GAS QUALITY STANDARDS IN THE EUROPEAN UNION
The need to develop European gas quality standards to achieve market integration and a competitive gas appliance market

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Keywords: gas quality, transmission, network, appliances, integration, EU, gas treatment, Wobbe Index, CEN

1. The history of gas quality as an issue in EU gas market policy

The European Union’s gas market liberalisation and integration started in the 1990s under the visionary Commission of Jacques Delors. Quite some years passed before the political decision was put into legislation, and the first internal gas market Directive was adopted in 1998. What started as a simple and one-dimensional policy to liberalise the energy markets, has turned into one of the core issues of the European Union that is determined by three dimensions. Although the order of priority changes with changing markets, new scientific reports and geopolitical twists and turns, competitiveness, sustainability and security of supply form the triangle within which the EU’s energy policy is shaped. Regulated access to networks in order to create competition between suppliers in an integrated European market is the basis of the gas policy. Previous integrated national monopolies that were responsible for development of networks and markets are separated into suppliers that need to compete in a European market on the one hand, and into regulated network operators that need to harmonise operations across borders on the other hand.

Integration of transmission networks in order to enable competition to develop on a European level is the cornerstone of the internal gas market policy. Such integration is formed through harmonisation of access rules for suppliers, which requires increased cooperation and coordination of transmission system operators (TSOs), as well as regulatory oversight on a European level. To this end, the third internal energy market package that has been adopted by the Council on 25 June and will enter into force in the second half of 2009 establishes a European Regulatory Agency for the electricity and gas markets, as well as the European Networks of TSOs for both Gas and Electricity (ENTSO-G and ENTSO-E). Network operations have always had a cross-border dimension as very few countries existed as autarkies and, in the case of gas, transit arrangements had to made to transport gas from production field to the area of consumption, since more than 60% of the gas consumed within the EU crosses at least one border. Cooperation as it happened in the old days is no longer possible in a world were supply and transmission businesses are separated, and integration of markets to accomodate competitive supplies requires far more intense and detailed cooperation.

With the first steps of gas market liberalisation, the difference in compositions of natural gas in function of were it was produced, was already identified as an issue that can hinder the integration of markets. Not the difference between the low-calorific gas (L-gas and G-gas) as produced mainly in the Groningen field and the high-calorific gas (H-gas) as produced in most other sources of gas of the EU at that time was meant, but the differences in quality within the H-gas as transported through the interconnected European network.

During the discussions on the functioning of the internal market that lead to the Commission’s third internal energy market proposal, gas quality came up as a topic, when Mr Alejo Vidal-Quadras, Vice President of the European Parliament and responsible for the Parliament’s response to the European Commission’s ‘Report on Prospects for the internal market for electricity and gas’ stated that: “The Rapporteur is concerned mainly by the lack of harmonised standards regarding natural gas. This situation causes uncertainty in the market as companies do not know if the gas they buy in one field would be allowed access into the different national networks. The Commission should strongly look into this problem and find a solution in a timely manner.”

* the views of the author are strictly personal and do not necessarily reflect those of the European Commission
A year before, the High Level Group on Competitiveness, Energy and the Environment, in which Commissioners Verheugen (Enterprise and Industry), Dimas (Environment), Kroes (Competition) and Piebalgs (Energy), as well as Member States and Industry representatives are present, recommended in its report: "The interoperability of gas systems requires greater harmonisation including co-ordination of the gas quality specifications at the EU entry points and within the EU to facilitate the development of a liberalised and competitive European gas market."[5] In fact, all along the process of liberalisation and market integration a search for a solution for the gas quality issue has been going on, as is shown by the discussions in the European Regulatory Forum for Gas (the Madrid Forum).

In the first Madrid Forum that took place on 30 September and 1 October 1999, some participants already stated that: "in a totally liberalised framework and with the increasing of gas trade between Member States, it is fundamental to ensure that there are no potential obstacles to trade, in particular those coming from different technical regulations (gas qualities, construction design of pipelines, balancing regimes...)."[6] In the second meeting of the Forum, Gas Transmission Europe (GTE), the association of gas TSOs in the EU, was invited to analyse "possible obstacles to trade caused by differences in gas qualities and other technical parameters having an impact on interoperability and interconnection of networks."[7] This seemed to have lead to a common understanding that gas quality was indeed an important issue, as the conclusions of the fourth Madrid Forum state: "The Forum stressed the importance of removing, as far as possible, barriers to trade created by gas quality issues. Efforts must be made to further harmonise gas quality specifications and to reduce the number of these as much as possible in order to facilitate cross-border trade."[8]

Inspired by the work of the North American Energy Standards Board (NAESB) in the USA as a representation of all industry to define standards for the gas industry, the European Association for the Streamlining of Energy Exchange (EASEE-gas) was set up in 2002 to develop Common Business Practices (CBPs) to develop interoperability of networks on a voluntary basis. Gas quality was identified as one of the core issues that this association should address.[9] The new organisation was officially set up in 2002 and got to work swiftly. CBPs were developed for many interoperability issues, such as data exchange and settlement, as well as codification of information. At the sixth Forum GTE stated that TSOs would be less capable of managing gas quality issues in the future, due to separation of supply and network operations. Gas quality now became a clear priority in the European Union, and the Forum agreed on 30 and 31 October 2002 to an action plan:

"1. Initiate immediate discussions among all relevant stakeholders (upstream to downstream) of the proposal presented by GTE at the 6th meeting of the Madrid Forum with regard to streamlining interoperability for high calorific gas qualities in terms of (i) combustion properties; (ii) Gross Calorific Value and (iii) additional components. EASEE-Gas shall be the forum for these discussions which shall include:
   - Consistent approach on combustion properties;
   - Review the billing arrangements that lead to restriction in the GCV range;
   - Agreement on common values on gas specifications (additional components).
   The scope for widening gas quality specifications shall also be analysed including cost-benefit analysis and recommendations shall be made if appropriate.
2. Depending on the recommendations made for the next Madrid Forum by EASEE-Gas (ref. Point 1):
   - The legal framework in some countries would have to be adapted. This, however, should not delay the implementation of existing commitments;
   - The necessary changes would have to be implemented in all supply and transportation contracts from upstream to downstream by all stakeholders."

b The European Regulatory Forum for Gas was set up by the European Commission to discuss the implementation of legislation with industry, gas consumers, regulators and Member States. It takes place once or twice every year in Madrid and is hosted by the Comision Nacional Energia (the Spanish regulator). Conclusions, agenda and issues discussed can be found at: http://ec.europa.eu/energy/gas_electricity/forum_gas_madrid_en.htm.
Discussions within EASEE-gas lead to a gas quality CBP by February 2005, which proposed that all gas within these specifications would be accepted at the border. It addresses both combustion and non-combustion parameters, the first ones being most relevant for the burning of the gas, whereas the second ones are mostly an issue for upstream transport and processing. Recognising the consequences for appliances of changing combustion parameters, EASEE-gas agreed that non-combustion parameters should be brought in line with the CBP by October 2006, and the combustion parameters by 2010. The CBP and the different parameters of the gas are shown in the table below:

