Proposed LNG Terminals Mask a Cloudy Near Term Supply Outlook

by
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The U. S. relies on imports of natural gas to meet annual natural gas demand, both pipeline imports (principally from Canada) and LNG imports through 4 regasification terminals located in the contiguous lower 48 states (Figures 1 & 2). As a result of the anticipated growing international trade in liquefied natural gas, the U. S. has experienced a large number of filings for new regasification terminals. This brief overview addresses a few of the key geopolitical and economic issues that may diminish the nation's ability to fully utilize these proposed terminals.

Figure 1. U. S. Natural Gas Demand Outstrips Domestic Supply

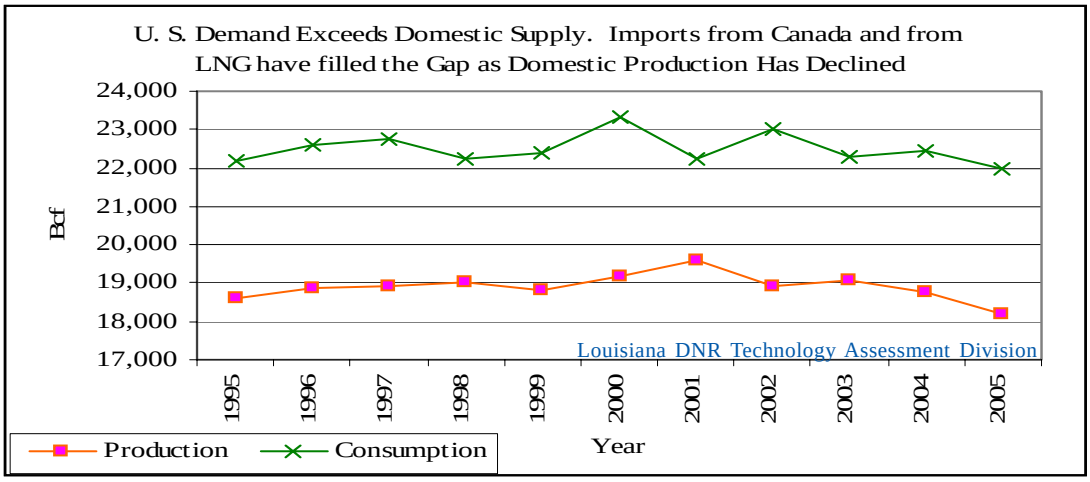
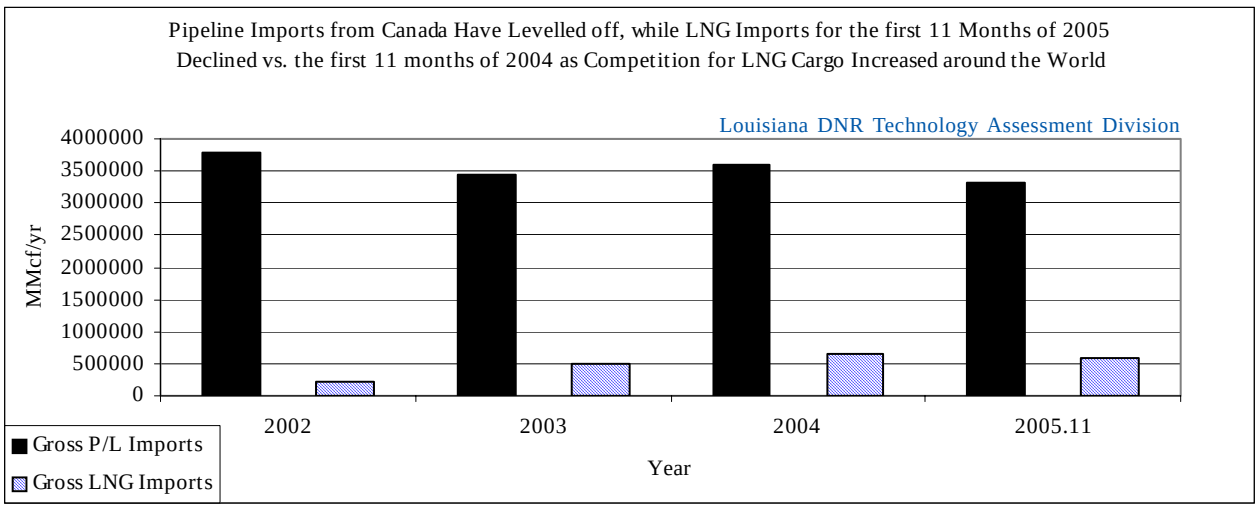
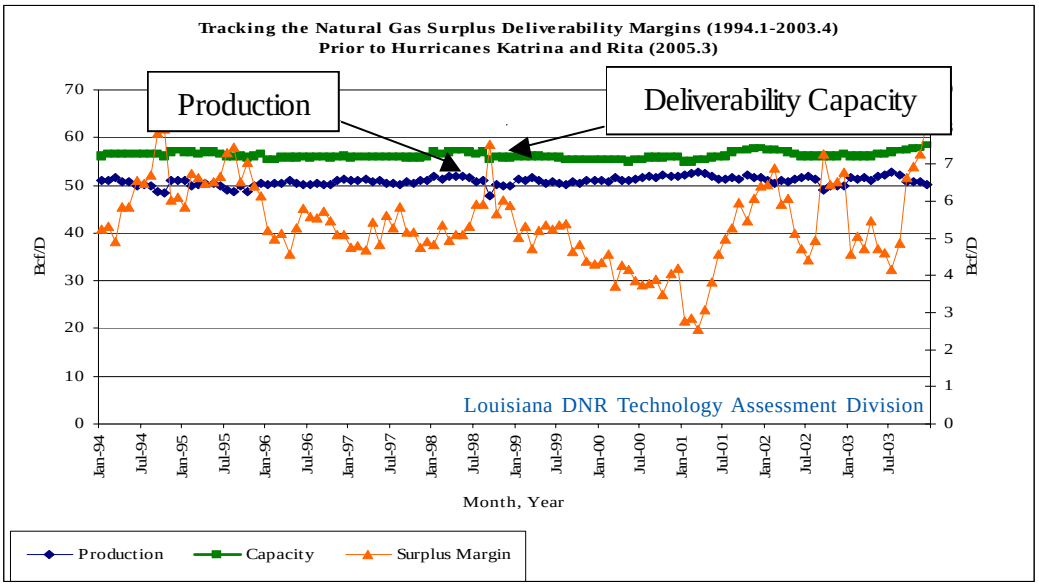


