3rd WS on INT NC regarding gas quality

Analysis of EN16726 impacts

Interoperability WG

ENTSOG System Operations

Image Courtesy of Thyssengas

1. Welcome and objectives

Hendrik Pollex, System Operations Business Area Manager
hendrik.pollex@entsog.eu

Objectives of Today's Workshop

Present Madrid Forum conclusions and their impact

Update from CEN on Wobbe Index standardisation work

Present a summary of stakeholders' responses to the second consultation questions (detailed feedback available at ENTSOG's website)

Present other ENTSOG gas quality related tasks

(INT NC monitoring and Gas Quality Outlook)

Panel discussion on potential gas quality issues and possible solutions

3rd WS on INT NC regarding gas quality

Agenda

No	Description	Time
1	***Opening (ENTSOG)*** ➢ *Welcome and agenda* ➢ *Objectives*	*10:30 - 10:45*
2	***Madrid Forum conclusions (EC)***	*10:45 – 11:00*
3	***Status of Wobbe Index standardisation (CEN)***	*11:00 – 11:20*
4	***IN INT NC monitoring results (ENTSOG)***	*11:20 – 11:30*
	Coffee break	***11:30 – 11:45***
5	***Second public consultation results (ENTSOG)***	*11:45 – 12:30*
	Lunch	***12:30 – 13:30***
5	***Second public consultation results (ENTSOG)***	*13:30 – 14:00*
6	***Questions and answers***	*14:00 – 14:15*
7	***Introduction to long term gas quality monitoring outlook (ENTSOG)***	*14:15 – 14:30*
	Coffee break	***14:30 – 14:45***
8	***Panel discussion: potential gas quality issues and possible solutions (CEFIC, IOGP, Marcogaz, EASEE-gas)***	*14:45 – 15:30*
9	***Questions and answers***	*15:30 – 15:50*
10	***Closure (ENTSOG)***	*15:50 – 16:00*

2. Madrid Forum conclusions

Zsuzsanna Szelles, DG ENER

Madrid Forum conclusions

04. Gas quality harmonisation

- Following intensive discussions and recognising the lack of support for making the CEN Standard EN 16726 legally binding, the Forum supports the Commission's announcement not to pursue legally binding provisions on this matter at this stage.
- Nevertheless, the Forum invites ENTSOG to finalise its assessment of the effects of the inclusion of the CEN Standard EN 16726 into the Network Code on Interoperability and Data Exchange Rules by the end of 2016.
- The Forum confirms its support for CEN to carry on the work on finding an agreement on a band for the Wobbe Index, elaborating on the possibility of regional bands, to be included in an updated CEN standard while ensuring the integrity of the existing standard and calls on market participants to be constructively engaged in this process. The Commission will reconsider further harmonisation activities in light of the outcome of the CEN revision work.

3. Status of Wobbe Index standardisation

Kris de Wit (KVGB/ARGB), Hiltrud Schülken (DVGW)3

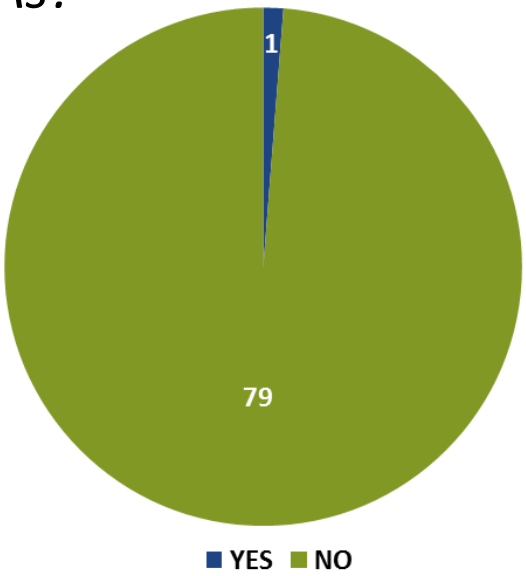
4. INT NC Monitoring results

Jef De Keyser, Interoperability Subject Manager
jef.dekeyser@entsog.eu

INT NC monitoring results

Article 15: Managing cross-border trade restrictions due to gas quality differences

Is there any cross-border trade restriction due to gas quality that cannot be avoided by the standard operations of the TSOs and that has been recognised by NRAs?

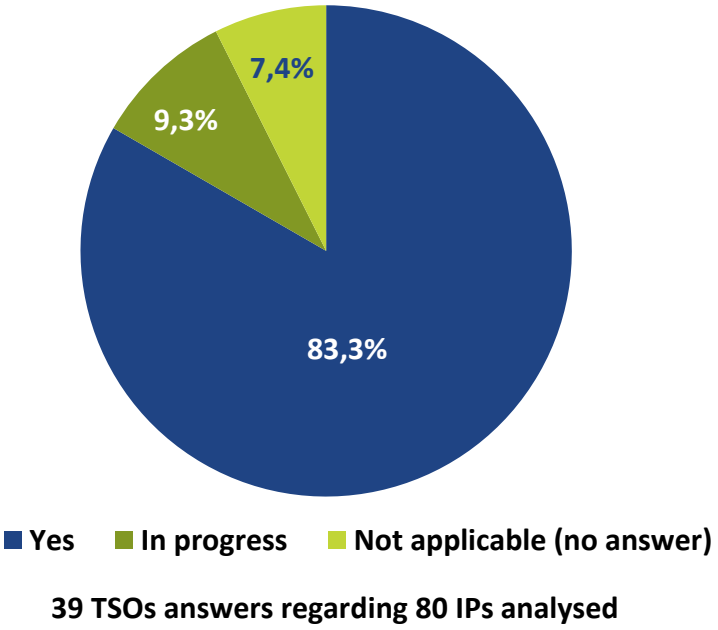


Currently, gas quality issues, if present, are solved by mutual cooperation between TSOs

INT NC monitoring results

Article 16: Short term monitoring on gas quality — data publication

Are Wobbe Index and Gross Calorific Value published on your website for each IP that acts as an entry point and once per hour?

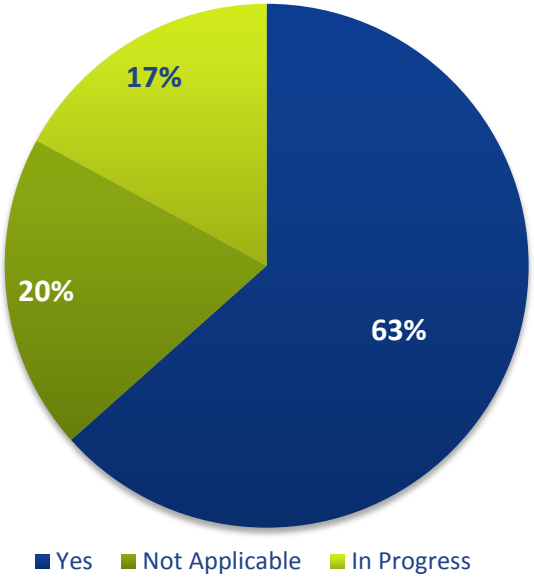


A wide majority of TSOs publish information on WI and GCV on their websites

INT NC monitoring results

Article 17: Information provision on short-term gas quality variation

Has the list of parties entitled to receive indicative gas quality information been defined?



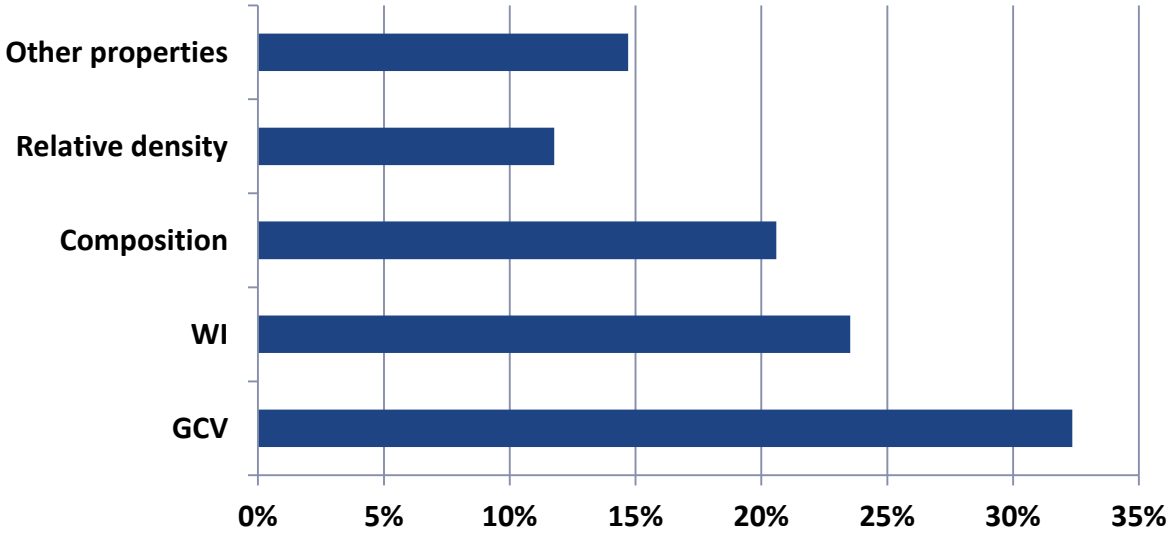
39 TSOs answers analysed

80% of respondents have either defined or are in the process of defining a list of parties entitled to receive indicative gas quality information

INT NC monitoring results

Article 17: Information provision on short-term gas quality variation

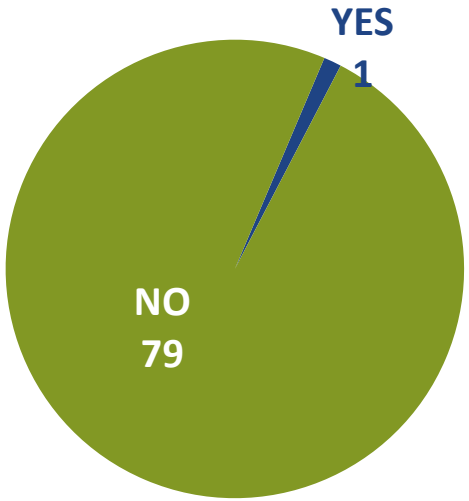
What information has been regarded relevant?



INT NC monitoring results

Article 19: Managing cross-border trade restrictions due to differences in odourisation practices

Is there any cross-border trade restriction due to differences in odourisation practices that cannot be avoided by the concerned TSOs and that has been recognised by NRAs?