<table>
<thead>
<tr>
<th>Parameter (as S)</th>
<th>Unit</th>
<th>Min</th>
<th>Max</th>
<th>Combustion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross (Superior) Wobbe Index</td>
<td>kWh/m³</td>
<td>13.60</td>
<td>15.81</td>
<td>Combustion</td>
</tr>
<tr>
<td>relative density</td>
<td>m³/m³</td>
<td>0.555</td>
<td>0.700</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Oxygen</td>
<td>mol %</td>
<td>-</td>
<td>0.01</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Total Sulphur</td>
<td>mg/m³</td>
<td>-</td>
<td>30</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Hydrogen sulphide + Carbonyl sulphide</td>
<td>mg/m³</td>
<td>-</td>
<td>5</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Mercaptans</td>
<td>mg/m³</td>
<td>-</td>
<td>6</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>mol %</td>
<td>-</td>
<td>2.5</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Water dew point °C at 70 bar (a)</td>
<td>-</td>
<td>-8</td>
<td>-8</td>
<td>Non-combustion</td>
</tr>
<tr>
<td>Hydrocarbon dew point °C at 1-70 bar (a)</td>
<td>-</td>
<td>-2</td>
<td>-2</td>
<td>Non-combustion</td>
</tr>
</tbody>
</table>

*Figure 1: EASEE-gas CBP Gas Quality [11]*

This CBP was extensively discussed at the tenth Madrid Forum, where it also became clear that implementation of such CBP would lead to considerable difficulties. The UK presented its study which lead to the conclusion that its gas quality standards could not be changed in line with the CBP, due to the safety of gas-appliances that only tolerate a narrow band.[12] At the same time, Spain argued that gas quality standards should be as wide as possible to include LNG, which typically has a higher calorific value than other gas in the EU. The industrial consumers, represented by the International Federation of Industrial Energy Consumers (IFIEC) and the Chemical Energy Federation International (CEFIC) were concerned that changes in gas quality would force them to invest to ensure continued operations, and specifically asked for timely announcement and transparency of gas quality.[13] To deal with all these concerns, the European Commission agreed to make an inventory of all gas quality issues, and to make a cost-benefit analysis that would propose a solution.

Despite the fact that the gas quality CBP provided for a common standard for TSOs at the border and explicitly left downstream effects to be solved on a national level, it seemed impossible to

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[11] The results of this inventory is an overview of interoperability issues and implementation of CBPs at all cross-border points and is put on line and managed by Gas Infrastructure Europe (GIE - the association of gas infrastructure operators in the EU): www.gie.1click.be
ignore the effects on gas appliances if a common gas quality at the borders was ever to become a reality. The 11th Forum “stressed the need to study common technical issues on a European level linked to the implementation of the EASEE-gas CBPs on gas qualities, including the functioning of gas appliances, safety, emissions and efficiency.”[14]

The European Commission then decided to issue a mandate to the European Standardisation Body (Centre Européen de Normalisation – CEN) to draw up European standards for gas quality so that the full gas chain from production to consumption would be taken into account. This mandate was sent as a formal request to CEN in January 2007 and was presented at the 12th Madrid Forum on 20 and 21 February 2007.[15]

The Madrid Forum brings together the gas industry and consumers with Member States and regulators, to discuss the European gas market legislation. This legislation however focuses on access to networks and the free choice of consumers to purchase their gas. The consumption of gas itself is outside of the scope and therefore the gas appliance market also. The European market for domestic gas appliances is organised according to Directive 90/396/EEC on gas appliances (Gas Appliance Directive – GAD)[16], in particular to ensure the safety of the consumer in relation to the gas quality used by the appliance. GAD has been a success since it has increased the competition in the gas appliance market which has resulted in increased economies of scale, lower prices, and the safety of the appliances has been maintained. However, the Directive requires Member States to communicate the types of gas and corresponding supply pressures to each other and to the Commission, so that supply manufacturers know the requirements in the different markets. Appliances that are placed on the market must be accompanied by technical instructions for the installer that specify among others the type of gas used. If the appliance manufacturer meets the requirements of GAD, including an approved quality system for the final inspection of the appliances and the testing of the appliances, the manufacturer will obtain the EC declaration of type conformity. Thereby all appliances are earmarked for a specific gas quality related to a specific market, even if they could be relatively easily adjusted. Moreover, upon installation the appliance may be adjusted according to national installation rules. The market for GAD appliances therefore remains segmented, with negative consequences for the prices of the appliances. Wide varieties in the prices of for example boilers exist across the EU. The European Commission is currently doing a study to look into the global competitiveness of the European gas appliance industry under the Entrepreneurship and Innovation Programme (EIP) within the competitiveness and Innovation Framework Programme (CIP) (2007-2013)[17].

To guarantee safety appliances need to be tested, and a standard has been defined for this, namely EN437. It consists of a series of gas compositions (but only defining combustion parameters) and relates to what appliances should be able to handle. The range of gas qualities under EN437 is however not useful for harmonisation of gas quality in the EU since it addresses the functioning of appliances under extreme conditions, and it does not oblige all appliances to manage the full range all the time.

2. Problem

It is evident that differences in gas quality in an integrated and liberalised market for gas supply and gas appliances create a problem, but what is it exactly? Before liberalisation some countries already obtained gas from different supply sources with different gas quality characteristics. What makes the current market situation different from the old days, and why have all the discussions and initiatives so far not have achieved the solution?

Historically countries have designed their gas market, from well-head to burner-tip, based on the gas quality of the supply source. Consequently, operational standards of the network as well as the design and installation requirements of gas appliances are determined by rules that originate in these historic gas sources. These rules in turn determine the specifications of the gas that can be transported, and it is the TSOs responsibility to ensure that the gas he accepts into his system meets the specifications. When markets integrate new gas from different sources will arrive in the system. However, in the European gas market TSOs are at least separate legal entities (for now) who cannot be involved in the supply or import of gas. The TSO measures the gas quality, but he does not own the gas he transports, nor does he know where the gas originates from. In case the
gas is not within the required specifications and it cannot be accepted in the system, he does not bear the costs, for example costs for being out of balance or for purchasing alternative gas. At the same time the owner of the gas, i.e. the supplier, bears the responsibility to meet the gas quality specifications in a market, but he does not know the gas quality specifications of his gas.

To ensure that gas is always within the required specifications, the TSO could install gas treatment equipment. In the time of integrated transport and supply companies he would have to bear the costs in case the gas would be out-of-spec, and he would know where the gas comes from. The integrated company could therefore design gas treatment facilities according to its well-known needs and/or match its imports with its possibilities to manage differences in gas quality.