Figure 2. Pipeline Exports from Canada are Slowing as Internal Canadian Consumption Grows and Global Competition is Escalating for LNG Imports, Increasing U. S. Competition for Gas Supply



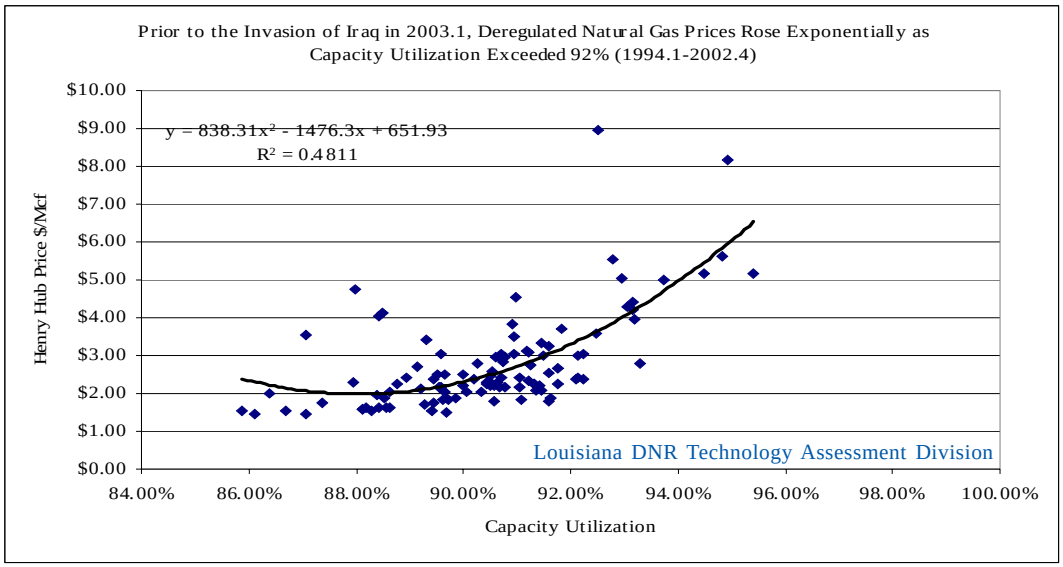
U. S. production of natural gas has remained almost constant over the past 11 years, and deliverability capacity is estimated to have remained steady. Therefore, the surplus deliverability margins have remained quite small in relation to demand (Figure 3).

