

Lessons and Technology Evolution from TP Sims to Permian 2018 and beyond

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The History of US shale production starts well before Mitchell's now famous work in the Fort Worth Basin. In fact the US's first shale well was also its first natural gas well that produced from the Albany Shale in Fredonia New York in 1825. The well was dug by William Hart a full 34 years ahead of Drakes famous well, in 1859. Americas shale gas history pre Mitchell seems to have been forgotten, but it involved a great history mostly in the Appalachian basin, (Roen 1993). Excellent work done by the Gas Research Institute in the 80's and 90's help helped lay the foundations for what would latter be the Shale revolution. The famous Mitchell TP Sims 2 kicked off the modern shale gas revolution when Mitchell was essentially ready to give up and they tried the cheapest thing they could "slick water" (personal communications Bowker et al). What they clearly had recognized was the size of the resource and had a strong motivation to sell gas into a very good gas sales contract that Mitchell had, and to utilize an infrastructure base that was quickly becoming idle. Then came the Fort Worth basin boom, and exploration extending into the Permian basin and other well know source rock areas. The initial round of work looked at source rocks nation wide but with a focus on those that most resembled the Fort Worth Basin Barnett, this meant micro porous black shales typically with high silica content that was of a typical of the Devonian and Mississippian shales. These where the closest analogs to the Barnett in the Fort Worth Basin and included Fayetteville of the Arkoma, the Caney and Woodford of the Anadarko, the Woodford and Barnett of the Permian, the Muskwa-Otter Park and Evie formations of the Horn River and the Marcellus of

the Appalachian Basin, with the Bakken formation of the Williston being unique as oil productive. Soon thereafter there was also a time when the limits of what organic shales might produce began to be pushed, as well as expansion into international project areas. As the Niobrara, Eagleford, and Utica began to produce a fuller understanding of the possible combinations of lithology and pore systems that could produce. There also began to be a shift towards oil producing or at least rich gas areas due to improved economics as natural gas prices fell in 2008. Effectively the US gas producers have been exceedingly good at bringing on line new gas production with prices on a long-term decline since the peak in June of 2008 when the US was producing about 56 BCF/day and has now increased production to 80 BCF/day. The shift to oil exploration from gas caused issues related to simply the number of areas that were good oil prone source rocks at the right thermal maturity. By far the biggest parts of the US where this is true is the Permian Basin, with other areas like the Anadarko, Gulf Coast, and areas of the Rockies having potential but not on the order of what exists in the Permian. And finally, a large portion of the remaining US basins were simply too gas prone. Companies that had long-term focus in the Oil rich basins have thus thrived. Now producers are set to tackle new sets of challenges, but very different from the historic issues they worked on before. Focus now is on capital efficiency, and land use optimization. With new tools being applied to further optimize value. How much additional efficiency can be brought to bear remains to be seen.

