Challenges and New Technologies for World’s Largest Floating LNG

Mun Keun Ha, Deog Jin Ha and Dong Hyun Lee
Samsung Heavy Industries
Geoje city, Gyeongnam Province, Korea

ABSTRACT

With the rate of worldwide LNG demand expected to grow faster than that of gas demand, most major oil companies are currently investing their resources to develop FLNG facility. The global FLNG market trend will be reviewed based on demand and supply chain relationships.

Currently, several remarkable projects on FLNG are in progress among major oil and gas suppliers and shipbuilders. One of those projects, Prelude FLNG, will be introduced in this paper. Typical technical issues associated with FLNG design and constructions are categorized in terms of global performance evaluation.

Although many proven technologies developed through FSRU and oil FPSO projects are available for FLNG design, we are still faced with several technical challenges to clear for successful FLNG projects. In this paper, some of the challenges encountered during development of the largest floating LNG facility, its investigated solution and a way forward will be reviewed.

At the same time, a continued effort to improve the LNG-related technologies by each party, including oil and gas suppliers and shipbuilders, will be the stepping stone to overcome the unrevealed challenges for the FLNG development. A few items which can provide a positive solution to the sloshing problem of LNG cargo will be briefly introduced.

KEY WORDS: World largest FLNG, LNG CCS, 2 row, center cofferdam, sloshing, ABAS, Prelude, SCA

INTRODUCTION

Due to the global economic recession, most energy and resource development plans have since been delayed. Despite the fluctuation of energy prices, the increasing oil and natural gas development activities in Australia have been actively leading the current natural gas development market. In addition, shale gas development in the United States has become a positive element in the activation of the LNG market worldwide, as well as the U.S. economy, which can increase the needs of LNG facilities worldwide.

According to BP’s long-term forecasts for the global energy market, the demand of natural gas and LNG will continuously increase, and LNG demand will be much higher than that for natural gas. LNG supply is projected to grow 4.4% p.a. by 2030, more than twice as fast as total global gas production (2.1% p.a.). Under the forecast provided, LNG production and LNG trade will increase accordingly.

Offshore LNG production using FLNG concept is promising due to its capability to solve increasing challenges faced by onshore projects as a result of local demographic constraints and increasing environmental and safety regulations. Further, FLNG provides some attractive benefits by developing the gas at the gas field location and not requiring subsea pipeline and additional upstream facilities. FLNG concept will put vitality into approximately 2,400 marginal gas fields, which were delayed because of excessive investment cost.

The latest expansion of gas exports and corresponding new field development has led to a rapid increase of FLNG projects. For example, Petronas 1st (1.0MPTA) and 2nd FLNG (2.0MTPA), Inpex Masela FLNG (2.5MTPA), and Excelerate FLNG (4.0MTPA) are typical ongoing projects following current market trends.

In this paper, some of the key LNG technologies will be introduced, including some design challenges and their solutions and a couple of design innovations devised for LNG containment systems. Also, some examples of how to overcome the challenges encountered during the development of the world’s largest FLNG will be introduced in the following sections.

GAS MARKET STATUS

Increasing population in developing countries and rising income levels are two key drivers of energy demand. Further shifting of population to cities will drive additional increase of energy demand, because the population residing in cities consumes more energy compared to rural areas. According to BP Energy Outlook 2030, published in 2011, gas production and demand will increase substantially, which is shown in Figs. 1 and 2.