

PATHWAYS TO POWER:

Bringing Compressed Natural Gas and Liquefied Natural Gas To the U.S. Marketplace

By Rolf A. Gafvert and Wayne D. Stinnett, Jr.

Recent industry publications have indicated that the United States may be headed toward slower economic recovery due to the lack of abundant and affordable natural gas. This possibility of this becoming a long-term issue has not yet crossed the radar screens of most policymakers or citizens. As leaders of the natural gas industry, we would like to initiate a discussion on this looming problem; to convey its potential impact on every business and individual in the Nation; and to work in tandem with lawmakers, regulators and other key parties to formulate effective regulatory strategies for creating sound energy policy related to natural gas.

America on the Brink

Far more than most people realize, natural gas plays a key role in the U.S. economy. Cleaner burning than other fuel sources, and relatively low in cost, natural gas became America's fuel of choice during the 1990s, with consumption increasing from 19.0 trillion cubic feet Tcf in 1991 to 22.0 Tcf in 2002. Over the next decade, natural gas is expected to be the primary fuel for the new electric generation plants that will power the Nation.

Gas is an engine of commerce that keeps our office buildings, industrial complexes, electric generation stations, hospitals, retail stores, schools, and homes running. Natural gas has been touted as America's most promising means of achieving energy independence and environmental cleanliness. Quite literally, a robust U.S. economy for the next 20 years depends in major part on access to a steady, reliable, and cost effective supply of natural gas.

But, we are on the verge of not having enough affordable gas to fuel robust growth in the U.S. economy.

Regulation Helped to Build the Natural Gas Industry

In the early 1900s, natural gas was abundant and cheap, but it was slow to gain acceptance as a fuel source because there was no efficient means of transporting it. By far the largest users of natural gas in the country were the burgeoning industrial and power plants along the Gulf Coast, which were close to abundant natural gas supplies.

In 1938, Congress passed the Natural Gas Act to give the federal government regulatory control over the interstate pipeline network. This jump-started the gas pipeline industry by providing financial certainty to the investments being made at the time. Within a decade, thousands of miles of gas pipelines were being built to link remote gas fields with the growing cities in the Midwest and Northeast.

For the next several decades, gas pipelines and local distribution companies (LDCs) were viewed as “natural monopolies,” in the same category as telecommunications, railroads, and electricity. Regulation promised a secure financial return to companies to encourage the enormous investment required to cover the costs of planning, permitting, building, and maintaining vast natural gas pipelines and distribution grids. The financial certainty established under state and federal regulatory regimes supported the long-term commitments to developing and maintaining gas transportation and distribution infrastructure and just as importantly provided the incentives to enter into long-term contracts with natural gas producers.

This regulatory system worked until the 1970s, when the first OPEC oil embargo sent oil prices skyrocketing. With gas prices regulated at the wellhead, demand for natural gas spiked among customers who could switch from oil to gas, particularly big industrials and power plants. But, low regulated interstate natural gas prices gave gas producers no incentive to drill new wells to produce gas that would be transported by interstate pipelines. As a result, the U.S. saw its first gas curtailments, as many customers served by interstate pipelines who wanted natural gas simply could not get it.

Regulators Respond to Changing Market Conditions

Fearful of enduring shortages, Congress passed the Natural Gas Policy Act of 1978 (NGPA), which raised the price of natural gas by developing a system of controls designed to stimulate exploration. Together with the Power Plant Industrial Fuel Act, the regulations promulgated by the NGPA of 1978 curbed demand, primarily that of power plants, and created 26 categories of natural gas that were subject to varying degrees of price control. The NGPA granted higher prices to gas using high-cost drilling techniques, thus encouraging producers to drill deep wells and into tight sand formations for new reserves. With an assurance of higher prices, the country’s natural gas supply burgeoned.

Eventually, this led to an over-abundance of gas, and prices fell rapidly for “spot gas”—gas sold on the short-term market. Long-term gas supply contracts remained at above-market levels. The big winners in this scenario were large industrial customers, who benefited by being able to contract for the inexpensive spot gas, while homeowners were required to continue to buy the higher-priced natural gas.

