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ExxonMobil's Acquisition of XTO Energy: The Fallacy of the Manufacturing Model in Shale Plays

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Most analysts believe that the ExxonMobil acquisition of XTO Energy (XTO) represents a dramatic shift in strategy by the premier exploration and production (E&P) company, and a validation of shale plays. It is neither. The move represents a considered and deliberate choice that acknowledges diminished opportunities for the oil giant to add and replace reserves. The acquisition acknowledges that natural gas is the only viable short-term solution to North America's energy needs, and that demand will grow. It implies that ExxonMobil believes that higher natural gas prices will be part of that energy future. It presumes that the company can improve on the flawed manufacturing model that has dominated the way that U.S. shale plays have been pursued.

ExxonMobil's acquisition of XTO only seems dramatic to those who have not paid attention to the company's strategy and change in project mix over the past decade. Its portfolio consisted of 75% unconventional resources before the XTO acquisition (Figure 1) with a strong emphasis on tight, acid and sour gas, LNG, and heavy oil projects. Tim Cejka, President of ExxonMobil Exploration Company, told The Wall Street Journal last year that his company has been "bullish" on shale plays since 2003 (Wall Street Journal, July 13, 2009). David Rosenthal, ExxonMobil Vice President of Investor Relations recently said, "It's not a strategic shift" (Houston Chronicle, February 2, 2010).

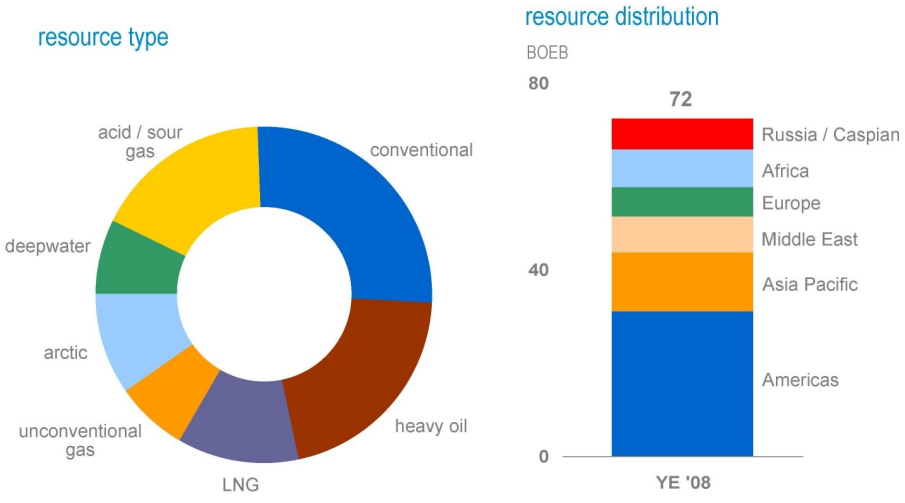

Figure 1. Exxon Mobil portfolio by resource type and geographic distribution (From 2009 Analyst Meeting, New York Stock Exchange, March 2009).

The Company has pursued tight gas plays in Colorado's Piceance basin and in Hungary's Mako Trough for many years. It announced its entry in a shale play in Canada's Horn River basin in

2009. It leased 20,000 acres in the Marcellus Shale play in 2008, and now has a joint venture with Pennsylvania General Energy that covers 290,000 acres in that play. ExxonMobil also maintains an ongoing commitment to oil sands in Canada.

Reserves

The main driver for the XTO acquisition was reserves, particularly in natural gas. Increasingly, ExxonMobil has had difficulty replacing reserves along with most major oil companies. The worst years ever for reserve replacement were 2007, 2008 and 2009 (Figure 2). While 2008 additions were officially 103% of production, without the contribution of oil sands, which the SEC does not consider reserves, replacement was only 27% (LaVine, 2009). Two-thirds of 2009 reserve replacement came from LNG projects in Australia and Papua New Guinea that were discovered years ago, but completion of processing facilities allowed the additions last year. The truth is that unconventional gas is the only scalable resource that exists for E&P companies that need large annual reserve additions to support their stock price. New SEC definitions allow more latitude in booking reserves especially in the proved undeveloped category for natural gas.

Figure 2. Exxon Mobil proved reserves and replacement ratio (modified from Barclays Capital CEO Energy/Power Conference, 9 September 2009).

