



PRESENTATION MADE BY LORI SMITH SCHELL, Ph.D.,
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“IMPACT ON GLOBAL LNG MARKETS OF BALANCING THE
NORTH AMERICAN NATURAL GAS MARKET”

INTRODUCTION

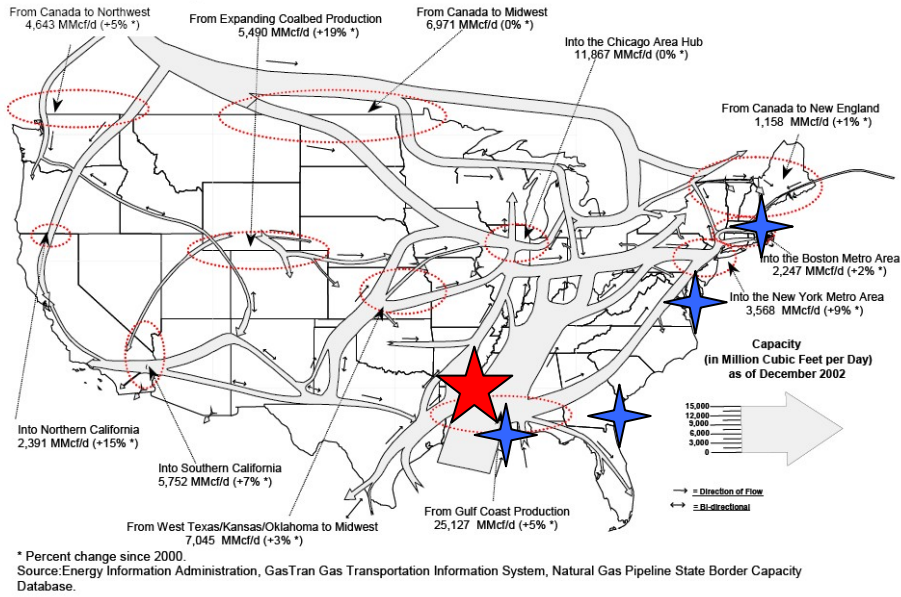
Good afternoon, Honorable Ministers and Fellow Delegates. I would like to thank the World Petroleum Council for the opportunity to make this presentation to the 18th World Petroleum Congress.

My purpose today is twofold. First, I will assess the potential for aggressive growth in LNG imports into the North American natural gas market, as currently forecast by many parties. Second, I will also assess the impacts of such growth both on global LNG markets and on the North American natural gas market within the context of existing market, regulatory, and geopolitical constraints.

CHARACTERISTICS OF THE NORTH AMERICAN NATURAL GAS MARKET

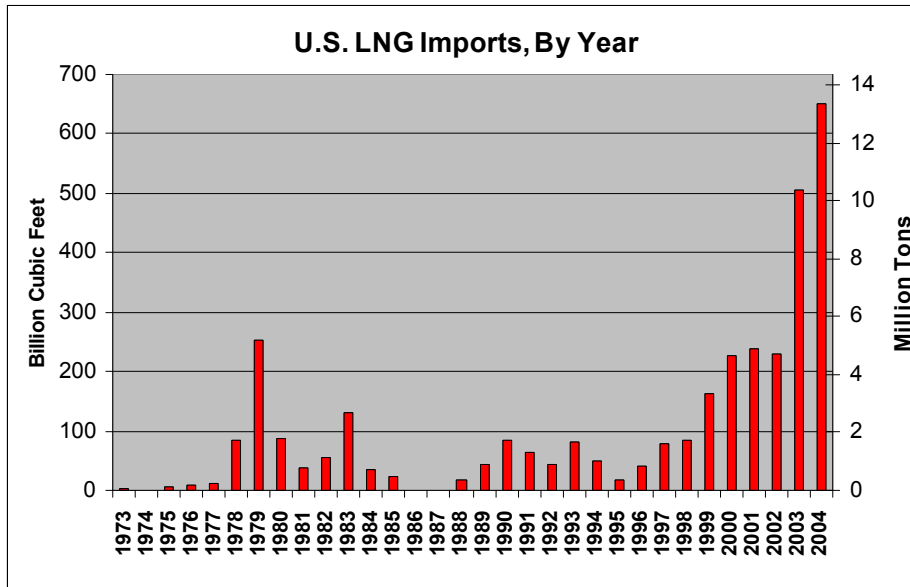
The North American natural gas market is characterized by net north-to-south flows, as shown in Graph 1: Net Canadian imports supply about 15 percent of total U.S. natural gas consumption. The U.S. exports the equivalent of about 2 percent of its total natural gas production to Mexico, meeting about 18 percent of total Mexican natural gas requirements in 2004.