In a European integrated market, where transport is separated from supply, and access to networks is granted not based on point-to-point transport of gas but based on decoupled entry-exit models in which the route and location of gas is irrelevant once it entered the market, the TSO does not know where the gas comes from that enters his system. To manage the gas quality, he can either oblige shippers to meet the specifications or to treat the gas before it enters the system. Only if a shipper buys the gas directly from the producer he will know what the quality is. But if he transports it through one system before entering the system where he delivers the gas for consumption, it has been mixed with other sources of gas or may be completely different gas all together. Moreover, when entering the system for final delivery, more shippers may deliver gas at that specific entry point, and neither the shippers nor the the TSOs, in particular the receiving TSO at that entry point, will know who is to blame if the gas does not meet the requirements.

Gas treatment can be provided for by the TSO, but he will not know what gas to expect and therefore cannot decide on the optimal size of the facility. It is also unlikely that he will know who to charge for the gas treatment, especially the TSO that is at the receiving end, but also the TSO upstream may have difficulties to determine the link between origin and ownership. This last TSO may have more knowledge on the origin of the gas but if it is not his system that requires gas treatment he will not be tempted to make the investment.

To put it short, the liability is with the ensemble of the shippers and the ability to manage the problem is with the TSOs, and each separately has too little information to find the optimal solution.

This problem is only expected to increase. As markets become more interconnected and domestic production in the EU decreases, the flow of gas is changing and will continue to change. More importantly, contractual transfers of gas within systems and between systems is increasing enormously. Differences in gas quality requirements that block the free flow of gas across borders will hamper market integration, the development of competition, and create risks in terms of security of supply.

If trading in gas needs to take into account the quality of the gas due to its final destination, it will impact negatively on liquidity as it will create parallel markets. Market integration is prevented due to ‘borders’ of gas quality specifications, and competition cannot develop on a European level as it should. In case of supply shortages, peak demand or sudden disruptions, differences in gas quality requirements at borders can forbid the inflow of certain gas sources and cause supply shortages or price peaks. Gas quality restrictions may also make markets less interesting for (global) producers or cause them to demand a premium to the gas price in other markets.

The market for gas appliances is also dysfunctional and segmented due to gas quality differences within the EU, and this leads to higher prices and less competitiveness. The climate change policy of the EU puts great emphasis on reduction of CO₂-emissions through increased energy efficiency, and a considerable contribution from gas appliances is expected. Innovation and installation of new and efficient technologies for domestic gas appliances are needed, which will thrive on large and competitive markets with a common gas quality standard. Ending the current market segmentation will require a solution for the gas quality issue on a European level.

However, the goal of competitive gas supply markets and the goal of high efficiency of appliances may require conflicting results when it comes to harmonisation of gas quality. Whereas the gas supply market would benefit from a wide range of gas specifications to be accepted at any border,
the gas appliances may benefit from a very narrow range so that the efficiency can be optimised for a precise balance of oxygen and gas in the combustion.

Both internal gas market liberalisation and competition in the gas appliance market require that a solution is found to deal with the differences in gas quality in the EU. So far, the issue has mainly been addressed from the point of view of the gas supply market. However, a solution as proposed by EASEE-gas in the Madrid Forum has not been implemented in many countries due to the unknown or feared effects on gas appliances. Legal or contractual requirements that define the gas quality specifications at transmission system level originate from the need to ensure safety of the users of appliances. Policy regarding gas appliances has also recognised the importance of gas quality to create a European market, but since it focuses on competitiveness and efficiency at the same time a desired outcome on gas quality is difficult to design, in particular when upstream effects and/or actions are outside of the scope of the policy.

Therefore, any solution needs to look at the full chain from production to burner tip. Therefore the European Commission has issued a mandate to CEN to draw up gas quality standards that has to take into account the effects on the full chain. How can the mandate ensure that a solution to the gas quality issue is finally reached within the EU?

3. Aims

The goal of this paper is to describe the European Union’s policy response to the issue of different gas qualities in the European Union. Gas quality needs to be harmonised in the EU to create a real internal market for gas supply and gas appliances, but it needs to take into account other policy goals, in particular the safety and efficiency of gas appliances. The paper will address the framework within a solution has to be found, based on the description of the problem above. In particular the solution will need to address the issue of liability and ability to act, and it will assess how this can be done while respecting the overall policy goals of competition, sustainability, security of supply and safety of users. Also the framework will explore different ways of harmonisation: do we need a single and common gas quality in the whole EU, should it apply only at borders, or should there be several zones with each a gas quality standard? It will address the parameters that are defined in the standard.

Subsequently the method to define the standard will be described. As stated above, the basis for the method is the mandate to CEN, which defines standards through meetings of expert committees of national standardisation bodies. This work is ongoing, and therefore the paper will not present the final answers but describe what needs to be addressed and what information will be needed to come to a standard. Finally, conclusions will be drawn on key aspects and critical points of the mandate, the success factors to come to a gas quality standard that meets the conditions, and the way forward will be explained.

4. Framework

Scope of gas quality harmonisation

First of all, the scope of the gas quality harmonisation needs to be assessed, in the sense of the geographic scope as in the sense of the scope of the parties to which it applies.

With increased market liberalisation and a change in the sources of gas that will enter Member States, as well as the increased imports of LNG and possible new sources of gas that will come to the EU, it is not likely that the gas quality will change everywhere. It is possible that some geographic areas in the EU will remain reliant on the traditional source of gas, even though contractually new suppliers with new sources may enter those markets. This is for example the case of Slovakia, a landlocked country that is close to Russian gas and far away from any other source of gas. In other areas many different sources will come in as they are trying to become a hub where different sources of gas meet, such as in Zeebrugge in Belgium and in the Dutch gas system that is envisaged to develop into a gas roundabout, and where LNG, Norwegian gas, Dutch gas and Russian gas may all meet. In Spain on the other hand, much LNG will continue to come in together with Algerian gas, and any other source of gas is again far away. Harmonisation
of gas quality will need to take into account the physical flows of gas and identify the zones where gas from various sources will be mixed, as well as the zones where gas quality is likely to be unchanged. In both kind of zones gas quality harmonisation is needed to ensure interoperability of the systems, but they may be different due to the physical characteristics of the gas present in those zones. In such case the frontiers of both zones are the most important, as those are the zones where risks for shippers arise and responsibilities for ensuring that the gas specifications are in line with the requirements of the system that is being entered need to be clearly allocated.

This is related to the other scope, namely the parties to which gas quality applies. In case of EASEE-gas’ CBP, the harmonisation applied to TSOs at cross-border points. In principle the two extreme possibilities would be to impose a common gas quality specification on all gas entering the EU (i.e. an obligation on upstream suppliers or an obligation on all the TSOs or LNG-terminal operators at the entry point into the EU), or to impose harmonisation of gas quality on the appliances. The issue at stake is of course the question who bears the costs of the harmonisation. Bluntly stated, the costs should be borne by those who benefit from it, which are normally the gas consumers and the gas appliance users (who are usually the same) because of the positive effects on gas prices and gas appliances. The benefits can also end up with the producer or supplier of gas or gas appliances who may be able to gain market share as a consequence of harmonisation of gas quality. In the end, all costs that are made in the gas supply chain are borne by the final consumer, but the question is to what extent the parties that face the direct cost can transfer those costs to the final consumer.

