

## Natural Gas Industry Special Report — Through the Eyes of Greenspan

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Recently, in two separate speeches, Federal Reserve Chairman Alan Greenspan voiced concerns about the increasing U.S. reliance on natural gas imports and a shortage in natural gas supplies. In this special report we take a closer look at what exactly it is the Chairman sees. This report is intended to give those who may be unfamiliar with the industry a quick grasp of the “big picture” issues surrounding the natural gas industry.

### Key Considerations:

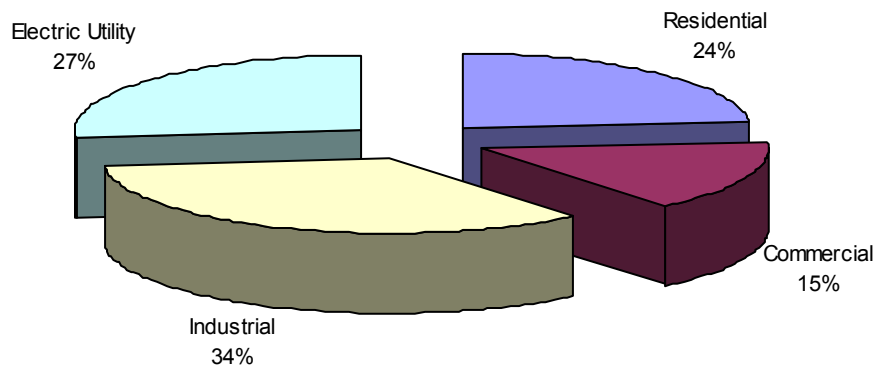
- The U.S. is becoming increasingly reliant on foreign sources for its natural gas and oil supplies
- U.S. and Canadian natural gas reserve lives are much lower relative to the reserve lives of other energy producing nations
- The price of natural gas has trended upwards over the past few years
- Much needed gas supplies are likely to come from Liquefied Natural Gas (LNG) imports and Northern Natural Gas

## Natural Gas — An Introduction

Natural gas was originally formed when various plant and animal substances were trapped beneath the earth under high pressure over millions of years. Most natural gas is delivered from the field to the final consumer by an extensive network of pipelines across North America. Natural gas demand is derived from four main user groups. The first two groups are residential and commercial customers, responsible for about 39% of 2002 demand in the United States. They use natural gas mainly for heating and running certain appliances such as stoves. The third group of customers are industrial users, responsible for about 34% of 2002 consumption, who use natural gas as a feedstock for making other products (such as fertilizers), for heating, for running various equipment, and various other purposes. The final group of consumers are electric utilities, 27% of 2002 demand, who take natural gas and convert it to produce electricity. Natural gas is extracted from the ground and processed by various independent and integrated oil & gas companies. Although most gas consumed in North America is transported by pipeline, a small portion is imported in LNG form. LNG is natural gas which has been super-cooled which allows it to be more easily transported by tanker and truck. Currently, LNG only supplies less than 2% of U.S. consumption though this is projected to increase due to higher natural gas prices, and declining reserves in North America.

Graph 1

Natural Gas Consumption by Sector



Data Source: EIA

## A Global Overview

*“...the United States contains only 1.9% of the world’s oil reserves, yet produces 8.7% of world supply”*

**Table 1** is a summary of the top ten countries in terms of natural gas and oil reserves (natural gas has been converted to a Barrels of Oil Equivalent “BOE” basis using a ratio of 6:1). These ten countries account for almost 80% of the world’s known reserves of oil and natural gas. Saudi Arabia’s importance to the global oil markets is clear from looking at the table, it contains over a fifth of the world’s oil reserves. Canada is second in terms of oil reserves. However, these reserves do not always receive acknowledgement in the oil literature as the reserves are non-conventional, in the form of oil sands. In terms of production, Saudi Arabia, Russia, and the United States are the world’s largest producers. Note that the United States contains only 1.9% of the world’s oil reserves, yet produces 8.7% of world supply. This has led to the U.S. having the shortest reserve life of the top ten countries—11 years.

