LNG SUPPLY WITH EMPHASIS ON QATAR’S ROLE IN GLOBAL LNG MARKET

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ABSTRACT

Demand for LNG is surging due to elements such as high demand growth of the US and European markets and the rise of emergent markets (China, India, etc.), etc. These elements are supported by growth of economy and consideration of the environment, etc.

To meet such demand growth, existing LNG suppliers such as Australia, Algeria and Nigeria are increasing their production capacity, and countries like Russia, Iran, Yemen, etc. will become LNG suppliers in the near future. Qatar will more than triple its LNG production capacity within this decade and its production capacity will reach 77 million tons per annum by 2010. Thus Qatar will become the largest LNG supplying country in the world within the next four years.

The paper will describe Qatar’s LNG industry expansion and will focus on challenges for new technology that Qatar plans to introduce in its expansions projects.
Table of Contents

Abstract

1. Preamble

2. Qatar’s LNG Expansion Plans

3. Technology Challenges
   - Large LNG Production Train
   - Large Size LNG Vessels

4. Sharing of Key Utilities and Infrastructure

5. Conclusion
1. PREAMBLE

In just over 10 years, Qatar has evolved from a relatively small oil producer to a major player in LNG industry. The state of Qatar started the production of LNG from 1996 by the countries first LNG venture Qatargas project that began delivering 6 million tons per annum (“MTA”) of LNG to Japan’s Chubu Electric Power Company and other 7 Japanese power and gas companies. Then, its sister company RasGas started production in 1999 with deliveries to Korea Gas Corporation of Korea. Since the startup, both projects have expanded their production and customers and in 2005, Qatargas and RasGas together produced and sold over 20 million tons of LNG to the world markets.

World LNG demand is expected to grow significantly over the next years. Current world LNG demand is over 140 MTA and it is forecasted to grow to 250 MTA by 2010, 330 MTA by 2015 and 410 MTPA by 2020.

From years ago, Qatar recognized and predicted the coming worldwide huge expansion in demand for LNG. Qatar had many advantages to become one of the major LNG producers to meet such huge LNG demand expansion. Such advantages include massive North Field gas resources which has 1000 trillion cubic feet of proven gas reserves, strong support from the Qatari government, partnership with strong and experienced international companies, world class infrastructure based around Ras Laffan area, access to both east and west of Suez, etc.
However, there was one big challenge that needed to be overcome. Given the distance from Qatar to major LNG markets in the world, there was a need to significantly reduce the unit cost by 20-30% compared to the available designs to reach the market with competitive price and this could not be achieved without significant increase in scale for both liquefaction capacity of train and cargo capacity of LNG ship, and also consolidation of key infrastructure such as storage/loading facilities to capture unprecedented economic of scale.

2. Qatar’s LNG Expansion Plans

To meet the need of significant increase of LNG in the world market Qatar has committed to the super mega LNG expansion projects that have never embarked before anywhere in the world and these expansion projects introduce many new technologies and ideas to allow cost reduction and to reach the market with competitive price. Together with Qatargas and Ras Gas ventures, current Qatar’s LNG production capacity is approximately 25 MTA. By 2010, Qatar’s LNG production capacity will be tripled and will be producing 77 MTA of LNG. These expansion projects include Qatargas II, Qatargas 3, Qatargas 4 and RasGasIII ventures and all these projects will introduce world’s largest LNG production train and LNG ship that has never built before.
QP and ExxonMobil signed an Heads of Agreement(HOA) in 2002 for Qatargas II and Joint Venture Agreement was signed in 2004 to develop and supply two large LNG trains (7.8MTPA x 2) to the U.K. and the production is targeted to start in the winter of 2007/2008. This project will be the first project to employ new large trains and ships to enable Qatar to enter into new markets at competitive price. QP signed HOA with ConocoPhillips for Qatargas 3 in 2003 and with Shell for Qatargas 4 in 2005 to respectively develop and supply one large train (7.8 x 1) mainly to the U.S. market. HOA for RasGas III was signed in 2003 and JVA in 2005 to develop and supply two large LNG trains (7.8MTPA x 2) to the U.S. and other markets. All these projects share the same technology and designs and all will benefit from the economies of scale and sharing many infrastructures.

3. Technology Challenges

One of the key to capturing the economic of scale is expanding the size of LNG liquefaction train and LNG vessel.

Large LNG Production Train
The liquefaction train that will be introduced will have a capacity of producing 7.8 MTA of LNG per train which is more than 60% larger than the existing largest train. The core element in the increasing train size of LNG train is the use of largest prime movers ever used in LNG liquefaction train. The expansion projects’ design will utilize three GE Frame 9E gas turbines each producing about 100MW of power. Over 300 Frame 9s are in service in the world today, but Qatar will be the first to utilize Frame 9Es in LNG liquefaction train starting by Qatargas II project. Each train will have three strings, and each string will include the gas turbine, a Siemens/ASIR 45 MW motor generator, and the refrigeration compressors. The combination of gas turbine with large motors allow full compression and liquefaction duty year around, full pressure restart, and redistribution of excess shaft power to other uses in the plant.

The key to the mega trains is the combination of GE-Frame 9 drivers with APCI process technology. APX process which essentially adds a third nitrogen-based cooling loop to the more conventional propane and mixed refrigerant cooling loops was adopted and separate sub-cooler with compander-based nitrogen cooling unit is also added to provide the additional cooling.

Not only train being large, but there will be innovation to improve efficiency and environment are considered such as low nox burners, minimum flaring, and waste heat recovery and will result in the one of if not the most energy efficient and lowest emissions LNG plant ever built.
Large Size LNG Vessels

Significant increase of cargo capacity of LNG ship was another big challenge for the Qatar’s expansion projects to achieve major transportation cost reduction.

For the expansion projects, Qatar will introduce largest size LNG ship ever built, especially in terms of cargo capacity, so called “Q-Flex” and “Q-Max”. The cargo capacity of Q-Flex is 210 thousand to 217 thousand cubic meters and for Q-Max it is 262 thousand to 265 thousand cubic meters and increase of 50% to 90% compared to conventional LNG ships. In spite of such increase in cargo capacity, increase in size of the ships is rather moderate and the length of the ship increases 5% to 15% compared to the conventional ships and will be smaller than the most common crude carriers. Over 50 of these large ships will be built for the expansion projects.
These ships will not only be the largest LNG carriers, they will also install on-board re-liquefaction of boil off gas facility and this will result in 99% reduction for boil off gas loss.

4. Sharing of Key Utilities and Infrastructure

Along with Qatar’s LNG expansion projects, there is a need for massive infrastructure development. All the LNG projects will need storage for LNG, by-products such as condensate, LPG and sulfur as well as offloading facilities for those products.

In stead of each project constructing and using individual facility, approximately US$5.5 billion of common facilities are being jointly constructed and to be shared by the projects to capture sizable reduction of capital cost and operation cost. LNG, condensate, LPG and sulfur produced from the expansion projects will be commingled to common storage and will be offloaded at common facility. However, there is great complexity compared to stand alone project as well as there is a lot of pressure on the first users schedule that need to build huge facility to be shared.
Conclusion

To meet worlds massive LNG demand growth, Qatar’s huge LNG expansions is underway very smoothly. The results of the new economies of scale, and infrastructure consolidation programs are being realized to reach every LNG market of the world in a competitive terms and conditions.

Qatar is on its way to achieving the nation’s vision of producing 77 MTA of LNG by 2010 and will be the lowest cost and most competitive LNG production the world has ever seen.