International Risks

Another important motive for the acquisition is the company's belief that overseas opportunities now carry too much political risk. These projects are too costly and competitive, and the prize no longer justifies the effort. The XTO purchase, therefore, represents another stage in the transformation from an integrated oil company to a capital and service provider. Integrated majors traditionally produced oil and added value by refining it into petroleum and chemical products. In recent years, they have focused increasingly on providing services like building plants and processing LNG for exporting nations, where they add value by providing capital and efficiency. ExxonMobil's entry into the North American unconventional gas sector moves the focus of the capital and service provider another important step away from the international arena.

Demand Growth and Gas Price

XTO has important acreage in all shale gas plays, but it would be incorrect to overstate its position as a shale gas producer. Eighty-three percent of its production is from tight gas, conventional gas and coal-bed methane reservoirs, with the remaining 17% from shale gas. It has positions in all major natural gas basins in the U.S. (Figure 3). The Powder River, Green River, Uinta-Piceance and San Juan basins contain no current shale plays. The Permian, Anadarko, Arkoma, East TX-Arkla, and Gulf Coast basins contain both shale and conventional plays. Only the Appalachian-Marcellus is exclusively a shale play basin.

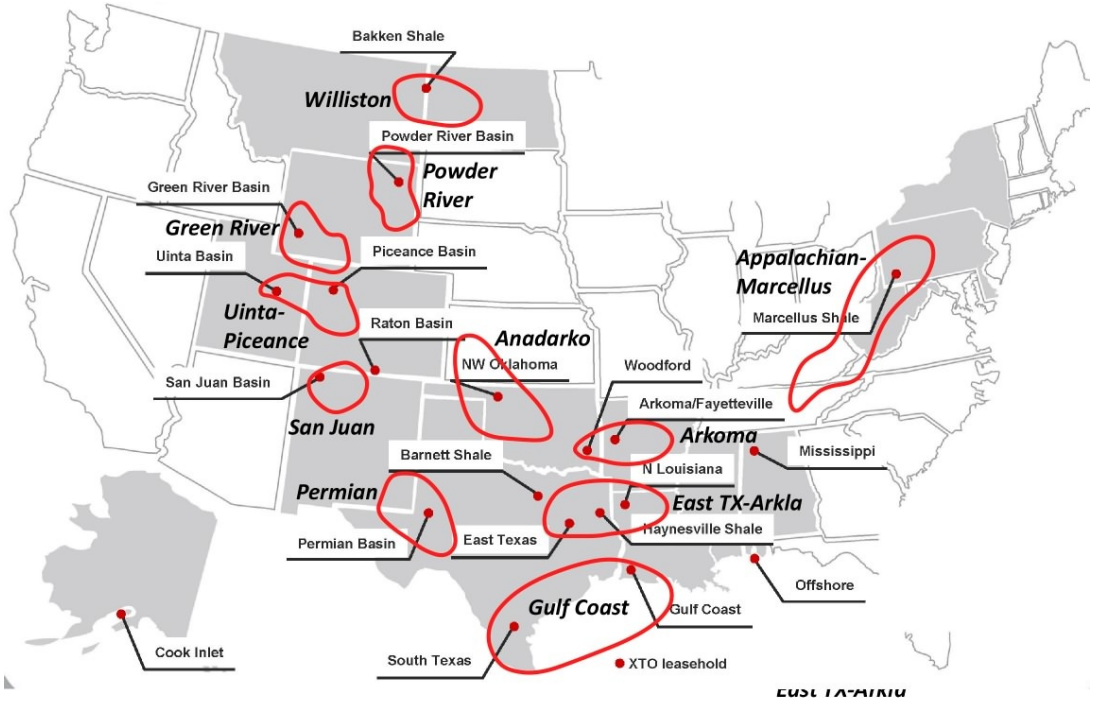

Figure 3. XTO positions in U.S. gas basins (Modified from XTO Investor Presentation January 2010).