**Table 1**

World Energy Reserve Summary

	Crude Oil					Natural Gas					BOE	
	Reserves (billions)	% of Total	2002 Production (bbls/d)	% of Total	Reserve Life (YRS)	Reserves (tcf)	% of Total	2001 Production (tcf)	% of Total	Reserve Life (YRS)	Reserves (Billion)	% of Total
Russia	60	4.9%	7,408,000	11.1%	22	1,680	30.5%	20.50	33.8%	82	340	16.0%
Saudi Arabia <sup>4</sup>	262	21.6%	7,634,000	11.4%	94	225	4.1%	1.90	3.1%	118	299	14.1%
Iran	90	7.4%	3,111,000	4.6%	71	812	14.8%	2.20	3.6%	374	225	10.6%
Canada <sup>3</sup>	180	14.8%	2,171,000	3.2%	227	60	1.1%	6.60	10.9%	9	190	8.9%
United Arab Emirates	98	8.1%	2,082,000	3.1%	129	212	3.9%	1.60	2.6%	133	133	6.3%
Iraq	113	9.3%	2,023,000	3.0%	152	110	2.0%	0.10	0.2%	1,096	131	6.1%
Kuwait <sup>4</sup>	97	8.0%	1,894,000	2.8%	140	53	1.0%	0.30	0.5%	155	105	4.9%
Venezuela	78	6.4%	2,606,000	3.9%	82	148	2.7%	1.10	1.8%	132	102	4.8%
Qatar	15	1.3%	679,000	1.0%	61	509	9.2%	1.10	1.8%	446	100	4.7%
United States	22	1.9%	5,817,000	8.7%	11	183	3.3%	19.40	32.0%	9	53	2.5%
<b>World Total</b>	<b>1,213</b>	<b>100.0%</b>	<b>66,916,000</b>	<b>100.0%</b>	<b>50</b>	<b>5,501</b>	<b>100.0%</b>	<b>60.64</b>	<b>100.0%</b>	<b>61</b>	<b>2,130</b>	<b>100.0%</b>

Sources: EIA, Oil & Gas Journal

Highlighted countries are OPEC members

*“The United States contains only 3.3% of the world’s natural gas reserves, yet is responsible for 32% of production leading to a 9 year reserve life!”*

Looking now at the natural gas figures, one is able to begin to see more clearly what Greenspan’s concerns are. The United States contains only 3.3% of the world’s natural gas reserves, yet is responsible for 32% of production leading to a 9 year reserve life! Canada, whom the U.S. relies on for over 90% of its natural gas imports, is in a similar situation. In order to hedge against the shorter reserve lives, and declining domestic production, the U.S. needs alternate sources of natural gas supplies. Many industry reports point to LNG imports and/or building a pipeline from the North (i.e. Alaska and the Northwest Territories) as the answer to the supply problem.

**Natural Gas Supply & Demand**

Table 2 shows U.S. natural gas supply and demand statistics from 1998-2002. U.S. natural gas total uses have exceeded total sources with the shortfall being supplied by imports. Imports have grown from 13.6% of total uses in 1998 to 15.1% of total uses by 2002. Graph 2 illustrates the growth in U.S. natural imports from 1973 to 2002. Natural gas imports have risen rapidly since 1986. Natural gas imports have risen from 1,033 bcf in 1973 to 3,492 bcf by 2002.

**Table 2**

**U.S. Natural Gas Supply & Demand**

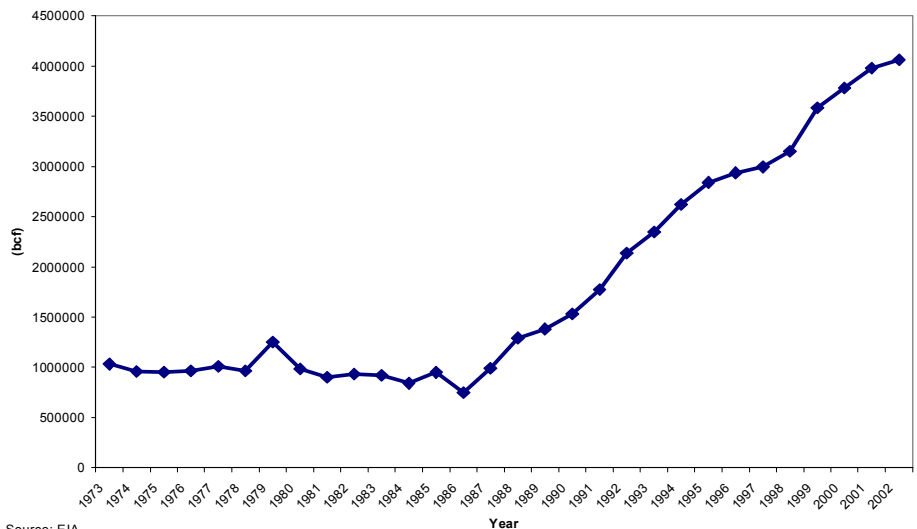
(bcf)

