
LINKING NATURAL GAS SUPPLIES TO CRITICAL MARKETS

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Natural gas could play a key role in the energy security of the United States and other countries in coming decades, says Banaszak. But, she says, development of the natural gas industry has been hampered by the investment costs and market issues involved in converting the gas to liquefied form and transporting it long distances to consuming markets. Banaszak argues that policies promoting stable and transparent regulatory regimes, standardization of energy content and shipping infrastructure for the gas, and understanding of safety and security issues will be critical for the industry's future expansion. She says that it will be particularly important to promote good governance in exporting countries that need to attract huge investments to develop a gas-supply infrastructure.

Natural gas has a key role to play in energy security, at least over the next 20 years, as the United States and other countries work toward developing next-generation and renewable technologies. Because it is clean burning and produces significantly fewer harmful emissions than gasoline, natural gas has become the preferred fuel for many end-users, from homeowners to large electric power plants around the world. In the United States, where the gas is the second largest source of energy and accounts for 24 percent of all energy consumed, demand for natural gas is projected to rise by more than one-third by 2025. To satisfy growing demand, the U.S. economy is expected to rely increasingly on imports, mostly in the form of liquefied natural gas (LNG). However, the price of natural gas is rising and becoming more volatile as domestic production is leveling off and Canadian exports appear increasingly limited. Until exporting and importing countries cooperate on reducing investment barriers and agree on common technical, safety, and security issues, the full potential of natural gas will not be realized.

Historically, natural gas has been traded across international borders less than oil. Only one quarter of the gas used globally in 2002 was imported compared to more than half of the oil consumed. On the other hand, trade of natural gas is growing twice as fast as that of oil. Consumption of gas worldwide is growing faster than oil,

as natural gas becomes a transition fuel in moving away from heavier, more polluting hydrocarbons (coal and oil) and toward new energy sources such as hydrogen cells. In addition, proven reserves of natural gas are more abundant than oil reserves and are being depleted at a much slower rate.

Why, then, is natural gas underutilized? Discovered gas resources are located far from end-using markets, with much of the gas located in technically challenging areas such as deep offshore formations or in areas that are environmentally sensitive. Offshore gas often must go through thousands of miles of pipeline to reach a market or be piped onshore for liquefaction before transportation by ship. Overall, transporting gas to consumers requires greater upfront investment and infrastructure than moving liquid oil or solid coal.

GETTING NATURAL GAS TO MARKET

Commercial technology that transforms natural gas to a liquid has enabled economic transportation of gas in the form of LNG in ocean-going tankers. This has led to creation of an industry with unique characteristics and issues. To make LNG, natural gas is processed to be mostly methane with some ethane and then super-cooled to minus 260 degrees Fahrenheit so that it settles into liquid state, shrinking the volume to 1/600th of the gaseous state. LNG tankers and storage tanks are heavily insulated to maintain the very cold liquid state, but only very slight pressure is involved in LNG handling. As LNG, natural gas is a special, very cold liquid that has very different properties contributing to its safe handling — LNG, for example, will not ignite until regasified back into natural gas and mixed with air at specific concentrations (between 5 and 15 percent volume concentration).

Achieving economically competitive LNG trade involves building large-scale facilities that require \$5-7 billion of capital for exploration, development, liquefaction, shipping, and regasification. To raise such large amounts of capital to get the gas to market, the LNG industry has relied on long-term (20-year) contracts between the gas

supplier and the gas buyer as a way to reduce market risk for lenders. This is an important difference compared to the oil industry, where producers develop resources without contracted buyers and then sell the product into the high-volume and heavily traded global oil market. In the case of LNG, neither consumer nor producer can rely on buying or selling significant volumes without securing a long-term contract, because only about 8 percent of global LNG is traded under short-term and spot market terms.

