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## Short-Term Energy Outlook Supplement: U.S. LNG Imports - The Next Wave

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### Overview

- This supplement to the Energy Information Administration's (EIA) January 2007 *Short-Term Energy Outlook (STEO)* focuses on recent trends in global and U.S. liquefied natural gas (LNG) trade and presents factors expected to influence U.S. LNG imports through 2008.
- After substantial increases early this decade (including more than doubling between 2002 and 2003), the volume of LNG imports has decreased over the past 2 years. LNG still accounts for less than three percent of total U.S. natural gas supplies, but the global market is growing, and EIA foresees another wave of U.S. LNG import growth over the next 2 years.
- EIA expects a revitalization of U.S. LNG imports during 2007 and 2008 with significant increases in year-over-year change (*Figure 1*). EIA's LNG import forecast is based in part on supply expansion in the global market over the coming years, including exports from up to 3 new source countries (Equatorial Guinea, Norway, and Yemen).
- Recent competition from buyers in Western Europe and Asia for LNG cargoes has resulted in LNG prices exceeding the corresponding natural gas market price in the United States. During periods of high global LNG demand and rising prices, LNG cargoes will continue to be diverted to countries that are more willing to pay the highest prices. However, increasing [global](#) LNG supplies will ease price pressure in the world market over time, and as a result the United States will likely attract a greater share of available LNG cargoes.
- Price competition in both the Atlantic and Pacific Basins, particularly from the Atlantic Basin's United Kingdom and Spain, has recently limited spot shipments of LNG to the United States. However, these markets are not

experiencing the turmoil of the previous year's severe winter, and prices are expected to ease in the coming months.

- As liquefaction capacity expands and LNG production increases globally, world supplies will grow, and competition among LNG consuming markets should soften. Under these circumstances, EIA's outlook is for LNG import potential to the United States to remain strong in the near term.

### *The Global Market for LNG*

The United States is included in the Atlantic Basin market of the global LNG industry.<sup>1</sup> By the end of 2006, liquefaction capacity in the Atlantic Basin was about 65 million tons, or 3.12 trillion cubic feet (tcf) a year.<sup>2</sup> Liquefaction capacity in the Atlantic Basin has increased considerably since 2005 as the result of capacity additions in Egypt, Trinidad and Tobago, and Nigeria. Despite large capacity additions on the liquefaction side, maintenance delays and lack of available feedstock gas caused LNG production in the Atlantic Basin during 2006 to grow at a much lower rate. At the same time, there has been strong demand for LNG in Atlantic Basin countries other than the United States, such as Spain, France, Belgium, and the United Kingdom. LNG traders with options to deliver to multiple destinations found higher prices, and more attractive markets, in Europe and Asia compared to the United States. As a result, U.S. imports of LNG were depressed for most of 2006.

In 2006, the United States imported an estimated 12.1 million tons of LNG, or the equivalent of 580 billion cubic feet (bcf), which was about 8 percent lower than the 631 bcf received in 2005 and 11 percent lower than peak receipts of 652 bcf in 2004. Through the end of October 2006 (the most recent month for which data are available), LNG imports to the United States were from a mix of source countries: Trinidad and Tobago (67.6 percent), Egypt (18.8 percent), Nigeria (10.0 percent), and Algeria (3.6 percent). However, the number of source countries providing LNG imports during to the United States in 2006 is considerably less than in previous years during which shipments—albeit not many—were received from countries in the Middle East and the Pacific Basin.

The four active onshore regasification terminals in the United States generally received similar volumes of LNG imports during the year, each importing between

