



**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals****Sub-Committee of Experts on the Transport of Dangerous Goods****Sixty-first session**

Geneva, 28 November-6 December 2022

Item 3 of the provisional agenda

Listing, classification and packing**Present and future products in the Liquefied Petroleum Gas
industry, amendment of UN Numbers, discussion points and
proposals****Submitted by the World LPG Association and Liquid Gas Europe****Summary*

Executive summary:	<p>A few years ago, the Liquefied Petroleum Gas (LPG) industry introduced into the market bioLPG i.e. LPG (C3/C4) of identical molecular composition with conventional LPG, but of bio/renewable origin. However, the existing definitions and UN numbers of LPG, described as a “petroleum” product, do not reflect any more either the renewable origin of bioLPG, or the conventional LPG extracted from natural gas.</p> <p>In addition, today, other molecules like renewable Dimethyl Ether (rDME), blended with LPG (and as stand-alone product), are already present in the market of the United States of America and expected to be also in Europe and other markets very soon.</p> <p>Some existing UN numbers need to be re-defined to also reflect the new products.</p>
Action to be taken	Informal exchange of views on the UN numbers for these new products, in preparation of a formal detailed proposal in the next session.
Related documents:	none.

* A/75/6 (Sect.20), para. 20.51

I. Background

1. Liquefied Petroleum Gas (LPG) has been a commercial fuel for just over a century. It consists of mostly propane and butane, supplied until a few years ago through only:

(a) **Petroleum refining** (covered by existing definitions and UN numbers), currently meeting 30-40 % of world demand and decreasing, and

(b) **Natural Gas (NG) processing** (not covered by one existing UN number, which refers only to “petroleum”), currently meeting 60-70 % of world demand. However, the LPG industry has been applying the same UN number (UN 1075) as that for the “petroleum” originated products.

2. Today, in the context of energy transition and aiming at de-fossilisation, decarbonisation and reduction of the overall carbon footprints, the LPG industry is transforming, by including also in its product range, the same propane C³H⁸ and butane C⁴H¹⁰ products, but also those of bio/renewable/recycled origin and gradually moving away from product originating from both, petroleum refining and extraction from natural gas. These two current sources are being replaced by non-fossil and bio/renewable supplies.

3. In addition, the LPG industry, started recently (in the United States) to include in its offerings other products and blends of bio/renewable/recycled origin of lower carbon footprint. More specifically, such an example is the inclusion of renewable DME (Dimethyl Ether), as a blend component, or as a standalone fuel. DME is a molecule with similar physical properties to LPG, that can originate from fossil, non-fossil and/or renewable or recycled sources. The renewable DME (rDME), is a complementary liquid gas that can be produced from multiple renewable/recycled feedstocks. Being a safe and clean-burning fuel, it is a viable sustainable addition to the energy mix. With its low greenhouse gas (“GHG”) footprint, it can reduce emissions by up to 85 % compared to fossil fuel alternatives. In both pure and blended form, rDME can help the de-fossilization of the LPG industry in all types of applications. It is highly compatible with the existing LPG infrastructure and equipment.

4. DME (UN 1033) has the same classification code as LPG (2F), the same label (2.1) and identical hazards:

- The vapour pressure of DME is approximately midway between that of butane and propane, almost the same as a 50/50 mix of butane and propane. That will have the effect of reducing the vapour pressure of propane rich mixtures and increasing the vapour pressure of butane rich mixtures, but only by small amounts when added at the maximum XX %¹ mass set out in this proposal.
- Calculations have been undertaken on the required flow capacity for safety valves (pressure relief valves) and those calculations show that if the safety valves are sized for LPG, they will also have the correct flow capacity for DME/LPG blends (and unblended DME).
- The thermal expansion ratios of DME and LPG are almost the same.

5. The above mentioned facts constitute new product offerings, and like any other new commercial fuel in general, they need to be assigned to a UN number that reflects them correctly.

6. For several years, there have been products transported, that did not completely correspond to the UN number used, like the example below, and there will be more coming in the future that will fall in these categories:

- The bioLPG (renewable LPG from biological or recycled feedstock) available today in many European markets, is in some areas transported using the number UN 1075,

¹ The quantity XX of DME, i.e. the drop-in level of DME in the LPG/DME blend, allowing full compatibility with existing LPG infrastructure equipment and appliances, without any impact to safety, is expected to be in the range of 10 % to 20 %. Ongoing research has already confirmed full compatibility at 10 % by mass, and this figure is expected to increase with the completion of the research work. This will be firmly defined and formally submitted for the June/July 2023 meeting for final approval.

however that is “Petroleum Gases, Liquefied” and although the bioLPG is identical to the fossil LPG, it is not a petroleum gas. BioLPG can exist as standalone product or as blend with fossil LPG.

- LPG blends with DME (commercialised many years ago in some countries outside Europe (e.g. China, Indonesia, etc.), do not have a specific UN number and therefore should be assigned to UN 3161 (Flammable Gases, Liquefied, N.O.S.), however that is a general UN number.

7. As DME has the same classification, labelling and hazards as LPG, permitting the addition up to XX % of rDME (by mass) to LPG assigned to UN Nos. UN 1075 or UN 1965 will have no effect on safety.

8. The emergency services instantly recognise UN 1075 and UN 1965 and know the dangers and required actions. However, if industry transports the rDME/LPG blend as UN 3161 Flammable Liquefied Gas, N.O.S. for some period of time, there may be a delay whilst the required emergency actions for UN 3161 are confirmed. There is also the problem with placarding and labelling on tanks, tankers and cylinders which could alternate between LPG and rDME/LPG blends, which is easier with tanks and tankers, but not as easy with cylinders.

II. Currently

9. UN 1075 is “PETROLEUM GASES, LIQUEFIED”, that needs to be amended to include renewable sourced LPG and also the addition of a “drop-in” level quantity of DME/rDME.

10. UN 1965 is “HYDROCARBON GAS MIXTURES, LIQUEFIED, N.O.S.” also needs the addition of a “drop-in” level quantity of DME/rDME.

III. Proposal

11. Amend the Dangerous Goods List in 3.2.2 as follows:

UN 1075	<u>PETROLEUM GASES, LIQUEFIED or molecular identical gases from renewable sources, may also include up to XX % by mass of DME</u>
UN 1965	<u>HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S., may also include up to XX % by mass of DME</u>

12. Amend the Alphabetical Index of substances and articles in Appendix A as follows:

Name and description	Class	UN No.
<u>PETROLEUM GASES, LIQUEFIED or molecular identical gases from renewable sources, may also include up to XX % by mass of DME</u>	2.1	1075
<u>HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. such as mixtures A, A01, A02, A0, A1, B1, B2, B or C, may also include up to XX % by mass of DME</u>	2.1	1965

IV. Safety implications

13. No safety implications are foreseen from the proposal. The LPG industry has the opinion that safety in the transport of the proposed LPG/DME blend will not be affected or changed compared to conventional LPG.

Annex I

Pressure temperature curves for DME, butane, propane and butane/propane mixtures

