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The Future of Arctic Oil and Gas Development: U.S. Perspective

Commentary by Lucian Pugliaresi

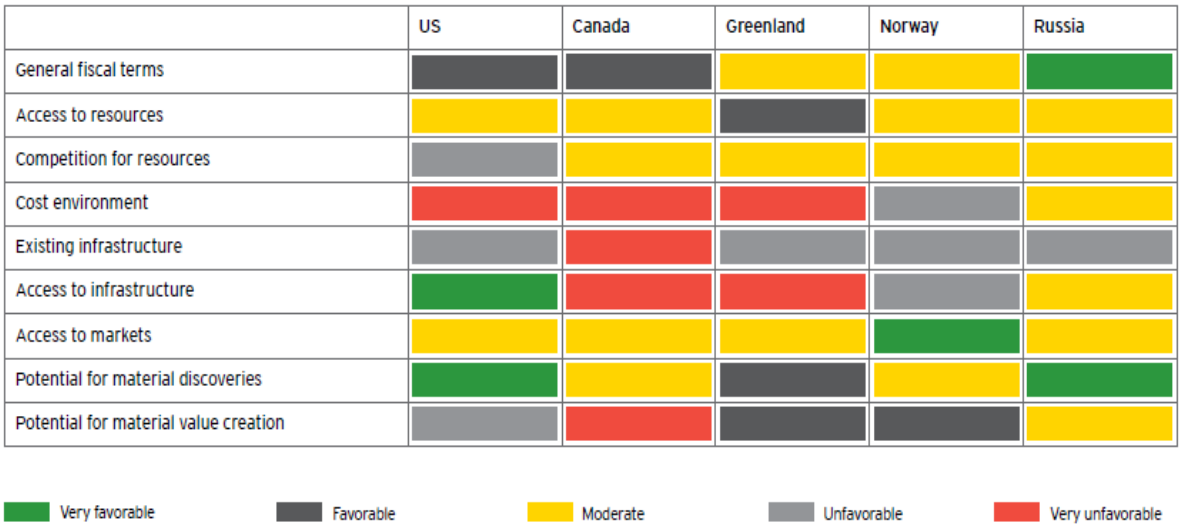
COST COMPRESSION AND UNCONVENTIONAL PETROLEUM PRODUCTION: IMPLICATIONS FOR OIL AND GAS PRODUCTION IN THE ARCTIC

INTRODUCTION

Oil and gas development is often constrained by so-called "above the ground problems." These obstacles can include political turmoil, government corruption and mismanagement, unpredictable political and legal risks, lack of contract sanctity (or even stability), uncertain tax regimes, poorly defined property rights, regulatory mismanagement, environmental activism, and extreme and harsh operating conditions. Nevertheless, large volumes of oil and gas have been produced even in environments where these risks are substantial. Many international oil companies (IOCs) have long experience in managing a wide range of above the ground concerns, achieving profitable oil and gas production in such diverse political environments such as Libya, Iraq, Nigeria, and Russia.

Even when political and regulatory environments are stable, the harsh environment, limited infrastructure, extended development time and long distances required to bring production to markets common in the Arctic require a willingness to undertake substantial financial and technical risk. Arctic oil and gas projects are characterized by large capital commitments, complex and long-term project management, advanced engineering, and a requirement for high-volume reserves and production to justify capital outlays. In general, Arctic

projects are costly and lumpy, i.e., they tie up large amounts of capital for a long period of time before initial production. A recent report by Ernst & Young ranked the range of technical and financial conditions for oil and gas development among the countries with Arctic resources.[1] These are shown in Chart 1 below.



Source: Ernst & Young

Figure 1. Challenges to Arctic development by country

The Ernst & Young assessment confirms conventional wisdom — it is expensive and risky to develop Arctic resources. If the price environment is favorable and advances in technology can reduce development costs, these risks can be managed. However, two forces are now in play that are likely to delay many higher-cost and risky Arctic projects. The first is an economic environment that is constraining sustained growth in the price of oil, especially at levels above $100/bbl. At prices above $100/bbl, there is growing evidence that advanced economies are adjusting to these price levels through lower economic growth. Economic adjustments to rising natural gas prices can also constrain price increases, but demand adjustments for natural gas are more likely to involve lower-cost fuel substitutes (e.g., coal) than lower economic growth.