LNG imports into the U.S. in 2004 supplied almost 3 percent of total U.S. natural gas consumption through four terminals, the locations of which are indicated by the blue stars in Graph 1. LNG imports began in the U.S. through those same four terminals in the 1970s during regulatory-induced natural gas “shortages.” Subsequent regulatory and legislative changes led to the so-called “gas bubble” of the 1980s, when an excess of North American natural gas supplies reduced the need for (and economics of) LNG imports; three of the four LNG import terminals in the U.S. were mothballed until the



Graph 1.

supply situation began to tighten again in the 1990s. Graph 2 shows the history of LNG imports into the U.S., and clearly illustrates the near tripling of LNG imports over the past three years. This growth in the level of LNG imports has been accomplished through capacity expansions at the existing four re-gasification terminals.



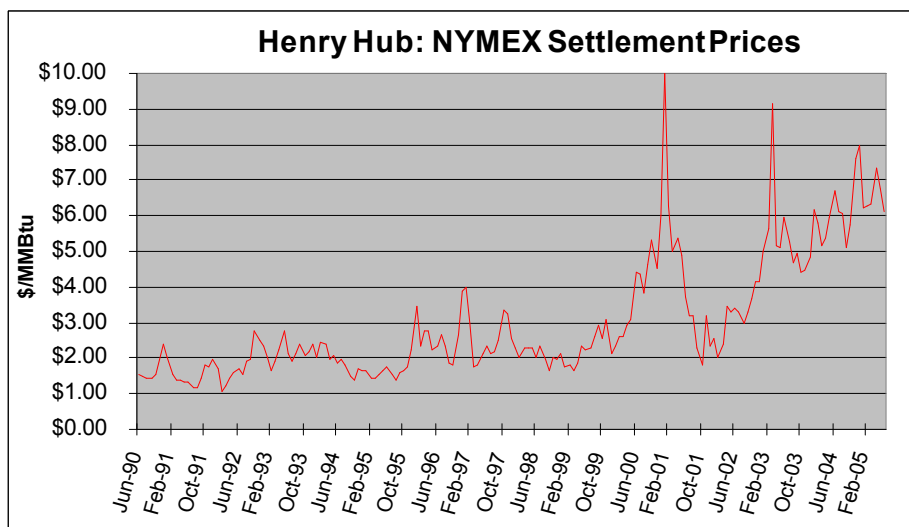
Graph 2.

The LNG receiving terminals in the 1970s were built by the interstate natural gas pipelines, entities that were and continue to be regulated at the federal level by the

Federal Energy Regulatory Commission, commonly referred to as the “FERC.” Prior to 1985, the interstate pipelines purchased natural gas directly from producers, transported the gas through the pipeline network and sold it as a bundled product to local distribution companies for ultimate delivery to customers. Starting in 1985, the FERC issued a series of orders that ultimately forced the interstate pipelines out of the natural gas merchant business and turned them into open-access transporters. Open-access transportation is the North American equivalent to third-party access in Europe.

The separation of natural gas sales from natural gas transportation gave rise to natural gas marketing as a whole new market segment. Although highly fragmented at first, subsequent consolidation led to the rise in the 1990s of seemingly monolithic companies such as the now-defunct Enron.

The rise of the natural gas marketing segment was accompanied and enabled by the development of an increasingly vibrant natural gas spot market. In 1990, the New York Mercantile Exchange (“NYMEX”) introduced a monthly natural gas futures contract with a notional volume of 10,000 MMBtu (the equivalent of 278 m3). The NYMEX futures contract is deliverable at the Henry Hub, onshore Louisiana (indicated by the red star in Graph 1), though most contracts are settled on a financial basis and never actually go to delivery. The NYMEX futures contract has become the dominant price reference in North American natural gas markets; the history of the NYMEX natural gas futures price contract is shown in Graph 3.