There has been some evolution away from this reliance on long-term contracts in the LNG industry. LNG producers have sought to build spare capacity in their facilities, and LNG tankers are being built that are not tied to specific long-term trades and could be available to transport spot LNG cargoes. In Asia, where long-term contracts from the 1980s are now expiring and requiring renewal, more flexible and shorter terms are being negotiated. However, the LNG industry will not escape its structure based on long-term contracts quickly because the capital requirements are still a significant barrier. Further evolution toward more flexible and shorter-term trading arrangements is expected but will occur slowly. For countries using LNG as part of their natural gas future, the structure of LNG trade helps define the available options for policies and actions that can reinforce national, regional, or global interests.

SECURING FUTURE NATURAL GAS SUPPLIES

For the United States, LNG is expected to play an important role in future natural gas supplies, as reflected in forecasts made by the U.S. Energy Information Administration (EIA), the National Petroleum Council, and industry consultants. According to projections of the EIA, the share of LNG in U.S. total natural gas supply will increase from less than 1 percent in 2002 to more than 15 percent in 2025. China, India, and Mexico are among new LNG importers while Europe, Japan, Korea, and Taiwan already rely on LNG for a key portion of their natural gas supplies. Other countries in Asia and Latin America have considered LNG imports to meet their natural gas demand — from the Philippines and Thailand to Brazil, Honduras, and Jamaica (the Dominican Republic and Puerto Rico already import LNG).

The LNG market will continue to grow but may not meet its full potential to supply natural gas to the United States and elsewhere unless both exporting and importing

countries cooperate to overcome barriers. Collaboration will be especially critical in three key areas:

- Promotion of stable and transparent investment environments
- Standardization within the LNG industry
- Research, development, and dialogue addressing safety, security, and environmental issues

PROMOTING STABLE AND TRANSPARENT INVESTMENT ENVIRONMENTS

Energy companies are already seeking to develop abundant natural gas resources that are located far from major markets and have announced or proposed more than 20 LNG schemes to double global capacity by 2010. Investment environments characterized by high political risk and other risks, however, can stop or delay development of new LNG supplies. LNG-trading countries can collaborate to improve the investment environment for LNG by promoting stability, good governance, and transparent regulatory regimes, using the same principles that support trade and cross-border investment in general.

As for regulatory regimes, identifying and implementing the best system for natural gas and LNG markets is a complex issue. In the United States, for example, regulatory changes to create competitive markets in natural gas supply and transportation have led to an emphasis on shorter-term contracts between gas buyers and sellers, a trend that is directly counter to the long-term contracts that LNG suppliers require. Creating competition in domestic gas transportation has altered the way the industry invests in transportation infrastructure, which is needed to transport all forms of gas supply, including LNG, around the country. In the near term, it has meant under-investment and delayed investment in needed infrastructure. For example, delays in the construction of pipelines or “just-in-time” construction occurs because local distribution companies are under pressure from the public utility commissions that provide oversight and sometimes from market competition created by deregulation not to sign long-term contracts that provide assurance to pipeline investors. Gas production companies that might invest in capacity expansion don’t want to tie up capital in gas transportation so they prefer to build only to the nearest liquid-market point. Investments have also been hampered by delays in getting required permits.

In the long term, if market forces do not lead to timely and adequate investment in infrastructure, regulators will need to reexamine how to facilitate both competition and profitability in domestic gas transportation.

EXPANDING STANDARDIZATION WITHIN THE LNG INDUSTRY

Because the LNG industry has evolved under long-term contracts, there has been less incentive to develop standardization compared to other traded commodities, including oil.

The standardization of LNG is an important but very difficult issue. The energy content of LNG varies because producing facilities leave different amounts of ethane in the gas, and the energy content needs of LNG consumers also vary. In the United States, the typical limit in a market area for the energy content of gas is about 1100 British thermal units per cubic foot (one British thermal unit is approximately equal to 1055 joules, a metric measure for energy). These “limits” arise because the energy content of gas can affect, for example, flame characteristics, smoke, soot, and emissions. For this reason, LNG supplies from certain facilities cannot be delivered into certain U.S. ports because the energy content is above the level of 1100 British thermal units per standard cubic foot and it is not possible for the importing regasification facility to dilute the energy content of the gas before it reaches consumers. For example, the U.S. terminal located in Boston would have difficulty accepting LNG from sources other than Trinidad or Algeria. The United States and other importing countries can work to increase flexibility within their own systems. They also can collaborate to increase the number of compatible LNG supply sources.

