



Liquefied Natural Gas (LNG) A New Clean Fuel Resource for California

A project of bhpbilliton

Liquefied Natural Gas -- LNG -- is simply the liquid form of natural gas, made possible through research that began nearly seventy years ago. And natural gas, of course, is the essential element of many of the conveniences we take for granted each day -- home-cooked meals, hot showers, and electricity for our appliances are made possible by the availability of this energy source.

California is a Leading Consumer of Natural Gas

Natural gas is used by about 55% of American homes, and in numerous commercial, institutional and industrial concerns. It comprises one-fourth of all the energy used in the United States, and Californians are the largest consumers of natural gas in the nation. One-third of all the electricity used in the state is generated by natural gas, a figure that is projected to rise to nearly 40% by 2009, according to the California Energy Commission.

From an environmental point of view, natural gas is a highly superior fuel source. It is the cleanest burning fossil fuel -- far more so than coal or oil, which account for more than 60% of U.S. energy consumption. In California, the substitution of natural gas for petroleum in fuel-intensive industrial and commercial operations and in electricity generation has been the central strategy in efforts to reduce harmful emissions and improve air quality.

Worldwide, natural gas is in plentiful supply; however, the United States holds less than 4% of total world reserves, and California produces less than 15% of the natural gas it consumes.

Recently, energy and economic experts have raised concerns about the available supply of natural gas in California and nationwide. In fact, Federal Reserve Chairman Alan Greenspan recently told a congressional committee that the United States should enhance its ability to import liquefied natural gas from other countries in order to address tight supplies and create a "safety valve" that can help stabilize natural gas prices.

LNG is the Transportation Solution to Supplying Natural Gas

Historically, one of the difficulties associated with natural gas was how to get this vaporous product from one point to another. In the continental United States, natural gas can be tapped and channeled through pipelines to its final destination. However, domestic supplies cannot meet current and future demand, and pipelines are not practical across oceans.

The process to liquefy natural gas into LNG

was developed to address the need to transport large quantities of natural gas across oceans and to other continents. The liquefaction process makes it possible to temporarily alter natural gas so that it can be transported as a liquid by ship (LNG carriers) or truck. As a liquid form of natural gas, LNG has substantially less volume than its equivalent in natural gas. One carrier load of LNG is equivalent to 600 times the volume of natural gas shipped via pipeline.

- To create LNG, natural gas is cooled until it condenses into a liquid form.
- Cooling the gas to a liquid occurs at minus 260 degrees Fahrenheit, reducing its size tremendously to just 1/600th of its gaseous volume.
- During the cooling process, the gas is also purified, virtually eliminating such compounds as nitrogen, carbon dioxide, hydrogen sulfides and other impurities, which enhances its clean-burning properties.
- LNG is a clean and safe energy that is far less dangerous than gasoline, propane or butane, all of which are commonly used fuels.
- Once it reaches its destination, LNG can be turned back into natural gas through re-gasification, a process that warms it to a point where it becomes natural gas again and can be distributed through natural gas pipeline systems.

In parts of the U.S., storing LNG, then converting it back to natural gas, makes it possible to prepare in advance for temperature spikes in the winter and summer, when there is greater demand for fuel for heating or cooling.

Worldwide, the LNG transport market continues to grow. Currently, there are 64 LNG liquefaction facilities producing LNG for carrier transport to LNG re-gasification facilities in 11

California Gas Demand

California -- Natural Gas 2001

| | Million Cu. Feet | Percent of National Total |
|--------------------------|------------------|---------------------------|
| Local Production | 366,764 | 1.86 |
| Consumption | | |
| Residential | 512,695 | 10.73 |
| Commercial | 245,795 | 8.09 |
| Industrial | 666,462 | 9.05 |
| Vehicle Fuel* | 2,312 | 18.77 |
| Electric Power | 976,912 | 18.47 |
| Total consumption | 2,404,176 | 11.74 |

* Year 2000 data taken from California Energy Commission Report

Source: American Gas Association



countries. In the United States, there are 113 LNG facilities in operation nationwide.

Storage and Transport of LNG

Today, all LNG carriers are designed with double hulls. This containment system consists of a primary tank made of alloys of stainless steel, nickel or aluminum and a secondary containment system made of similar materials. In the unlikely event of a leak in the primary tank, the secondary containment system prevents LNG from reaching the inboard surfaces of the vessel's double hull. This double containment system is well insulated to keep the LNG cold and in its liquid state.

At the receiving point, LNG is returned to a gaseous state through the re-gasification process. The LNG is first pumped from the containment system through a heat exchange system, which simply warms it, thereby converting it back to its gaseous form. The former LNG, now converted back to natural gas, can then be transported by pipeline just like other natural gas.

