ENTSOG Position Paper

A flexible approach for handling different and varying gas qualities

Problem description - current challenges around gas quality

As reflected in ENTSOG's TYNDP and its Vision 2050, diversification of supply sources, decarbonisation, and the decline of indigenous production are **EU wide trends** that will influence the gas quality delivered to an increasingly diverse range of end-use applications.

Markets will be looking at new supply routes and sources for achieving greater liquidity or to local renewable gas production in their path to decarbonisation. Both in the short and long term, **gas will be a key energy carrier** for modulating seasonal demand, providing high-temperature heat to industry and accommodating the intermittency of renewable energy sources in the electricity sector.

National standards, when unable to accommodate these new supply sources without additional treatment, may introduce extra costs for meeting energy policy targets. On the other hand, there is a legitimate concern amongst end users that diversification of gas supply could expose end-use applications to gas quality fluctuations or unpredictability with potential adverse effects on safety, efficiency and emissions. In this context, TSOs are facing **competing requests from producers and end users** and, at the same time, assessing the readiness of their system to increase renewable gases share. In the framework provided by the network code on interoperability and data exchange rules, TSOs are also actively cooperating to avoid the emergence of any cross-border issue related to gas quality, with a special focus on renewable gases.

Despite the intense efforts of the standardisation community, today there is not a clear EU technical agreement on the gas quality standards that should be delivered to and accepted by end use applications. ENTSOG finds that **further clarity on EU-level would be beneficial** for achieving energy policy targets. In addition, ENTSOG believes that information provision and flexibility in the application of gas quality standards, including an understanding of how to share flexibility among parties, have a key role to play.

The purpose of this paper is to explore the options available to address these challenges and set out ENTSOG's views of what needs to happen at EU level.

The current situation

Today, there are **requests to revise gas quality standards** both at entry and exit points. TSOs often receive requests from gas suppliers to extend the operational limits at injection points, and at the same time are faced with a wish from the end-users to keep the gas quality as narrow and stable as possible at exit points. For the TSOs, accommodating these requests and, at the same time, securing a free flow of gas across the borders is a **technical challenge**. The operation of the transmission network influences the gas quality in the system only to a certain extent, at entry points as well as at exit points. Furthermore, the **competence for the regulatory limits** in the gas quality standards lays at the national authority in each EU member state.

Additionally, the European energy system is changing to a sustainable low-carbon energy network to ensure the goals of affordable, secure and sustainable energy for Europe and its citizens. Thereby, the gas sector looks towards a low-carbon 2050 future mainly, if not solely, using green gases (e.g. biomethane, H2, H2NG). On their side, TSOs are already considering different options to adapt networks to higher shares of renewable gases (e.g. when replacing compressors, TSOs could consider increasing readiness for hydrogen -starting by e.g. 10 % H2- to make sure compressor stations are not an obstacle) or even to convert existing pipelines into a fully decarbonised system. This transition from natural gas to green gases will not only have a significant impact on the gas quality but also on flow dynamics in the network as production points will be more **distributed** and, in some cases, **intermittent** (e.g. power-to-gas). This means that the **need for gas quality flexibility** in the whole gas sector value chain will become more pronounced in the future.

In some cases, gas quality standards may limit the capacity to inject green gases in the transmission network in an economical way and make it difficult to **offer all project promoters a non-discriminatory green gases capacity**. TSOs see a need for the development of a procedure to orderly allocate the system's flexibility between project promoters, otherwise, it will most likely result in a first-come, first-serve procedure.

One of the main challenges around gas quality is how to share the flexibility within the system and across borders so that a reasonable compromise between the competing wishes of market participants is found. Gas quality standards should be applied in a flexible way so that **costs for the different actors across the whole gas value chain are minimized**.

Cross-border trade restrictions for green gases

Cross-border trade restrictions can appear between countries having **different gas quality standards**.

Today, TSOs manage these issues on a bilateral level, as foreseen in the network code on interoperability and data exchange rules Articles 15 and 19, which, when the restriction cannot be avoided by TSO standard operations, set out detailed procedures to implement feasible solutions in coordination with the national authorities.

The operational measure adopted at the Danish-German border in 2016 to avoid the immediate market restrictions in relation to biomethane (due to its oxygen content) is a good example of TSO-TSO cooperation[1]. This case, however, demonstrates that a flexible solution for gas quality at the EU level is necessary as a long-term solution. The risk of cross-border (or national) restrictions will increase all over Europe as renewable gases injection projects develop and compete for the renewable technical gap in the system. The Danish-German case shows that restrictions may appear as soon as biomethane (due to its oxygen content) or hydrogen is injected in the main transmission pipeline. In that respect, it is key to ensure that gas quality standards do not pose barriers for renewable gases.