Figure 3. Time Series of Natural Gas Production, Productive Capacity, Surplus Margins



Taken together, the escalating competition for imports and the failure to increase domestic natural gas deliverability capacity, the nation's gas supply is operating at close to capacity utilization; so close that prices have become much more volatile than is healthy for any market and business investment planning (Figure 4).

Figure 4. As in Any Sector of the Economy, as Capacity Utilization Increases, Prices Rise



Source: Energy Information Administration (EIA) natural gas data series

Including Alaska and Puerto Rico in the pictuer, the U. S. has 7 LNG terminals as of 2006. One is a liquefication terminal in Alaska. Alaskan LNG is shipped to Japan. A second terminal, a regasification terminal, is located in Puerto Rico where imports serve as the source for power generation and water desalinization for the island residents. In the lower 48 states, a 5th regasification terminal called "Energy Bridge" became operational in the Gulf of Mexico during 2005. The other 4 have been operational for several years (Figure 5 & Table 1).

Figure 5. There Were 4 Main Regasification Terminals Serving the Lower 48 States in 2004

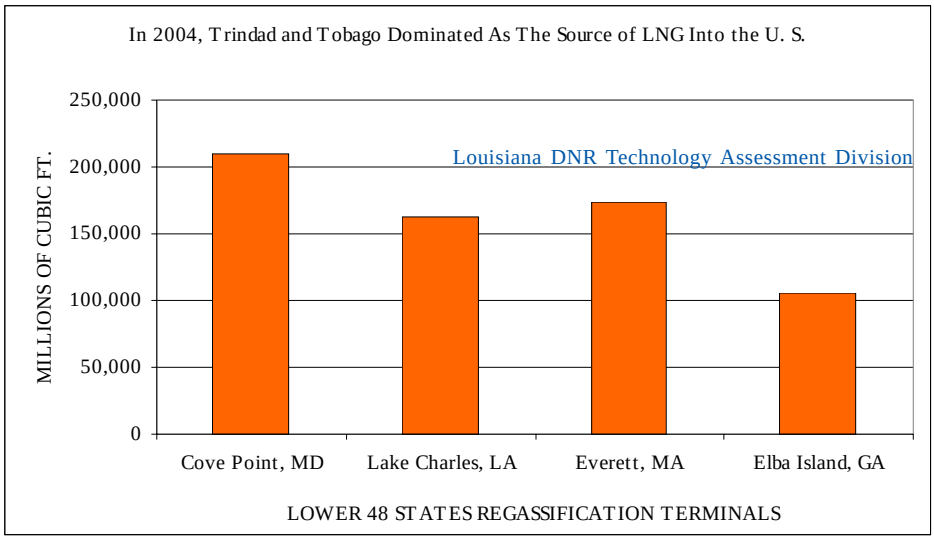


Table 1. Trindad & Tobago Has Become the primary source of LNG for the U. S.

Country of Origin	Cove Point, MD	Lake Charles, LA	Everett, MA	Elba Island, GA	Totals MMcf	Country %
Algeria	33,554	86,789	0	0	120,343	18.50%
Australia	0	14,990	0	0	14,990	2.30%
Brunei	0	0	0	0	0	0.00%
Indonesia	0	0	0	0	0	0.00%
Malaysia	0	19,999	0	0	19,999	3.07%
Nigeria	2,986	8,831	0	0	11,817	1.82%
Oman	0	9,412	0	0	9,412	1.45%
Qatar	0	11,854	0	0	11,854	1.82%
Trinidad & Tobago	172,753	10,364	173,780	105,203	462,100	71.04%
UAE	0	0	0	0	0	0.00%
2004 Totals	209,293	162,239	173,780	105,203	650,515	100.00%
2004 %	32.17%	24.94%	26.71%	16.17%	100.00%	