	<b>2002</b>	<b>2001</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>
Consumption	23,066	22,201	23,639	22,516	21,612
Net Storage Injections	-	1,165	-	-	530
<b>Total Uses</b>	<b>23,066</b>	<b>23,366</b>	<b>23,639</b>	<b>22,516</b>	<b>22,142</b>
Production	19,047	19,676	19,182	18,832	19,024
Other	80	86	90	98	102
Net Storage Withdrawals	447	-	829	172	-
<b>Total Sources</b>	<b>19,574</b>	<b>19,762</b>	<b>20,101</b>	<b>19,102</b>	<b>19,126</b>
<b>Imports</b>	<b>3,492</b>	<b>3,604</b>	<b>3,538</b>	<b>3,414</b>	<b>3,016</b>
<b>Import / Uses (%)</b>	<b>15.1%</b>	<b>15.4%</b>	<b>15.0%</b>	<b>15.2%</b>	<b>13.6%</b>

Source: EIA

**Graph 2**

**U.S. Natural Gas Imports**

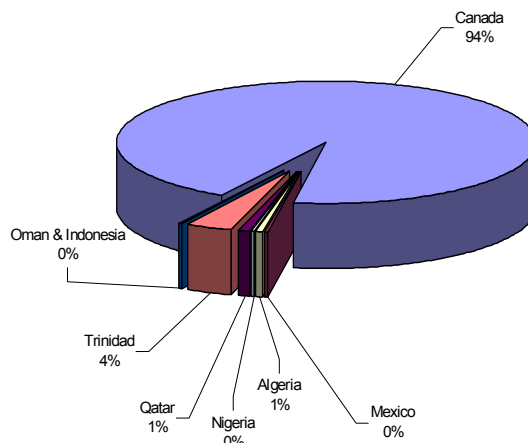


Source: EIA

**Profile of U.S. Imports**

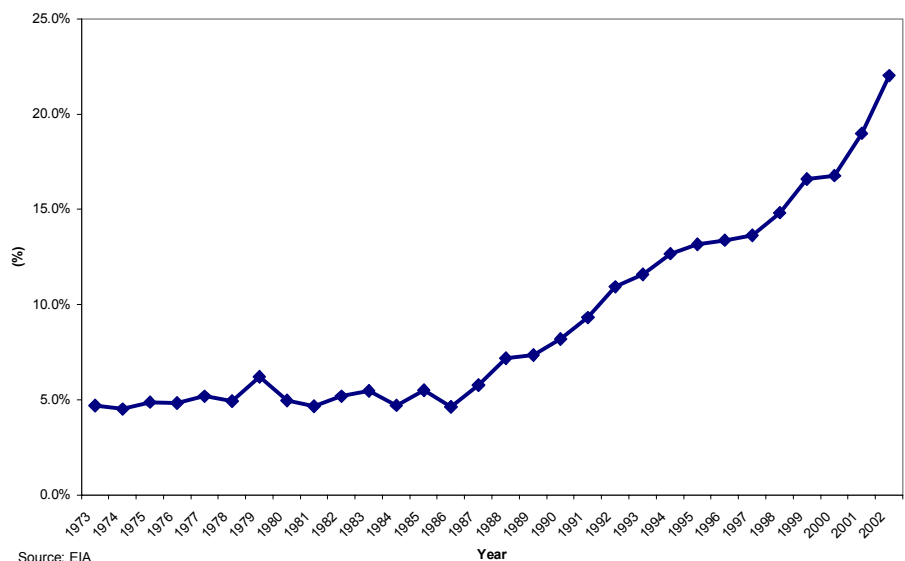
In the past, security concerns and the higher cost of LNG operations meant that natural gas could only be transported economically by pipeline. Therefore, unlike oil where large volumes are imported by tanker, the majority of U.S. natural gas imports come from Canada as Graph 3 illustrates. Since 1973, Canada has been responsible for about 94% of U.S. natural gas imports. In 1973, the U.S. imported only about 5% of its gas needs, today, as Graph 4 shows, that figure has grown to almost 20%!

