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LNG STS Operations in Arctic Waters

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Abstract

The LNG market is expanding, and development plans exist for LNG processing plants in Arctic Russia. This paper discusses a possible transport chain for LNG produced at shore-based terminals on the Yamal Peninsula. The recent disagreement between Russia and Ukraine on gas export to Europe has demonstrated the vulnerability of the present over-land export system for natural gas. The planned North Stream will increase energy security for several European countries. However, a sea transport system may create a win – win situation for Russian gas producers and world-wide customers of natural gas.

The first part of the paper describes the individual legs of the proposed transport chain. The second part discusses ship-to-ship transfer of gas in general, followed by a review of LNG ship-to-ship transfer, and ends with a specific case, of which high-seas ship-to-ship transfer in Arctic waters is a critical element. The final part of the paper describes necessary developments in cargo-handling equipment and operational procedures for LNG transfer between two large LNG vessels in Arctic waters.

Ship-to-ship transfer of oil and gas is a routine operation in many parts of the world. A cost-effective transport system from Arctic LNG plants in the western part of the Russia to markets in Western Europe and east coast US/Canada could be achieved through the use of dedicated icebreaking LNG tankers transloading their cargo to conventional LNG carriers in ice-free waters in the Barents Sea.

1 Introduction

With the expected increase in demand for oil and decrease in production in certain areas in 2010 - 2020, pressure to develop the Arctic region is growing. The extreme conditions with ice and very low temperatures will make even more stringent demands of the ships, equipment and crew than normal. The Arctic is particularly sensitive and vulnerable, and the vision of zero harmful discharges is now generally accepted. A sharper focus on the part of IMO, EU and Arctic organizations, on environmental issues and safe operations will influence vessel operation. There will be a focus on new and innovative cost-effective solutions to satisfy the strict requirements for ships and equipment from ship-owners, class societies, operators, the authorities and other stakeholders. The development of the Snøhvit gas field with its Melkøya LNG terminal has moved offshore gas production far north. Much larger offshore and onshore fields exist in the Russian sector of the Barents Sea and on the Yamal Peninsula. The recent problems with Russian gas export to Europe may increase pressure to develop an independent sea export route from the Russian European Arctic in addition to the planned North Stream pipeline. Current plans for development of LNG plants include a plant in Teriberka, where the Shtokman gas will be landed, and a facility on the Yamal Peninsula. Ship-based export from these plants will give the Russian gas company Gazprom access to both the European and North American markets.

2. Possible ship-based LNG export chains

The map in Figure 1 gives an overview of the major gas fields in the Barents Sea region. At present the Snøhvit field is the only offshore gas field in operation. The LNG plant at Melkøya has been through a number of upgrades and is currently (January 2009) producing at approximately 80% of design capacity. Dedicated winterized LNG carriers have been selected for