

BUSINESS PLAN

CEN/TC 326

NATURAL GAS VEHICLES – FUELLING AND OPERATION

EXECUTIVE SUMMARY

Scope of CEN/TC 326 "Natural Gas Vehicles – Fuelling and Operation"

The scope of CEN/TC 326 covers the design, construction, operation, inspection, safety and maintenance of fuelling stations and facilities for natural gas vehicles (NGV's).

It includes natural gas and biomethane in compressed (CNG) or liquefied (LNG) form and covers the operational aspects of NGV's during their life cycle.

The resulting standards will address the minimal safety requirements.

Business Environment

The European Parliament and the Council of the European Union issued on 22th October 2014 the directive on the deployment of alternative fuels infrastructure (AFI) 2014/94/EU. At the 12th March 2015 the European Commission sent a standardization request to the European standardization organisations to draft European standards for alternative fuels infrastructure (Mandate M/533). This request includes the development of standards for CNG and LNG fuelling stations. Due to the fact, that two ISO standards are in development and nearly finished, the European Commission asks CEN to transfer these ISO standards to European standards, if possible. These ISO standards for CNG and LNG fuelling stations that will be published in 2016 are:

- ISO 16923 *Natural gas fuelling stations — CNG stations for fuelling vehicles*
- ISO 16924 *Natural gas fuelling stations — LNG stations for fuelling vehicles*

For the use and operation of CNG and LNG vehicles only the European standard EN 13423 for CNG exists.

There are also national standards and/or technical rules in the different European countries for CNG and LNG stations as well as for the use and operation of CNG and LNG vehicles that should be considered, especially in the development process of the two ISO standards. For this purpose CEN/TC 326 recommended all European countries to take part at the development process of the two ISO standards.

Involved parties in CEN/TC 326 are manufacturing companies for CNG and LNG fuelling stations, operating companies as e.g. gas and fuel supply companies, operators of the grid and supplier of natural gas to the vehicle stations and also CNG and LNG vehicle manufacturer.

Benefits

To define the necessary standards to be used to reach the desired level of technical operability and safety for CNG and LNG fuelling infrastructure and operation of vehicles fuelled with CNG or LNG at the European market.

- Increase the confidence and social acceptability of CNG and especially LNG infrastructures and use
- Diversification of vehicle fuel chain in the European Union
- Value added experience and contribution for the international development of CNG and LNG fuelling infrastructures and operation of vehicles fuelled with CNG or LNG

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Date: 2016-04-05

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Priorities:

To make European standards available related to

- Safety
- Harmonized requirements for CNG and LNG fuelling appliances on the European market
- Establishment of confidence of the consumers by harmonized handling principles
- Development of the market
- Sharing expertise and experience for the growing European activities
- Addressing innovative fuel retail markets, uses and technical solutions for CNG and LNG fuelling stations
- Environmental aspects

1 BUSINESS ENVIRONMENT OF THE CEN/TC 326

1.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal, societal and/or international dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this CEN/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards.

The main factors influencing the decision to carry out standardisation activities are the following:

Political and economical factors

In the mobility and transport sector alternative fuels are urgently needed to break the over-dependence of European transport on oil. Transport in Europe is 94 % dependent on oil, 84 % of it being imported, with a bill up to EUR 1 billion per day, and increasing costs to the environment.¹

Declining gas reserves in Europe [i.g.: North Sea, Netherlands (Groningen), Germany (Lower Saxony)], production costs and the deregulation of European gas and electricity markets have all combined to create new opportunities for CNG as well as LNG as fuel in Europe. Further, many European countries rely on a limited number of energy supply sources. Such reliance may create serious issues of security of supply in the future.

The Compressed Natural Gas (CNG) industry is well established in most countries of the European market. In 2015 there were nearly 1,15 million CNG vehicles (other than ships, trains and aircraft) in Europe, which corresponds to a share of 0,41 % of all land vehicles, and 3.280 CNG fuelling stations. 210 stations were planned.²⁾

The Liquefied Natural Gas (LNG) industry and market show a very strong activity both at European and international level. For today's energy world, the LNG market is the most dynamic energy supplier with a high growing potential related to a yearly increasing demand and new identified resources. Within this economical context, numerous projects for LNG fuelling stations are realized (around 65³⁾ or are underway. LNG is more flexible than pipeline gas and is therefore seen as an essential aspect of diversification of energy supply sources.