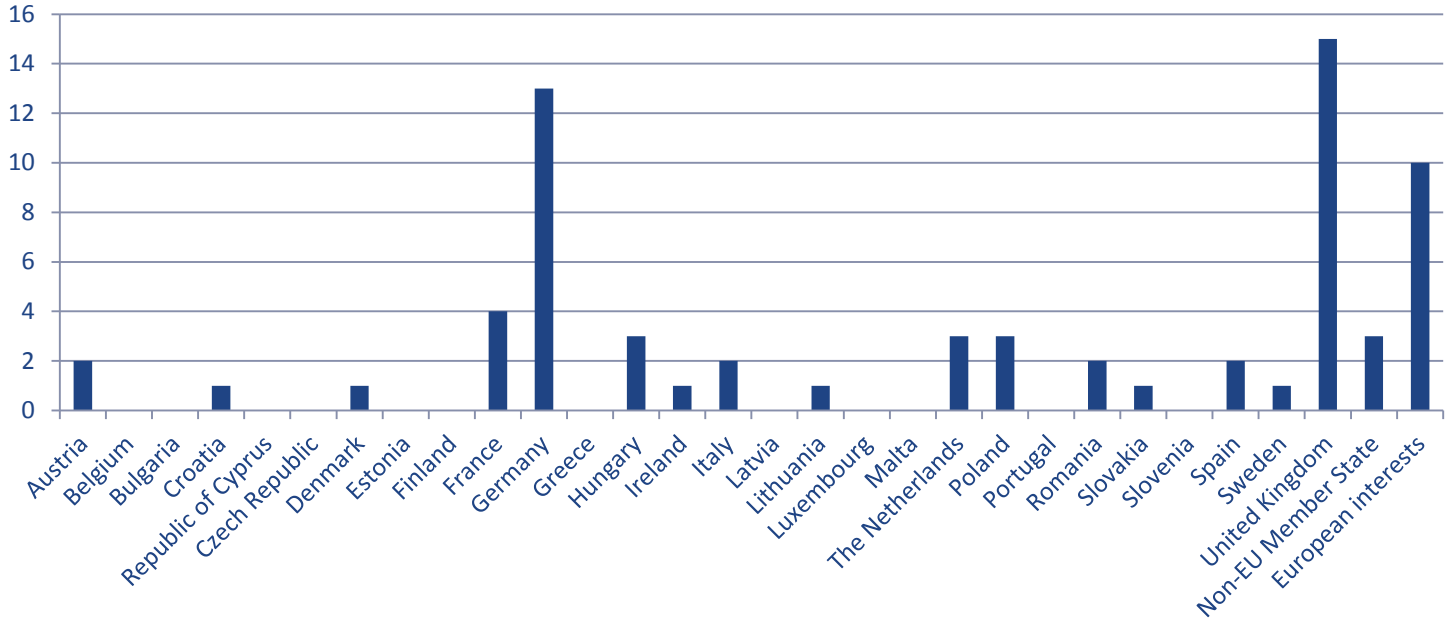


Only on one IP, has a restriction linked to odourisation practices been reported. However, flows are not actually restricted as the IP is unidirectional and gas can only flow from the adjacent TSO's non-odourised transmission system to the odourised one