Source: Natural Gas Annual 2004 Energy Information Administration (EIA)

The Federal Energy Regulatory Commission (FERC) and U. S. Dept. of Transportation Maritime Administration (MARAD) have approved 13 new regasification terminals totaling 16.870 billion cubic feet per day (Bcf/D) deliverability capacity as of March 8, 2006 (Table 2). Will these all be built? As of this writing only Pelican Point has been canceled. Many approved terminals are under construction. Proposed capacity expansion approaches 30% of existing deliverability capacity. This is a significant expansion that,

if completed, would provide substantial surplus deliverability margin to the nation's natural gas capacity. (Note: In addition, Mexico has approved 3.1 Bcf/D of new capacity and Canada has approved 2.0 Bcf/D.)

Table 2. From the Federal Energy Regulatory Commission as of March 8, 2006

Constructed LNG Terminals

Location	Regasification Capacity - Bcf/D	Owner
Everett, MA	1.035	SUEZ/Tractebel-DOMAC
Cove Point, MD	1	Dominion-Cove Point LNG
Elba Island. GA	1.2	El Paso-Southern LNG
Lake Charles, LA	1.5	Southern Union-Trunkline LNG
Gulf of Mexico	0.5	Gulf Gateway Energy Bridge-Excelarate Energy
Total Constructed	**5.235**	
Approved by FERC		
Location	**Regasification Capacity - Bcf/D**	**Owner**
Lake Charles, LA	0.6	Southern Union-Trunkline LNG
Hackberry, LA	1.5	Cameron LNG-Sempra Energy
Bahamas	0.84	AES Ocean Express1/
Bahamas	0.83	Calypso Tractebel1/
Freeport, TX	1.5	Cheniere/Freeport LNG Development
Sabine, LA	2.6	Cheniere LNG
Corpus Christi, TX	2.6	Cheniere LNG
Corpus Christi, TX	1	Vista Del Sol-ExxonMobil
Fall River, MA	0.8	Weaver's Cove Energy/Hess LNG
Sabine, TX	1	Golden Pass-ExxonMobil
Corpus Christi, TX	1	Ingleside Energy-Occidental Energy Ventures
Total Approved FERC	**14.27**	
Approved by MARAD/Coast Guard		
Location	**Regasification Capacity - Bcf/D**	**Owner**
Port Pelican	1.6	ChevronTexaco
Louisiana Offshore	1	Gulf Landing-Shell
Total MARAD	**2.6**	
Grand Total Approved	**16.87**	
Current Estimated Deliverability Capacity = 57 Bcf/D		
Approved LNG Construction % of Current Capacity= 30%		

It is well known that natural gas burns with the lowest carbon emissions of the fossil fuels. One hundred fifty-five (155) nations were signatories to the Kyoto Protocol, agreeing to reduce carbon emissions over a predetermined time period. Using the best available sources for global natural gas production and international trade, it seems that internal consumption in many nations, particularly those who are

natural gas exporters, is reducing the quantity of natural gas available for export. Two major pipeline exporters, Canada and Russia, have reduced exports over the past 5 years (Table 3).

Table 3. Growth of Global Production has Exceeded Growth in International Exports. The Proportion of Natural Gas Dedicated to International Trade has Declined.

Year	Production1/	Pipeline Exports2	LNG Exports3	P/L & LNG % Production
2000	235.3	49.9	13.2	26.84%
2001	240.9	51.8	13.9	27.28%
2002	244.8	54.2	14.6	28.09%
2003	253.1	57.3	16.3	29.10%
2004	260.3	48.6	17.2	25.25%
	Units are billions of cubic feet per day (Bcf/D)			
1/	from BP Statistical Review of World Energy June 2005			
2/	from Cedigaz Statistical Data Files			
	2003 is estimate			
	2004 is Provisional as provided to BP			
3/	from Cedigaz Statistical Data Files			
	2003 is estimate			
	2004 is Provisional as provided to BP			

Japan and South Korea are the two largest importers of LNG (2004). Both nations are recognized as major industrial powers with limited natural resources. The U. S. is the third largest. But the U. S. is a small component of the global LNG trade. Several European nations are also noteworthy importers of LNG.