Technical factors

The aim of the stakeholders is to develop a safe fuelling infrastructure for CNG and LNG to get these technologies accepted by the customers. The safe fuelling infrastructure is the key for a sustainable market development. Therefore, technical harmonization is required as an important contribution. The aim of the CEN/TC 326 is to develop standards to cover the design, construction, operation, inspection, safety and maintenance of fuelling stations and facilities for natural gas vehicles. The resulting standards will address the minimal safety requirements.

Regulatory and legal factors

The developed European standards of CEN/TC 326 would be appreciated as good references to avoid case by case discussions with local authorities and the subsequent waste of time and risk to increase project costs.

International trade and standardisation aspects

¹ http://ec.europa.eu/transport/themes/urban/cpt/index_en.htm, 2015-10-27

² <http://www.ngvaeurope.eu/european-ngv-statistics>, 2015-10-07:

³ Presentation Matthias Maedge, NGVA, EUROFORUM, SMALL SCALE LNG, 29th/30th September 2015, Hamburg, Germany

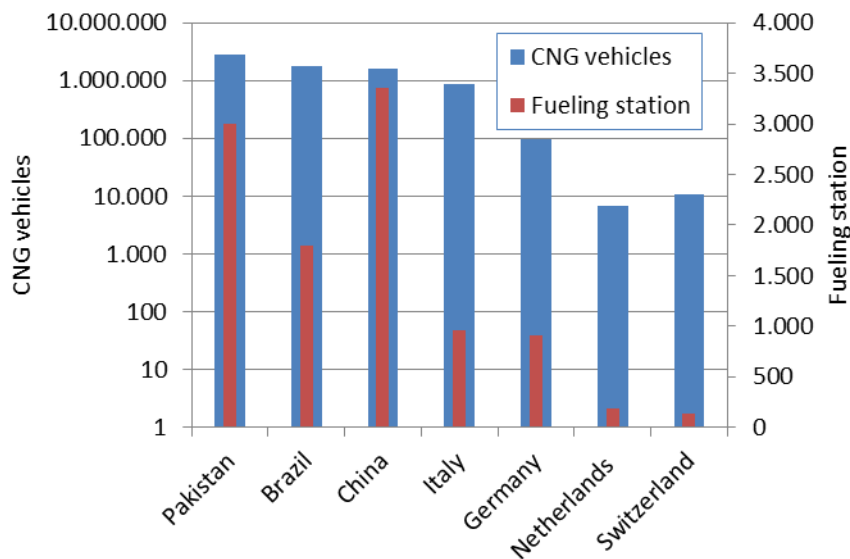
US standards are predominant outside Europe to design LNG installations; it would be an advantage for European engineering companies to be able to refer to a standard corresponding to the design philosophy prevailing in Europe (based in particular on a safety assessment as required by e.g. the “SEVESO” directive); the European industry, which played from the beginning an important role in that field, has an interest in basing their practise on recognised standards.

1.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the CEN/TC 326.

The compressed natural gas (CNG) industry is well established in several countries of the European market. In 2015 there were nearly 1.15 million CNG vehicles (other than ships, trains and aircraft) in Europe, which corresponds to a share of 0.41 % of all land vehicles. In Italy, the country with the highest rate of CNG vehicles in Europe, the share is 2.07 % of all land vehicles, in Germany, the country with the most CNG fuelling stations, it is 0.20 %. In Europe there are 3.280 CNG fuelling stations. 210 stations are planned. ⁴

CNG vehicles (other than ships, trains und aircraft) and fuelling stations worldwide in 2013 ⁵