As a result, pipelines with high-priced, long-term supplies lost markets, as customers moved to short-term gas. This led to take-or-pay suits, where pipelines that had entered into

long-term, fixed-price contracts with producers were sued for not buying the quantities of gas that they had agreed contractually to purchase.

With many pipeline companies facing bankruptcy, the government encouraged producers and distributors to renegotiate their supply contracts. Nevertheless, producers found themselves in a “gas bubble,” having invested heavily to produce far more gas than the market could absorb. The low prices caused by this glut left producers in dire financial straits, and massive corporate cutbacks resulted.

This led to the next round of regulatory changes.

In 1985, concluding that pipeline operators should begin to move out of the business of selling gas, the Federal Energy Regulatory Commission (FERC) instituted Order No. 436, which, in part, unbundled natural gas supply and transportation, leading to the creation of open-access natural gas pipelines. This move allowed end users to contract directly with producers for natural gas supplies. Order 436 began to change the role of pipeline companies to that of transporters only, and gas marketers came into existence to provide gas supplies to end users. Natural gas prices continued to fall, as the market moved to short-term contracts.

In November 1993, FERC Order No. 636 completed the unbundling process by requiring pipelines to separate sales and transportation services. Pipelines were required to abandon their gas sales service totally and provide only transportation service.

The transportation and delivery of natural gas from wellheads has grown significantly since the 1980s. Today, there are 180,000 miles of interstate natural gas pipelines nationwide. The growth of the industry is a result of the ongoing ability of the federal government and the industry to recognize and respond to changes in the natural gas market; to work together to create regulatory conditions that satisfy consumer demand and keep the cost of natural gas competitive; and to create a climate that allows producers and distributors to operate profitably.

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Looming Shortages

The deregulated, short-term contract structure worked for both consumers and the industry during most of the 1990s. America had an adequate supply of natural gas, largely because imports from Canadian gas fields filled the gaps, and prices remained attractive.

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Policymakers, consumers, and even many in the natural gas industry continue to feel that the status quo is sufficient.

The past decade also spawned a proliferation of environmental and safety regulations that discouraged the development of power generation stations fueled by coal, nuclear or hydropower. Realistically, the only viable option for producing electricity for the foreseeable future is natural gas. The foremost consideration for energy markets for the next 20 years will be the availability of natural gas supplies at competitive prices to meet the growing national electricity demand.

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Today, the United States stands at the threshold of a potentially sustained natural gas shortage that this country has not witnessed since the Carter Administration. For 20 years, U.S. production has been flat, and it has started to decline over the past two years. Once our saving grace, the massive Canadian gas fields—at least those that are accessible via existing pipelines—are running low. Gas prices are twice as high as they were two years ago, and Americans in some regions of the U.S. may begin to see their electricity bills soar as early as this summer. The U.S. will enter the winter of 2003-2004 with stored natural gas supplies that may be barely adequate to take us through another cold winter. Should we face record-cold temperatures, many regions of the Nation could face shortages of natural gas during peak demand.

Office buildings, industrial plants and retail complexes that depend on natural gas for heat may experience delivery curtailments during weather-related peak demand. Schools also may be closed due to lack of gas supply. Homes will be heated, but the cost to consumers will be high.

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CNG and LNG: The Keys to a Secure U.S. Economy

America does not find itself in this position because there is no gas, however, by far the most abundant supplies of natural gas in the world are located outside of the United States. There are trillions of cubic feet of natural gas in many potential export nations where there is little demand for the resource and no infrastructure to move it. By far, the largest fields are located in the Persian Gulf, East Caspian, West Siberia, Southeast Asia, Far East, North Africa, northern South America, and Nigeria-Angola. We have the technology to find gas in these remote regions and to build the infrastructure necessary to transport it to U.S. markets. These

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Finding the gas and bringing it home will require significant investments of both time and money. Wells must be drilled under the arduous conditions of extreme cold or heat, probing deep into geological formations lying beneath sand, ice or seawater. Being located too remote for traditional pipeline solutions, the discovered gas must be developed and shipped to market by way of Liquefied Natural Gas (LNG) or the emerging Compressed Natural Gas (CNG) transport technology.

