Doubts about Shale Plays: Examples from the Barnett, Fayetteville and Haynesville Shales
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The investment community now believes that as a result of shale gas plays, the United States has almost an inexhaustible natural gas supply. The balance sheets of many of the key operators in shale plays, however, tell a different story, characterized by substantial debt, ongoing asset sales, and low cash reserves. Our analyses indicate that the reserve levels claimed by certain operators and analysts for shale gas plays are difficult to justify by standard decline-curve methods unless production is projected decades beyond any reasonable economic limit. If we are correct, these companies may be substantially overstating the profitability of shale gas ventures as well as their net asset values based on present accounting practices.

We evaluated the Barnett and Fayetteville shales because these have the longest production history of any of the shale plays, and the Haynesville because it holds the most promise for high rates and reserves. What I found surprised me. The average reserves for Barnett and Fayetteville wells are less than 1 Bcf for horizontal wells, while operators claim an average of 2-3 Bcf/well. The Haynesville Shale evaluation is more tentative because of limited production, but the average per-well reserves are 1.75 Bcf based on early evaluation, although operators claim an average of 6.5-7.5 Bcf/well.

In all of these plays, reserve predictions based on type-curve methods are too optimistic. There is a questionable correlation between initial production (IP) rates and Estimated Ultimate Recovery (EUR). Actual average well life appears to be much shorter than predicted, and the volume of the commercially recoverable resource may have been greatly overestimated.

Most companies and analysts use a type-curve approach to calculate and justify their reserve estimates. Operator and investment group pro forma hyperbolic decline curves commonly have hyperbolic exponents that exceed the theoretical limit of hyperbolic curvature, and that are flatter than all of the individual well decline curves that they are supposedly derived from.
The implication of these conclusions is profound. Reserve estimates may be over-stated by 100-450%. Most of the over-estimation is because overly optimistic decline trends are projected years into the future without applying an appropriate terminal decline rate, a practice contrary to standard methods and not supported by observed decline rates. This raises questions about the reporting from companies that claim the reserves as well as the companies that certify them.

Many E&P companies and financial analysts state that shale gas plays are profitable in the $4-5/Mcf range. Yet stated costs by these same companies in their SEC filings indicate that the marginal cost of production is $6-8/Mcf. Recent asset write-downs suggest that costs substantially exceed even the hedged-price positions of many companies. It is astonishing that financial analysts rarely challenge shale operators about the cost and profitability of their wells when their public filings appear to present a contradictory view.

It is equally surprising that some investment companies publish similarly misleading statements about cost and profitability in their research reports, and do not consider that recent asset write-downs are noteworthy. Is it any wonder that investors and politicians believe there is an unlimited supply of low-cost natural gas that can be produced profitably in the United States?

The Barnett and Fayetteville Shales are marginally profitable plays at best, and the Haynesville Shale will be unprofitable if current decline projections continue. None are commercial at current gas prices. Many companies that have bet on shale plays rely on public markets for financing, and must resort to asset sales to repair their balance sheets and service debt. How can they say that they are profitable if they cannot run their businesses from cash flow?

At some point, the companies that claim success in shale plays, the investment companies that promote their stock and publish favorable reports about their activities, and the engineering companies that certify their net asset values must be held accountable for their conclusions based on results. I have published challenges to these claims for several years but have not gotten any material response from the parties involved. I interpret that to mean that they either do not take my position seriously, or do not contest it.

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He has published over 50 articles on geology, technology, and the petroleum industry during the past 10 years. Publication topics include petroleum exploration, oil and gas price trends and cycles, petroleum play evaluation, sequence stratigraphy, coastal subsidence, earthquakes, tsunamis, and petroleum geopolitics. He has published 8 articles on shale gas plays including the Barnett, Haynesville and Fayetteville shales.

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