EUROPEAN
COMMISSION

Brussels, XXX
[…](2015) XXX draft

PART 1/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Commission Regulation (EU) N°.../... establishing a Network Code on Interoperability and Data Exchange Rules

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Commission Regulation (EU) N°.../... establishing a Network Code on Interoperability and Data Exchange Rules

Table of Contents

1. INTRODUCTION

Europe is facing increasing competition from rapidly growing economies around the globe. Competitive energy prices for European companies will be crucial in keeping our competitive advantage. Completion of the gas internal market has recently been calculated to generate up to EUR 30 bn in gross benefits[1]. The EU has committed itself to completing the internal market in electricity and gas by 2014[2], which means the building of an integrated and interconnected market in gas allowing all market players to compete on a level playing field while creating the framework for securing supplies. The completed internal market will ensure that gas is produced (or sourced), transported, and consumed as efficiently as possible, allowing consumers to benefit from historical national markets growing beyond borders and benefiting from more competition and security of supply. But in order for our gas market to deliver these benefits, Europe's gas transmission networks need to be able to facilitate trade and accommodate changing flows patterns. Gas generally travels further and crosses more borders than electricity does[3], but nevertheless European gas markets today remain predominantly national[4]. Reasons for this may be the historic development of the gas market, setting out from

[1] Benefits of an Integrated EU Energy Market –Booz&Co (July 2013)
[2] The political objective of completing the internal market for electricity and gas is set out in the European Council Conclusions of 4 February 2011.
[3] This is simply due to the fact that the EU imports two-thirds of the natural gas it consumes whereas electricity imports are negligible compared to EU production.
[4]Nevertheless there are clear differences as to the level of progress of market integration between EU regions.

the promotion of national incumbents and perpetuated by the policy of producers to negotiate gas supply separately per Member State. For the transmission sector, which today is effectively separated from the trade and supply side[5], this means that gas is usually transported through one or more Member States up to the final border, where it is handed over to the supplier active in that particular Member State. Before liberalising the gas market the incumbent could rely on a single, long-term contract with its upstream counterpart that was making the arrangements for transit and was choosing the route. The technical details at the point of interconnection were often an integral part of the import contract.

In order to facilitate cross-border trade and remove obstacles to the physical flow of gas within the internal energy market, it is crucial to ensure the ability of the transmission systems operators (TSOs) to work together and interact with network users. Ideally, in a fully integrated system a user of two or more transmission systems operated by different transmission system operators in Europe should not face technical, operational, communications barriers higher than those if the relevant networks had been efficiently operated by a single transmission system operator.

That said, national rules continue to differ from one Member State to another hampering the creation of efficient internal market arrangements for gas by 2014. Developing EU-wide interoperability and data exchange rules will remove obstacles deriving from these national arrangements and facilitate the completion of the EU internal energy market. The development of EU-wide rules on interoperability and data exchange has been consistently supported by essentially all stakeholders. The aim of the network code interoperability and data exchange is to remove technical barriers that could hamper trade, introducing the standardization of so-called interconnection agreements between TSOs and the utilisation of same units at the different interconnection points, and promoting the harmonisation of communication formats among market participants to facilitate technical, operational related communications.

Key steps have already been taken on the road towards a single EU gas market with the adoption of the Guidelines for Congestion Management Procedures (CMP)[6], of the Commission Regulation establishing a Network Code on Capacity Allocation Mechanisms (CAM) in Gas Transmission Systems[7] and of the Commission Regulation establishing a Network code on Balancing in Gas Transmission Systems (BAL)[8]. These are market-related measures that should be complemented by the Network code on Interoperability and Data Exchange which is of a more technical nature and provides the essential bridge for a good functioning of the markets. In other words, harmonizing rules on Interoperability and Data Exchange ensures that transmission system operators use the same principles for a variety of technical aspects of the operation of their respective networks, ranging from odourisation to data exchange and units. While the former is pertinent in ensuring that gas can physically flow in to and from Member States the latter two contribute to streamlining and procedures ultimately lowering related costs.

---

[5]This separation between transmission and supply is being achieved with the unbundling provisions of the Third Energy Package.

[6] 2012/490/EU Commission Decision of 24 August 2012 on amending Annex I to Regulation (EC) N° 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission networks text with EEA relevance, Official Journal L 231, 28/08/2012 P.0016-0020.

[7] 2013/984/EU Commission Regulation of 14 October 2013 supplementing Regulation (EC) N° 715/2009 of the European Parliament and of the Council establishing a Network Code on Capacity Allocation Mechanisms in Gas Transmission Systems text with EEA relevance, Official Journal L 273, 15/10/2013 P.0005-0017

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32013R0984:EN:NOT

[8] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.091.01.0015.01.ENG

In the process of developing the harmonised rules for Interoperability and Data Exchange (IO & DE) there have been numerous and extensive consultations, workshops and studies, aimed at better understanding the nature and extent of the problem in the way TSOs interact on technical, cross-border issues and the possible benefits and drawbacks of the various options which could be considered to improve the current rules for interoperability and data exchange in the gas sector.

2. PROCEDURAL ISSUES

2.1. Identification

(1) Lead DG: DG ENER

(2) Associated DGs: SG, COMP, LS, ENTR, EMPL, ECFIN, ENV

(3) Agenda Planning/WP references: 2013/ENER/040

2.2. Organization and Timing

2.2.1. Drafting Process

This Impact Assessment analyses the effect of the new measures as proposed in the European 'Network Code' (NC) on Interoperability and Data Exchange Rules for Gas Transmission Networks to improve and supplement existing disparate national rules on Interoperability and Data Exchange in the EU gas transmission networks.

European-wide Network codes are introduced by the Third Energy Package. Their goal is to set, in specific areas, detailed rules on the coordinated technical or commercial operation of gas and electricity transmission networks. Regulation (EC) No. 715/2009 ("the Gas Regulation") foresees the development of network codes in areas such as capacity allocation and congestion management, balancing, interoperability and data exchange, tariffs, etc. Given their highly technical nature they are drafted by different stakeholders at different stages in the establishment process as laid down in Gas Regulation[9]. In short, three main stakeholders – the Commission, the representative bodies of regulators (ACER[10]) and network operators (ENTSOG[11]) – are subsequently responsible for the text and scrutinize each other's work. Details on the drafting process of the NC IO & DE can be found in the **Annex 1.**

2.2.2. Impact Assessment

The Impact Assessment has been prepared by DG ENER with input from ACER and ENTSOG in their respective roles as authors of respectively the Framework Guideline and Network Code. DG ENER also received contribution from an Inter-service Steering Group where representatives from

[9] Article 6,7 and 8(6) of the Gas Regulation

[10] Agency for the Cooperation of Energy Regulators, a Commission Agency established by Regulation (EC) No. 713/2009

[11] ENTSOG is the acronym of the European network of Transmission System Operators for Gas

the following Directorates General were invited: the SG, LS, DG COMP, DG ENTR, DG EMPL, DG ECFIN, and DG ENV. The Impact Assessment has been amended in several areas on the basis of the recommendations of the Impact Assessment Board. In particular Chapter 3 ("Problem description") has been modified to better clarify the baseline scenario and to provide a more detailed overview of actual problems that are currently experienced by parties active in the gas market and Chapter 6 to assess impacts in greater detail. In addition, Annex 2 has been modified to provide better description of the gas market in Europe today.

2.3. Consultation and expertise

As described in Annex 1, both ACER and ENTSOG have repeatedly solicited input to their work from all segments of the gas sector from the outset and problem identification phase up until the fine-tuning of the detailed technical elements in the final text of the NC IO&DE. The consultation included formal written consultations as well as a series of dedicated workshops and bilateral meetings by both ACER and ENTSOG. Further details on the consultation process of this project can be found in **Annexes 3-6**. In the development of the Network Code ENTSOG also dedicated one full workshop session in order to involve Energy Community countries more actively.[12].

2.4. External expertise

External consultants were used in the preparation of the Initial Impact Assessment of the Framework Guidelines by ACER which commissioned a study to Pöyry with regards to problems that gas companies encounter in trading across borders due to the existence of different interoperability and data exchanges rules. Furthermore in order to develop the baseline scenario, DG ENER developed a questionnaire and invited ENTSOG and ACER to liaise with TSOs and NRAs respectively to collect and analyse the necessary information for all Member States affected by the NC IO & DE[13].

3. Problem Description

3.1. Discrepancy between the fundamental goals of the EU and the existing situation

Operational, technical and communication interoperability of transmission networks is a prerequisite for integration and well-functioning of energy markets. The absence of such common interoperability rules in the European Union can constitute an obstacle to the creation of an integrated, competitive internal European market for energy. This is part of the on-going effort to eliminate such discrepancy between the fundamental goals of the EU of reaching a single European energy market (Article 3(3) TUE and Article 194 TFEU) and the existing situation with barriers to the free flow of gas in Europe, the Network code on Interoperability and Data Exchange Rules identifies areas where increased harmonisation of technical, organisational, communication rules

[12] On 16 April 2013 ENTSOG held a so called Third-Countries workshop were almost 30 stakeholders from Energy Community countries were present. The material presented and the minutes of this Third countries workshop can be found on ENTSOG website under the following link: http://www.entsog.eu/public/uploads/files/publications/INT%20Network%20Code/2013/INT0398-130423%20INT%20DataExchange%20WS%20Agenda%20-%20final.pdf

[13] See Annex 3.

will foster market integration. Such harmonisation is expected in particular to enhance cooperation among TSOs as well as between TSOs and gas transmission network users.

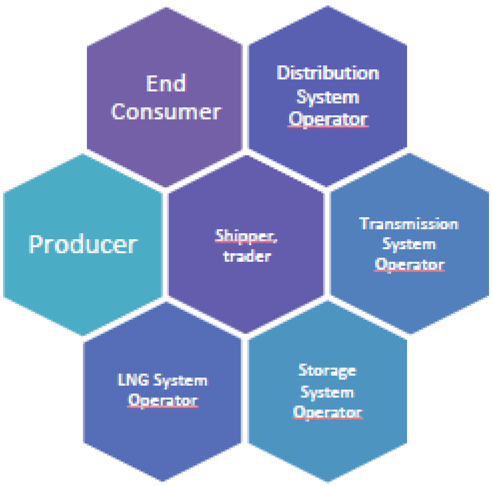
3.2. Context of the problem

The pipeline system is made up of interconnected high-pressure transmission systems and local distribution grids, through which the gas reaches the customers (See Annex 2).

In order to be able to transport gas through the system to the consumers, transmission system operators have to put in place a set of detailed technical and communication rules which allows the gas to flow freely from one side to the other of the interconnection points (IPs). In the pre-liberalisation, monopolistic sector structure, the same party was responsible for gas imports and therefore relied on a single, long-term contract with its chosen upstream counterparts and consequently could control the flow of gas emanating from each contract. If gas was coming via other EU countries, the upstream counterparty made the arrangements for the transit and for the choice of route. The technical details at the interconnection point were often an integral part of the import contract.

In a liberalised market structure, where multiple network users are interacting and TSOs generally are not operating across a border, it means that cross-border points usually provide an interface between two (or more) TSOs.

Figure 1: Structure of liberalised gas market



The networks that TSOs operate are subject to some stringent safety requirements because gas is transported under significant pressure, it is inflammable, and both it and its combustion products are noxious. To ensure the integrity of their systems, it is therefore necessary for TSOs to establish and publish standard terms and conditions for network users, setting out the interaction of network users/ TSOs and TSOs/TSOs. There are a variety of these terms and conditions that have attracted the accusation of being an unnecessary barrier to trade between Member States, such as differences in the scope of the interconnection agreements, in gas quality, in matching process, in units used, in data exchange protocol. The gas industry itself started to work voluntarily on some of these issues almost 10 years ago when liberalisation was beginning. Through its association EASEE-gas[14] the gas sector has developed a number of recommendations (so called Common Business Practices – CBPs) for

[14] European Association for the Streamlining of Energy Exchange-gas

operating at the network interconnections with the intention to simplify and streamline the business process among the different stakeholders (i.e. TSOs, DSOs, LNG, shippers, suppliers). However these CBPs were only recommended practices, they were not standards and had no legal standing therefore their implementation has been mixed and focused almost exclusively on some Western European Member States.

3.3. Current regulation- the NC IO&DE in a broader context

The Third Energy Package

Adopted in 2009, the Third energy package is seen as the final piece of legislation in the stepwise liberalization of the EU's gas and electricity markets. The cornerstone of liberalization is the effective separation (unbundling) of generation and supply departments of vertically integrated utilities from the transmission business. The Third energy package ensures the independence of TSOs through a certification regime of national regulators (NRAs) and the Commission.
Well-regulated, independent TSOs, with a transmission-only perspective, are the key enablers of an open, well-connected and competitive market. The gas TSOs operate the large high pressure gas transmission pipelines in their own region as regulated monopolists. They are regulated by the NRAs in terms of their income (the NRA sets the tariffs) but also in terms of their behaviour. There are high level European rules laid down in the Gas Directive and the Gas Regulation, but there are also more detailed rules aimed at safeguarding the technical and operational aspects of the transmission of natural gas. These latter rules are usually laid down in grid codes. The obligations concerning interoperability and data exchange are mainly to be found in the Gas Regulation of the Third energy package. Art.8§6(d) and Art 8§6(e) of the Gas Regulation specifically requires the establishment of a network code covering the interoperability and data exchange areas.

Interrelation with CMP Guidelines, NC Capacity Allocation Mechanism (CAM) and NC Balancing (BAL)

BAL NC, CAM NC and CMP contain provisions relating to nominations[15] and re-nominations[16] creating interdependency between BAL, CAM and CMP. Furthermore the Commission Decision on CMP has implication for all the three network codes.

NC BAL

In terms of BAL, there are nomination (respectively re-nomination) timings included, which have to be taken into account in the matching process developed in the Network Code Interoperability and Data Exchange.

NC CAM

With regard to CAM, there are interactions between nominations when using bundled transport capacity products and the processing of these nominations in order for transmission system operators to decide the same resulting gas flow at both sides of an interconnection point.

[15] 'nominations' means the prior reporting by the network users to the TSO of the actual flow that the network user wishes to inject into or withdraw from the system.
[16] 're-nomination' means the subsequent reporting of a corrected nomination.

Possible temporary capacity reductions to meet any emergency or an exceptional event need to be taken into account within the network code.

<u>CMP Guidelines</u>

The CMP guidelines require for the firm day-ahead use-it-or-lose-it mechanism, that firm re-nomination is permitted only up to 90% and down only to 10% of the contracted capacity by the network user at an interconnection point that is determined as contractually congested. This is important for the matching rule defined in the network code.

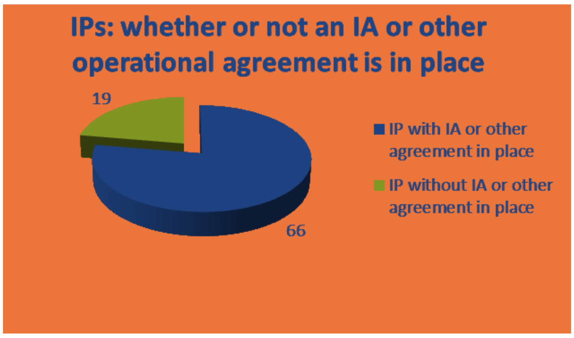
3.4. Problem identification

Each TSO is connected to other TSOs in neighbouring Member States at so-called interconnection points. In order to ensure the efficient functioning of the entire European transmission grid, it is essential that TSOs across borders intensify their cooperation and agree to implement common technical rules. These rules cover different areas and deal with heterogeneous issues such as: interconnection agreements, units, data exchange, gas quality and odourisation.

Interconnection Agreements

TSO to TSO arrangements are usually captured in some form of agreement at the interconnection points[17]. However the responses received to the EC questionnaire to NRAs and TSOs (Annex 3) show that there are at least 19 IPs where TSOs will have to conclude an IA when the Network Code for Interoperability and Data Exchange comes into force.

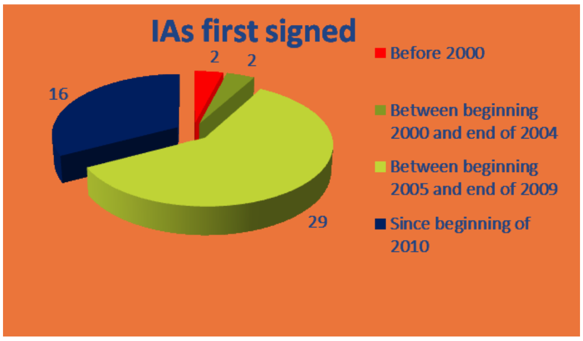
Figure 2: IPs with/without IA in place



As far as the date of original signature of each of the agreements is concerned answers were given covering 49 IPs. The earliest 2 agreements were signed in 1998 and the most recent in 2012. ENTSOG has carried out a detailed analysis which shows that the bulk of agreements (in total 29) were signed in the period 2005 - 2009. See the Figure 3 below:

Figure 3: Year of signature of the IAs

[17] The evidence collected in the Pöyry report shows that not all interconnection points are covered by explicit written agreements. When there is no written agreement, the content of the reciprocal relations is defined by the practice and if necessary through litigation.



Whenever written agreements are in place their content is widely different[18]. They can serve a number of purposes broadly categorised as safety-related, physical & operational, commercial and contractual as showed in the table 1 below.

Table 1 – Interconnection agreement potential contents and categorisation

	Categorisation			
Purpose:	**Safety related**	**Physical & operational**	**Commercial**	**Contractual**
Demarcate geographical boundaries and connection points	✓	✓		
Set out safety requirements and the routines to be followed in emergencies and/or exceptional events[4]	✓	✓	?	
Set out other technical requirements in respect of the physical construction and operation of the infrastructure		✓	✓	
Set out commercial operations (e.g. OBAs) and timings that are compatible with or relied upon by other commercial processes such as a network code			✓	
Specify metering and measurement arrangements		✓	✓	
Set out required characteristics for the gas conveyed	✓	✓	✓	
Define communication requirements, methods and channels		✓	✓	✓
Enable maintenance activities to be planned/carried out		✓		
Set out each counterparty's liability toward the other				✓
Set out requirements for confidentiality				✓
Set out change management process			✓	✓
Set out dispute resolution practices & choice of law				✓
Set out force majeure considerations			?	✓
Set out duration and termination clauses				✓

There is a range of different costs and risks that are dependent on the structure of the interconnection agreements which might lead to higher costs and/or lower flows. In fact

[18] Interconnection Agreements are confidential however Pöyry managed to access four of them.

commercial compatibility issues generally have an impact on users' costs and risks such as on the processes for allocating gas quantities to specific users. It is important to have a clear definition of the physical and operational issues and of the respective roles and responsibilities of adjacent TSOs. For instance at any given moment in time only one TSO can be physically controlling the flow. It is therefore important to establish which TSO is responsible for controlling the flow and under what conditions. Without establishing these responsibilities, uncoordinated actions by TSOs could result in artificial constraints, limiting the capacity available on the day, and impact users.

Units

A variety of units and reference conditions are used throughout Europe for describing various parameters. Whilst there is for instance an EN ISO standard as regards standard reference conditions[19] this has not been consistently adopted and was also not enforced across the EU and particularly historical usage predetermines the current unit in use. Units used within the industry include:

- **volumes of gas,** usually specified in volume terms (cubic metres) at specified reference conditions (pressure and temperature), and sometimes assuming a non-specific calorific value (which should be stated) and therefore analogous to a unit of energy;
- **energy content,** either expressed in mega-joules (MJ) or kilo-Watt-hours (kWh), although occasionally in units of therms (‘th’, approx. 29.31 kWh) or British thermal units (‘Btu’, equals 0.00001 therms);
- **calorific value** (CV), a measurement of the energy content of a volume of gas, usually either expressed in mega-joules per cubic metre (MJ/m3) or kilo-Watt-hours per cubic metre (kWh/m3), and at specific reference conditions for the volume of gas (i.e. a pressure and a temperature) and for the final temperature of the combustion products (so there are two reference temperatures quoted);
- **Wobbe index**, a measurement of the flame characteristics of a gas, usually either expressed in MJ/m3 or kWh/m3 at specified reference conditions, similarly to CV;
- **pressure**, usually expressed in bar (either relative to ambient pressures, ‘gauge pressure’, or relative to a vacuum, ‘absolute pressure’), although sometimes (especially in respect of reference conditions) in units of Pascal or multiples thereof;
- **temperature**, usually in units of degrees Celsius or Kelvin;
- **constituents of natural gas**, usually expressed in molar per cent, but sometimes also parts per million or parts per billion by either mass or volume, volumetric per cent, or units of mass per volume (g/m3, etc.).

The use of different units leads to inconsistencies, among others, resulting from approximate conversion factors. The most obvious conversion mistakes seems to appear in relation to the use of volume, pressure, gross calorific value and energy units, as the use of different units in these areas unnecessarily adds complexity to the daily activity of network users. The lack of harmonization of units affects traders, network users and transmission system operators on the wholesale markets:

- Traders using conversion factors face mismatches between counterparties and invoicing discrepancies;

[19] EN ISO 13443

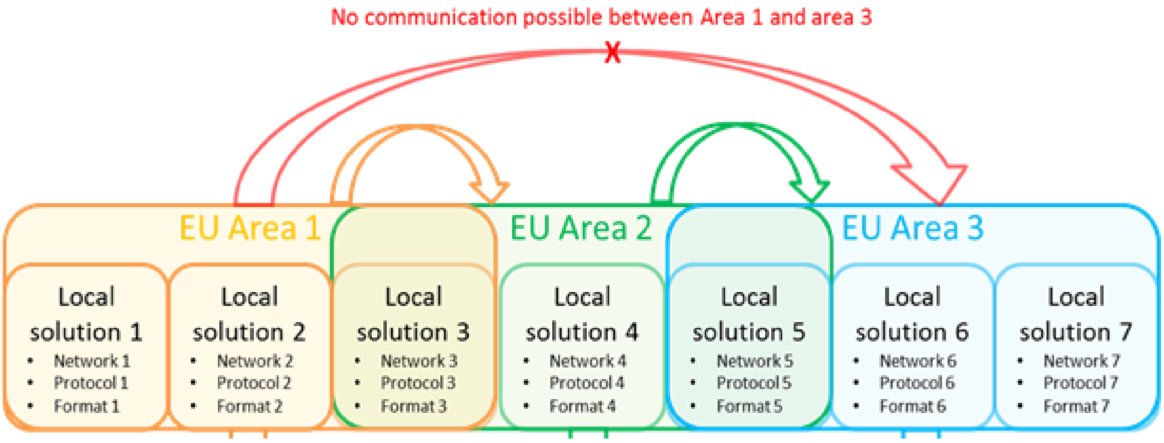
- Network users face difficulties in the nomination process: nominations to the transmission system operators using different units lead to difficult interfaces interactions between portfolio handling and nomination systems;
- Transmission system operators facing a lack of harmonised use of units are obliged to build conversion tools in their nomination handling systems in order to exchange messages with their adjacent operators and network users (matching and confirmation). This complicates the handling of measurement differences and requires them to provide assistance to market participants in order to sort out mismatches. Due to the central role of TSOs in the operation of the internal gas market, their communication choices bear significant impact on the stakeholders. Although individual parties have struggled to find their own solutions avoiding the raising of major barrier to trade, the solving of this issue will result in general efficiency improvement.

Data exchange

In order to communicate two parties must agree on common data exchange solution. The components of the data exchange solution are: 1) Data network; 2) Data format; 3) Data protocol codifying possible interaction between the two parties.

Information, be it technical (i.e. physical measurements) or commercial (i.e. nominations, allocations, trade confirmation), is continuously exchanged among transmission system operators, as well as between transmission system operators and stakeholders. Today many local data exchange solutions are in place in the gas industry between TSOs and their counterparts in different EU Member State, mainly because of local historical developments to cover data exchange needs on one hand and because of national legislation on the other hand. This resulted in multiple solutions for data exchange in different areas in Europe. The figure below explains the current situation and also the reasons for improving it through the data exchange harmonization in Europe.

Figure 4: Communication areas



In the example above communication is possible between area 1 and area 2 where they communicate through solution 3. Area 2 and 3 communicate through solution 5. However there is no communication possible between area 1 and area 3 as a common local solution for communication is missing. The different approaches adopted by TSOs across Europe therefore introduce a barrier to entry: a user active in one particular market may need to implement a new communication protocol, using a different communication standard, prior to entering a new market. As a case study included in the ACER impact assessment analysis shows (Table 2 below), a shipper trading gas along three different routes - two North-South routes, and a South-East to South-West route would be exposed to a maximum of 10 different standards

Table 2 - Examples of cross border data exchanges requirements

Route	Country/TSO	Data exchange system	# systems
GB to Italy via France/Switzerland	GB/National Grid	IXN (UK Link & Gemini)	4 to 6
	GB/Interconnector(UK)	ISIS	
	BE/Fluxys	Edig@s	
	FR/GRTgaz	Trasn@ctions (Edig@s/XML)	
	CH/Transitgas	Unknown	
	IT/Snam Rete Gas	Caminus	
GB to Italy via Germany/Austria	GB/National Grid	IXN (UK Link & Gemini)	4 to 7
	GB/BBL	Edig@s/EDIFACT	
	NL/gastransportservices	Edig@s	
	DE/OGE	Edig@s/XML	
	AT/BOG(WAG)	Unpublished; not Edig@s as at 2010	
	AT/TAG	Unpublished; not Edig@s as at 2010	
	IT/Snam Rete Gas	Caminus	
Greece to Portugal via BG, RO, HU, AT, SK, CZ, DE, FR, ES, PT	Greece	Unpublished	4 to 10
	Bulgaria	Unpublished	
	Romania	GMOIS	
	Hungary	Proprietary system (internet, XML)	
	Austria	Unpublished; not Edig@s as at 2010	
	Slovakia	Unpublished	
	Czech Republic	Edig@s/XML	
	Germany	Edig@s/XML	
	France	Trans@actions (Edig@s/XML)	
	Spain	SL-ATR	
	Portugal	Unpublished	

It is evident that there are different solutions implemented for data exchanges in the different segments of the energy business. The choice of a single solution based on a cost-benefit analysis will increase effectiveness and ensure reliable, secure and smooth exchange of information among TSOs, as well as from TSOs to relevant counterparties.

