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Subsea Cryogenic Pipeline—Defining the Next Generation for LNG Loading: Analysis of New Technology vs. Conventional Trestle System

Dieter K. Beike, SPE, Frank B. Gibbons, SNAME, ASME, ASCE, and Edward G. Stokes, SNAME, SPE, Brass LNG

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ABSTRACT

The decision to apply a new “unproven” technology is a difficult one to make. Companies avoid it as much as possible. We all like to be the second one to use a new “successful” idea. Be the “fast follower” and get the benefit of lower cost and/or schedule without having the development cost or the risk of failure. If we ever apply “unproven” technology it is usually the result of either being forced into it by not having a suitable alternative or the assessment of the risks is overwhelmingly in favor of applying it.

In the case of LNG/LPG loading terminals the use of traditional technology has been slow to change. It seems that sticking with what has worked in the past outweighs the risk associated with the incremental benefit that could be obtained from a new product. When traditional technology gets stretched beyond the point of reasonableness, then new technology has a chance to be applied. As new LNG loading and regas facilities are being studied, it can be observed, that some terminal locations are several kilometers away from the plant, hence, a traditional loading approach might not be the best solution. Thus, the new technology of using a subsea cryogenic pipeline has been under development over the last several years and promises substantial reduction in cost relative to a trestle. This paper focuses on the process that projects like Brass in West Africa and elsewhere are following when faced with this problem and have to compare and contrast the risks and uncertainties of applying new technology to their product loading system.

INTRODUCTION

In April 2007, at the San Antonio LNG Conference, the Managing Director of the Brass LNG Project announced that the project had decided to install sub-sea cryogenic pipelines (SSPL) as an integral part of its LNG marine loading facilities. The use of SSPL was largely driven by expected cost reductions due to ongoing optimization studies and the unstable security situation in the Niger delta.

Today’s LNG mega projects face significant capital costs, from \$200/tonne in 2004 to more than \$1,000/tonne in 2008. This is forcing investors to make final investment decisions with project costs in excess of \$5-10 billion. Thus, the steps to reduce cost and optimize the design are essential for the viability of these projects. In projects with long shallow near shore environments and long trestles, costs for trestle construction and operation constitute a major part of lifetime costs of an LNG plant. Therefore, cost reduction is the determining driver.

Traditionally, the system configuration for an LNG product loading terminal consists of a loading platform and operations control building. Connecting the terminal to the shore is a trestle or jetty. An alternative solution to trestle based civil works is a subsea cryogenic pipeline that eliminates the need for building such a superstructure. The SSPL uses materials with special properties to handle the cryogenic temperatures and the expansion of the linear structure. Using alloyed materials and placing the lines below sea level was considered new technology. Therefore, welding characteristics of the alloyed pipe material, when coupled with thermal stresses, and placing these materials subsea, are of major concern. Hence, the risk of business interruption that