ExxonMobil expects that natural gas demand will increase in the future, and much of the corresponding supply growth will come from unconventional gas (Figure 4). I assume that the company also believes that prices will be higher--perhaps much

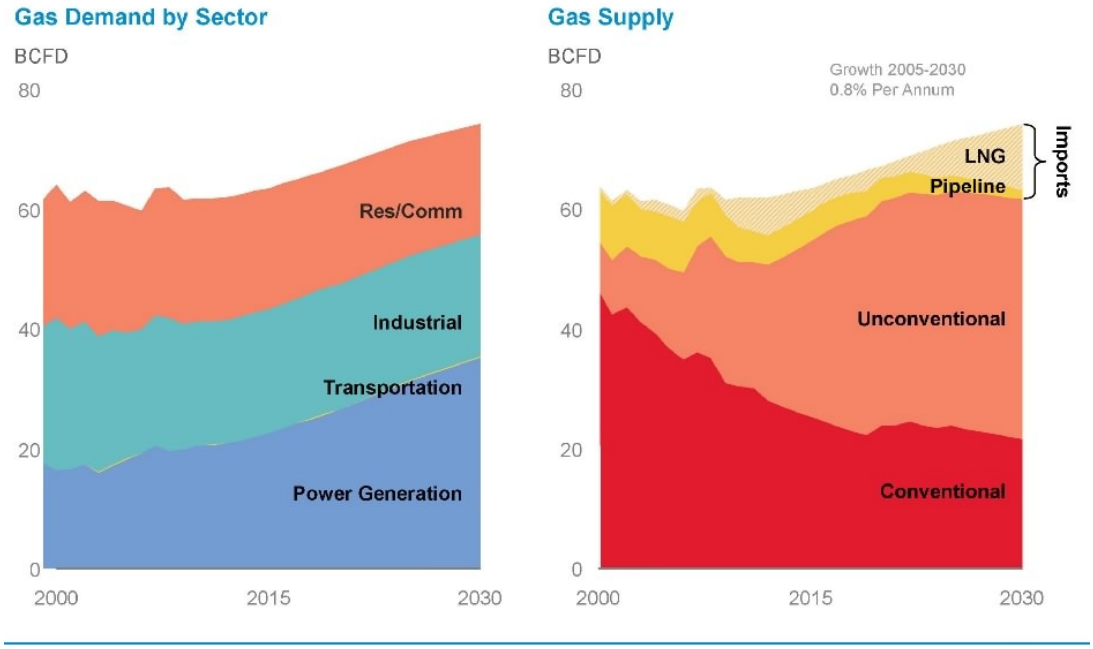

Figure 4. U.S. gas demand and supply (From ExxonMobil - Global Gas Perspective, Bank of America Conference, New York, November 18, 2009).

higher--in the future. This is because the current marginal cost of gas production is at least $8/Mcf, and prices will eventually rise to meet that cost (Figure 5). If shale gas reserves have been overstated, that unit cost will rise accordingly.

