

Concern About LNG Cold Energy Utilization

Traditional LNG receiving stations use the seawater open rack vaporizer or the submerged combustion vaporizer to vaporize the LNG, which wastes the precious cold energy resources.

Since the temperature range of air separation is $-190^{\circ}\text{C} \sim -150^{\circ}\text{C}$ and the temperature of vaporizing LNG is -162°C matching the temperature range of air separation, it can lower significantly the energy consumption by applying the premium low-temperature cold energy of LNG to the air separation device based on the energy cascade utilization in line with the temperature range.

In recent years, China's LNG import has grown at the rate of over 20% annually. The LNG cold energy market has tremendous potentials. China has begun to import 88.96 million tonnes equivalent to 124.5 billion cbm since 2006.

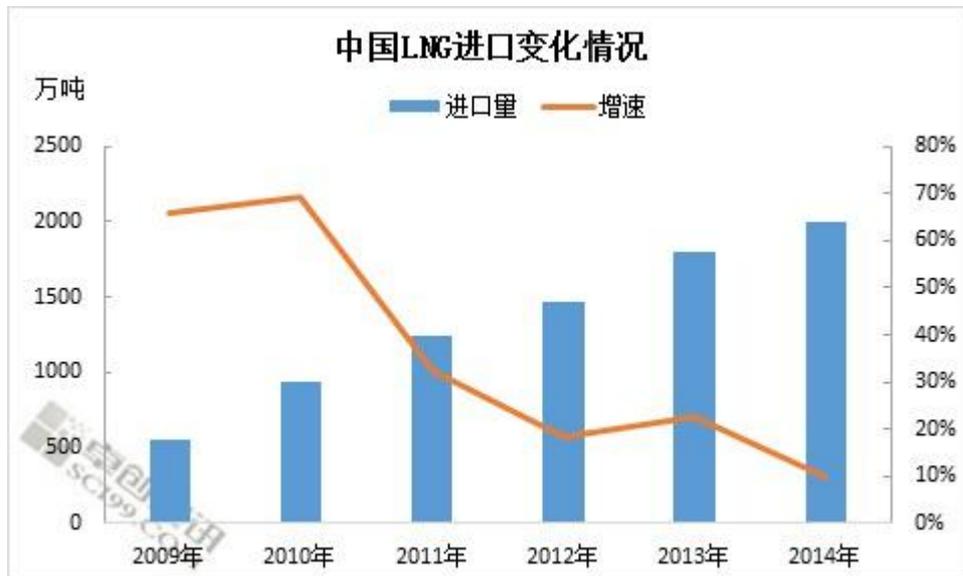


Diagram Translation:

Variation of China's LNG Import
(10,000 tonnes) — Import Volume — Growth Rate

Year	2009	2010	2011	2012	2013	2014
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Substantial Benefits of LNG Cold Energy Utilization

Application of deep cooling to LNG can produce liquid oxygen, liquid nitrogen and liquid argon separately. Based on the estimation, vaporizing each tonne of LNG is equivalent to the release of 830 joules — 860 megajoules of cold energy. The recycling of such tremendous cold energy can generate tremendous economic benefits. After deducting the consumption in the pressure of the high-pressure outgoing transmission of gas, one LNG receiving station in the capacity of 3 million tonnes/year can utilize 76 mW cold power equivalent to approximately 1 billion kWh, which equals one year's power generating capacity of a 200,000 kW power plant.

Current Utilization of LNG Cold Energy in China

At present, only two LNG receiving stations have started the cold energy utilization in China, that is, Putian Receiving Station in Fujian (under CNOOC) and Rudong Receiving Station (under CNPC) and these projects are still at the initial stage of development without achieving the scale operation.

However, no matter whether it is the government or the three oil companies (Sinopec, CNOOC and CNPC) operating the receiving stations, they have more in-depth understanding for the cold energy utilization. Following the on-going technical maturation, the future development prospects are expected.

)(Source: SCI99.COM)