

The Case **Against** Gas Dependence

Greater reliance on gas-fired power implies serious economic, technological, and national security risks.

Over the past two decades, the United States has, by default, come to rely on an “In Gas We Trust” energy policy. Natural gas increasingly has been seen as the preferred fuel for all applications, nowhere more than in the electric generation sector. However, the greatly increased use of natural gas forecast for the electricity sector may not be economically or technically feasible, and it does not represent optimal or desired energy policy. Rather, a more rational energy policy would be to use coal and nuclear power as the sources of new electricity generation and to use natural gas for the applications for which it is best suited—space heating and industrial use.

The nuclear power industry in the United States has established an enviable economic and safety record, and a revived nuclear power option is essential for a balanced and secure U.S. energy future. The price of coal-fired electricity has been declining for more than 20 years and is forecast by the Department of Energy’s Energy Information Administration (EIA) to continue declining for at least the next 20 years. Coal-burning electric utilities also have made impressive environmental advancements: The rate of emissions per ton of coal use has decreased nearly 70 percent during the past 30 years, and this trend continues.¹

Certainly, the recent run-up in natural gas prices has easily made the case for many of the perils of using more natural gas. But as early as 2000, many experts became alarmed when natural gas consumption for electricity generation exceeded the amount used for residential or commercial purposes. By 2025, use of natural gas to generate electricity will equal that used in the industrial sector and will exceed the combined use of natural gas in both the residential and commercial sectors. Total natural gas consumption is forecast to increase 49 percent between 2000 and 2025, from 23.5 Tcf to 34.9 Tcf; however, gas consumption for electric generation will more than double, increasing from 5.2 Tcf to 10.6 Tcf.

Is such a dramatic increase in the use of natural gas to gen-

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erate electricity feasible without straining gas supply and infrastructure? Government and industry energy analysts have expressed doubts. Even after reducing its forecasts of natural gas use for electric generation twice in the past two years, EIA remains concerned about the adequacy of future gas supplies, cautioning that “a major consideration for energy markets through 2025 will be the availability of adequate natural gas supplies at competitive prices to meet growth in demand.”² EIA finds that domestic gas production is increasingly dependent on unconventional and costly conventional resources, both onshore and offshore. The 2003 EIA forecast of U.S. natural gas production in 2020 is 3.4 Tcf (or 12 percent) lower than the 2002 projection because of reduced estimates of reserves, changes in the economics of production, and reduced expectations for unconventional gas.³

EIA also has reduced its forecasts of the amount of gas that the United States will consume in the future, and nearly all of this reduction is due to lowered forecasts of new electric generation that will be gas-fired. In 2002, EIA projected that nearly 90 percent of all new electric generation over the next two decades will be gas-fired, while in its 2003 forecasts it projects that 80 percent of new electric generation will be gas-fired. Its 2003 forecast of total gas consumption in 2020 is 1.7 Tcf lower than the 2002 forecast, and most of this (1.1 Tcf) is from reduced consumption in the electric generation sector. EIA recently has reduced its forecasts of the use of natural gas for electricity generation. In its 2001 forecast, EIA projected that in 2020 11.6 Tcf of natural gas would be used to generate electricity; in its 2002 forecast, EIA lowered this projection to 10.5 Tcf; in its forecast published in January 2003, EIA further reduced the projected 2020 use of natural gas in the electric generation sector to 9.6 Tcf. This represents a lowering of the forecast by 17 percent in only two years.

U.S. natural gas production will not keep pace with demand—even with EIA’s reduced estimates of future demand—and gas imports will increase significantly. The more than doubling of the use of natural gas to generate electricity by 2025 will be accompanied by a big increase in U.S. gas imports. In 2000, U.S. natural gas imports totaled 4.6 Tcf; by 2025 imports are forecast to total 8.3 Tcf. Thus, at a time when energy policy-makers are concerned about America’s increasing dependence on imported oil, the United States will become increasingly dependent on imported natural gas as well, and much of these gas imports will come from the same politically unstable regions that contain most of the world’s oil supplies.⁴

Further, U.S. gas markets may not be able to accommodate the huge anticipated increase in natural gas demand over the next two decades. As Wayne Andrews of Raymond James & Associates noted:⁵

- U.S. gas supply is declining at an unprecedented rate, and U.S. producers will find it very difficult to reverse this negative trend;
- The gas industry is searching from smaller reserves and decline rates are increasing; and
- Imports from Canada are declining; and liquefied natural gas (LNG) is the only long-term solution.