In case of a gas quality harmonisation at appliance level, it requires more flexibility of appliances and this will increase the costs of the appliance. Appliance manufacturers will be able to regain those costs from consumers, in particular if there is an EU-wide obligation for appliance manufacturers, but if the costs are too high these consumers may switch to other fuels.

In case the harmonisation is imposed on TSOs, who are regulated businesses, either shippers or upstream producers need to be charged explicitly for gas treatment, or the costs of ensuring that gas quality is in line with the specifications the costs are included in the tariffs for network use. As shown above, it is difficult if not impossible to identify which shipper inserts gas into a system that does not meet the requirements. This may be possible at the entry into the EU’s transmission system from an upstream pipeline (or an LNG-terminal). At the moment this is the case at all the entry points into the system, whether they are inside the EU (such as local production in the Netherlands or Romania) or outside the EU (such as gas coming in from Algeria through Italy or Spain, Russian gas into Slovakia, or gas from Norway coming into the UK). Only if upstream suppliers or producers are willing to accept those costs at the expense of their profit margin, can they explicitly be charged. Otherwise huge investments from the TSOs at the EU’s border are required and downstream TSOs benefit from these investments. As this will lead to an increase of network tariffs it will also increase the gas price for consumers in the system of those TSOs without any direct benefit.

Moreover, general measures at the beginning or end of the chain risk to be inefficient, because they do not distinguish between areas where gas quality will actually change and where it is not likely to change. Therefore, any gas quality harmonisation needs to look into the physical flows of gas now and in the future, and identify where the measures are most efficient.

Policy Framework

A solution for the gas quality issue needs to meet the general objectives of the European energy policy: competitiveness, sustainability and security of supply. Competitiveness is also the main objective that needs to be met from the point of view of European industrial policy. Furthermore, a solution for the gas quality issue needs to guarantee the safety of the citizens, in particular the users of the appliances, as a key objective of European consumer policy.

In terms of competition, the EU works towards integration of the national or regional networks by harmonising the access conditions at the borders. Different rules regarding the flow of gas, the allocation of capacity and the determination of balancing payments pose major risks to suppliers that want to optimise their portfolio across a border. Harmonisation would minimise the risks of transporting gas across a border and remove the entry barriers for suppliers into new markets, for
example by allowing suppliers to pool their imbalances across borders or use their storage capacity with the same degree of freedom in more than one transmission system. To this end, the third package proposes in the Gas Regulation (Article 6 to 8) a structure in which network access rules are harmonised on a European level through binding European network codes. The Commission defines the priorities for network codes to be developed, the Agency subsequently draws up a framework guideline setting the problem analysis, the goal and the criteria the network code needs to meet, after which ENTSO-G proposes a network code. All these steps depend on input from the market parties, in particular suppliers and consumers, to ensure that any network code facilitates cross-border network access. If the network code meets this requirement and is agreed by the Agency and the Commission, it can be made binding. This happens through the so-called comitology process, that enables the Commission to adopt binding rules after approval of a committee of experts of national governments and consultation of the European Parliament. This procedure is much faster than a normal legislative procedure and is only possible for detailed rules that are needed to implement the principles agreed in the basic legal act (in this case the Gas Regulation).

The list of topics for which network codes can be developed is listed in Article 6 of the new Gas Regulation, and includes ‘interoperability of networks’. Gas quality is of course one of the major interoperability issues, but work towards harmonisation is not done through network codes but through a mandate to CEN. As explained above, this relates to the importance of gas appliances that fall outside of the scope of the internal gas market framework. However, any future standard for gas quality may still require rules on cooperation between TSOs to optimise the ability to blend gases from different sources and/or use of gas treatment facilities that can be addressed in a network code.

At the same time, gas markets will integrate and physical gas flows will become decoupled from trading in gas and transport of gas in a decoupled entry-exit system, as is described in chapter 2. The new Gas Regulation makes decoupled entry-exit transmission systems compulsory in Article 13. In such a system shippers can book capacity into a system independently from the point where they want to exit the system, thereby creating a virtual zone in which all the gas that has entered the system can be traded without the need for it to be physically in the same location. Harmonisation of access rules of networks reinforces this trend and will lead to integration of hubs and balancing zones across borders.

The mandate on gas quality follows the policy objectives set in the new Gas Regulation. Gas quality needs to be harmonised so that it cannot be a hindrance to market entrance, nor create an additional risk when a border is crossed. Therefore, the risk that is currently borne by a shipper needs to be transferred to the TSO. Gas quality specifications need to be harmonised across borders, as proposed by EASEE-gas, since shippers cannot control the gas quality of the gas they want to ship in a liquid gas market. The harmonised specifications need to be as wide as possible from the perspective of competition in the gas market, so that any supplier with any source of gas can enter the market. The network operators are responsible for the flow of gas, and they have the opportunity to optimise the differences in gas quality. Normally this means minimising the variation in gas quality that consumers receive. The standards should not eradicate the responsibility nor economic incentive that a network operator has for this optimisation.

With respect to Security of Supply, a distinction needs to be made between long-term and short-term security of supply. In the long-term security of supply means being able to import gas into the EU, i.e. making sure that sufficient gas is produced outside the EU and that it can be brought to the EU. The infrastructure that is needed to import gas needs to be there, and not pose any unnecessary restrictions to the imports, for example by imposing strict gas quality standards that not many producers will be able to meet. In the end of course this is a matter of money, and if the EU would impose strict conditions on upstream suppliers, it would need to pay for it, in particular in a global market hungry for gas where other consumers have a much less acquired taste. Only in case upstream suppliers provide gas below the marginal cost, may increase market share and do not have a choice regarding the delivery of their gas, they could accept such conditions that go at the expense of their profit margins. Such situation is not likely in the long term where gas is a scarce resource.
In the short term security of supply means that the gas can flow where it is most needed, and that gas quality is not a factor that limits the responsiveness of the system. Recent events have alarmed Member States’ governments and the EU about the constraints that gas quality can put on the ability of markets to deal with peak demand or sudden supply interruptions.

In the winter of 2006 high import requirements lead to peak prices in the UK while the interconnector between the UK and Belgium was not fully used to bring gas to the UK. The lack of response in Belgium and its neighbouring markets was first of all a fundamental issue of the absence of gas-to-gas competition and pricing that left absent any trigger for the Belgian market to reduce consumption and ship gas to the UK. However, it also raised questions if the narrow band of gas quality specifications that defines gas that can flow into the UK through the interconnector caused any restriction of flows from Zeebrugge (without any clear answer but with the general perception left behind that something needed to be done). The Russia-Ukraine dispute in January 2009 also triggered a discussion, albeit outside of the big political discussions on how to deal with transit and import dependency. The restrictions in gas flows on the German-French border due to differences in gas quality (in particular the odourisation of gas that in France takes place in the transmission system whereas in other MS in the EU it takes place in the distribution system) prevented gas flowing into Germany as part of the market’s response to flow gas from west to east.

