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INSIGHT

LNG Exports to Europe: What Are Floating Storage Regasification Units (FSRUs)?

June 22, 2022

U.S. to Europe LNG Capacity

On March 25, 2022, as part of the U.S. response to the Russian invasion of Ukraine, President Biden announced an initiative to help Europe reduce dependence on Russian natural gas supplies by increasing U.S. exports of liquefied natural gas (LNG) to the European Union. U.S. gas exporters already were moving in this direction, as exports to Europe accounted for 74% of total U.S. LNG exports in the first quarter of 2022, compared to 34% in the first quarter of 2021. However, Europe's total LNG imports would need to increase substantially beyond current levels to replace all Russian natural gas imported to the EU by pipeline. Europe's ability to import more LNG, and the United States' ability to supply it, are physically constrained. The existing LNG terminals and associated infrastructure on both sides of the Atlantic already are operating at full capacity, and one U.S. LNG terminal has been temporarily shut down due to an accident.

To increase trans-Atlantic LNG supplies, developers in the United States have begun constructing new onshore export terminals and expanding existing terminals, while plans for at least one onshore import terminal have been announced in Europe. Onshore LNG terminals can take several years to design and construct, so European companies are turning toward floating storage regasification units (FSRUs) as a means of increasing imports more quickly. In recent testimony before Congress, a U.S. Department of State official highlighted the importance of FSRUs to expanding bilateral energy trade. However, although FSRUs are an established technology, their availability may largely determine how much more LNG Europe can ultimately import from the United States.

FSRU Capabilities and Global Fleet

FSRUs are specialized marine vessels that can store, transport, and regasify LNG for direct injection into natural gas pipelines. They require some onshore and port infrastructure, but not the extensive berthing, piping, storage tanks, and associated infrastructure required for conventional LNG import terminals. FSRUs are seagoing vessels that can be readily relocated. Thus, they may be used simply as LNG tankers, but in regasification service they remain moored at an unloading facility which connects them to an

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IN11956

onshore natural gas pipeline system. Stationary FSRUs receive LNG cargoes from conventional LNG tankers via ship-to-ship transfer and can store the LNG onboard prior to regasifying it and offloading it to a pipeline. The typical newly-built FSRU has a capacity of around 170,000 cubic meters of LNG, which is also the typical size of an LNG tanker. In some cases, LNG tankers have been converted into FSRUs.

At the end of 2021, the world fleet of FSRUs consisted of 48 vessels. (By comparison, there were 588 conventional LNG tankers in the world fleet.) Three new FSRUs started commercial operations in 2021, while 19 were reportedly under construction. South Korean shipyards have built much of the existing FSRU fleet. Shipbuilders in Singapore and China also have built several vessels. The United States has never built an FSRU, although it did build LNG tankers in the late 1970s. One U.S. company, Excelerate Energy, owns 10 FSRUs deployed around the world and also provides the onshore infrastructure and services required for natural gas delivery from FSRUs.

Building an FSRU can take up to three years and cost $300 million, whereas converting an existing LNG tanker into an FSRU can take 18 to 24 months and cost $100-$150 million. Of the 48 FSRUs in the global fleet as of 2021, 10 were conversions. The cost and construction time for the berthing and onshore facilities required to offload the natural gas are highly site specific, depending upon permitting requirements and existing port infrastructure. But FSRU onshore facilities require less capital than conventional LNG terminals and have been put into service in under six months. FSRUs generally are owned by companies that also own tankers, and LNG importers typically charter them for specified periods. If an existing FSRU is available in the vessel charter market, a new LNG import location can be operational in less than a year. By comparison, developing a conventional onshore LNG terminal can take four years or longer.

FSRU Demand in Europe

There were four active FSRUs located in Europe at the end of 2021 in Italy, Croatia, Lithuania, and Kaliningrad (Russia). Since then, several European countries have sought to contract for additional FSRUs to establish greater LNG import capacity. These efforts have accelerated as Russia has cut off natural gas exports to Poland, Finland, Bulgaria, the Netherlands, and Denmark. For example, Germany is seeking to secure four FSRUs, Poland is developing one FSRU project and is exploring a second one to serve Czech and Slovak demand, and Finland and Estonia jointly have chartered an FSRU. Long-term LNG purchase agreements to supply some of these FSRU projects, such as Poland's agreement with U.S.-based Sempra, are providing the principal financial backing for U.S. LNG infrastructure expansion.

Europe's ability to increase LNG import capacity quickly is limited by the availability of existing FSRUs for charter. In the current market few if any FSRUs remain uncommitted, so LNG import expansion over the next several years may depend to a significant extent on constructing new FSRU vessels. But demand is also strong for conventional LNG tankers and containerships, which are built by the same shipyards that build FSRUs. Many shipyards that might otherwise build FSRUs are booked. Conversion of older LNG tankers into FSRUs at other shipyards provides an alternative, but the availability of shipyards with such conversion capabilities also may be constrained. Chartering existing FSRUs deployed outside of Europe as their current contracts expire is an option, but current users likely will seek to keep them where they are. These potential impediments to further European FSRU deployment could inhibit the growth of demand for U.S. LNG exports. They also may factor into decisionmaking of European buyers on whether to pursue other alternatives, such as building pipelines to source more natural gas from Africa and Asia, and accelerating investment in renewable energy and conservation.

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