**Graph 3** U.S. Natural Gas Imports by Source



Source: EIA

**Graph 4** U.S. Natural Gas Imports to Consumption

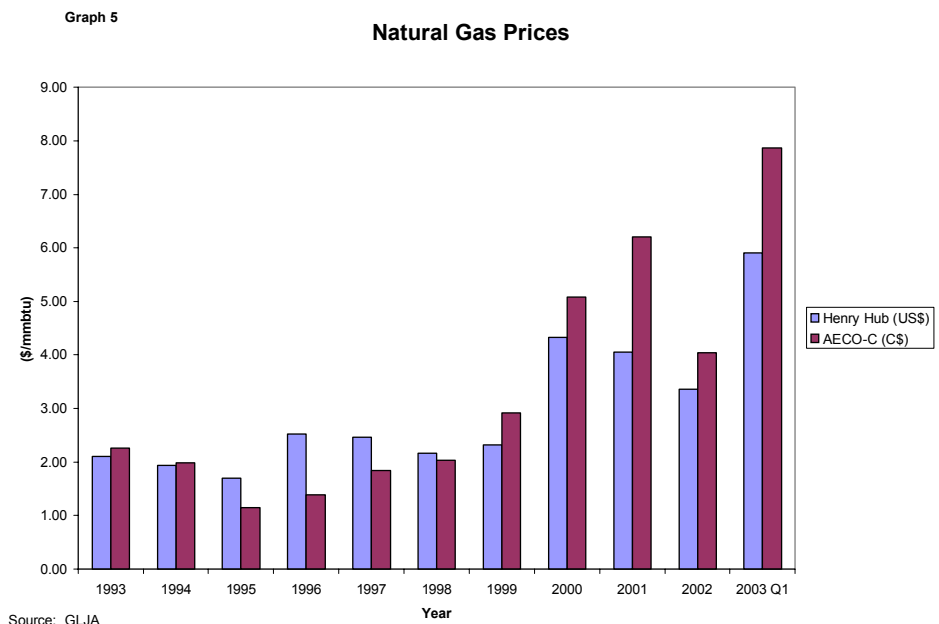


Source: EIA

So far we have established that large U.S. demand for natural gas has caused it to: a) produce a large amount relative to its reserve base leading to a low reserve life (9 years) compared to other nations, and b) the U.S. is increasingly reliant on Canada, which is in a similar situation in terms of reserve life, to supply it with natural gas. Next we look at how the tight supply/demand situation is reflected in natural gas prices.

## Natural Gas Prices

Due to the fact that natural gas is currently only transported in any significant quantities by pipeline, the market is regional for the most part. There is no OPEC equivalent group influencing North American natural gas prices. The benchmark prices for natural gas are Henry Hub in the United States and AECO-C in Canada. As Graph 5 shows, natural gas prices have increased noticeably in recent years; most likely reflecting the tight supply situation.



We believe that it is these high prices, together with the low reserve lives in Canada and the U.S., combined with the increasing reliance on imports which is worrying Alan Greenspan. Furthermore, as all the “easy” reserves have been developed, companies are facing increasing finding and development costs further contributing to the high prices.