The European Commission proposed on July 16 a new Regulation on Security of Supply[18], to improve the EU’s ability to deal with future supply disruptions as well as peak demand situations. It is based on two elements, first of which is ensuring that the internal gas market is better able to deal with such situations, by proposing concrete measures regarding the interconnections between markets, the ability of the transmission system to accommodate market responses, and the restrictions to random political interference in the market. Second element is the harmonisation of standards when it comes to dealing with extreme situations, in particular peak demand. Therefore all Member States need to have national emergency plans based on risk assessments, that incorporate cross-border effects of crisis responses, and, if the Commission recommends so, ensures that Member States prepare emergency responses on a regional level. In case a real emergency takes place and the ‘normal’ market forces are not able to cope with it, the Commission will ensure a coordinated European response so that individual Member States do not take measures at the expense of one another.

The measures on infrastructure consist of the so-called N-1 rule, that obliges Member States to have an infrastructure back-up if the largest piece of infrastructure fails to supply, and of the reverse-flow obligation, that requires Member States to install the physical ability to accommodate bi-directional flows at interconnection points. In both cases, previously separated markets will now be connected and gas sources that were previously physically unable to reach some markets, will now be able to flow into new markets. Security of supply concerns, in particular after the events of January 2009, have lead to a diversification policy in some countries that were previously dependent on a single source, such as Bulgaria that has recently agreed to build a new pipeline to Greece to connect to Turkey, and the Polish initiative to build an LNG terminal. This will lead to new sources of gas with difference in quality compared to the traditional source flowing into the country. In the rest of the EU, the gas flows under normal (commercial) conditions will not change, but in case of emergencies, installation of reverse flows will cause a change of gas quality in some systems. It is unimaginable that investments that are made to diversify and be able to cope with a supply disruption, are consequently unused due to differences in gas quality. Whereas it is a national policy to diversify on a long-term basis Member States may be expected to take care of it, but when it comes to crisis-responses and investments in gas treatment following investments in reverse-flows, that is less obvious. Therefore European harmonisation of gas quality is needed.

In a recently published study GIE, in response to the Commission’s proposal on security of supply, states that all the investments in reverse flow can only function if there is no the issue of gas quality, and they do not know where this may be an issue, nor what kind of investments are needed to solve it.[19]

The EU’s climate change policy goal is to limit the effects of emission of greenhouse gases on the atmosphere to a maximum increase of temperature of 2 degrees Celcius.[20] The main policy instrument to achieve this is the climate change and renewable package that was adopted on 18 December 2008.[21] The Emission Trading Scheme, that was amended through this package,
puts a price on carbon emission and thereby makes gas, as the fuel with the least CO₂-emission per unit of electricity produced, cheaper compared to other fossil fuels. Electricity from renewable energy sources will become cheaper in comparison to fossil fuels, and the binding targets for Member States to generate a share of the electricity from renewable sources will further ensure a switch away from fossil fuels in the generation mix. Wind and solar energy, both expected to make a major contribution to the renewable targets, are unpredictable sources and therefore need the back-up of other predictable but equally flexible sources of electricity, and so far the only viable alternative is gas-fired electricity. The climate change policy will therefore increase the relative importance of gas, and competition in the gas market becomes ever more important to ensure that gas is delivered at the cost of efficient supply. The increasing share of gas in electricity production, reinforced by improved isolation of houses to reduce gas demand for heating, will demand more flexibility of the gas transmission system and more variation in flows. Such variation in flows will also create wider variation in sources of gas that end up in different TSO systems, and eventually in generators, which underlines the need for harmonisation of gas quality.

The climate change policy also addresses the use of gas, in particular through the policies regarding efficiency. Legislation that puts minimum requirements on the efficiency of appliances already exists for quite a while, but much of this legislation is outdated. The efficiency requirements in these laws are insufficient to reach the current climate policy goals, and their implementation is no longer effective. The new policies include measures regarding eco-design and co-generation. Indirectly the policies regarding energy end-use and energy services also promote efficiency by imposing measures on energy companies and final consumers. These policies aim at reducing CO₂-emissions, other greenhouse gases and a reduction of other environmental pollution such as gases that cause acid rain. They define a framework within which binding design parameters for the construction (and replacement) of appliances can be implemented through comitology, and the goal is to make sure that the EU produces and uses the most efficient appliances possible. Appliances that function efficiently reduce the energy consumed and thereby the emission of CO₂. Gas appliances also emit nitrogen oxides (NOₓ), which are indirect greenhouse gases that trigger formation of ozone, as a consequence of the Nitrogen that natural gas contains (typically between 0 and 5%[22]) With respect to the general environmental policy of the EU, NOₓ can also convert to acids that damage the environment through acid rain, as is the case for sulphur dioxide (SO₂) that is produced when the hydrogen-sulphide (H₂S) that is contained in natural gas (also typically between 0 and 5%[23]) is burned. Compared to other fuels the contribution of natural gas to acid rain is very small however. Moreover, the efficiency of the burning process, and hence the level of emissions of appliances, is also determined by the temperature at which the gas is injected into the appliance.

Gas quality plays an important role in the efficient functioning of appliances and consequently the emission of greenhouse gases, because they are designed and optimised for a specific composition of the natural gas they burn. Changing carbon content (i.e. less methane and more inert gases or more longer hydrocarbons such as ethane and propane) in the gas may cause suboptimal combustion that emits carbon monoxide (CO) which is poisonous and an indirect greenhouse gas as it triggers formation of ozone, or unburned hydrocarbons (methane, CₓHₓ) of which methane is a greenhouse gas. The Dry Low NOₓ-combustors that are increasingly used are optimised for a very narrow band of gas quality. Moreover, differences in gas quality may also damage the appliance, when changes in the calorific value cause changes in the flame characteristics such as flame-flashback and flame failure. This may cause a malfunctioning of the appliance or may cause damages that shorten the lifetime of the appliance. For appliances the change of composition is also very important, i.e. the variation in the gas quality that is used in the appliance. If changes in gas quality occur appliances may need to adjust, and this requires investment in detection mechanisms. The rate at which these changes in gas quality occur, and the extent to which they are predictable, impacts the needs for appliance users to monitor and invest. In particular for industrial appliances, provision of information from TSOs that measure gas quality to the gas appliance users may be helpful and reduce the cost of investment.