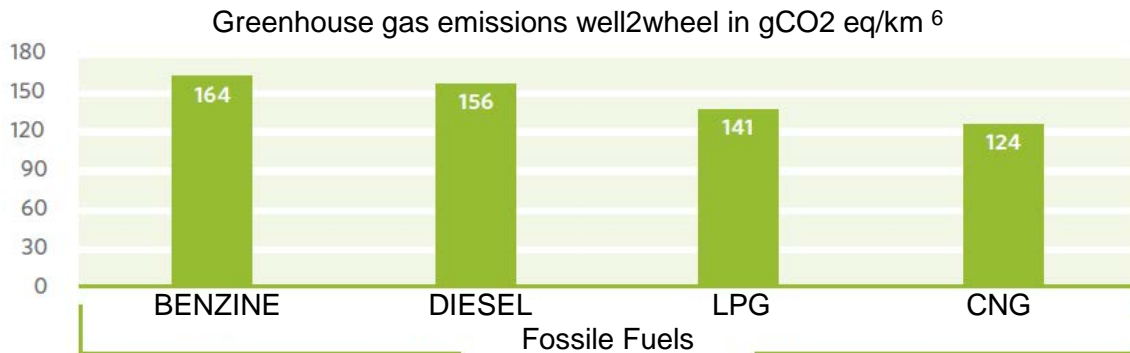
Possible reasons for the low share of CNG vehicles of all land vehicles, which are of interest for CEN/TC 326, are ⁵

- number of CNG fuelling stations in Europe, in several countries CNG is well established (e.g. Italy, Germany) in other countries the number of vehicles is raising (e.g. Netherlands) and in other European countries there is it nearly not existent.
- missing knowledge about CNG technology on the customer side, confusion between CNG and LPG in several countries

⁴ <http://www.ngvaeurope.eu/worldwide-ngv-statistics>, 2015-11-24

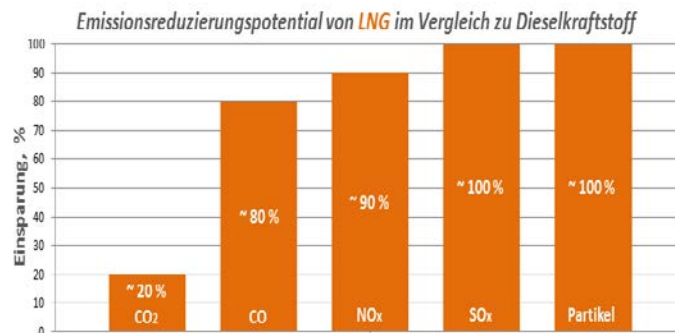
⁵ Dudenhöffer, F.; Pietron, K.: CNG AS AUTOMOTIVE FUEL FOR EUROPE /CEE IS IT POSSIBLE TO ACHIEVE 5 % + X MARKET SHARE FOR CNG? NECESSARY STEPS AND ACTIONS TO ACHIEVE?“ CAR-Center Automotive Research Universität Duisburg-Essen, September 2010

Due to the CEN/TC 326 standards the competitiveness of the technology and the acceptance at the customers will be increased. Compared to the South American and the Asian market there will be a great potential for CNG to replace oil in Europe in the future.



The liquefied natural gas industry (LNG) is a rather young one. The real beginning of its development goes back to 1964/65 with the first LNG chain between Algeria, UK and France. The main drivers for the use of LNG as fuel are the much lower emissions of LNG compared to diesel fuel. Well-to-wheel GHG emissions of a high pressure direct injection (HPDI) LNG truck can be 17–25 percent lower than for diesel⁷. An environmental pollution caused by particulate matter is not given in the use of LNG as fuel practically. The use of LNG trucks leads also to a significant lower noise level, up to 50 percent compared to a diesel vehicle. LNG as fuel for large trucks contributes to greater independence of the transport sector on oil and increases security of supply. It is an increasing market in Europe.