The second constraint to widespread development of Arctic resources is competition from lower-cost resources made available through advances in the production of oil and gas from so-called unconventional resources, now largely focused on expansion of new supplies from the

[1] "Ernst & Young Provides Arctic Assessment," *Oil & Gas Journal*. N.p., n.d. Web. Aug 11, 2013.

United States and Canada, but offering the potential for growth in other major world petroleum provinces. The U.S. in particular has shown remarkable growth in oil and gas production from so-called tight formations, particularly shale deposits in Texas and North Dakota. Recent proposed reforms for the petroleum sector in Mexico may further expand North American petroleum output.

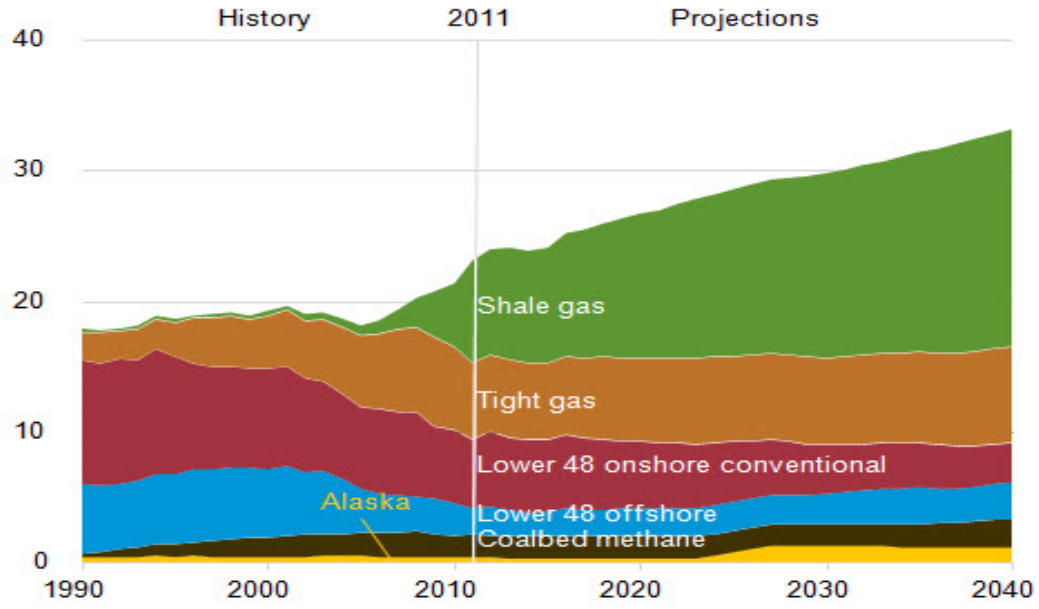
Although it is too early to know whether the rapid expansion of oil and gas production in the U.S. can be replicated in other petroleum provinces, a recent assessment by the Energy Information Administration (EIA) and the private research group Advanced Research International (ARI) of world shale deposits lifts technically recoverable world reserves by 11% for liquids and 47% for natural gas compared with estimates made as recently as 2011.[2] An often overlooked feature of shale resource development is that financial and project risks are low. Although per barrel production costs for shale production can be relatively high by world standards, for the most part shale development in the U.S. does not require massive capital outlays for long periods of time before initial production.

UNCONVENTIONALS: SHALE AND OIL SANDS

Since 2007 the U.S. has experienced large increases in both natural gas and crude oil production, raising domestic production to levels not seen since 1990. The U.S. resurgence as a major petroleum producer began with the rapid and sustained development of natural gas from shale formations in Texas and Pennsylvania. This expansion of domestic natural gas output has produced a paradigm shift in the outlook for U.S. natural gas supplies. In 2008, conventional wisdom operated under expectations that the U.S. was to become a major importer of LNG; a large number of costly LNG import terminals were constructed, and European and Middle East suppliers were looking to the U.S. as a major outlet for LNG shipments. The rapid expansion of U.S. production, combined with new discoveries of natural gas supplies worldwide, has limited the pricing power of major exporters such as Australia, Qatar, and Russia.