5. 2nd public consultation results

Antonio Gómez Bruque, Interoperability Adviser
antonio.gomez@entsog.eu

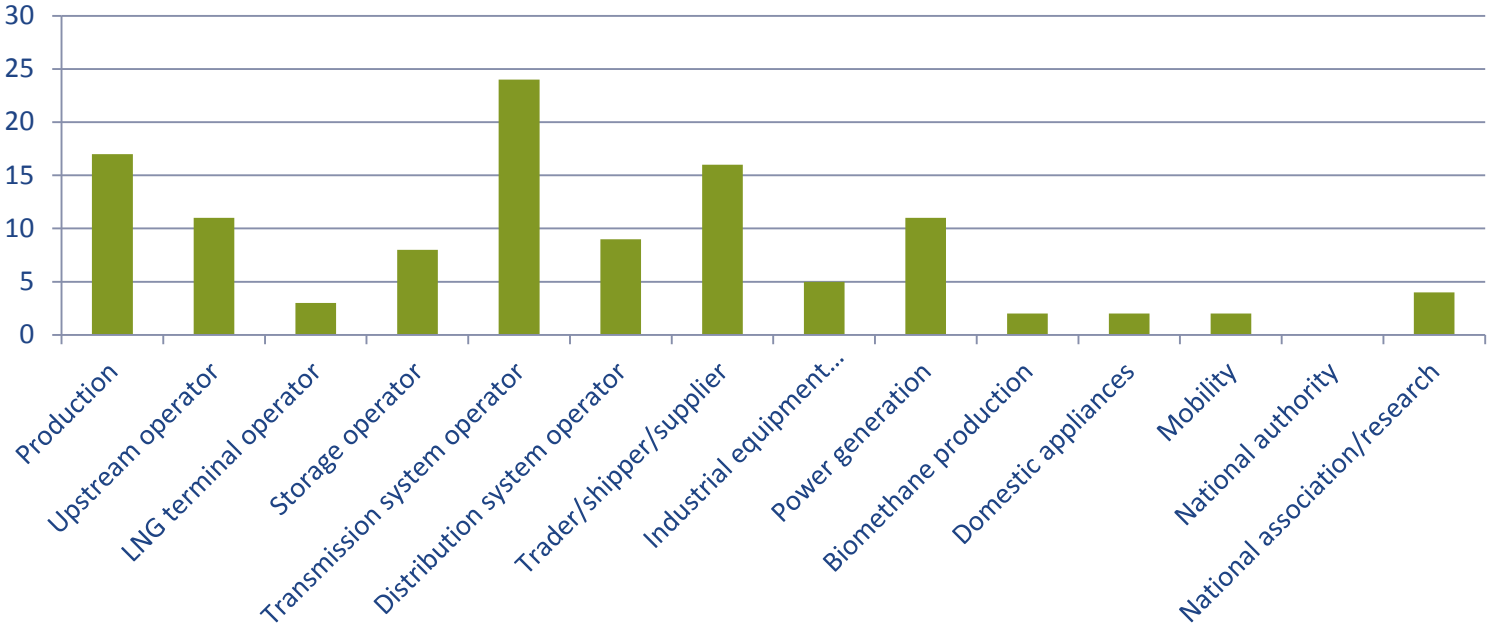
2nd PC on EN16726 impacts



Participation by country

- 68 replies
- 16 EU Member States
- 2 non EU countries

2nd PC on EN16726 impacts

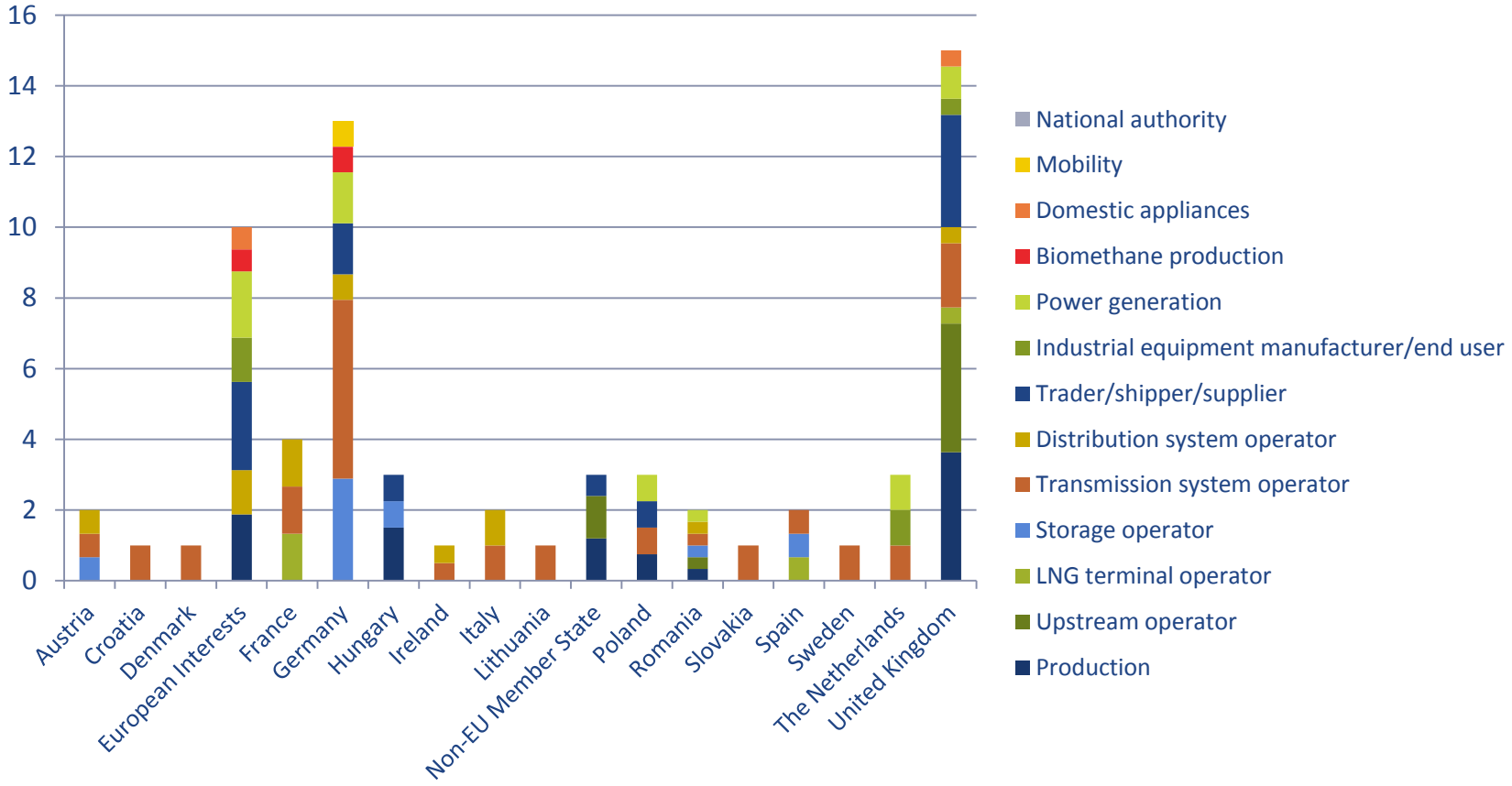


Participation by segment

> 68 replies covering 13 categories

> Associations: EUROGAS, IFIEC, IOGP, EUROMOT, EBA, EHI

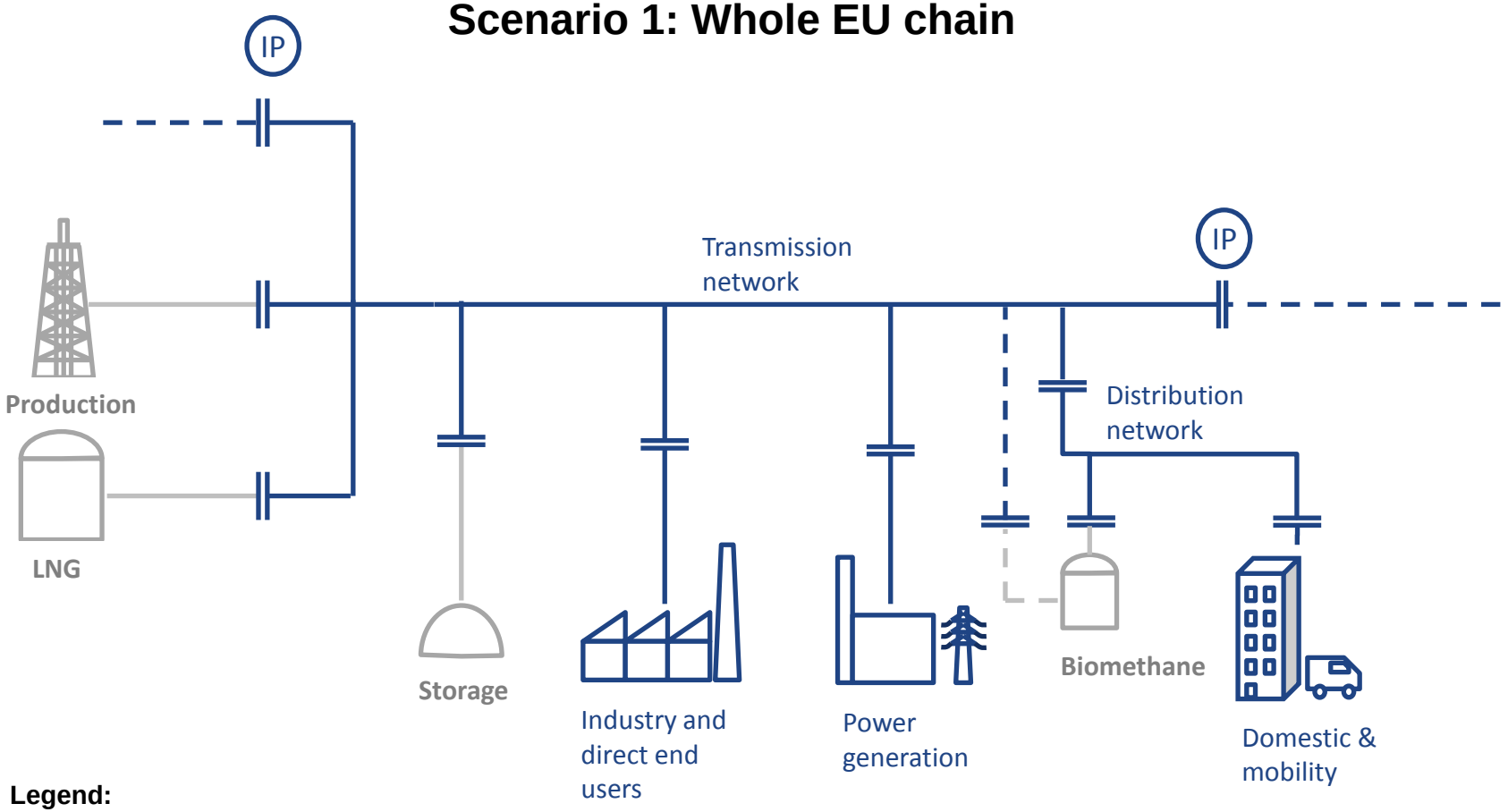
2nd PC on EN16726 impacts



Participation by country and segment

Refined scenarios for consultation

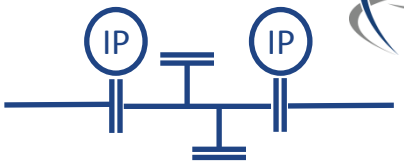
Scenario 1: Whole EU chain



Legend:

In scope
Out of scope

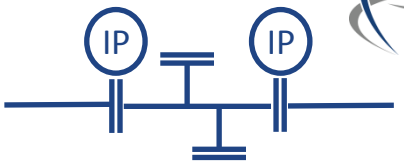
Refined scenarios for consultation



Scenario 1: Whole EU chain

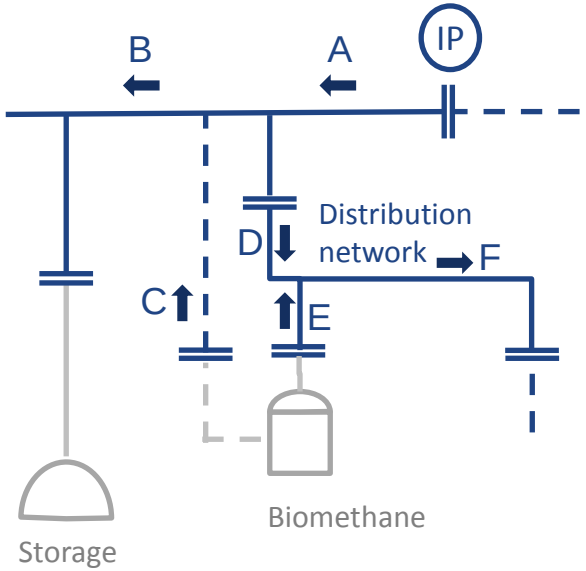
- **Description**: parties injecting gas in gas networks need to ensure compliance of the gas with the CEN standard.
- National requirements/network code would be fully valid and enforceable for parameters not included in the standard, e.g. Wobbe Index, sulfur in end-use (also for end users directly connected to TSOs), hydrogen and any other.
- **Scope**: same as EN16726. TSOs, SSOs and all downstream segments would receive standard gas. It shall also apply at entry points to EU.
- **Impacted parties:** producers/infrastructure operators delivering gas into TSO/DSO networks (all gas supplies) and consumers /infrastructures receiving gas from those networks.
- **Implementation timing**: fixed and equal for all countries and segments. This scenario would fully apply after a fixed transition period (to be consulted) after INT NC amendment.
- **Interaction with NC**: After the transition period, article 15 would not apply for the parameters covered in the standard.

Refined scenarios for consultation



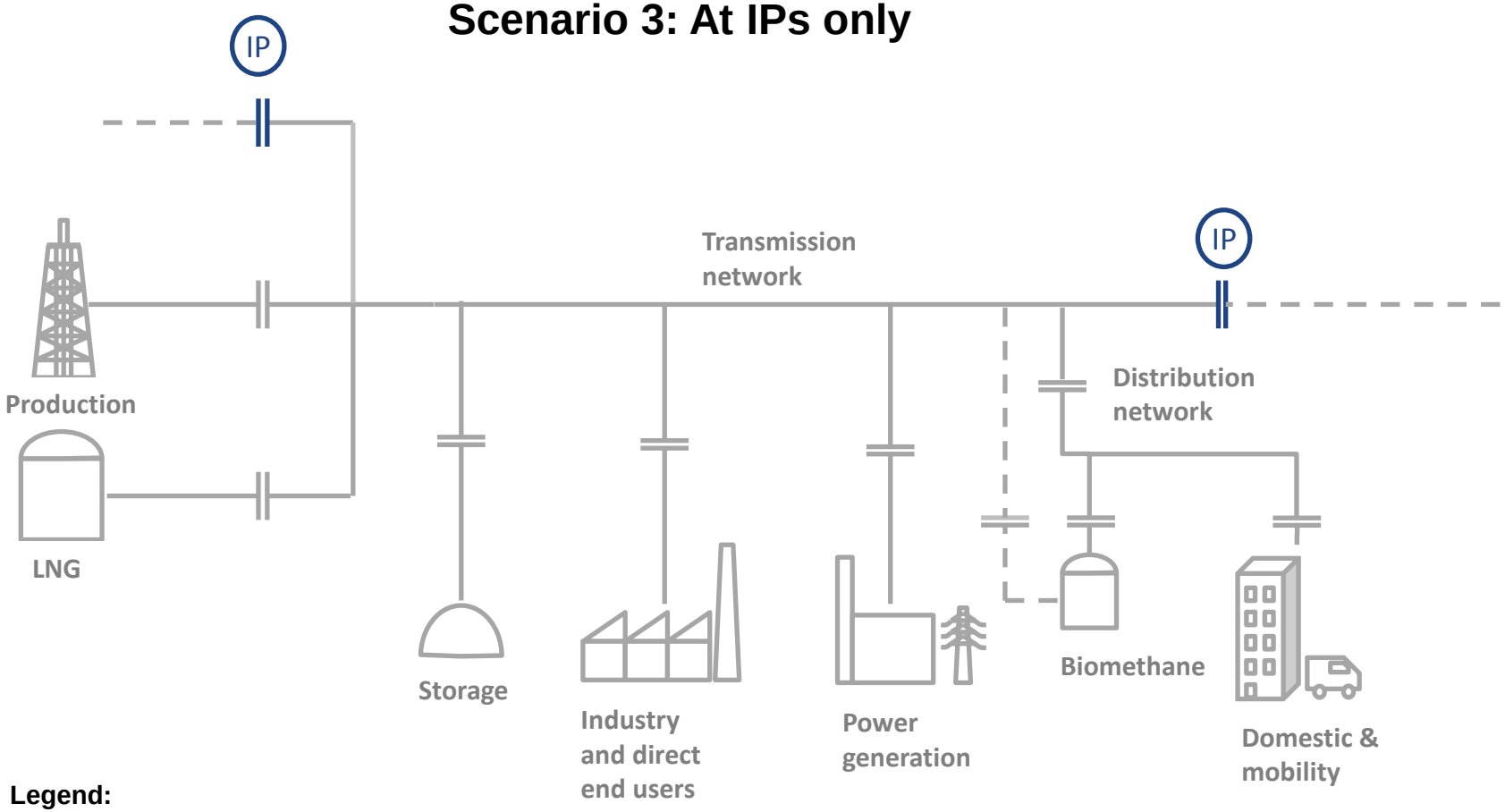
Scenario 1: Whole EU chain (continued)

- **In-spec gas**: Any gas meeting the standard should be accepted provided that national requirements for additional parameters are also met.
- **Off-spec gas**: Any gas not meeting the standard should be refused.
- **A-deviations**: Applicable up to the date on which compliance with the standard is required but not afterwards.
- **Flexible limits**: The effect of a sensitive installation on the limits for O_2 and CO_2 to be set for a connection point should be studied on a case by case basis



Refined scenarios for consultation

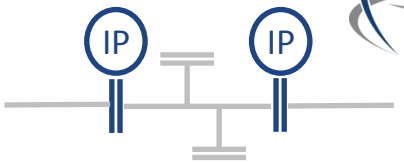
Scenario 3: At IPs only



Legend:

In scope
Out of scope

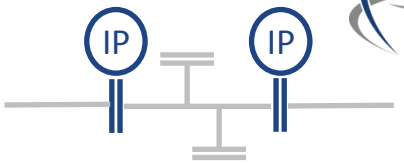
Refined scenarios for consultation



Scenario 3: At IPs only

- **Description**: only when a restriction to cross-border trade is recognised, TSO will analyse, via the process set out in Article 15, feasible solutions (flow commitments, gas treatment) without changing specs and, as another possibility, adopting EN16726:2015 for the conflicting parameter.
- This scenario did not have as a prerequisite a full harmonisation of national legislation.
- **Scope**: interconnection points between EU Member States.
- **Impacted parties**: transmission system operators
- **Implementation timing**: as described in Article 15, the best timeframe would be determined on case by case basis by the involved TSOs and competent authorities.
- **Interaction with NC**: CEN standard would neither substitute nor act as a fall-back (default rule) for Article 15. On the contrary, the application of the standard for the parameter causing the restriction, together with retaining national specs, would be subject to the cost-benefit analysis and public consultation process described in the network code.