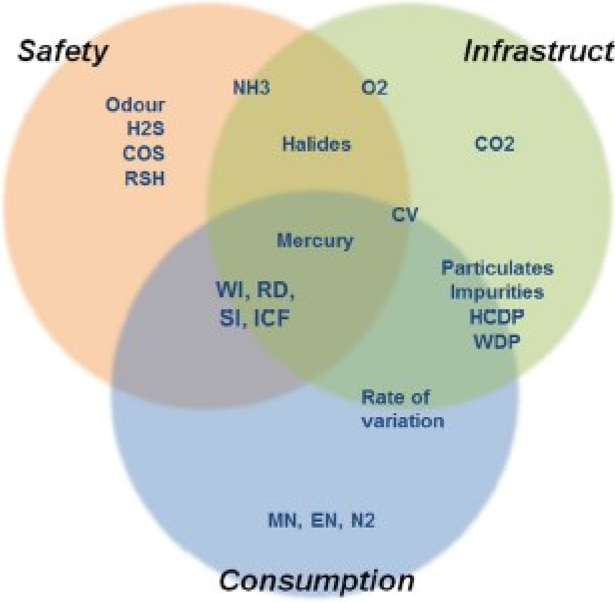
Gas quality

Natural gas is not a fully homogenous and fully fungible product. There is a variety of gases and each gas can be classified according its own quality. As gas flows through a network, it co-mingles with other gasses, and the resulting mixture of gasses is considered as homogeneous product. A gas quality specification is a set of parameters that describe acceptable limits for various characteristics of a gas:

- the specific constituents (e.g. methane, hydrogen sulphide)
- the physical characteristics (e.g. energy content, density), or
- derivations of these (Wobbe index, rates of change).

Some parameters are important in a safety context, some parameters have economic impacts, and the importance of individual parameters varies in different parts of the physical value chain. A simple visual representation of these drivers is shown in the following figure 5:

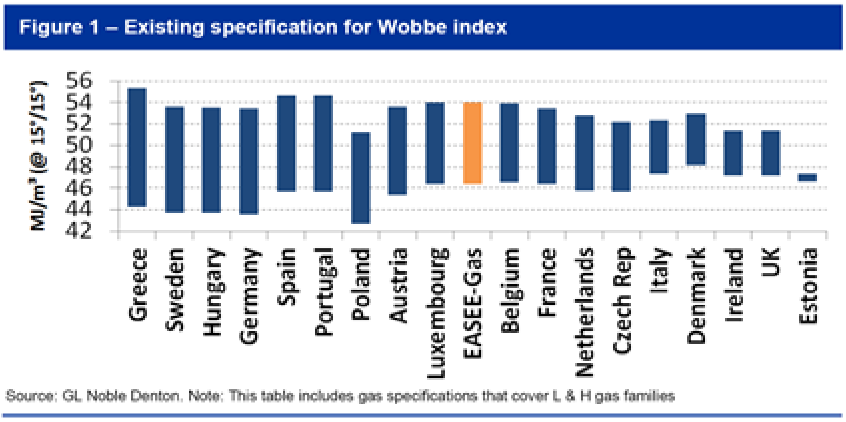
Figure 5: Parameters in Gas Quality



Boundaries to the value of these parameters are established in order to: ensure safety, ensure the integrity of the infrastructure and prevent a negative impact on particular applications. The establishment of boundaries implies establishing the width of these boundaries. Wide boundaries give flexibility to the nature of the product, narrow boundaries ensure that the properties of the gas consumed by an end user are fully defined and allow total safety and process optimization. There is a variety of different sources of gas flowing into Europe, with a corresponding variety of gas qualities. With respect to their historical supply portfolio, Member States have developed their own practices with regard to the control of the safety of natural gas appliances.[20] This has resulted in the establishment of a range of disparate gas quality specification throughout Europe. The wider a country's specification, the more gases it legally accepts.

Figure 6: Different Wobbe Specifications in MS

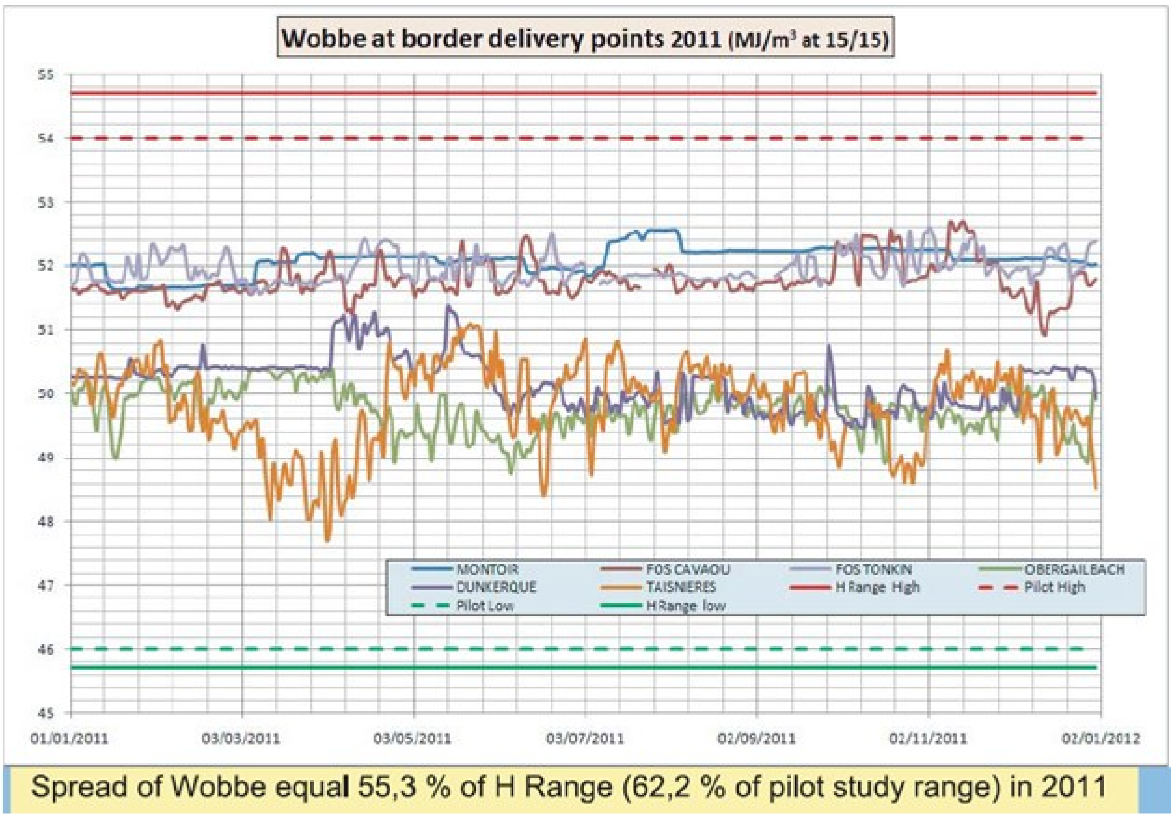
20 The health and safety as well as rational use of energy of gas appliances is subject to the provisions of Directive 2009/142/EC on appliances burning gaseous fuels (GAD). The GAD applies to the placing on the market and putting into service of appliances while the gas installation regulations remain within the competence of the Member States. Also the commissioning and the surveillance of safety of appliances in service falls within the competence of the Member States.



Source: Gas Quality Harmonisation CBA, Poyry report 2012

In practice however, the picture looks very different. This picture does not mean that in a country with a broader band, such as Germany, all types of gases covering the entire range will end up in every appliance in every town across the country. In fact, all countries today have a good idea of what gases end up where. As such, all users in that area are used to a relatively stable supply within a narrow Wobbe-range. Only where a large new supply project is commenced (such as an LNG terminal) is it necessary to review its potential impact on existing infrastructure and appliances. Figure 7 gives good insight in the actual gas qualities that regions within France have actually been receiving compared to the country's legal specification.

Figure 7: Gas Quality in France



Source: Association Francaise du Gaz

As of today very few direct cross-border technical barriers to trade have been observed[21], resulting from the lack of harmonization of gas quality parameters. However the completion of the internal gas market is likely to cause a change in the current gas flow patterns in a way that issues of feasibility and cost of handling differences in gas quality will arise. It is therefore necessary to adopt a forward looking approach on how to manage this issue from now rather than to wait for Gas Quality to become a serious obstacle for the free flow of gas across borders and thus an impediment to the well-functioning of the internal gas market. Obviously, beyond the pure commercial considerations, the issue of technical barriers, and the avoidance thereof, is also highly pertinent in the energy supply security context. In this sense it is crucial that gas quality specifications from one Member State to another are not disparate so as to disallow necessary flows of gas.

The Reference 2013 scenario[22] reflects current trends in development in the EU energy systems, based on this trend the total primary energy supply is downward throughout the projection period, with a moderate increase after 2035. Natural gas maintains an almost stable share in primary energy supply throughout the projection period. Recovery from the economic crisis brings an upward effect on energy demand, observed up to 2015,which is consequently reflected on primary supply and import dependence (mainly for natural gas and solids). Evolution of primary energy production follows the declining trend of primary energy supply, it is however steeper and continuous throughout the projection period (with a small increase in the period 2035-45), as it reflects the depletion of domestic fossil fuel reserves. Beyond 2020, despite the decreasing trend in final energy demand for fossil fuels, limited domestic resources result in an increase in imports of natural gas and oil products, which drive net imports as well as import dependence moderately upward. By 2030, import dependence reaches 55%, and by 2050 it is close to 57%. The imports in turn are in all likelihood will come from a more varied set of sources (including from LNG) which is fully in line with the Commission's energy policy target on supply diversification. This then is likely to lead to a more varied mix of natural gas in the EU supply portfolio than has been the case in the preceding period. In addition, also in line with the above-mentioned target to create the internal market in gas, gas flows will become more complex. That is to say, the standard east-west and north-south flows are likely to be supplemented by flows from new import terminals as well as flows occurring on the basis of market/price signals relating to the particular supply-demand situation.

Therefore it is becoming clear that for a large part of the EU this situation of relative stability is changing or likely to change in the future as a result of three main developments:

- the decline of indigenous European production leads to an increase of imports from a growing number of sources, including in particular LNG;
- the implementation of the Third Energy Package will further liberalise European gas markets and create stronger market integration resulting in an increase in cross-border trade (and corresponding gas flows) between Member States; this is coupled with the introduction of entry-exit regimes in which the path of single molecules is much more difficult to track than in the past;

[21] Gas quality has, to date, only caused 5 individual instances of gas being rejected at an IP. They have been of short duration (less than a day). *Source. Poyry report*

[22] http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2050_update_2013.pdf The baseline scenario is based on the Commission's EU Reference scenario 2013 "Trends to 2050" finalised in July 2013 that starts from the assumption that the legally binding GHG and RES targets for 2020 will be achieved and the policies agreed at EU level by 2012 (notably the Third Energy package) will be implemented in Member States.

• the impact that biogas and potentially sources of unconventional gas and hydrogen input may have on gas quality variations.

These developments are likely to lead to demonstrable changes (including variations within hours) in gas quality and composition in many regions across the EU and at the same time make the quality and composition less predictable.[23] In operational time scale (i.e. within-day), changes in gas quality can occur suddenly where there is a change in any individual supply stream, for example through unforeseen infrastructure outage. Differences in specification between TSOs can lead to a situation where there is an increase in the cost of flowing gas or gas is prevented from flowing. An example of a case whereby a changing flow direction led to a sudden change in gas quality with consequences for certain existing appliances occurred in Denmark[24] (see Figure 8 below) following the introduction of bi-directional flows at the Ellund interconnection point on the border with Germany. Similar changes are taking place in the context of the slowly phasing out low-calorific gas or for instance with the arrival of a new gas source, such as LNG, into a market area.

Figure 8: Wobbe Variation in Southern Denmark and in Northern Germany

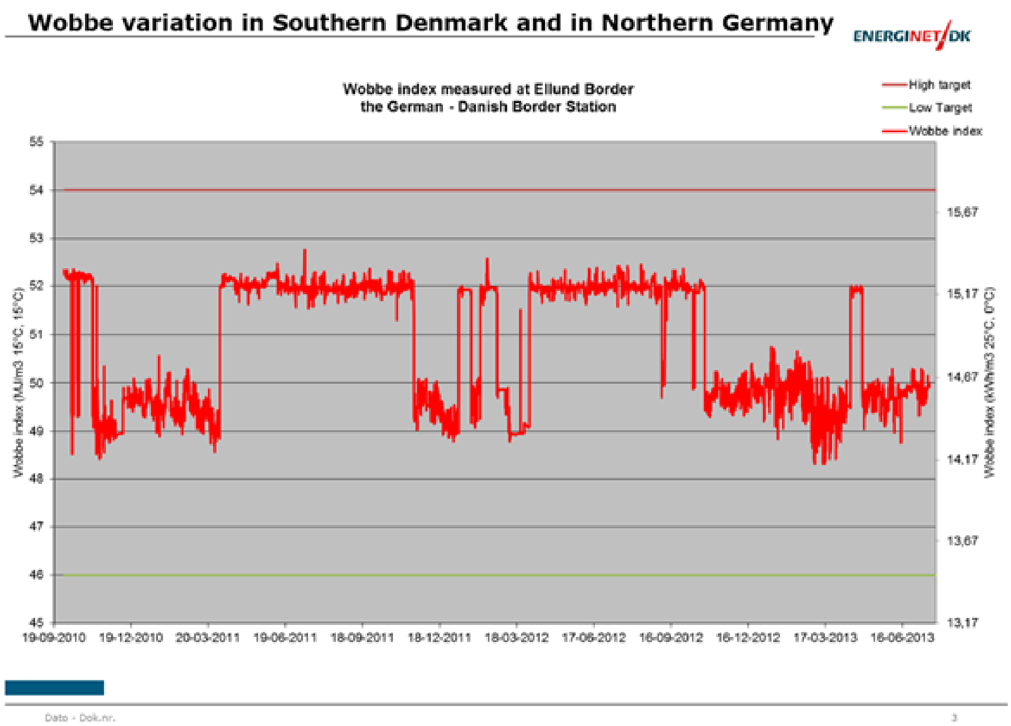


Figure 9 below summaries the operational changes to gas quality.

Figure 9: Operational changes to Gas Quality

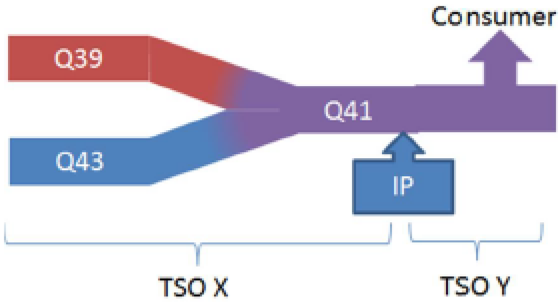
---

23 N.B. the quality of gas supplied to end-users shall not go beyond the limits communicated by the Member States in accordance to Art. 2(2) of the GAD Directive 2009/142/EC and as subsequently published in the OJEU.

24 Denmark reacted by widening its Wobbe-index but also by adjusting certain types of appliances.

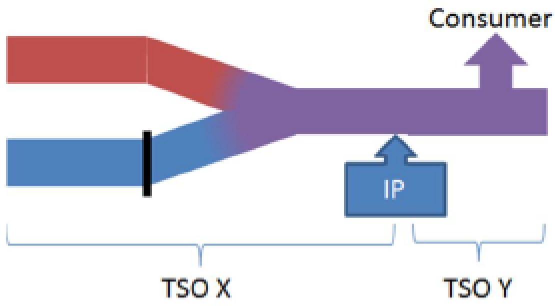
State 1 – Normal operation

In this state, two approximately equal volumes of flow each with quality parameters of Q39 (red) and Q43 (blue) respectively, are co-mingled by TSO X to create a flow of Q41 (purple), for onward transmission to the interconnection point and via TSO Y's system to a consumer.



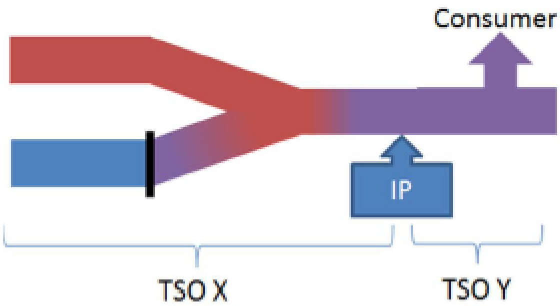
State 2 – Trip of one flow

This state is the immediate situation if the Q43 gas supply becomes suddenly unavailable. This could be due to plant failure (i.e. a trip), or for commercial reasons.



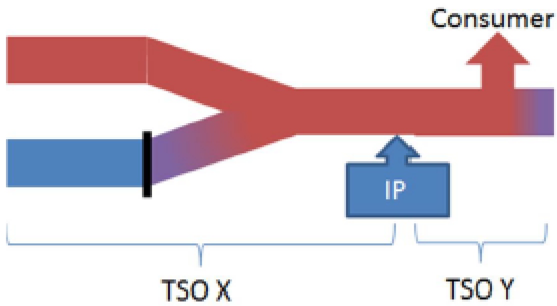
State 3 – sometime after the trip

Sometime after the trip, the Q41 gas is still flowing through the interconnection point and to the consumer however there is a 'plug flow' situation, where the gas quality in the pipeline system changes to the Q39 over a relatively short length of time/distance.



State 4 – a further time after the trip

As the 'plug flow' passes a consumers' offtake there is a rapid change in gas quality experienced by the consumer.



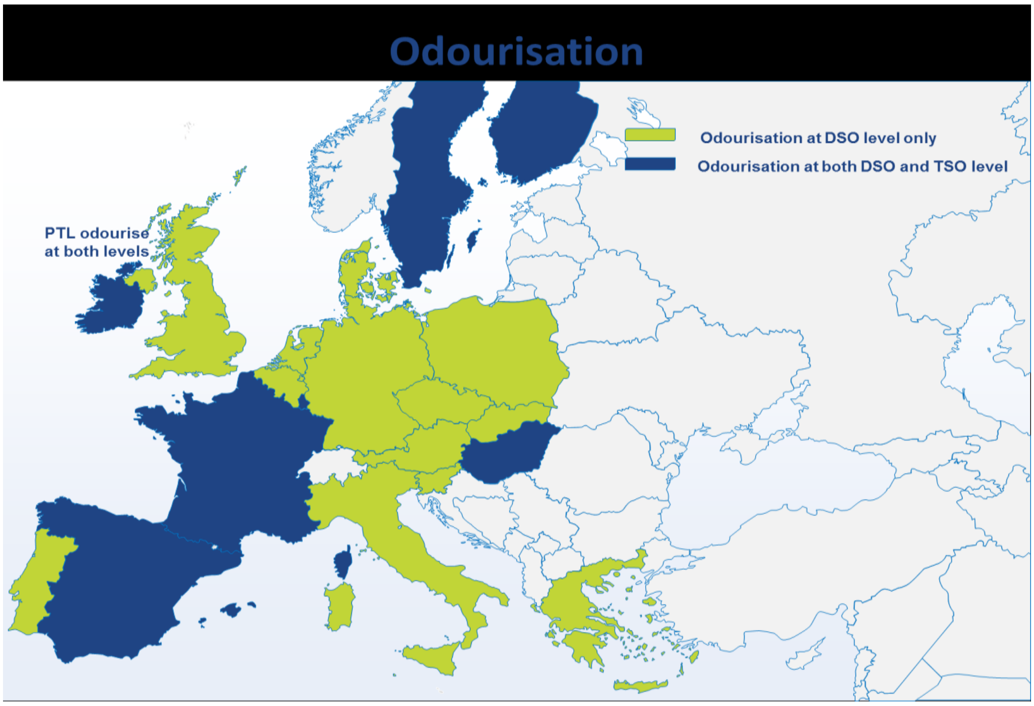
Receiving a stable quality of gas has important benefits: gas appliances can be set or "adjusted" in such a way that they operate more efficiently and emit less harmful substances such as CO or NOx. The scope for the NC IO&DE is to consider only issues concerned with TSOs interactions. To deal with the other aspects linked to gas quality the Commission has tasked CEN in 2007 to develop a European-wide standard for H-gas[25]. The two processes are therefore parallel and feeding each other.

[25] http://ec.europa.eu/energy/gas_electricity/doc/gas_quality/2007_01_16_mandate_gas_quality_en.pdf

Odourisation

Natural gas is odourless. For safety purposes (so that gas leaks can be detected), artificial odorants are added. Within the EU, the point on the system at which odourisation occurs varies. Most of EU TSOs do not odorize the gas in their transmission networks (which is safe because of a much higher level of integrity compared to low pressure systems), and odorant is injected only into distribution networks. The map below illustrates overview of different odourisation practices in EU, according to the received answers from TSOs and NRAs.

Figure 10- Odourisation zones



Source: ENTSOG

The differences in practices arise for national historic reasons and generally relate to cost issues. Technically, particularly once investments have been taken it is less costly to odorise large volumes of gas. Safety-wise, countries in favour of odourisation at transmission level argue that odour can be used for leak detections on the transmission system as well as in industrial sites connected to the transmission system. Countries in favour of odourisation at distribution level underline that odour is not a defining safety factor at transmission level and the odourants added to all of the natural gas (at the transmission level) are particularly unwelcome for environmental policy reasons as well as for reasons relating to interference with production processes at industrial customers.

High pressure pipelines undergo constant preventive surveillance (surface, integrity of the pipeline, monitoring pressure, anti-corrosion measures), thus preventing leaks resulting from progressive wear of the pipeline. Due to the high pressure, leaks resulting from a sudden breach of the pipeline would be visible (discolouration of vegetation) and audible (noise from pressure dropping) immediately. Therefore it is much less likely that an unnoticed leak occurs on a transmission pipeline compared to a distribution pipeline. This is also due to the different materials used for their construction. Moreover if a leak were to occur, there is a lower risk of explosion and safety impacts on a transmission pipeline (which run across the countryside) than on distribution pipelines (which enter buildings). Also odourisation at distribution level is avoiding additional black powder and elementary sulphur formation in pipelines, compressor stations, measurement stations and valves, as well as avoiding problems in the piping-system of underground storages. Finally it's highly unlikely that a leak on high pressure grids will be detected because of odourant perception.

Industrial sites that can accept odorised gas will not possibly rely solely on the sense of smell to determine if natural gas is present in the ambient air of a work space, as: i) the odorant might be disguised by other odours in the working environment; ii) individuals who have worked around natural gas odorant for an extended period of time are likely to suffer from odour fatigue thus being unable to recognize the presence or change in odour; iii) odour fade may unexpectedly occur during the process. Thus, some industrial sites are monitored using electronic hydrocarbon sensing devices in order to detect natural gas leaks, coupled with heat sensing devices to detect fires. Moreover is noted a negative impact of odourants on some chemical industry processes. In addition end users can reduce their emissions by receiving non-odourised gas, as turbines, industrial applications and storages are not adjusted to the respective odorant.

The different approaches are not compatible. While it is not problematic for a country with a centralised odorised gas to receive non-odorised gas, the opposite is not always true. Member States only odourising on the distribution level have a 0 or very low tolerance for the sulphur or other odourising agents in the gas at transmission level for reasons of particularly of environmental policy. Consequently there is at the moment 0 available firm entry capacity from France into Germany and Belgium. Though currently this is clearly not the general direction of the gas flux, the advantages of the well-interconnected internal market with harmonized rules would allow for gas to flow on the basis of supply-demand fundamentals which could like also mean flows against the dominant direction.[26] Therefore the differences in TSO positions regarding odourisation may reduce cross-border flows and the development of the internal market if TSOs reject odourised gas. Because of the over-injection risk[27], and the different odours used[28], non-odourised TSOs may reject odourised gas on safety grounds via their gas quality specifications.

The different approach to gas odourisation between France and Germany is the main obstacle to the opening of a South- North natural gas corridor from Italy to France, Germany and Belgium via Switzerland, the so-called "reverse flow project". The promoter of the project (i.e. Fluxys) has informed DG ENER that the difference in odourisation practices and to avoid gas flowing into grids where it is not compliant with national gas specifications or to have such gas treated is the main challenge they are encountering. This project has been identified by the European Commission as a project of common interest on 14 October 2013 (PCIs number 5.9, 5.10 and 5.12 all part of the Gas West priority corridor).

In its 2012-2021 Ten-year Network Development Plan the French TSO GrtGaz sets out the problem related to transmission-level odourisation as follows:

---

26 Such flows against the historical dominant direction are e.g. also occurring at the Interconnection point between Slovakia and the Czech Republic where physical flows have nowadays been reversed for delivery <u>into</u> Slovakia. A similar trend has also been occurring on the Austrian-German border at Oberkappel with gas at times physically flowing <u>into</u> Austria instead of Germany.

27 If too much odour is added to the gas, it can cause an increase in the number of reported leaks where the volume of gas released is in reality too small to be genuine safety concern.

28 A mix of different odours might mask the odour in a unpredictable way.

"Whereas France and Spain can receive LNG and transmit it to other European countries, the gas offloaded into their terminals may not be transmitted to Germany or to Belgium, as these countries do not accept pre-odourised gas. As a consequence, centralised odourisation:

• impedes the construction of a large scale interconnected European transmission system

• prevents the creation of bi-directional capacity at the cross-border interconnections, as required by the European regulation of 20 October 2010 on security of supply

• limits the diversification of supply in countries without sea coasts enabling the reception of LNG

• minimises the development potential of gas marketplaces in France and in Spain, and works against the economy of both countries."

The issue of odourisation is also presenting a cross-border barrier on the border between UK and Ireland. At the moment there is no need for physical flows of gas from the Irish market to the UK market, because the Irish market is reliant on UK gas for over 95% of its gas. Irish odourisation practices therefore do not currently present a barrier to trade. There is the potential that physical flows might be required from the South West Europe zone and a barrier to trade will be caused by the differences in odourisation practice between France (centralised approach), Belgium and German (local approach). ENTSOG, in its 2011-2020 Ten Year Network Development Plan ('TYNDP') conducted a series of assessments of market integration, consisting in analysing the extent to which the network would hamper flows from a given source. In that series, LNG was considered as one source. The barrier to trade due to incompatibility of odourisation practices between France, Belgium and Germany was confirmed as follows: "*In 2020 taking into account non-FID LNG terminal projects, even if the capacity congestion between Spain and France will have been relieved, the lack of eastward export capacity from France will hamper LNG maximization in Iberian Peninsula and France and its spread further into the European gas network.*"

Furthermore, as set out above, the lack of firm exit capacity from France to Belgium and Germany, may also disadvantage French storage operators as shippers active in the broader North-West European region may rate those storages less reliable in cases they need to move their gas across the border to follow price movements in neighbouring markets.

In addition to the considerations above mainly related to the fact that different practices of odourisation create trade barriers, it is important also to keep in mind that odourisation on the distribution level is in line with environmental policy of reducing harmful sulphur additives as the throughput of the distribution system is ca. 30-40% of the transmission system.

4. OBJECTIVES

4.1. General objectives

The general objective is to create the necessary framework for interoperability and data exchanges rules to achieve the objective of a well-functioning, efficient and open internal gas market and to enhance the following general EU treaty goals:

- to establish a functioning internal market in gas, in the spirit of solidarity between the Member States (Article 3(3) TEU; Article 194(1) TFEU);
- to ensure security of energy supply in the Union (Article 194(1)(b) TFEU);
- to promote the interconnection of energy networks (Article 194 (1)(d) TFEU).

4.2. Specific objectives

The specific objectives of harmonizing interoperability and data exchange rules across EU gas transmission systems are to:

- set non-discriminatory rules for access conditions to natural gas transmission systems,
- harmonize the terms under which adjacent TSOs set the ground for their cooperation,
- remove barriers to cross-border gas trade,
- improve competitiveness and transparency in the gas market.

