

EXPLAINED ECONOMICS

Small-scale LNG, a big idea

LNG is cleaner and cheaper than diesel, and can save India valuable foreign exchange. However, its large-scale use is currently hindered by significant transportation and distribution challenges

SUKALP SHARMA
NEW DELHI, MARCH 20

UNION MINISTER for Petroleum and Natural Gas Hardeep Singh Puri this month dedicated to the nation India's first small-scale liquefied natural gas (SSLNG) unit at GAIL (India) Ltd's Vijaipur complex in Madhya Pradesh.

Whysmall-scale LNG?

The government has been pushing for the adoption and use of natural gas across sectors, and aims to increase the share of natural gas in its primary energy mix to 15% by 2030 from a little more than 6% at present.

This is because natural gas is far less polluting than conventional hydrocarbons like coal and oil; it is also cheaper than oil, more than 85% of India's requirement for which is met through costly imports. Natural gas is seen as a key transition fuel in India's journey towards green energy and future fuels.

However, a major challenge in scaling up gas consumption lies in the transportation of gas to places that are not connected by the country's natural gas pipeline grid — a problem that also hinders the use of LNG directly as fuel for long-haul trucks and inter-city buses.

Large-scale pipeline projects that are in the works will take years to be completed; even so, last-mile delivery challenges may persist in many parts of the country. In this scenario, new-age solutions with fast turn-around times can help expand the reach, access, and consumption of natural gas.

SSLNG is one such promising solution. Puri said many plants like the one at Vijaipur were expected to come up in the coming years, which could potentially change the country's natural gas landscape.

GAIL also plans to invest Rs 650 crore to develop dispensing stations along the Golden Quadrilateral and other major highways to provide LNG as an automotive fuel.

What exactly is SSLNG?

There is no standard definition of this still globally nascent industry. But basically, SSLNG refers to the liquefaction of natural gas and its transportation using unconventional means in a significantly smaller-scale operation than the usual large-scale liquefaction, regasification, and transportation infrastructure and processes. Simply put, LNG — gas in its liquid or super-chilled form — is supplied in specialised trucks and small vessels to industrial and commercial consumers in regions that are not connected by pipelines.



Petroleum Minister Hardeep Singh Puri inaugurated India's first small-scale LNG unit at GAIL's Vijaipur complex this month. GAIL

In relatively traditional use cases such as supplying compressed natural gas (CNG) for vehicles and pipe gas for house holds and manufacturing units, the buyer would regasify the LNG using small vapourisers, and then supply it to end-users. Where the fuel is to be used directly in its liquid form, it would be supplied to end-users without regasification.

The SSLNG chain can start from a large-scale LNG import terminal from where the LNG, instead of being regasified and supplied through pipelines, can be transported to consumers by cryogenic road tankers or small vessels.

The chain can also start at locations with ample natural gas supply or production, where small liquefaction plants can be set up. The SSLNG unit at Vijaipur, which is GAIL's largest gas processing facility, is an example of the latter kind of location.

How does the SSLNG unit at GAIL's Vijaipur complex work?

The Rs 150 crore facility has SSLNG skids with a combined capacity of 36 tonnes per day, along with associated liquid handling systems. There are treatment skids — zeolite pretreatment skids (ZPTS) — and liquefaction

skids, known as cryo boxes, for converting natural gas to LNG. The SSLNG unit is controlled by an automated, web-based Supervisory Control and Data Acquisition (SCADA) system, a mechanism that is typically used to monitor large industrial devices and processes.

Natural gas is processed in the ZPTS at a pressure of about 15 bar to remove non-desirable components such as nitrogen, water, sulphur, and carbon dioxide. It is then fed to the cryo box, where it is compressed in a four-stage compressor to a pressure of around 260 bar.

The gas is cooled by a propane-based external refrigeration system to minus 60-70 degree Celsius, and then subjected to expansion, such that the temperature falls below minus 140 degree Celsius, allowing it to liquefy. The LNG will then be dispatched by cryogenic tankers to nearby areas for use in city gas distribution networks as CNG and piped gas, and in the proposed LNG filling stations for medium and heavy vehicles.

What is the business case for SSLNG?

GAIL is the first off the blocks, but almost all major oil and gas firms in India have their eyes on this potentially high-growth segment.

The first strong push for SSLNG had come

years ago from Petronet LNG Ltd, India's largest importer of LNG, which has been supplying LNG to some of its small industrial consumers from its large LNG import terminals at Dahej in Gujarat and Kochi in Kerala.

Petronet, which is promoted by GAIL, Oil and Natural Gas Corporation Ltd (ONGC), Indian Oil Corporation Ltd (IOC), and Bharat Petroleum Corporation Ltd (BPCL), has also been pushing for greater adoption of LNG as automotive fuel, marine fuel, and in regulation use cases such as city gas distribution networks and industries that use natural gas as feedstock.

Petronet's push for SSLNG and the use of LNG as a direct fuel for road and marine transportation was aimed at raising both LNG consumption in the country and LNG volumes at its Kochi terminal, which was struggling due to the absence of pipeline connectivity to major consumers.

Why is the use of LNG in long-haul trucks and buses attractive?

As mentioned above, compared with diesel, which is the dominant fuel in these segments, LNG is significantly cleaner — with reduced carbon dioxide emissions and negligible amounts of particulate matter, nitrogen oxide, and sulphur dioxide emissions.

LNG offers a slightly longer range to vehicles than diesel with similar-sized fuel tanks, and is usually cheaper than crude oil, from which diesel is derived. Although India imports around half of its natural gas requirement, this dependency level is much lower than in the case of crude oil. Replacing a major chunk of India's diesel consumption by LNG could lead to substantial foreign exchange savings.

LNG has been used successfully and aggressively in medium and heavy commercial vehicles in many countries, most notably in China. The challenges in India include a lack of easy availability of LNG-powered vehicles, the higher initial cost of these vehicles compared with diesel and the absence of an LNG vehicle financing ecosystem, and the virtually non-existent LNG retail network.

Companies such as GAIL and Petronet are working to build a viable ecosystem for transporters to move from diesel vehicles to LNG.

Petronet has collaborated with commercial vehicle manufacturers and other public sector oil and gas companies for trials and pilot projects for LNG-fuelled trucks and buses, is in discussions with state roadways corporations and truck fleet operators, and has established a few LNG dispensing stations along highways. IOC, like GAIL, is looking to build LNG dispensing stations along major highways.

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