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AN INTERVIEW WITH JAMES SLUTZ

The Shale Gas Revolution

Implications for U.S. and Canadian Energy Policy and Asian Energy Security

By LYNANN BUTKIEWICZ

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North America is enjoying a greater wealth of energy resources, with new technology making it easier to extract natural gas from dense shale rock formations. This increase in supply has caused gas prices to plummet in the United States to approximately $3 per thousand cubic feet, compared to $16 per thousand cubic feet in Asia. With Asia struggling to meet its growing energy demand, countries such as China, South Korea, and Japan are looking toward North America to help diversify their energy imports. Many in the United States and Canada are interested in fulfilling Asia's need for gas in order to help diversify trade and boost the economy. Others fear that liquefied natural gas (LNG) exports will hurt North America's energy security and that LNG exports may raise domestic gas prices. NBR recently spoke with James Slutz, President and Managing Director of Global Energy Strategies LLC, to better understand this debate and the implications for U.S. energy and foreign policy.

How much gas does the United States currently use? What is the potential to increase the role of gas in U.S. energy consumption?

The United States is the world's largest natural gas producer and consumer. In 2011, the United States produced 23.0 trillion cubic feet (TCF), which was 20% of global production. Our country consumed 24.5 TCF in 2011. Only five years ago, most experts believed that the United States would need to substantially increase its imports of natural gas to meet demand. In fact, in 2007, the U.S. Energy Information Administration (EIA) forecast that by 2030, the United States would import around 20% of the nation's natural gas supply. In 2012, the EIA projected that the United States would be a net exporter of natural gas by 2022, a phenomenal change in just a few years. This change is a result of unlocking the natural gas reserves in shale deposits found across the United States. The nation's natural-gas resource base, which includes proven and unproven reserves, is now estimated at 2203.0 TCF, or almost 90 years of supply.

JAMES SLUTZ is the President and Managing Director of Global Energy Strategies LLC, focusing on energy project development, technology commercialization and strategic energy advisory services. Jim serves on the Advisory Boards of the Canada Institute of the Woodrow Wilson International Centre for Scholars, Hart Energy Publishing, and the University of Southern California's Induced Seismicity Project. Slutz is also a Distinguished Associate of FACTS Global Energy.

What factors are behind the shale gas revolution in the United States?

The shale revolution is actually the culmination of the work by a committed visionary, George Mitchell. Geologists have known that the shale formations throughout the United States contained hydrocarbons. In fact, they are known to be the source rock (origin) of the oil and natural gas that has accumulated in conventional oil- and gas-bearing geologic zones. Mitchell's vision was that he could figure out the technology necessary to commercially produce the natural gas, and he began drilling shale natural-gas wells in the Barnett formation around Dallas in 1984. After many years and many attempts, Mitchell was successful in effectively applying hydraulic fracturing to the shale formations. The real breakthrough in shale gas production came with the application of both horizontal drilling and multi-stage hydraulic fracturing, which resulted in more wide-scale shale gas development beginning around 2005.

While the successful application of technology required many years, the growth of production and resources has occurred very fast. EIA projects that from 2010 to 2035, natural gas production from shale formations will rise from 23% to 49% of the U.S. gas supply. The term "game-changer" is often used and is very appropriate for this development.

What does the shale gas revolution mean for energy independence in the United States? How does it affect global energy markets?

I prefer the term "energy security" over "energy independence" because it captures the complex relationship between international markets and geopolitics. Energy commodities are globally traded; some such as oil more than others like gas. It is the global supply and demand that is the key driver in setting a price and also has huge ramifications for our trading partners, even if the United States was self-sufficient.

The shale gas revolution does have a significant immediate impact and a potentially huge, long-term global benefit to energy security. While we are talking about shale gas, it is important to remember that it is both an oil and natural gas development. In fact, because of the growth in shale oil production, the United States has been increasing our crude oil production and reversing the long-term production decline. The growth in shale oil and gas production has the potential to make the United States a petroleum (both oil and natural gas) exporter, an unimaginable position just a few short years ago.

Specific to natural gas, the United States will remain the largest global gas producer for the foreseeable future. Natural gas is a key feedstock to manufacturing industries and provides a cost-effective fuel for power generation. This natural gas endowment, coupled with the world's most extensive pipeline and delivery system, provides a great competitive advantage to U.S. industries.

Currently, gas prices in the United States are low compared to Asia, but the divergence in price is expected to narrow. To what extent might this happen, and what would this change mean for the potential of U.S. exports of gas to Asia?