Table 4. U. S. Imports Represent Only 10.4% of Global LNG Trade

Gas: Trade Movements 2004 - LNG *

Billion cubic meters	From												
To	USA	Trinidad & Tobago	Oman	Qatar	UAE	Algeria	Libya	Nigeria	Australia	Brunei	Indonesia	Malaysia	**Total Imports**
North America													
USA	-	13.13	0.27	0.34	-	3.41	-	0.33	0.42	-	-	0.57	**18.47**
South & Central America													
Dominican Republic	-	0.18	-	-	-	-	-	-	-	-	-	-	**0.18**
Puerto Rico	-	0.68	-	-	-	-	-	-	-	-	-	-	**0.68**
Europe													
Belgium	-	-	-	-	-	2.85	-	-	-	-	-	-	**2.85**
France	-	-	0.08	-	-	6.72	-	0.83	-	-	-	-	**7.63**
Greece	-	-	-	-	-	0.55	-	-	-	-	-	-	**0.55**
Italy	-	-	-	-	-	2.02	-	3.5	-	-	-	-	**5.9**
Portugal	-	-	-	-	-	-	-	0.85	-	-	-	-	**1.31**
Spain	-	0.08	0.32	1.87	0.24	7.48	0.75	4.22	0.08	-	-	-	**17.51**
Turkey	-	-	-	-	-	3.86	-	1.13	-	-	-	-	**4.27**
Asia Pacific													
India	-	-	-	2.63	-	-	-	-	-	-	-	-	**2.63**
Japan	1.68	-	1.48	9.22	7.1	-	-	0.16	11.2	8.29	21.19	16.63	**76.95**
South Korea	-	-	6	7.96	0.08	0.3	-	0.24	0.55	1.21	7.3	6.25	**29.89**
Taiwan	-	-	-	-	-	-	-	0.08	-	-	5	4.05	**9.13**
TOTAL EXPORTS	**1.68**	**13.99**	**9.03**	**24.06**	**##**	**25.75**	**0.63**	**12.59**	**12.17**	**9.5**	**33.49**	**27.68**	**177.95**
* LNG (Liquefied Natural Gas)													
Note: Flows are on a contractual basis and may not correspond to physical gas flows in all cases													

Source: Cedigaz (provisional)

If there is a significant underinvestment in new natural gas productive capacity around the globe where would the U. S. look for LNG investment that might be made competitively available to the U. S. market?

Table 5. Top 30 Reserve Countries and Their Exports

Country	Reserves Tcf 1-1-05 [1/]	Consumption 2004 Bcf/day [2/]	Production 2004 Bcf/day [2/]	LNG Plant Capacity 2002 Bcf/day [3/]	LNG Plant(Bcf/day) Proposed 2010 [3/]
Russia	1,694.40	**38.9**	**57**	0	1.2
Iran	970.8	**8.4**	**8.3**	0	1
Qatar	910.1	**1.5**	**3.8**	2.9	2.4
Saudi Arabia	238.4	**6.2**	**6.2**	0	
UAE	213.9	**3.8**	**4.4**	0.7	
US	186.9	**62.5**	**52.5**	0.2	
Algeria	160.4	**2.1**	**7.9**	1.7	0.4
Venezuela	148.9	**2.7**	**2.7**	0	0.6
Nigeria	176.4	N/R	**2**	1.2	2.3
Iraq	111.9	N/R	N/R	0	
Indonesia	90.3	**3.3**	**7.1**	3.6	1.4
Australia	86.9	**2.4**	**3.4**	1.5	2.4
Norway	84.2	**0.4**	**7.6**	0.5	
Malaysia	87	**3.2**	**5.2**	3	
Turkmenistan	102.4	**1.5**	**5.3**	0	
Uzbekistan	65.7	**4.8**	**5.4**	0	
Kazakhstan	105.9	**1.5**	**1.8**	0	
Netherlands	52.7	**4.2**	**6.7**	0	
Canada	56.6	**8.7**	**17.7**	0	
Egypt	65.5	**2.5**	**2.6**	0.9	
China	78.7	**3.8**	**3.9**	0	
Libya	52.6	N/R	**0.7**	0.2	
Oman	35.1	N/R	**1.7**	0.4	0.4
Bolivia	31.4	N/R	**0.8**	0	0.9
Trinidad/Tobago	18.8	N/R	**2.7**	0.4	
Yemen	16.9	N/R	N/R	0	0.4
Brunei	12.1	N/R	**1.2**	0.9	
Peru	8.7	**0.1**	N/R	0	0.6
Equatorial Guinea	1.3	N/R	N/R	0	0.5
Angola	0	N/R	N/R	0	0.5
sub-total	5,864.90			18.1	15
Rest of World	472.5				
Total world	6,337.40				