With LNG shipping, both importing and exporting countries would benefit from efforts to maintain standardization, which could be affected by the appearance of several new technologies (such as the introduction of special LNG hoses and offshore tanker unloading). Countries can work to facilitate standard LNG loading and off-loading systems so that LNG tankers can service as many ports as possible. Developing port compatibility within the LNG tanker fleet increases flexibility, contributes to security for LNG trading countries, and helps to facilitate spot market trade.

A third area that could benefit from greater standardization involves LNG sales contracts. Again,

because of the legacy of long-term transactions, the contracts involved have been non-standard, long, and complex. Developing standard contracts and standardized clauses would facilitate trade, benefiting both importers and exporters. Although this issue has been identified by some industry players, it may be lacking a natural advocate because buyers, sellers, and the lawyers in between could each be suspicious if one side stepped forward with a plan to address legal standardization. There may also be no natural forum under which this activity should take place. Because the U.S. government has no commercial interest in the LNG industry, it might be possible for the U.S. to initiate or promote legal standardization for LNG under the umbrella of a trade organization or under a new or existing consortium (for example, the Groupe International des Importateurs de Gaz Naturel Liquéfié).

RESEARCH, DEVELOPMENT, AND REGULATORY DIALOGUE

The LNG industry has an exemplary safety record, but maintaining it requires ongoing research and development. In the post-September 11 world, security risks to LNG facilities are perceived as greater and are garnering more public attention in the United States and elsewhere. Responding to public concerns and designing expanded safety and security measures would benefit from increased understanding of LNG containment infrastructure (tankers and storage tanks). Research and development also should focus on exploring questions such as how to prevent a breach of facilities and what might be the environmental and health implications of a large-scale release of LNG. These are areas for government leadership and collaboration, but countries should coordinate any efforts with existing groups that work in this area, such as shipping and standards societies or gas and technical associations.

In the United States, building energy infrastructure has become complicated by laws that enable local communities to review and influence projects based on their local environmental impact. The existing process for project review does not emphasize community discussion of the potential impact of a project on energy supply, energy prices at the regional level, or the broader regional/national impact. Government can play an important role in this arena and can promote, via international collaboration, more informed discussion of

energy choices and the options available for having safe and secure future energy supplies.

CONCLUSION

With LNG expected to play a larger role in supplying natural gas to the United States and elsewhere, there is much that countries can do to assure future supplies. Stable and transparent investment environments are critical to expanding LNG infrastructure, which requires large-scale capital investments. Standardization within the industry and further research — particularly to bolster safety and security — are key to developing a robust international market. Robust markets provide the greatest form of security to energy importers by contributing to price transparency, providing access to multiple supply sources, and promoting supplier competition and market-driven efficiencies. The U.S.-sponsored LNG Summit held at the end of 2003 featured collaboration among energy ministers and high-level representatives from 24 countries and could be built upon to further cooperation in these areas.

As the United States increases LNG imports along with China, India, and Mexico, supply security is derived from the availability of abundant gas resources and the diversity of countries seeking to join the field of LNG exporters. In the Atlantic Basin, Norway, Angola,

Venezuela, and Equatorial Guinea have plans to join the existing LNG exporters — Nigeria and Trinidad and Tobago.

LNG is used as a way of transporting natural gas to distant markets and across borders, sometimes competing with pipeline transportation. In the future, alternative ways of transporting gas could arise to compete with LNG. Pipeline technologies, for example, could become more advanced and cheaper, extending their reach. Gas-to-liquids (“GTL”) technology is under development but is still too expensive to compete with LNG as an outright form of natural gas transportation. The hydrocarbon liquids produced from the first GTL projects will more likely be used to compete with high-end oil products, at least until this complicated chemical process becomes cheaper. For the immediate future, LNG is set to grow, and for countries involved in LNG trade, it is in their interest to facilitate development of this maturing market. □

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