Lesson 1 - Focus of the Petroleum Industry

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Frequently Asked Questions (and their Answers) from the Webinar

Webinar Presented on June 6, 2017

1. **Is the current downturn in oil and gas an anomaly, or something that happens often?**

   The current downturn is part of the cyclic nature of the energy sector, although this downturn is by far the worst in my 40-year career. The business climate is controlled primarily by the price of a barrel of oil, which is largely based on supply and demand.

   While there are short period, yearly fluctuations, based on the demand for heating fuel in winter seasons (more demand and higher prices in very cold years) and gasoline in the summer (people taking long driving trips for vacations/holidays), there are also longer period changes that occur on an ~7-year cycle. We are in one of these longer-term cycles.

   The success of unconventional oil and gas (e.g., hydraulic fracturing) has resulted in a bit of an oversupply. Oil producing countries (e.g., OPEC member nations) have not cut back their production enough to balance supply and demand. This has caused oil prices to drop 50% over the past 2 years.

   Getting less per barrel has caused big losses for oil and gas companies. Dividends are down and investors are worried. To minimize losses, companies want to cut expenses. They are not going to put on hold or even slow down major projects, such as constructing a $1+ billion offshore platform. A “quick fix” is to reduce staff and stop hiring. Most companies have cut staff too much; those still working have trouble keeping pace.

   Thus, until oil prices rise to about $60/barrel and are stable at that level, finding a geoscience job within the energy sector will remain a major challenge. Once we have solid evidence for a recovery, companies will begin to staff up again. People of my generation will probably not return to full-time employment. Other former staff will have found other careers and may decide to stay out of oil & gas. This creates a great opportunity for geoscience professionals who graduated in the last few years or will be graduating in the next couple of years.

2. **What strategy/strategies do you suggest for someone unable to find a starting career position in the energy industry while this downturn continues?**

   I understand how frustrating it is to work so hard on a geoscience degree and then have difficulty in getting a career position. There are a few jobs for recent

grads or soon-to-be grads, but competition is fierce. I see evidence that the number of jobs is on the rise. (See my reply to question 1 above).

Thus, what to do until more positions open up? You might look for a geoscience job outside the energy sector, in environmental, water, or academic positions, to name a few. You might work towards a higher degree or as a post-doc. Perhaps you could get a position within your geoscience department. Of course, others are trying to do the same thing so there is a lot of competition here too.

Perhaps you should step back a little and consider yourself as a proven science and math expert. What skills can you market to other industries? Where do people do data collection and analysis? How might you use your computer and other skills to land a job?

3. **What type of geoscience professionals are in high demand for the industry?**

   My opinion is that a student should focus on something they have a passion for. Recruiters look for great scientists. As long as you have a strong basis in geoscience with some depth in your area of specialization, you should be fine when hiring returns to normal. Listen to a longer response in the Q&A of the Webinar 1 – Focus of the Petroleum Industry.

4. **With oil production cost almost equaling the market price, what major steps are Exploration and Production (E&P) industries taking to address this?**

   E&P companies are doing what they can to lower costs as much as possible. They are trying to be more efficient so the costs per barrel are as low as possible. They are using fewer people, new procedures, negotiating better deals with those they contract to provide services. Two years ago people would have said they could not operate if oil was around $50/barrel. Now many companies are surviving with oil this low.

   A lot of activities for achieving mid- to long-term goals have been drastically cut or eliminated. This could cause problems five (5) to ten (10) years out. Most companies want to replace their annual production with newly booked reserves. This is not happening in the current market situation.

   If you look at where most layoffs and budget cuts are happening, it is in the exploration departments.

5. **Do you recommend pursuing a PhD after completing an MSc, or should a person start working?**

   Most geoscience professionals in the energy industry have a Masters degree – perhaps 65%. PhDs might be around 20%, with 15% holding a BS or BA as their

highest degree. A person with a Masters can start in about any job, except in a research company for one of the mega-companies. I've heard that some PhD candidates have trouble getting interviews with mid- to small-size companies because they are "over qualified." Since jobs are sparse, however, one tactic is to stay in school beyond a Masters. I cannot definitively say if this is a good plan or not.

