NGVA Europe

for sustainable mobility

Brussels, 23 June 2020

NGVA Europe reaction

Compressed natural gas vehicles: a clean solution for transport

Brussels, 23 June 2020 – Yet again, we are faced with another release from the NGO 'Transport & Environment'[1] which is doubting the proven environmental benefits of natural gas in transport, specifically for air quality this time. It is targeting the inclusion of CNG into the support schemes for accelerating the renewal of the current fleet in Italy.

As associations promoting gas in transport both in Italy (NGV Italy) and in Europe (NGVA Europe), we are wondering about the reasoning behind the constant attacks from T&E to the solution for sustainable mobility - natural gas in transport - that today represents less than 1% of the total car and heavy-duty vehicle fleet in Europe.

One reason could be that natural gas in transport, unlike other solutions, is mature, reliable, and a very cost-effective technology, able to answer all mobility and transport needs. Therefore, it attracts various operators – thanks to its ecological and economic standpoint. These benefits are recognized not only in Europe but even more, in the rest/in other parts of the world. The NGV fleet in Europe counts about 1,5 million vehicles while the rest of the world more than 25 million units are circulating.

After the coronavirus pandemic crisis, it is time to question our previous certainty and habits: we have to reinvent our common vision of a net zero emissions future. Here, we have to look for the best combination of solutions that can support a sustainable, feasible and socially acceptable evolution of our transport system as a whole.

Moreover, we have to ensure a business-based timeline, considering implementation and penetration of new technological solutions all across Europe.

Zero tailpipe emissions technologies are part of the solution, but there are 300 million vehicles in Europe that are (still) fuelled with conventional fossil fuel. These vehicles will require a change to alternative and renewable fuels if the immediate decarbonisation of transport is the real objective. Limiting the future options to one solution for all transport modes is not enough.

Natural gas and air quality

This is because clean solutions based on Internal Combustion Engines (ICE) provide immediate answers to urban pollution and unlock huge carbon reduction potential thanks to renewable fuels.

[1] https://www.transportenvironment.org/publications/are-compressed-natural-gas-vehicles-clean-solution-transport

The chemical properties of natural gas ensure a clean combustion process. Looking at the progressive tightening of pollutant emissions standards, future internal combustion engines, even when fuelled with conventional fuels, will have to be "clean". However, to meet such standards under real driving conditions, the cost and the complexity of gas after-treatment systems (ATS) will increase.

Unfortunately, people assume too often that natural gas engines would emit as many pollutants as diesel engines. But in reality, it is the contrary: today's diesel engines, thanks to very complex ATS, are able to reduce their emissions close to these of natural gas vehicles.

It is also interesting to notice that, when referring to particles pollution, this is not strictly dependent on ICEs: this is documented, for example, in the recent study[2] by ARPA (the Italian regional agencies for the environmental protection) which shows that particulate matter is mainly caused by non-transport sources, and that the share in charge to road vehicles is mainly caused by the brakes system and tyres wear and, only marginally, by exhaust gases from combustion engines[3][4].

Independent publications and tests: facts about particle pollution

Regarding the formation of particulate matter due to internal natural gas powered combustion engines, there are plenty of publications and tests accredited by CNR[5], JRC[6] and EMPA[7] (which are all independent and therefore represent neutral opinion about the subject) which categorically deny what has been declared by T&E, namely that gas in transport produces ultrafine particulates in large quantities or beyond limits.

The study used by T&E (DownToTen. Samaras, Z. (2019) Measuring automotive exhaust particles down to 10 nanometers-DownToTen) does not underline any difference between natural gas and gasoline emissions while the report itself shows that PN emissions from natural gas are 10 times lower than gasoline.

This fact is also confirmed by the study from EMPA[7], where a reduction factor by 30 is measured between natural gas and gasoline PN (Particle Numbers) emissions.

Today, the question of ultrafine particle emissions is under discussion: current measurements, according to Euro 6/VI legislation, are done considering only particles with an equivalent diameter > 23 nanometres, while future legislation will most probably look also in the range down to 10 nanometres, or even lower.

[2] https://www.fundacionnaturgy.org/wp-content/uploads/2019/05/4.-guido-lanzani-bruxelles-070519.pdf
[3] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/non-exhaust-traffic-related-emissions-brake-and-tyre-wear-pm
[4] https://www.sciencedirect.com/science/article/abs/pii/S135223101630187X
[5] https://www.repubblica.it/economia/rapporti/energitalia/mobilita/2020/03/26/news/il_gas_naturale_emette_meno_co2_e_polveri_dell_ibrido-252385244/
[6] http://www.gason.eu/documents/get_doc/1166
[7] https://www.iet.hsr.ch/fileadmin/user_upload/iet.hsr.ch/Power-to-Gas/Kurzberichte/Berichte_Ueberarbeitet/EMPA-Bericht_CNG-Mobility.pdf

In 2016, the European Commission has launched three Horizon 2020 projects (http://www.pems4nano.eu) (http://sureal-23.cperi.certh.gr) (http://www.downtoten.com) to develop new methodologies to measure nanoparticles below 23 nanometre diameter on board. This will be done thanks to the use of dedicated PEMS (Portable Emissions Measurement System). The DownToTen project collaborated also with the Gason[6] project: experimental activities run at JRC demonstrated that even in the domain down to 4 nanometre diameter, PN generation from a CNG dedicated engine was still below the current emission threshold, and this even in absence of the filtering device.