4.3. Operational objectives

The Network Code on Interoperability should contribute towards these general and specific objectives by setting out technical rules for the operation of the European gas transmission systems. The network code on Interoperability and Data Exchange covers the complete area of activities for operating a gas network, including TSO-TSO interconnection agreements, how to manage differences in gas quality and odourisation practices, which units and data exchange solution to use. The operational objectives of harmonizing interoperability and data exchange rules across EU gas transmission systems are:

- the structural and technical harmonization of the terms under which adjacent TSOs set the basis for their cooperation;
- the harmonization of data exchange rules and units used by TSOs when communicating to counterparts;
- the creation of a clear process for TSOs to monitor, communicate to end-users and cooperate with adjacent TSOs on gas quality issues and solutions;
- the prevention of odourisation practices as a cause for the hampering of cross-border flows.

4.4. Legal Base and subsidiarity principle

The right of the EU to provide a more detailed regulation on interoperability and data exchange in gas transmission system in the form of binding EU network codes (NC) is set out in Article 8(6)(e-d) of the Gas Regulation. The Commission's initiative to adopt IO&DE NC is fully in line with the principle of subsidiarity, as the IO&DE NC only set the minimum degree of harmonization necessary to ensure interoperability between system operators. There are also significant differences in data exchange procedures implemented at national, level and specific agreements between TSOs and DSOs at national level. These national differences are taken into account in the NC IO&DE which will provide for the possibility of interim measures to be taken and for the possibility to apply ad hoc solutions.

5. Policy Options

This Chapter aims at identifying and describing the different policy options to address the problems as described in Chapter 3.

To tackle the issue of interoperability and data exchange rules in gas transmission systems, the following options will be assessed in further detail:

- **Option 1:** no further EU action to address interoperability and data exchange rules (baseline scenario);

- **Option 2:** harmonised EU rules on interoperability and data exchanges with room for specific/national arrangements;
- **Option 3:** full harmonised interoperability and data exchange rules without room for specific/national arrangements. Option 3 differs from Option 2 primarily in that it essentially eliminates the margin of manoeuvre for TSOs and NRAs to negotiate solutions – in the spirit of a harmonized approach – for the benefit of achieving more complete uniformity of rules.

The option of developing non-binding guidelines of best practices, which could be regarded as an enhanced baseline scenario, will not be assessed further in this impact assessment as EASEE-gas has already developed Common Business Practices on Interoperability issues, some of which have been in use for over 10 years with varying success. However as these CBPs are non-binding, their implementation has been limited as operators and regulators could not agree on a common set of parameters and consequently many were not willing to make the necessary changes to current practices. Adaptation of the CBPs has been particularly low in the EU-13 Member States. Therefore the Commission services are of the view that the option of non-binding guidelines would not be sufficient to provide the necessary output in order to solve the outlined problems. Broader implementation of more harmonized rules therefore appear to only be prove successful if they are done in the form of a legislative proposal. In addition, the Gas Regulation foresees a framework for designing technical rules of the EU gas (and also electricity) sector with the use of network codes which has become well accepted by stakeholders. Finally, the development of binding interoperability and data exchange rules through a Network code process was strongly supported by stakeholders and Madrid Forum.

5.1. Option 1: no further EU action

This policy option does not foresee any further rules on interoperability and data exchange. Under this option no harmonised measures are proposed. Interoperability and data exchange rules would develop either on a voluntary basis as market maturity grows, or as the national measures dictate. Under this approach one may need to consider that the national rules would focus on the national specifics and may fall short when it comes to cross-border trade and cross border aspects of gas transactions. The current system of bilateral negotiation of interconnection agreements will stay in place bringing to three main inefficiencies: i) the existing/resulting interconnection agreements could be inefficient or might miss some vital elements, impacting on flows and/or costs, and potentially causing a barrier to market entry; ii) renegotiation of the existing interconnections agreements (to accommodate wider industry changes) might take a long time to be agreed, introducing a unnecessary administrative burden to TSOs/NRAs and potentially lowering the effectiveness of wider changes iii) some of the existing deficiencies in the quality of the existing agreements would remain in the renegotiated agreements. Many of today's agreements exist in situations where the implementation of the Third Package will cause significant changes in practice: (e.g. harmonisation of the gas day, daily balancing, bundled capacity products, common nomination and re-nomination times). This means that many of the existing contracts will need to be renegotiated. Under this option differences in units, data exchanges rules, gas quality and odourisation practice will remain and it would be difficult to achieve convergence to a significant degree that would promote further market integration. Rather, they will be solved bilaterally and no regional impact or hampering to cross border trade is expected.

As far as gas quality/odourisation issues are concerned, this option is characterised by a situation where: existing gas quality specifications prevail; existing TSO information practices prevail such that users and consumers are unable to quantify and/or manage their risk; and existing TSO' behaviour is not coordinated. However an important consideration that should be kept in mind is that future supplies of gas to Europe might be substantially different from the current supplies, and that the future patterns of flows within Europe might be substantially different to current patterns of supply. This might require investment to enable new supplies to enter the EU, and might lead to constraints appearing at interconnection points where the current disparate gas quality specifications/odourisation practices do not usually present constraints. To the extent that gas quality constraints are expected to become more prevalent, the increased reliance on the flexibility of LNG cargoes may increase short-term security of supply risks.

As far as data exchange and units issues are concerned this option is characterised by a situation where the current barrier to trade will remain.

The baseline scenario builds on the largely organic process of market integration as set out in the high level principles of the Gas Regulation and Gas Directive but does not build on the stipulation of the former on the need for further binding EU-wide harmonised, technical operational rules. In addition the baseline scenario does not have the clear objective of completing the internal market expediently by 2014, instead favouring a more incremental and longer-term approach.

5.2. Option 2: harmonised EU rules on interoperability and data exchange with room for specific/national arrangements

Under option 2, harmonised rules for interoperability and data exchange that enable TSOs and network users to exchange gas efficiently would be set. These harmonised rules would leave room for national specificity where this better achieves the objectives, whilst ensuring that such specific arrangements do not go against the objectives of common interoperability and data exchange arrangements.

5.2.1. Interconnection agreements

This option foresees that interconnection agreements (IA) based on a set of harmonised terms shall be established on a mandatory basis by all concerned TSOs at all interconnection points. As a general requirement, interconnection agreements will impose no restriction to cross-border trade and will promote the development of competitive and liquid markets at both sides of the interconnection points. This option provides that the interconnection agreement will include at least the following mandatory terms on: rules for flow control; measurement principles of gas quantities and quality; matching; rules for the allocation of gas quantities; exceptional events and procedure for modifying the agreement (amendment process).

Under this option, the contractual freedom of two adjacent TSOs is preserved, while at the same time, the elements to be agreed on are fixed. This option recognises also that some mandatory terms[29] could affect network users. Therefore the Network Code would identify these as relevant issues where the network users have to be informed in order to gather their feedback prior to the TSO making any changes[30]. This option establishes for each mandatory term a set of fully defined rules, to be used by default if TSOs fail to agree on the terms of an interconnection agreement within 12 months (hereafter *'default rule'*). The default rules, in combination with the set of minimum terms to be included in the IA, ensure that non-matching

[29] i.e. the matching rule, the allocation rule and the communication procedure towards network users in case of an exceptional event

[30] A minimum timeframe (i.e. from 1 month to 3 months) is considered to be appropriate for gathering the aforementioned feedback of the network users

or disparate IAs cannot become a barrier to trade. Hereafter the description of the mandatory terms to be included in each IAs according this option:

Rules for flow control: the adjacent TSOs shall agree on the timing, direction and procedures for flow control. The reason for agreeing on rules for flow control in an IA for an interconnection point (IP) is to facilitate a controllable and predictable flow across the IP for the benefit of both TSOs and network users. In order to meet these requirements the rules in the IA need to cover the following items: 1) the reference period for the flow control target is the hour; 2) the input parameters to be used when agreeing upon the target flow; 3) the accuracy sufficient to minimize the difference between the measured flow and the target flow; 4) the flow stability, i.e. acceptable deviations within the reference period from a constant flow; 5) any special rules concerning for instance: ramp-up, ramp-down, minimum flow, switch of flow direction, etc.; 6) the minimum and maximum pressure. For the predictability and efficiency of the transportation of gas and to meet the contractual pressure obligation a high level of accuracy and stability is desirable. The above mentioned rules determine that transmission system operators agree how to steer the flow and try to minimize the deviations for all network users.

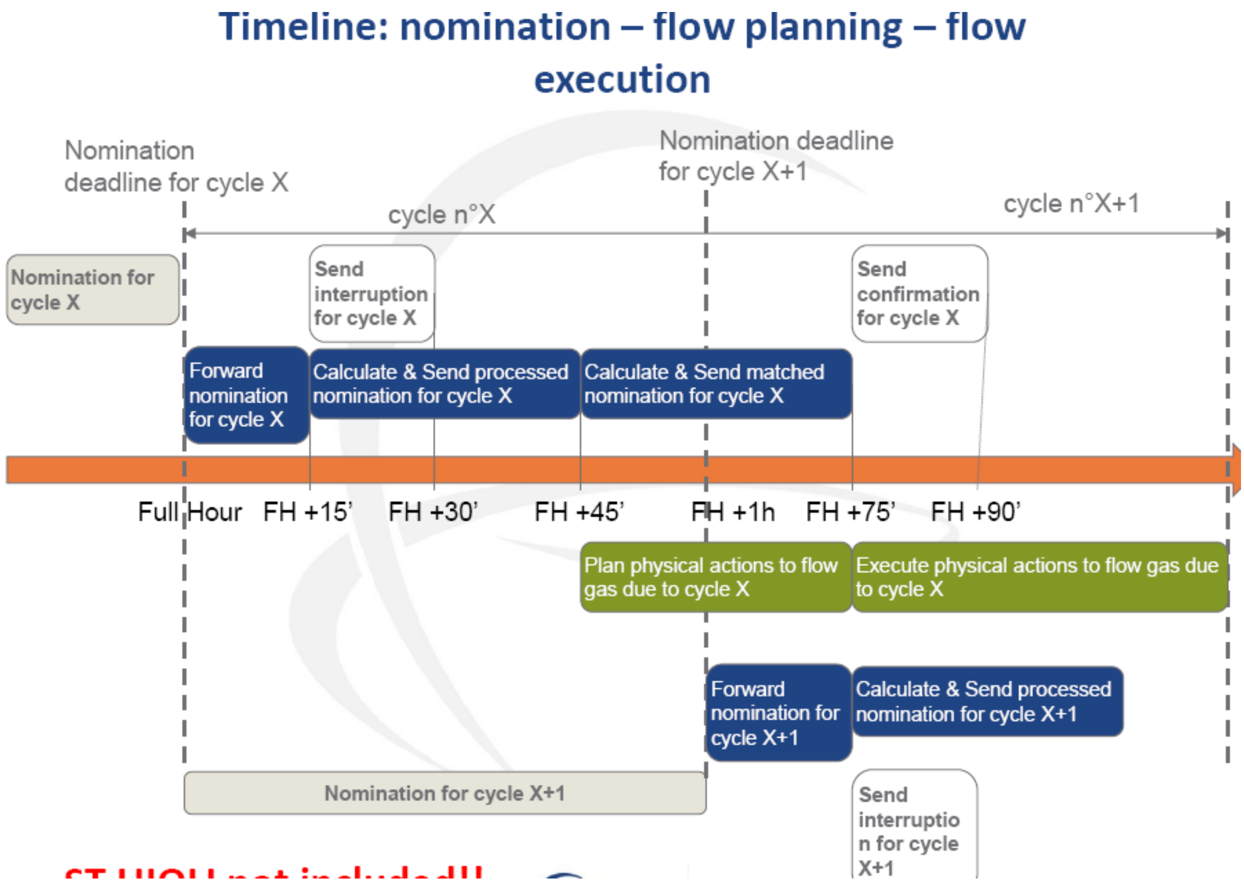
Measurement principles of gas quantities and quality: The inclusion of measurement principles of gas quantities and quality in the IA provides for the agreement of these procedures between adjacent TSOs, thus improving the cooperation and coordination between them. There are several measurement principles that adjacent TSOs must agree upon such as: which is the TSOs responsible for the installation operation and maintenance of the measurement equipment; the means by which volume and energy delivered to/received from network users are to be measured at the interconnection point; which gas quality parameters are to be measured; for each parameter, the range and uncertainty over which the measurement equipment will operate, the frequency of measurement and in what units the measurement shall be made; the manner of data exchange between transmission system operators in respect of measurement data; arrangements that shall apply in the event of failure of the measurement equipment; the measurement validation arrangements and the quality assurance policy; the specific list of signals and alarms to be provided by the transmission system operator who operates the measurement equipment to the other adjacent TSO. Therefore, general rules and requirements about the content of these procedures are defined under this option.

Matching: The matching process describes the communication and processing of the relevant data among the TSOs to calculate the processed quantities and confirmed quantities of the network users and finally the resulting flow. Flow is required to be calculated at both sides of an IP on an identical basis. Therefore, for the matching process, adjacent TSOs need to mutually agree on: i) the matching rule to apply (e.g. lesser rule, agent rule); ii) the time schedule for the matching process within the nomination and re-nomination cycle; iii) their roles in the matching process (e.g. which is the initiating transmission system operator and which is the matching transmission system operator). Network users always have to know which rule is currently being applied in the matching process. This option leaves the possibility to the adjacent TSOs to agree on the rule to be applied and, in case they cannot agree, the lesser rule[31] will apply as default rule.

[31]'lesser rule' means that in case of different processed quantities at either side of an interconnection point, the confirmed quantity will be equal to the lower of the two processed quantities.

This option would define that the matching process has to be performed within the nomination/re-nomination cycle of two hours and has to be implemented with certain timing for each process.

Figure 11: Timeline in the matching process



Rules for the allocation of gas quantities: The allocation rules either side of an IP should not present a barrier to cross border trade and should ensure that all network users are informed about the allocation methodology in place. The allocation rules have to be consistent at both sides of an IP. Whenever an update of the allocation rule is needed, all involved network users need to be informed by the relevant transmission system operators well in advance. These rules have to be reflected in the transportation contracts between transmission system operators and network users. There are 4 different allocation rules that are currently applied within EU: 1) OBA, 2) Balancing Network User, 3) Pro-Rata, 4) Agent.[32] Under this option, the NC would require that IA stipulate how TSOs should cooperate and provide where necessary for consistent rules in the allocation of gas quantities to shippers in the IP at both sides. Where TSOs would be unable to agree on allocation rule, the OBA shall apply as default rule.

[32] 1) OBA: the steering difference is allocated to the operational balancing account (OBA) of the transmission system operators and the confirmed quantities will be allocated to the network users in accordance with their nominated quantities ('allocate as nominate'); 2) Balancing Network User (BNU): the steering difference is allocated to a balancing network user (BNU) and the confirmed quantities allocated to the non-balancing network users; 3) Pro-rata: the metered quantities are fully allocated on a proportional basis to all network users; 4) Agent: an allocation agent carries out the allocation function appointed by the network users based on the rules agreed between the agent and the network users.

Exceptional events: In case an exceptional event occurs the original confirmed quantities may no longer be transported and may have to be reduced. As the outcome of an exceptional event cannot be defined before the event occurs (as well as the technical difficulties to solve it), it is impossible to define harmonised timing for communication. As a general provision TSOs should be obliged to inform each other and network users with all necessary information as soon as possible. The priorities in case of such an event shall be the safety of people, then the security of the network and finally provision of information. This option would require that IA include provisions on the way in which TSOs establish contact with the adjacent TSOs, as well as with network users and coordinate necessary actions in case of an exceptional event. The IA would in particular define the content and timing of information to be exchanged.

*Amendment process**:*** Transmission system operators could have the need to modify an IA. TSOs will also have to consider any need to ensure the good implementation of the IA and modify it accordingly to reflect such need for operational[33] or commercial purposes. Therefore this option specifies that IA would define a transparent process for their modification.

5.2.2. Units

A lack of harmonisation with regard to the units used by TSOs along the gas value chain may constitute a barrier to cross-border trade and access to markets. The policy option 2 foresees to prescribe the following units when communicating to counterparties:

- Pressure: bar
- Temperature: °C (degree Celsius)
- Volume: m^3
- GCV: kWh/m^3
- Energy: kWh (based on GCV)
- Wobbe-Index: kWh/m3 (based on GCV)

The reference conditions for volume shall be 0 °C and 1.01325 bar and the combustion reference temperature for GCV, Energy and Wobbe-Index would be 25 °C. Unfortunately the reference conditions for these units are not in line with the CEN/ISO standard EN ISO 13443. Although there has been a close cooperation with CEN in order to tackle the issue it was not possible to come to a common view. The suggested units and related reference conditions were mainly chosen for three different reasons. Firstly there is a legal obligation according to Chapter 3 of Annex I of the Gas Regulation under 3.1.1.(f) which defines that TSOs have to use kWh with a combustion reference temperature of 25 °C for the content of energy and for volume m^3 at 0°C and 1.01325 bar. Secondly these units only have to be used by TSOs for communication. Thirdly the units and reference conditions as defined under this option are the ones currently mostly used by transmission system operators as illustrated by the graphics contained in Annex 4, based on an internal survey within ENTSOG carried out beginning 2013. The common set of units will be used in all communications in writing and which is related to the transportation of gas across an IP between adjacent TSOs and between TSOs and other counterparties or in respect of the publication of data on a common platform. This option would permit the utilization of additional units for data communication between adjacent TSOs and between TSOs and other counterparties where both parties agree.

5.2.3. Gas Quality

[33] For example a new compressor station with ramp-up/ramp-down times or new pressure requirements for the IP could lead to the necessity to amend existing IAs.

Differences in gas quality specification may arise and could potentially prevent gas from flowing across borders, therefore this option would require: i) TSOs to cooperate in order to manage non-compliant gas presented by an upstream TSO wherever it is economically/financially appropriate; ii) TSOs to provide sufficient information to enable users and consumers to understand the forward-looking risks associated with gas qualities. Option 2 is therefore meant to specifically address possible barriers to cross-border flows due to differences in national gas quality specifications.

i) Managing cross-border trade restrictions due to gas quality differences

This option provides that adjacent TSOs would have to cooperate in order to avoid restrictions to cross-border trade due to gas quality measures by implementing swapping[34] or co-mingling[35], where feasible. When the restriction cannot be avoided and when it is recognized by the relevant NRAs, taking into account the following criteria: i) frequency of occurrence of hampered flow (based on historical data); ii) expected future gas flows and gas qualities (could be based on the Long term Gas Quality Monitoring Outlook done by ENTSOG), then TSOs should jointly investigate options to address the situation. TSOs assessments are envisaged to include the following criteria: 1) Availability of technology (for physical solutions); 2) Efficiency, cost and practicality of implementation; 3) Investigation of the feasibility of commercial solutions. Existing arrangements could serve as benchmark for potential solutions. Possible solutions might include, but shall not be restricted to gas treatment[36] and flow commitments[37]. TSOs shall jointly determine the solutions facilitating cross-border trade based on a cost-benefit analysis and submit them for approval to the relevant NRAs, following a public consultation with the market.

ii) Improve information provisions

This option seeks to improve the provision of existing information by TSOs to network users. The current legal provisions do not extend to other parameters included within applicable gas quality specifications, and allow TSOs to restrict publication of averaged values. Users therefore have insufficient information on which to judge the risk of gas quality issues emerging.

- Short Term Monitoring

Option 2 obliges TSOs to provide relevant parties with pertinent indicative information on Gas Quality and variations thereto. It classifies the cases where it is necessary or useful to provide further information to end-users or suppliers on fluctuations of gas quality in order to allow them to take preventive measures. Option 2 identifies the nature and frequency of submission of such information after duly consulting all concerned parties, so as to allow the concerned parties to take account of the gas quality variations[38].

---

[34] Adjacent TSOs have the opportunity to swap amounts of gas on reasonable endeavours basis

[35] It is a form of gas blending and refers to a situation where two or more gas streams blend fortuitously prior to the gas entering the network on which the gas quality limits apply with the aim of delivering an acceptable 'blended gas'

[36] Physical treatment of natural gas (injection or removal of certain compounds)

[37] They are contractual arrangements between network users and TSOs providing the TSO with the option to request network users to manage their inputs or off-takes resulting in gas flows within an agreed range at one or more entry or exit points, for the purpose of maintaining existing entry and exit capacities.

[38] There are already few examples in place of such cooperation between TSOs and parties receiving gas quality information in place. They are: 1) Belgium: development of an 'alert system to be provided in reasonable time to selected sensitive end-users where gas quality might vary significantly and may influence their operation; 2) the Netherlands: publishing on the website real time information on gas quality parameters transmitted from existing

- Long Term Monitoring

By making assumptions about the most likely pattern of near-term gas flows, it should be possible for TSOs to calculate the gas qualities that might be presented at different network points using suitable network analysis software. This set of information would allow gas traders to accommodate any near-term risk in the price signals within the market, for example by allowing prices of secondary capacity to vary by location according to the attractiveness or otherwise of the gas quality available at that point. This information would be beneficial to gas consumers, so it would be useful to specify this for exit points as well as cross-border points. In addition to this, a longer-term view of the potential changes to gas quality that could arise as a result of capacity changes on the network would also allow the market to factor in gas quality concerns into price signals. This option would require ENTSOG to provide a view about the gas quality that could possibly be transported through transmission system operators' networks in the future (10-year outlook) by building on the Ten Year Network Development Plan (TYNDP) experience and making additional assumptions about scenarios on the gas quality of every supply source.

5.2.4. Odourisation

Since flows can be impeded due to different odourisation practices in the Member States across EU cross-border, this option requires that relevant TSOs work to resolve the issue either via bilateral agreements or by cooperating with relevant authorities, to facilitate a shift towards transportation of non-odourised gas at the relevant IPs. The cooperation with the competent national authorities is required, since transmission system operators cannot decide unilaterally to change odourisation practices on their own. TSOs, after respective NRAs' decision recognising that odourisation practices create a barrier to trade, should actively asses the impacts related to the eventual flow of odourised gas and evaluate local solutions to mitigate those impacts and at last define the level of odourant in the gas below which those impacts are acceptable. The process of cooperation between adjacent TSOs is divided in two phases:

1st phase (6 months): the adjacent TSOs can find a bilateral agreement to maintain existing odourisation practice through easy solution that do not change the national odourisation practices such as swapping, flow commitments, etc. Once the solution has been identified, TSOs shall provide their NRAs with the agreement.

2nd phase (12 months): if TSOs fail to reach a bilateral agreement or if the agreement is not acceptable to the relevant authorities, they have to submit detailed planning how the goal of shifting towards cross border flow of non-odourised gas can be reached. Therefore TSOs should assess the consequences related to potential flow of odourised gas into non-odorised network; conversion towards non –odourised gas; possible acceptable level of odourant. TSOs should also produce cost estimates and implementation time for each identified option taking into account impact on relevant parties, they should conduct a public consultation, submit the feasible solution including the cost recovery mechanism to the relevant national authorities. The shift towards the physical flow of non-odourised gas shall be implemented within the timeframe approved by the national authorities. The approach proposed under option 2 is balanced and applies only if concrete obstacles appear. In other words the so-called default rule on odourisation merely sets out that odourised gas may not need to be accepted by Member States not odourising on the transmission level. Consequently, in case there are trade

measuring equipment from their network and identifying the map of zones indicating which chromatograph reading may be specific for which area.

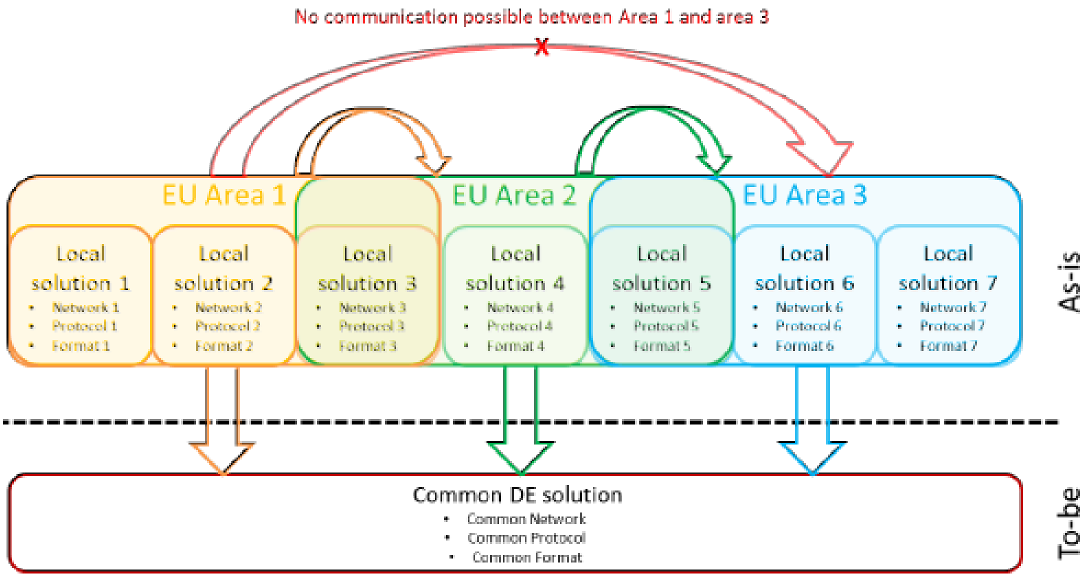
movements of gas from a Member State with odourisation on the transmission level, the ultimate logic of the option sets out that after having conducted a cost-benefit analysis and explored all alternatives, the trade in non-odourised gas should prevail. A change in practice is then the "last –resort option" when all other possibilities have been explored to address possible barriers to cross-border trade and the two adjacent Member States base their decision on a detailed cost benefit analysis.

5.2.5. Data Exchange

This option foresees a common set of data formats, data network and exchange protocol for the reliable, secure and smooth exchange of information among TSOs, as well as from TSOs to relevant counterparties. The selection of such a Data Exchange solution by ENTSOG has been based on a cost-benefit analysis (CBA) subject to public consultation (see Annex 5). This analysis, as well as the subsequent selection process has taken into account in particular a list of criteria[39]. The CBA was divided in three part: 1) a technical evaluation that has led to the selection of the network, format and protocol of the harmonised data exchange solution for the three types of data exchanges; 2) an economic evaluation giving an overview of the spread of the various data exchange solutions in use today and cost evaluation for the document based data exchange type protocol; 3) further conditions describing data volumes exchanged, discrimination of small shippers and new market entrants, synergies with electricity data exchange rules and compatibility with counterparty solutions.

The bottom part of Figure 12 presents a common solution to the problem described in chapter 2:

Figure 12: Common solution to Data Exchange



Option 2 foresees the following data exchange solutions:

[39] 1) best available technologies, particularly in terms of security and reliability; 2) the actual spread (whether the solution considered is widely used) of the solutions considered; 3) the volume of data traffic required to transfer information; 4) the costs of first introduction and cost of operation; 5) the potential for discrimination of small shippers or new market entrants; 6) the synergies with current electricity Data Exchange rules; 6) the compatibility with counterparties' Data Exchange solutions

Data exchange type	Data network	Data format	Data protocol
Document based	Internet	Edig@s-XML	AS4
Integrated	Internet	Edig@s-XML	HTTP(S)/SOAP
Interactive	Internet	N/A	N/A

Option 2 allows for the co-existence of existing solutions in parallel with the harmonised approach.