Refined scenarios for consultation



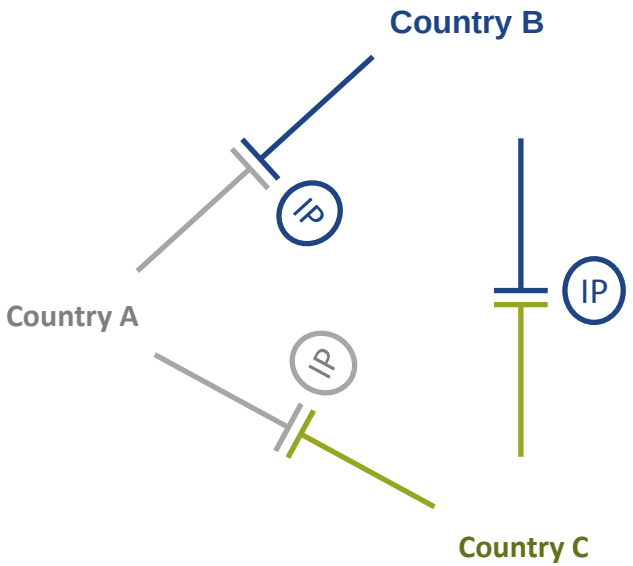
Scenario 3: At IPs only (continued)

- **In-spec gas:** If the standard came out as the optimal solution, any gas meeting the standard should be accepted provided that national requirements for any other parameter than the one causing the barrier are met.
- **Off-spec gas**: If the standard came out as the optimal solution, TSOs would retain flexibility they have today to cope with gas not meeting the standard by swapping or co-mingling (Article 15(1)).
- **A-deviations** would not be applicable at those IPs where the standard were applied
- **Flexible limits**: The cost benefit analysis would determine the required flexibility to apply the standard (or the national requirements).

Applicable specs	Flow commitments	Gas treatment	…
National requirements	CBA 1	CBA 2	
EN16726:2015 (without A-deviations)	CBA 3	CBA 4	

Refined scenarios for consultation

Scenario 4: Voluntary adoption



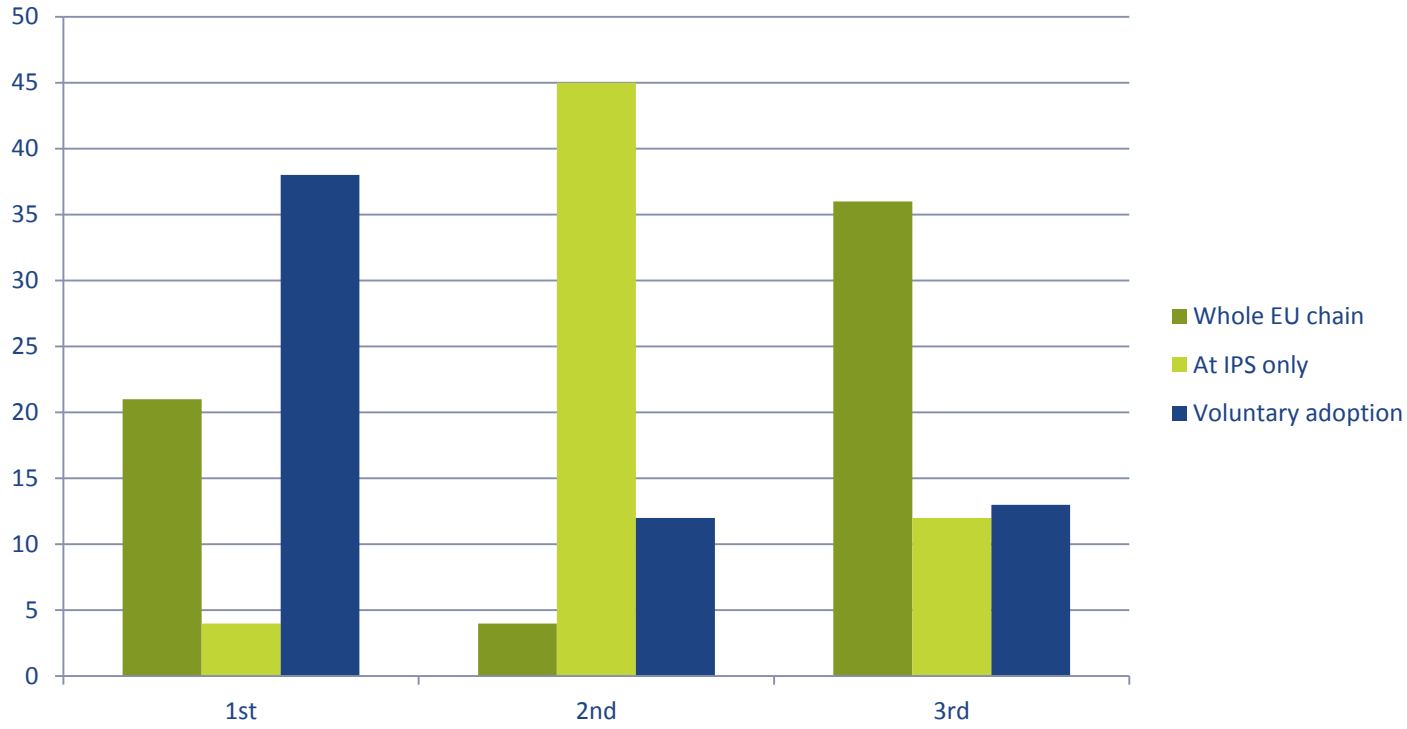
Legend:

- EN 16726
- National spec A
- National spec C

Description: This scenario meant that ENTSOG would propose not to amend the INT NC,

If there is any cross-border trade restriction due to gas quality, Article 15 will be applied.

2nd PC on EN16726 impacts

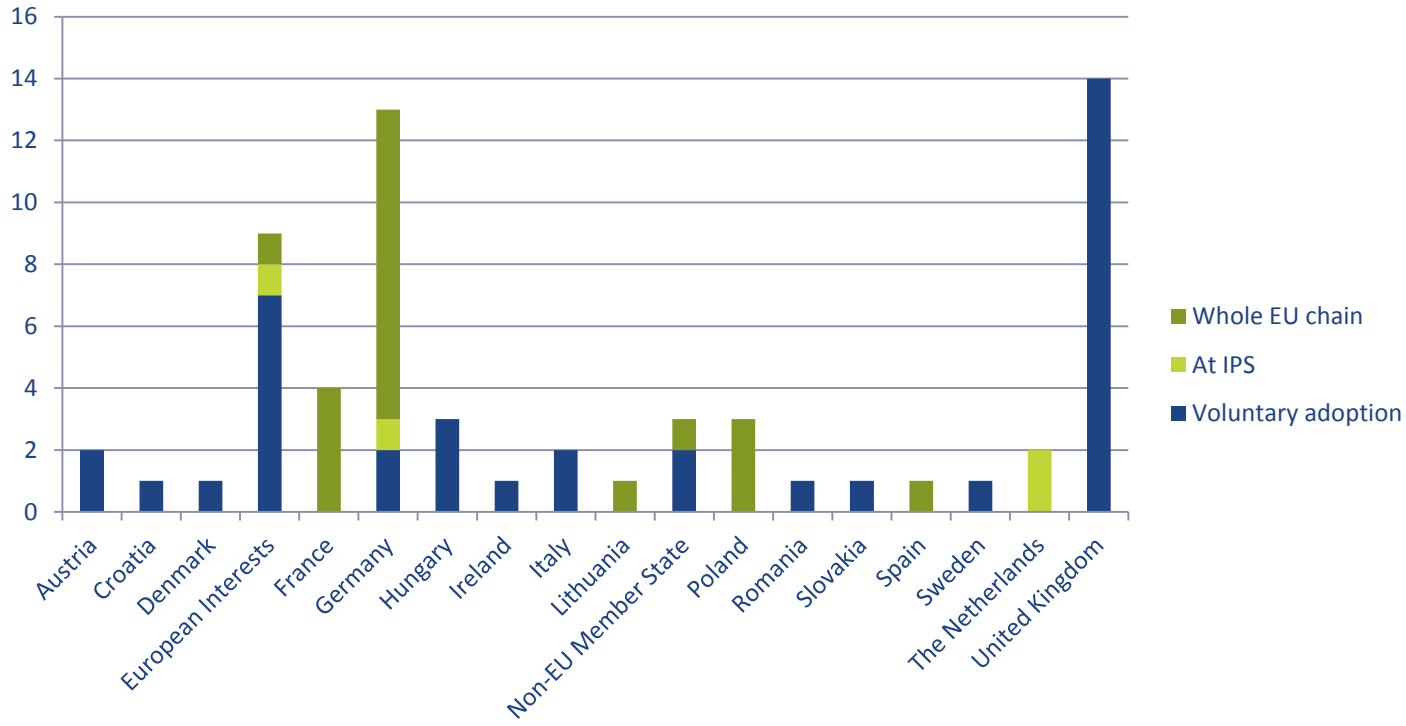


Q6 Scenario preference: overall results

> 60% in favour of voluntary adoption

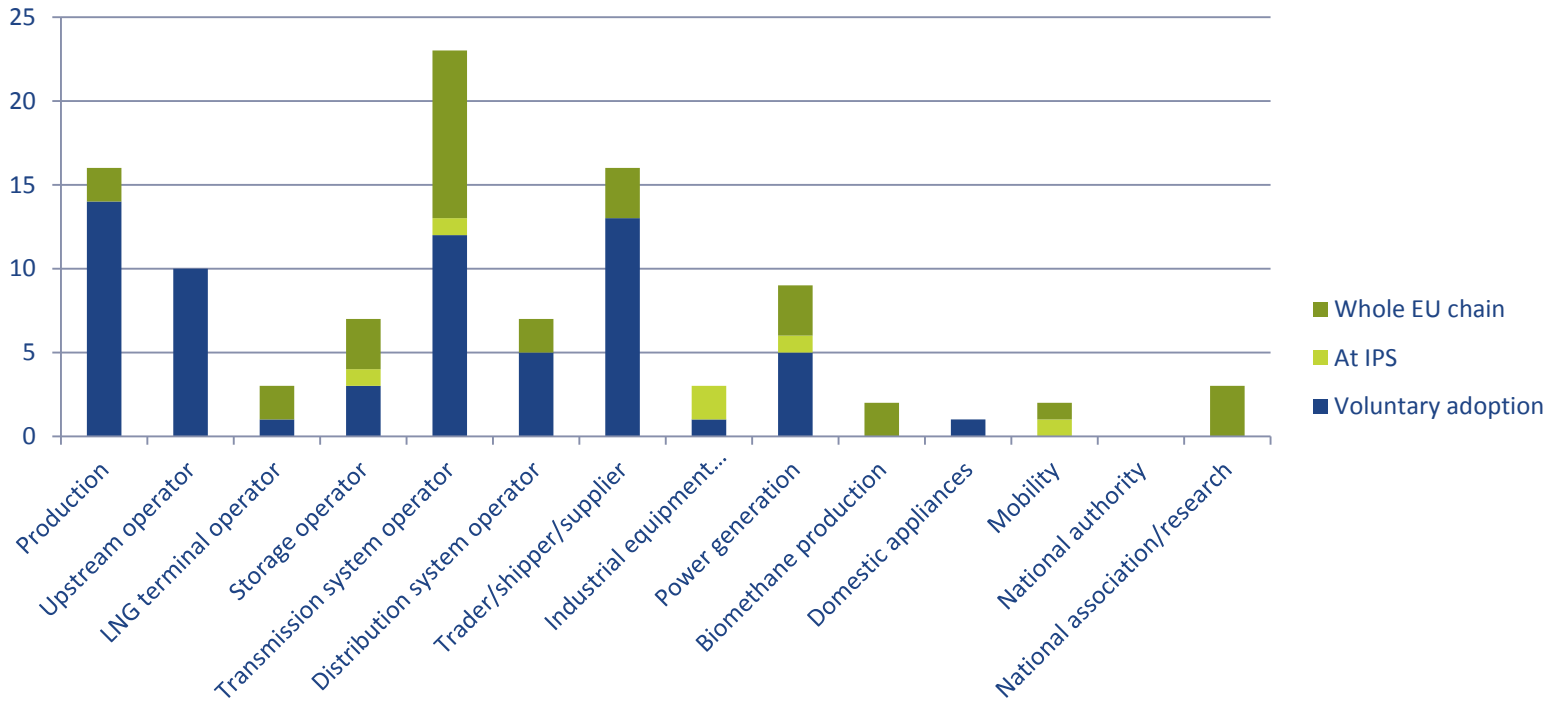
> At IPs seen mainly as compromise solution