The LNG Safety Record

As a form of energy, LNG is subject to the same level of regulation as any other fuel, which means it must meet rigorous safety standards. Offshore, the United States Coast Guard (USCG) monitors safety at LNG terminals and carrier ships in U.S. Coastal Waters. The Department of Transportation (DOT) regulates LNG tanker truck operations, the U.S. Federal Energy Regulatory Commission (FERC) reviews and permits onshore LNG terminals, and the U.S. Environmental Protection Agency (EPA) and state environmental agencies establish air and water standards for the LNG industry. All of these agencies provide ongoing investigation and oversight.

LNG has been safely handled for many years. New technology has put in place even more measures to ensure safety both onshore and offshore. Over the past 40 years, with worldwide transport of some 120 million metric tons of LNG each year -- covering a distance of more than 60 million miles -- there have been only a few safety incidents. This is due, in large part, to the rigorous training and certification requirements for officers and crews operating the LNG carriers, which are generally more stringent than for

any other class of commercial shipping. Extensive safety equipment that is standard on LNG carriers, including sophisticated radar and positioning systems, as well as highly sensitive, computerized monitoring also contributes to this safety record. In fact, according to a report by the U.S. Department of Energy, only eight marine incidents worldwide have involved spillage of LNG, with none involving cargo fire. Seven other incidents involved damage, but no spillage. There have been no fatalities on LNG carriers.

An accident attributable to LNG at an onshore facility in the U.S. occurred in 1944, resulting in strengthening of industry-wide design codes for LNG facilities. Since then, onshore LNG facilities have had an admirable safety record.

LNG itself does not burn. When LNG is warmed up and turned back into natural gas it is flammable within a very limited range. If the mixture of natural gas with air contains less than 5% natural gas, it cannot burn because it is too lean. If the mixture of natural gas with air contains more than 15% natural gas, it cannot burn because it is too rich.

A Fuel for the Future

LNG is a clean, economical and stable fuel that can help California meet its growing demand for natural gas in order to advance the state's energy and environmental goals, and significantly reduce our dependence on other fossil fuels. It can also help stabilize natural gas prices by diversifying our gas supply and delivery alternatives.

For more information about Cabrillo Port, please telephone (805) 604-2785. Or, visit the Cabrillo Port website at LNGsolutions.com.



LNG is transported around the world by carrier ship every day, delivering a vital energy resource to fuel households, power plants and scores of other users.



The Cabrillo Deepwater Port

A project of  bhpbilliton

The Cabrillo Deepwater Port offers an opportunity to bring to California the benefits of a clean, safe energy source and, at the same time, increase the reliability and diversity of the State's energy supply. It will provide California, the nation's second largest consumer of energy, with a new entry point for natural gas, allowing for a more consistent supply of natural gas.

Cabrillo Port: The Transportation Solution to Supplying Natural Gas

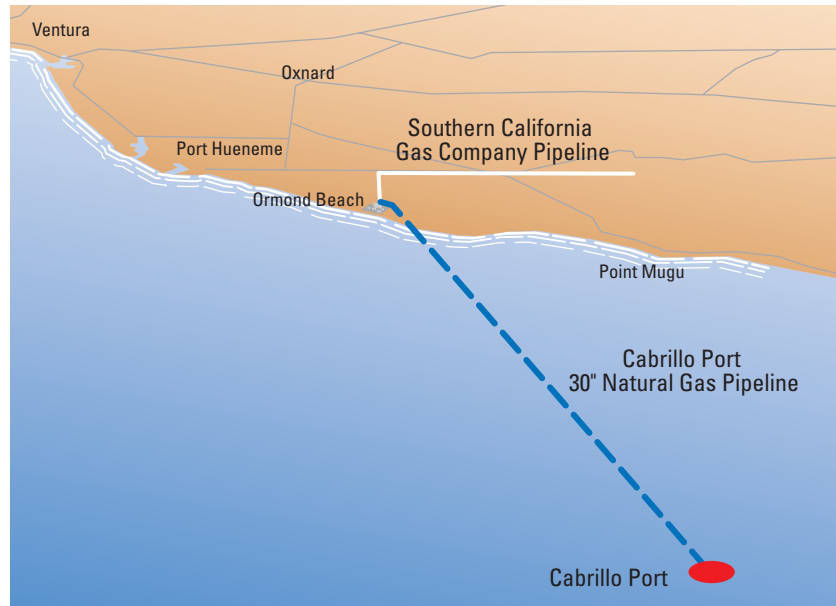
Liquefied Natural Gas (LNG) is simply the liquid form of natural gas. A process called liquefaction makes it possible to alter natural gas so that it can be transported as a liquid via ocean-going LNG carriers.