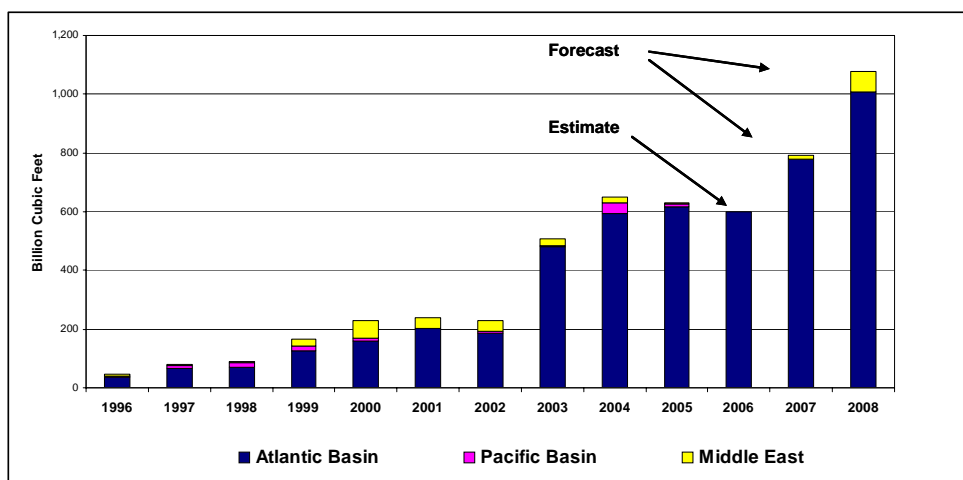
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<sup>1</sup> The United States as an importer is considered part of the Atlantic Basin. The United States also exports LNG from Alaska to Japan, which is considered part of Pacific Basin trade. The exports from Alaska are relatively small volumes, being slightly more than 60 bcf per year, and are approved only through April 2009.

<sup>2</sup> The conversion factor from tons of LNG to cubic feet of natural gas used in this report is 1 million tons of LNG equals 48 bcf of natural gas.

20 and 30 percent of the total. These onshore facilities are located in Everett, Massachusetts; Lake Charles, Louisiana; Elba Island, Georgia; and Cove Point, Maryland. Through October 2006, the lone offshore facility, Gulf Gateway, in the Gulf of Mexico had only received one partial shipment of LNG. Of the four onshore regasification terminals, the Trunkline LNG facility in Lake Charles had the lowest utilization rate (an average of about 25 percent over the first 10 months of 2006). While the United States is primarily dependent on Atlantic Basin supply, the Lake Charles facility has in the past received volumes of LNG from Middle East and Pacific Basin countries when supplies have been available on the spot market or through the use of short term contracts. However, Trunkline LNG received no cargoes from east of the Suez Canal through the end of October 2006 (the latest month for which source country data are available). By comparison, Trunkline LNG received 5 cargoes in 2005 and 19 cargoes in 2004 from outside the Atlantic Basin.

**Figure 1. Historical and Projected U.S. LNG Imports, 1996-2008**



Source: 1996-2005: U.S. Department of Energy, Office of Fossil Energy. 2006-2008 (Estimates and Projections): Energy Information Administration, Short-Term Integrated Forecasting System database.

LNG volumes to the United States in 2006 are estimated to have accounted for only about 22 percent of Atlantic Basin LNG consumption, while European purchasers accounted for nearly all of the remaining volume.<sup>3</sup> Through October 2006 (the most recent time period for which actual data are available), European LNG imports grew an estimated 12.6 percent over the corresponding time period in 2005 with most

<sup>3</sup> Mexico has recently received its first LNG volumes at an import plant in Altamira. Additionally, it has received small volumes (delivered by truck) from the United States for several years. The Dominican Republic and Puerto Rico also have imports facilities and received relatively small amounts of LNG in 2006. References to LNG industry activity in the United State do not include volumes imported through the terminal in Puerto Rico, which is a territory of the United States.

supplies coming from Algeria and Nigeria.<sup>4</sup> For the year, LNG imports to Europe are now expected to exceed 2 tcf, with France, Belgium, and Spain accounting for most of the volume consumed. Europe's largest-volume LNG importer is Spain, which relies heavily on LNG deliveries for its natural gas supplies and has outbid U.S. buyers in order to meet core demand, including the demand for growing power generation needs. The biggest percentage change in LNG imports last year in the Atlantic Basin occurred in the United Kingdom. During its first full year of operating since re-opening (for international trade) in 2005, the Isle of Grain terminal in the United Kingdom in 2006 received LNG imports of over 2.4 million tons (or 115 bcf).

