

# Your road to LNG. Linde supports you from start to finish.

## Step 1: Why LNG is worth your while

We will help you to understand how LNG fuel can impact your bottom line. Our sales specialists have a thorough understanding of local markets and we work closely with most heavy truck OEMs and selected retailer chains.

## Step 2: Analysis and preparation

Our starting point is a joint analysis of your operation and fuelling process. Based on this analysis, we will create a profile of your fleet (including driving patterns etc.) in order to quantify opportunities, potential benefits and required fuelling solutions. In addition, we will develop a plan for how you can introduce LNG in your company. Linde covers the entire technology chain for LNG fuel – from LNG supply to on-site fuelling solutions. We also offer solutions for fuelling CNG from LNG, so-called LCNG, for vehicles driving shorter distances, in which case the gas is compressed before being stored in the vehicle.

## Step 3: Test

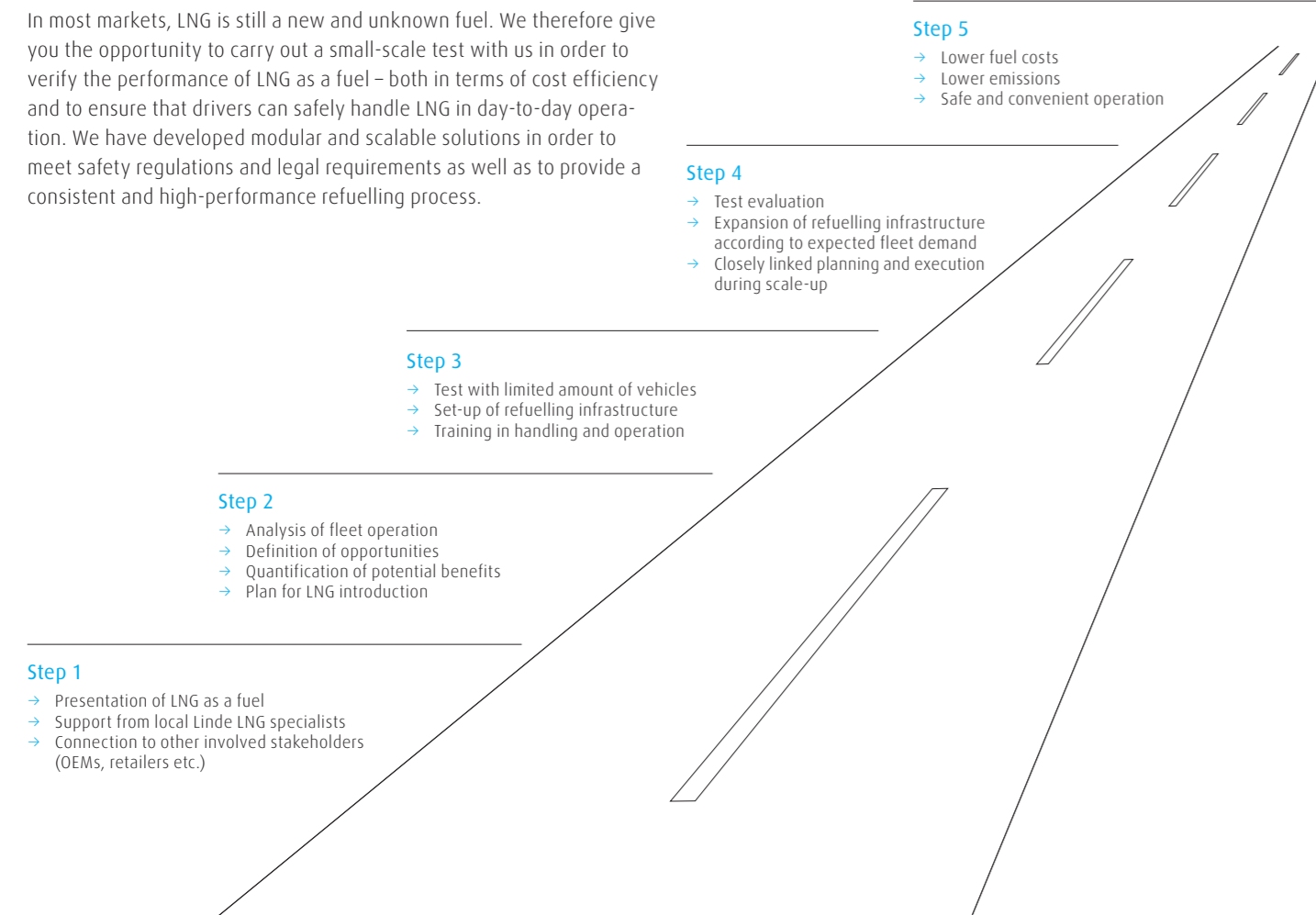
In most markets, LNG is still a new and unknown fuel. We therefore give you the opportunity to carry out a small-scale test with us in order to verify the performance of LNG as a fuel – both in terms of cost efficiency and to ensure that drivers can safely handle LNG in day-to-day operation. We have developed modular and scalable solutions in order to meet safety regulations and legal requirements as well as to provide a consistent and high-performance refuelling process.

