



## Helping to meet future energy needs with natural gas

**Many companies rely on our Engineering Division for efficient ways of recovering, processing, purifying and liquefying natural gas. As the global demand for energy grows, natural gas is growing in importance.**

### Sizeable share of the global energy mix

Global reserves of the fossil fuels coal, crude oil and natural gas will run out over the next few decades. Yet new forms of renewable energy are not mature enough to effectively bridge the resulting deficit if worldwide energy demand increases as expected. So it is crucial that we work on improving the recovery, and processing of fossil fuels. Natural gas plays the most important role here as it offers three major benefits. Firstly, it has a higher heating value than coal or crude oil. In other words, more energy can be gained from gas than from the equivalent amount of coal or crude oil. Secondly, natural gas combustion produces fewer pollutants, residues and carbon dioxide emissions. And finally, at current consumption levels, global natural gas reserves are forecast to last for at least 60 years, whereas experts anticipate that oil wells will run dry within the next 40 years.

### Liquefied natural gas (LNG)

Across the natural gas entire value chain, Linde delivers a wide range of process technologies aimed at raising efficiency levels or reducing emissions. Prime examples include onboard reliquefaction of LNG on tank ships, and floating production, storage and offloading units or FPSO.

Cryostar, a member of The Linde Group and leading outfitter of LNG tankers, has been contracted to supply the onboard boiloff gas reliquefaction facilities for five LNG tankers currently under construction. FPSO floating platforms open up natural gas reserves in coastal waters or far out at sea where pipeline transport is not feasible.

Natural gas liquefaction plants are one of the core competencies of our Engineering Division. We engineer these LNG plants in a variety of sizes for the widest range of applications.

Our most impressive reference project here is Europe's largest LNG plant at Hammerfest, in Norway. Designed and constructed by Linde, it was opened by the Norwegian petroleum company StatoilHydro at the end of September 2007. The plant separates CO<sub>2</sub> contained in natural gas and pipelines it back into storage 300 metres below ground.

See Corporate Responsibility at [www.linde.com](http://www.linde.com) for more information.

### Gas to liquids (GTL)

Liquid fuels such as diesel or kerosene that have been produced from natural gas can easily meet the increasingly stringent emissions standards in North America and Europe. In contrast to conventional fuels, GTL fuels primarily comprise paraffins and are almost completely free of harmful aromatic hydrocarbons, nitrogen oxides and sulphur.

Converting natural gas into liquid fuels is a multi-step procedure known as gas to liquids (GTL). First of all, oxygen is used to convert natural gas to a synthesis gas made up of hydrogen and carbon monoxide. The Fischer-Tropsch process is then applied in a second step to convert this synthesis gas to sulphur-free, liquid hydrocarbons.

Growing demand for air separators to produce GTL fuels presents a promising new growth opportunity for Linde Engineering. In 2006, Linde Engineering won one of the biggest contracts in the history of engineering. On behalf of Qatar Shell GTL Ltd., it is building eight of the world's largest air separation plants, to be handed over turn-key by the end of 2010. See Corporate Responsibility at [www.linde.com](http://www.linde.com) for more information on the GTL process.

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