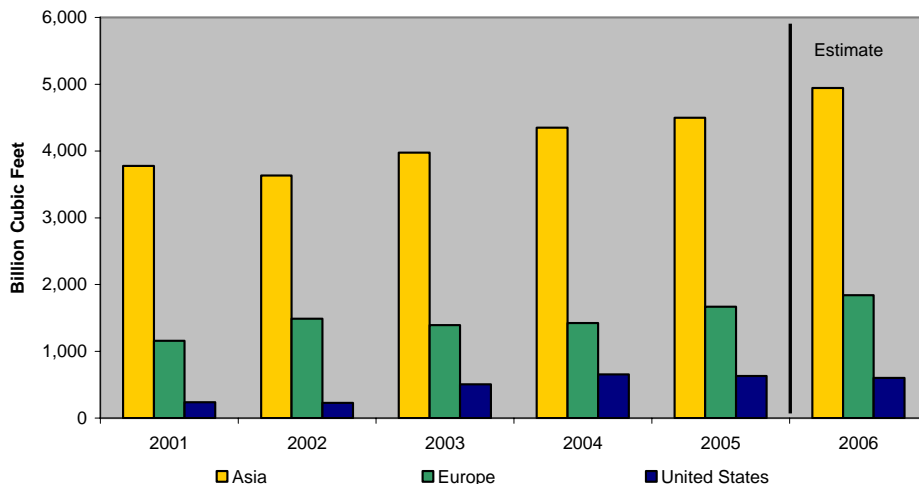
Asia consumes most of the LNG traded in the world (*Figure 2*). Asian demand for LNG imports, including from source countries in the Middle East, has been strong through 2006. South Korea has shown the biggest year-over-year growth in volumes through the end of September 2006, increasing from 15.6 million tons (749 bcf) in 2005 to 18.7 million tons (898 bcf) in 2006. Across the region, Japan and India have continued to expand their imports of LNG, and China has recently emerged as a burgeoning player in the market. It is estimated that LNG imports to the region for the year increased approximately 10 percent to just under than 4,900 bcf.

In general, U.S. LNG trade volumes in 2006 were below most projections. Data on LNG flows and related information for LNG prices gradually revealed a global market that is tighter and more competitive than previously expected. Although nameplate liquefaction capacity has increased in many exporting countries, capacity utilization has lagged for a variety of factors, such as delays in startup of the new liquefaction plants or maintenance needs. For example, difficulties acquiring feedstock supplies in countries such as Trinidad and Tobago and Nigeria were a primary factor that affected liquefaction operations during 2006. In addition to lower than expected capacity utilization, U.S. imports were also affected by a lack of long-term contracts relative to other markets. Although the market for short-term trade of LNG is growing, spot transactions still are a small part of global LNG exchange. For the most part, the current LNG market functions through long-term contractual agreements for delivery of cargoes from producer nations to Western Europe and Asia. With the exception of deliveries from Nigeria and Trinidad and Tobago, U.S. importers have not yet begun to bring in the large volumes of LNG under similar long-term agreements. Reflecting this experience, short-term U.S. LNG import projections published in the *STEO* over the past year were reduced as the year progressed, yet still show expansion in the future.

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<sup>4</sup> Facts Global Energy, *Gas Insights*, Issue #79, (Honolulu, HI, November 2006). All statistics on global LNG trade (not including the U.S. trade) in 2006 in this report are from FACTS, Inc.

**Figure 2. LNG Imports by Region, 2001-2006**



Source: Energy Information Administration, *Natural Gas Monthly*; and FACTS Global Energy, Inc., *Gas Insights*.

### LNG Netbacks

The United States has faced substantial price competition for LNG shipments in recent years. Between 2000 and 2005, even during periods of lower market prices in the United States, Pacific Basin exporters delivered several spot cargoes almost every year. However, no cargoes were received from Pacific Basin or Middle East countries in 2006 (through October) even though U.S. import prices were the highest ever recorded by EIA. Taking advantage of arbitrage opportunities between importers, cargoes from Trinidad and Tobago—as well as other Atlantic Basin suppliers with flexible delivery terms—have actually ended up in the Pacific Basin despite higher transportation costs.

