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Natural Gas and Complacency

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This past week Exxon Mobil announced the closure of their operating coal mine in Illinois, and their departure from the coal business. For those who worry most about greenhouse gas emissions this might seem to be a step forward, and, while I will likely write about that issue some other time, I would rather express a different concern today. Electric power is a fundamental part of our everyday life. Outside of the impact of the occasional storm, we expect that when we flip a light switch, the light will go on. Yet few give much thought to the power station that is generating that power. In recent years the new power stations that have been built have largely got their power from natural gas. But if the world oil is within that zone that we will, in future years, refer to as the peak plateau, the state of US Natural Gas is in a much more perilous position.

One of the most productive recent developments for the production of natural gas (NG) has been the Barnett Shale, and it has been followed by the development of the Fayetteville Shale in Arkansas. If one reads the prospectus of a company working in the Barnett Shale, for example Truestar Petroleum they will tell you that

> The Barnett Shale is estimated to have a trillion cubic feet of natural gas every 7 square miles. The average gas in place in the Barnett Shale is 160 billion cubic feet of gas per square mile. The expanded play now has well over 2,000 successful commercial wells with very few disappointments and marginal wells, attributable to the low-risk, blanket nature of the productive formation. Driven by technological advances in fracturing techniques and horizontal drilling, natural gas production from the Barnett Shale has now reached levels exceeding 900m cubic feet per day.

And, more germane to the topic today

> The wells initially produce for about 1m cubic feet of gas per day but experience a 50% decline in the first year. Then the wells stabilize and produce for an average 20 years, with expected life in excess of 30 years. Re-fracing a well after 5 years or so of production can add another three quarters of a billion cubic feet of gas to a well's overall production. . . In general, horizontal drilling has resulted in significant and material improvements in initial production rates over vertical wells (300-400%) with only a 40-50% increase in drilling costs. . . Ultimate expected recoveries have improved due to the flattening of the vertical well hyperbolic decline curve, to a much flatter exponential decline curve. Ultimate expected recoveries are anticipated to be in the range of 3-5 Bcf per well over the 30-40 year anticipated productive life, which should include initial

> fracture stimulation and at least one re-frac.

Now you read that, you look at the number of wells that are producing and the thought does arise, that maybe we are being a bit pessimistic since, with all those wells producing at that rate over that amount of time, maybe the problem isn't going to be upon us that quickly.

But then I remembered that article that I had read in World Oil about the economics of the wells being drilled in the Fayetteville Shale. The article is a useful one to source, since Arthur Berman has included estimated drilling costs for both vertical wells (at $650k) and horizontal wells (at $2.6 million) (an interesting ratio given the Truestar numbers), as well as anticipated production numbers, before concluding that

> Based on data from 187 Fayetteville wells provided by IHS and the Arkansas Oil and Gas Commission, I find little economic justification for the play at present. None of the vertical wells that I analyzed will recover drilling and operational costs. Only 3 of the 136 horizontal wells will be economic in the most-likely case, and only 13 in the optimistic case. Further, I cannot substantiate per-well reserves that approach the levels claimed by operators.

. Now in his subsequent column in the October edition of the magazine, he corrected some of the initial article, having been given access to proprietary information on well production. As a result he concluded that slick-water fracture stimulation can make a well profitable, some of his estimated charges were high, and the hyperbolic decline model does predict somewhat higher production and well life than he had originally assumed.

However, he then went on to discuss the difference between hyperbolic and exponential decline models, and ended with the following:

> There were a few readers who objected to using a four-year average well life in the economic model that I presented. One reader even suggested that I should have used 30-year well lives for the Fayetteville Shale. The longest production history in the Fayetteville play is 25 months and the average well has been producing for under seven months. I, therefore, investigated longer well histories from the Barnett Shale where 320 horizontal wells have been producing gas for at least two years (the longest production history is 68 months). The three longest-lived of these are currently producing at rates that are below lease operating costs.

Erk! And now Arthur Berman has revisited the Barnett Shale, in his most recent article concluding, after looking at close to 2,000 wells, that

> approximately 28% of Barnett Shale wells should realize revenues that meet or exceed drilling, completion and operating costs in the most likely case based on assumptions incorporated into a 10% net present value (NPV 10) economic model.

Again, the article contains a fair amount of underlying data that provides useful information, including an estimate of $3 million for the drilling and completion costs of the wells. Currently he does not see the economics of the operation changing, nor does he anticipate any short-term changes in the market that will lead to an increase in gas prices.

Yet I go back to his earlier article and the line “the three longest-lived of these are currently producing at rates that are below lease operating costs.” Those wells are around 5 years old. If, in fact their effective operational life is around 4 years or so, and they are typical of the wells in the field, then the longer term future of production has got to provide more concern that folks are currently exhibiting. That appears to be that we have no immediate problem and so . . . . .

Beginning to sound a bit familiar isn’t it. The current complacency over the longer term natural gas supply extends to the lack of viable replacement sources, and to what will need to be done to supply us, in the short-term, with the power that puts the light on, when I flip that switch. The other problem, of course, is that you don’t change power station fuel sources at the drop of a hat, and if, concurrently, we are hesitating to build the stations that we anticipate will be needed to match future growth, then the supply issue on the other side of that switch may give us concern sooner than we think.