According to the U.S. Energy Information Administration, natural gas production is likely to see sustained production increases (Figure 2) over the next 20 years even in a period where natural gas prices remain well below $6-7/mcf. The reason for such an optimistic

[2] Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States, Energy Information Agency. June 13, 2013. http://www.eia.gov/analysis/studies/worldshalegas/



Source: EIA

Figure 2. U.S. natural gas output likely to continue growth (trillions of cubic feet/year)

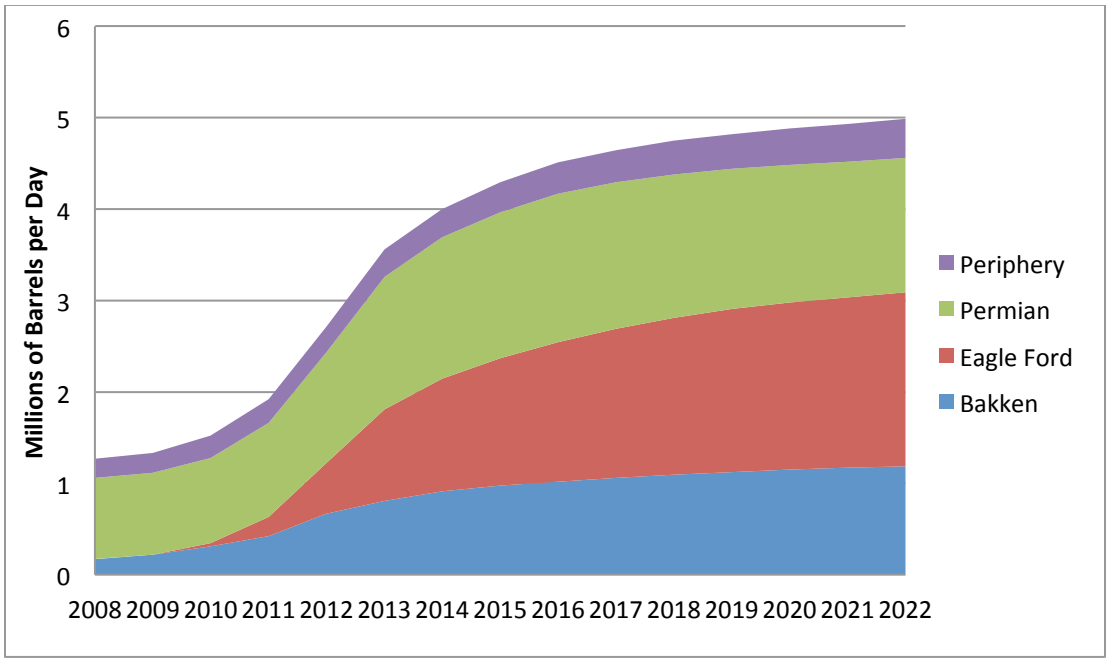
production outlook is the continued domestic growth in natural gas output from growing volumes of associated gas from shale oil development. The high value of oil production is promoting low-cost natural gas production.

Technologies and production techniques (both art and science) contributing to rising natural gas production from tight formations are also available to oil-prone domestic shale plays. For shale oil development, North Dakota and Texas have been the largest success stories in the U.S. North Dakota's Bakken shale is responsible for a crude production increase of 600,000 barrels/day (b/d) in just five years, from average production of 172,000 b/d in 2008 to 773,000 b/d in 2013. Texas alone is accountable for nearly a third of U.S. production, standing at 2.4 million barrels/day (mbd) for 2013. The relatively recent development of the Eagle Ford play has added over 1 mbd to Texas' production since 2008. The application of innovative technologies

and relatively favorable "above the ground" conditions has brought about a surge in oil and gas production in North America.

These growth trends are likely sustainable for some time to come. While initial achievements in lateral drilling and multistage fracking tapped the reservoirs, continual advances in technology have been and will continue to play an integral role in unlocking more barrels out of this tight source rock. To date only a small fraction of the reserves are being extracted from within these reservoirs. Through technological advances, producers are realizing that there is far less drainage of the reservoir than originally expected. As a result, companies have begun to downsize their acreage spacing between wells and place more horizontal wells both next to each other and on top of one another in stacked formations.