The Lisbon agenda puts high emphasis on the competitiveness of the European manufacturing industry. Competitiveness of the European industry means a competitive internal market. Big
industrial appliances are produced in a competitive market as the clients are also major industries that know their needs and have their own strict safety standards. For small (domestic and SME) gas appliances, GAD combines the two goals of creating an internal market while maintaining safety of appliances. As stated in chapter 1, this market does not function very well, and a study is currently being prepared for the European Commission to analyse the competitiveness of the gas appliance manufacturing industry in the global market. This study focuses on the following types of appliances:

- All “appliances” and so-called “fittings” as referred to in Article 1 of the GAD;
- All appliances falling under the definition “appliances utilising gaseous fuels as energy source”, but not considered to be covered by the current definition of the scope of the GAD, and
- All components, parts and fittings for in-house gas installations for appliances downstream of the delivery point of the gas supply network.

In order to determine the competitive position of EU gas appliances sector and the developments on EU internal market, the study will look into the profitability, price-cost margins, development of market shares. It will also look into the role of other stakeholders in the value chain, such as notified bodies, supply chain/distributors, installation services, after sales market, etc. What is particularly relevant in the study related to gas quality harmonisation is the identification of potential barriers to entry and exit, like fixed costs and economies of scale, sunk costs (e.g. costs of sales networks, etc.) and possible regulatory barriers to entry or exit, as many of those issues are related to gas quality differences in different markets.

At the same time, the competitiveness of the appliance market is also key to achieve the European goals regarding efficiency. To produce and use the most efficient appliances a competitive market is needed, where investments in new environmental friendly technologies pay off because the market is big and new customers always look for the best deal. A number of studies have been and are being undertaken by the European Commission, which look into the efficiency and environmental impacts of the use of gas appliances, as well the existence of the current measures that are taken to improve their functioning (such as legislation, standards and voluntary agreements).[24]

Another sector for which competitiveness is the key policy consideration when it comes to harmonisation of gas quality, is the industry that uses gas as feedstock, which is mainly the production of fertiliser. This sector is affected by changes in gas quality as they use the methane in natural gas, so any changes in the composition will affect the value of the gas they receive. Normally they pay their gas bill not for the methane content but for the energy content.

The safety of appliances is obviously a key issue in the whole discussion on gas quality harmonisation. It is a matter of national interest and the main reason for gas quality restrictions at the borders. Therefore any work on harmonisation needs to ensure that safety of gas appliances is not compromised. It can in theory be included in a cost-benefit analysis but in reality this is politically unacceptable and no Member State will accept any change in gas quality standard if it does not guarantee safety of the appliances.

Parameters

The different parameters of the gas quality CBP as proposed by EASEE-gas are stated above. Some parameters are not addressed in the CBP, or are not defined in detail and they will be addressed here. For a description of the relevance of the parameters that are considered, the reader is referred to the EASEE-gas CBP and supporting documentation.[25]

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E It should be kept in mind that there are indications that e.g. appliances are more and more “re-imported” within the single market also by companies not authorised by the manufacturer. This increases the complexity of the market structures and may have an impact on the role of different parties.

F This should include also potential indirect intra-EU barriers to trade like analyses of impacts of national regulations on gas installations, qualification requirements for gas installers, requirements related to aspects not covered by the GAD (e.g. environmental aspects), etc.
Hydrogen is not addressed in the CBP since it is not found in natural gas. However, EASEE-gas recognises that in the future hydrogen may be increasingly important as an energy source, and that the natural gas system may be used to transport hydrogen, for example by mixing natural gas with hydrogen produced from sustainable energy sources. The European Commission has done major research into these possibilities, and the long term sustainable energy policy has already for a long time addressed the potential of hydrogen as the new energy carrier.[26] However, such policy goals are not yet put in practice, and therefore it is difficult to analyse the impact on the gas supply chain and on the gas appliances. Moreover, with respect to the goals of integrating the gas market and improving competition in the appliance market, hydrogen is not relevant. It must be made sure that once hydrogen will be inserted into natural gas systems, and will be transported beyond local or regional systems, it does not block the market integration nor has damaging effects on appliances, but it can only be integrated into a harmonised gas quality standard.

Regarding nitrogen, EASEE-gas recommends in its CBP that any nitrogen content shall be accepted as it does not cause any problems for the gas supply chain. As argued above, nitrogen produces polluting emissions when burned in the appliances. Nitrogen is mostly used to add to natural gas if the calorific value is too high, in so called ballasting. Therefore, the effects of ballasting upstream on the emissions of the appliances needs to be taken into account, even if it is not part of a gas quality standard, for example through the work on efficiency of appliances. The same applies to the temperature at which gas is injected into the appliance.

The CBP by EASEE-gas does not address the content of methane, ethane, propane and other hydrocarbons in natural gas, as it only defines the Wobbe index and relative density. Indirectly this can be a measure for the content of longer hydrocarbons but it does not define a fixed mixture. The methane content is important for the industry that uses gas as feedstock. The content of other hydrocarbons is also important for appliance users, as it impacts the functioning of the flame. Such longer hydrocarbons mainly are present in LNG, and therefore this issue particularly arises in areas where LNG is consumed.

Another factor that is not addressed is the change of composition. As stated above, this is not an issue that can be solved through rules on harmonisation of gas quality, but needs to be solved through communication and coordination between TSOs and the appliance users.

5. Method

This chapter will explain how the work to harmonise the gas quality is put in practice. It will present the mandate to CEN, and explain the different elements of the mandate.

The process proposed under the third package to design European codes is not fit to solve the problem of gas quality. As gas eventually ends up at the burner, effects of gas quality harmonisation go beyond the gas market that is the usual framework for policy discussions. Moreover, gas quality differences and its effect on appliances cannot be left to a policy discussion alone since it concerns the safety of these appliances. In order to fully integrate the whole chain into the discussions, and to create a platform where the knowledge of national bodies responsible for appliances and normalisation is combined with the knowledge of consumers, gas supply companies and network operators, a mandate has been issued to CEN that includes a strong feedback between the normalisation bodies represented in CEN and the gas industry stakeholders.

The legal basis for the mandate is defined in Article 6 of the current Gas Directive:

"Member States shall ensure that technical safety criteria are defined and that technical rules establishing the minimum technical design and operational requirements for the connection to the system of LNG facilities, storage facilities, other transmission or distribution systems, and direct lines, are developed and made public. These technical rules shall ensure the interoperability of systems and shall be objective and non-discriminatory.”[27]

The goal of the mandate is to define standards that are as wide as possible within reasonable costs. This means that the standards enhance the free flow of gas within the internal EU market, in order to promote competition and security of supply minimising the negative effects on
efficiency and the environment and allow the maximum number of appliances to be used without compromising safety.

In the approach to define the standards, a distinction is made between combustion and non-combustion parameters. Due to the lack of information on a European level, the effects of changing gas quality needs to be analysed for appliances. Current testing of appliances only tests are insufficient to conclude on those effects. In particular for those appliances where the owner of the appliance cannot be expected to manage its operations, i.e. the household appliances and appliances of SME’s, a European inventory needs to be made. As the functioning of gas appliances with changes in gas quality relates primarily to the calorific value, such study needs to focus on the combustion parameters. The mandate therefore includes a testing programme to analyse the effects of changing gas quality on safety, efficiency and environmental impact of appliances. The variety of appliances in the EU is huge, and it is impossible to test the effects on all these different appliances. Therefore, a limit in geographical scope and share of the appliance market has been made. Also the testing programme is limited to appliances that fall under GAD, since only those appliances form part of the European gas appliance policy. The testing focuses on household appliances as the variety in non-domestic appliances is simply too wide to establish any reasonable testing sample.