Graph 3.

- The relative calm of the 1990s was shattered in the winter of 2000-2001, when natural gas futures prices spiked to over \$10.00/MMBtu. This was the result of an early and very cold winter that led to a rapid drawdown of storage levels early in the storage withdrawal season.

- The first run-up in natural gas prices was followed by an equally rapid return of prices to historical levels, giving comfort to some that the price run-up was an anomaly that was not likely to be repeated.
- However, longer-term and historically high prices subsequent to the second price run-up (peaking in March 2003) have convinced many that North American natural gas markets have undergone a fundamental paradigm shift. Futures prices in 2005 have ranged from \$6.00-\$8.60/MMBtu on a rolling 12-month basis, with yesterday's NYMEX 12-month strip settling at nearly \$12.00/MMBtu.

The upward shift in long-term natural gas prices in North America has led to substantial interest in LNG, with nearly 60 new LNG import terminals under discussion. With landed LNG costs in North America estimated to be \$2.50-\$3.50/MMBtu, many see aggressive growth in LNG imports as a cure-all for increasing decline rates, higher drilling costs, and the risks (and costs) associated with increasingly remote production areas (such as the deep-water Gulf of Mexico). A dozen new LNG re-gasification terminals could increase North American LNG imports to as much as 15 percent of total consumption by 2015. Given the size of the North American natural gas market in absolute terms, this would approach the equivalent of the actual 2004 LNG imports of Japan, South Korea, and Spain *combined*, and would result in significant competition for global LNG supplies.

SITING AND JURISDICTIONAL ISSUES

Siting for new LNG terminals is being driven by proximity (i) to population centers located far from producing areas and (ii) to those areas most amenable to the onshore pipeline expansions required to increase take-away capacity. Thus, LNG import terminals have been proposed in the Northeastern U.S. and southeastern Canada, in southern California on the Pacific Coast, and along the heavily industrialized Gulf of Mexico (where more than 20 projects have been suggested). It will be interesting to see what impact the effects of Hurricanes Katrina and Rita will have on the debate over siting of prospective LNG terminals along the Gulf Coast.

A significant factor that is already slowing aggressive growth in LNG imports into North America is public opposition to siting of LNG receiving terminals. This is a particularly sensitive issue for the U.S. in a post-9/11 world where reliance on foreign energy sources and fears of terrorism against domestic energy infrastructure are foremost in many peoples' minds. Opposition is raised by "NIMBYs," who object to local siting of LNG receiving terminals by saying "not in my back yard," and by "BANANAs," those who object more broadly by saying "build absolutely nothing anywhere nor anytime."

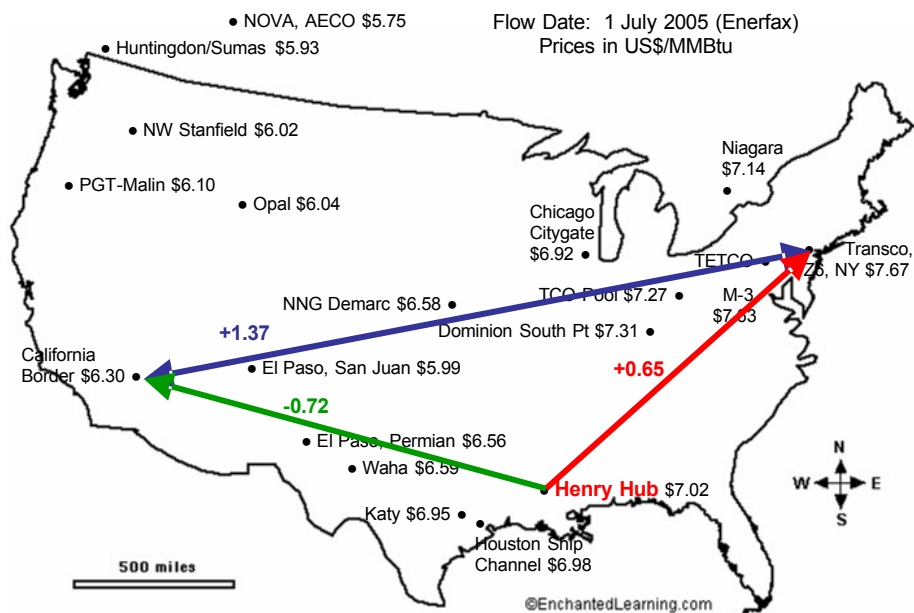
The FERC has jurisdiction over the onshore pipelines and storage facilities required to deliver and manage flows of re-gasified LNG to consumer markets. Issues of bottlenecks in onshore take-away capacity cannot be ignored. However, challenges have been raised