To help explain this production growth and its potential, EPRINC has developed a forecast model (Figure 3) for the three major shale plays in the U.S.: the Bakken, the Permian Basin, and the Eagle Ford.[3] A "periphery" play category has also been added to designate other plays contributing to U.S. production, such as the Niobrara in Colorado and the many stacked



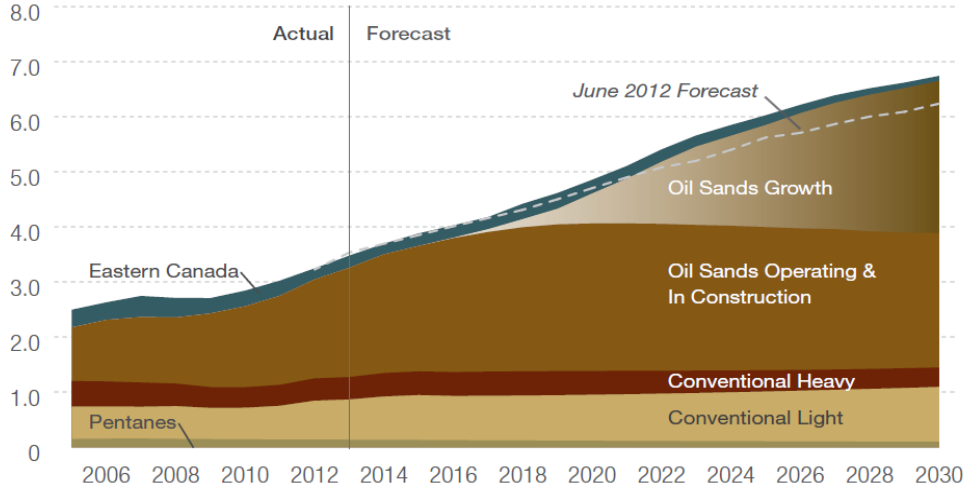
Source: EPRINC

Figure 3. U.S. Unconventional oil production forecast

[3] Forecasts are from a forthcoming report to be published in September 2013 by the Energy Policy Research Foundation, Inc. (Washington, DC). The project author is Trisha Curtis, director of upstream and midstream research.

plays in Oklahoma. While there are justifiable reservations regarding this forecast should oil prices fall below $50-60/bbl, this is a relatively conservative calculation given current production rates, EPRINC's assessment of the technical difficulty of each play, pace of new drilling permits, and economics of production. Clearly, the experience to date with shale production has played to inherent strengths in the U.S. petroleum investment environment, among which are well-defined property rights for the mineral resources and a robust oil and gas service infrastructure. These conditions generally do not exist outside of the U.S.

The growth in the U.S.' lower 48 crude oil output has been paralleled by growing production in Canada. Oil sands production in the Western Canadian Sedimentary Basin has been gaining momentum for the last five years as substantial financial commitments are now underway to continue Canadian production growth, as shown in Figure 4 below.



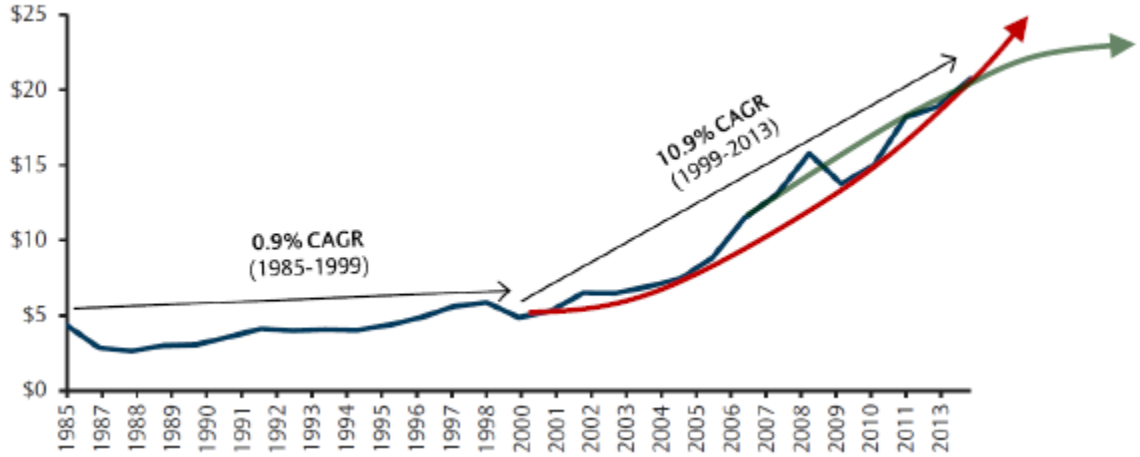
Source: Canadian Association of Petroleum Producers, 2013 forecast

Figure 4. Canadian production growth (millions of barrels/year)

