

World Forum for Harmonization of Vehicle Regulations  
(WP.29)

Working Party on Pollution and Energy (GRPE)  
66<sup>th</sup> session, 4-7 June 2013

**Information about LNG Vehicles for GRPE  
at the request of the GRSG**

**André Rijnders/Jeff Seisler**  
**Informal GFV Group**

# Liquefied natural gas (LNG) is becoming more popular as a fuel for heavy duty trucks and also for ships, locomotives and non-road vehicles.



# Natural gas liquefies at $-162^{\circ}\text{(C)}$

- LNG is stored in specially designed vacuum insulated tanks in order to keep it cold when in transit, stored at the fuelling station, or on-board the vehicle. But at each step LNG absorbs a small amount of heat, which causes the temperature and pressure to increase over time
- LNG vehicle and fuelling systems are designed to be '**vent free**' otherwise operators 'lose money into the atmosphere'



# LNG now is regulated as a vehicle fuel

- LNG reference fuel was part of the Heavy Duty Dual-Fuel amendments in R.49 (GRPE)
- The GFV - LNG Task Force began its work in May 2011 to include LNG vehicle components and systems into Regulation 110 (NGV safety/installation)
- The LNG vehicle amendments to R.110 were approved by the 104th session of the Working Party on General Safety (GRSG) in April 2013 (ECE/TRANS/WP.29/GRSG/2013/7)



# LNG 'hold-time' and venting ('boil-off') is an operational issue

- 5 day minimum LNG 'holding time' in R.110 amendments are aligned with US regulations (SAE J 2343 and CARB)...the most severe in the industry
- Recognizing that potential methane release -- venting from 'boil off' -- is an environmental issue (not a vehicle safety concern), the GRSG suggested that the GRPE be made aware of this



# Though designed to be 'vent free' it is not possible to prevent small amounts of methane escaping to the atmosphere

- Commercial trucking systems are designed to match fuel consumption with fuel storage and delivery quantities
- Few commercial operators have trucks immobile for five days
- Venting in enclosed spaces (i.e. workshops) is taken into account (as with CNG) to provide proper ventilation



# LNG venting management systems and techniques are well known

- Pressure regulator ('economizer' regulator) vents at pre-set pressure, opening for ~10-30 seconds and then closes again.
- Adding LNG to the fuel tank condenses 'warmer' fuel
- Starting the engine or driving briefly relieves pressure in the tank and prevents venting
- Vapor recovery systems on the vehicle can be installed, sending 'warm' fuel back to fuelling station tanks



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