in the regulatory arena over who has ultimate jurisdiction over approval of the actual LNG terminals. The debate has been most heated in California, which has asserted jurisdiction in lieu of the FERC.¹ One consequence of such regulatory uncertainty is the move towards development of offshore LNG re-gasification facilities, whose geographic locations puts them outside of FERC jurisdiction. A price example of this is the Gulf Gateway Deepwater Port facility owned by Exceleerate Energy. This facility, which started operations in February 2005, is located in the Gulf of Mexico, nearly 120 kilometers (116 miles) offshore Louisiana.

INTEGRATED PRICING THROUGHOUT NORTH AMERICA

The integrated nature of the North American natural gas market is critical to understanding how increased imports of LNG will affect market prices. Extending nearly 5000 kilometers from coast to coast, natural gas pricing throughout the North American market is highly rationalized; any pricing anomalies are quickly arbitrated out of the system. Almost all natural gas purchases, including LNG imports, are somehow linked to NYMEX pricing at the Henry Hub, onshore Louisiana. (Note this significant difference from LNG pricing elsewhere in the world, which tends to be linked to global oil prices.) Using recent spot market prices, Graph 4 illustrates how natural gas prices can be “triangulated” between any three points in North America:

“Basis” Is Continually Rationalized Across North America



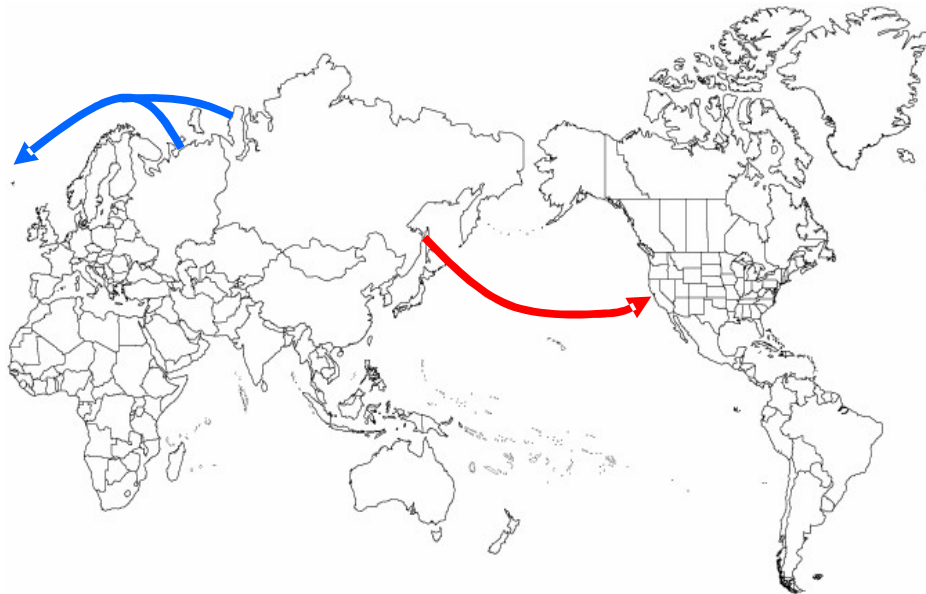
Graph 4.

¹ In addition, there are other federal level approvals required from the U.S. Coast Guard and the U.S. Army Corps of Engineers.

