The Unconventional Black Swan:  
An Opportunity to Measure the Economic Impact of Petroleum Geology*

Edward A. (Ted) Beaumont¹

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¹AAPG President, 2012-2013, Independent geologist, Tulsa, OK (beaumont@aapg.org)

Abstract

Today, we are actually producing more gas in the United States than we ever have. Just five years ago or so, few of us thought this was possible. Natural gas is a finite resource, and at some point natural gas production will decline. Now we know it has not already happened; it will happen sometime in the future.

In 2007, Nassim Taleb published The Black Swan: The Impact of the Highly Improbable”. He coined the term “Black Swan Event” for surprising, high-impact, hard-to-predict events. The Black Swan is a statement of impossibility from the 16th century. Black Swans were believed not to exist until 1697 when one was found in Australia.

Taleb says that Black Swan events have three features,

1) they are outliers – they lie outside the realm of normal expectations
2) they carry extreme impact.
3) they have retrospective predictability – they appear explainable and predictable after the fact.

Examples of Black Swan events are September 11, 2001, when the World Trade Center in New York was destroyed or the advent of the internet. Both were surprising, high-impact, and hard-to-predict events.

By definition, the unconventional resource play is a Black Swan event. First, it is surprising. Who saw the effect it had on U.S. oil and gas production coming? Most of us agreed with Matt Simmons when he said that M King Hubbert’s prediction that U.S. oil and gas production would peak about 1970 had come true and that decreasing U.S. oil and gas production was something we would have to live with. Hubbert’s predictions made sense and appeared to be very close to reality.
Second, the unconventional resource play has seen a high impact. The U.S. is producing more gas than ever and the price dropped from more than $10 per MCF to less than $2 per MCF. Just a few years ago, the United States imported 65% of the oil it consumed. Mainly, as a result of the Bakken and Eagle Ford oil resource plays, today the United States imports 45%, and some predict that it will fall to 25% by 2020. Think of what a huge economic impact that is.

Finally, in retrospect, it looks like we should have predicted the significance of resource plays. Hydraulic fracturing technology was improving dramatically with new fluids like “slick-water” and better propants. Horizontal drilling became main stream.

Why do we miss Black Swan events like resource plays? Taleb says that Black Swan logic makes “what you don’t know far more relevant than what you know”. He says that we have an excessive focus on what we know and that focusing on what we know obscures the importance of the unknown. In his often quoted 1952 paper, “Toward a Philosophy of Oil-Finding,” AAPG Past-President Wallace Pratt stated that the biggest barrier to oil-finding was not technological. He said that the biggest barrier to oil-finding is “the tendency of the human mind to discount or to ignore the significance of what remains unknown to it.” “For him, the disparity between the known and the unknown is unusually large. For him, the need to be always alert to the potentialities of what he does not know is paramount. He must maintain a constant awareness that he does not know everything that may enter into his problem. To assume that our knowledge of an area is complete when it is not, may be to conclude that there is no oil where there is oil.”

In North America, the resource play has caused a seismic shift in exploration objectives. No longer are companies exploring for ‘conventional’ targets; instead they are focused almost entirely on unconventional resource plays. As a result, most North American exploration geologists are prospecting for potential new resource plays exclusively. Outside of North America, industry is just beginning to explore for unconventional plays.

The unconventional play raises a lot questions. For example, will there be a market for conventional plays in the future? When will oil and gas from unconventional resource plays reach its peak? Will resource plays be economical outside North America?

Selected References


Selected Websites


The Unconventional Black Swan:
An Opportunity to Measure the Economic Impact of Petroleum Geology
“Crazy” Edwin Drake

Titusville, PA, 1859
Range Resources Sign at Pittsburgh Airport

Economy...prepare for take off.
Bill Zagorski and the Marcellus
The Coming Oil Crisis?

“..the peak of production will soon be passed – possibly within three years.”
– David White, Chief Geologist, USGS, 1919

From Ahlbrandt 2012
M. King Hubbert’s Peak Oil Forecast or “Hubberts Curve”

1956 Prediction


Era of energy crisis

Hubbert (1903-1989)

en.wikipedia.org/wiki/Image:Hubbert.jpg

From Ahlbrandt 2012
U.S. Gas Production at Record Highs

2012
24 TCF/yr
(55 year supply)
Hubbert’s Predicted U.S. Oil Production Peak Versus Actuals

Estimated 2013 Production, EIA
44 year `supply

After Ahlbrandt 2012
Black Swan Events

• Definition
  • Surprising
  • High-impact
  • Psychological biases
  • Retrospective predictability
The Unconventional Resource Play: A Black Swan

- Surprising
- High-impact
- Psychological biases
- Retrospective predictability
Oil is first found … in the mind.
Pratt’s Blinders to Oil-Finding

- Conservatism of trained scientific mind
- Ignore significance of what remains unknown

“however small our knowledge may be, tends often, not only to color, but actually to obscure what remains unknown to us”
“Part of the definition of a new idea is that it will be rejected at first. Evolution teaches us that most new ideas don’t work, so we learn to be against them. Big ideas do not come from groups or committees. Throughout history they have come from individuals and ‘normal’ people almost never recognize the importance of the idea until much later on.”

- Oil and Gas Investor, July 1, 2008
Pratt’s Black Swan - Saudi Arabia

• “No Oil in Arabia”
• World’s largest oil reserves
• Oil and gas seeps known for hundreds of years

Max Steineke – Creator of Ghawar Prospect
Natural Gas Imports & Exports, 2004 (BCF)
Measuring the Impact of Tight Oil

- 65% imported oil 5 years ago
- 45% imported oil today
- 20% less imported oil = $125 Billion/Year
- 25% imported oil by 2020 ? 0% ?
Measuring the Impact of Shale Gas

- 1.7 to 2.8 million new jobs
- $380 billion/year to US economy
- Industries returning to US

Source: IHS and ExxonMobil

Dan Steward creator of the Barnett Shale gas play
Shale Gas Politics

What shale we do?

- Shale-gas basins
- Extraction: 2012
- Banned/moratorium
- Allowed
- Allowed & permits issued

*Restrictive laws
1Bids for permits invited

Sources: International Energy Agency; KPMG; press reports

www.economist.com
• "We usually find oil in new places with old ideas. Sometimes, also, we find oil in an old place with a new idea, but we seldom find much oil in an old place with an old idea. Several times in the past we have thought we were running out of oil whereas actually we were only running out of ideas."

• Parke A. Dickey, 1958
Plaque Commemorating Founding of AAPG in 1917