The potential generation of ultrafine particles in CNG engines is not due to the combustion process itself but reasoned in its oil consumption and also affected by the properties (viscosity) of lube oil. In a recent SAE publication[8], it has been demonstrated that oil viscosity and its ageing are fundamental in the PN generation process, and that the precursors for the nucleation of the nanoparticles are mainly sourced by lubricant additives (metals).

Again, the study used by T&E (DownToTen. Samaras, Z. (2019) Measuring automotive exhaust particles down to 10 nanometers-DownToTen) also mentions lubrication as potential source in natural gas engines for particle nucleation to explain PN generation in the sub-23 area. Nevertheless, the paper does not present the preliminary analysis on the engine lube consumption that would have been needed from a methodological point of view before running such a critical measurement campaign.

Natural gas is the simplest hydrocarbon fuel and, thanks to its gaseous nature, provides an immediate benefit in terms of pollutants (THC, NOx, PM/PN) reduction, not only from a quantitative point of view but also from the qualitative one.

For instance, when looking to the effects on the human respiratory tract from the combination of sun radiations with vehicle emissions, the potential in forming ground ozone is playing a fundamental role and this is highly depending on the nature of the fuel.

In the same study from EMPA[7] the emissions from bi-fuel Euro 6b vehicles, operating with gasoline and the other on CNG, have been compared. The formation of ozone promoters is depending on the combination of NOx emissions and the rate of NMHC (Non Methane HydroCarbons), and the benefit from the composition of natural gas is quite clear, cutting the ozone promoters by a factor 5 compared to gasoline.

Furthermore, T&E insists on the future evolution of the emissions legislation (Euro 7/VII) and the need to set specific targets for CNG/LNG vehicles. Even in this case they are not considering the principle of the fuel neutral / technology neutral approach that is the base principle also looking to the simplification of the regulation. NGVA Europe's position about emissions legislation evolution is available online[9].

[8] SAE Paper 2017-01-0778

[9] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12313-Development-of-Euro-7-emission-standards-for-cars-vans-lorries-and-buses/F521796

Thanks to its fuel properties, CNG and LNG technologies effectively lower pollutant emissions. There is constant evolution in aftertreatment technologies and in simplicity of the ATS which is also guaranteed in terms of robustness and durability.

Carbon neutrality with biomethane

Even more, T&E also questions the use of biomethane. Also here, it is very difficult to understand the reasoning behind this.

Biomethane is mainly produced through sustainable anaerobic processes converting waste and dedicated biomasses into a clean fuel. This fuel is providing a GHG saving between 80% to 95% compared to conventional fuels and, in some cases (e.g. liquid manure), can even lead to negative emissions.

Today, biomethane, as bioCNG and bioLNG, is already widely distributed through existing infrastructure, without any additional costs.[10] With this in mind, we see that existing and future CNG and LNG infrastructure is key. It needs to be preserved, further supported and extended for use of biomethane fuelled NGVs all across Europe. Today, the system is already delivering 17% biomethane to the road transport sector; this means that, despite what could be measured at the tailpipe, GHG emissions result with additional 20% less emissions. Globally, compared to conventional fuel, the GHG saving is already equivalent to approximately 40%. This, while using the same technologies and the same distribution infrastructure.

Conclusion

To conclude, we would expect from a NGOs to be first in place to try and apply a holistic and effective approach to solve the complex equation of reaching a decarbonation transport system. This is what our environment and society is asking for, not only in 2050 – but today.

It is time to collaborate, to integrate solutions, to consider the economic conditions across all European Member States to build a solid roadmap where EU industries will continue to express their leadership.

Natural gas, together with biomethane, offers an ecosystem that is a great example of circular economy, liaising the mobility with the renewable energy and agriculture sector.

It is a cost-effective solution to quickly start a process, which is today unfortunately still acting in slow motion, shaping our future mobility and transport system[11].

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[10] https://www.ngva.eu/wp-content/uploads/2020/05/NGVA-Europe_Biomethane_May2020.pdf
[11] https://www.ngva.eu/medias/the-european-green-deal-in-the-fast-lane-with-biomethane-in-transport/