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**LNG the Growing Alternative
Emergence of a US Market
& the Role of Qatar as an International LNG Hub**

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Basic Facts

Global natural gas reserves are abundant (estimated at 5,500 trillion cubic feet or roughly 60 times the volume of natural gas used in 2003);

Unfortunately, much of this gas volume is considered “stranded” as it is located in areas geographically distant from major consuming areas. In some cases, overland piping of gas is economic, but in order to access geographically distant markets liquefying the gas and shipping it around the world is becoming an increasingly attractive option. In addition, costs for producing and delivering LNG to the US have declined in recent years at a time when domestic gas prices have been rising. LNG can generally be produced and delivered to the US market for less than \$3.50 per million btu;

Russia (31%), Iran (15%) and Qatar (9%) collectively hold over half of all global proven gas reserves. The FSU and the Middle East combined account for over 70% of world gas reserves;

Gas is widely viewed as an environmentally preferred fuel (especially for industrial use, electricity generation and heating/cooling) so demand for natural gas is expected to substantially increase in the decades ahead, displacing global demand for coal as the second leading energy form. The IEA projects gas demand to increase from 23% (2000) to 28% by 2030. EIA forecasts US conventional gas production will be able to meet less than 40% of US demand in 2025 (down from over 50% in 2002) and that the bulk of US demand will be met by gas from unconventional sources (coal bed methane, tight sands and shale), natural gas from Alaska (assuming a new pipeline is built) and increasingly from LNG imports;

Not surprisingly, the growth in world LNG trade is driven by a combination of increasing demand and declining domestic resources in gas consuming countries and by the desire of gas producers to commercialize their resource;

In 2002, 12 countries (Algeria, Libya, Qatar, Nigeria, UAE, Oman, Australia, Brunei, Indonesia, Malaysia, the US and Trinidad & Tobago) shipped 5.4 Trillion cubic feet (tcf) to about the same number of countries worldwide;

Three additional exporters (Russia, Norway and Egypt – with a third of global reserves) are currently constructing liquefaction facilities;

There are at least 7 additional potential exporters (Iran, Yemen, Equatorial Guinea, Angola, Venezuela, Bolivia and Peru) waiting in the wings;

The continental US imported about 230 Billion cubic feet (4.8 million tons) of LNG in 2002 (roughly 4% of world totals), but 2003 imports were expected to double to 550 Bcf (11 million tons) or about 2% of total US gas consumption; EIA projects that LNG imports will increase to 2.2 tcf in 2010 (representing some 8% of US gas consumption) and to 4.8 tcf in 2025;

Although LNG is widely viewed as a global commodity, there currently are two distinct market areas – the Atlantic and Pacific basins. The Pacific Basin includes LNG trade along the Pacific Rim (including Alaska) and in South Asia, including India. The Atlantic Basin includes activity/trade in Europe, Africa and the western Hemisphere (exclusive of Alaska's Pacific Ocean terminal);

The Pacific Basin is the world's largest LNG producing region, supplying nearly half of all global exports in 2002. Indonesia supplied some 21%; the Middle East, led by Qatar, exported 23%. Algeria led the way in Atlantic basin exports;

Three countries in the Pacific basin – Japan, South Korea and Taiwan – accounted for over 2/3 of global LNG imports in 2002; Seven European countries received 28% of imports, while the US imported the remaining 4%;

LNG trade has evolved differently in the two market basins. This evolution has affected pricing, contract terms, import volumes and trade. For example, Pacific basin importers are almost totally dependent on LNG imports to meet domestic gas needs, Atlantic basin customers generally have substantial domestic supplies and rely on pipeline imports as well as LNG shipments. Gas usage also differs;

In Asia, LNG prices are generally linked to imported crude; In Europe, LNG pricing has historically been linked to competing fuel prices, such as low sulfur resid although that is changing. In the US, the competing fuel is pipeline gas and the benchmark price is either the Henry Hub price or long-term contract prices in specific markets.