The industrial appliance users are expected to be able to know and monitor the functioning of the appliances themselves, and therefore a testing programme is not needed. Such programme is not needed either for the non-combustion parameters such programme is not needed, and the mandate states that the definition of the standards can be based on the work performed by EASEE-gas.

“Therefore the mandate consists of two phases. In the first phase an analysis concerning the combustion parameters is elaborated. The goal of the first step is to create an overview of:

(1) the existing population of gas appliances falling under the GAD Directive that are certified for H-gas;
(2) the current certification practices;
(3) the installation and inspection rules and practice;
(4) the behaviour of domestic appliances (falling under Directive 90/396/EEC) in terms of safety, efficiency and environmental performance, handling different gas qualities.

In the second phase combustion and non-combustion parameters are involved, and CEN is invited to draft actual European standard(s) on a European gas quality. ”[28]

The knowledge and work of the gas market stakeholders is included in the mandate through the defined cooperation between CEN and the European Commission, in the form of a cost-benefit analysis by the European Commission. In the mandate is stated explicitly that:

“The Standards that will be defined by CEN shall take into account:

(1) The efforts of the Madrid Forum with respect to interoperability of gas qualities;
(2) International standardisation activities;
(3) The results of the Interoperability study of the European Commission;

CEN is invited to base the standardisation work on the achievements of the Madrid Forum process and particularly the achievements of the EASEE-gas’ CBP (Common Business Practice) 2005-001-01 on Gas Quality Harmonisation.

The standardisation work must involve representatives of all parts of the gas chain, in the same manner as they are also represented in the Madrid Forum, as well as the gas appliance industry.”[29]
Originally, this cost-benefit analysis was part of the interoperability study that analysed not only gas quality harmonisation but also other interoperability issues, and that is now published as an inventory on GIE’s website, but the European Commission concluded that more analysis was needed. Therefore, the Commission has this year launched a new call for tender to perform a cost-benefit analysis. At the time of writing, the selection procedure is going on and no contract has been signed yet, but this is expected for October or November.

The mandate consists of the following phases:

- Phase 1: Execute an assessment of the combustion parameters according to the requirements stipulated in Annex 1;

- Coordination with the European Commission: CEN will present the results of phase 1 of the mandate and the European Commission will integrate this into the Cost-benefit Analysis of the Interoperability project. The results of the Interoperability project will provide input for a definition of standards that are the broadest possible within reasonable costs;

- Phase 2: Taking into account the results of Phase 1 and the results of the Interoperability study, draft a European Standard(s) for H-gas qualities, including at least the parameters established in Annex 2.

Regarding the planning, The European Standard(s) (EN) shall be adopted within five years of the acceptance of the mandate. This includes two years to perform the testing programme and three years for CEN to draw up the standards. At this time, the three linguistic versions (German, English, French) shall be available.

Implementation of the gas quality standards happens through transposition into national standards and differing national standards shall be withdrawn within six months of their adoption. In order to address the effects on appliances that fall out of scope of the testing because they are from pre-GAD days, Member States may analyse effect of the standards on appliances installed before the coming into force of Directive 90/396/EEC and take the results into account in the use of the standards.

**Phase 1 of the mandate – the testing programme**

The goal of the testing programme is described in the mandate itself, and Annex 1 of the mandate describes the basic requirements for the testing programme:

"A cross-European programme should be instigated, allowing more effective working and also making the whole investigation much cheaper. As the situation of many countries is very similar, this collective work will avoid the duplication of actions and it will also give more credibility to the results (same procedures used, wide panel of experts involved). It is therefore important that CEN finds an adequate way of identifying on how to do the work, e.g. via a subcontractor, who must at least comply with the following criteria:

1. Have the capacity to effectuate the task in a timely manner, according to the timetable of the mandate;

2. Be clearly independent from specific parts of the gas chain, e.g. producers or appliance manufacturers;

3. Be balanced from a geographical and European perspective. This means that testing laboratories should reflect the gas used in the EU; notably North Sea gas, Dutch (H-) gas, Algerian gas, Russian gas, LNG;

4. Not more than 5 testing laboratories should be involved in order to make an efficient, unbiased and verifiable testing programme;

5. Be aware of the efforts of the Madrid Forum with respect to interoperability of gas qualities;
The investigation should cover as many EU25 countries as possible, but at least the largest 15 gas using countries and/or 75% of EU gas market.

Phase 1 of the mandate should at least consist of the following aspects:

1) Market study to understand the existing population. How many appliances are installed, typology. Market for new appliances. What will be the future gas profiles (market of the gas in the future);
2) Existing certification practices;
3) Installation rules and practices;
4) Conclusion for the final test programme and final selection of appliances;
5) Testing of appliances;
6) Conclusions.

(1) (2) and (3) must be done for each country involved.[30]

As stated in the previous section, the testing programme is limited to GAD-appliances, and focuses on household appliances, but non-domestic appliances are also taken into account. This is done in the aspects (1) to (3) described above.

The testing programme starts with an inventory of the gas appliances in the EU, and therefore it will make use of all the studies that have already been done for the European Commission for specific types of gas appliances. This inventory will be the first European wide inventory including all types of appliances.

The inclusion of certification and installation rules and practices is also very important, and this has not been analysed so far on a European level. As the study into the competitiveness of the gas appliance market also recognises, the notifying bodies and their role in certification, as well as the installers play an important role in the appliance market. Gas appliances are often tuned to gas specifications upon installation, and those may be within a narrower band than originally indicated by the manufacturer or a modified specification all together. These changes upon installation affect the functioning of the appliance, and therefore the laboratory testing needs to be compared to the final installation and the functioning under different installation practices. At the same time, the inventory of installation practices is needed to analyse the possibilities to adjust appliances so that they are able to handle a wider variation in gas quality.

The standards itself will not address the certification and installation of appliances, but it may be needed to address this issue, either implicitly in drawing up the standards by CEN, or in subsequent work. This is essential to ensure that installation practices are aligned with gas quality harmonisation policy and do not annul the benefits of such policy. The role of installation practices naturally depends on the question addressed earlier, namely where in the gas supply chain the standards will apply.

Based on the annex of the mandate CEN had published a call for tender, and subsequently selected GASQUAL, a consortium of different organisations and laboratories, to perform the testing programme. The funding for the testing programme is part of the overall funding of the mandate by the European Commission, and a contract for the mandate, including the testing programme, was signed between the European Commission and CEN at the end of 2008. GASQUAL has started working in January and has two years to finalise the testing programme, after which the information will be given to the European Commission, so that the contractor of the cost-benefit analysis can include it in its analysis.