Matthew Simmons of Simmons & Co. International similarly believes that:⁶

- Although the gas well drilling boom of 2000/2001 was unprecedented, it resulted in few new supplies, and U.S. gas production has been essentially flat since 1995;
- The decline in domestic gas production is not reversible through a new drilling boom;
- A 10 percent decline in domestic production is likely but could be far worse; and
- By 2004, a large number of new gas-fired electric generation plants will be on line and, if are all used in the same week, the “sucking impact on gas will be unprecedented.”

Simmons concludes, “If the above points hold, new gas-fired generation beyond 2005 may not be feasible, and alternate fuels will have to be used for new electric generation plants.”

Strains on Supplies

The United States has only 3 percent of the world’s natural gas reserves—about 170 tcf out of a world total of 5,300 tcf. William O’Grady of A.G. Edwards states the challenge succinctly: “Here’s the problem with natural gas. There’s lots of natural gas, but there are no pipelines from Kazakhstan to Los Angeles. That makes U.S. gas consumers critically dependent on U.S. production, and U.S. production is in a long-term decline that most experts do not think will reverse. We have been poking holes in the lower-48 [states] since the 1920s. The relatively easy gas-producing areas have been picked over, and what’s left are tough and expensive fields like deep gas zones.”⁷

Daniel Yergin, an LNG proponent, has estimated that meeting anticipated natural gas infrastructure needs through 2010 requires an industry investment of more than \$500 billion—double the investments made during the 1990s.⁸ “The United States is making a major bet on future gas supplies—without realizing it,” he notes.⁹

According to the Strategic Center for Natural Gas at the National Energy Technology Laboratory (NETL), 400,000 miles of new pipelines will be required by 2015 to meet expected near-term increases in natural gas demand.¹⁰ Such rapid growth, driven largely by the use of gas to generate electricity, will place severe strains on the industry. Along with



increasing loads, the expansion of natural gas use will place new burdens on the gas storage and delivery infrastructure. In addition, building new pipelines is an expensive, lengthy undertaking that generates intense local opposition.

Most (80 to 90 percent) of the 350 GW of new generating capacity required over the next two decades is expected to be gas-fired. By 2020 an additional 6 Tcf of gas will be required—about 6 Bcf per day. NETL concludes that “even with favorable market conditions for natural gas technologies, there is growing concern that demand could outstrip supply.¹¹ Legitimate concerns exist about the adequacy of the pipeline system not only for interstate transportation, but also for regional and local distribution.”¹²

NETL doubts that technologies will be developed in time to produce new sources of natural gas economically. Investment in R&D by major energy producers is declining, since a competitive energy market has forced the industry to streamline operations and reduce R&D.¹³

Increased Price Volatility

In addition to concerns about future supplies, price volatility is a major problem with using gas to generate electricity. Annual

average prices of natural gas to electric utilities have been extremely volatile, and price fluctuations of 50 to 100 percent have been common. Monthly gas price variations to electric utilities have been even more extreme. In recent years, the monthly price of natural gas has varied by more than 300 percent.

Natural gas prices are likely to remain extremely volatile during the next two decades. This volatility likely will worsen, given the increased demand for natural gas (especially for electricity generation) and tightening supplies. Even more seriously, this volatility will be occurring along a trend line of increasing gas prices. EIA forecasts that natural gas prices will increase as technology fails to offset resource depletion and increased demand, and prices to electricity generators are projected to reach \$4.40/mcf by 2015 (2001 dollars)—equivalent to more than \$6.00/mcf in nominal dollars.