N/R = not reported

1/ is from BP's World Energy Review, 2005

2/ is from BP's World Energy Review, 2005

3/ is from NPC Study, 2003

Tables 4 & 5 illustrate one key problem area. Most of the existing, known natural gas reserves are located in areas that are geographically closer to other markets, such as Europe or Asia Pacific. Only Venezuela, Trinidad & Tobago, Bolivia and Peru are in the Western Hemisphere, and they

represent only 3.5% of the existing known natural gas reserves of the top 30 reserve holding nations.

With the exception of Trinidad & Tobago, in these other South American countries there has developed some significant anti-American sentiment. These attitudes inhibit the role American private sector companies can play in developing these potential LNG resources. The current state of relations with Venezuela is well publicized so geographic distance and foreign policy are 2 key issues that may reduce the quantity of LNG available to the U. S. market.

If natural gas in the form of LNG is a fungible commodity as it is, "other investors" may develop these resources thereby making available some of the existing capacity to the U. S. But who might these "other investors" be? So far the national oil companies have not shown a willingness to develop and make available for international export their global natural gas reserves. China and India, two rapidly growing economies, are interested in securing supplies to sustain their own internal growth consumption.

This leads to a third key issue: the enormous investment cost of a complete LNG delivery system, from reservoir(s) through liquefication, shipping, domestic liquefied storage and regasification (Table 6). First given the fixed investment cost in liquefication and regasification terminals, a supply of natural gas for a 20 year life will be a requirement for long term financing. A 1 Bcf/D liquefication terminal would require nearly 7 Tcf (trillion cubic feet) of reserves dedicated to the supply. Such an investment in reserves and deliverability couild easily approach $7 billion dollars (@ $1.00/Mcf exploration and development costs).

Table 6. The Total System Cost Approaches $10 Billion (U. S.) for a 1 Bcf/d System
($7 billion for Reserves, $2 Billion for Terminals, $1 Billion for 4 LNG Ships)

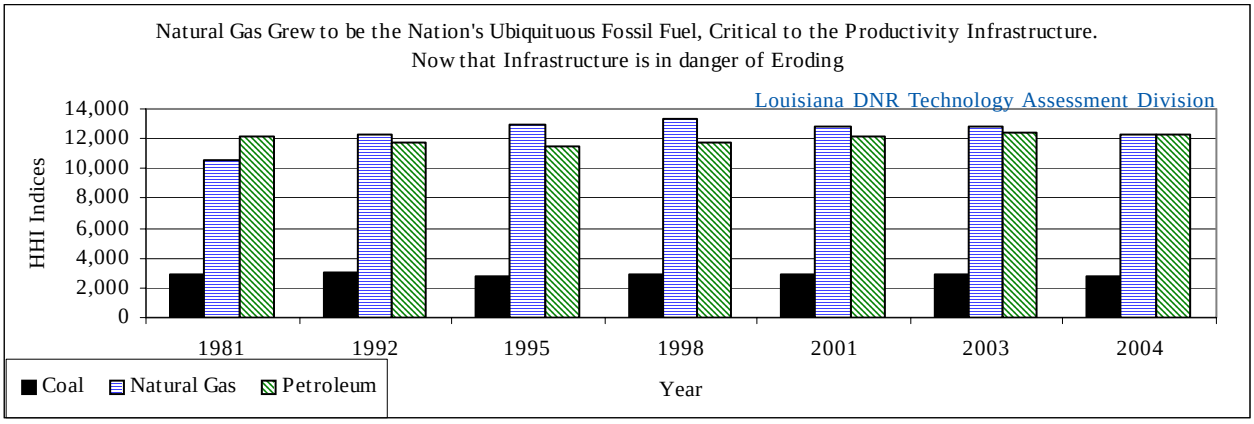
Liquefication Train	Description	Capex	IRF	$MM/yr	$/mmbtus	Component $
Capex	$1.5-$1.7 billion per 1 Bcf/day	$1.5 billion	0.18548	$278.22	$0.83	.83/mmbtu
Opex	1.5-2.5%%/year of Capex	$30 MM/yr	335 Bcf/yr	$0.09		$0.09/mmbtu
Total Projected Costs, Capex and Opex, for Liquefication Terminal						$0.92
where Capex is capital expenditure / Opex is operating expenses						
Regassification						
Capex	$500 MM per 1 Bcf/day	$500 MM	0.179	$89.50	$0.27	
Opex	21.76-27.34cents/mmbtus fixed		$0.27			
	2.7-2.99 cents/mmbtus variable		$0.03			
	1.66% fuel loss	$3.50/mmbtu	$0.06			
Total Projected Costs, Capex and Opex, for Regasification Terminal			$0.36			$0.36
Combined Total Projected Terminal Costs						$1.28