## Step 4: Scale-up

The test phase normally takes around 6 months. After the evaluation of the test, we will meet with you to make a plan for the continued conversion of your vehicles and refuelling infrastructure. Typically, this plan identifies how many refuelling locations are required and ensures that the new infrastructure meets the demands of the new vehicles and routes.

## Step 5: LNG for the future

Looking ten years into the future, it is our strong belief that LNG will conquer many markets, where it will commonly be used as an on-board fuel, specifically for heavy trucks in point-to-point and back-to-back operation. Moreover, an LNG fuelling infrastructure will be broadly available along both larger and smaller transport corridors. As an early mover, you now have the chance to create significant value by converting your fleet to LNG, while lowering emissions at the same time.



## Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimisation and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

**Linde – ideas become solutions.**

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→ Liquefied natural gas for trucks

THE LINDE GROUP

*Linde*

Liquefied natural gas as a fuel for trucks.

# Fast tracking energy solutions.



## Liquefied natural gas – the new power source for trucks. A perfect substitute for diesel and other fuels.

Natural gas is a non-toxic, non-corrosive gas, consisting predominantly of methane with low concentrations of other hydrocarbons and inert gases after its purification. Natural gas can be stored in a vehicle either in its liquid or gaseous state. It has the highest octane number of any existing fuel used for road transport and the number of gas-optimised engines for trucks and other heavy vehicles is increasing rapidly. The core reason for this development is that natural gas (either liquid or gaseous) offers compelling benefits, ranging from competitive economics to strong environmental advantages.

### Benefits of natural gas

In all developed markets, the transport industry operates under strict emission regulations and, in the future, the need to lower CO<sub>2</sub> and noise emissions will even be more in the focus of public interest than today. Natural gas is clearly a more environmentally friendly solution than diesel: it produces less CO<sub>2</sub> emissions, less NO<sub>x</sub> emissions, less solid particle emissions and virtually no SO<sub>2</sub> emissions. Furthermore, natural gas is cheaper than oil and, in the long term, the price spread between the two is likely to continue to grow.

Another major benefit of natural gas is its safe application. It contains no toxic or corrosive components and does not pose broad dangers in terms of auto-ignition like diesel or other fuels. Linde makes the fuelling of natural gas just as simple and quick as the fuelling of diesel or gasoline, and the regional networks of natural gas fuelling stations are growing. Last but not least, trucks fuelled by natural gas are less noisy than conventional diesel motors.

## Fully equipped by Linde. LNG and LCNG fuelling stations.

### LNG or CNG?

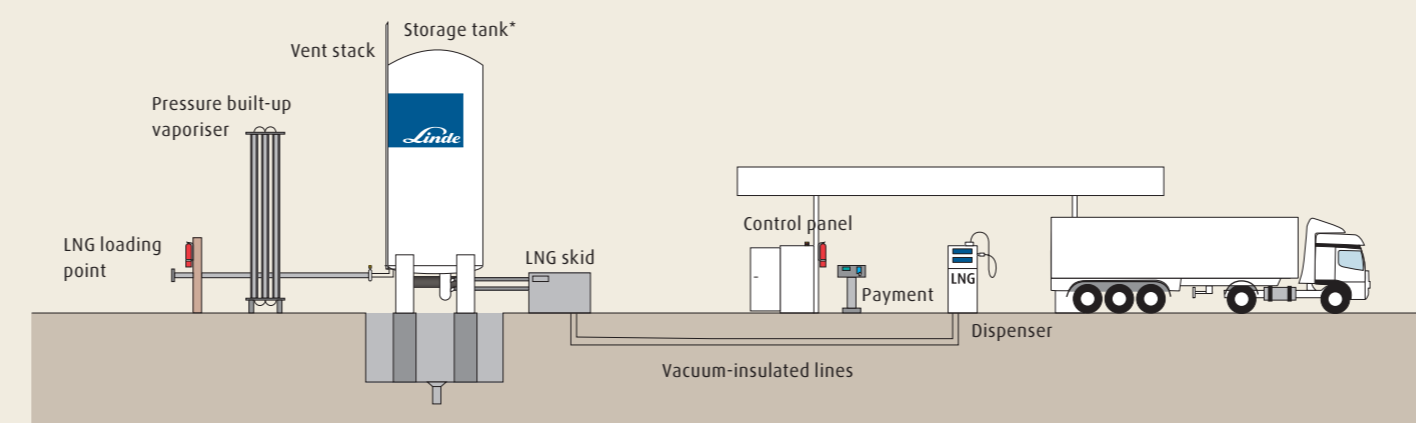
Natural gas can be fuelled either in gaseous (CNG) or liquid (LNG) form. Liquefied natural gas is getting more and more attractive for trucks that have long distances to travel. An important advantage of LNG is its higher density, containing up to 3 times more fuel than an equivalent volume of CNG. Therefore, much more LNG than CNG can be fuelled into tanks of the same size. Consequently, longer distances can be covered without refuelling. Another advantage of LNG is that it can be pumped at high flow rates. As a result, LNG can be dispensed more rapidly into LNG-powered vehicles, allowing for a diesel-like fuelling performance.

