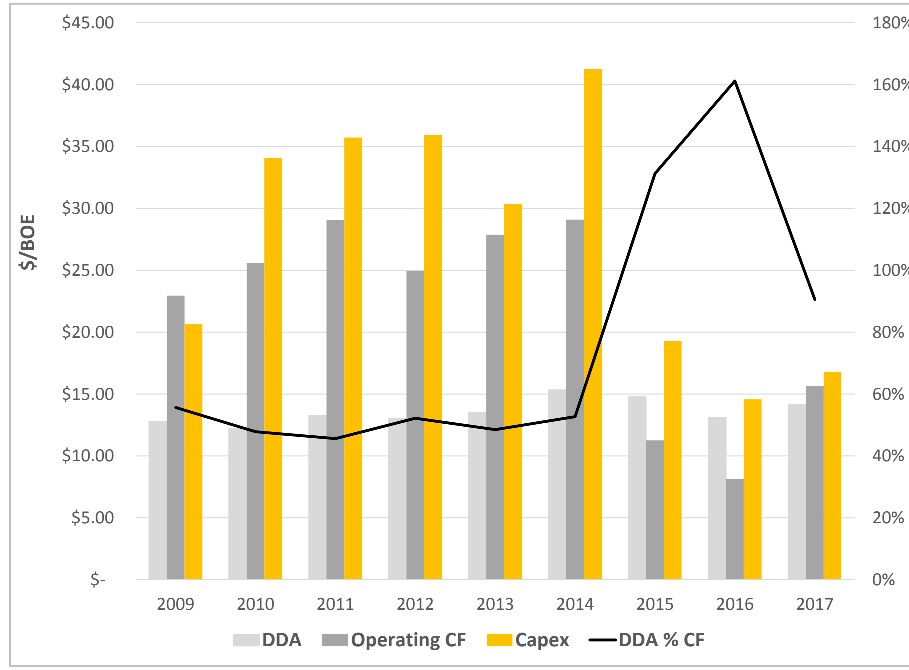


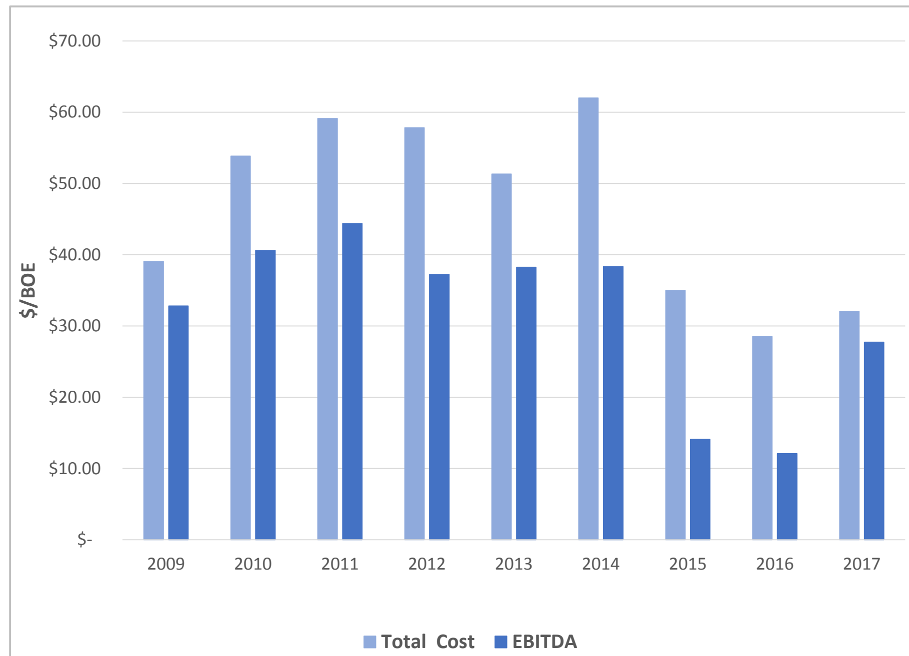
- In the **Appalachians**, these costs include capacity commitments to reverse flows on interstate pipelines to deliver gas production to the Gulf Coast for exports and petrochemicals feedstock as operators strive to improve pricing.
- Lack of field-to-market connections in the **Permian** are challenging producer revenues and supporting a drive to increase exports as well as fueling refining acquisitions.

All of these shifts are coincident with the push by midstream developers to implement fee based contracts, rather than rely on commodity receipts, to secure revenue streams. Commodity price risk also has been shifted to producers. See: *http://www.beg.utexas.edu/files/energyecon/think-corner/2013/7%20June%202013%20Midstream.pdf*

Financial health has improved, mainly through capital discipline

- DDA (depreciation, depletion, amortization) credits **have dropped** as a proportion of operating cash flow.
- This is a result of both **reduced capital spending** and **improved commodity prices**, predominantly for oil and other liquids.
- EBITDA for all of the companies in our sample returned to **positive territory** in 2017 with stronger oil prices and better cost management.
- **Managing operating costs** will be a key element for U.S. producers going forward. Pressures on cost components build with stronger commodity prices.
- **Shifts in capital cost** will come as companies pursue larger, more complex drilling and development plans and acquisitions. Industry consolidation is a widely anticipated trend, with the Permian of particular interest.





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INDEPENDENT THINKING

Hedging Natural Gas is Difficult

- Producers rely on **hedging** production using prices in the future to protect cash flows.
- The deeper, more "financially liquid" oil marketplace provides **better opportunities** for hedging. Oil prices are influenced by supply and demand balances, including within the U.S.; geopolitical events; and other factors. Oil is less influenced by seasonal variations than natural gas. In addition, oil production is easier to move from fields to markets, with more options for transportation.
- For the companies that report realized oil prices, including the benefits of hedging, their reported realized price is **very close to the actual traded price** for each quarter of 2017.
- Results are **not as favorable** for natural gas.

WTI is West Texas Intermediate, light sweet crude oil. Henry Hub is natural gas after processing. See http://www.cmegroup.com/trading/energy/ for definitions and futures contracts terms and conditions.