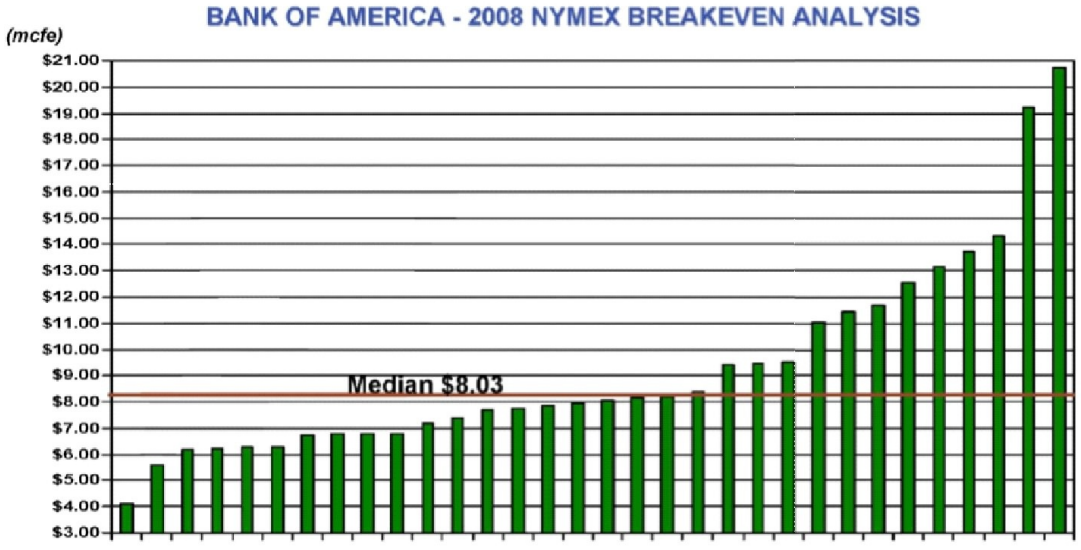

Figure 5. 2008 NYMEX breakeven costs for a consortium of U.S. gas producers. Modified from Range Resources IPAA 2009 Oil & Gas Investment Symposium Presentation, April 20, 2009 and from Bank of America. All-in costs defined as production cost, G&A, interest cost and reserve replacement cost. . Companies include (in alphabetical order): Atlas, Berry, Brigham, Chaparral, Chesapeake, Cimarex, Clayton Williams, Comstock, Delta, Denbury, El Paso,Encore, Energy XXI, Exco, Forest, Helix, Mariner, McMoRan, Newfield, Petrohawk, Petroquest, Pioneer, Plains, Quicksilver, Range Resources, SandRidge, Southwestern, Stone, Swift, Venoco, W&T, Whiting.

The price of oil, moreover, is likely to increase substantially as oil-exporting countries use more of their subsidized production at home to meet the needs of developing economies and growing populations. While oil and gas prices are not always linked, higher oil costs will drive North America to rely increasingly on indigenous natural gas supplies. This will probably mean higher prices as more costly unconventional resources are tapped to balance this market. Growing emphasis on clean energy sources will further reinforce these supply, demand and cost imperatives. Carbon tax schemes will also push the price higher.

Supply Reality

The widespread belief that there is 100 years of natural gas supply in the U.S. because of shale plays is incorrect. Claims that shale gas has resulted in 100 years of supply are based on circular references without underlying documentation, and also do not take high decline rates or anticipated future demand growth into account. The Potential Gas Committee (PGC) estimated 1,836 Tcf of technically recoverable gas resources for the U.S. in its report released in June 2009. Along with proved reserves of 238 Tcf, there are 2,074 Tcf or 85 years of total supply based on current demand of 25 Tcf per year (EIA). The contribution of shale gas is 661 Tcf, or about one-third of the total technically recoverable resource (Figure 6). The PGC estimate of probable resource volume is 441 Tcf, or about 18 years of supply. Shale gas accounts for one-third of that amount, or 147 Tcf, which is about 6 years of supply at current U.S. demand.

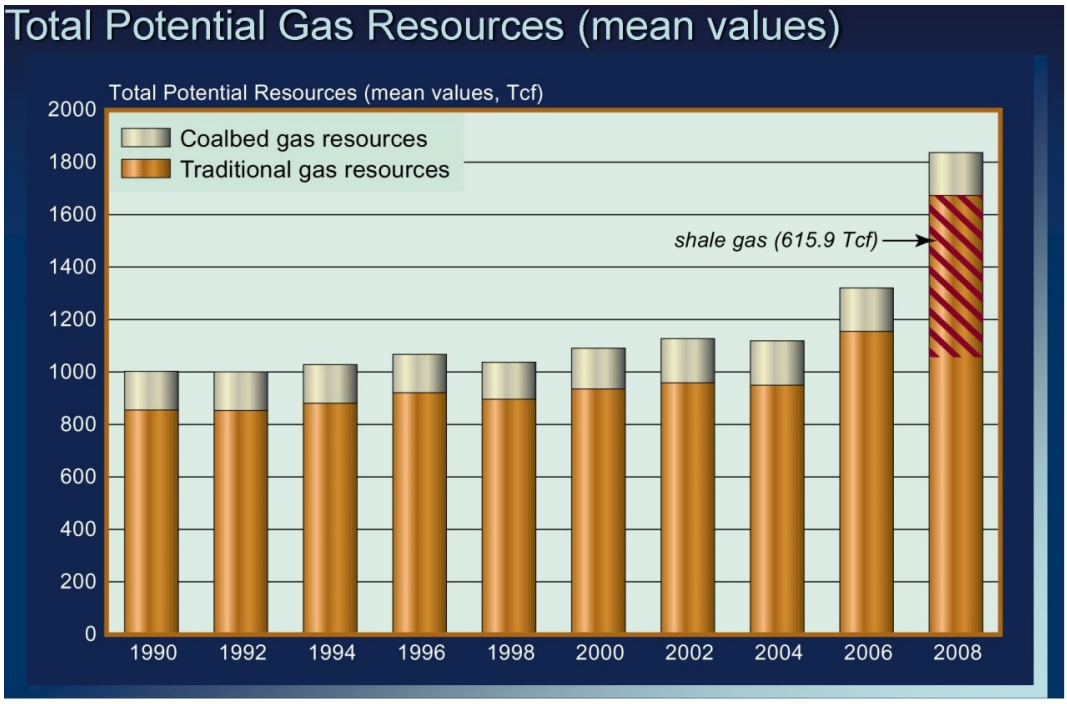

Figure 6. Shale gas total potential resource, from Potential Supply of Natural Gas in the United States,, June 18 2009.

