



NGV DAY 2014

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**Technical standards and safety for CNG
and LNG**

Technical standards and safety for CNG and LNG presentation contents

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Matthew Sherwood, Technical Officer, Institution of Gas Engineers & Managers (IGEM)



- I support and facilitate production of IGEM technical standards for the onshore gas industry
- For the leading membership and standards organisation for the global industry and supply chains
- I'm a good first port of call for technical enquiries relating to NGV fuelling infrastructure and wider gas industry

Call 01509 678188, email Matthew@igem.org.uk, or find me on [LinkedIn](#)



Role of IGEM

- We're licenced by the Engineering Council to award our members CEng, IEng and EngTech status and provide certified IPD and CPD
- Our technical standards provide the authoritative engineering best practice and legal requirements for all parts of the industry
- Includes technical standards for CNG and LNG fuelling stations, gas transmission & distribution, biomethane conveyance & injection etc.
- Membership of 200+ companies and 4,000+ individuals operate in transmission, distribution, utilisation, metering and all other parts of industry
- We're the independent voice of onshore industry, representing members to parliament, government and also an NGV Network steering group member

IGEM: Setting standards for engineering best practice and supporting legal compliance



- IGEM's technical standards are relied upon daily by the UK and global industry and supply chains
- Viewed globally as the Rolls-Royce of gas industry standards and are used for contracting purposes
- Combine legal/regulatory compliance with engineering best practice
- Produced by panels of the leading experts from industry, regulators and government departments
- Designed to promote highest standards of professional competence and health, safety and environmental performance whilst facilitating innovation

IGEM's members and partners include:



Global Energy Associates : Gas Consultancy & Training



NGVs: global snapshot

- Over 16 million NGVs worldwide, reported 30% growth annually and could reach 35 million by 2020
- Mature NGV markets include Argentina, China, Germany, India, Italy, Japan, Sweden, and the United Arab Emirates
- Business and environmental benefits leading to increased uptake from fleet managers of trucks, buses and goods vehicles in UK
- Necessary infrastructure is under development served by a gas industry with a 200+ years pedigree
- IGEM is developing new technical standards for CNG fuelling stations and LNG fuelling stations building on ISO international standardisation work

NGVs: business case summary

- Gasoline and diesel prices have risen faster than general inflation – significantly lower NGV fuel costs and favourable UK tax differential
- Commercial case for NGVs exists, where whole life costs are considered over time
- Increased availability of NGVs and infrastructure, as well as improvements to refuelling technology – experience now similar to conventional fuels
- Increased business awareness of air quality and climate change issues through reporting – great potential for natural gas and biomethane
- Potential for further government support and economic incentives due to pressure to decarbonise transport

Safety: natural gas as a vehicle fuel

- Natural gas is non-toxic and is the cleanest burning hydrocarbon producing less harmful emissions than diesel/gasoline
- Methane (CH_4) is a naturally occurring compound which compared with diesel/gasoline burns at low temperature with a narrow flammability range
- Unlike diesel/gasoline CH_4 is lighter than air meaning any leakages will quickly dissipate with no risk of pooling at ground level
- With odourisation natural gas becomes easily detectable to average person at much lower concentration than is combustible (5–15%)
- But as with all fuels which contain energy the individual characteristics of CH_4 /natural gas must be understood and respected

Safety: vehicle and fuelling system integrity

- Natural gas requires little processing and is safely transported to fuelling stations by pipeline, tube trailers or in cylinders
- CNG is natural gas compressed to e.g. 200 bar and LNG is natural gas cryogenically cooled to e.g. -160°C
- High pressure gases are used every day in industry; compression, cooling, storage and dispensing CNG and LNG is safe working to stringent rules
- NGVs are built to be safe in both normal operation and in accidents; fuel tanks are thicker and stronger than diesel/gasoline tanks
- But no matter what fuel, fuelling stations, repair garages and indoor parking structures must be built to ensure high levels of safety

Safety: vehicle survey and track record

- Survey of 8,331 NGVs travelling 178.3 million miles, NGV fleet injury rate was 37% lower than gasoline fleet rate
- No fatalities compared with 1.28 deaths / 100 million miles for gasoline fleets
- NGV fleet was involved in 7 fire incidents, only 1 of which directly attributable to failure of the natural gas fuelling system
- In crashes the strength of fuel tanks and fuel systems generally avoids any leakage or fire
- E.g.s include: CNG pick-up broadsided; most vulnerable part of fuelling system hit but CNG tank survived intact and driver walked away
- Bi-fuelled Honda impacted another vehicle at 100 mph; gasoline fire broke out but natural gas tank intact and still secured in brackets

Safety: what can we conclude?

- The unique properties of natural gas as a vehicle fuel must be understood and respected
- Accidents involving NGVs are testimonials to the safety of the on-board tanks and fuelling systems
- Common sense attitude must be adopted and industry standards followed with full legal compliance
- “...natural gas powered vehicles will be the safest vehicles in your fleet, we have no reservations about insuring them.” – Nationwide Insurance, 1992

IGEM pioneered UK technical standards for CNG vehicle infrastructure in the 1990s



Some changes, updates and issues

- **Risk assessments**
- **Hazardous areas**
- **Location**
- **Odourisation**
- **Operational requirements**
- **LNG supplies and as a fuel**
- **Potential impact of biomethane and shale gas?**

IGEM/UP/20 will become the new authoritative UK technical standard for CNG fuelling stations

- Guidance and requirements for design, construction, testing, commissioning and operation of CNG fuelling stations
- Intended audience includes manufacturers, installers, operators and inspectors of CNG fuelling stations
- Scope covers stations which deliver CNG supplied by either:
 - Piped natural gas from the supply network
 - LNG from onsite storage
 - A mobile CNG storage unit
 - Piped biomethane supply
- And includes private and public access stations offering fast and timed fill fuelling

IGEM/UP/20 CNG fuelling stations panel consists of leading UK/international experts

- Led by Chair Dr Richard Marrow, Global Energy Associates, development process ensures industry participation and feedback
- Work started early 2013, finished product expected to be available late 2014
- Will be available in hard copy and via online access to IGEM technical standards
- Free email enquiry service will support user interpretation of IGEM/UP/20 and all other IGEM technical standards
- Subject to industry demand will be regularly reviewed and updated as per other related standards for e.g. gas supply and biomethane

IGEM/UP/2X LNG fuelling stations

- New UK technical standard planned to cover LNG fuelling stations complementary to draft ISO standard ISO/DIS 16924
- Early scoping work currently underway, anticipated for completion early 2015
- Increasing demand for technical and regulatory guidance on LNG fuelling station infrastructure
- Complements work being undertaken by British Compressed Gases Association (BCGA)
- Working together to maintain the UK's world class record for health, safety and environment whilst facilitating innovation

Buying and accessing IGEM technical standards

- Hard copies can be purchased from IGEM's online shop at <http://shop.igem.org.uk>
- Online access packages are available through IGEM's Technical Services department
- Free technical standards and draft standards for industry consultation can be accessed via IGEM's website at www.igem.org.uk
- New, short term access options are in the pipeline and the potential for apps and interactive content are being explored
- IGEM's Technical Services department is here to help with access options



Contact IGEM

Call +44 (0)1509 678182

email General@igem.org.uk

Find/follow IGEM on LinkedIn, Twitter and Facebook

Thank you for listening...