2nd PC on EN16726 impacts



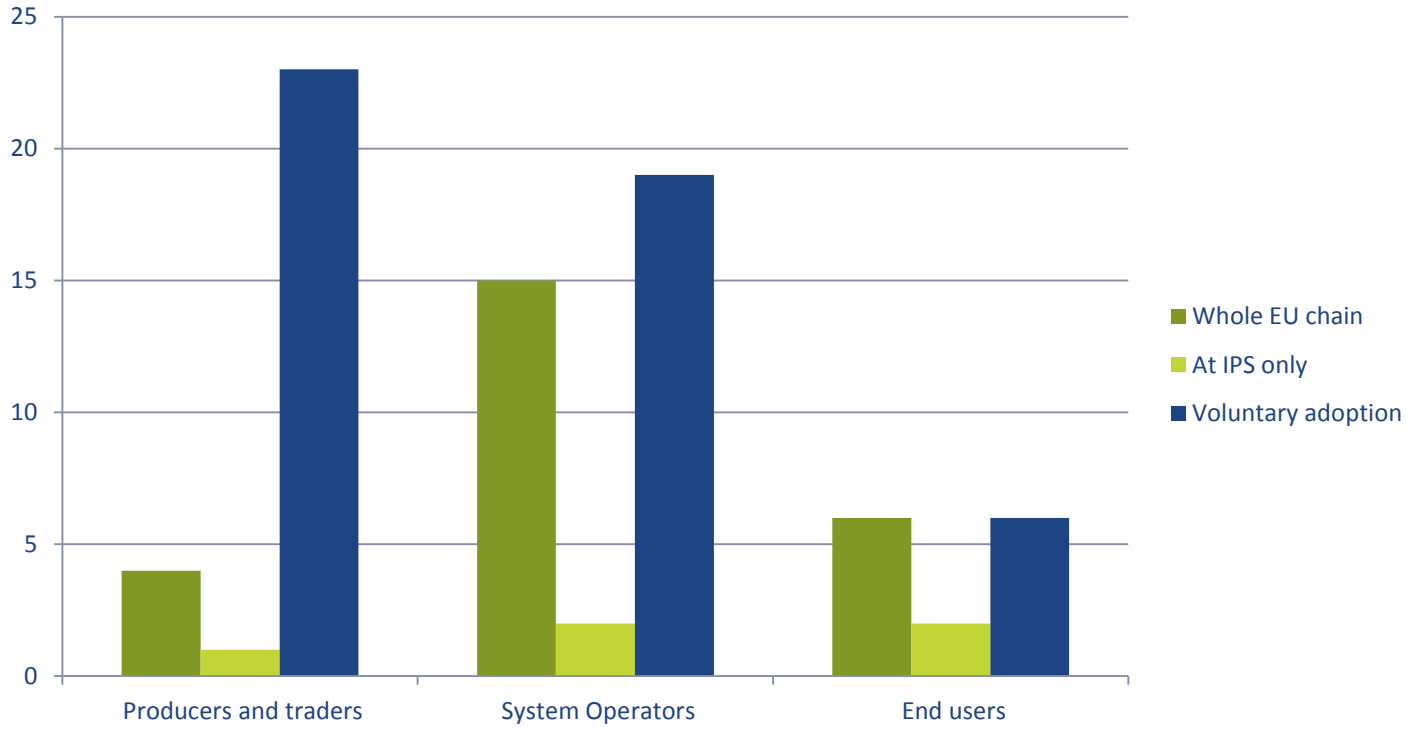
Q6 Scenario preference: First choice by country

2nd PC on EN16726 impacts



Q6 Scenario preference: First choice by segment

2nd PC on EN16726 impacts

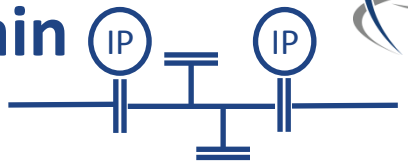


Q6 Scenario preference: key groups of stakeholders

> Producers and traders includes also upstream operators and biomethane producers

> System Operators includes: TSOs, LSOs, SSOs and DSOs

Scenario assessment: whole EU chain



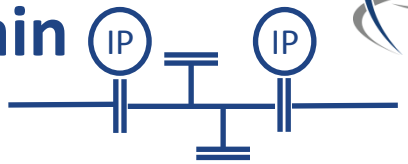
Benefits

- *Clear rules, safe reliable transmission ensured to all downstream systems* [TSO, DE]
- *Natural gas standardised as a product* [TSO, UK]
- *Ensure free flow across segments and EU regions also in case of disruption and eliminate contracting difficulties* [Trader/shipper, HU]
- *Higher degree of protection thanks to low limits in O_2, CO_2 and H_2S* [SSO, HU]

Impacts (summary)

- *Elimination of flexibility to apply less stringent criteria at entry and exit points Indigenous production shut-in* [Producer, EU]
- *Restriction of flows in interconnectors, e.g. UK-IE, and less efficient cross-border trade* [Producer, EU]
- *Increased biomethane injection costs due to O_2 limit* [TSOs, DK and SE]
- *Barrier for LNG imports due to sulfur, H_2S and O_2 (10 ppm) limits* [LSO, UK]
- *Existing national regulations (WI, sulfur, etc.) are often much too wide exposing appliances to safety risks, performance issues and higher emissions (NOx)* [Industrial end user, EU].

Scenario assessment: whole EU chain



Barriers

- *Economic (welfare loss), operational (equipment) and legal (beyond scope of INT NC and third package)* [Producer, EU].
- *The different limits for sulfur depending on odourisation (20 vs. 30 mg/m^3) introduce unjustifiable asymmetry* [TSO, IT]

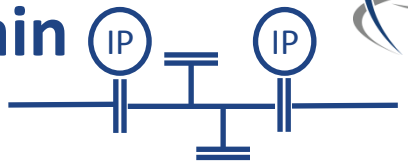
Costs

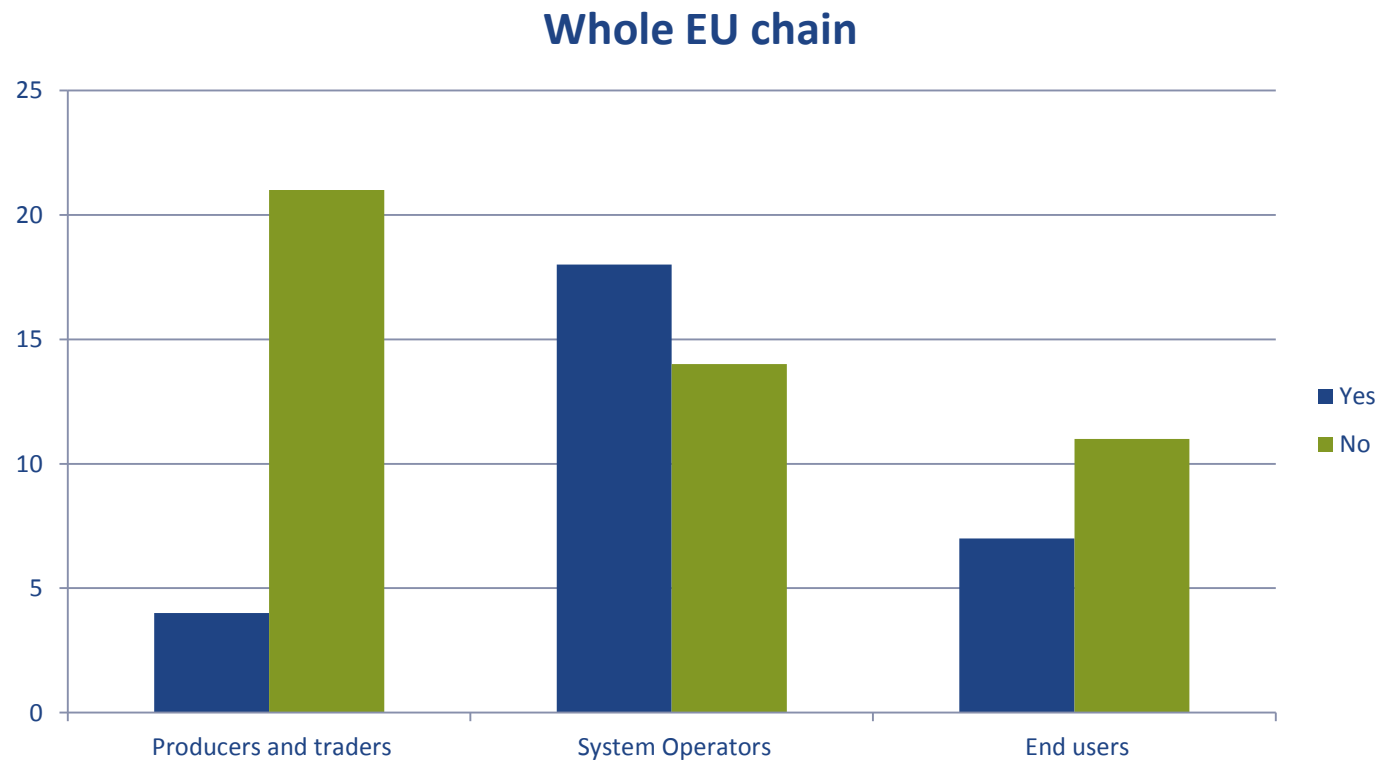
- *15.9 bcm (€2 billion, 20% of UK supplies) from existing developed offshore fields in the UK and Norway would have been off-spec in 2015 due to CO2 (2.5%) and O2 (10 ppm) limits (13.8 and 2.1 bcm respectively*) [TSO, UK].
- *Amine sweetening unit: CAPEX: 350€/(m^3/h) OPEX: 0,031€/m^3* [Producer, HU].
- *15 bcm of imports would be off-spec (water dew point)* [TSO, ES]

Time

- *Not feasible until mid-20s* [Oil & gas association, NO]
- *5 years for sensitive customers* [DSO, FR]
- *3 to 5 years to adapt contracts* [Trader/shipper, HU]
- *More than 10 years* [TSOs, DK and SE]

Scenario assessment: whole EU chain





Is this scenario feasible for your segment/organisation/country

Scenario assessment: whole EU chain

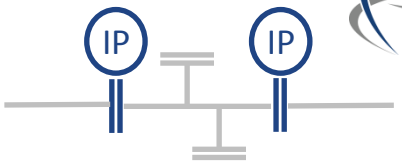
Overview of reported potential impacts per country and parameter

