



# National Operational Guidance



**NFCC**  
National Fire  
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## Liquefied petroleum gas (LPG)

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### Information

LPG is widely used to describe two prominent members of a family of light hydrocarbons called natural gas liquids (NGL): propane (C<sub>3</sub>H<sub>8</sub>) and butane (C<sub>4</sub>H<sub>10</sub>).

The term 'liquefied gas' may seem a contradiction in terms because all things in nature are either a liquid or a solid or a gas. Yet liquidity is the unique characteristic of LPG that makes it such a popular and widely used fuel.

At normal temperature and pressure, LPG is gaseous. It changes to a liquid when subjected to modest pressure or cooling. In liquid form, the tank pressure is about twice the pressure in a normal truck tyre, which means it is very safe when properly handled.

LPG is a derivative of two large energy industries: processing natural gas liquids and refining crude oil.

Propane and butane are chemically quite similar but the difference in their properties means that they are particularly suited to specific uses.

- Propane's lower boiling point suits outdoor storage and is primarily used for central heating, cooking, as a transport fuel and in numerous commercial applications
- Butane is used mainly in cylinders for portable applications, such as in mobile heaters in the home and for leisure activities such as boats, caravans and barbecues. Butane can be used as a propellant or refrigerant, or to fuel torches. Often, propane and butane will be mixed to get the best energy yields and properties.

### Production

Approximately 60% of LPG is recovered during the extraction of natural gas and oil from the earth, and the remaining 40% is produced in refining crude oil. LPG is thus a naturally occurring by-product. In the past, LPG was destroyed through venting or flaring (the burning off of unwanted gas), wasting the full potential of this exceptional energy source.

### Natural gas processing

When gas is drawn from the earth, it is a mixture of several gases and liquids. Commercial natural gas is mainly composed of methane. However, it also contains ethane, propane and butane in accordance with the specifications for natural gas in each country where it is distributed. Therefore,

before natural gas is marketed, some natural gas liquids (NGLs), including LPG (propane and butane), are separated out, depending on the 'wetness' of the gas produced. NGLs represent 1 to 10% of the unprocessed gas stream.

### Crude oil refining

In an oil refinery, LPGs are produced at various stages; at atmospheric distillation, reforming, cracking and others. The LPG produced will be between 1 and 4% of crude oil processed. This yield will depend on the type of crude oil, the degree of sophistication of the oil refinery, and the market values of propane and butane compared to other oils products.

### Distribution of liquefied petroleum gas (LPG)

#### Step 1 - Production

The production of 'field-grade' LPG is the result of the treatment of NGLs. This treatment is necessary to produce:

- Oils that are suitable for transport to refineries
- Natural gases that correspond with commercial specifications

#### Step 2 - Transportation

While crude oil is transported from the production sites to refineries by tankers or pipelines, LPG is transported to storage terminals by large LPG carriers, pipelines or train.

#### Step 3 - Refining and storage

Butane and propane can also result from the oil refining processes. LPG storage terminals store products that are imported in large quantities.

#### Step 4 - Transportation

The LPG is then delivered by train, road, coastal tanker or pipeline to cylinder filling sites and intermediate-size storage areas.

#### Step 5 - Bottling and storage

Cylinders are filled with butane and propane at bottling sites. LPG is generally stored in pressurised tanks (vessels or spheres) in intermediary storage centres. LPG can be stored in cylinders of up to 47kg, with quantities above 47kg being classified as bulk LPG

#### Step 6 - Distribution

LPG can be transported virtually anywhere, either in cylinders or bulk. Trucks transport butane and

propane cylinders from the bottling site to retailers, as well as to private and professional customers. Meanwhile, small bulk trucks distribute LPG from the storage centres to various consumers.

#### Step 7 - End users

LPG is easily available to end users through cylinder sales points such as commercial stores or service stations close to their locations. Customers requiring larger volumes can purchase LPG in bulk.

Hazards (for further information refer to National Operational Guidance: Utilities and fuel and National Operational Guidance: Hazardous materials)

- As LPG vapour is heavier than air, it will flow along the ground and into drains, etc., sinking to low levels
- In still air conditions, any accumulation of vapour will take some time to disperse; this means that a flammable mixture might be ignited some distance from the point of leakage, with the flame travelling back to that point
- When LPG pressurised containers are heated, without adequate cooling, a BLEVE (boiling liquid expanding vapour explosion) could occur; this is usually a result of an external fire heating a vessel containing a flammable liquid

#### References and further reading

[www.wlpga.org/about-lpg/safety/](http://www.wlpga.org/about-lpg/safety/)