Such a rationalization of transportation differentials can be expected to develop in regional LNG markets as the number of spot LNG cargoes increases, with each cargo seeking its most profitable market. The role of the North American market as a huge demand sink should effectively maintain two distinct LNG markets, in the Atlantic Basin and in the Pacific Basin; I believe that this effect will be strengthened in proportion to the number of LNG receiving terminals built along the Pacific Coast.

Globally, proven natural gas reserves (158.2 thousand million tonnes of oil equivalent) slightly exceed proven oil reserves in size (156.7 thousand million tonnes).² The top three natural gas reserve holders (Russia, Iran, and Qatar) together hold 57 percent of total proven reserves, making holdings of natural gas reserves even more concentrated than those of oil reserves. (Saudi Arabia, Iran, and Iraq together account for “only” 44 percent of total oil reserves.)

RUSSIAN POTENTIAL: LNG to Both the Atlantic and Pacific



Graph 5.

Russia's ownership of nearly 27 percent of the globe's proven natural gas reserves is proportionally *greater* than Saudi Arabia's ownership of 23 percent of proven oil reserves. Russia has the potential to become a dominant LNG supplier, with the location of its natural gas reserves along its extensive coastline providing ready access to both the Pacific and Atlantic Basins, as seen in Graph 5. Russia could thus enhance its current dominance in providing pipeline supplies of natural gas throughout Europe and Eurasia with significant LNG exports. LNG imports into North America from Russia would have

² International energy statistics throughout this presentation are derived from “BP Statistical Review of World Energy,” June 2004.

the advantage of diversifying North American energy supplies geographically, though the relationship between Moscow and Washington has not been without its own tensions.

NATURAL GAS: A FUEL OF CHOICE

One major difference between natural gas markets and petroleum product markets is that natural gas markets are often driven by economic choice, rather than by necessity as is often the case with petroleum products (especially in the transportation sector).³ The captive nature of many petroleum product markets undoubtedly contributes to the impetus for oil exporting nations to maximize domestic use of natural gas in order to maximize oil exports. The captive nature of oil markets may also contribute to potential LNG exporters looking more closely at gas-to-liquids production as an alternative to LNG exports. In either case, increased export markets for what have until recently been stranded natural gas supplies should result in environmental benefits due to reduced amounts of natural gas being flared.

The Kyoto Protocol, which calls for reduced amounts of greenhouse gas emissions from 2008-2012, should provide additional impetus to LNG markets that will be rapidly expanding during the same time period. Although the United States is not a signatory to the Kyoto Protocol, in recent years an increasingly large number of states have voluntarily established Renewable Portfolio Standards to encourage the use of renewable fuel in electricity generation. In an ironic twist, to the extent that aggressive LNG imports into North America result in lower natural gas prices, the economics of renewable energy will become less favorable, making it more costly (and, hence, more difficult) to achieve the established Renewable Portfolio Standard thresholds. This illustrates the inter-related nature of all energy markets. The impact of the market for one energy source on the markets for all other energy sources is overlooked less often today than previously. Arguably, a single-minded emphasis on increased natural gas, especially for electricity generation in the 1980s and 1990s, has been a major factor contributing to the energy “crisis” that faces North America today. One benefit of today’s high price environment is that a broader spectrum of energy supplies is now being seriously considered almost universally, resulting in renewable solar energy development even in oil- and gas-rich countries such as Algeria, as we heard yesterday.