5.3. Option 3: Detailed harmonised Interoperability and Data Exchange Rules without room for specific/national arrangements

Under this option, there would be more prescriptive and more detailed harmonised rules across Europe without the possibility of system-specific solutions. Rules on interoperability and data exchanges will be defined in detail.

5.3.1. Interconnection Agreement

This option requires the specification of a full set of rules that a TSO is mandated to apply at each interconnection point. TSOs will not have any contractual freedom as all the mandatory terms: i.e. rules for flow control, measurement principles of gas quantities and quality, matching, rules for the allocation of gas quantities, exceptional events and procedure for modifying the agreement (amendment process) will be laid down in a standard interconnection agreement. Each mandatory term would be fully described therefore adjacent TSOs will not have the possibility to agree on something more specific, in line with their national situation. For instance under option 3, OBA[40] will be the only rule for allocation of gas quantities without taking into consideration a specific characteristic of an interconnection point[41]. In case of the matching, option 3 would prescribe the lesser rule as the only possible rule not taking into account the interdependencies with other network codes. For instance the application of the short term use-it-or-lose-it mechanism as foreseen in the CMP (please see *Figure 11* earlier).

5.3.2. Unit

This option would be equal to option 2 fixing the following units:

- Pressure: bar
- Temperature: °C (degree Celsius)
- Volume: m^3
- GCV: kWh/m^3
- Energy: kWh (based on GCV)
- Wobbe-Index: kWh/m3 (based on GCV)

However option 3 would not allow TSOs to agree to use additional units besides the ones fixed. This option would not permit the utilization of other units for data communication between adjacent TSOs and between TSOs and other counterparties, e.g. in domestic transactions where both parties agree.

[40] Please see footnote 28

[41] For instance in case of a pressure-steered interconnection point an OBA is not a good rule because it is not possible to steer a certain flow as the flows are dependent on the ruling pressure and as such the flow cannot be kept within a certain range

5.3.3. *Data Exchange*

Option 3 would be equal to some extent to option 2, i.e. extending harmonisation of data exchange solutions to all areas where TSOs exchange data among themselves or communicate data to counterparties. However option 3 will not allow the co-existence of parallel solutions that would minimise the cost impact on the market, it will impose a common data exchange solution to distribution system operators at national level as well without the possibility for TSOs to maintain flexible implementation schedule between TSOs and network users.

5.3.4. *Gas quality*

Under this option there will be a full physical harmonisation of the entire EU H-gas market to an agreed specification. Such a pan-European specification could either be very broad, encompassing the majority of existing specifications and obliging TSOs to accept most gases presented to them at any interconnection point. A specification could also be very narrow, which would ensure a predictable gas quality for users but entail significant treatment costs at entry points. Currently, the European body for standardisation, CEN, following a mandate of the Commission[42], is in the process of developing a gas quality standard for high calorific gas quality, that are the broadest possible within reasonable costs. Thus this option will be implemented over the mid- to long-term (5-10 years) after the publication of and inclusion into EU legislation of[43] by CEN of the new standard establishing the same gas quality specifications across the EU.

5.3.5. *Odourisation*

Option 3 requires all Member States to apply the same odourisation practice without the possibility to assess alternative solutions (i.e. swapping, flow commitments, etc.) when the problem arises. As the majority of EU member state odourised gas at distribution level, this option will imply for Member States odourising gas at transmission level to move their odourisation practice from transmission to distribution level.

6. IMPACT PER MEASURE

6.1. Option 1: No further EU action (baseline scenario)

Differences in interoperability and data exchange across the EU as identified in chapter 2, will persist and potentially become more serious. The problem is unlikely to swiftly solve itself, since the current patchwork of national systems would require changes in the technical rules in many Member States that would have to result in compatible systems across the border. Thus a higher degree of cross border coordination would be needed which is difficult to achieve without cooperative legislative framework of the EU. Moreover, it is not just the national regulatory authorities and the European legislator that have called for new rules on interoperability and data exchange in the third energy package. Also gas traders and network users perceive interoperability and data exchange as one of the main obstacles for true market integration and strongly support addressing these issues as has been demonstrated in public consultation by ACER and ENTSOG.[44]

---

[42] http://ec.europa.eu/energy/gas_electricity/doc/gas_quality/2007_01_16_mandate_gas_quality_en.pdf

[43] E.g in the form of a measure such as the Interoperability Network Code

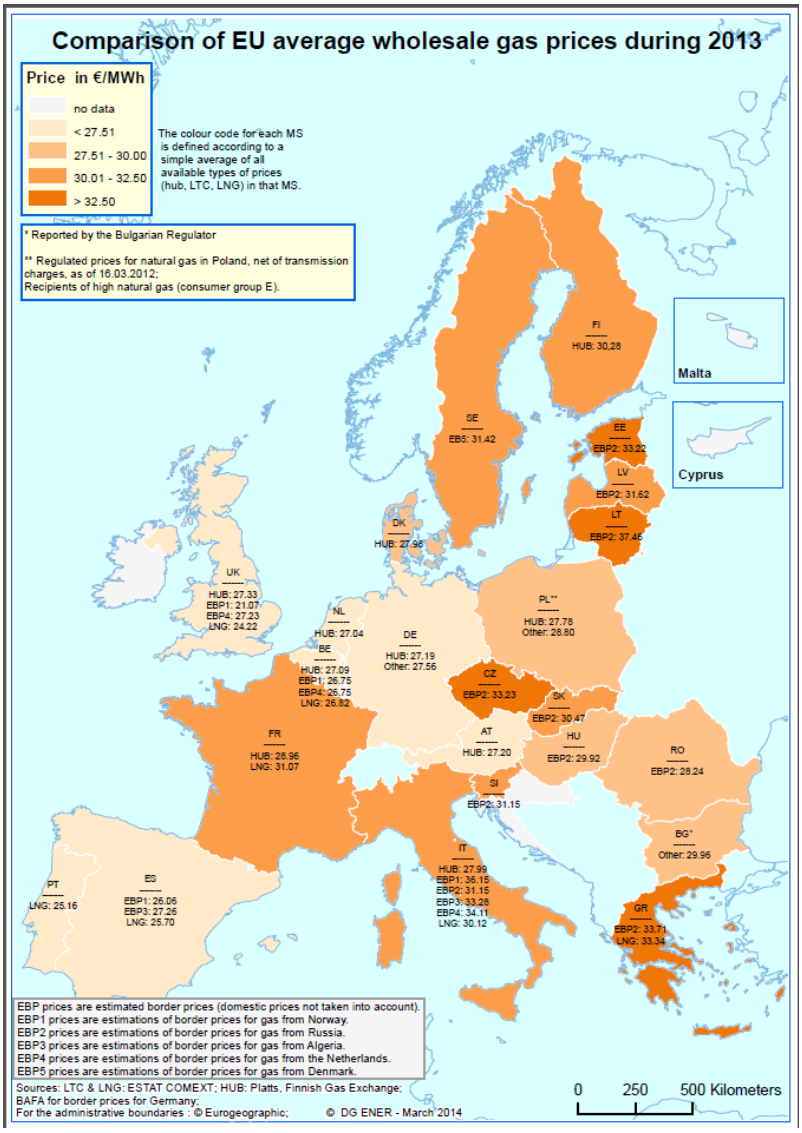
[44] http://www.acer.europa.eu/Official_documents/Public_consultations/Closed%20public%20consultations/PC-07_Draft_FGs_on_Interoperability_and_Data%20Exchange%20Rules/default.aspx
http://www.entsog.eu/publications/interoperability#All (see Annex 1 for a visual overview of the ENTSOG's stakeholder involvement)

6.1.1. Economic Impacts

Rules for IO&DE in gas transmission networks are very complex and technical. This in itself would likely inhibit or at very last significantly prolong and render inefficient any organic initiative to improve them across the EU. The overall aim of IO&DE is to ensure that users of two or more transmission systems operated by separate entities in EU do not face technical, operational barrier to trade and subsequently to facilitate gas trading across the EU. A key contributing factor to the development of gas hubs and of gas-to- gas competition is the lack of any barrier to trade. As the map below shows this diversity is important, because markets with access to multiple sources of gas and competitive trading arrangements (e.g. North-West Europe, UK) have benefitted from lower prices in recent years. By contrast, Eastern European countries that depend predominantly on long-term, oil-linked contracts have paid relatively higher prices. It is worth noting, however, that not all EU markets have been equally affected by the sharp rises in the price of oil, which have pushed up natural gas prices in the case of persisting, oil-indexed contracts. EU Member States with well-developed gas hubs have not only enjoyed the benefit of greater price stability; the prices of gas supplied in these markets have also been lower due in large part to supplier competition owing to wider infrastructure. This further underlines the importance of hub based trading in the EU.

It goes without saying that interoperability and data exchange measures do not suffice to solve the situation shown in the map. Neither is the assertion made that improved interoperability rules would not have significant benefits in markets where there is already today relatively liquid trading. Nevertheless the improvement and harmonisation (e.g. moving away from the business as usual scenario) of interoperability and data exchange rules have as their core objective to ensure that physical gas flows and ancillary communication in the internal market can take place in an uninhibited fashion. This in turn would set the stage and enables commercial transactions to determine in as broad a manner as possible the will foster and enable broad trading of the commodity gas and market based price development of it..

Figure 13: Average wholesale prices in 2013



Source: DG ENER- Prices for BG might be different.

Results from the public consultations: this option was not supported during the public consultation processes. There was very large support for the view that the rules defined under option 2 will enhance the functioning of the internal gas market. Only one German association, BDEW, grouping local companies active in natural gas, electricity and district heat, water and wastewater has argued that no legally binding interoperability and data exchange rules should be developed across the European Union because these issues should be dealt at national level[45].

Facilitating competition: The absence of additional harmonized principle may mean that interoperability and data exchange rules will continue to differ across Europe which may add complexity to trade rules. Indeed, while trading itself (so-called paper trading) can take place on markets somewhat away from the physical product-related transactions, the fundamentals of

[45] http://www.acer.europa.eu/Official_documents/Public_consultations/Closed%20public%20consultations/PC-07_Draft_FGs_on_Interoperability_and_Data%20Exchange%20Rules/default.aspx

all financial trading rests with the physical markets. This in turn depends on physical deliveries being assured and operational cross-border concerns being out of the way. These could act as barrier to new entrants and to cross border trade. Furthermore different interoperability and data exchange rules may hinder the development of broad trading on newer EU markets.

Transparency and non-discrimination: Network users active in various national markets across the EU may need to build up substantial knowledge about the different rules that may apply in the Member States, resulting in higher costs for practical application of the different rules. This would be particularly challenging for new entrants and small competitors as they might face higher costs in setting up different national rules.

Administrative burden: This option is easiest to implement, as it leaves it up to national authorities how to implement the requirements from the Third Package. Whilst this may at the outset be perceived as being less onerous than to implement harmonised arrangements, it may also create significant inefficiencies. What is more, the direct administrative and economic costs of disparate systems are likely to increase disproportionately as integration reaches its final stages.

6.1.2. Social Impacts

Direct social impacts are not significant. More important are the indirect impacts. As set out earlier, interoperability in the gas sector is a technical albeit crucial aspect to ensure the proper functioning of the sector. As also set out, further integration of the electricity and gas markets has a significant potential to contribute to GDP growth and consequently also job creation. Therefore the BAU option which does not foresee further harmonization of EU-wide interoperability rules with the view of ensuring one of the operational backbones of an integrated EU gas market, which in turn may not benefit from efficient price discovery, may lead to undesired social impacts which follow from the likely scenarios developed when assessing the economic impacts. A decreased competitiveness of EU industries resulting from potentially higher gas prices, due to a less efficient market structure, may have negative effects on the European industry and therefore may have an impact on the labour market. The annual growth survey 2013 of the Commission therefore states that the performance of network industries across Europe also has a critical knock-on effect on the rest of the economy and can be significantly improved by ensuring the full transposition and implementation of the third energy package[46]. The survey especially calls for overcoming obstacles to activities in wholesale trade in order to tap potential new sources of growth and jobs as outlined in the first edition of the Single Market Integration Report[47]. The report on the single market integration states that the GDP share of the energy sector in the EU has been increasing since 2000 and has exceeded 2½% in recent years. It states further that this indicator does not fully reflect the importance of the energy sector in the economy, which provides critical production inputs for all other sectors thus contributing significantly to their cost competitiveness. The report acknowledges that the internal energy market slowly but surely starts to bear fruit. Wholesale gas prices have been noticeably lower in those Member States where markets work better. Gas supplies to retail consumers have been more resilient to temporary volume reductions by exporting countries thanks to more flexible infrastructure and clear price signals inside the EU[48].

[46] COM (2012) 750 final, Annual Growth Survey 2013, p.10

[47] COM (2012) 752, State of the single market integration 2013- Contribution to the Annual Growth Survey 2013

[48] COM (2012) 752, p.13.

Markets with only a few actors are likely to see less trading and liquidity suggesting fewer jobs for new entrants. A restructuring of the gas market might have effects of job losses at the incumbent. Some countries or regions may be more affected than others. The impact on countries which already have a well-developed gas wholesale market is expected to be less. The quarterly review- December 2011 of EU Employment and Social Situation[49] showed that for the year 2010 in the gas sector[50] in total 253 job cuts and 700 job gains were reported. Furthermore high level of gas prices may cause "energy poverty" and social exclusion of the most vulnerable groups. At this stage no impacts on job rights, job equality or job health and safety are expected. Stakeholders didn't provide views with regard to social impacts.

6.1.3. Environmental impact

The Commission Services believe that the baseline scenario has no direct environmental impacts. However, not fostering the internal gas market could have indirect impacts. For example, when – due to lack of a well-functioning internal market (a basis of which are the operational elements related to interoperability) – gas prices go up relative to coal due to oil-linked prices it has an impact on the choice of the generation source for electricity. A higher gas than coal price makes power producers switch to more polluting coal as the fuel of their choice, resulting in higher emissions. If the high prices were to last over a longer period of time they could also distort market participants' investment decisions potentially resulting in more polluting power generation facilities.

During the last two years coal's share is increasing in many European countries' power generation. In 2011 several EU Member States decided to reduce its reliance on nuclear power generation, having an immediate impact in some cases as significant amount of nuclear capacities were taken off the power grid. The missing nuclear capacities could only partly be replaced by the increasing renewable (mainly wind and solar) sources. The remaining part is being replaced in a large extent by coal-fired generation capacities. The increasing role of coal is supported by its relative cheapness compared to natural gas. As set out above, the size of the indirect environmental impact of the baseline scenario is difficult to assess and clearly the technical issue of interoperability of networks is just an element in making markets work. It will not only depend on the level of gas prices but also on the price level of coal and the duration of the differences in price level.

6.2. Option 2: harmonized EU rules on interoperability and data exchange with room for specific/national arrangements (NC IO&DE)

Under option 2, harmonized rules for interoperability and data exchange that enable transmission systems to be operated more effectively and to ensure that users of two or more TSOs in Europe do not face technical barriers higher than those that would have been expected if the relevant networks had been efficiently operated by a single TSO, would be set. These harmonized rules would leave room for national specificity where this better achieves the objectives whilst ensuring that such specific arrangements do not go against the objective of interoperability and data exchange arrangements. The application of specific agreements between two adjacent TSOs or between TSOs and networks users would help ensure that rules are sufficiently ambitious and at the same time allowing to take into account specific characteristic of the different national systems. For more details on the stakeholder responses on the rules proposed by option 2 please see Annex 3-6.

---

[49] http://ec.europa.eu/social/BlobServlet?docId=7293&langId=en

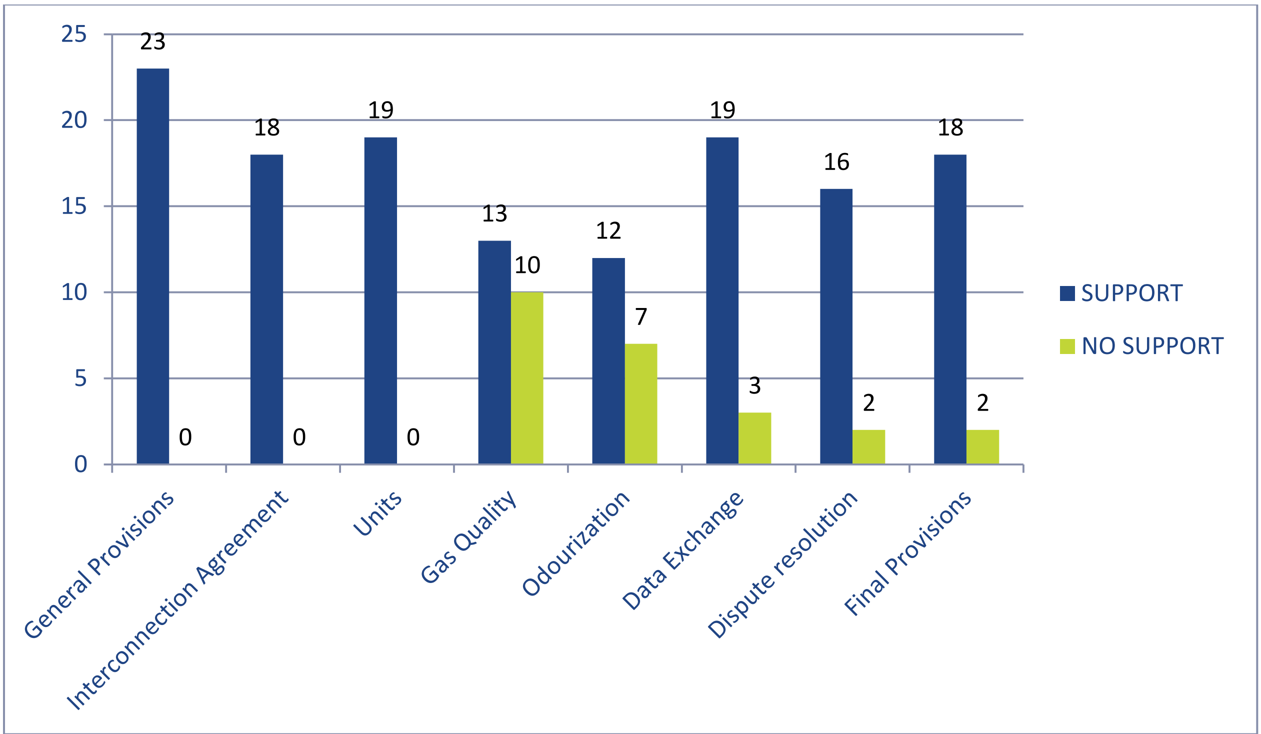
[50] Manufacture of gas; distribution of gaseous fuels through mains (NACE 40.2).

6.2.1. Interconnection agreement

Results from the public consultations: 16[51] out of 25 respondents during ACER's public consultation process[52] have expressed their support for the introduction of mandatory interconnection agreement at each interconnection point. As far as the set of mandatory terms to be included in the IA, option 2 proposes to include the terms that stakeholders have identified as the most urgent/important to be covered and that are also in line with the terms already covered by the existing IAs[53].

Option 2 foresees the possibility to add other terms if the interested TSOs consider relevant for their business. ENTSOG asked during the public consultation: "do you agree with the proposed 7 identified issues for mandatory terms in an Interconnection Agreement?" out of 20 respondents 13 answer unconditional yes, while 7 asked for addition of other terms such as capacity calculation and maintenance planning. The other additional terms were not selected to be mandatory because out of the 7 stakeholders asking for additional terms only few were in favour of capacity calculation or maintenance planning as additional mandatory terms showing that the problem has not the European dimension to be tackled into a EU legislative proposal. In addition to this the current proposal under option 2 does not exclude the possibility for any TSOs to include them in the Agreement if considered necessary.

Figure 14: Support at the measures proposed under Option 2



As far as the rules through which to impose a minimum degree of harmonisation for each mandatory term in the Interconnection Agreement are concerned (i.e. so-called "default rules")

---

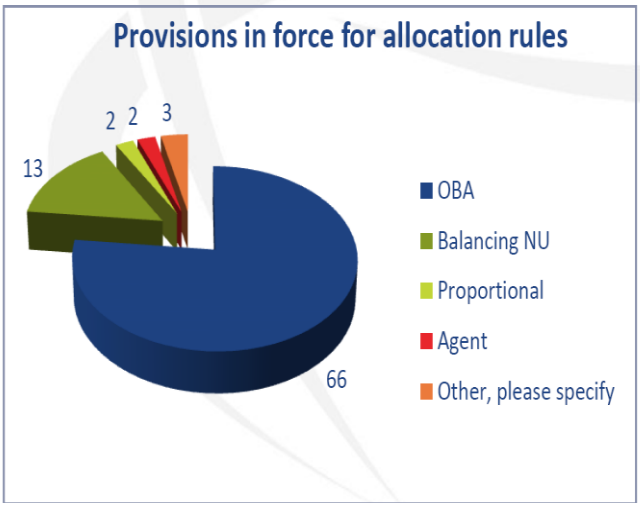
[51] DEPA, EDF, Edison, EFET, ENBW, ENI, EURLECTRIC, Eurogas, EUROMOT, GTG Nord, JP Morgan, Statoil, Gas Natural Fenosa

[52] From Annex 4: The total number of answers listed for each item does not match because respondents may have chosen not to respond to a specific question, or may have commented instead. It should be noted that this does not mean that the remaining respondents disagreed with the proposal.

[53] For details please see Annex 4

the selection criteria were: a) the degree of application among stakeholders and b) their effectiveness as market based measures. For instance in the case of the allocation rule ENTSOG found that in 66 cases out of a total 86, the OBA is used as the allocation method (please see figure 16 below)

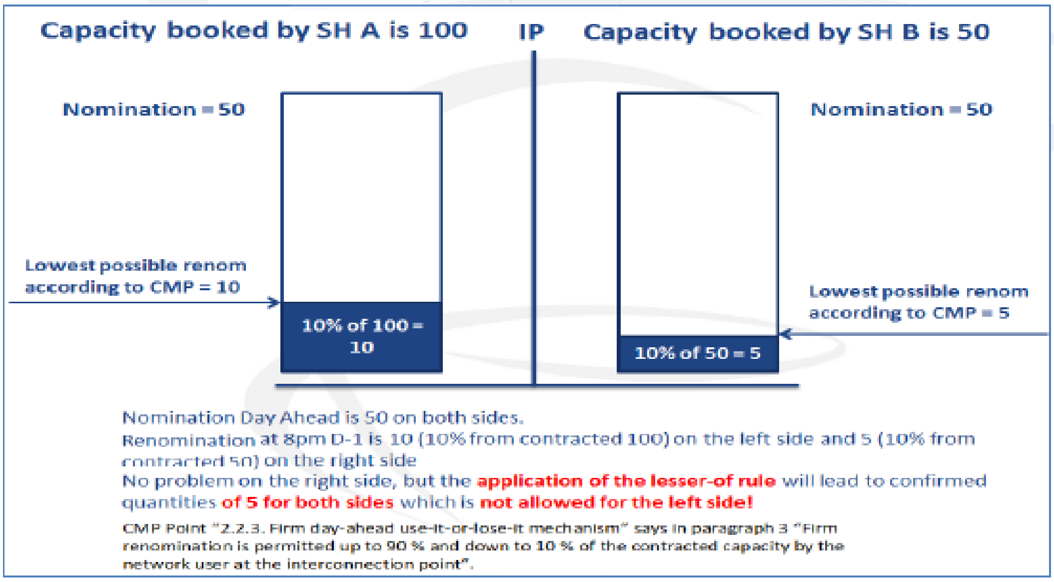
Figure 15: Provisions in force for allocation rules



Option 2 proposes then OBA as default rule, unless another prevailing allocation rule in an existing interconnection agreement is maintained or, following consultation on new interconnection agreements, the contracting parties choose another option. A few stakeholders wanted to have the OBA as the only possible allocation rule applicable at all interconnection points. This seems not to be possible due to a number of reasons. One reason was that, as mentioned above, a large majority of stakeholders were supporting the current text proposal. For them it was important that transmission system operators would be obliged to justify, on a case by case basis, their decision not to favour an OBA and to give network users the opportunity to comment. Another reason was the existence of pressure-steered interconnection points. In the case of such interconnected transmission systems it is not possible to steer a certain flow as the flows are dependent on the ruling pressure and as such the flow cannot be kept within a certain range.

Option 2 was also favoured by stakeholders for some degree of flexibility that it leaves. For instance the case for the lesser rule being the only rule applicable to EU level has been discarded because of its incompatibility with the short term use-it-or-lose-it mechanism as foreseen in the CMP guidelines which makes problematic the application of the lesser rule as it is shown graphically below in Figure 16.

Figure 16: Lesser rule in case of short term UIOLI



Economic Impact– Facilitating trade: this option prevents poor quality interconnection agreements thereby reducing barriers to trade gas. This option mitigates the possibility that existing deficiencies in the quality of the existing agreements (e.g. not aligned matching procedures) would also continue in renegotiated agreements or that due to the lengthy renegotiation procedure some of the existing agreements would continue to prevail despite being incompatible with the wider changes required by the third package such as daily balancing, unified nomination and re-nomination times, gas quality cooperation. In addition as it does not specify the precise content of the interconnection agreements it enables TSOs to discover, agree and establish mutually beneficial arrangements that do not impact on the quality of service offered to their users. In addition network users can reasonably expect what the terms of the IA will be therefore they can trade more effectively. The default rules foreseen in this option for each term of the interconnection agreement would act as a deterrent to both TSOs to unnecessarily delaying agreement. It could form a starting point for, and expedite, negotiation: it provides both a common basis and allows the TSOs to identify the elements that are mutually objectionable.

Administrative burden: Regulatory oversight would be necessary to ensure that the minimum requirements are fulfilled. The regulatory oversight would be limited to i) ensuring compliance with the minimum requirements, and ii) ensuring that the commercial matching and allocation arrangements are compatible with any relevant national policy objectives.

Others (social, environmental): this option maximizes the potential for the efficient use of interconnection capacities, resulting in fewer pipeline/ compressor being constructed than otherwise required and lower level of emissions.

6.2.2. Gas quality

Results from the public consultations: the majority of the respondents (19[54] out 29) in the ACER's consultation process assessed positively the introduction of gas quality measures to manage possible cross-border trade restrictions due to differences in gas quality and to provide more information towards the final customers.

[54] CEDEC, EDF, EDP, Edison, EFET, ENEL, ENI, EURELECTRIC, EUROGAS, Exxon Mobil, Gas Links, Gas Natural Fenosa, GMT, GTG Nord, IFIEC, Marcogaz, OGP, VNG, JP Morgan.