Gas quality specifications: standards, legislation and operational arrangements

When analysing gas quality specifications, different types of limits in the value chain can be distinguished:

- *technical* limits according to safety/integrity/environment requirements of end-use applications and system integrity,
- *regulatory* limits in national legislation or network code
- *contractual* limits set between different operators
- *operational* limits according to best practice of operators

Gas quality standards detail technical limits arising from the different applications; however, they are often the result of stakeholder agreement between conflicting positions across the value chain. In some cases, standards reflect the common least denominator of the different tolerance levels for a given parameter across the value chain.

Competent authorities within each EU MS are responsible for setting gas quality requirements, in particular for all safety-related parameters. Member states have incorporated gas quality requirements in legislation as the different supply corridors developed, resulting in a diverse range of specifications

Contractual and operational arrangements, in a prudent approach, often set stricter requirements than international standards or regulatory limits. In addition, TSOs may specify further requirements for the sake of the transmission system integrity. At interconnection

[1] See First ACER Implementation Monitoring Report of the Network Code on Interoperability and Data Exchange, section 2.3.5.

points, where different national standard may differ, interconnection agreements between TSOs specify the applicable limits.

In parallel, since the establishment of **mandate M-400** in 2007, CEN (European Committee for Standardization) has been developing a pan-European gas quality standard for H-gas [EN 16726:2015 on 'Quality of gas – Group H'], with the aim of developing the broadest possible standards within reasonable costs.

In 2015 EC requested ENTSOG to analyse the impacts along the gas value chain of a binding application of the CEN standard EN16726. At the **Madrid Forum in 2016**, EC announced their intention not to pursue binding provisions on this matter at that point in time. The forum confirmed its support to CEN to continue working on a European band for the Wobbe Index, elaborating on the possibility of regional bands. Once the standard is completed, the "EC will reconsider further harmonisation activities".

Proposals and solutions at hand:

ENTSOG believes that the following should be done at EU level **:**

- Put forward solutions for applying gas quality standards in a flexible way, in order to facilitate the injection of green gases and the diversification of supply sources in the near future, while keeping gas as an attractive energy carrier for end users in the long term.
- Prioritise information provision by TSOs -and also DSOs- and more dynamic ways of data sharing over gas treatment.

- Explore tools and procedures for:
    - Sharing transmission networks' flexibility among all parties in a non-discriminatory way, so that costs for the different actors across the whole gas value chain are minimized.
    - Opening TSOs networks for increasing shares of renewable gases while facilitating network users' readiness.
    - Adopting regional and local solutions as a necessary complement to EU standards.
    - Minimising end user's uncertainty and impact from gas quality variability through information provision in the short-term in accordance with Article 17 of the Network Code on Interoperability and Data Exchange, (NC INT).
    - In the longer term, providing historical information on the gas quality variability in the past and an outlook to the probability of future gas qualities based on expected developments (network as well as supply) in order to enable end-

users to make a risk analysis for its applications (including information on regional/local level)[2].
    - Facilitating green gas injection by covering part of the costs or otherwise include them in the tariffs if so approved by the National Regulatory Authority.
- innovation projects with links to gas quality should be encouraged.
- Emphasize that when additional investments in measurement equipment and/or IT systems -or gas treatment facilities- might be deemed necessary from the end user point of view, the recovery of additional costs incurred by the TSO should be guaranteed.
- Support and facilitate an agreement on a European gas quality standard that contributes to achieve the European energy policy goals and to further advance the path to the gas sector decarbonisation.
- Communicate ENTSOG's reflections to the European gas sector stakeholders and policymakers.

Flexibility around gas quality standards and information provision

From ENTSOG's perspective, it would be beneficial to have a **clear EU technical agreement** in the form of a standard on the applicable limits for gas quality parameters, having **end-user application safety as the core requirement**. To achieve this, it is paramount that stakeholders provide and document **clear technical evidence** for the different sensitive elements in the value chain.

The EU gas quality standard should be established with **end-user application safety as the bottom line**, but as flexible as possible in relation to the necessary compromise between supply diversification and end-user application optimization and performance.

In this regard, **information provision and flexibility in the application of quality standards** have a key role to play and should be explored before resorting to gas treatment.