Liquefied Natural Gas—natural gas chilled to minus-263.2 degrees Fahrenheit—is a viable long-term option for transporting gas from large-producing, faraway fields such as those found in the Middle East or Africa. Because of the long transit distances involved, however, each ship must be able to transport a very large quantity of gas in order to make multi-billion dollar LNG investments profitable. Since LNG has a relatively high storage density, it can be practical for such long-range transport service.

For LNG to be a viable resource, the United States must have gasification plants to return the liquefied gas back to its original gaseous state. With a construction cost of approximately \$1 billion for one LNG gasification plant and about ten years' of project development and construction time, the task of making LNG a significant part of America's gas supply will require the investment of tens of billions of dollars in the U.S. alone. In the recent gas market environment, there has not been a compelling financial incentive to make the massive long-term investments in the LNG infrastructure needed to bring the imported gas to U.S. markets.

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Rather than liquefying natural gas in expensive land-based processing plants, CNG works by compressing gas directly from the producing fields and into containment systems on large ocean-going vessels. At a cost of less than \$50 million per offshore loading facility, CNG provides a viable, cost-effective and timely solution to address short-term energy demands and to bring natural gas to U.S. markets from small- to medium- sized gas fields over shorter distances

of 200 to 4,000 miles. VOTRANS CNG is a new and revolutionary technology that is currently being commercialized. Within the next five years, it is expected to be transporting between one and two billion cubic feet (Bcf) per day or more of CNG from stranded, under-valued markets. Suitable supply sources for import of CNG into the United States exist in the deepwater Gulf of Mexico, the Caribbean, Atlantic Canada, Alaska, Colombia and Venezuela.

Because of each technology's advantages and weaknesses, neither CNG nor LNG is expected to be the absolute solution to the natural gas supply problem. On one hand, the investment costs required to build the infrastructure needed to liquefy, transport and re-gasify LNG make it feasible only for extremely large and very low risk projects. CNG, on the other hand, manages risk well and is quite cost-effective for medium-sized, medium-distance projects. Together, these two complementary technologies provide a comprehensive, practical strategy for serving America's long-range energy demands.

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Working Together for America

The lurking energy shortage that threatens to slow the U.S. economy can be averted—if government and industry work together to acquire new supplies of natural gas. Domestic reserves no longer are sufficient to satisfy America's energy appetite. Our country's future depends on accessing the vast fields of natural gas located in remote parts of the globe. The debate should focus on creating a regulatory environment that encourages producers and pipeline companies to develop the infrastructure needed to bring both CNG and LNG home to American consumers, with some assurance of financial reward for invested capital.

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Public utility commissions should consider it prudent for LDCs to enter into long-term contracts with producers to bring adequate incremental supplies of CNG and LNG to their regions. They should encourage LDCs to diversify 10-15 percent of their portfolios to include

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alternative supplies of gas, even if that means committing to long-term, fixed pricing. Further, the U.S. Department of Energy should support research and development to prove out more efficient ways to build CNG and LNG infrastructure.

At times, long-term prices may be either above or below the prevailing prices for short-term or “spot” supplies. Policymakers must resist the historic temptation to second-guess the wisdom of these contracts during periods when long-term prices are above “spot” natural gas prices. Indeed, the delivery of significant volumes of CNG and LNG may be the catalyst for lowering U.S. gas prices overall, to the benefit of all consumers.

So far, there appears to be little recognition that a problem exists, and even less understanding or discussion of what to do about it. The leaders of the natural gas industry are willing to begin engaging policymakers and regulators on this important issue, from city halls to state capitals to the U.S. Congress.

As the American economy has grown over the past three-quarters of a century, the one constant on which all businesses and industries have depended—and will continue to depend—is energy. Energy consumption is related directly to economic growth. Declining domestic gas reserves make it probable that 25 years from now, 50 percent of our natural gas supplies will have to be imported, as is the case with our oil industry. We must do something *today* to jumpstart the CNG-LNG business.

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We, the leaders of the natural gas industry, cannot afford to wait until it is too late—until hospitals shut down, schools close their doors, shopping centers are dormant, and industrials are forced to suspend production. We must start the discussion now, rather than later, because there is still time to fix this problem. We do not want to wait until America asks us: *Why didn't you tell us before it was too late?*

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