Parameter	AT	BE	DK	DE	HU	IE	IT	LT	NL	PL	ES	UK	NO	RU	EU
Relative density					P										
Total sulfur	S	IC		M	P		I D		L	P		L			W H
H2S					P										
Mercaptan sulfur															
O2		S	B	B	P					P		PL		P	
CO2	S			B	P							P	P		
HC dew point					P					P	IC				
Water dew point	S				P					P					
Methane number			P												M
Unspecified parameters								IC							W, I

S: Storage
IC: Imports
B: Biomethane
M: Mobility
D: Distribution
L: LNG
P: Production
I: Industry
W: power generation
H: Domestic

Only countries reporting specific impacts are included
EU column accounts for additional impacts reported by EU assocs

Scenario assessment: at IPS only



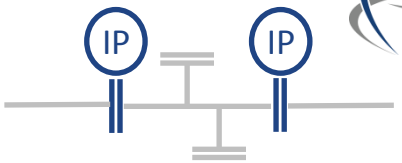
Benefits

- *It's good for users as it allows the upstream sector to feed in gas of deviating qualities* [Mobility, EU]
- *Ensures free flows in case of disruption* [Trader, HU]
- *Natural way to implement the standard in the current framework* [TSO, NL]
- *Greater clarity to the INT NC by explaining how Recital 5 and Article 15 work together* [TSO, UK]

Impacts

- *No impact if local gas qualities remain applicable.* [Power generation, NL]
- *Added value of the reference to standard is zero. Nothing prevents TSO to consider the standard as solution for IP issues* [Producer, EU]
- *Predefining the application of CEN standard might predetermine suboptimal solution (tunnel-vision)* [Producer, EU]
- *No secured entry-exit spec at national level* [TSO, DE]
- *End users still exposed to national legislation (including WI)* [Industrial user, EU]

Scenario assessment: at IPS only



Costs

> *As INT NC mechanisms prevail, it would not imply additional costs.* [TSO, ES]

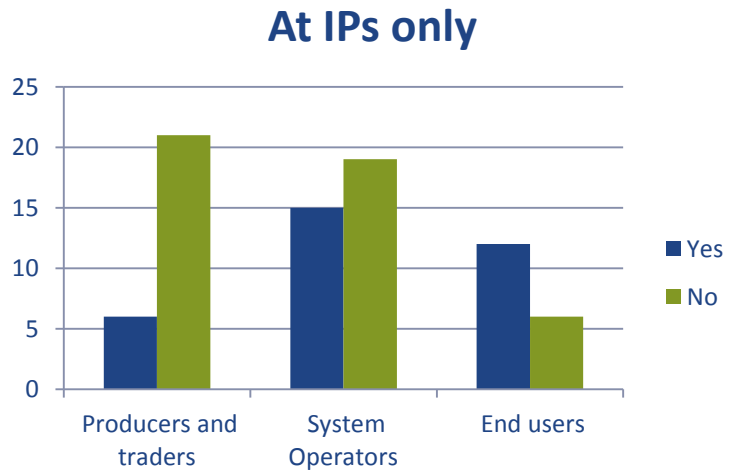
> *IP gas treatment facility (500.000 m³/h) approx. 75 M€* [TSO, DE]

Time

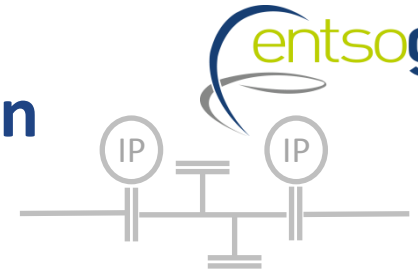
> *No implementation lead-time required.* [TSO, UK]

> Note: if Article 15 is triggered and solution is gas treatment facility, stakeholders estimate 3-5 years depending on permits (based on whole-chain responses).

Feasibility



Scenario assessment: Voluntary adoption



Benefits

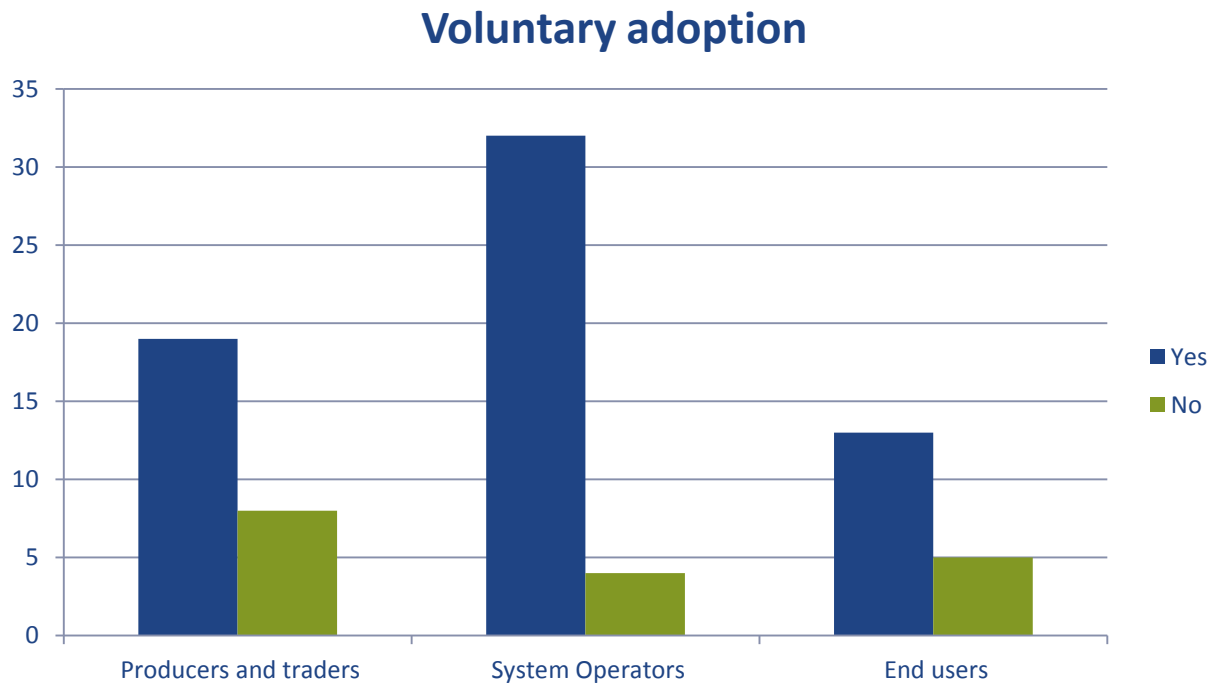
- *Member states are best placed to take proper account of consumer safety, SoS and regulatory framework* [Producer, UK]
- *Standard ready to be used if so decided, no unnecessary barriers introduced* [DSO, EU]

Impacts/costs

- *Member states wishing to adopt the standard should conduct CBA. Application of standard would eliminate flexibility at entry points, including IPs* [Producer, EU]
- *No direct negative impact. Flexibility and access to sources retained. Article 15 would be used if needed* [TSOs, IT and UK]
- *No significant costs and voluntary adoption would grant higher environmental protection* [Domestic appliances, EU]
- *It could lead to different national regulations with even more uncertainty and risks and/or infringement on European competitive level playing field. Mitigation measures for wide ranges still needed* [Industrial user, EU]

Scenario assessment: Voluntary adoption

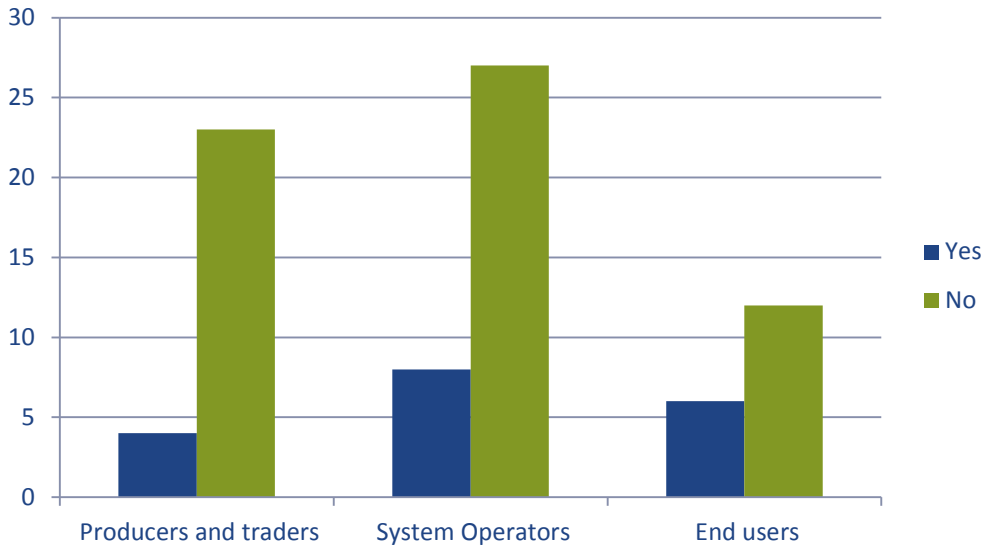
Feasibility



Scenario assessment: summary table

Policy issue	Scenario 1: Whole chain implementation	Scenario 3: At IPs only	Scenario 4: Voluntary adoption
Benefits	Clear rules for whole EU chain Standardised gas in EU No barriers in SoS crisis Storage integrity	Certainty on a proportionate application of the standard Flexibility retained	Maximum MS flexibility Avoids immediate unintended consequences
Impacts	Elimination of flexibility Indigenous production shut-in Restrictions at interconnectors and import points Barrier for biomethane and LNG End user uncertainty	No immediate impacts Limited added value Unsymmetrical entry-exit specs Risk of biasing Article 15 (nothing forbids now considering EN16726) End user uncertainty	No immediate impacts If the standard is adopted, loss of flexibility, scenario 1 at national level. End user uncertainty
Barriers	Economic, operational, legal (conflicts with national specs and outside third package scope)	No barriers	No barriers
Costs	Welfare loses > €2 billion @2015 Prohibitive for small fields and some storages Reduced market liquidity	No immediate costs Depending on CBA for Article 15 triggered projects (reported example costs of 75 M€ per IP)	No immediate costs Depending on national situation if the standard is adopted
Time	From 3 to 10 years Not reachable until mid 20s in some corridors	Immediate 3 to 5 years for Article 15 triggered projects	No time, status quo. Up to 5 if standard is adopted
Feasibility	Not feasible for the majority of producers /traders and end users	Not feasible for the majority producers/traders and SOs	Feasible for the majority of stakeholders

2nd PC on EN16726 impacts



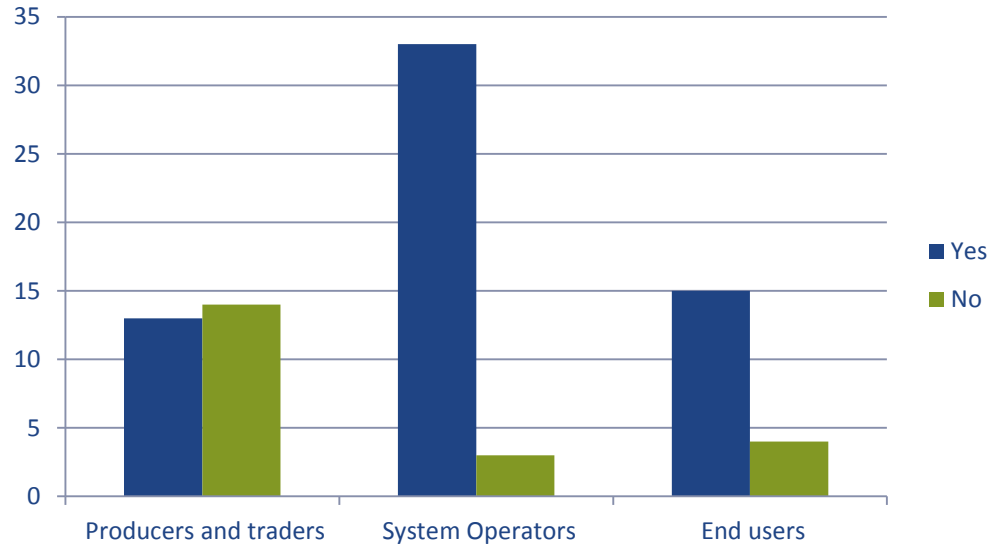
Q22: Would you propose any amendments to the refined scenarios proposed by ENTSOG?