Experience shows that the whole range of gas qualities within a standard or within the entry points of a system is not experienced at all exit points. In regional supply corridors or local areas, only part of the gas quality range exits the network. This makes it possible to use narrower operational and contractual ranges in these corridors and areas. ENTSOG believes this can help **end-users to optimise** their applications in an efficient and environmentally friendly way.

[2] As an example, the Gas Ten Year Statement of National Grid already provides specific information about gas quality developments.

Today ENTSOG publishes a European **long-term gas quality outlook** for gross calorific value and Wobbe Index for different European regions. In the future, this could be accompanied with both national and/or regional gas quality outlooks from the TSOs -including potentially other parameters-, which help to identify specific operational ranges in order to enable end-user risk analysis and application optimization.

Information provision on **short-term gas quality variations** as foreseen in the network code on interoperability (Article 17) can also help to prevent potential adverse effects for sensitive users. If end users would need additional information on gas quality parameters, TSOs could install additional measurement (in particular for green gases) or forecasting systems, provided that NRAs approve the additional costs. Recovery mechanisms for these investments should be explored in order to be cost and benefit reflective.

In addition to the solutions described here, ENTSOG believes that DSOs could play an important role in providing gas quality information to DSO end users. In that respect, TSOs can provide DSOs with the necessary information regarding gas quality in the transmission network.

In addition, taking into account the specifics of each transmission network, **TSOs should be allowed to set less strict limits at entry points** in a transparent and non-discriminatory way.

By introducing this practice, the **entry point gas quality limits may be decoupled from the exit point gas quality limits**, thereby offering the flexibility in the transmission system for optimising the diversification of supplies. It has to be acknowledged, however, that the ability to offer flexibility at entry points is not uniform across Europe as it depends, among other things on network topology, in particular, on the type of end users and their location. Network modelling and simulation, assessment of different possible supply scenarios, and cross-border cooperation mechanisms are tools that TSOs can use for this purpose.

Such flexibility has to be offered via a strong **stakeholder engagement process**, involving NRA when suitable to ensure that flexibility is shared in a non-discriminatory manner towards third parties and that the different actors are aware of their competing requirements and the potential costs for all parties.

All these solutions are compatible with the current regulatory framework and should be considered by the different sectors while drafting the EU gas quality standard and by the relevant authorities when considering how the standard may be implemented. However, costs that TSOs will incur in to implement them should be recognised and recovered.

Additionally, ENTSOG believes that technology development (e.g. digitalisation, gas quality sensors) has potential to overcome some of the technical challenges that may result from diversification and decarbonisation (e.g. energy content measurement and managing gas quality variations).

Appendix: Examples of gas quality innovation projects with participation of TSOs

Some TSOs are already promoting innovative approaches towards green gases and gas quality. The following list includes a few good examples:

- National Grid's CLoCC project aims to minimise the cost and time of new connections to the National Transmission System in the UK and is primarily pitched towards smaller and unconventional gas customers for whom connecting to the NTS under the current arrangements can be extremely challenging.
- Following the conclusions of the OBAN project, the Institute of Gas Engineers and Managers (IGEM) is looking at the review of the UK gas quality specification contained in the Gas Safety (Management) Regulations (GS(M)R).
- National Grid is starting to explore the potential for offering gas quality blending services at transmission entry points where more than one stream of gas is delivered. Safety assurance, technical, commercial and regulatory issues will be explored in an initial scoping phase.
- H2-PIMS: The partners of H2-PIMS project develop a pipeline integrity management to evaluate and guarantee safe and reliable transportation of hydrogen-natural gas-mixtures and pure hydrogen as well. This includes determination of relevant requirements to convert existing infrastructures such as ONTRAS very own grid. The project is part of the German HYPOS technology network.
- At H2-MEM, Fraunhofer IKTS and DBI GUT aim to design and develop special carbon-based membranes to separate hydrogen-natural gas-mixtures. The project is part of the German HYPOS technology network.
- The GERG project 'trace components in biomethane', with the participation of SNAM, GRT-Gaz and Terega among other parties, aims at sharing knowledge on biomethane quality & impacts; studying the real impact of biomethane quality on the gas chain, and anticipating potential operational issues for gas operators.
- Gascade projects:
    - Oxygen-removal facility (including a drying unit) on basis of a catalytic process with use of LPG for the biomethane injection in Fuchswinkel (in the transportation pipeline RHG) in 2014.

- Oxygen-removal facility on basis of a catalytic process under direct oxidation of Methane on the biomethane injection point Nonnendorf in the transmission-Pipeline JAGAL in 2015.