The process to liquefy natural gas into LNG was developed to address the need to transport large quantities of natural gas across oceans and to other continents. As a liquid, LNG has substantially less volume than natural gas. One carrier load of LNG is equivalent to 600 times the volume of natural gas shipped via pipeline.

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Cabrillo Port

BHP Billiton, a leading diversified natural resources company, is seeking approval to construct and operate Cabrillo Port, a Floating Storage and Re-gasification Unit (FSRU) off the California coast, approximately 21 miles offshore of Port Hueneme. This innovative deepwater "port" would be the receiving point for shipments of LNG from carriers that routinely cross the oceans and deliver to LNG facilities in North America, Asia, and Europe. This "California-bound" LNG would be



Cabrillo Port will be approximately 21 miles offshore from the City of Port Hueneme. The pipeline will come to shore to connect with the existing Southern California Gas Company pipeline system.

restored to natural gas by a process called re-gasification for delivery into the existing pipelines of Southern California Gas Company.

Cabrillo Port would be permanently moored offshore, well outside the existing shipping lanes, far from a sensitive marine sanctuary, and set apart from any marine mammal migratory patterns. The offshore location minimizes both environmental impact and risk by providing for protection from coastal development, heightened security advantage, and diminishment of risk to society.

Cabrillo Port is a floating offshore vessel, similar in shape and general design to an ocean-going ship, that measures 938 feet by 213 feet. Cabrillo Port houses three spherical storage tanks into which the LNG is pumped from delivering carriers. These storage tanks incorporate the most widely used technology for LNG storage and are considered an industry standard. Each tank has a storage capacity of 41,678 tons of liquid, or the equivalent of about 2 billion cubic feet of natural gas -- for a total equivalent of 6 billion cubic feet of natural gas.

Eight vaporizers on Cabrillo Port will allow for the re-gasification of up to 1.5 billion cubic feet of natural gas per day. However, normal output will be approximately 800 million cubic feet per day -- about 13% of California's average daily natural gas consumption.

LNG fuels the operation of the off-loading carriers and Cabrillo Port itself, and the re-gasification process is entirely self-



contained. Unlike some cooling or heating processes, this one uses its own fresh water, eliminating the use of sea water and protecting against any impacts to marine life or the environment.

After the LNG is converted to natural gas, the gas will be transported via an underwater pipeline to the shore. The pipeline will be buried as it approaches the shore and emerge at a Southern California Gas Company connection in Ventura County. The natural gas will be directed to the existing natural gas pipeline system of the Gas Company for distribution through the company's regular pipelines. No extensive onshore facilities will need to be constructed to operate this project.

State-of-the-Art Technology

For decades, floating production and storage systems have been used successfully around the world, and BHP Billiton is a leader in the installation and operation of floating offshore facilities. The idea and the technology for floating LNG re-gasification facilities is not new: studies go back nearly 30 years, and the structural and technological components for these floating facilities have been in use for decades. BHP Billiton is proposing an innovative, state-of-the-art solution that takes advantage of the best available technology for offshore transfer. Its design has been reviewed by the leading classification, certification and safety consulting firm for the LNG industry (Det Norske Veritas), and it has been found to meet both operational and safety standards.

Environmental Review & Community Participation

The proposed Cabrillo Deepwater Port will be approved only after a lengthy process of environmental review, public hearings and consideration by numerous federal, state and local jurisdictions.

The United States Coast Guard (USCG), which has responsibility for the safety of LNG facilities and carriers in U.S. Coastal Waters, will be the primary federal agency with oversight authority for preparation of a comprehensive Environmental Impact Statement (EIS). The EIS will examine the potential impact of the project, both offshore and onshore, with respect to construction and operational safety,



Cabrillo Port's Floating Storage and Re-gasification Unit will be the receiving point for LNG shipments.

environmental issues, community issues, and other areas of interest.

Concurrent with the preparation of a federal EIS, the project must go through California environmental review under the jurisdiction of the California State Lands Commission, as well as permitting review from several other agencies and jurisdictions.

Ongoing operation of the Cabrillo Deepwater Port will be subject to additional oversight. The USCG will continue oversight and inspection for the life of Cabrillo Port. Additionally, the U.S. Department of Energy (DOE) reviews and permits LNG imports and the U.S. Environmental Protection Agency (EPA) and state environmental agencies establish air and water standards for the LNG industry.

Importantly, in addition to the public hearings mandated by the environmental review process and those scheduled by local jurisdictions, BHP Billiton is committed to regularly communicating with the local community and answering questions about Cabrillo Port.

To establish a new point of entry for a clean, safe supply of energy will be of major importance to California. BHP Billiton believes this project can be a model for the U.S. and is looking forward to receiving comments and suggestions on how Cabrillo Port can best work for California.

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