2nd PC on EN16726 impacts

Comments on refined scenarios (summary)

- Producers, upstream operators, traders & shippers
  - RU: Operators should be allowed to agree on less strict limits than standard
  - EU: Standard should be made based on good quality data. TSOs should be given an incentive to use flexibility of the system for co-mingling and blending
- TSO/DSO
  - TSO/DSO AT: Whole chain excluding production on DSO level
  - TSO ES, NL and DSO FR: “Whole chain” with the addition of allowing to accept off-spec gas on own criteria (e.g to bring it into spec range via mixing)

2nd PC on EN16726 impacts



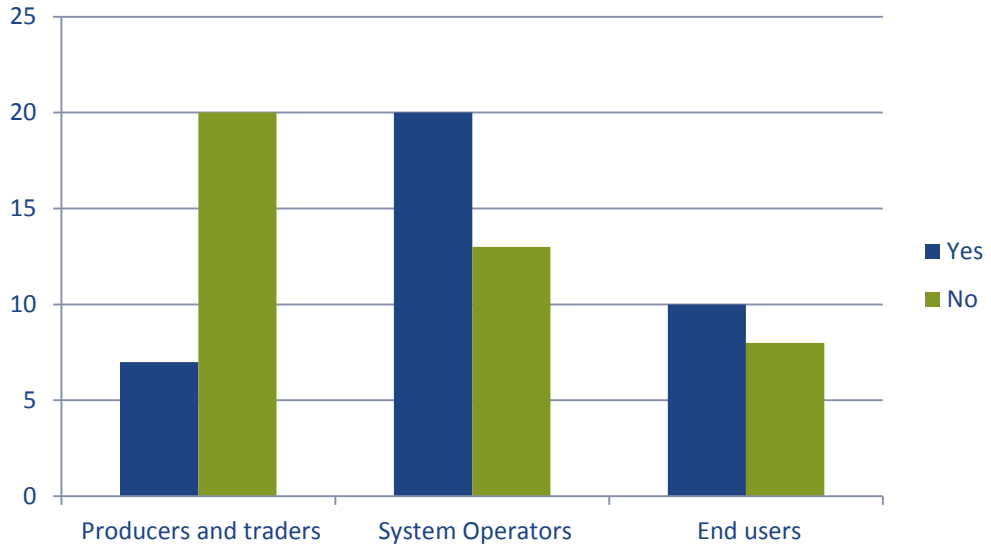
Q23: To provide stability in the legal framework, if the INT NC is amended, the reference to the standard will be linked to the 2015 version, preventing any revision to become automatically binding. Do you agree with this approach?

2nd PC on EN16726 impacts

Comments on fixed (not dynamic) reference to EN16726:2015

- LNG
  - FR: A standard not yet written should not become legally binding by default
- TSO
  - DE: Yes to static reference but not to the 2015 standard as it is
  - UK: If reference, then static (not to change without consultation) / Every revision should undergo fair assessment
- End users
  - Mobility, EU: Revisions can only improve the standard (should be automatically binding)
- Producers, upstream operators, traders & shippers
  - EU: In articles 15 and 19 of the network code there is nothing that prevents TSOs to consider whether an IP issue could be solved by adopting the 2015 version of the CEN standard for the conflicting parameter or any revision of the CEN standard. This would be another reason not to select scenario 3

2nd PC on EN16726 impacts



Q24: For the "At IPs only scenario", would you agree to use the CEN standard as default rule when TSOs do not reach an agreement on a solution?

2nd PC on EN16726 impacts

Comments on standard as default rule

Clarification: the current "At IPs only" scenario does not give any prevalence to the CEN standard with respect to national ones. That wouldn't be the case if the CEN standard is set as default rule, i.e., the standard is imposed when TSOs fail to agree

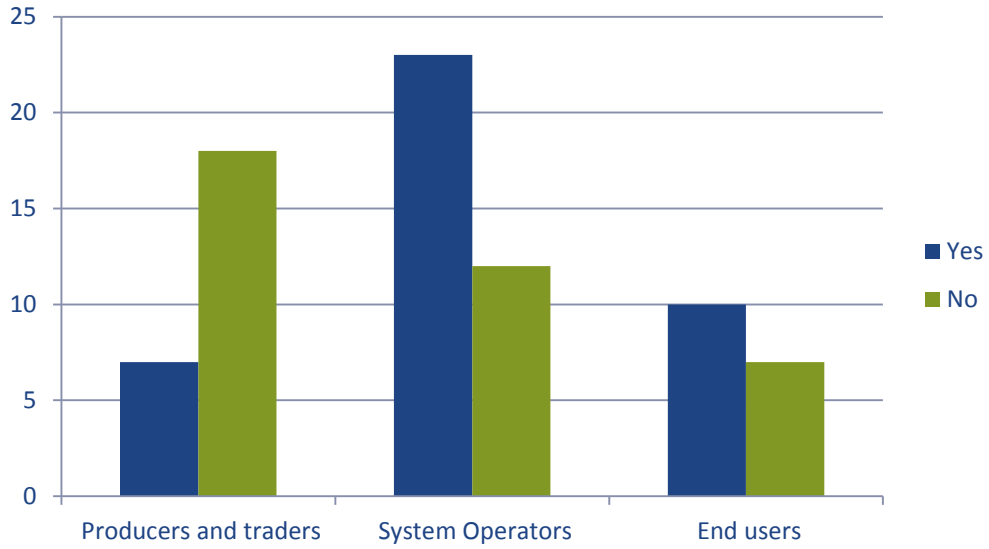
> Producers, upstream operators, traders & shippers - No

- EU: Predefining the application of the CEN standard at IPs where there is a gas quality issue as a default rule, even if subject to a CBA, may create tunnel-vision and predetermine a given suboptimal solution.
- UK: Implementing a default might put one of the negotiating parties in an advantage (hinder negotiation process) / Non-consensual decision making progress implies friction / Referring to a code could discourage innovative solutions

> TSO

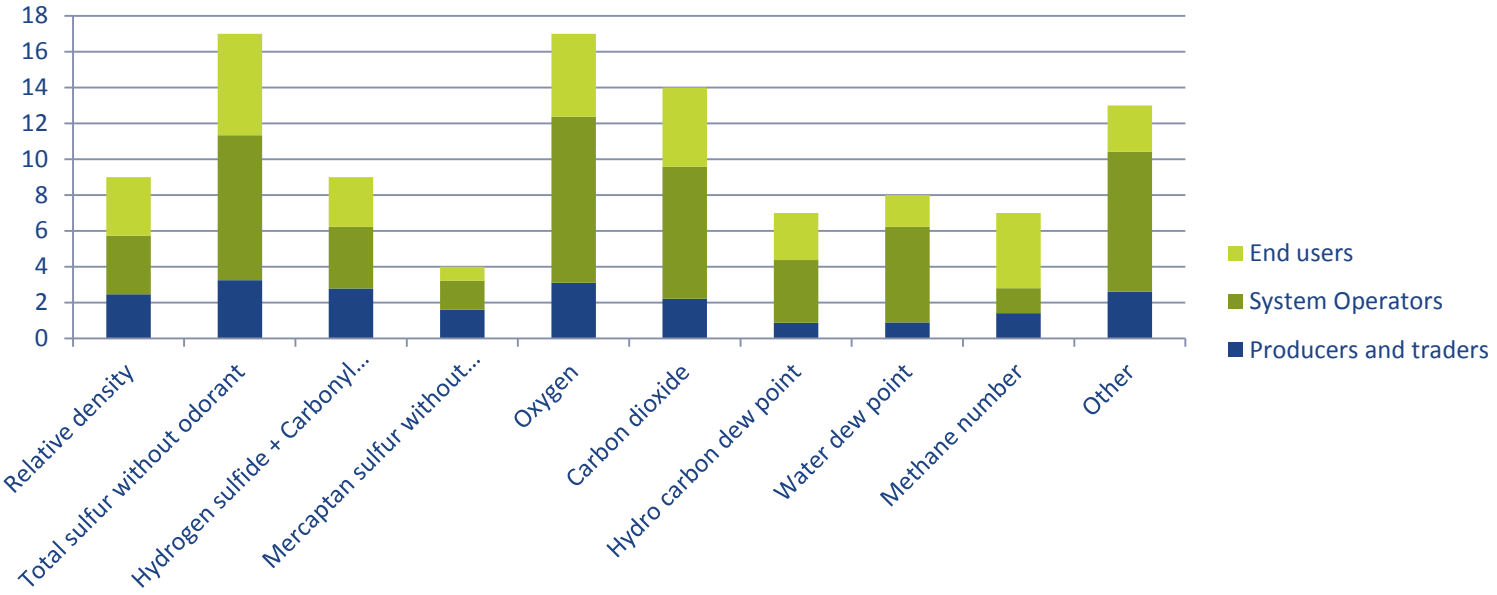
- PL, IE, DK, IT, UK: putting one of the parties in a better position might hamper negotiations.

2nd PC on EN16726 impacts



Q25: Would you recommend the revision of the current requirements of the CEN standard?

2nd PC on EN16726 impacts



Q26: For which parameter, term or condition?

2nd PC on EN16726 impacts

Requirements in EN16726:2015

Parameter	Unit	Min	Max
Relative density	-	0,555	0,700
Total sulfur	mg/m^3	-	20 (30*)
H2S + COS	mg/m^3	-	5
Mercaptan sulfur	mg/m^3	-	6
Oxygen	mol/mol	-	10 ppm to 1%
CO2	mol/mol	-	2.5% to 4%
HC dew point	°C (up to 70 bar)	-	-2
Water dew point	°C (at 70 bar)	-	-8
Methane number	-	65	-

This European standard specifies gas quality characteristics, parameters and their limits, for gases classified as group H that are to be transmitted, injected into and from storages, distributed and utilized.