Economic Impact – Facilitating trade: The measures relative to manage gas quality differences are expected to decrease the potential for gas quality related incidents and therefore lower the costs associated with moving gas between networks, although the extent of the reduction is not clear because of the apparently low levels of current risk. The economic impact of longer-term solutions should be contained within the individual cost-benefit analyses. As far as the economic impact of the measures aiming to improve short and long term provision of information is concerned, this option is expected to decrease the overall risk assumed by users at cross-border points. It should: i) lower the costs of cross-border trade; ii) increase flows and reliance at points where there is an apparently low risk; iii) decrease the potential for gas quality related incidents by providing users with insight into the potential patterns of flow that can help or hinder gas quality issues.

Administrative Impact: This option will require additional manpower resources in the TSO to undertake additional analysis and communication. However the amount of data required to be published is relatively small compared to other transparency obligations, so DG ENER considers that this impact will be marginal.

Others (social, environmental): This option both widens the potential gas qualities that a TSO would be able to accept into its network at the interconnection points (accepting a non-compliant gas that would otherwise be rejected) and lowers the chances of sudden gas quality changes (arising from cessation of non-compliant flows). This option maximizes the potential for the efficient use of interconnection capacities, resulting in fewer pipeline/compressor being constructed than otherwise required and lower level of emissions.

6.2.3. Data exchange & Unit

Results from the public consultations: 16[55] respondents have expressed their support for the introduction of a common data exchange solution agreeing on the benefit to be gained from harmonization of data exchange. While almost all the respondents think there is a need for harmonization of units (24 answers out of 27). Option 2 is favoured by DSOs because it maintains the possibility for them to keep their actual data exchange solution if the NRAs considers that there are no impediments to competition.

Economic Impact – Facilitating trade: If a harmonised data exchange solutions were to be implemented then the following qualitative benefits have been identified: i) smaller shippers may be able to enter more markets and put additional competitive pressures on the larger shippers – this may lower gas prices; ii) larger shippers would only have to maintain one set of IT systems – there is an on-going operational cost saving associated with this, but it is probably not large; iii) fewer communication solutions (for each platform or business process) to maintain will lead to reduced costs; iv) less time effort in preparing and establishing new connections with partners; v) higher communication reliability with fewer data exchange solutions; vi) reduction of cross border trade barrier through less expensive transaction due to more intensive use of harmonised data exchanges. The movement to a single, common communication standard would provide the benefit of reducing the costs of operating across multiple markets, thereby enhancing competition. The introduction of new communication systems requires an initial investment[56]; however this cost can be substantially reduced through progressive implementation. DG ENER therefore conclude that there would be a net benefit from obliging TSOs to adopt a single, common standard for data exchange protocols and units.

[55] DEPA, EDF, EDP, Edison, EFET, ENEL, ENI, EURELECTRIC, Exxon Mobil, Gas Links, Gas Natural Fenosa, GMT, VEN, VNG, JP Morgan, Statoil

[56] Estimations of costs are provided in Annex 5.

To minimise the costs' impact on the market this option allows the co-existence of existing solutions in parallel with the common data exchange solution in place and foresees a flexible implementation schedule for communications between transmission system operators and network users. The condition to have a longer implementation time to migrate to the common solution is that the existing solution that is in place at the moment the regulation comes into force, is compliant with the business requirements of the corresponding business process and subject to NRA's approval. The NRA is best placed to evaluate the local (national) situation with respect to data exchange and business practices to keep existing solutions in place as long as the market needs them. ENTSOG has been able to provide only some rough estimates of EUR 30-157 million as costs associated with harmonization of data exchange solution. These estimates are made up with average costs provided by the respondents to the public consultation: EUR 137.000 of average set up cost and EUR 108.000 of average maintenance costs. The setting up of a single solution allows each operator to save the expenditure associated with the setting up of different coexisting solutions at the same time rather than paying the costs only once.

Administrative impacts: There will be costs associated with developing the common standard. This impact could be minimised by adapting pre-existing communications standards wherever possible/appropriate.

Others (social, environmental): some positive social impacts are expected through the creation of some jobs in IT to apply the new standards.

6.2.4. Odourisation

Results from the public consultations: Out of 25 respondents, 19[57] from the network users, traders and distribution segment, agree that there is an issue with odorization and agree on the default of non-odourised gas and with the introduction of European provisions on how to deal with the current differences in odourisation. Member States and subsequently stakeholders coming from these MS that are more concerned are the few (ES, FR, IE and to some extent HU) where the current practices differ from the ones implemented by the majority.

Economic Impact – Facilitating trade: Differences in odourisation practices might become a barrier to trade. ENTSOG provide figures on how much it cost the transition from gas being odorised at transmission level to gas odorised at distribution level in Great Britain during the mid-1990s. The **Great Britain** national transmission system made the transition from being odourised to non-odourised in the mid-1990s. This meant that odourant were no longer be added to the gas at points of entry to the transmission system, but instead were added at off-takes from the transmission system that fed gas into distribution networks. This remains current Great Britain practice. The main reason for doing this was to facilitate interoperability with the Belgian network due to the construction of the IUK pipeline, which started operation in 1997, particularly because the expectation at the time was that gas would flow predominantly from Great Britain to Belgium. The capital cost of installing an odourant injection facility at each of the 126 off-take points was GBP 21m (at 1998 prices) which was considerably cheaper than the alternative option of installing a de-odourisation facility at a suitable location on the GB network. There would also have been higher on-going operational costs associated with the de-

[57] CEDEC, EDF, EDP, Edison, EFET, ENEL, ENI, EURELECTRIC, EUROGAS, Exxon Mobil, Gas Links, Gas Natural Fenosa, GMT, GTG Nord, IFIEC, Marcogaz, OGP, VNG, JP Morgan

odourisation facility option, partly because such a facility would have generated a waste product that would need to have been managed. Prior to the decision being taken to move to a non-odourised regime, all end consumers that were directly connected to the transmission system were consulted.

Administrative Impact: This option will require additional manpower resources in the TSO to undertake additional analysis and communication.

Others (social, environmental): this option maximizes the potential for the efficient use of interconnection capacities, resulting in fewer pipeline/ compressor being constructed than otherwise required and lower level of emission

It is also important to point out that above and beyond the principle argument relating to dismantling barriers to cross-border trade, from a more general perspective, the change in odourisation practices (from the TSO to the DSO level) has important environmental and ancillary economic benefits as well. These are due to the fact that by not odourising the transmission level the amount of odourising agent (principally the environmentally polluting sulphur) added to the gas at the subsequent distribution level is significantly lower as the throughput of the distribution system is generally only 30-40% of the transmission system throughput[58]. This in turn also clearly reduces the variable costs of odourisation[59], leading ultimately to lower costs for consumers.

6.3. Option 3: Detailed harmonised Interoperability and data exchange rules without room for national arrangements or interim steps

6.3.1. Interconnection Agreement

Results from the public consultations: only 7[60] respondents to ACER's consultation were in favour of full harmonisation with no possibility for differences or national arrangements. There was no large support for having the same rule applied to all IPs.

Economic impact-Facilitating trade: This option prevents poor quality interconnection agreements, thereby mitigating the costs identified in option 1. Under this option there is no requirement for TSOs to negotiate interconnection agreements. This option rather allows TSOs to avoid the costs of negotiation. However the specification of safety and/or technical parameters, e.g. minimum pressure, will need to rest with the TSOs. There is therefore a risk that an agreement is established with technical parameters that are more onerous than they could otherwise be, impacting on technical capacity available where the relevant parameters are associated with system integrity. There is a risk as well that this option imposes sub-optimal arrangements for a particular situation (e.g. an OBA or lesser rule).

Administrative Impact: Once established, the administrative impacts of this option are expected to be limited. However if the standard agreement is shown to be deficient such that it requires

[58] This is due to the fact that, though to varying degrees per Member State, large industrial consumers and gas fired power generation make a significant share of the respective national natural gas demand.

[59] The variable costs of odourisation have been estimated by ACER and ENTSOG to be about EUR 150,000-200,000 per billion cubic meters, which translates into saving on the variable costs of several million EUR/year in a larger system.

[60] OGP, VNG, JP Morgan, Energie Ned, GDF Suez, Gas Natural Fenosa, EURELECTRIC

modification, there is a risk of incurring additional administrative costs to establish the modifications (they would be subject to comitology).

Others (social, environmental): This option increases the potential for the efficient use of interconnection capacities, resulting in fewer pipeline/compressors being constructed than otherwise required and lower levels of emissions. Given the extreme level of regulatory intervention and imposition that this option represents, it is likely to be opposed by several entities.

6.3.2. Gas Quality

Results from the public consultations: only 7[61] respondents to ACER's consultation were in favour of full harmonisation with no possibility for interim steps.

Economic impact – Facilitating trade: Such option implies a trade-off between security of supply (associated to the choice of a broad specification that encompasses the majority of existing specifications), as opposed to the choice of a narrow specification, that would ensure unhampered flows between European TSOs, and safety for the end consumer. However, this choice would raise the following risks and unintended consequences: i) the definition of a narrow gas quality scope would contradict the promotion made in the Security of Supply Regulation of the diversification of gas routes; ii) benefit to European consumers of removing the current gas quality constraints are at most EUR 0.2 bn per annum. However processing costs to meet local gas quality specifications ensuring appliances will operate safely is estimated at EUR 11 bn. Alternatively replacement of gas appliances would cost an estimated EUR 179 bn.[62]

Administrative Impact: Once established, the administrative impacts of this option are expected to be limited

Others (social, environmental): Gas quality issues can impact on appliance emissions – generally, wider specifications and variations cause higher emissions of NOx and CO2. In extreme circumstances, appliances burning gas for which they are technically incapable of can emit fatal concentrations of carbon monoxide.

6.3.3. Data Exchange and Unit

Results from the public consultations: the majority of respondents was in favour of full harmonisation in data exchange (20 out 28) and units (24 out of 27). This option has been strongly opposed by DSO as they consider they will be forced to apply one data exchange solutions and therefore to bear unnecessary costs.

Economic impact –Facilitating trade: the benefits will be equal to the one under option 2 only with higher costs due to lack of flexibility in implementation and to the obligation also for DSOs

Administrative Impact: The costs associated then with this option would be the same but without the benefits of leaving to two adjacent TSOs the possibility and the freedom to agree on something that could be relevant for their transmission systems.

Others (social, environmental):no environmental impact is expected.

[61]JP Morgan, Marcogaz, EDISON, EDF, EURELECTRIC, Gas Natural Fenosa, DEPA

[62] Source: "Study on Interoperability - Gas Quality Harmonisation - Cost Benefit Analysis" prepared for the European Commission in July 2011

6.3.4. Odourisation

Results from the public consultations: 9[63] responses were in favour of full harmonization for odourisation practices. This option is strongly opposed from MSs which currently odorised gas at transmission level (FR, ES, IE) as they feel this option would disproportionately affect them in terms of costs related to the changing of the odourisation practices.

Economic impact – Facilitating trade: The benefits of this option are the same as the one in option 2 in the sense that trade of non-odourised gas should prevail. However the cost associated with option 3 are higher because this option would oblige to change odourisation practices also in Member States where currently there is no reasonable expectation to change the current pattern of gas flow disproportionally influencing some Member states. Indeed de-odourisation of the network may not at all be necessary as other options may be more appropriate and more cost-efficient to address the problem emanating from barriers to cross-border trade.

Administrative Impact: This option will require additional manpower resources in the TSO to undertake additional analysis and communication

Others (social, environmental): this option maximizes the potential for the efficient use of interconnection capacities, resulting in fewer pipeline/ compressor being constructed than otherwise required and lower level of emission. Odourisation at distribution level has positive environmental impact as it reduces harmful sulphur additives as the throughput of the distribution system is ca. 30-40% of the transmission system.

7. EVALUATION OF OPTION

7.1. Comparing the policy options

The table below indicates the scoring of the various options on the Impact Assessment criteria:

	Economic			**Social**	**Environment**	**Public consultation support**
	Facilitate competition	Transparency and non-discrimination	Administrative burden			
Option 1: no further EU action to address IO&DE rules (baseline scenario)	**-**	**-**	**0**	**0/-**	**0**	**-**

[63] EFET, JP Morgan, EDISON, EDF, Statoil, EURELECTRIC, ENI, GAS Natural Fenosa, EnBW

Option 2: harmonised EU rules on IO&DE that allow for interim measures and differences	++	++	**0**	**0**/+	**0**/+	++
Option 3: detailed harmonised IO&DE rules without room for national arrangements or interim steps	+/-	+	**0**	**0**/+	**0**/+	+/-

Table 2: Comparison of Policy Options in terms of their effectiveness, efficiency and coherence of responding to the specific objectives.

Specific objective	Option 1	Option 2	Option 3
Improve competitiveness and transparency in the EU gas market	**-**	++	+/-
Set non-discriminatory rules for access conditions to natural gas transmission systems	**0**	++	+
Removal of barriers to cross-border gas trade	**0**	++	++
Harmonize the terms under which adjacent TSOs set the ground for their cooperation	**0**	++	+

7.2. The preferred policy option

The Commission services propose to pursue **Option 2**, thereby submitting the Network Code Interoperability and Data Exchange for the opinion of the Gas Committee in the context of the Comitology procedure. It was explicitly foreseen by the legislator in the Third Energy Package that the rules had to be further complemented by more technical market design and network operation rules to be developed under the Comitology procedure. In order for the 2014 political target of the completion of the internal gas market to be achieved, a national development is not sufficient.

Option 2 has the right balance between the necessary harmonisation of rules on interoperability and data exchange that would ensure better and easier use of the gas transmission systems without adding unnecessary extra costs due to the lack of flexibility in the implementing measures.

Option 1 would not foster the liquidity of the European gas market and therefore hinder the development of competitive energy prices, something that is essential in maintaining the competitiveness for Europe's industries. The implementation of the Third Energy Package will, in itself, not solve the problems outlined in chapter 2. Interoperability and data exchange rules adopted at national level could only contribute to the integration of the European gas market if sufficiently coordinated. The Commission services are not convinced that such coordination can be done on a voluntary basis as these measures are highly technical and the interests between market players and often TSOs too are representing positions that are quite far from a compromise. The experience shows that in case of contentious issues, opposing national models and approaches, even between adjacent Member States, may not be resolved easily or could be resolved only over a lengthy period of time. The resulting barriers to cross border trade are vital and would significantly delay the integration of European gas markets beyond 2014. The Commission agrees with stakeholders that European wide binding rules on interoperability and data exchange are necessary in order to integrate the European gas market. Therefore, option 1 is not appropriate to be pursued.

While the ambition of option 3 may be appropriate from the point of principle, its lack of flexibility may not be necessary at the moment, also adding extra costs. The fully harmonised levels set out in Option 3 is also contemplated in option 2 but only as last option after having explored alternative solutions according to a proper cost benefit analysis. It seems therefore that this option at the moment is not proportionate and not effective in terms of costs.

8. MONITORING AND EVALUATION

Core indicators of progress in the field of improved interoperability and data exchange in gas transmission systems are:

- Improved liquidity on the gas wholesale markets,
- Elimination of any cross-border trade restrictions
- Increased number of active shippers and traders on the market,
- Increased trading at the virtual trading points,
- Better price convergence between gas markets.

Article 9(1) of the Gas Regulation tasks ACER with the monitoring of all the Network Codes. ACER can be assisted by ENTSOG where needed on the basis of article 8(9). The individual TSOs are obliged to cooperate with ENTSOG according to Article 4. Article 41 of the Gas Directive 73/2009/EC foresees very broad monitoring rights and duties for NRAs. It is therefore foreseen that the Interoperability Network Code is subject to the general ACER and ENTSOG monitoring obligations concerning Network Codes with the aim of ensuring that a correct and full implementation of these legislative initiatives contributes to the completion of the EU internal energy market.

9. ABBREVIATIONS

ACER	Agency for the Cooperation of Energy Regulators
IO&DE	Interoperability and Data Exchange
CAM	Capacity Allocation Mechanisms in Gas Transmission Systems
CMP	Congestion Management Procedure
DSO	Distribution System Operator
ENTSOG	European Network of Transmission System Operators for Gas
FG	Framework Guideline
IA	Interconnection Agreement
IP	Interconnection Point
NC	Network Code
NRA	National Regulatory Authority
TSO	Transmission System Operator

10. LIST OF ANNEXES

Annex 1: NC IO&DE development process

Annex 2: Gas Industry Structure

Annex 3: ENTSOGs analysis of answers to DG ENER questionnaire

Annex 4: ACER's Evaluation of the public consultation of the Framework Guideline on Interoperability[64]

Annex 5: ENTSOG Cost –Benefit Analysis –document for the selection of a harmonised data exchange solution between gas transmission system operators in Europe[65]

Annex 6: ENTSOG- Public Consultation Responses Report[66]

---

64 http://www.acer.europa.eu/Official_documents/Public_consultations/Closed%20public%20consultations/PC-07_Draft_FGs_on_Interoperability_and_Data%20Exchange%20Rules/Document%20Library/1/Evaluation%20of%20Responses%20to%20ACER%20Public%20Consultation%20on%20Interoperability%20and%20Data%20Exchange%20Rules%20for%20Gas.pdf

65 http://www.entsog.eu/public/uploads/files/publications/INT%20Network%20Code/2013/INT0414%20CBA%20DataExchange-final.pdf

66 http://www.entsog.eu/public/uploads/files/publications/INT%20Network%20Code/2013/INT0421-130709_Supporting%20Document%20SSP_Public%20Consultation%20Responses%20Report%20draft%20Network%20Code.pdf

EUROPEAN
COMMISSION

Brussels, XXX
[…](2015) XXX draft

PART 2/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Commission Regulation (EU) N°.../... establishing a Network Code on Interoperability and Data Exchange Rules

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Commission Regulation (EU) N°.../... establishing a Network Code on Interoperability and Data Exchange Rules

Annex 1: NC IO&DE development process

For the development of a network code, the Commission invites ACER to develop a so-called Framework Guideline (FG) within a period of 6 months which remains non-binding. If the Commission considers that the Framework Guideline contributes to non-discrimination, effective competition and the efficient functioning of the market it may request ENTSOG to submit a Network Code – which is in line with the relevant Framework Guideline – to ACER within a reasonable time not exceeding one year. After submission of the network code by ENTSOG, ACER has to provide a reasoned opinion on whether the network code is in line with the framework guideline. Once ACER is satisfied that this is the case, it shall submit the network code to the Commission and may recommend its adoption. In case ENTSOG has failed to develop a Network Code or in case ACER is not satisfied that the Network Code is in line with the Framework Guideline, the Commission may adopt the Network Code on its own initiative[1].

The Framework Guideline on Interoperability and Data Exchange for European Gas Transmission Networks (FG IO&DE) were developed by ACER during the 6 months period from January to July 2012. They were adopted on 26 July 2012. Stakeholders have been involved in the development through ACER's public consultation[2] on the draft Framework Guidelines (16 March until 16 May 2012). Based on these Framework Guidelines, ENTSOG established the respective draft Network Code on Interoperability and Data exchange Rules, which was published on 27 February 2013 for consultation until 26 April 2013, and issued on 21 May 2013 a Cost-Benefit Analysis study for the selection of a harmonised data exchange solution for consultation as well. The draft Network Code on Interoperability and Data Exchange Rules was broadly consulted through ENTSOG's Stakeholder Support Process[3]. ENTSOG formally submitted the final draft Network Code to the Agency on 10 September, enabling the Agency to prepare its formal reasoned opinion on the code within 3 months which was delivered on 5/11/2013. Following this opinion ENTSOG refined the NC on IO&DE and provided a new version on 18/12/2013.

Building on the significant work of ACER and ENTSOG, including the multiple rounds of public consultations at various levels of maturity of the developing NC, work on this Impact Assessment started in July 2013.

Key dates in the NC IO&DE development process were:

- 31/01/2012-26/07/2012 ACER Framework Guideline development
- 11/09/2012-10/09/2013 ENTSOG Network Code development
- 16/07/2013 1st meeting of the Inter-service Steering Group (ISSG)
- 2/10/2013 Informal Member State Meeting on i.a. IO&DE
- 5/11/2013 ACER Reasoned Opinion

---

[1] Art. 6 (11) Gas Regulation: "The Commission may adopt, on its own initiative where the ENTSO for Gas has failed to develop a network code, or the Agency has failed to develop a draft network code as referred to in paragraph 10 of this Article, or upon recommendation of the Agency under paragraph 9 of this Article, one or more network codes in the areas listed in Article 8(6). Where the Commission proposes to adopt a network code on its own initiative, the Commission shall consult the Agency, the ENTSO for Gas and all relevant stakeholders in regard to the draft network code during a period of no less than two months. Those measures, designed to amend non-essential elements of this Regulation by supplementing it, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 28(2)."

[2] http://www.acer.europa.eu/Official_documents/Public_consultations/Closed%20public%20consultations/PC-07_Draft_FGs_on_Interoperability_and_Data%20Exchange%20Rules/default.aspx

[3] All details in Annex6

- 15/11/2013 2nd meeting of the ISSG
- 09/12/2013 3rd meeting of the ISSG
- 18/12/2014 Submission of the Impact Assessment to the IAB
- 18/12/2014 New ENTSOG Network Code sent to ACER
- 15/01/2014 ACER issued final recommendation

Annex 2 – Structure of Gas Industry in EU

In general, the natural gas sector in the EU is made up of the following players:

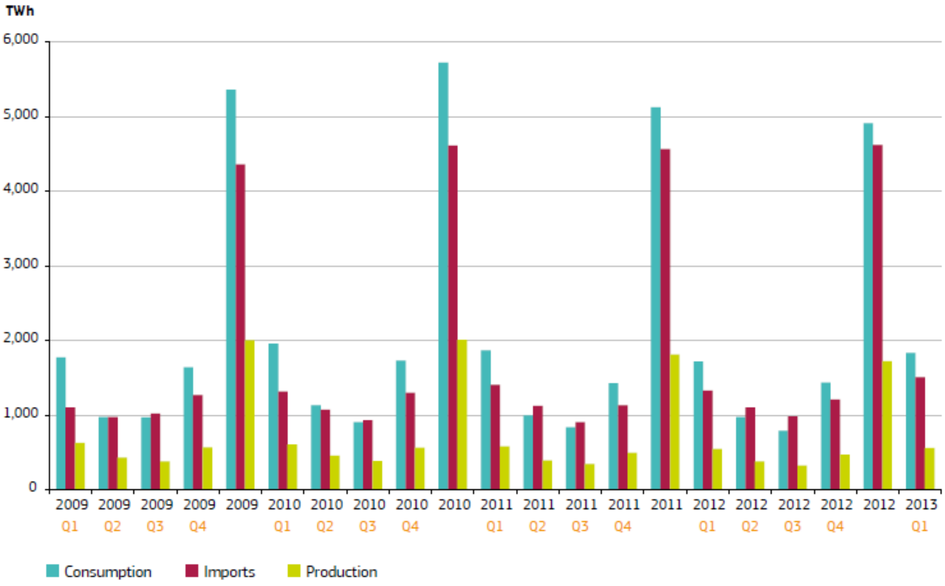
i) producers/importers, active on the upstream part of the gas market bringing the gas from the production sites to the demand centres;
ii) Transmission System Operators ("TSOs") who own and operate the high-pressure gas network;
iii) Distribution System Operators ("DSOs") who own and operate the low-pressure networks;
iv) shippers or network users, who transport gas through the networks and act on the wholesale level (Shippers can be incumbent gas market players as well as new entrants or, from another perspective, can be supplying final customers or be trading on the wholesale market or a combination of both.);
v) traders who do not necessarily take physical ownership of the gas but use the various market places to take positions in different products thereby increasing market liquidity;
vi) suppliers who are active on the retail segments of the market; and
vii) customers (industrial, commercial and household), who are active on different levels of the value chain depending on their size and consumption.

Figure 1: *The gas value chain, Source: Galp Energia*

In EU there are 43 TSOs for gas.

From ENTSOGs capacity maps, Poyry counted 50 border points where gas flows across the border between two Member States (MS) (a 'cross-border point'). They also counted 90 EU TSO to EU TSO interconnection points: 83 of these are at a cross border point, with the remaining 7 being internal to a MS.

FIGURE 1 - EU 27 GAS CONSUMPTION, IMPORTS AND PRODUCTION



Gas Security of Supply 2010

	GROSS INLAND CONSUMPTION (1) TWh/yr	NATIONAL PRODUCTION (2) TWh/yr	TRANSIT QUANTITY TWh/yr	PEAK (3) TWh/day	MAXIMAL TECH AVAILABILITY PIPELINE IMPORTING CAPACITY TWh/h	PEAK HOURLY IMPORT GAS FLOW TWh/h
BELGIUM	197.24	N/A	240.00	1.10	0.19	0.08
BULGARIA	26.07	N/A	N/A	0.14	0.03	0.01
CZECH REPUBLIC	93.26	1.94	338.00	0.60	N/A	0.03
DENMARK	51.45	85.41	N/A	0.26	0.00	N/A
GERMANY	853.71	112.74	287.70	N/A	N/A	N/A
ESTONIA	6.54	N/A	0.00	0.05	0.00	N/A
IRELAND	54.61	3.68	N/A	N/A	N/A	N/A
GREECE	37.61	0.08	N/A	N/A	N/A	N/A
SPAIN	362.71	0.60	22.40	1.85	0.02	0.07
FRANCE	494.74	7.51	53.70	3.28	0.09	N/A
ITALY	791.50	80.07	3.68	4.90	0.13	0.11
CYPRUS	N/A	N/A	N/A	N/A	N/A	N/A
LATVIA	17.00	N/A	N/A	N/A	N/A	N/A
LITHUANIA	28.98	N/A	12.90	0.19	0.01	0.01
LUXEMBOURG	13.92	N/A	N/A	0.07	0.01	0.00
HUNGARY	114.15	25.99	41.35	0.69	0.04	0.01
MALTA	N/A	N/A	N/A	N/A	N/A	N/A
NETHERLANDS	457.16	738.90	N/A	2.50	N/A	0.04
AUSTRIA	95.53	17.28	336.98	0.54	0.08	0.08
POLAND	148.92	42.95	284.60	0.75	N/A	0.02
PORTUGAL	52.20	N/A	0.00	0.22	0.01	0.01
ROMANIA	125.47	100.23	155.50	N/A	0.02	N/A
SLOVENIA	10.03	0.07	10.52	0.06	N/A	0.00
SLOVAKIA	58.22	1.03	686.40	0.35	0.15	0.11
FINLAND	44.63	N/A	N/A	0.21	0.01	0.01
SWEDEN	15.27	N/A	0.00	N/A	N/A	N/A
UNITED KINGDOM*(4)	994.40	598.57	413.09	4.86	2.72	N/A

*Sources: National Regulators data Eurostat * DECC (UK)*

Notes: (1) Gross Inland Consumption = Production + Imports - Exports + Storage variations. (2) All dry marketable production within national boundaries, including offshore production. Production is measured after purification and extraction of NGLs and sulphur. Excludes extraction losses and quantities reinjected, vented or flared. (3) Maximum quantity of gas consumed in a day during the year. (4) UK numbers include Great Britain only as gas demand from Northern Ireland and the Republic of Ireland is not possible to differentiate.