It is important to appreciate that before natural gas exports can occur, industry must spend several billion dollars for each export terminal to build the liquefaction facility. To make this decision, companies must believe that U.S. natural gas prices will remain low enough and Asia prices high enough to make money on exports to Asia for the entire term of a 20-year contract. While the differentials between Asia and North America currently support trade, the cost of liquefaction and shipping will account for a significant amount of that differential. Asia's LNG contracts are based on oil prices. At oil prices below $80 per barrel, importing LNG from North America is less attractive to Asian buyers. As oil prices rise, the economics of importing gas from North America become more attractive. The United States does have a very large resource base, which will support production of more natural gas than will be consumed domestically. The market, not government, will be the best mechanism to determine the extent of exports. Most projections, including from the EIA, anticipate some level of North American gas exports in the next four to eight years. The level of exports will be

determined by the cost of gas and the cost of converting it to LNG, as well as the cost of transporting the gas to market. The United States has huge gas resources, but the cost of production varies between different areas. While there is plenty of gas for domestic use and exports, as we move into areas that cost more to develop, there is less incentive to export gas. The other important issue to remember is that significant gas resources exist around the world. Gas exports from the United States directly compete with other supplies and the least costly supplies will be the ones that go to market. Economics will ultimately determine how much gas is exported.

What steps are required for industry to obtain approval to export LNG from the United States?

Natural gas exporters must obtain an authorization from the U.S. Department of Energy (DOE). For exports to countries with a free trade agreement (FTA) with the United States, the authorization is by statute considered to be in the "public interest" and is granted once all the regulatory process steps are completed. For countries with which the United States does not have an FTA, such as Japan, a more detailed process, including a review of whether the export is in the "public interest," must be completed. The DOE is currently studying the impact of natural gas exports on U.S. natural gas markets. The outcome of that study will be important in determining the future of U.S. natural gas exports. The DOE has indicated that the study will be released in the summer of 2012, followed by comment and response periods. Therefore, a decision on currently pending export-authorization applications will not be made until late 2012 at the earliest.

What are the prospects for granting an exemption for Japan or establishing an FTA between Japan and the United States?

The prospects for an exemption for Japan are very low. The provision that provides a presumption of the public interest for FTA countries is set by statute. Whether Japan and the United States would enter into an FTA is well beyond the issue of natural gas trade, since the two countries are significant trading partners. I don't know the possibility of timeline for an FTA. However, if the DOE decides that gas exports to non-FTA countries are in the "public interest," the FTA issue in terms of gas exports doesn't matter.

Some importers of U.S. LNG have expressed concerns over a provision in the Natural Gas Act that can allow the president to invoke a natural gas emergency, like the Emergency Natural Gas Act of 1977, which stated that an emergency would affect "certain contractual obligations." What are your thoughts on this issue?

While the provision exists, I don't see it has a major impediment to commercial arrangements under export authorizations. Should the DOE move to modify or revoke an export authorization, the government would have the burden of proof to make a different public-interest finding than in the original authorization decision. This is a significant burden and requires a new administrative procedure and hearing, so the likelihood of the DOE taking an action is very low. This is also one reason that the DOE is moving cautiously on approvals. It is important to note that that provision has been in the statute for decades.

What are the key policy questions for the United States and Canada in considering greater LNG exports to Asia?

Fundamentally, governments need to decide under what trade principles they wish to operate. In reality, petroleum exports are no different than other commodities. In the United States, history has shown that restrictions on the natural gas market have inhibited production and supply, resulting in higher prices. A key example of this was the Fuel Use Act of 1978. Opening up the natural gas market and market-based pricing in the 1980s resulted in new technologies and resources, such as coalbed methane (coal seam gas), tight and deep gas, and now shale gas.

The United States has been a strong advocate of free trade, and restricting natural gas trade would weaken its stance as a leader of global free trade.

Canada is interested in diversifying its natural gas export market to include China and other Asian nations. What regulatory steps are involved? If Canada were to start exporting significant quantities of gas to Asia, would this impact U.S.-Canada relations?

Canada has its own regulatory process for approving exports, as well as the infrastructure development (pipelines and terminals) that would be required to enable exports. There doesn't appear to be policy hurdles that would prevent exports, and the decision is wholly Canada's and does not involve the United States. North America has a huge natural-gas resource base, much more than is needed to meet its demand for gas.