Just as the liquefication terminal requires a 20 year supply of natural gas, so is there a requirement for long term contracts (20 years) from customers. This has been a problem for Local Distribution Companies (LDCs) in the U. S. Regulatory agencies in the U. S. have been reluctant to approve such lengthy contracts to this point in time, although those attitudes may now be changing.

How critical might these impediments be to U. S. strategic and economic security? Natural gas is the most ubiquitous of the energy sources. It is used in every sector of the economy: residential; commercial; industrial; utility; transportation. When the market shares of each sector are squared (an Herfindahl-

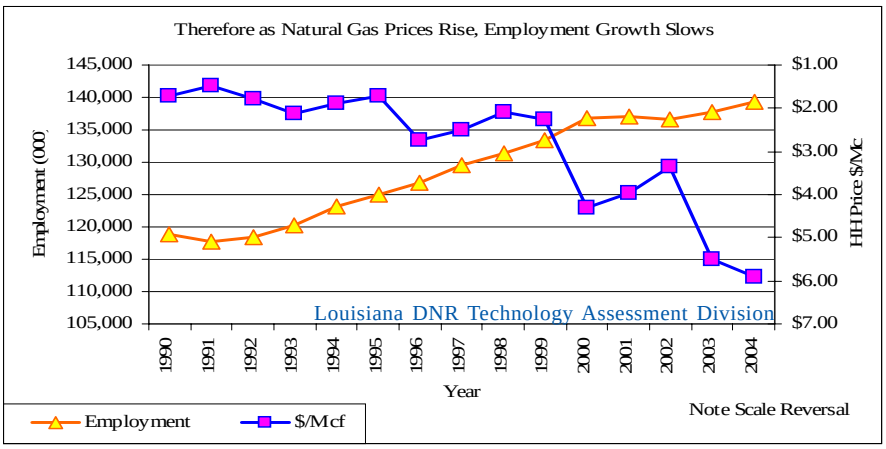
Hirschman (HHI) index), then added together, natural gas is the most pervasive energy source of all. But in 2001, following the run-up in prices in 2000, its role began to decline as measured by the HHI index (Figure 6).

Figure 6. Crude Oil Commands the Largest Market Share, but Natural Gas is More Pervasive in the Economy



The importance of a stable and dependable source of natural gas to the economy is further illuminated by the change in the rate of growth in civilian employment in 2001. Since the rise in natural gas prices beginning in 2000, the rate of growth of employment has been about half that of the previous economic expansion of the 1990s (Figure 7).

Figure 7. Because of the Pervasive Role of Natural Gas in the Economy, Price Volatility Reduces Employment Growth



By all economic and physical measures, a stable and dependable supply of natural gas is critical for the security of the U. S. economy. Energy security is closely integrated with the nation's domestic, foreign, and environmental policies. Unless all policy issues can be aligned, it may not be possible to build the proposed regasification capacity currently planned, further exacerbating natural gas price volatility and domestic business investment uncertainty.