COST COMPRESSION

Cost compression occurs when rising development project costs cannot be passed through — hence the compression. The rapid increase in oil prices over the last decade has brought about substantial investment and explosive growth in the worldwide petroleum service industry, including construction of deepwater rigs, drill ships, specialty steels and products, as well as advanced engineering and technical services. The run-up in capital costs for exploration and development is shown in Figure 5 below. The rate of increase accelerated beginning in 2005 and

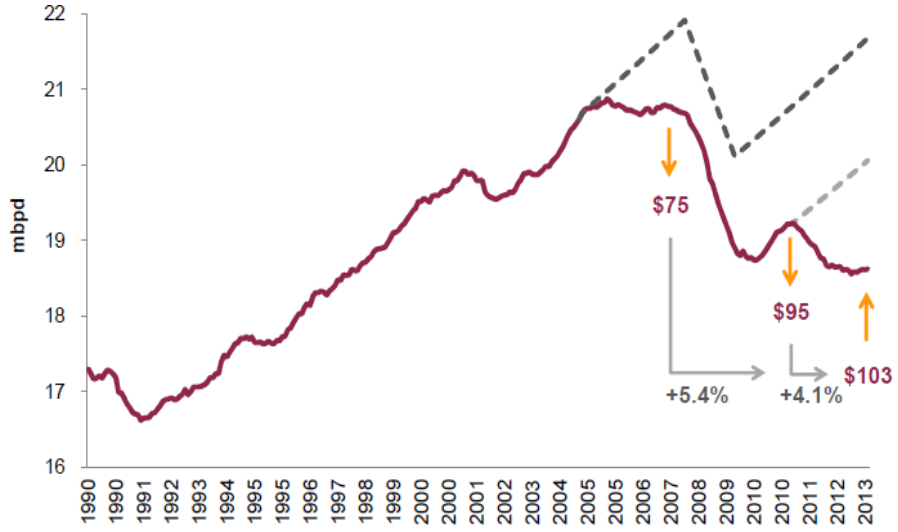
is no doubt a feature in recent announcements of not just major Arctic projects, but a long list of deepwater prospects, and rising regulatory costs and delays as operators adjust to a post-Macondo world.



Source: Barclays Research, IEA

Figure 5. Cost outlook scenarios, growth in exploration and capital expenditures, per barrel

Against this background of rising costs for exploration and production, there is growing evidence that these costs are unlikely to find accommodation through rising prices. Figure 6 below provides an estimate of the capacity of the U.S. economy to adjust to rising oil prices.



Source: EIA, Analysis from Douglas-Westwood

Note: The solid purple line shows actual U.S. consumption of liquid petroleum (crude and products). Carrying capacity is shown as declining from 5.4% of GNP in 2007 to 4.1% in 2011. Some analysts argue that the economy's growth is at risk even with petroleum consumption below 4% of GNP.

Figure 6. U.S. oil consumption with carrying capacity estimates

In this model, economic growth is constrained as rising oil prices act much like rising interest rates, choking off investment and consumer confidence and bringing about lower growth rates.[4] The lower growth rates cut oil demand and potential growth in oil prices.

What does all this mean for Arctic petroleum development? Clearly, managing both cost and price risks are central elements of any investment in petroleum development. However, Arctic projects offer much longer time exposure to both risks. We can expect more delays in Arctic development and a cautious approach in taking on major projects where any combination of regulatory risks, long lead times to development, and limited infrastructure are prevalent. The decision by Statoil to pull out of the Russian Shtokman gas field project and the Johan Castberg oil field project, both in the Barents Sea, is driven by more than concerns over costs and price risks. But these concerns are now an important factor in any Arctic project. Royal Dutch Shell cancelled plans to drill off Alaska during 2013 after having spent $4.5 billion since 2005. The company may not return for another attempt in 2014. ConocoPhillips, which was working with Keppel to develop a landmark ice-class Arctic rig, has put the project on hold, and has shelved plans to drill in the Chukchi Sea in 2014. Total has publicly stated that the petroleum industry should refrain from developing resources in the Arctic.

None of these development delays are written in stone, and circumstances can change. But policy makers should not fret over a massive (black) gold rush in the Arctic. Except for some unique opportunities, large-scale petroleum development in the Arctic will remain on hold.

[4] Lenzer, Robert. "The Price of Oil Is the New Economic Spoiler," *Forbes Magazine*. September 12, 2012. http://www.forbes.com/sites/robertlenzner/2012/09/12/the-price-of-oil-is-the-new-economic-spoiler/.Lenzer provides an extensive review of the research on how higher oil prices curtail growth.