One way to track the relative attraction of destination markets for LNG exporters is through the determination of producer “netbacks” as indicated by prevailing prices across regions. Economic preferences suggest that LNG exporters will ship spot cargoes (those not bound by contract) to the import terminal with access to markets offering the highest netback. The netback for LNG exports is determined by: the net revenues from downstream sales, less all costs associated with bringing the commodity to market, excluding production and liquefaction costs. The largest typical cost included in the calculation of LNG netbacks is the cost of transportation, which can represent a considerable portion of the final LNG cost. While long-term supply contracts may limit the majority of LNG exporters from capturing profit-

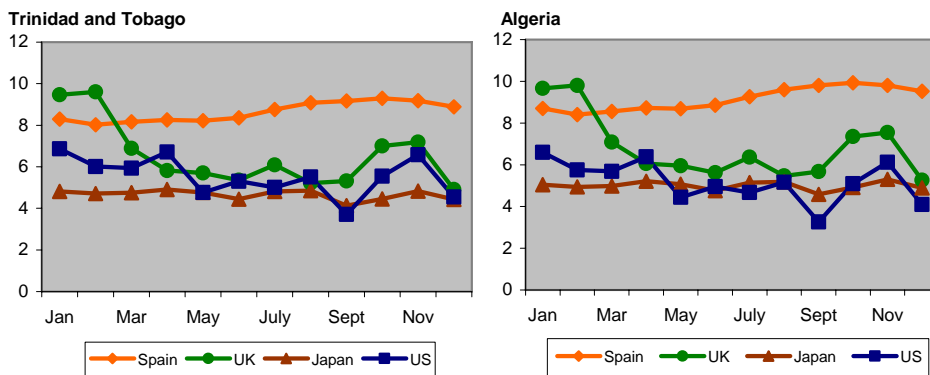
maximizing netbacks, clear incentives exist for economic gains at the margin in the growing spot market.

Reported netbacks from various exporting countries to Spain and the United Kingdom are indicative of the European premium on spot LNG cargoes relative to prices in the United States (*Figure 3*). For example, LNG netbacks to Trinidad and Tobago for cargoes shipped to Spain and the United Kingdom in September were \$9.17 and \$5.32, respectively, compared with \$3.71 for shipments to the United States (at the Lake Charles terminal).<sup>5</sup> Indeed, over the course of 2006, LNG to Japan’s Sodegaura port and the Lake Charles terminal in Louisiana traded at a discount for LNG exporters worldwide when compared with shipments to European import points.

Comment [E1]: Over what time period?

The recent trend in LNG shipments away from U.S. terminals underscores the relative importance of LNG to the overall supply mix of various countries around the world. South Korea and Japan, for example, have demonstrated a consistent willingness to outbid U.S. importers. Both South Korea and Japan rely on LNG for over 90 percent of their natural gas supplies, much of which is critical for electricity generation. Spain also depends heavily on LNG deliveries for natural gas supplies used in the power sector. Conversely, U.S. consumers are less reliant on LNG due to the diversity of domestic and imported natural gas supplies. The United States also has considerable underground storage capacity, which is used during periods of high demand such as the winter.

**Figure 3. Reported LNG Netbacks from Major Exporting Hubs: Trinidad and Tobago and Algeria (2006 dollars)**



Source: Energy Intelligence. “World Gas Intelligence, *Weekly Edition*”.

<sup>5</sup> Netback calculations are from Energy Intelligence’s *World Gas Intelligence*, as published in the January 2, 2007, edition, and are reprinted with permission from the publisher.

### ***Note on Netback Calculation:***

Netbacks are calculated using a long-term charter rate of \$65,000 per day for 138,000 cubic meter tankers. Regasification fees in the United States and the United Kingdom are taken as 10 percent of the base price. U.S. netbacks are calculated using the first and second month out closing price taken from the New York Mercantile Exchange (NYMEX) on the 3 trading days before and including the date reported. A local adjustment for delivery to the Lake Charles terminal is made using prior month spot prices reported by *Natural Gas Week*. The calculation of United Kingdom netbacks comes from an average of the closing price on the Intercontinental Exchange (ICE) futures contract for delivery at National Balancing Point (NBP) on the first and second months out. Japanese netbacks are derived from the official average ex-ship prices for the most recent month. A *World Gas Intelligence* European Border Price table is used to estimate the most recent ex-ship prices for Spanish netbacks.