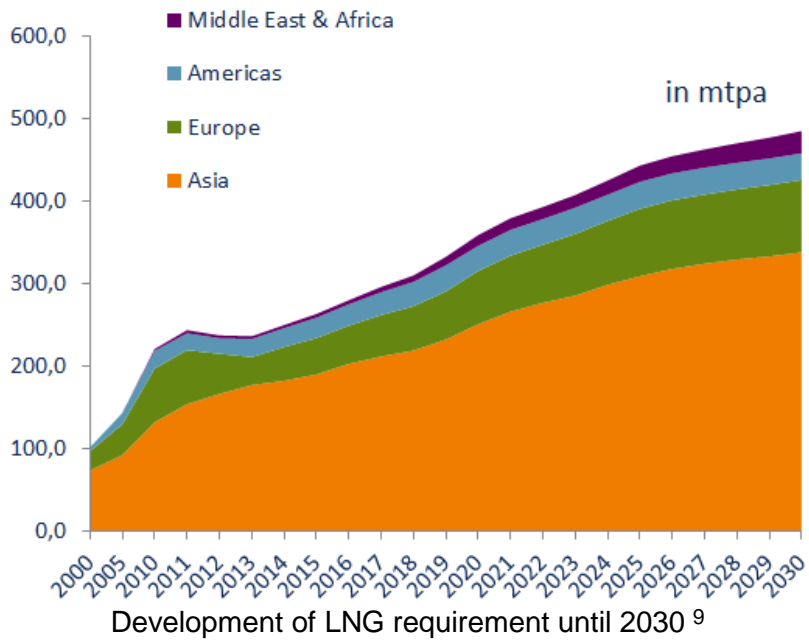
Reduction of emission of LNG compared to Diesel ⁸



⁶ Kofod, M., and Stephenson, T. (2013). Well-to-wheel greenhouse gas emissions of LNG used as a fuel for long haul trucks in a European scenario. SAE Technical Paper no. 2013-24-0110. September 8. Warrendale, Pa.: SAE International.

⁷ Kofod, M., and Stephenson, T. (2013). Well-to-wheel greenhouse gas emissions of LNG used as a fuel for long haul trucks in a European scenario. SAE Technical Paper no. 2013-24-0110. September 8. Warrendale, Pa.: SAE International.

⁸ Gas- und Wärmeinstitut Essen e.V.



LNG Blue Corridor Project¹⁰

⁹ IGU.org

¹⁰ LNG Blue Corridors

2 BENEFITS EXPECTED FROM THE WORK OF THE CEN/TC 326

Benefits expected from the work of CEN/TC 326 are mainly:

- to develop standards to cover the
 - design
 - construction
 - operation
 - inspection
 - safety
 - maintenanceof fuelling stations and facilities for natural gas vehicles and to cover the
 - use
 - operationof CNG and LNG vehicles
- to satisfy the requirements of the European AFI directive 2014/94/EC.

3 PARTICIPATION IN THE CEN/TC 326

All the CEN national members are entitled to nominate national delegates to CEN Technical Committees and experts to Working Groups, ensuring a balance of all interested parties. Participation as observers of recognized European or international organizations is also possible under certain conditions. To participate in the activities of this CEN/TC, please contact the national standards organization in your country.

4 OBJECTIVES OF THE CEN/TC 326 AND STRATEGIES FOR THEIR ACHIEVEMENT

4.1 Defined objectives of the CEN/TC 326

The objectives of CEN/TC 326 covers the design, construction, operation, inspection, safety and maintenance of fuelling stations and facilities for natural gas vehicles (NGV's). It includes natural gas and biomethane in compressed (CNG) or liquefied (LNG) form and covers the operational aspects of NGV's during their life cycle. The resulting standards will address the minimal safety requirements.

4.2 Identified strategies to achieve the CEN/TC's defined objectives

To draft the standards, CEN/TC 326 has five active working groups:

- CEN/TC 326/WG 1 CNG Filling Stations
 - Minimal safety requirements for natural gas filling stations; also in the case of CNG supplied as product and not as fuel.
- CEN/TC 326/WG 3 CNG Vehicle Use and Operation
 - This working group provides requirements for the operation (“user manual”) of vehicles using CNG (fossil and renewable) as fuel, giving recommendations of good, safe and environmental friendly practice for users, including transit through specific areas (tunnels, ferries, etc ...), refuelling, parking, and workshops, and also giving instructions in case of accident.
The working group provides requirements for competence of operatives.
- CEN/TC 326/WG 4 LNG Fuelling Stations
 - The scope of this working group is to develop a European Standard including technical specifications and describing minimal safety requirements for LNG/LCNG fuelling stations for road vehicles. The standardization work will review the ISO

standard and, if necessary, align it with respect to European framework (directives, codes, standards) and market requirements.