Cost benefit analysis

The goal of the Cost-Benefit analysis is to provide input to CEN for the definition of the gas quality standard. Its scope is the whole chain from production to final consumption, and explicitly includes the use in the appliances. It contains of two main elements: scenarios and indicators of costs and benefits.

Firstly the contractor shall develop scenarios on flows of gas in the EU and supply-flows to the EU. To keep the work manageable, this has to be done for two years, namely 2015 and 2025. The
scenarios shall be developed with the aim of identifying the distribution of physical gas qualities in the EU. (e.g. are there “zones” where certain localised ranges of gas quality are likely to be seen?).

The scenarios shall include the following aspects:
1. Flows of gas within the EU
2. Supply flows to the EU
3. Gas quality requirements in the EU,
   a. the adoption of the EASEE-gas CBP in the whole EU (at all IPs),
   b. other gas quality requirements in the whole EU (wider and smaller than the CBP’s);
   c. adoption of discrete gas quality “zones” within the EU with gas quality conversion services at the interfaces;
   d. no gas quality standard in the EU.

The scenario will deal with the following assumptions:
1. 2 years (situation in 2015 and 2025).
2. Different assumptions for the supply sources to EU (dealing with 6 supply possibilities: Caspian, Middle East, LNG, Russia, Norway, North Africa).
3. Evolution of the supply needed in each country (hypothesis low, high and medium).

The cost-benefit analysis is split up in two parts: the supply chain and the gas appliances. With respect to the supply chain, the following aspects have to be taken into account:
1. Treatment of gas & gas processing in the supply chain, e.g. gas blending and ballasting facilities;
2. Role of gas quality in attractiveness of the EU market compared to the USA and Asia;
3. What is the impact of short term supply disruptions on gas quality: Does it play a role in the flexibility of the EU transport system/gas market to deal with short term supply disruptions;
4. Competition in the natural gas market;
5. Short-term and long-term costs and benefits;

The contractor shall take into account the following with respect to costs and benefits regarding appliances:
6. Safety, environmental impact and efficiency of appliances;
7. Investment in new appliances and/or replacement or modification of appliances;
8. Treatment of gas & gas processing at the burner tip;
9. Competition in the gas appliance market;
10. Short-term and long-term costs and benefits;

To analyse the impacts of gas quality harmonisation, the contractor is asked to develop indicators that quantify its effects in the gas supply chain:
1. gas quality aspects in gas price differences in different zones/MS;
2. gas quality aspects in security of supply and gas supply interruptions;
3. treatment of gas & gas processing;

For appliances indicators have to be developed for the following:
4. competition in the appliances market;
5. effect of changes in gas quality on existing appliances;
6. replacement/adjustment of appliances.

Much of the information that is needed to analyse the costs and benefits need to be provided by stakeholders along the gas supply chain. For the appliances that are part of the testing programme the information will be provided by GASQUAL at the end of their work, but the industrial users of appliances need to provide information themselves to the consultant.

Of course it is impossible to develop a full range of costs and benefits for all possible variations in the parameters of the mandate. Therefore the basis for the cost benefit analysis will be EASEE-gas’s CBP. In particular when it comes to the upstream (i.e. before being burned in the appliance) the cost benefit analysis is not expected to give any differences in results from CBP, since it was developed in corporation of all upstream parties. The focus of the cost benefit analysis will therefore naturally be on the effect of harmonisation of the combustion parameters in the different
parts of the chain. The main challenge for the work is to define the optimal allocation of costs that leads to a recommendation of the scope of the standards, taking into account future changes in gas flows and future actions to improve efficiency of gas appliances.

Normally the work can start at the end of 2009, and the results need to be provided within 2 years.

After the finalisation of the cost-benefit analysis, a report with a recommendation for a gas quality standard will be sent by the European Commission to CEN, who will then analyse this recommendation and has 3 years to turn it into a European standard for gas quality parameters.

5. Conclusions

This paper has outlined the history and future of European policy to harmonise gas quality, as well as the policy objectives that either drive this harmonisation or set conditions to this harmonisation.

The continuing work to enhance competition based on the integration of gas networks into a single European market where gas molecules become a commodity that are traded in liquid markets where gas contracts are interchangeable regardless of the gas quality, only stresses the need to solve the gas quality issue. In a liberalised gas market no single TSO can manage the issue, nor can a shipper. Moreover, the shipper that currently bears the risk for being out-of-spec has neither means to know the quality of his gas nor to act to solve the issue.

As a fundamental characteristic of the gas market the whole chain from production to burner tip needs to be taken into account in a policy to harmonise gas quality. The European Commission has concluded that the best way to ensure full involvement of all stakeholders is best done through a mandate to CEN.

Harmonise gas quality will mean that costs have to be made somewhere in the supply chain. These costs should be borne by the parties that benefit from the harmonisation, which is in the end usually the consumer, but it may also be the upstream supplier. However, costs may be lower if gas quality harmonisation takes into account the physical composition of gas in different areas in the EU. In such case an overall requirement on all gas appliances to deal with a wider scope of gas quality will be a suboptimal solution. Investments to deal with gas quality may then be put on network operators, but they may not be able to transfer the costs to the beneficiaries, in particular in case they are located in another system or in case upstream suppliers do not want to accept the treatment costs at the entry of the system. The big challenge of the mandate, in particular of the cost-benefit analysis, is to find the best solution for this issue. It may be the case that the mandate alone may not solve it, as other measures are needed to ensure cooperation of TSOs to manage gas quality optimally across borders.

The mandate will provide clarity on the use of small appliances in the EU, as well as installation and certification practices through the testing programme. The role of installation practices is a key aspect of any efficient implementation of the gas quality standards.

The European policy to improve efficiency of gas appliances is a major factor in harmonisation of gas quality standards. Firstly because many highly efficient appliances are optimised for narrow bands of gas quality, and secondly because (the use of) appliances need to become much more efficient as part of the European climate change policy.

The mandate aims to set standards for gas quality through a forward-looking approach. It cannot be expected that all appliances are changed overnight to deal with changing gas qualities. This is not impossible: it has been done before, for example when the Netherlands changed from town gas to natural gas and laid out and adjusted the full infrastructure within 5 years or so. Where there is a political will, it is possible.
6. References


[12] Interoperability: report on the gas quality issue (presentation from the UK), Dr Christopher Mansfield, Department of Trade and Industry, presented at the 10th Madrid Forum, 15 and 16 September 2005


[21] see the following website for references to all the adopted texts:

[22] www.naturalgas.org

[23] www.naturalgas.org

[24] See the following websites for more information on these studies:
http://ec.europa.eu/energy/efficiency/ecodesign/studies_en.htm


[28] Mandate to CEN for standardisation in the field of gas qualities, M/400 EN, Brussels, 16 January 2007, European Commission, DG TREN

[29] Mandate to CEN for standardisation in the field of gas qualities, M/400 EN, Brussels, 16 January 2007, European Commission, DG TREN