The Economy and Demand Destruction

The energy crises of the 1970s demonstrated the harmful impact on jobs and the economy that natural gas shortages can have. The U.S. economy suffered through recessions, widespread unemployment, inflation, and record-high interest rates. In the winter of 1975-76, unemployment resulting

from gas curtailments in hard-hit regions ran as high as 100,000 for periods lasting from 20 to 90 days.¹⁴ These effects were especially serious for the poor and for the nation's minorities.¹⁵ More recently, the winter of 2002-2003 brought higher natural gas bills to many consumers, and low-income families were especially hard hit.

As Paul Cicio, director of the Industrial Energy Consumers Association, notes: "The economic welfare of our economy, the competitiveness of our industries, the affordability of natural gas for all consumers are at risk. We cannot afford another natural gas crisis. Every U.S. energy crisis in the last 30 years has been followed by an economic recession, and the 2000-2001 price spike was no exception. The energy crisis devastated industrial consumers. When natural gas prices reached \$4/MMBtu, manufacturing began to reduce production and shift production to locations outside the U.S. At even higher prices, they shut down production, laying off employees, and damaging communities. We have arrived at this price threshold."¹⁶

Moreover, two articles last year in *Public Utilities Fortnightly* that addressed natural gas supply, demand, and price issues seemed to confuse the solution with the problem. Robert Linden noted that high gas prices would lead to "demand destruction" in the industrial sector, which would, in part, counterbalance increasing power sector demand.¹⁷ He further stated, "This price-induced demand destruction can be added to the other causes of reduced gas demand, including the closure of industrial facilities using natural gas as a feedstock."¹⁸ Similarly, John Herbert, after noting that high natural gas prices have forced U.S. fertilizer plants to shut down, stated, "As fertilizer and other chemical plants continue to shut down, this will reduce demand for natural gas and increase overall supplies."¹⁹

Both authors are correct in pointing out that high natural gas prices will tend to reduce industrial natural gas demand as industrial plants shut down, and that this will temper future natural gas price increases. However, the "destruction" of the nation's industrial sector is an extremely serious problem for the United States; it is not a "solution" to the natural-gas pricing problem. We should be very concerned with the strongly negative impact high natural gas prices are having on the U.S. industrial sector and the potential implications of this for the U.S. economy.

Despite all of the hype in recent years about the new economy, the information economy, the service economy, etc., manufacturing is, by far, the most critical sector of the U.S. economy, and it creates the broad foundation upon which the rest of the economy grows.²⁰ Manufacturing drives the rest of the economy, provides a disproportionate share of the nation's tax base, generates innovation, and disseminates new technology throughout the economy. The average manufacturing job

creates 4.2 jobs directly and indirectly throughout the economy, whereas the average service and retail job generates about one other job, directly and indirectly.

The manufacturing sector uses 40 percent of the natural gas consumed in the United States, and virtually every manufacturing industry is heavily dependent on natural gas as a fuel, feedstock, and, increasingly, as a source of electricity generation. Price spikes in the cost of natural gas and electricity in the fall of 2000 precipitated the current manufacturing recession. During the past three years, this sector has been severely affected, losing more than 2.5 million jobs.²¹ The current manufacturing recovery is slower than the first year of any recovery in 40 years.²² Manufacturing is suffering from intense global competition and cannot pass through increased energy costs via product price increases.

Reliance on low-cost natural gas has been an often-unrecognized factor in the U.S. manufacturing sector's global competitiveness, and an ample supply of reasonably priced natural gas is critical to its competitiveness. This sector is bearing the brunt of the energy impacts of the natural gas crisis and is suffering from a triple whammy: High natural gas prices are causing industrial electricity prices to increase, the cost of natural gas as a feedstock and fuel is greatly increasing manufacturing costs, and industrial operations are the first to be cut off from natural gas supplies when winter emergencies occur. The natural gas crisis has become a matter of exporting profits and jobs to countries with cheaper natural gas.

Thus, the impact of high natural gas prices is, indeed, to destroy the U.S. industrial sector. However, instead of viewing this as an effect that will serve to moderate future natural gas price increases, this must be viewed as a very serious problem resulting from high natural gas prices. To the extent natural gas demand and prices are being driven by the increasing use of gas for electric power generation, the solution should be to substitute other fuels, such as nuclear and coal in this sector, and not to accept demand destruction in the nation's industrial sector.