Annex 3 – ENTSOGs analysis of answers to DG ENER questionnaire

INTRODUCTION

The European Commission (EC) issued a questionnaire on Interoperability to Member States' (MSs) Transmission System Operators (TSOs) and National Regulatory Authorities (NRAs) (via ENTSOG and ACER) for the purposes of the EC Impact Assessment. Certain questions are mainly addressed to TSOs, others to NRAs, but respondents were welcome to provide replies to all questions. ENTSOG have been provided with answers to these questionnaires and have prepared this report for the EC.
The answers on the questions below are a summary of the responses of the Transmission System Operators' (TSOs) on each question. Some of the questions have a pure informative character and don't need any further explanation; some are aimed at showing what impact the new Regulation can have on the business of the TSOs. Where considered necessary extra comments are included in order to further describe the impact. In total 33 of 41 ENTSOG members replied to the Questionnaire, representing 20 EU Member States.
The answers on the questions to the NRAs were consolidated by ACER and included on EC's request in this report. In total 13 NRAs replied to the Questionnaire.

INTERCONNECTION AGREEMENTS (IA)

Questions to TSOs:

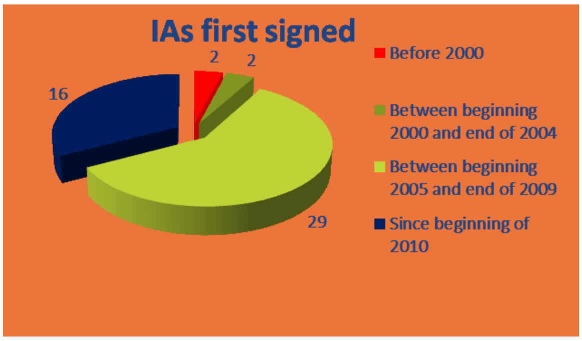
1. Please provide a list of all the points at which your network is connected to another TSO's network. For each of these IPs please state:

   > whether or not an IA or other operational agreement is in place;

   Responses were received in relation to interconnection points (IPs) between MSs and for IPs between MSs and third countries. Only IPs between MSs have been taken into account. The graphic below shows that there are at least 19 IPs where TSOs will have to conclude an IA when the Network Code for Interoperability and Data Exchange comes into force. The extent of work required to existing IAs is dependent on how far they comply with the content of the new Regulation.

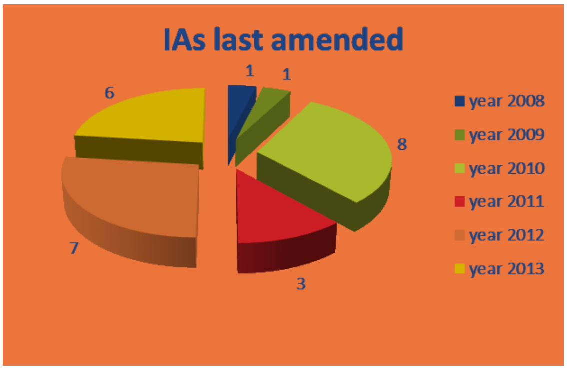
> the date of original signature of each of the agreements;

Answers were given covering 49 IPs. The earliest 2 agreements were signed in 1998 and the most recent in 2012. ENTSOG has carried out a detailed analysis which shows that the bulk of agreements (in total 29) were signed in the period 2005 - 2009. See the graphic below for more information:



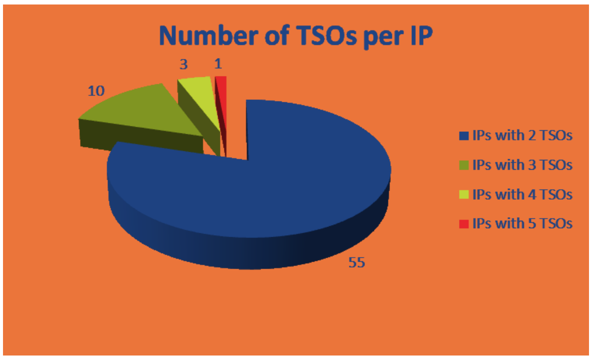
> the date upon which each of the agreements was last amended;

26 agreements have been amended. The longest period between signing and amending an IA is 13 years and the shortest period only a few months. Most of the amendments took place about 2 – 3 years after the signing of the agreements:



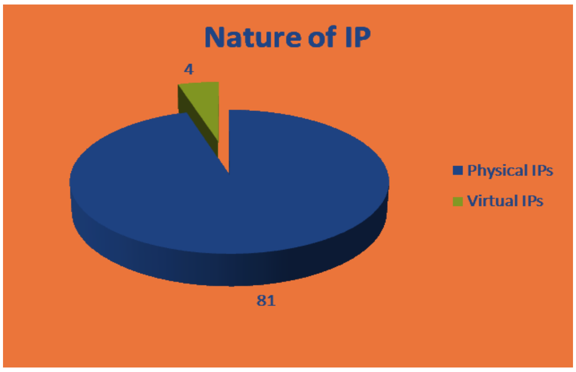
- the number of TSOs whose networks are connected at the IP;

The majority of IPs connects 2 networks. This is 55 times the case. There is 1 IP with 5 interconnected networks (the highest number of interconnected networks). At 10 IPs 3 systems are interconnected, and at 3 IPs 4 systems are interconnected. See picture below for a summary of the survey:



- the nature of the IP (virtual/physical).

81 of the 85 IPs are physical (one point between connected networks) and 4 are virtual (comprising more than one physical IP which is treated as one IP).



2. On the IPs where an IA or other operational agreement exists – what are the main reasons for the establishment of an Agreement?

   - Safety-related reasons:
     - ✓ set out safety requirements and the routines to be followed in emergencies and/or exceptional events (46 times mentioned);
     - ✓ demarcate geographical boundaries and connection points (45 times mentioned);
     - ✓ define communication requirements, methods and channels (51 times mentioned);

- Physical & operational reasons:
  - set out technical requirements in respect of the physical construction and operation of the infrastructure (62 times mentioned);
  - specify metering and measurement arrangements (72 times mentioned);
  - set out required characteristics for the gas conveyed (65 times mentioned);
  - define communication requirements, methods and channels (56 times mentioned);
  - enable maintenance activities to be planned/carried out (50 times mentioned);
- Commercial reasons:
  - set out commercial operations and timings that are compatible with or relied upon by other commercial processes such as a network code (60 times mentioned);
  - define communication requirements, methods and channels (52 times mentioned);
  - set out change management process (27 times mentioned);
  - set out force majeure considerations (32 times mentioned);
  - other reasons (5 times mentioned)

5 responses stated 'other reasons' which were specified as:

- Allocation process
- Liability
- Set out exit flow profile requirements
- Security of supply
- Flexibility services.

Of the above areas only 'Allocation process' is required in the new Regulation (Article 9 Rules for the allocation of gas quantities).

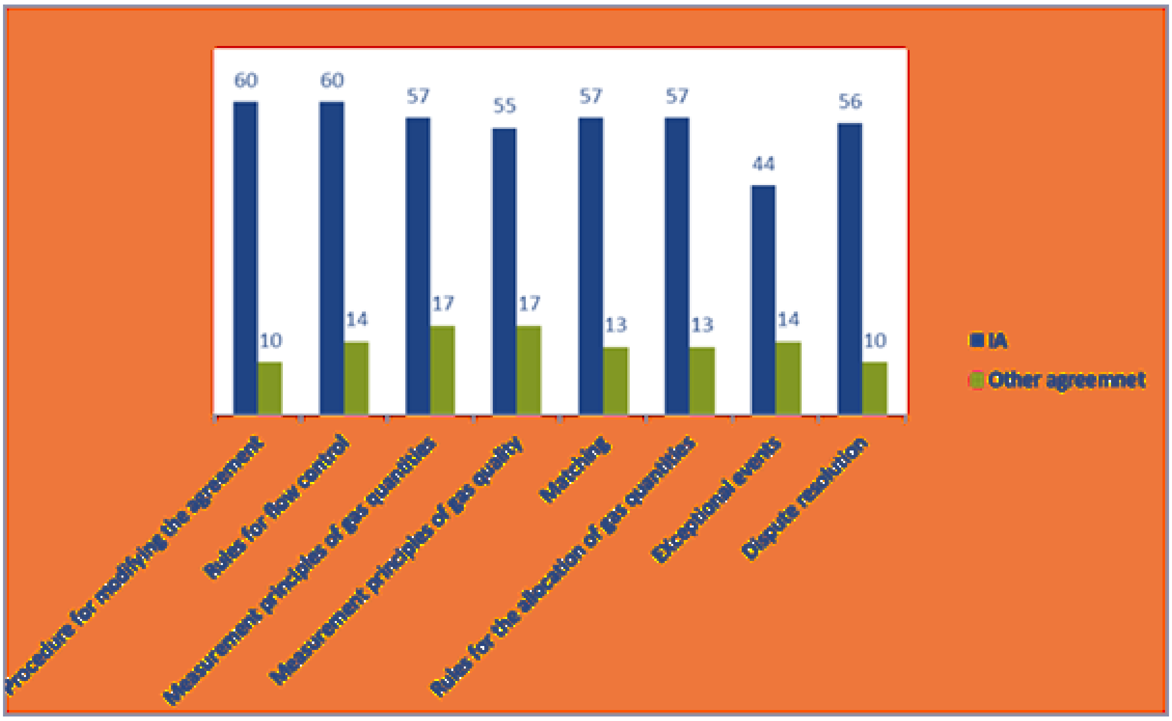
On the IPs where neither IA nor other operational agreement exists – What are the main reasons not to establish an agreement (not to agree on one of the above categories safety-related, physical & operational, commercial, others ...)?

- Is taken care of through historical supply contracts (9 times mentioned);
- Never faced the need to modify existing practices (please specify, e.g. never had accidents, downstream has no control, there is only one shipper active, ...) (0 times mentioned) ;
- Discussions are initiated, but no agreement has been reached yet (please specify on which of the above categories specified) (18 times mentioned);

- Other reasons (0 times mentioned).

Therefore, in respect of the majority of IPs where there is no IA or other agreement in place, TSOs have begun to negotiate an agreement. However, there are still some cases where historical supply contracts substitute for IAs or other agreements. Once the new Regulation comes into force new IAs will have to be concluded in respect of these IPs for compliance purposes.

3. Please specify per IP if rules are included in the above mentioned agreements about following categories? If not included in an IA are they covered in other arrangements (please specify).
    - Procedure for modifying the IA [included in: 1. IA; 2. Other arrangement]
    - Rules for flow control [included in: 1. IA; 2. Other arrangement]
    - Measurement principles of gas quantities [included in: 1. IA; 2. Other arrangement]
    - Measurement principles of gas quality [included in: 1. IA; 2. Other arrangement]
    - Matching [included in: 1. IA; 2. Other arrangement]
    - Rules for the allocation of gas quantities [included in: 1. IA; 2. Other arrangement]
    - Exceptional events [included in: 1. IA; 2. Other arrangement]
    - Dispute resolution [included in: 1. IA; 2. Other arrangement]



The graphic above shows that, in general, mandatory terms as defined in the new Regulation, are already covered by existing IAs. References to 'Other agreements' often mean National Network Codes.

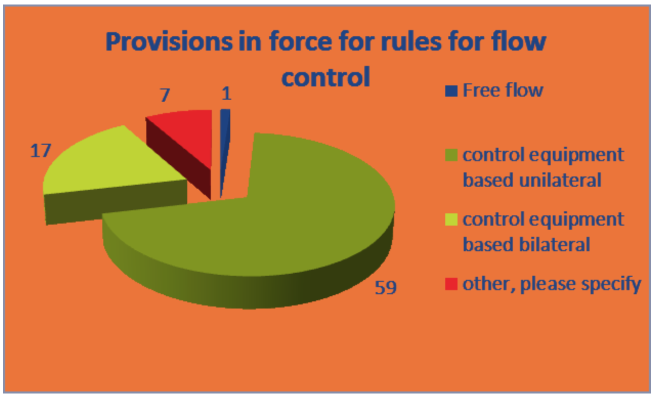
An analysis of responses under 'other agreements' also shows:

- Measurement principles are sometimes included in the operating manual of a metering station
- Matching and allocation is included in an agency agreement or code of operations
- Exceptional events are included in the protocol of operational cooperation between the parties in emergency situations or in National Codes in connection with a supporting document
- In general there are operating manuals in place or National Network Codes.

TSOs which currently have rules on the above topics contained within 'other agreements' will have to ensure these are included in IAs after the new Regulation enters into force. Furthermore, the impact of the new Regulation on existing National Network Codes has to be assessed and modifications carried out as appropriate.

4. For each IP and counterparty, please specify for following subcategories the provisions that are currently in force?

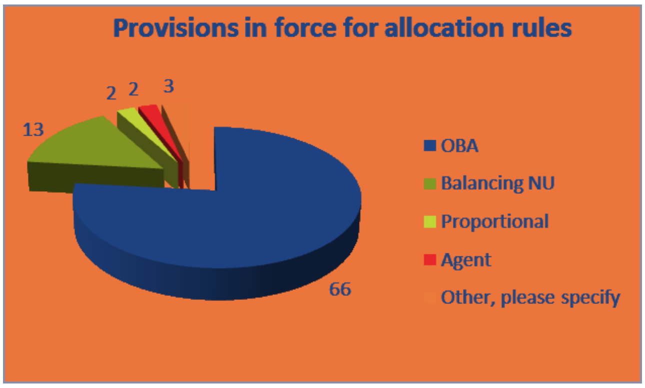
> Rule for flow control (free flow, control equipment based unilateral and/or bilateral, other)



In most cases there are unilateral rules for flow control (flow control equipment is managed by 1 TSO). Free flow applies in only one case. There are also some other rules and procedures:

- Rules defined according to an exit flow profile methodology, approved pursuant to a code of operations
- Provisions of a flow profile by a TSO to the adjacent TSO
- Other rules but these were not described

> Allocation rule (OBA, Balancing network user, Proportional, Agent, other (please specify))

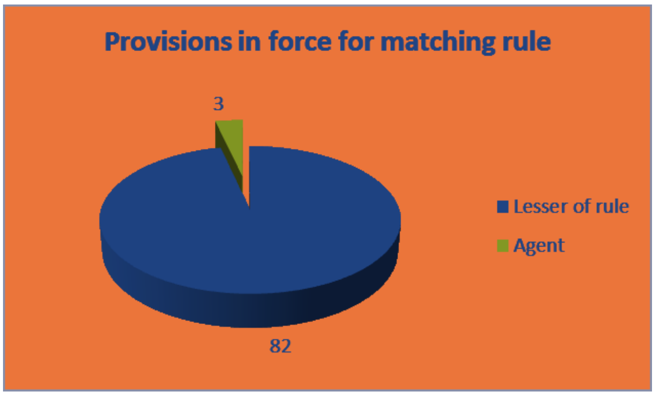


In 66 out of 86 cases the OBA method is used for allocation purposes. In 13 cases there is a balancing network user, in 2 cases the proportional (pro-rata) allocation rule applies, and in 2 cases an allocation agent is in place.

There were also mentioned 3 other allocation rules:

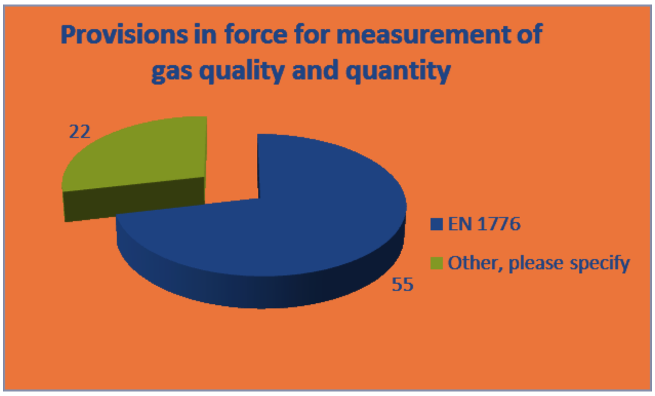
- Allocation Data is communicated by the adjacent TSO
- Allocation is carried out in accordance with an shipper's agreement
- Allocation is equal to nomination

> Matching rule (lesser rule, other (please specify))



The graphic above shows that the lesser rule applies in 82 out of 85 cases. In three other cases the matching is carried out by an agent in accordance with a shipper agreement.

> Measurement standards for quantity and quality measurement (EN 1776, other (please specify)



In 55 cases out of 77 the EN 1776 standard is already applied throughout Europe. But there are also some other provisions in force for the measurement of gas quantity and quality:

- Measurement has to be carried out in accordance with national and international standards and laws
- ISO 5167 for gas quantity and ISO 6976 for gas quality
- UNI 10023
- ISO 17089-1
- GOST 8.586
- AGA 9 and ISO 6974
- EASEE-gas and ISO 18453
- ISO 5167 and ISO 5168
- **Quantity**
  Measurement equipment: BS EN1776; Quantity ultrasonic metering systems: BS 7965, AGA 9 or 'standards/guidelines as may be agreed between the parties'; also uncertainty of Measuring Equipment is assessed in accordance with ISO5169 and relevant parts of ISO5167, 9951 and BS 7965 (or such other standards as may be agreed between the Parties)
  Quality
  Calorific Value: ISO6976 or ISO10723
- **Quantity**
  Measurement of Uncertainty in volume (quantity) flow rates: ISO5167 and ISO TR5168
  Quality
  Calculation of Uncertainty in measurement of energy flow rates: ISO5167 and ISO TR 5168

Question to NRAs:

5. Are there any national rules/regulations setting out/governing any framework for cooperation between TSOs resulting in or specifying the content of interconnection agreements? If so, please provide any relevant details:

    - Bundesnetzagentur (Germany)

    Yes,

    Cooperation Agreement between German network operators (current version 29 June 2012), esp. §§ 22-27 and §§ 50-60 set out content elements of IAs. Some TSOs have published template IAs on their websites.

    - Ofgem (UK)

    The National Network Code specifies that a shipper may not deliver or offtake gas at an entry point or exit point on the transmission system unless a Network Entry Agreement / Network Exit Agreement is in force between the operators, containing certain minimum requirements. The three existing Interconnection Agreements combine these entry and exit requirements to recognise the bi-directional nature of these points.

    - CREG (Belgium)

    In section 4.8 of the royal decree of 23 December 2010 on the code of conduct for access to the natural gas transmission system, the storage and LNG facilities and amendment of the royal decree of 12 June 2001 on the general conditions for natural gas supply and the conditions for granting of natural gas supply licenses (BS 05/01/2011), the following is stipulated:

    "Art. 166 §1 The transmission system operator aims at executing interconnection agreements with the other operators and the adjacent system operators.

    §2 This interconnection agreement shall contain amongst others:

    1° the mutual obligations of the operators for the provision and exchange of the necessary information for the safe and efficient transport of natural gas on the transport systems;

    2° the method for and the accuracy with which the metering is performed, and the agreements regarding the quality control on these metering;

    3° the method enabling the involved shippers to evaluate the metering method and results;

    4° mutual obligations of the operators for the provision of metering data to each other and to the involved shippers;

    5° the mutual criteria for pressure, temperature and quality of natural gas that the operators of the adjacent transport facilities must comply with as supplying transport companies when injecting natural gas in the natural gas transport system;

6° the procedures and rules for nomination, re-nomination, allocation and data exchange;

7° the rules for allocation of natural gas at the interconnection point and allocation in case of unavailability of metering data;

8° provisions regarding the use of an operational balance ring agreement (OBA);

9° provisions regarding a minimum natural gas flow, change to the rate and direction

of the natural gas flow and how this is communicated to the shippers;

10° the mutual agreements with a view of guaranteeing the network balance;

11° the mutual agreements regarding maintenance planning and execution;

12° the mutual agreements regarding incident management and emergency situations;

13° the mutual liabilities.

§3 Changes to the interconnection agreement that have consequences for the shippers shall be submitted to them in advance for consultation.

- CNE (Spain)

There are no specific national regulations regarding cooperation between TSOs and the content of interconnection agreements.

In Spain, the interconnection agreements among TSOs are not regulated. In some cases the agreement form is published. The main Spanish TSO is also the technical system management, who is the responsible for the coordination among TSOs.

- Hungarian Energy Office

Regarding contractual relations between system operators, the law is mainly focused on the interface between transport & distribution. In this framework, a contract between a TSO and network user has to contain the following aspects:

  - General terms and conditions to use the network (detailed)
  - Entry and Exit points, transported gas volumes and capacities required
  - Services fees
  - Invoicing conditions, payment conditions
  - Bank guarantee
  - Termination conditions

No special rules for cross-border interconnections.

- E-Control (Austria)

Yes. System operators shall conclude uniform interconnection point agreements for all interconnection points. OBA is the preferred option. Provisions are contained in the Natural Gas Act 2011 and in the Gas Market Model (Amendment) Ordinance 2013.

Note: the English versions of the Natural Gas Act and the Gas Market Model (Amendment) Ordinance 2013 are non-binding documents. For a legally binding version of the texts, please refer to the relevant Bundesgesetzblatt (Federal Law Gazette).

Natural Gas Act 2011 Chapter 3 - Common Provisions - Interconnection Point Agreements

Section 67.(1) The system operators shall conclude uniform interconnection point agreements with each other for all interconnection points between their systems. Such interconnection point agreements at interconnection points shall be concluded in consultation with and following the specifications of the market area manager and the distribution area manager, as applicable. The same shall apply for interconnection point agreements with system operators in other countries and the operators of storage or production facilities. Inasmuch as such agreements with system operators in other countries or operators of storage or production facilities impact on distribution network control, the corresponding contracts shall be concluded following the specifications of the distribution area manager.

(2) Interconnection point agreements shall regulate, in line with the aims of this Act, the technical terms for the interconnection of the systems. Interconnection point agreements shall include the following arrangements as a minimum:

1. technical specifications for the operation of the interconnection point and the systems interconnected at such point, including, but not limited to, gas pressure and quality;

2. a list of the data necessary for the technical control of the interconnection point;

3. data and information exchange procedures;

4. procedures for handling any deviations, in particular in the case of compressor station breakdowns, metering inaccuracies and differences between nominated and allocated gas quantities;

5. procedures and conditions for the mutual provision of line pack pursuant to par. 3.

The interconnection point agreements shall be notified to the regulatory authority. The regulatory authority may request by official decision that the interconnection point agreements be amended where they do not conform to the provisions of this Act.

(3) Each transmission system operator shall establish operational balancing accounts at the interconnection points for the adjoining transmission system operators and the downstream distribution system operators, to enable the use of each others’ line pack. Such operational balancing accounts shall be as large as is technically possible

and economically feasible. The limits of the operational balancing accounts at an interconnection point may differ for different systems.

(4) In cases of interconnection points at which schedules or nominations must be submitted, the contracts shall be designed so that system users can normally rely on them being exercised precisely.

Section 26(3) Gas Market Model (Amendment) Ordinance 2013 – Balancing and clearing by the Market Area Manager

(3) Discrepancies between nominated and metered values shall be offset among the network operators by way of operational balancing agreements. At entry/exit points where no operational balancing agreements are in place yet, such discrepancies shall be borne by the system operators. The balance responsible party shall assume that confirmed nominated volumes correspond to allocated volumes.

Interconnection Point Agreements and Line pack Section 29

The interconnection point agreements to be concluded in accordance with section 67 Gaswirtschaftsgesetz (Natural Gas Act) 2011 shall ensure the efficient deployment of line pack as control energy.

- INSTITUT LUXEMBOURGEOIS DE REGULATION (Luxemburg)

The Luxemburgish law stipulates that the system operators may exchange with foreign system operators to ensure the interoperability of the gas network, and more particularly with system operators from neighbor Member States (art 13). In addition, in order to ensure the security of supply, the system operators have to manage the gas flows taking into account the exchanges with other interconnected networks (art 14.2).

Regarding contractual relations between system operators, the law is mainly focused on the interface between transport & distribution. In this framework, a contract between a system operator and its uphill system operator has to contain the following aspects (art 31):

  - General conditions to use the network
  - Counting, recording of the load curve and/or application of standard profiles
  - Supplying points to be linked to supplier perimeter
  - Invoicing conditions, payment conditions
  - Exchange and use of data
  - Responsibility aspects
  - Guaranties
  - Termination conditions

- AEEG (Italy)

The conditions for the access to the Italian network are set in the Legislative Decree. 164/2000 (as integrated by Legislative Decree. 93/2011) and in the Authority resolution n. 137/02 and they are implemented TSOs network codes. The above-mentioned rules require, inter alia, the cooperation between interconnected TSOs but they don't specify the content of the interconnection agreements (ref. art 21 of Legislative Decree n. 93/2011).

- CER (Ireland)

There are no national rules or regulations setting out or governing cooperation between TSOs. CER has oversight and unofficially signs off on the Connected Systems Agreement governing the agreements between adjacent TSOs on interconnectors.

GAS QUALITY

Handling of different Gas Quality specifications at IPs:

Question to NRAs (TSOs are welcome to provide response):

6. Is there any potential barrier identified or to be expected at the IPs due to different limits set in gas quality specifications at each side? What criteria should be considered by TSOs to determine whether or not a solution is required?

None of the NRAs has recognized any barrier currently persisting to the cross border flows. NRAs recognized that the potential barriers that could be expected due to increased flows or future diversification are:

> UK – the continent: due to the differences in WI;
> Hungary – 3rd Countries: sulphur content and H_2O dew point;
> Spain – France: potential barrier if the odourisation practices change;

NRAs and TSOs listed up the criteria to determine whether or not a solution is required:

> Whether the security of supply is affected;
> Technical safety both of TSOs infrastructures and users plants or final appliances;
> Market demand, i.e., reporting by network users of specific problems related to different limits set in gas quality specifications at each side;
> Whether the implementation and ongoing costs can be justified by the potential benefits;
> The degree of capability of the TSO to facilitate the gas flow (for example its ability to blend different gas streams);
> Formulate a view of the likelihood and frequency of future flow restrictions materialising. This requires an assessment of the actual gas quality that is likely to materialise at the IP in future years – information which would be held by upstream parties and perhaps shippers but not necessarily TSOs. The potential consequences of such potential flow restrictions – both in economic and security of supply terms shall be considered. Specifically, regarding the former, the risk of higher gas prices in the potentially constrained member state needs to be balanced against the costs of solutions to mitigate the flow restriction risk. Regarding the latter, there is a need to consider the extent to which other sources of supply into a TSO network could meet the potential shortfall from the IP.

Question to TSOs (NRAs are welcome to provide response):

7. Is there any potential barrier identified or to be expected at the IPs due to different limits set in gas quality specifications at each side? What rules/regulations setting out/governing any framework have been established to cope with this barrier?