LNG can also be used for fuelling CNG-powered vehicles where the “L” is converted to “C” right at the dispenser in an operation referred to as LCNG. This is mainly used in locations with no access to a natural gas grid, e.g. along main highways outside of more densely populated city areas. Over the past years, Linde has equipped dozens of fuelling stations with LNG as well as LCNG technologies. In each case, the technologies have been selected according to the individual requirements on site in order to achieve the best and most economical solution.



Our mature and cutting-edge technology for LNG fuelling stations.

### Function of an LNG fuelling station



### Comprehensive fuelling station concept

Linde is an international gases and engineering company with a long tradition and a deep expertise in various industries. Based on its extensive experience from designing and engineering various technical solutions for LNG, including production plants, re-liquefaction units, cryogenic storage tanks and fuelling station equipment, Linde has now developed a unique fuelling station concept, which is modular and scalable, and offers 0-venting of methane to air and a diesel-like fuelling performance. Moreover, the concept also includes LCNG technologies to serve CNG-powered vehicles – either as a free-standing or

LNG-integrated solution. Together with the supply of LNG, this fuelling station concept is the core of our offer for customers wanting to tap into the benefits of using LNG to fuel their truck fleet.

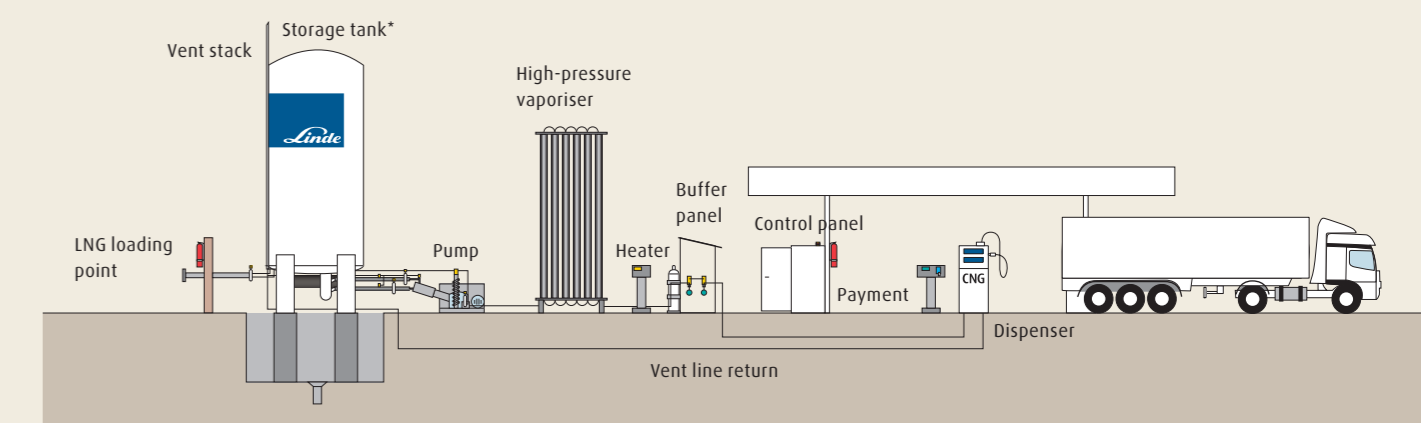
### What makes our LNG/LCNG fuelling stations unique?

- 0-vent technology
- Diesel-like fuelling performance
- Modular, scalable and suitable for any on-board storage solution



This fuelling station in Stockholm, Sweden, is equipped with a combined LNG and LCNG technology provided by Linde's subsidiary AGA.

### Function of an LCNG fuelling station



\* The storage tank is filled by an LNG trailer.