Winner's Curse and a Return to Basics

ExxonMobil's approach to evaluating and entering unconventional gas plays was antithetic to the manufacturing model. I believe it was comprehensive and systematic, and involved evaluation of major risk elements of the total petroleum system for all North American basins. The Company revealed its North American emphasis in 2007 when Kurt Rudolph, Chief Geoscientist, gave a keynote address at the AAPG Annual Meeting in Long Beach, California.

Rudolph's talk, "Current Exploration Trends: Prudent Investments or Irrational Exuberance," described his company's world view that there were few attractive international opportunities that had not already been captured. State oil companies held all the cards, and were offering concessions that had been recycled over the past 25 years of exploration. Remaining prospects in the international arena were relatively small, because most available blocks were in their second or third phase of appraisal, and fiscal terms were unattractive. Rudolf called this the "winner's curse," because if you win a bid round in today's environment, you lose because the prize doesn't justify the cost (World Oil, April 2008).

ExxonMobil decided to focus its petroleum-system and basin-analysis evaluation methods and technologies in North American basins where risks and costs were lower, and where financial returns were more immediate. The result was a deliberate and comprehensive assessment and ranking of both conventional and unconventional natural gas opportunities. When XTO approached ExxonMobil about a merger (Form S-4 Exxon Mobil Corp, February 1, 2010), its existing production and exploration positions must been deemed a good fit based on ExxonMobil's study.

Multi Zone Fracture Stimulation Technology (MZST) and Piceance Basin Tight Gas

ExxonMobil has developed proprietary technologies that allow them to do 50 individual fracture stimulations in a vertical hole on one run called MZST. It has found other technologies to accelerate the drilling and zone perforating processes (Figure 7). The Piceance Basin in northwestern Colorado has been the laboratory for this technology where ExxonMobil has about 3,000 acres in the Piceance Creek-Love Ranch Field area. Gas production in the Piceance Basin is from low permeability Cretaceous sandstone reservoirs. If ExxonMobil can successfully drill and complete vertical shale wells with comparable or better results than with horizontal wells, this would indeed be a breakthrough.

