U.S. Shale Oil

U.S. Shale Oil: Expectation & Experience

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Shale Magical Thinking

"I know not any thing more pleasant, or more instructive, than to compare experience with expectation, or to register from time to time the difference between idea and reality. It is by this kind of observation that we grow daily less liable to be disappointed."
--Samuel Johnson: Letter to Bennet Langton

What few people realize:

• While oil production has increased somewhat, the U.S. is not going to become energy independent.
• Resources are not reserves, and reserves are not supply.
• Oil production from the Eagle Ford and Bakken shales will probably increase U.S. supply by 1-1.5 million barrels per day by 2020.
The Good News Propaganda Campaign

Move Over, OPEC—Here We Come

In energy, North America is becoming the new Middle East. The only thing that can stop it is domestic politics.

Americans Gaining Energy Independence With U.S. as Top Producer

The Oil Scarcity Myth

The U.S. oil “reserves” President Obama talks about are just the very tip of the oil pyramid

22 billion barrels “proved” reserves

2,303 billion barrels “undiscovered resources”

800 billion barrels oil shale

400 billion barrels “technically recoverable” crude oil

U.S. Awash In Oil Investors Business Daily 14 March 2012

“the country is awash in vast quantities — enough to meet all the country's oil needs for hundreds of years.”—Investors Business Daily

Raymond James Industry Brief 13 Feb 2012

“We’re now forecasting that U.S. oil production (excluding NGLs) will grow from 5.6 MMBpd in 2010 to a whopping 9.1 MMBpd in 2015. Including natural gas liquids, total U.S. petroleum liquid production grows 60% from 7.7 MMBpd in 2010 to 12.2 MMBpd in 2015.”—Raymond James
• Crude oil production in the U.S. peaked in 1970 at 10.04 MMbo/day.
• Current consumption is 14.6 Mmbo/d and production is 5.7 Mmbo/d.
• The difference is 8.9 Mmbo/d and must be imported.
• Shale oil has added 690,000 bo/d since 2008.
• Shale oil contribution is 4.7% of total consumption.
• Shale oil will not make the U.S. energy independent.
• It is unlikely that shale oil will add more than 1.5 Mmbo/d (9.4%).
Resources ≠ Reserves ≠ Supply

- Reserves are a very small sub-set of resources.
- Reserves take years of development drilling to become supply.
- Proved undeveloped reserves may never be developed.

Modified from Medlock (2010)
• 247 rigs drilling in the Eagle Ford play and more than 1,400 producing wells.
Eagle Ford Shale Production

- Since the play began in 2008, oil production has increased to 225,000 barrels of oil per day and 1.1 bcfg/d.
- Average well is 129 barrels of oil per day. Well cost is $10 million.
• 100% annual decline rate.
• Oil is a larger molecule than gas so is harder to move through the reservoir.
• The gas-oil ratio varies across the play geographically.
• The lower the gas-oil ratio (more oil), the higher the decline rate.
Bakken Shale Location Map

- 219 rigs drilling in the Bakken play and more than 3,400 producing wells.
• Oil production has increased to 422,000 barrels per day.
• Average well is 122 barrels of oil per day. Well cost is $11.5 million.
Bakken Shale Static Decline Profile

- 60% annual decline rate.
- The play has existed for 50 years but comes and goes according to oil price.
**Bakken Shale Elm Coolee Field**

- The field is in Montana.
- Discovered in 2000.
- The play is a dolomite within a tight carbonate shale.
Elm Coolee Field Production

- The field began to decline after 5 years from first oil production.
- Drilling more wells has stabilized the decline rate for now.
The field is in North Dakota.
It is the newest “hot” play in the Bakken Shale.
Sanish-Parshall Field Production

- The field is in North Dakota.
- It was discovered in 2006 and began to decline 3 years after first oil production.
- Drilling more wells has not arrested the decline.
• The decline rate is 80% annually.
Shale Oil Observations

- Shale oil obeys the laws of physics:
  - Plays are not fields,
  - Commercial oil is found in fields,
  - Plays will contract to fields that will represent 15% of the play area along with corresponding reserves.
- Oil decline rates are higher than gas decline rates.
- Fields will reach peak production in 3-5 years and then decline.
- Newer discoveries decline faster than previous discoveries because of better completion technology.
- Shale oil plays are really exploitation projects and will fall short of expectations.
- The oil plays require very high oil prices to be commercial.
- The total contribution of shale oil to U.S. supply is presently 690,000 bo/d and will probably not add more than twice that amount (9.4% of consumption).
- The good news propaganda must be calibrated to reality.
- Dr. Johnson was correct: experience is more useful than expectation.
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