

“Graves” wrote a letter to the editor in response to this article. The text of our January 7, 2019 letter is as follows:

Gentlemen:

We read with interest Bradley Olsen, et al’s article titled “Fracking’s Secret Projection Gap” (Thursday, January 3, 2019). We’d like to address several points made by the authors.

The authors didn’t include in their review certain large producers such as Exxon Mobil Corp. “because they didn’t make shale-well projections.” Actually, large producers like Exxon Mobil do in fact prepare forecasts of future production and income from their shale wells on a well-by-well basis. They just don’t break out those numbers in public statements. Instead, their reserve numbers provided in public statements are typically company-wide and may include combined projections from a wide range of conventional and unconventional resources. We think it should be pointed out that the reserves touted in investor presentations may include probable and possible reserves in addition to proved reserves. The authors don’t seem to make this distinction.

The authors stated that, “All oil companies are required to file estimates of total proven oil reserves with the Securities and Exchange Commission.” This should have read “all *public* oil companies...” The majority of oil companies in the United States are private entities who issue no reports of any kind to the SEC. In fact, according to the IPAA, it is private, independent oil and gas companies who produce 27% of the oil and 35% of the natural gas in the United States today. Most private oil and gas companies prepare their own internal reserves projections (and/or have third-party independent projections prepared for them), and these are frequently used externally for acquisition and divestiture purposes or delivered to financial institutions such as banks or private equity firms who provide debt or equity financing to oil and gas companies.

We disagree that the use of estimated ultimate recovery (“EUR”) as a metric in reserves evaluations is somehow a ruse concocted by shale drillers to get around the definition of reserves as being those that are anticipated to be produced as a result of operations planned to be conducted over the ensuing five years. Under SEC guidelines, companies report the reserves remaining to be produced over the economic life of the property. In addition, companies are limited to including in their total reserves, those undeveloped or non-producing reserves that will be added to their production base during only the next five-year period. In the case of unconventional formations or shale plays, the estimates of EURs are generally based upon the use of “type curves” that are based upon the average of individual well production decline curves of wells producing in the same area.

The use of EUR estimates to define well recoveries is not something new that resulted from the shale boom. It has been a common and widely used metric in the forecasting of reserves and the preparation of projections of future cash flows since the early 1900s. The use of curve analysis methods for estimating EUR’s and future production rates goes back to 1945 (Arps, J. J.: “Analysis of Decline Curves,” *Trans., AIME* [1945]); however, unconventional and shale plays are more difficult to forecast in their early development. The authors fail to address the importance of sample size in the determination of decline curves utilized to determine EURs. Industry organizations recommend that sample size may need to encompass as many as 100 or more analogous completions to determine a definitive type curve, otherwise, early forecasts of

unconventional or shale completions may not represent accurately the reserves volumes determined once substantial data is available.

The authors appear confused about decline rates. Production declines are hyperbolic in nature and the percentage rates of decline decrease continuously with the life of production until a terminal rate of decline is realized. An unconventional or shale well usually starts out at an annualized rate of decline of 95% or more and decreases continuously until five or so years later when it may be in the 12-16% range. The 5% decline rates the authors say are optimistic are actually the terminal exponential (constant) decline rate that makes up the "tail" or extended life of the well, perhaps from 20 years onward. It is not meaningful to compare decline rates in the way they do.

We agree with your authors' assertion with respect to the risks of spacing horizontal shale wells too close together as having the potential to result in reductions in recoverable reserves. However, ever-improving technology is delivering improved results in shale wells. In East Texas, recent Haynesville wells are performing 3-4 times better than the first-generation wells drilled ten years ago, mostly due to longer laterals and higher proppant concentrations. Increasing well density while mitigating well interference is a very active area of research today.

The balance of the article is on point with respect to the importance of a responsible, conservative outlook in projecting reserves. The authors' research clearly points to the importance of independent, third-party evaluations of oil and gas reserves.

Regards,

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