### ***The LNG Outlook for 2007 and 2008***

EIA's projected volumes of U.S. LNG imports for 2007 and 2008 are considerably higher than the final expected volume for 2006. Predominantly driven by a significant expansion in world supply, EIA forecasts year-over-year increases in U.S. LNG imports of 34.5 percent and 38.5 percent for 2007 and 2008, respectively.

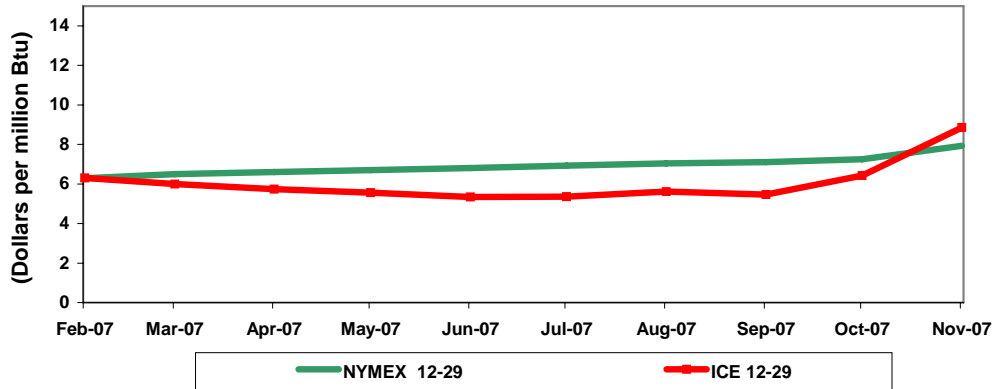
LNG imports to the United States in 2007 are expected to reach 770 bcf, about 210 bcf more than received in 2006, as exports from Nigeria and Trinidad and Tobago increase with the availability of more feedstock gas. Additionally, a greater portion of current exports from Nigeria and Trinidad and Tobago are expected to come to the United States as world prices adjust to lower demand growth in LNG in Asian and Western European countries. Although U.S. prices have been strong relative to historical norms over the past year, futures prices on the NYMEX have been trading at a discount to the forward curve for deliveries at the NBP in the United Kingdom (traded on the ICE). This has suggested that higher netbacks are generally available in Europe. Higher netbacks may continue to be available in the United Kingdom during the early months of 2007; however, the respective forward curves now suggest higher netbacks at U.S. markets as the year progresses (*Figure 4*). Finally, supplies are expected to arrive from Equatorial Guinea, which will become the world's fourteenth LNG exporting country in 2007. As of late 2006, the Marathon Oil Corp.-led Equatorial Guinea project on Bioko Island was 85 percent complete. BG Group has contracted to market supplies from the one-train facility and has focused on the United States as a destination market for the supplies.

EIA projects the growth in LNG imports to U.S. markets to continue in 2008 with the likely arrival of supplies from the Snohvit LNG project in Norway through a contract with Statoil ASA. The Norwegian firm already has contracted for capacity at the import terminal in Cove Point, Maryland. A greater volume of supplies should be exported from Nigeria (over and above supplies from the recently completed trains 4 and 5), as a sixth train is expected to be completed by the end of 2007. In the Middle East, Qatargas II is expected to come on-line in 2008 with a capacity of more than 15 million tons, or 720 bcf, much of which is targeted for the Atlantic Basin (although not directly for U.S. markets). New supplies are expected to come online in Yemen by late 2008. Again, much of the LNG is targeted for U.S. markets, although the Total S.A.-led project near Al Mukalla is not expecting full operations until early 2009. Lastly, the Sakhalin II project in Russia is scheduled to begin operations in 2008. Supplies from this project are not likely to directly enter the U.S. market in the forecast period. However, LNG imports to Mexico from this project may occur at the Costa Azul terminal in Baja California, Mexico, which is now under construction. The owners of the Costa Azul terminal have targeted U.S. markets as a final destination for some of the LNG throughput, with transportation of the regasified LNG over the Mexico-U.S. border by pipeline. With the increased availability of LNG, U.S. imports are projected to reach 1,080 bcf in 2008.