## Greenspan's Comments

In two recent speech's, Federal Reserve Chairman Alan Greenspan expressed concerns about the natural gas situation in the United States. On May 23, 2003, before the Joint Economic Committee of the U.S. Congress, and again on June 10, 2003, before the U.S. House of Representatives Energy and Commerce Committee. Below are some excerpts from his testimony:

May 21, 2003

"...prices for natural gas have increased sharply in response to very tight supplies. Working gas in storage is presently at extremely low levels, and the normal seasonal rebuilding of these inventories seems to be behind the typical schedule. The colder-than-average winter played a role in producing today's tight supply situation as did the inability of heightened gas well drilling to significantly augment net marketed production. Canada, our major source of gas imports, has little room to expand shipments to the United States. Our limited capacity to import liquefied natural gas effectively restricts our access to the world's abundant supplies of natural gas. The current tight domestic natural gas market reflects the increases in demand over the past two decades. That demand has been spurred by myriad new uses for natural gas in industry and by the increased use of natural gas as a clean-burning source of electric power."

June 10, 2003

- Our inability to increase imports to close a modest gap between North American demand and production (a gap we can almost always close in oil) is largely responsible for the marked rise in natural gas prices over the past year
- rising demand for natural gas, especially as a clean-burning source of electric power, is pressing against a supply essentially restricted to North American production.
- Since 1985, natural gas has gradually increased its share of total energy use and is projected by the Energy Information Administration to gain share over the next quarter century
- improving technologies have also increased the depletion rate of newly discovered gas reservoirs, placing a strain on supply
- the long-term equilibrium price for natural gas in the United States has risen persistently...from...\$2 per million Btu to more than \$4.50
- Access to world natural gas supplies will require a major expansion of LNG terminal import capacity.
- a major expansion of U.S. import capability appears to be under way. These movements bode well for widespread natural gas availability in North America in the years ahead.

## Solutions: LNG & Northern Gas

Two possible solutions for the natural gas supply problems currently facing the U.S. are the development of a larger LNG import capacity, and the construction of a pipeline which would deliver gas from the Northern Canadian Territories and Alaska. Some industry reports suggest that LNG is economical if natural gas prices remain above \$3.50 per mmbtu. That would certainly make it economical at today's prices. Currently, there are only four LNG import terminals in the United States, all along the East Coast. There is a fifth export terminal located in Alaska which exports LNG to Japan. About 15 LNG projects have been announced in the past couple of years. Many sources predict that LNG will account for 10% of U.S. supplies by 2010. Although we do not review the LNG market in detail in this report, Table 3 lists some companies which have recently announced some type of LNG project though the list is by no means comprehensive or exhaustive:

**Table 3: Companies with Announced LNG Projects**

Company	Symbol	Project/Location	Target Date
Marathon Oil	NYSE: MRO	Tijuana/California, Atlantic	2005+
British Gas	NYSE: BRG	Various	Various
Golar LNG	NASD: GLNG	Owms fleet of LNG tankers, involved in Marathon project	N/A
Shell	RDAS	Various	Various
Cheniere	AMEX: LNG	Various projects in Texas	Various
ChevronTexaco	NYSE: CVX	California, Gulf of Mexico	2007+
El Paso	NYSE: EP	Various (owns the Elba Island import terminal in GA)	Various
Irving Oil/Chevron Canada	Private	East Cost of Canada	N/A
Access Northeast Energy Inc.	N/A	Nova Scotia (financed by ARC Financial Corp.)	N/A

Sources: EIA, Companies, Industry Reports

In terms of building a pipeline to bring gas from the North, there are three competing routes all connecting to existing infrastructure in British Columbia or Alberta. The first would tap the natural gas reserves in Prudhoe Bay, Alaska, and would run through Alaska. The second will receive gas produced in the Mackenzie Valley (in the Canadian Northwest Territories, "NWT"), and through the NWT eventually connecting to pipelines in Alberta. The third route, "Over the Top", is a plan to build a pipeline connecting the two areas. The second route is by far the cheapest and is proposed by Imperial Oil (TSX: IMO), ConocoPhillips (NYSE: COP) Canada, Shell Canada (TSX: SHC), Exxon Mobil (NYSE: XOM), and TransCanada Pipelines (TSX: TRP). The group recently announced that it had come to an agreement on funding issues, and has submitted a Preliminary Information Package to regulators with formal applications to follow in 2004. The pipeline is expected to cost C\$5 billion, and will have throughput capacity of about 1 billion cf/d of natural gas.

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