6. **Do you recommend young geoscientists to train to be a specialist in an area or have a variety of skill sets across different geoscience disciplines?**

   Companies tend to look for people who demonstrate a breath of understanding with some depth in one or two specialized areas. My impression is that many students are highly specialized in a very specific instrument or analytic method, but lack a good breath of knowledge in other areas of geoscience. I see this as limiting a person's ability to meet the qualifications of jobs, unless the company needs a person for that specialized "niche."

7. **How do petrophysicists come into play in the oil industry?**

   Seismic data is of primary importance to hydrocarbon exploration, development and production. These data give us information on subsurface acoustic properties (mainly density and velocity). We want to know rock and fluid properties. Petrophysics is the link. A petrophysicist uses various equations and procedures to turn acoustic properties into predictions of rock and fluid properties in intervals of interest.

8. **I am interested in seismic inversion, what would you suggest for me to read? I have some experience in this topic.**

   Lesson 29 is on seismic inversion. Offhand, I do not have a list of suggested reading. Your advisor and/or an internet search should give you a list of possibilities. Christopher Liner's book "Elements of 3D Seismology" has some sections on inversion, which is another good starting point. (This book is fairly mathematical.)

9. **Is the lack of available mentors due to the present oil industry situation or something else?**

   There are never enough good mentors. Those able to mentor have a lot of experience, and so are in high demand for normal business operations. Good mentoring takes a chunk of time. Often the mentor is expected to maintain his/her regular work output while also serving as a mentor, so it takes a person willing to invest time in a young professional that gives "extra" time with little reward.

   A downturn hits experienced staff hard. Some are forced into early retirement. Their salaries are above average and they have few years for future service to

the company than someone in their 40s or early 50s. So the "pool" of willing mentors goes down as oil prices fall.

10. **Will you be talking about prospect risking?**

    Yes. There is a little about prospect risking in Lecture 2, Exercise 2 and Exercise 3. Lesson 14 and its exercise are on prospect risking.

11. **What is the role of the structural geology in the discovery of the petroleum fields?**

    Structural geology is very important in the O&G industry. In exploration, one of the five (5) main play elements is a trap (see Lesson 2). The vast majority of traps are either purely structural or are a combination with structural and stratigraphic components. Structural geologists also work on the effectiveness of seals above and around traps, e.g., which faults seal versus leak on a geologic and production time scale and what controls the downdip limit on how filled a particular trap is. See Lessons 9, 10, 11 and 24.

12. **What role do you think coal will play in the future? Is the demand for this resource mostly coming from developing countries? As I believe more developed countries are looking to move away from coal due to its higher environmental impact and emissions?**

    If you are interested in future energy supply and demand, BP has their energy outlook on the web, which they update annually. The web address is: http://www.bp.com/content/dam/bp/en/corporate/pdf/energy-outlook-2017/bp-energy-outlook-2017.pdf

    They have coal dropping from its current level of filling around 30% of the energy demand to about 22% of the energy demand in 2035. I believe that developed countries will move away from coal more and faster than developing nations.

13. **Which costs more to explore for and produce – offshore conventional oil or onshore unconventional oil?**

    My impression is that costs for conventional offshore fields (E&P) are more, but the recoverable volumes are also much higher. E&P operations on land are cheaper than deep water. What you have to look at is not just costs, but profits. It does take a lot of money to extract a reasonable amount of oil from unconventional fields (mostly drilling and stimulation). However, for a deepwater field, the significantly larger volumes of recoverable oil offset the higher overall costs. Profit margins for unconventional fields are low when oil is selling around $50/barrel. Expenses are high for a deepwater field, but the recoverable reserves can be up to a billion barrels. Senior management is always looking at

rates of return on investment (as are stock analysts). This drives the distribution of a company's working capital on where they are active.