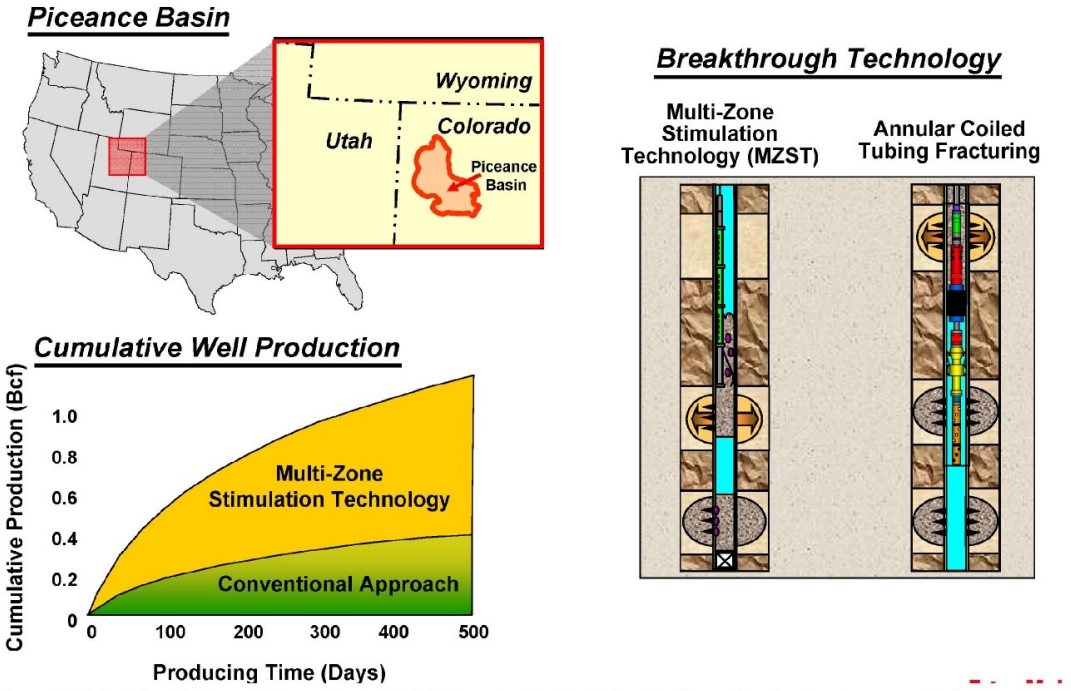

Figure 7.Unlocking tight gas. From Exxon Mobil Opportunity Portfolio, Goldman Sachs Conference, 16 January 2008)

The Fallacy of the Manufacturing Model

Operators represent shale plays as low-to no-risk ventures in which gas is ubiquitous, and success can be achieved and repeated through horizontal drilling and fracture stimulation. They have developed a manufacturing model for these plays in which the fundamental elements of petroleum geology--trap, reservoir, charge and seal--are not critical. This appealing model has not been supported by production results. ExxonMobil probably sees a competitive advantage in taking a different approach than competitors who embrace the manufacturing model.

The manufacturing model developed in the Barnett Shale play (Fort Worth basin, Texas), where

almost 14,000 wells have been drilled. The greatest number of commercially successful wells are located in two core areas or "sweet spots," and results are not uniform or repeatable even within these core areas (Figure 8). The Barnett Shale play is largely non-commercial because the controls on production are complex and difficult to predict.

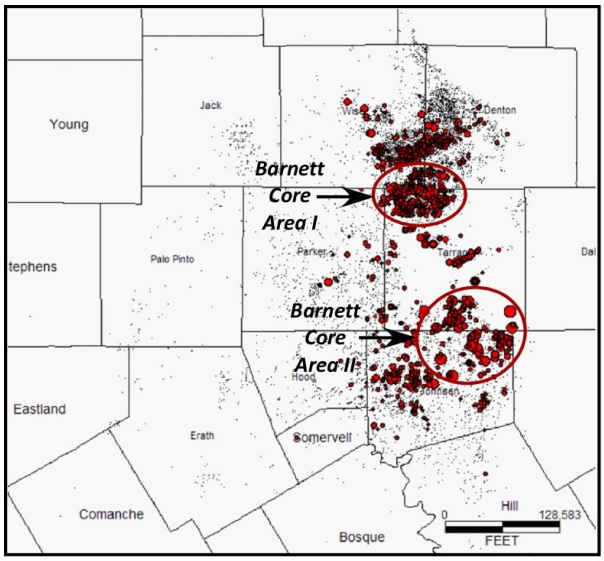

Figure 8. Barnett Shale horizontal wells. Red circles represent wells estimated to be commercial at $6.50/Mcf netback natural gas price. The Barnett core areas are shown. Data provided courtesy of IHS Inc. However, the analysis and opinions expressed here are solely those of the author and do not represent those of IHS or any other organization.

The absence of well-defined structural traps greatly increases risk. Core areas in the Fayetteville and Haynesville shale plays have strong structural control, and have been identified with far fewer wells than in the Barnett play (Figures 9 and 10).

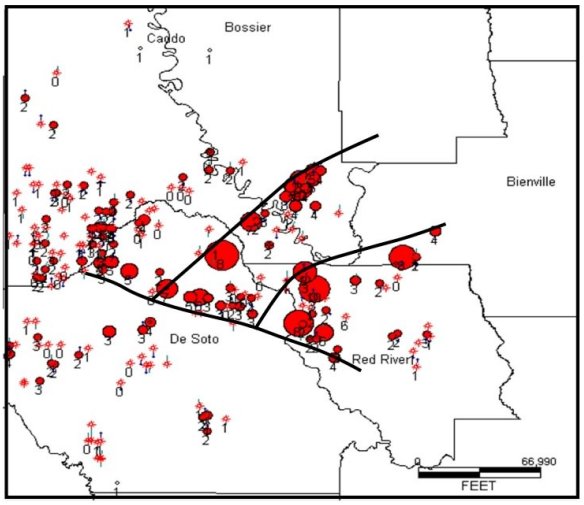

Figure 9. Bubble Map showing estimated ultimate recovery for all Haynesville Shale wells in Louisiana. showing possible structural interpretation for production trends (data from Louisiana Department of Natural Resources through October 2009).