In addition, Canadian natural gas resources have the disadvantage of being farther from U.S. markets, so they have a lower value for Canadian producers. For these supplies, such as natural gas in the Horn River basin in British Columbia, it makes economic sense to look for markets in Asia to commercialize the gas.

This also shows a difference between natural gas and oil. The United States can be a partner to Canada as a market for additional crude oil from the oil sands. The only restriction is the need for added pipeline capacity. The United States has extra capacity in oil refineries, which are specifically designed to process heavy oil, so it makes economic sense to ship more oil to the United States. The regulatory delays by the U.S. government regarding the Keystone XL pipeline are directly responsible for Canada's increased urgency in seeking oil-export opportunities in Asia. This has also raised concerns by Canadians about whether Canada is overly reliant on the United States as a trading partner.

Despite strong gas production in the United States, some gas will still need to be imported from elsewhere. Why is this happening, and from where will this gas come?

The one region of the United States that depends on natural gas from LNG imports is New England. The LNG infrastructure (primarily the Everett terminal in Boston) was developed to supply natural gas to Boston and New England because of insufficient gas pipelines and gas supply in the 1970s. This terminal now supplies about 25% of the natural gas to New England annually and is even more important as available peak-load gas supply in the wintertime. Because of the geology of New England, subsurface natural gas storage is impractical, so above-ground LNG storage tanks are used to store natural gas for peak winter days. The LNG in these tanks is trucked from the Everett terminal to dozens of remote locations. In addition, the primary electrical generation for Boston is fueled directly from the Everett LNG terminal. Therefore, even with the significant discoveries of new natural gas supplies, New England will likely remain an LNG importer.

The gas that supplies the LNG terminal in Boston comes from a variety of international sources: Trinidad and Tobago, Algeria, and other counties. A natural question is, why don't we send LNG via tanker from the U.S. gulf coast to New England? Current U.S. law requires the shipment of goods between U.S. ports to be carried on U.S.-flagged vessels (the Jones Act of 1920). There are no U.S.-flagged LNG carriers in the world, so it would be impossible to ship LNG from the Gulf coast to Boston without Congress changing the law

Countries in Asia, such as China and India, may also have large quantities of shale gas. How do you see shale gas production in Asia developing? How would it affect the North American energy outlook? To what extent could these developments lead to a world gas market?

China and India, as well as other countries around the world, have a huge potential for shale gas development. However, many experts predict that development will proceed more slowly than in the United States. There are a number of reasons for this:

- The United States has a huge advantage in understanding our geology because of the hundreds of thousands of wells that have been drilled over more than 100 years. State geologic surveys have required companies to submit geologic information and records from those wells for decades; so the United States has an unmatched record on our geology.

- The United States has a private property system of oil and gas ownership. This has greatly facilitated the development of shale gas, which has been largely on private property.
- The United States has a vast oil and gas industry infrastructure, including drilling and well-development equipment, that can be easily moved around the country.

These are reasons that the U.S. development has moved very quickly in the past few years. It is also important to remember that the first shale gas well was drilled in the Barnett shale in Texas in 1984 and it took George Mitchell many tries to achieve success. There is much still to learn about the shale in the various basins around the world and how best to economically produce it. Natural gas from shale will be produced in other countries, but it will take time for the developments to mature. While it will take time for other countries to develop shale gas and other unconventional resources, it will happen in the years ahead. Exploration is occurring in Australia, Poland, Argentina, and other countries. China is estimated to have the largest shale gas resources in the world.

It will be a long time before a global gas market develops. While there may be movement in that direction, challenges exist to the development of a U.S.-style, Henry Hub–type market. Gas markets in Asia and the United States function quite differently. In Asia, much of the gas supply depends on LNG, which requires huge upfront investment and therefore is predicated on long-term contracts, typically twenty years. These contracts use oil prices as a basis for determining gas value. In the United States, gas is traded independently of oil price and on a much shorter-term basis. A typical contract in the United States is measured in months, not years. Long-term contracts will remain a key component of LNG project development because of the financing required to undertake the infrastructure construction. The other important component of pricing is to remember is that there is a significant cost to liquefy and transport LNG, in most cases more than the cost of the gas. Therefore, just because there is a current significant differential between U.S. and Asia prices does not automatically mean that exporting gas to Asia will be economically attractive for the long term. By economically attractive, I mean from both the buyer's and seller's perspectives. While governments have advocated issues such as supply diversity and other policy issues, in the end almost all players in the global LNG market are acting in their economic interest. For example, Japan is very interested in diversifying its LNG supplies by importing from the United States, but only if the price is attractive. ◈