Majority of the TSOs respondents neither identified any barrier in the past nor are expecting in the future.
Potential barriers identified by TSOs that could be recognized in the future are:

- Austria - H_2O DP because of the existing differences in calculating the dew point;
- Hungary - H_2O DP and sulphur content has been identified as potential barrier in the past and may persist in the future;
- Germany and the Netherlands - a potential barrier identified might be due to not harmonised gas quality specification in Europe (mainly WI and O_2 level).
- Germany – Poland/the Czech Republic - differences in acceptable ranges for sulphur, H_2 and O_2 level;
- Italy - at present, Italy has not experienced any barrier linked to gas quality specifications in gas flowing at IPs. The Interconnection Point Agreements identify gas quality specifications allowing for the acceptance of natural gas by the receiving Countries.

  The Italian system is currently working without reporting particular issues related to gas quality. In this view, any change in gas quality ranges, introducing possible restrictions to gas flows, should be fully justified.

Currently all the potential barriers that could hamper cross border flows have been prudently managed by the TSOs, however, TSOs capabilities to manage those barriers are limited. Applicable national practices/regulations to cope with the potential barriers due to gas quality differences are:

- Germany: follows EASEEgas CBPs for gas quality as well as national rules DVGW G260 and G262;
- Hungary: usually framework is described in the IAs, but may be not sufficient in all cases.
- Finland: practices are described in contracts and provision specifications;
- UK: There is currently no formal framework in Great Britain that has been established to manage a potential barrier to gas flows. Between 2004 and 2007, the UK Government conducted an initiative to investigate the case for Great Britain widening its gas quality specification, which concluded that the specification would not be changed, at least until 2020. In parallel, GB regulator Ofgem led an industry initiative which examined the potential regulatory arrangements under which National Grid might offer blending / processing services at its Bacton entry point (as an alternative to changing the specification) although such services have not been introduced.
- Italy: Italian rules provide for gas odourisation only at TSO-DSO interfaces and at interconnection points with specific categories of end users directly connected to the transmission network. So far no specific rules have been set up, even if upcoming drafts from TC234 and CBP from EASEEgas seem not to address the issue in the way above expressed.
- Spain: TSOs and network users shall comply with gas quality provisions according to the Royal Decree 1434/2002 (27th December).

SHORT-TERM INFORMATION PROVISION

Questions to TSOs:

8. In general terms, please describe the type, location and ownership of:
   i. gas quality measurement equipment on your network; and
   ii. which gas quality parameters are measured at which locations.

All the TSOs respondents have process gas chromatographs located on the IPs. In all the cases TSOs monitor and measure gas quality using their own equipment. All of the chromatographs located on the IPs measure: gas composition, N_2, WI and/or GCV and/or density. Some IPs are additionally equipped with sulphur chromatographs (17 countries), water dew point and hydrocarbons dew point analysers (13), oxygen analysers (13); THT measurement (2). Moreover TSOs from the following countries identified that they are the owners of measurement equipment located on their networks (16) mostly on the points:

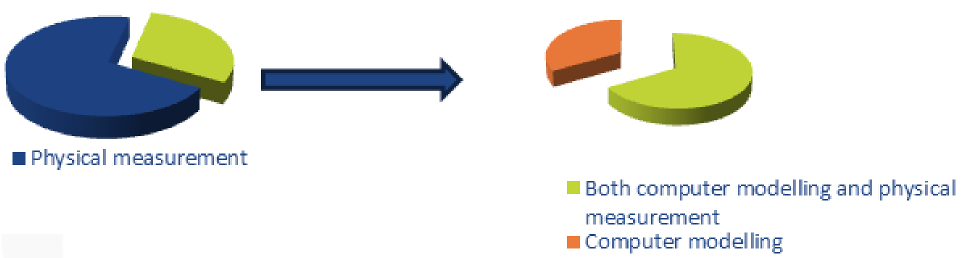
- connection to distribution networks (Greece, Spain, Belgium, Poland, the Netherlands, Denmark, the Czech Republic);
- connection to storage facilities (Spain, France, Portugal, Sweden),
- LNG plants (Spain, Belgium),
- Biomethane production facilities (Spain),
- National production points (Poland, Germany, the Netherlands, UK, France)
- Stations at the comingling points or reference or strategic points (Germany, Spain, Hungary, Belgium, Poland, France, the Netherlands, the Czech republic, Portugal, Denmark),
- Major end-user delivery point (i.e. CCGTS: Portugal, Belgium, the Netherlands; others: Hungary, Germany, France,)

Some countries do have inside their networks tracker devices for smaller off takes (2).

9. For the monitoring of gas quality on the exit points in your transmission system, do you rely on:
   a. physical measurement only?
   b. computer modelling ?
   c. other (please explain)

From the received answers:

- 28 TSOs rely on physical measurements,
- 8 TSOs rely on computer modelling and physical measurements (+1 TSO under study),
- 4 TSOs rely on computer modelling only.



10. Please provide for the last 3 years (broken down for each month) regarding gas quality variation of Wobbe index and/or GCV:
    a. the number of occasions the nationally set gas quality standard has been breached and indicate your national gas quality specification
    > UK: WI (since Jan 2012 – 4 times)
    > Hungary: WI (lower limit around 70 times)
    > Belgium: WI (lower limits are breached frequently).
    b. based on hourly values the minimum, maximum, average value and standard deviation
    The historical flows show that most of the countries' variations in WI and GCV have been lower than 5% of the monthly average value. Only few examples were identified where the gas quality variations were between 5-10%:
    > Hungary
    > Denmark
    > Belgium

    c. triggered complaints from consumers or from adjacent TSOs
    > SRG: 24 notifications (8 per year) out of a total of more than 7000 end users connected to SRG network.

11. Is there an existing practice of data provision from the TSO to network users regarding gas quality variations? If yes, please describe the details.

Most of the TSOs send their network users the daily/monthly data on GCV for the billing purposes (Spain, Ireland, Austria, Slovenia, Portugal, and Italy). In UK, National Grid publishes an indicative specification in its Ten Year Statement. TSOs generally inform their network users in case of off spec gas.

All TSOs publish the average daily GCV at IPs because of the Transparency Guidelines requirements.

Some TSOs publish additional data, such as:

> Germany: GCV 2 hours after it has been measured by gas chromatograph;
> Bulgaria: gas quality certificate on daily basis for 6 identified zones;
> France: Quadipgaz – availability of receiving data from the closest CG located to the affected end customer;
> The Netherlands: reading from gas chromatograph per point published every 15 min;
> Sweden: publish on their website real time gas quality data;
> Denmark: hourly values of GCV, WI, RD of the exit points are published and additionally values from the GC located within the county are available online.

Some of the TSOs developed more specific warning systems to the concerned end customers:

- Germany (GUD): direct contact in case of major variations;
- Germany (Ontras): daily simulated gas quality values – subscribers need to pay for the service;
- Spain: CCGT, chemical industries receive real time gas quality information from metering equipment or analyzers;
- Belgium: dispatcher operator calls the identified eligible customer (16) in case the agreed threshold may be breached and inform about the nature of the variation and expected time of arrival;
- Finland – CNG fuelling stations receive data on H_2O DP variations and hydrogen facilities receive data on O_2 variations;
- France - GRTgaz proposes 2 services of forecast of the variations of the characteristics of the natural gas:
  - The information service: a dispatching operator warns by fax / e-mail the consumer in case of variation of a characteristic of the natural gas beyond a threshold defined in advance. The operator gives the content of the variation and an approximate time of emergence onto the site.
  - The Qualipgaz service: the consumer site, if it is placed on the network so as to obtain relevant information, has access to the data of the closest network chromatograph upstream to its site, in real time.

GRTgaz also proposes a real time information service on the characteristics of the natural gas delivered through the service of counting in energy. This service requires the installation of a chromatograph on the site of delivery; the consumer can be informed in real time characteristics of the natural gas.

- The Netherlands – Gasradar: prognoses gas quality variations are available on the website and in specific cases dispatcher operator can inform individually by phone call eligible end customer;
- Denmark – expect from the real gas chromatograph reading available on the website TSOs sends a sms to the eligible end customers when the flow direction (from/to Germany) is changing.

12. Please provide your views on what types of end-users may be potentially affected by short term variations in gas quality on the network for which you are responsible?
    Please provide a total estimation of potential end-users.

Individual TSOs mentioned that following types of the end customers might be potentially affected by gas quality variations:

- Industrial customers:
  - Chemical industries;
  - Gas manufacturers;
  - Gas turbines;
  - Glass manufacturers;
  - Lime producers;

- Fertilizers;
- Ceramic producers;
- Thermo electrical plants
- Refineries
- Industries using natural gas as: slag, oven, flame, raw material;

> Power plants (i.e. CCGT)
> DSOs customers
> Storage facilities (i.e. of LNG).

Even though individual TSOs identified some manufacturers that may become an eligible party, it has to be noted that the process should be equipment led rather than user led and therefore the details has to be defined individually at national level in cooperation with the Stakeholders.

13. Please provide any information you may have about whether short term variations in gas quality on the network for which you are responsible have affected end-users.

In recent years some TSOs received some complaints that gas quality variation affected eligible end customers. This are mainly identified according to:

> GCV/WI: Hungary (glass and ceramic industries); France; The Netherlands; UK; Portugal; Sweden; Denmark, Italy;
> N_2: Belgium; Poland;
> Others: total sulphur (Poland); compressor oil due to pigging (Belgium); CO_2 (UK); rate of change of CH_4 (France); dew point and impurities (Italy).

In most of the cases TSOs try to cooperate by providing the information about the possible variations. It was noted that this measure reduced complaints from end customers.

LONG-TERM MONITORING

Questions to TSOs and NRAs:

14. What measures do you have in place to be prepared for handling gas with a different quality pops up in your network during the next 10 years? Please substantiate your views.

TSOs and NRAs are not expecting gas quality to change significantly during next 10 years, but in case there is such situation they have identified few measures to apply in such case:

> Bilateral meeting with end users to discuss changes in gas quality due to the upcoming new sources (Spain; the Netherlands; Germany; Italy; Austria);
> Implement monitoring measures (Ireland, Finland);
> Trying to find measures in order to manage quality pops up (Greece – installing cyclone filters on IPs, Belgium – building ballasting facility or commercial measures, the Netherlands – blending, installing ballasting facility or in the worst case rejecting gas out of the national specification

- In the UK National Grid has recognised that new sources of gas may need to be brought onto the network in future and has worked with the relevant parties to facilitate such gas being brought into compliance with the requirements.

ODOURISATION

<u>Questions to system users:</u>

15. In the case of those IPs where a system is connected to another system where odourisation takes place at different levels, do you (would you) experience barriers to trade in both directions? Are you aware of cross-border trade related problems? Please list examples.

ENTSOG received 1 reply from a system user regarding this Question:
The cooperation between adjacent transmission networks operators should be encouraged. Odourisation practices are linked to local context and modifying only the odourisation practices without changing the whole context could reduce the safety. Besides, changing odourisation practises would have an impact on operating costs for all operators along the networks because odourisation is linked to the policy of leak research along the network and also this might have an impact on the regulation regarding the installation of gas equipment.

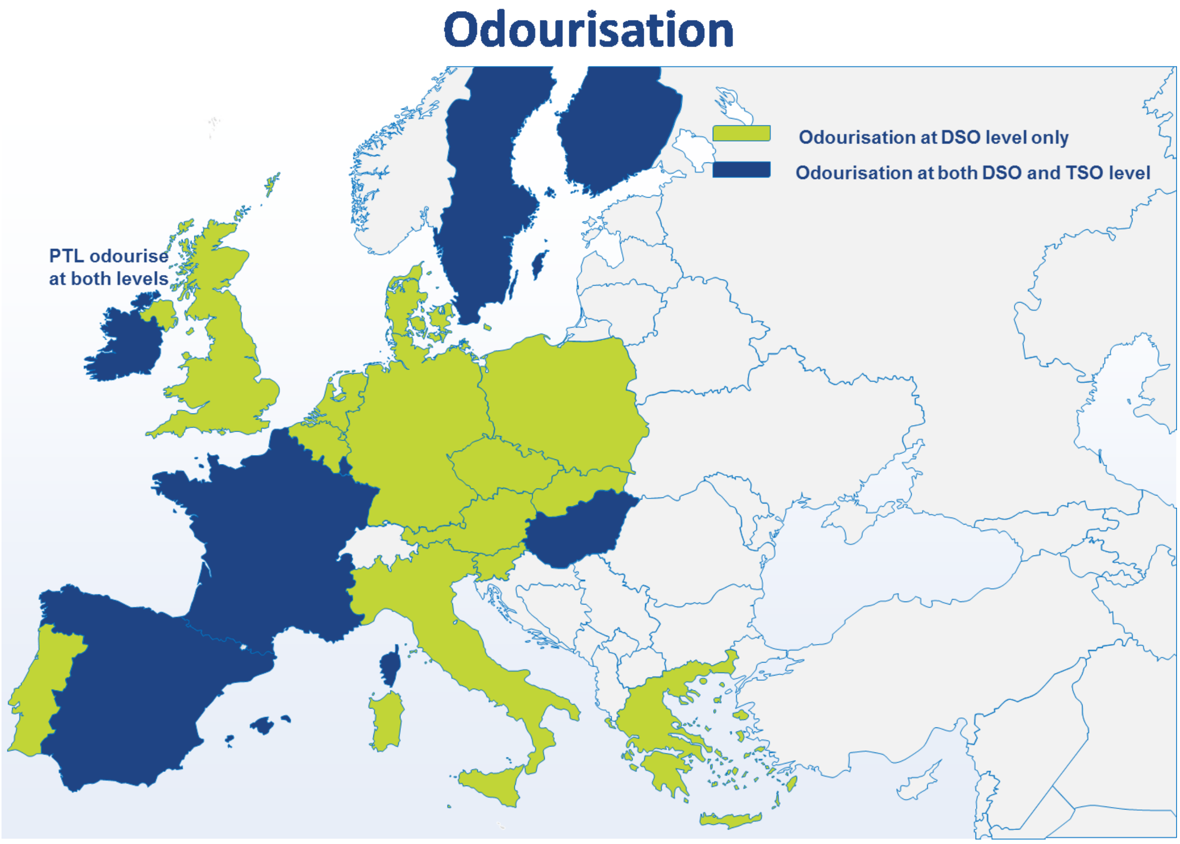
<u>Question to TSOs:</u>

16. In relation to the IPs to which your network is connected and for your own gas transportation network, please specify if the gas is odourised at transmission level, at distribution level or both.

The map below illustrates overview of different odourisation practices in EU, accordingly to the received answers from TSOs and NRAs. Some respondents identified that the odourisation practices on the transmission and the distribution level are defined case by case:

> Great Britain: Transmission is non-odourised, distribution is odourised, but the transmission pipeline to Ireland (owned by the Irish TSO) is odourised,
> Finland: odourisation is done generally on distribution level ,but in case of Mäntsälä-Tempere pipeline is done at transmission level, from which the gas is not exported to any other country and it is used for domestic purposes;
> Hungary: odourisation at transmission level takes place only in the area of western Hungary (Mosonmagyaróvár), there are some studies done to change the central odourisation in these region;
> Spain: gas is odourised on transportation network - 15 mg THT/(n)m^3 and additionally at distribution network 7 mg THT/m^3, which means that the final concentration of 22 mg THT/(n)m^3 (8 mg S/m^3) is received;
> Italy: transmission is non-odourised, distribution is odourised. The odourised gas coming from France through Italy is accepted. In Italy, where odourant is treated as total sulphur component it's necessary for TSO to cooperate to agree a maximum acceptable content of odorant which is safe, reasonable and technically sustainable, in order to guarantee both the legitimate need to fulfill national law obligations and to support cross-border trade of gas among EU member States. Maximum content of odourisation could be based, for example, on maximum sulphur content or other chemicals used in odourisation.
In the future it will be preferable a full non-odorized transmission network in the EU,

provided that gas under the maximum level of acceptable odorant content can be assimilated to non-odorized gas. This seems also to be the most cost efficient solution.



For TSOs and NRAs in Member States (MS) where gas is odourised at TSO-level:

17. Please explain the contractual and technical rules relating to as well as experiences exporting gas to MSs where
    a. odourisation takes place at transmission level:
        > In case of transport of gas from France to Spain there is a difference in the level of odourant added and in case of transporting gas to from France to Spain, France need to add 10mg/m^3 of THT;
        > In case of flows coming from Germany and Belgium to Luxembourg there is odourisation taking place at entry point to the Luxembourg network. Nowadays there is no export of gas from Luxembourg to Germany and Belgium.
    b. odourisation does not take place at transmission level:
        > In case of flows from France to Italy, Switzerland and Spain, and from Spain to Portugal there is no problem. The current practice is that Italy and Switzerland accepts odourised gas. In case of transport of gas to Belgium there is planned investment of direct pipeline from Dunkerque LNG to Belgium border of non-

odourised gas. In case of flows from France to Germany – there is no physical flow, but it can be possible only in the exceptional events. One of the 2 French TSOs in its TYNDP considers the possibility to decentralize the odourisation practices in order to enhance the gas flows towards Germany;

- Hungary is delivering non-odourised gas;
- Ireland would deliver odourised gas to Great Britain but Ireland is not exporting gas for the time being;
- Finland did not came across any barrier as Finland do not export the gas;
- Denmark is odourising downstream the gas that is delivered to Sweden, which is odourising at transmission level. In that case there is no reverse flow.

For TSOs and NRAs in MSs where gas is not odourised at transmission level which border MSs where gas is odourised at transmission level:

18. For each IP where the above statement is relevant, please explain:

    (a) whether gas physically or commercially can flow into your network

    There are several cases where gas can or in future might flow physically:

    - Portugal
    - Italy
    - Denmark – future flow of biogas

    There are also some cases where gas can flow ‘commercially’ only if the nominations to exit gas from the odourised transmission network are less than or equal to the nomination from the countries transporting non-odourised gas:

    - Germany some TSOs
    - UK - Ireland
    - Belgium - France
    - Slovenia - Hungary

    (b) under what circumstances gas physically or commercially can flow:

    - In case of emergency flows
    - In case nominations of the odourised gas are equal to the nominations of the non-odourised gas for the same countries – commercial flow

    (c) in what volumes gas can flow.

    - In the volumes that is technically possible for the IP
    - In case of emergency in small volumes.

19. In the case of those IPs where your system is connected to another system where odourisation takes place on a different level, do you (would you) experience barriers to physically move the gas in both directions? Are you aware of cross-border trade related problems brought to your attention by network users? Please list examples.

    - There might be a barrier in case of one IP of Hungarian TSO – Austrian border –

where the odourisation takes place at the transmission level and in case of reverse flow there will be a barrier in trade.

- Belgium recognized the barrier on the Belgium – France border. The main reason is that Belgium in very interconnected to other countries that do not odourise at the transmission level.
- Germany recognized the same barrier, but they also allow booking of the interruptible capacity at these IPs. Also counter flow-nominations up to the amount of physical flow in the other direction would be accepted.
- UK does not see any barrier caused by different odourisation practices compared to Ireland unless Ireland becomes capable of exporting the natural gas to the UK network which is not expected to be required at least for the medium term.
- Italy does accept odourised gas flows and on the other hand do not odourise at the transmission level in order to avoid creating barrier to flow. In Italy view, all those potential barriers shall be diminished by applying harmonized approach towards the odourisation practices in the future

  Currently, in Europe, national systems where gas odourisation is carried out at transmission level co-exist with other national systems where gas is odourised downstream, for example at the city gates level. In the future, it shall be guaranteed that these differences do not constitute any barrier to cross-border flows, therefore preventing a complete integration of the European market.

  To this extent, "odorised gas free", "odourisation free" or similar expressions should be avoided in new interconnection agreements debates/negotiations, replacing them with maximum levels of acceptance clearly identified and recognizable from national and/or international codes.

  Actually, interconnecting a system where odorised and not odorised gas are mixing up, with another system, might result in residual, not harmful and technically acceptable levels of odourisation, that should be allowed to favour cross border trade and market integration.

  As traces or residual levels of odourisation components, resulting from flow commingling might not be completely avoided, a definition of maximum levels of acceptable odorant should be set at EU level and preferred to a definition of non-odourised gas.

20. What are the best options to overcome barriers to cross-border trade related to different odourisation techniques? Please indicate the order of anticipated magnitude of costs of the solutions.

Options	**Order of magnitude of costs (1, 2, 3..) NRAs**	**Order of magnitude of costs (1, 2, 3..) TSOs**
Increased transparency and TSO cooperation	Spain, Germany, The Czech Republic, Hungary, Poland, Austria, Luxembourg, the Netherlands, France, Italy, UK, Ireland	Spain, Hungary, France, Portugal, Italy
Full non-odourisation of	Belgium	Greece, Hungary,

transmission network in the EU		Belgium, Germany, Slovenia
Full odourisation of transmission network in the EU		
Installation of deodourisation facilities at IPs	Very expensive option: Germany, Belgium, UK	Very expensive option: Spain, Hungary, Belgium, France, Germany (but less expensive than changing all EU into odourisation at TSO), Portugal, Italy
Other (please add and specify)		Acceptance of odourised gas (Spain, Portugal) Swapping (Belgium) Specific agreement between TSO eg. between GRTgaz and Fluxys for the future connection between Dunkirque LNG and Belgium, where the gas will be delivered without being odorised Deodorisation at specific site of end users (France)

21. Have any studies been undertaken to examine the implications of a change in odourisation practices? If so, what were the scenarios studied (partial or full, gradual or immediate change etc.) and the investment cost associated with each scenario? How long did it/ would it take to implement such a change? Please attach the comprehensive study to your answer.

    In **Hungary** there are ongoing studies to modify the central odourisation in the Western Hungary region. All the possible options are under the feasibility study (deodourisation, odourisation at transmission level or odourisation at distribution level).

    In **France** a social study has been performed few years ago concerning gas odorisation. THT could be replaced by a mercaptan such as TBM but not by a sulphur free odourant as this last one is not recognised by the public as gas odour.

    GRTgaz is studying a change of its odourisation practises for its own network.

Two possibilities have been examined. The first one, consisting in deodourising gas at IPs would represent a low investment depending on the quantities of gas, but would conduct to important operating cost. The second one consisting in odourising gas at regional level of the transmission network would lead to an important investment, estimated to several hundred million of euros. It would take around four years to be operational and would consist in implementing 630 odourisation platforms + operating costs. Stakeholders, especially DSOs, might be reluctant to accept such option. A particular attention will have to be paid to safety issues.

The **Great Britain** national transmission system made the transition from being odourised to non-odourised in the mid 1990s. This meant that odourant would no longer be added to the gas at points of entry to the transmission system, but instead would be added at offtakes from the transmission system that fed gas into distribution networks. This remains current Great Britain practice. The main reason for doing this was to facilitate interoperability with the Belgian network due to the construction of the IUK pipeline, which started operation in 1997, particularly because the expectation at the time was that gas would flow predominantly from Great Britain to Belgium. The capital cost of installing an odourant injection facility at each of the 126 offtake points was £21m (at 1998 prices) which was considerably cheaper than the alternative option of installing a deodourisation facility at a suitable location on the GB network. There would also have been higher ongoing operational costs associated with the deodourisation facility option, partly because such a facility would have generated a waste product that would need to have been managed. Prior to the decision being taken to move to a non-odourised regime, all end consumers that were directly connected to the transmission system were consulted. Some of these consumers stated that their safety procedures required odourised gas and in these cases odourant injection facilities were installed close to the point of offtake. Others were happy to receive non-odourised gas and actually benefitted from the change because it helped them reduce their emissions. Safety implications of making the change were also considered. It was concluded that a non-odourised transmission system would be no less safe that an odourised one for the following reasons:

- It is much less likely that a leak will occur on a transmission pipeline compared to a distribution pipeline due to the different materials used for their construction;
- If a leak were to occur, there is a lower risk of explosion and safety impact on transmission pipelines (which run across the countryside) than on distribution pipelines (which enter buildings)
- Monitoring pressure (and any drop in pressure) and discolouration of vegetation are more effective ways to detect a leak on a transmission pipeline than a human nose.

After the new odourant injection facilities had been constructed, implementation of the transition was managed over a period of approximately three weeks during which odourant injection was gradually reduced at the transmission system entry points and gradually increased at the distribution off takes. This was done to ensure that the distribution networks did not become over-odourised (which could have caused an increase in the number of public reported gas escapes) taking account of the time required the gas to travel from the transmission entry points to the distribution off takes.

22. Do you expect that differences in odourisation practices will hamper the diversification of flow patterns over the next 10 years? Please substantiate your views.

    In the view of some TSOs (Spain, Hungary, France, Belgium, UK, Slovenia and Portugal) the current direction of the flows will not change for the foreseeable future and TSOs will cope with differences in odourisation practices and this will not constitute a barrier to the cross border flow.

    Belgium and Germany believes that when France will become net exporter then the barrier will hamper the cross border flows.

    The non-harmonised EU odourisation practices currently hamper gas flows from France to Belgium and Germany but not to some other countries, which accept the flow of odourised gas. It also limits the full integration of the North South corridor in Western Europe, as expected in the Energy Infrastructure Package.
    As such, and as explained in previous questions, GRTgaz has already worked on a study to evaluate the possibility of a non-odorised gas transport solution, as detailed in its TYNDP.
    A main first step consists in putting in place a direct non-odourised connection ("Pitgam – Veurne") to export gas from France (LNG terminal in Dunkerque) to Belgium by end 2015.
    Depending on a market confirmation of its interest for additional backhaul capacity at Obergailbach (from France to Germany) and depending on the arrival of important LNG flows from France and Spain to NW Europe, GRTgaz will need to develop a broader solution to deal with different odorisation practices to enable gas flows from West to East.

23. Can deodourised gas be considered as an alternative for non-odourised gas (if cost-efficient). Have any studies been completed at national level about the acceptable level of odourant?

    Some of the TSOs/NRAs specified that deodourised gas can be considered as an alternative for non-odourised gas, supporting their statements with the following arguments:

    > **Spain** believes that the odourant level shall be treated as total sulphur content and the maximum level for sulphur to be accepted between MSs shall be defined;
    > **Germany** believes that it can be and alternative only if the THT concentration is less that 2mg/m3, which is technically and economically impossible to achieve;
    > **Italy** believes that it is necessary to agree a maximum acceptable content of odourant which is reasonable, in order to guarantee both the legitimate need to fulfill national law obligations on safety and to support cross-border trade of gas among EU member States. In the future it will be preferable a full non-odourised transmission network in the EU, provided that gas under the maximum level of acceptable odourant can be assimilated to non-odourised gas. This seems also to be the most cost

efficient solution (see cells below for order of magnitude of costs ranking).

- **Great Britain** considers that deodourised gas can be considered as an alternative for non-odourised gas (if cost-efficient) in order to address interoperability between networks. When considering the odourisation-related interoperability issue between Belgium and GB in the 1990s, the installation of a deodourisation facility at a suitable point on the GB network was one of the options considered, however it was not pursued because it was cheaper to change to a completely non-odourised transmission network;
- In case of a change of odorisation practice in **France**, full non-odorised gas cannot be reached for several years, because of the underground gas storages that will continue to produce few mg/m3 of THT, so, networks will contain traces of THT. Deodorisation is not a 100% efficient treatment and traces of THT will remain. That is why technically, whatever the chosen solution (deodorisation or change of odorisation practice), end users will receive traces of THT. As the content of sulphur odourant (total or residual) is an issue for end users, dedourised gas or what is called non-odourised gas in the NC will have the same impacts, and deodourisation is an alternative. In any case, sulphur content from odourant must be added to sulphur content already present into the natural gas to respect total sulphur specification to prevent end-users from large damages. Concerning the sensitive end-users (feed-stock), specific installations have been designed in order to accept odorised gas at normal level (25 mg/m3).