It is worth noting, however, that the rapid growth in Middle East LNG supply may ultimately lead to a convergence in pricing between the two basins. To date, the volume of LNG flowing from the region in to the Atlantic basin has been relatively small, but several ME projects are targeting European and North American markets. Additionally, if LNG import terminal are constructed on the North American west coast, Pacific Basin suppliers could gain greater access to the US market.

The Projected US Market

The US is both an importer and exporter of LNG. LNG has been exported from Alaska to Japan for the past 30 years. While Algeria has historically been the US' largest supplier of LNG, in the past few years it has been overtaken by Trinidad and Tobago, which now accounts for 2/3 of the nation's LNG imports. In addition to imports from Trinidad and Tobago and Algeria, the US also receives LNG cargoes from Brunei, Malaysia, Nigeria, Oman and Qatar.

As a consequence of growing gas demand, higher prices and limited supply options, renewed interest in US LNG imports has again surfaced. To date, more than 30 new LNG projects have been announced for North America with facilities proposed for a variety of sites along the east coast from Nova Scotia to Florida, in the Bahamas, along the Gulf Coast from Alabama to Mexico and along the west coast from Alaska to the Baja in Mexico.

While most observers believe that only a portion of these proposals will ever be realized, projections for somewhere between 5 and 10 new facilities are not uncommon. The questions are where, when and at what cost.

Recent Market Changes and Trends

Traditional LNG contracts focused on long term security of supply for buyers, but increasingly contract terms have become more flexible and include short term arrangements. This has obvious plusses and minuses for buyers and sellers, especially as companies consider significant new investments in facilities; Short term/spot cargoes work well in situations where facilities have spare capacity, but not when capacity is constrained;

Although LNG project costs remain expensive, industry costs have been declining in recent years in virtually all areas of the LNG delivery chain. The result of these improvements is that the overall cost of LNG delivery has been reduced by about 30% in the last 20 years.

Costs for LNG systems are generally grouped around 4 major categories:

Gas production activity, representing 15-20% of total costs, but declining with advancements in extraction technology;

LNG plant costs for gas treatment, liquefaction, LPG and condensate recovery, LNG loading and storage – 30-45% of total cost. According to the Gas Technology Institute (GTI), liquefaction costs have decreased by 35-50% in the last ten years, although still remain in the \$1-2 billion range;

LNG shipping costs, which represent 10 to 30% of the total- these have also been in decline with tanker construction costs dropping from \$280 million in the mid-1980s to \$155 million in 2003.

Receiving Terminal costs, including unloading, storage, regasification and distribution (account for 15-25% of cost); depending on size and location can range from \$100 million to \$2 billion for state of the art complex in Japan.

This All Adds Up To A Bright Future, But Challenges Remain:

Investment and Financing – Requires huge capital outlays and long lead times in what is still an uncertain market (duration of fuel/facility as energy bridge or long term fuel of choice, price, environment, competitive fuel choices, etc.); note: additional LNG supplies could actually reduce domestic gas prices, making future projects more difficult to finance;

Regulatory Hurdles – from siting and permitting of new facilities to environmental, price regulation and safety restrictions imposed by homeland security and local communities; Despite extraordinary track record on safety, residents of communities where LNG facilities and tankers are proposed are still leery of safety concerns, especially with respect to the facilities being terrorist targets – local communities recently forced abandonment of proposed projects outside of Oxnard, California and in Harpswell, Maine and Mobile Bay, Alabama;

Policy Questions on Import Dependence: Current US oil import dependence is largely a function of our love affair with the car and transport needs; question remains on the merits of increasing reliance on imported energy forms to fuel the nation's electric power generation needs – especially if supply sources are from a region perceived as politically unstable or inhospitable to US interests.

Concerns over price volatility - in the event of an LNG OPEC - also must be taken into consideration. Would we be better advised to spend some of the IEA projected \$16 trillion in new energy investment to develop clean coal technology for power generation or more efficient electricity delivery systems (currently takes 3-4 units of primary energy to produce 1 unit of electricity)?