THE ROLE OF RELATIVE LEVELS OF INDIGENOUS ENERGY SUPPLIES

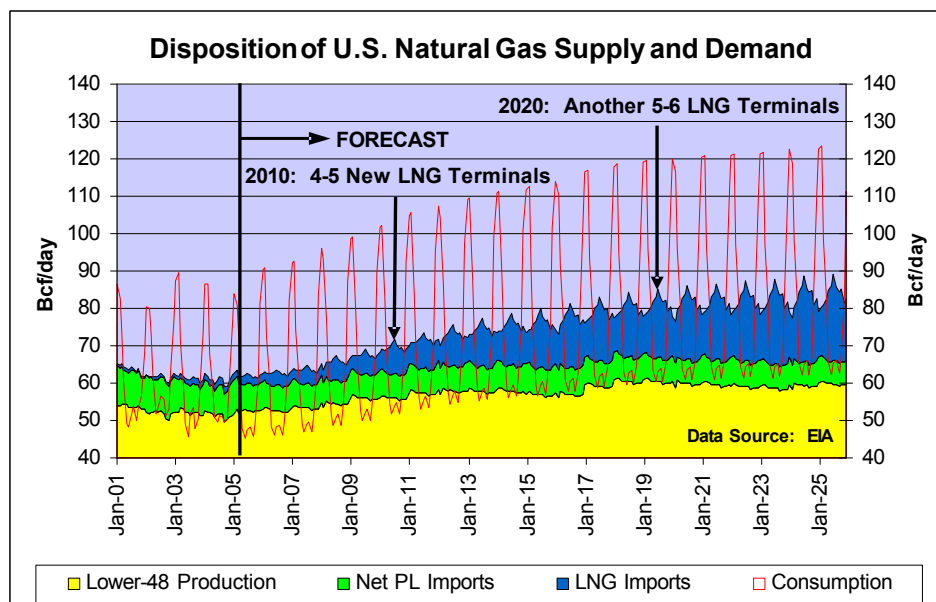
It is important to consider indigenous energy supplies when assessing the intensity of competition for LNG imports. Although the North American LNG import market is potentially huge in absolute terms, North America is relatively blessed in terms of energy resources when compared with many other LNG-importing countries. The recently passed energy policy legislation in the U.S. provides incentives to encourage utilization of abundant indigenous coal reserves using clean coal technologies, which may offset

³ Clegg, Michael, “Introduction,” p. 3 in *The Future of Natural Gas in the World Energy Market*, 2001, The Emirates Center for Strategic Studies and Research, Abu Dhabi, United Arab Emirates.

some of the demand for LNG imports. On a percentage basis, North America's consumption of primary energy (including hydroelectricity and nuclear energy) in 2003 exceeded its supply of primary energy by 20 percent. In comparison, the primary energy consumption of the two largest LNG importers (Japan and South Korea) exceeded their primary energy production by over 500 percent; for Spain, the third largest LNG importer, the excess was over 350 percent. China's 2003 deficit of primary energy production versus consumption was relatively small at less than 10 percent, though an annual growth rate in primary energy consumption in excess of 10 percent will soon push China's deficit into double and triple digits on a percentage basis. Although India's annual growth rate in primary energy consumption has been about half that of China's, India's primary energy production deficit was already 35 percent in 2003 and its primary energy resource base is significantly smaller than China's.

FORECAST OF U.S. NATURAL GAS AND LNG SUPPLY AND DEMAND

So what is the prognosis for LNG imports into the North American natural gas market? Graph 6 is based on the U.S. Energy Information Administration's most-recent long-term natural gas forecast for the United States. Based on this forecast, about a dozen new LNG receiving facilities would be required just to meet the forecast quantity of natural gas demanded by the year 2025. U.S. natural gas consumption is currently forecast to achieve a 30 Tcf (~85,000 MM m3) market in about 2020. I should note, however, that reaching the "magic" level of a 30 Tcf market has proven to be a moving target over the last 10-15 years, with the date it is to be achieved moving ever farther into the future. Notably, this latest forecast does not incorporate the demand response that will result from the current extremely high price levels.



Graph 6.

Whatever the ultimate growth rate in North American natural gas consumption, its interaction with declining U.S. and Canadian production will result in LNG becoming a much larger force in the North American natural gas market over the next 15-20 years. The North American market will face strong competition from other areas of the world for LNG supplies. The fact that many of the countries competing for LNG have far fewer indigenous energy alternatives than North America means that global competition for LNG will become an increasingly powerful force in global geopolitics. There is no doubt that LNG will become an increasingly important component of North America's energy portfolio. However, the over exuberant outlook held by many for almost unlimited increases in North American LNG imports will be tempered by three realities: (1) The relative energy wealth of North America compared to many other LNG-importing regions; (2) the increasingly strong desire (particularly in the United States) to reduce dependence on foreign energy supplies; and, (3) the tendency to overestimate long-term growth in energy consumption. LNG imports into North America will be an important, though (I believe) infra-marginal, energy supply source for the foreseeable future, with my best guess being that only 7-9 new LNG re-gasification terminals will be built prior to 2020.