Some of the TSOs/NRAs (Belgium and Hungary) specified that deodourised gas cannot be considered as an alternative for non-odourised gas, supporting their statements with the following arguments:

- the deodourised gas has to be compatible with other odorants used
- the deodourised gas should be accepted by our adjacent TSO's
- end users with processes sensitive to odorants should not have a negative impact.

24. Please provide a motivation why for safety or other technical reasons gas should/should not be odourised at transmission network level?

TSOs/NRAs responses are summarized in the table below.

Motivation why for safety or other technical reason gas should be:		
Country	Odourised at TSO level	Not odourised at TSO level
Belgium		✓ Negative impact of odourants on some chemical industry processes; ✓ Masking effect - today different odourants are used at distribution level and in different countries, which seem not to be compatible with each other; ✓ Efficiency - much higher volumes have to be odourised, when odourising at transmission level;

		✓ Different protective and safety measures exist on transmission level compared to distribution level, because of difference in material, pressure level, zonal and human protection which keeps the transmission as far as possible away from urban areas (in contrast to distribution)
Great Britain		✓ End users can reduce their emissions by receiving non – odourised gas ✓ A non-odourised transmission system would be no less safe that an odourised one for the following reasons: ▪ It is much less likely that a leak will occur on a transmission pipeline compared to a distribution pipeline due to the different materials used for their construction; ▪ If a leak were to occur, there is a lower risk of explosion on transmission pipelines (which run across the countryside) than on distribution pipelines (which enter buildings) ▪ Monitoring pressure (and any drop in pressure) and discolouration of vegetation are more effective ways to detect a leak on a transmission pipeline than a human nose.
France	✓ Odourisation is a safety argument in case of weak leaks that would migrate towards buildings;	
Germany		**Technical reasons:** ✓ to avoid additional black powder formation in pipelines, compressor stations, measurement stations and valves, ✓ to avoid additional elementary sulphur formation in pipelines, compressor stations, measurement

		stations and valves, ✓ to avoid problems in the piping-system of underground storages, ✓ turbines, industrial applications and storages are not adjusted to the respective odorant ✓ technical restriction with SSOs **Commercial reasons:** ✓ normally the sulphur content is low in natural gas, additional sulphur could lead to production problems at industrial customers, **Environmental aspects:** ✓ Higher amounts of sulphur in natural gas could lead to higher sulphur dioxide emissions by power plant (legal limits may be violated)

25. Has any research about "masking effects" been done at national level?

There have been some researches done about "masking effects" by European organizations such as Marcogaz and GERG and in some countries namely in Hungary, Belgium and France. Summaries of those studies can be found below.

It has been reported in the Marcogaz' paper GI-OD-12-03 from October 2012, usually no masking effects is appearing from mixture of different sulphur odourants, even if it can be hypothesized some effects of enhancement of the odour in mixtures between sulphides and mercaptans (for example in mixtures containing TBM and MES) which make it difficult to predict the strength of smell of the mixture. In case of mixtures of sulphur odorants and sulphur free odorants, no public data are available yet and it could be necessary to perform olfactory tests to know the behaviour of the mixture in terms of odour).

Hungary:
At the time (early nineties) of introducing the currently used odorant such research was carried out on TSO level. At the same time the odorant from ethyl mercaptan was switched to 50% THT + 50% TBM.

Belgium:
Yes: a study has been made in Belgium in the late 90-ies following which UK has changed his law and practices in odorisation (due to the start-up of Interconnector)

France:
Some research has been done by European WG such as GERG (Italgas) about odourant masking effects between the two major odorants: THT and TBM. These studies showed

that the population would identify the odour of the mixture as natural gas in case of leaks, so no safety problem would occurs. Odour intensity would be higher than usual, and very near from TBM odour (as its odourant power is much higher than the THT).
A sociologic study was performed in France few years ago to compare the population perception of THT, TBM and sulphur free odorant. It confirms that the French population would identify TBM odour as natural gas in case of arrival on the French network. This would not be the case with sulphur free odour in France.
No study has been done with a mixture of sulphur free odourant and THT or TBM.

<u>Questions for NRAs</u>

26. Are there any national rules/regulations setting out/governing rules on odourisation practices at transmission level? If so, please provide any relevant details on their content as well as on their legal nature.

    There has been listed up national rules/regulations setting out/governing rules on odourisation practices, both requiring odourisation to be done at transmission level as well as on distribution level, described by NRAs and TSOs.

Obligation to do the odourisation at transmission level	
Spain	Yes, Royal Decree 1434/2002, 27th December, in his chapter X (Quality on gas supply), article 63-Gas quality, reads as follow: "Gas quality levels regarding composition, calorific values and other product characteristics, to supply, are those included in H group, second family, according to gas classification set up in UNE-EN-437, and they shall comply with provisions established in Technical Management of the Gas System Regulations". PD-01 approved by "Resolución" for Ministry of Industry, Energy and Tourism on 22 September 2011: Transportation network - 15 mg THT/m3 + Distribution Network 7 mg THT/m3 = final concentration of 22 mg THT/m3 (8 mg S/m3).
Hungary	Yes, there are some stipulations in the gas act, which are obligatory as well as there are some national standards, which define the level of odour, how to measure it and placement of odourising units. Vhr. Article 103 (1) The natural gas injected into transmission and distribution lines must be odourised. (2) Except in the case, the responsibility for the odorisation of natural gas shall lie with the transmission system operator. Network Code (6.9 Odourisation) a) According to the VHR and with the exceptions defined therein, the odourisation of the natural gas is the obligation of the TSO. In case of direct feed-in into the transmission and the distribution network the odourisation may be done by the producer on the basis of a contract or, in the lack of such contract it is done by the TSO. b) In the transmission system the odourisation is done by the TSO in accordance with the prevailing norms and Network Code at the off-take points of the grid.

	c) The injection of the odourisation material is performed by the TSO in centrally or locally installed odourising equipment. d) The amount of odourising material is controlled and recorded by each odourise. The odour level in the interconnected gas grid is checked and recorded according to the Hungarian Norm MSZ-09-74.0011 by the partner system operator too. The distribution operator is obliged to ensure the check and recording of the odour level and the transfer of such data to the TSO. e) The TSO is obliged to regularly check by measurements the appropriateness of the odour level at the designated points of the transmission grid. f) The flow-proportional odourisation is done by the TSO in accordance with the winter and summer odourisation norms. Such seasonal norms are specified in the Grid Code. g) Any level of odorization other than specified in the Grid Code i.e. from an interconnected system is to be published by the TSO on its home page among the Quality Accounting Rules.
France	Article 11 of the 19 March 2004 Decree (relating to public service obligations in the gas sector) provides that transmission system operators shall take the necessary measures to ensure that gas delivered at all exits to the facilities of non-domestic customers directly connected to the transmission network and at all exits to distribution networks has an odour that is sufficiently characteristic so potential leaks can be detected. Gas leak must be detected thanks to its odour at least at 20% of its lower explosion limit that means 1% gas in air. According to that, THT content in gas has been defined by gas operators (TSO and DSO). This odour has to disappear once gas is burned. In France, natural gas is currently odourised with THT in a centralized way, i.e. at the entry points to the main transmission network and at the exit from storage facilities. This historical practice has economic justifications: less injection points for THT are needed. In addition, it ensures that the odorisation level is homogeneous on the whole network.
Obligation to do the odourisation at distribution level	
Germany	The technical rules DVGW G 260 and 280 foresee that the TSO level is non-odorized.
UK	The relevant GB legislation governing safety requirements – the Gas (Safety Management) Regulations 1996 – specifically exempts high pressure pipelines from an odourisation requirement: "*The gas shall have been treated with a suitable stenching agent to ensure that it has a distinctive and characteristic odour which shall remain distinctive and characteristic when the gas is mixed with gas which has not been so treated, except that this paragraph shall not apply where the gas is at a pressure of above 7 bar(g).*" In the light of the above, National Grid makes the following statement in its Ten Year Statement publication concerning odour of gas delivered to the network:

	"*Gas delivered shall have no odour that might contravene the statutory obligation not to transmit or distribute any gas at a pressure below 7 bar(g) which does not possess a distinctive and characteristic odour*".
Italy	Law 6th December 1971 n.1083 imposes an obligation of odourising gas for household or similar use. This implies the odourisation of gas by DSOs. TSOs are required to odourise gas only at the exit points at the service of end users directly connected to the transmission network (for household or similar use). The obligation was expressly extended to all gas transportation companies operating on regional networks where household customers are directly connected to the transmission network. (Decree of the Ministry of Productive Activities of 29th September 2005). Pursuant to the Law Decree of 1st June 2011 n.93, the "household customer" is defined as the customer buying natural gas for own domestic use. Moreover, the Italian regulatory authority (AEEG) has expressly provided for in the "Regulation of the transportation service quality" a reference to the above-mentioned ministerial laws (Decision ARG / gas 141/09, Annex A - Article 5).

27. If so, do these rules/regulations comprise different provisions regarding a non-odorised gas and a de-odourised gas? (*For the avoidance of doubt, a non-odourised gas has never been subject to odourisation along the gas chain, whereas a de-odourised gas has been odourised, then processed in order to remove the previously added odourant.*)

    None of the respondents identified that those rules/regulations comprise different provision regarding a non-odourised and de-odourised gas. In Germany deodourised gas has to comply with the same technical standards as non-odourised gas and is not generally excluded.

28. Do all gas transmission systems in your Member State follow the same odourisation approach? If not, on which ground are the differences justified?

    All the Member States follow the same odourisation approach, with two exemptions:

> **France:** TSOs follow the same odourisation practice with one exemption for GRTgaz, which received administrative authorization to build and operate the pipelines flowing non-odorized gas in the North-East of France as of 2015 on the basis of compensatory measures to be taken by GRTgaz to maintain a consistent level of safety;

- Germany: all the DSOs follow the same odourisation practices, but with different kinds of odourants in use (sulphur free, mercaptans and THT)

UNITS

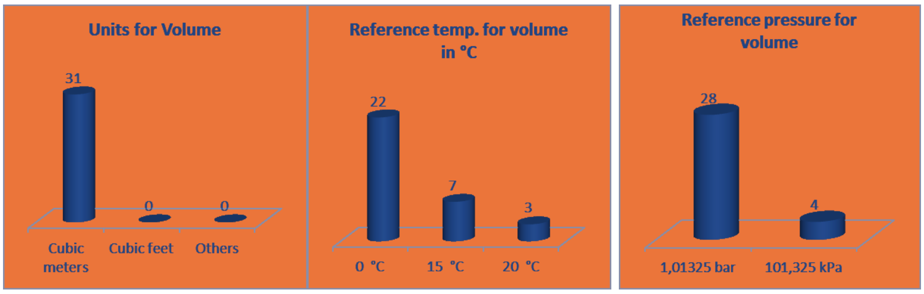
<u>Questions to TSOs:</u>

29. Please describe:

> What units are in use in your daily external communication and public information for:

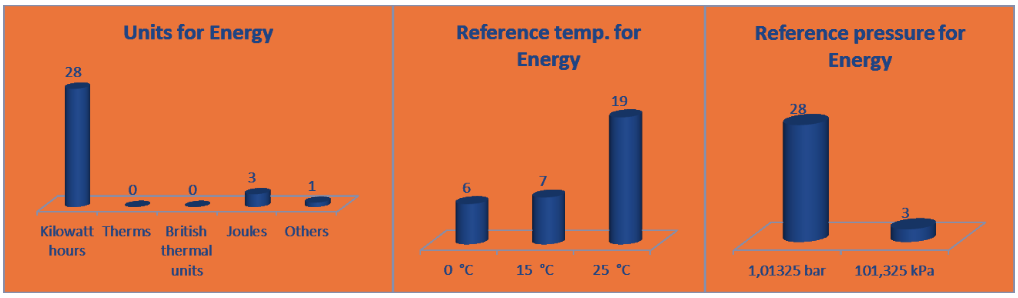
✓ Volumes (please specify the reference conditions of temperature and pressure):

1. cubic meters
2. cubic feet
3. others (please specify)



✓ Energy content (please specify the reference conditions of temperature and pressure)

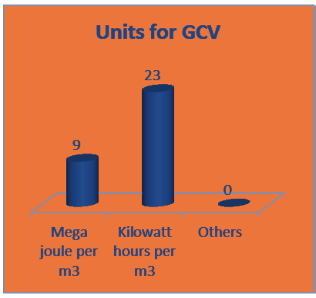
4. Kilowatt-hours (and multiples)
5. therms
6. British thermal units
7. Joules (and multiples)
8. others (please specify)

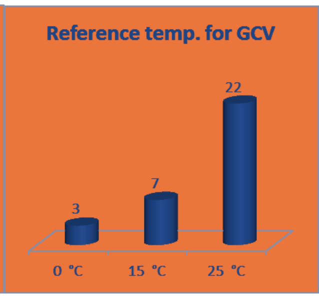


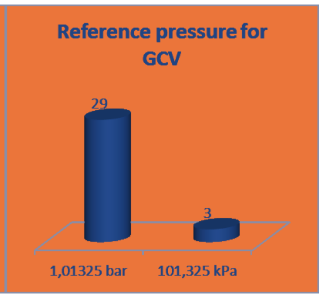
✓ Gross Calorific Value (please specify the reference conditions of temperature and pressure):

9. Mega-joules per cubic metre

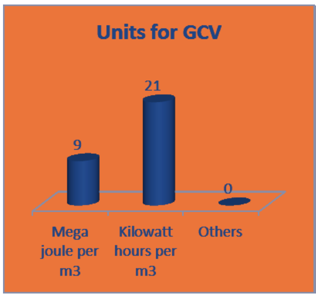
10. Kilo-Watt-hours per cubic metre
11. others (please specify)

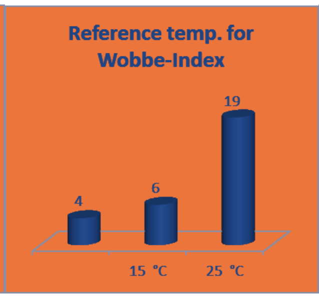


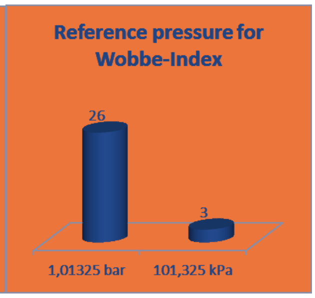




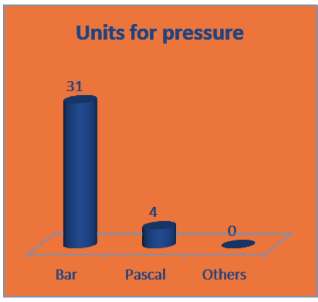
- ✓ Wobbe index (please specify the reference conditions of temperature and pressure):
  12. Mega-joules per cubic metre
  13. Kilo-Watt-hours per cubic metre
  14. others (please specify)

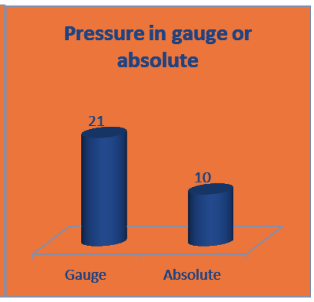






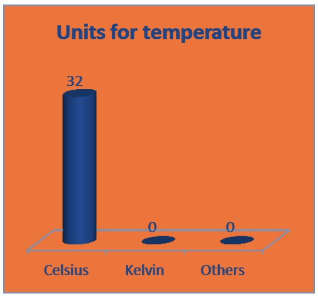
- ✓ Pressure:
  15. Bar
      a. Gauge pressure
      b. Absolute pressure
  16. Pascal
  17. others (please specify)





- ✓ Temperature:
  18. Degrees Celsius

19. Degrees Kelvin
20. others (please specify)



The outcome of the questionnaire shows that the common set of units and reference conditions as stated in the draft Network Code for Interoperability and Data Exchange are already commonly used in several MSs. Therefore most TSOs don't have to switch over to new units and reference conditions.

30. Please provide elements of cost associated with units' harmonisation. Please detail to what extent the use of common units could enable economic IT investments required by other processes (e.g. auction, data exchange).

- *Some TSOs stated that progressive* software modifications at flow computers of metering stations at entry and exit points are required. In addition implementation of the harmonised units requires in some countries remarkable additional cost in the adjacent systems (productions, underground storages, distribution systems, consumer systems). The SCADA-Systems of some TSOs also have to be modified as well as the accounting systems.
- Several TSOs argued that it is difficult to estimate costs for switching over to the new set of units and conversion factors. The estimation run from 50 to 1000 k €. Other TSOs stated that in connection with the introduction of the EASEE-gas standard in 2005 a switch over to a new set is not necessary and therefore no additional costs are expected.
- One TSO believes that the introduction of the common reference temperature that is currently proposed by ENTSOG will create an error in the energy measurements at its IPs. The initial analysis suggests that this error is approximately 0.02% and for its IPs it is likely to result in a misallocation of energy equating to several hundred thousand pounds per year.
- Another TSO stated in the hypothesis to manage a transitory period with the coexistence of old and new measure sets, it is necessary to arrange the measure collection system to recognise what kind of measure comes from field and to operate with different sets of units.
- Two TSOs stated that they subscribe the view on harmonisation of processes; it will lead to lower costs on systems and its interfacing and less effort because of preventing confusion. They therefore use as much as possible the common set of standards and units in internal and external systems as well as message exchange and external communication for several years. When new platforms will be attached (like for e.g. auction platforms) they expect further extension of the use of standard units.

Switching over to a different set of units other than the one proposed in the new Regulation would lead to substantial costs.

Question to NRAs:

31. With regard to the categories of units listed in Question 30, please provide information on whether and which the use of any specific units are enshrined in national law/regulation, substantiating the reply.

> Ofgem (UK)
  - 'Gas Safety (Management) Regulations 1996 GS(M)R:
    - hydrogen sulphide content ≤5 mg/m3;
    - total sulphur content (including H2S) ≤50 mg/m3;
    - Wobbe Number ≤51.41 MJ/m3, and ≥47.20 MJ/m3
  - The Gas (Calculation of Thermal Energy) Regulations 1996
    - This piece of GB national legislation makes repeated reference to gas reference temperature of 15°C when defining how gas flow calculations should be completed.

> ACM (Netherlands)
  - In the national grid codes the following units are used:
    - Wobbe index MJ/m3(n)
    - Transport capacity m3(n;35,17)/hour or MJ/hour
    - m3 (n) normal conditions of gas are T = 273,15 and P =101,325 kPa

> AEEG (Italy)
  - For the metering process
    - Volumes (please specify the reference conditions of temperature and pressure):
      - cubic meters 15 °C, 1.01325 bar
    - Energy content (please specify the reference conditions of temperature and pressure)
      - Joules (and multiples) MJ/m3 at 15 °C (enthalpy), 15°C, 1.01325 bar
    - Gross Calorific Value (please specify the reference conditions of temperature and pressure):
      - Mega-joules per cubic meter MJ/m3 at 15 °C (enthalpy), 15°C, 1.01325 bar
    - Wobbe index (please specify the reference conditions of temperature and pressure):
      - Mega-joules per cubic meter MJ/m3 at 15 °C (enthalpy), 15 °C, 1.01325 bar

- Pressure:
    - Bar
- Temperature:
    - Degrees Celsius

- For transparency publications: Units foreseen by Regulation 715/2009 Chapter 3 of Annex I - kWh with a combustion reference temperature of 298,15 K for energy content and m3 at 273,15 K and 1,01325 bar for volume (ref. TSOs network codes)

> Hungarian Energy Office

- Units are in use in daily external communication and public information
    - Currently: m3 (15 ºC); MJ (15/15 °C) based of NCV (Normal Calorific Value)
    - Energy content:
        - Joules (and multiples)
    - Calorific value:
        - Mega-joules per cubic meter
    - Wobbe index:
        - Mega-joules per cubic meter
    - Pressure:
        - Bar, Absolute pressure
    - Temperature:
        - Degrees Celsius

> CER (Ireland)

- No categories of units are specified under national law or regulation. Gas quality specifications are set out in the Gaslink Code of Operations. The Code of Operations is legislated for in Section 13.1 of the Gas Amendment Act, 2002. The units and ranges set out in the Code are included below.
    - Quality Specification Of Natural Gas At Entry Points
        - Total Sulphur ≤ 50mg/m3 (including H2S)
        - Oxygen ≤ 0.2 moll%
        - Carbon Dioxide ≤ 2.5 moll%[1]
        - Hydrogen Sulphide ≤ 5mg/m3
        - Water Content ≤ 50mg/m3
        - Gross Calorific Value (Real Gross Dry) 36.9 - 42.3 MJ/m3
        - Wobbe Index (Real Gross Dry) 47.2 – 51.41 MJ/m3
        - Incomplete Combustion Factor < 0.48
        - Delivery Temperature 10C to 38oC

    - Hydrogen < 0.1 moll%
    - Soot Index < 0.60
    - Organo Halides < 1.5 mg/m3
    - Radioactivity < 5 Becquerels/g
    - Ethane < 12 moll %
    - Nitrogen ≤ 5 moll %
    - Hydrocarbon Dewpoint ≤ - 2oC up to 85 barg
- The CO_2 limit of 2.5% will not be considered breached if the total inert (including CO_2) in the gas is less than 8% where: "inert" in natural gas means carbon dioxide(CO_2), nitrogen(N_2), helium(He), argon(Ar), and oxygen(O_2).

Data Exchange

Questions to TSOs:

The answers on the questions below are a summary of the responses of the TSOs' answers on each question. A detailed analysis of the answers can be found in the cost benefit analysis study on data exchange executed by ENTSOG. The CBA can be found at: http://www.entsog.eu/public/uploads/files/publications/INT%20Network%20Code/2013/INT0414-130709%20CBA%20DataExchange_Final.pdf

32. Please describe your existing practice of data exchange with adjacent TSOs and to counterparties including network users, third parties, trading platforms etc.

Data exchange(s) in use today		Application context (nominations, Matching, trading, other)	Type of data network (Internet, ISDN, VPN …)	Data exchange protocol (FTP, AS2, ebMS …)	Data content format(EDIFACT, Edigas-XML, Excel)	Communication partners			Comments & Remarks
						TSOs	non-TSOs		
						number of TSOs	Type of counter party (DSO / SSO / LSO…)	number of non-TSOs	
Document based Data Exchange	1..n								
Integrated Data Exchange	1..n								
Interactive Data Exchange	1..n								

The answers collected from TSOs on the question above are presented in the tables below giving an overview of the current practices in the EU member states.

Spread of data exchange network (document based DE)					
	Internet	*ISDN*	*VPN*	*PN*	*Others*
Country					
AT	X				
BE	X			X	
CZ	X				
DE	X	X	X	X	
DK	X				
FR	X	X		X	X
GB	X	X	X		
GR	X				X

HU	X									
IE	X									
IT	X		X				X			
NL	X		X							
PT	X									
SE	X									
SI	X								X	
SK	X									
SP	X		X							
	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO
Used by % of respondents	86 %	100%	24 %	30%	14 %	0%	17 %	10%	14 %	0%

Spread of data exchange protocols (document based DE)														
Country	*AS2*		*FTP*		*sFTP*		*HTTP*		*HTTPS*		*SOAP*		*SMTP*	
AT	*X*				*X*		*X*		*X*				*X*	
BE	*X*		*X*						*X*		*X*			
CZ	*X*										*X*		*X*	
DE	*X*		*X*				*X*		*X*		*X*		*X*	
DK	*X*										*X*		*X*	
FR	*X*		*X*						*X*		*X*			
GB	*X*		*X*		*X*		*X*		*X*					
GR													*X*	
HU					*X*								*X*	
IE			*X*						*X*				*X*	
IT	*X*		*X*		*X*		*X*		*X*				*X*	
NL	*X*		*X*		*X*		*X*		*X*				*X*	
PT			*X*						*X*				*X*	
SE													*X*	
SI													*X*	
SK	*X*												*X*	
SP			*X*		*X*		*X*		*X*		*X*		*X*	
	TSO	*Non-TSO*	*TSO*	*Non-TSO*	*TSO*	*Non-TSO*	*TSO*	*Non-TSO*	*TSO*	*Non-TSO*	*TSO*	*Non-TSO*	*TSO*	*Non-TSO*
Used by % of respondents	*45%*	*35%*	*45%*	*30%*	*21%*	*10%*	*14%*	*5%*	*17%*	*55%*	*21%*	*0%*	*59%*	*25%*

Spread of data exchange protocols (integrated DE)							
	AS2	*FTP*	*sFTP*	*HTTP*	*HTTPS*	*SOAP*	*SMTP*
Country							
AT					X		
BE						X	
DE				X	X	X	
DK						X	
FR						X	
GB					X		
HU						X	
IE						X	
IT					X		
NL				X	X	X	
SI						X	
SP						X	

	AS2		*FTP*		*sFTP*		*HTTP*		*HTTPS*		*SOAP*		*SMTP*	
	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO
Used by % of respondents								40%	36%	20%	64%	40%		

Spread of data exchange format (document based DE)						
	XML	*CSV*	*Excel*	*EDIFACT*	*Edig@s XML*	*Kiss-A*
Country						
AT					X	X
BE		X		X	X	
CZ					X	
DE	X			X	X	X
DK	X			X	X	
FR	X	X		X	X	
GB	X				X	
GR			X			
HU			X			
IE	X	X				
IT	X		X	X	X	
NL	X			X	X	
PL		X	X		X	

PT					X							
SE							X					
SK					X				X		X	
SP	X		X		X		X		X			
	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO
Used by % of respondents	38%	65%	24%	0%	28%	5%	34%	45%	48%	30%	17%	10%

Spread of data exchange format (integrated DE)												
Country	*XML*		*CSV*		*Excel*		*EDIFACT*		*Edig@s XML*		*Kiss-A*	
BE	X											
DE	X								X			
DK	X											
FR	X											
GB	X											
IE	X											
IT	X											
NL	X		X									
SI	X										X	
SP	X								X			
	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO	TSO	Non-TSO
Used by % of respondents	92%	80%	8%	20%					8%	20%	8%	

33. What long term benefits and to whom are expected if every TSO will be ready to use the same data exchange rules and technology? Please explain your reasoning.

Based on responses given in the questionnaire the following qualitative benefits were identified when harmonising the Data Exchange solutions:

> *Harmonised gas-market Data Exchange will remove cross-border trade barriers*

> *Fewer communication solutions (for each platform or business process) to maintain will lead to reduced costs*

> *Less time effort in preparing and establishing new connections with partners*

> *Higher communication reliability with fewer Data Exchange solutions in place*

Less expensive transactions due to more intensive use of harmonised data exchanges