- CEN/TC 326/WG 5 LNG Vehicle Use and Operation
 - This working group provides requirements for the operation (“user manual”) of vehicles using LNG (fossil and renewable) as fuel, giving recommendations of good, safe and environmental friendly practices for users, including transit through specific areas (tunnels, ferries, etc ...), refuelling, parking, and workshops, and also giving instructions in case of accident.
- CEN/TC 326/WG 6 NGV Refuelling Appliances
 - This working group will provide standard specifications for the design, manufacturing, assembling, installation, inspection and operation of NGV Refuelling Appliances. This includes Vehicle Refuelling Appliances (VRA) and Home Refuelling Appliances (HRA). This standard applies to NGV Refuelling Appliances intended as a natural gas compressor package containing limited storage.

CEN/TC 326 tries to avoid any duplication of work or conflicts in the texts with other CEN or ISO TCs or national regulations in Europe. For this purpose the following liaisons with European and international organisations are existent:

- CEN/TC 12 *Materials, Equipment and Offshore Structures for Petroleum, Petrochemical and Natural gas industries*
- CEN/TC 268 *Cryogenic vessels and specific hydrogen technologies applications*
- CEN/TC 282 *liquefied natural gas*
- CEN/PC 408 *Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid*
- CEN/TC 441 *Project Committee on Fuel Labelling*
- ISO/TC 22 SC 41 *Specific aspects of gaseous fuels*
- ISO/TC 22 SC 41 WG 4 *Fuel system components and refuelling connector for vehicles propelled by Liquefied Natural Gas (LNG)*
- ISO/TC 58/SC 4 *Operational requirements for gas cylinders*
- ISO/TC 67 *Materials, Equipment and Offshore Structures for Petroleum, Petrochemical and Natural gas industries*
- ISO/TC 220 *Cryogenic vessels* to be asked
- ISO/PC 252 *Natural gas fuelling stations for vehicles*
- MARCOGAZ
- NGVA Europe (*Natural & Bio Gas Vehicle Association*)
- OIML

CEN/TC 326 aims to promote its EN standards in Europe and in the rest of the world.

4.3 Environmental aspects

The gas supply companies, in the widest sense of their activities (production, transport, distribution) have a long tradition in ensuring that networks and facilities are operated according to well-defined procedures which are the centrepiece of quality management systems. They are based on the general criteria of the series ISO 9000 and currently developed gas-specifically as EQAS (European Quality Assurance System) in CEN/TC 234 in order to adhere more efficiently to the procedures peculiar to the gas activities.

Companies are more and more inclined to take into account environmental aspects, since the series ISO 14000 resulting in EMAS (Environment Management System) have a similar structure,

and the measures to be taken are directly linked to the technical operations and therefore cannot be dissociated from them.

Review of the key environmental issues associated with the scope of the work covered by CEN/TC 326:

- Noise/Vibration
- Emissions to air
- Waste
- Risk to environment from accidents/misuse
- Use of energy
- Use of land
- Use of materials

These aspects have been addressed in details in the technical report CEN/TR 16388 "Gas-Specific Environmental Document – Guideline for incorporating within standards to minimize the environmental impact of gas infrastructure across the whole life cycle".

Tables regarding the aspects and the processes addressed in the standards help for the environmental review while drafting a European Standard.

The definition of the objectives regarding the addressing of environmental issues and consideration of how to assess progress in achieving those objectives will be part of an ad-hoc group mission for the next years in CEN/TC 326.

5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE CEN/TC WORK PROGRAMME

The main factor impacting negatively the completion of the work is

- the lack of expert resources with only few European countries having an LNG industry.
- interest of the European industry in special fields of CNG appliances.

This means that having five countries participating to a new work item or a revision of a standard is very difficult.

Furthermore, the technical expertise needed and the size of the standards makes it difficult to follow the short CEN timeframe.