Although EIA has incorporated considerable increases for U.S. LNG imports into their projection, the outlook is tempered by the recognition that supply estimates are affected by several unknown factors relating to liquefaction capacity and its utilization. It is very difficult to judge “ramp up” times and rates (the production schedule by which a new facility reaches its optimal production point). Geopolitical developments likely will continue to play a major role in energy prices and supplies, as has been the case in Nigeria and elsewhere. Lastly, and perhaps most importantly, the degree of competition from other countries will be a crucial variable that determines the actual flows of LNG to the United States.



**Figure 4. Futures Contract Prices at the NYMEX for Delivery at the Henry Hub in Erath, Louisiana, and at the ICE for Delivery at the NBP in the United Kingdom, December 29, 2006**



Source: New York Mercantile Exchange ([www.nymex.com](http://www.nymex.com)) and the Intercontinental Exchange ([www.theice.com](http://www.theice.com)).

### U.S. Import Capacity

Regasification capacity in the United States is expected to be more than adequate to handle the projected increase in LNG imports. Current LNG import terminals have expanded or have plans for expansion in the near term. Additionally, EIA expects 3 new regasification terminals to come online by the end of the forecast period (*Table 1*). While many of the owners of capacity at these new terminals have interests in upstream LNG supply projects, it remains difficult to estimate flows for terminals because of a lack of information regarding new supply arrangements. For example, ConocoPhillips will likely have options for delivery of LNG from interests in supply from Qatar. ConocoPhillips has capacity reserved for regasification at the Freeport LNG terminal, which was approved by the Federal Energy Regulatory Commission (FERC) on June 18, 2004. This facility, located near Freeport, Texas, is under construction with a planned completion date in late 2007. Initially, it will have the capacity to deliver 1.5 billion cubic feet per day (bcf/d) into the pipeline grid, but project sponsors are proposing to eventually expand its deliverability to 3 bcf/d. ConocoPhillips also has an interest in the Golden Pass LNG terminal in Sabine Pass, Texas, which is also under construction but not expected to come online by the end of the forecast period (end of 2008).

**Table 1. Deliverability and Storage Capacity at U.S. LNG Import Terminals, 2006 and 2008.**

LNG terminal	Deliverability	Deliverability	Storage Capacity
	Million Cubic Feet per Day (Year-end 2006)	Million Cubic Feet per Day (Year-end 2008)	Billion Cubic Feet (Bcf) (Year-end 2008)
<b>Onshore</b>			
<b>Existing</b>			
Cove Point, MD	1,000	1,800	14.5
Everett, MA	725	725	3.5
Elba Island, GA	1,200	1,200	7.3
Lake Charles, LA	1,800	1,800	9.2
<b>New</b>			
Freeport LNG	0	1,500	6.9
Sabine Pass	0	2,600	10.2
Cameron LNG	0	1,500	10.2
<b>Onshore Total</b>	<b>4,725</b>	<b>11,125</b>	<b>61.8</b>
<b>Offshore</b>			
Gulf Gateway (Gulf of Mexico)	500	500	0

Source: Company filings at the Federal Energy Regulatory Commission, press releases, and trade press.

Other than the Freeport LNG terminal, two additional facilities are expected to be complete by the end of the forecast period. Cheniere Energy's Sabine Pass LNG terminal in Cameron Parish, Louisiana, was approved by FERC on December 21, 2004, with a design send out capacity of 2.6 bcf/d. It is now under construction with operations expected to commence in early 2008. Cheniere Energy already has plans to expand this facility by 1.4 bcf/d by 2009, for a total deliverability of 4 bcf/d. Lastly, Cameron LNG, approved by FERC on September 10, 2003, is another terminal under construction in Cameron, Louisiana. The project also has an expected completion date in early to mid-2008. Its capacity to deliver regasified LNG into the pipeline system will be 1.5 bcf/d. Sempra Energy, the owner, has requested permission to subsequently expand the deliverability to 2.65 bcf/d.