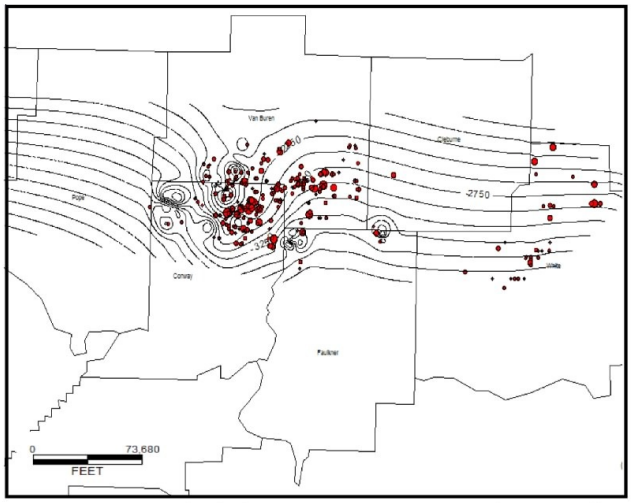

Figure 10. Fayetteville Shale Structure Contour Map with estimated ultimate recovery bubble map superimposed. Data provided courtesy of IHS Inc. However, the analysis and opinions expressed here are solely those of the author and do not represent those of IHS or any other organization.

The overriding problem with most U.S. shale plays is the lack of any elements of natural reservoir rock. Shale typically has no effective (connected) porosity, and have permeabilities that are hundreds to thousands of times less than the lowest permeability tight sandstone reservoirs. Unless siltstone or sandstone interbeds are present within the shale that have better matrix porosity and permeability, all reservoir is artificial--it must be created by engineering brute force.

Much progress has been made with completion methods, but unless stimulation produces an extensive, micro-fractured rock face, long-term production at commercial volumes is unlikely. Different fracture methods must be developed to achieve this result with greater certainty.

Conclusions and Implications

The mainstream belief that shale plays have ensured North America an abundant supply of inexpensive natural gas is not supported by facts or results to date. The supply is real but it will come at higher cost and greater risk than is commonly assumed. The arrival of ExxonMobil and other major oil companies on the shale gas scene is positive because they will not follow the manufacturing approach, and will do the necessary science that should make shale plays more commercial. This does not, however, ensure success.

ExxonMobil has come late to the domestic shale party. They may have overvalued XTO's existing wells without fully taking high production decline rates into account. It is also possible that XTO has already drilled the best areas in more mature shale plays, while the potential of newer plays has not yet been established. It is unclear how ExxonMobil's enormous overhead structure and its associated cost will fit with operating thousands of relatively low-rate gas wells.

ExxonMobil will undoubtedly learn a lot about unconventional plays and operations from XTO staff. It may be difficult, however, to absorb these employees into the company's culture and structure, and retain them, another indication that ExxonMobil may have paid too much. Despite the new technologies and expertise that they bring, ExxonMobil's unconventional project in Colorado has not achieved commercial success, and the company has abandoned its Hungary play after drilling a water-producing well (Oil and Gas International, February 19, 2010). Also, environmental opposition to shale drilling and hydraulic fracturing is gaining momentum especially in the Marcellus Shale play, and the entrance of ExxonMobil will provide activist groups with a large and familiar target.

Shale gas plays will, nonetheless, become a permanent and important part of the E&P landscape. ExxonMobil's acquisition of XTO Energy was based on a deliberate and conscientious evaluation of remaining resource potential in North American basins. Instead of viewing the XTO acquisition as a validation of shale plays, it should be seen as a repudiation of the wasteful manufacturing approach that has characterized these plays thus far.

I believe that ExxonMobil understands the technical risks and uncertainties in these plays, and has made realistic projections of reserves and costs. ExxonMobil's bet is that efficiency, science and technology will result in commercial success. They bring abundant capital and little debt to plays that have been dominated thus far by highly leveraged companies. Inherent in their assessment is the belief that demand will grow and gas prices will rise eventually to meet the marginal cost of production. It not clear that they fully appreciate the business risks that arise from competitors who will over-produce and keep prices low as long as an undisciplined capital market continues to provide them with money.

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