The case against natural gas for electricity generation is quite clear. Specifically:

- The use of gas for electricity generation is forecast to more than double by 2025, and, according to both EIA and industry analysts, this demand increase may not be achievable. Natural gas imports are forecast to increase dramatically over the next two decades and, at a time when we are concerned about the nation's increasing dependence on imported oil, America is becoming increasingly dependent on imported natural gas from the same politically unstable regions that contain most of the world's oil supplies.

- The increasing use of gas for electric power generation is placing strains on natural gas supplies and the gas transmission and distribution infrastructure, and this will further hinder the provision of adequate gas supplies.
- This increasing use is causing the price of natural gas to increase and to become more volatile. Increased prices and price volatility are having adverse consequences for natural gas consumers and are resulting in market disruptions. Gas price volatility will likely increase in the future, thus causing further market disruptions
- Natural gas shortages and price volatility can have adverse economic and employment effects, and they can increase U.S. dependence on imported oil.
- High natural gas prices are having a devastating impact on U.S. manufacturing industries, and this should be viewed as the most serious effect of the current (and future) gas crisis. ■

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Endnotes

1. For example, over the past decade, sulfur dioxide emissions have decreased 28 percent, nitrogen oxide emissions have decreased 15 percent, and particulate matter emissions have decreased 13 percent.
2. *Ibid.*, p.2.
3. *Ibid.*, p. 7.
4. EIA forecasts that LNG imports will have to increase more than 13-fold

- by 2025; *Ibid.*, p. 138.
5. Wayne Andrews, "Are U.S. Gas Markets Headed for a Disaster?" Presented at FERC's *In the Matter of Natural Gas Marketers Conference*, Washington, D.C., Oct. 25, 2002.
6. Matthew R. Simmons, "The Natural Gas Outlook: Crisis Ahead?" Presented to the Texas Alliance of Energy Producers, Forth Worth, Texas, May 2002.
7. George Hager, "Crisis Looms as Demand Booms for Natural Gas." *USA Today*, May 31, 2002.
8. Daniel Yergin, et. al. *The Future of North American Gas Supply*, Cambridge Energy Research Associates, September 2000.
9. Quoted in David R. Francis, "Natural Gas Prices Double, But Where's the Furor?" *Christian Science Monitor*, July 16, 2000.
10. National Energy Technology Laboratory, Natural Gas Transmission, Storage, and Delivery Infrastructure Issues, January 2003.
11. National Energy Technology Laboratory, U.S. Energy Security, January 2003.
12. *Ibid.*
13. National Energy Technology Laboratory, Strategic Center for Natural Gas. *Strategic Plan and Policy Support: Economic Issues*, January 2003.
14. U.S. Congress, Office of Technology Assessment. *An Analysis of the Impacts of Projected Natural Gas Curtailments for the Winter of 1975-76*, November 1975.
15. Management Information Services, Inc., *Potential Economic Impacts of the Kyoto Climate Change Protocol on Blacks and Hispanics in the U.S.*, Washington, D.C., June 2000.
16. Paul Cicio, comments at FERC's *In the Matter of Natural Gas Marketers Conference*, pp. 71-72.
17. Robert S. Linden, "Is It Real or Is It Hype," *Public Utilities Fortnightly*, August 2003, p. 33.
18. *Ibid.*
19. John H. Herbert, "Prices Pointing Skyward," *Public Utilities Fortnightly*, August 2003, p. 28.
20. See the succinct discussion in Adam Hersh and Christian Weller, "Does Manufacturing Matter?" *Challenge*, March-April 2003, pp. 59-79.
21. Letter from Michael E. Baroody, executive vice president of the National Association of Manufacturers, to George V. Voinovich, chairman, Subcommittee on Clean Air, Climate Change, and Nuclear Safety of the Senate Environment and Public Works Committee, May 7, 2003.
22. Letter from Michael E. Baroody, executive vice president of the National Association of Manufacturers, to Pete V. Domenici, chairman, Senate Energy and Natural Resources Committee, Feb. 24, 2003.

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