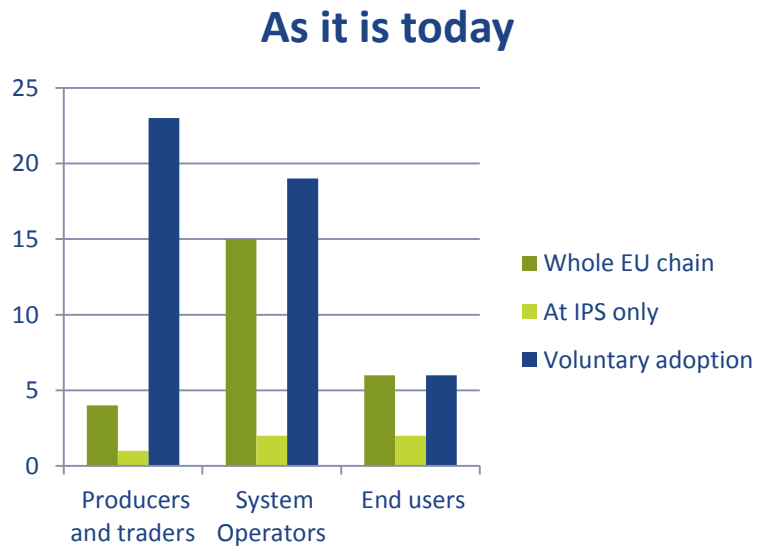
2nd PC on EN16726 impacts

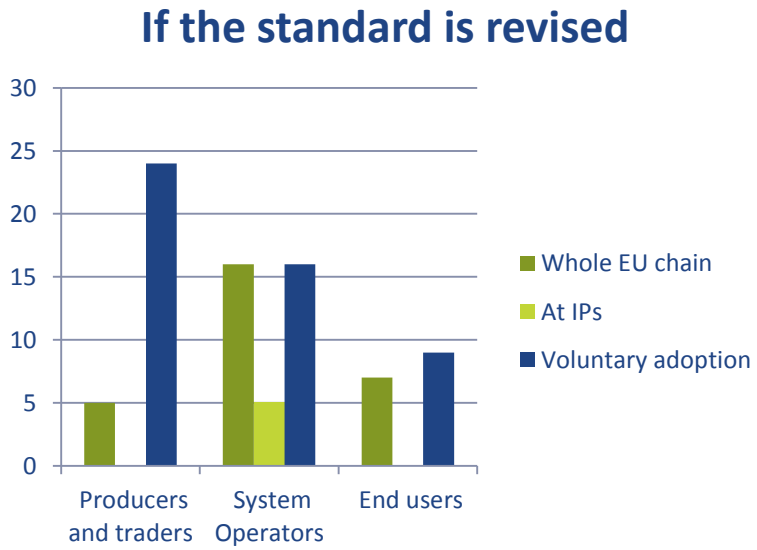
Suggestions for EN16726:2015

Parameter	Lower or narrower	Higher or wider	Other
Relative density	Mobility, EU	Producer, RU	
Total sulfur	Power generation, EU	Producer, RU	TSO, DE: Include odourant
H2S + COS, Mercaptan sulfur		Producer, RU	
Oxygen		TSO SE, Producer, RU	TSO, UK: who is responsible? Sensitive site?
CO2		-	
HC dew point		TSO, SK	
Water dew point		-	TSO, DE: include absolute water content
Methane number*	Biomethane production	Power generation, Mobility, EU	
Other			Include WI and H_2

*For MN higher implies narrower and vice versa

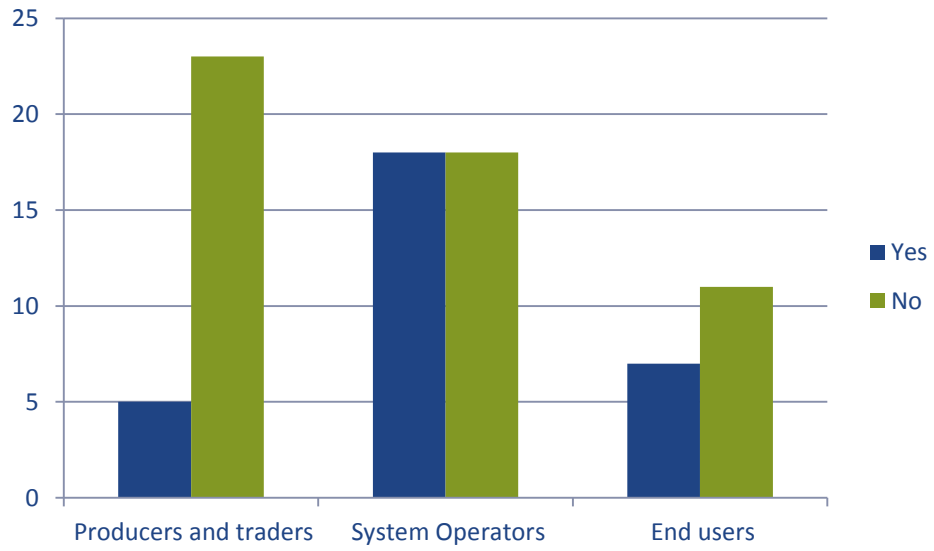
2nd PC on EN16726 impacts





Q27: Would such revision change your preference for the scenarios? Which one would you choose?

2nd PC on EN16726 impacts



Q28: Do you agree to amend the INT NC to include a reference to the gas quality standard (i.e. you support "whole EU chain" scenario and/or "At IPs only")?

2nd PC on EN16726 impacts

Comments on whether the INT NC should be amended

> Producers, upstream operators, traders & shippers
  - PL: Yes, after revision of the standard.
  - UK: No, neither approach would be an improvement / As much diversity of supply as possible should be allowed

> End User
  - Power generation, NL: no, the standard should be adjusted in cooperation with technology suppliers and end users.
  - Mobility, EU: No, only if the standard guarantees quality gas is available

> TSOs
  - ES: Yes, if standard would include WI, the code should be amended
  - SE: Yes, for scenario “At IPs only”
  - NL: No, it is questionable if there is legal basis for whole EU chain in a NC.
  - UK: No, a vision of the future of EU gas transmission is needed first, current standard has been negotiated on the gases MSs can cope with today
  - DK: No, the standard was developed and approved as a voluntary one

2nd PC on EN16726 impacts

Draft conclusions

- A whole chain implementation of the EN16726 would have widespread significant negative impacts across segments and MS and affecting the tree pillars of EU energy policy.
- A revision of the values in the standard would not substantially increase its acceptance. However, a key question is whether when applying the standard higher flexibility should be considered for specific requirements (e.g. CO_2, O_2 limits for sensitive customers) and for any off-spec gas in general both at entry and exit points.
- In this process no evidence of cross-border trade restrictions in normal conditions has been revealed. An amendment of the INT NC to include a weak reference to the standard is not justified, would bring little added value and perhaps limit the possibility to adapt the standard to future needs.
- Many end users expressed concerns on the uncertainty and potential exposure to undesired quality ranges, both in CEN and national standards and independently from the examined scenarios.
- The status quo (voluntary adoption) is not risk free. If the standard were to be adopted at national level a careful examination of implications for the whole chain, including IPs is advisable.

6. Questions and answers

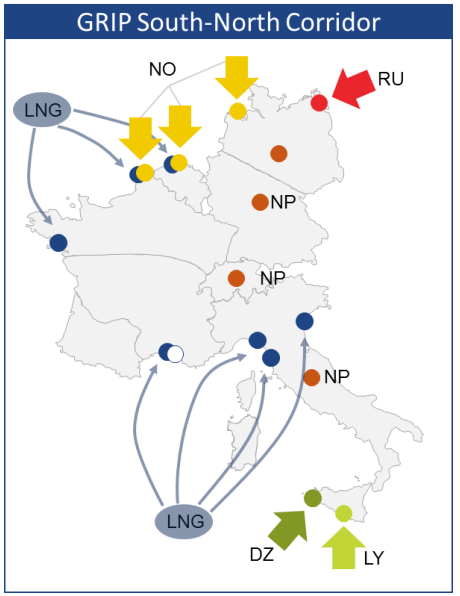
7. Introduction to long term gas quality monitoring outlook

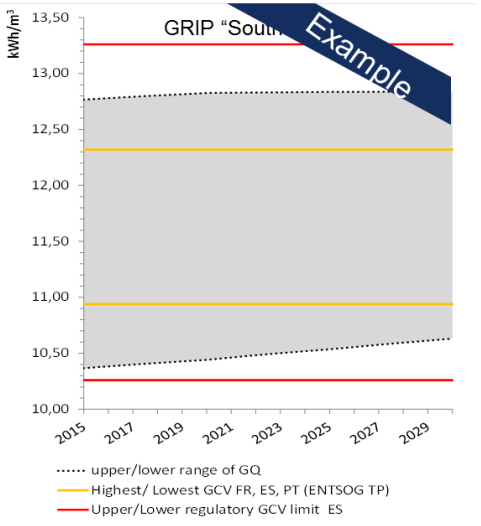
Antonio Gómez Bruque, Interoperability Adviser
antonio.gomez@entsog.eu

Gas Quality Outlook

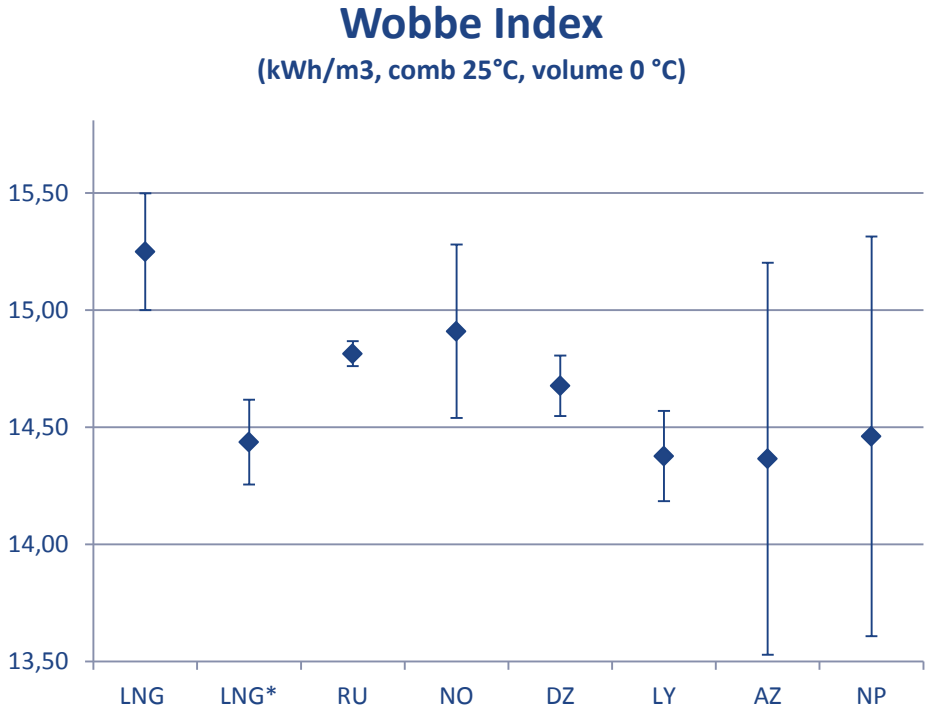
Introduction (INT NC Article 18)

- ENTSOG will publish an outlook identifying potential trends and varaibility of GQ parameters
- Covering at least WI and GCV
- Different forecasts for different regions
- Every two years and valid for the next ten
- Including existing and new sources
- Based on reference values from previous years
- The forecast will consist of a range within which the parameter is likely to evolve
- Consistent and aligned with Ten Year Network development plan
- Open to stakeholder input
- The following slides present a summary of **Wobbe Index** and **Gross Calorific Value** data gathered for different supply sources.





Wobbe Index reference values

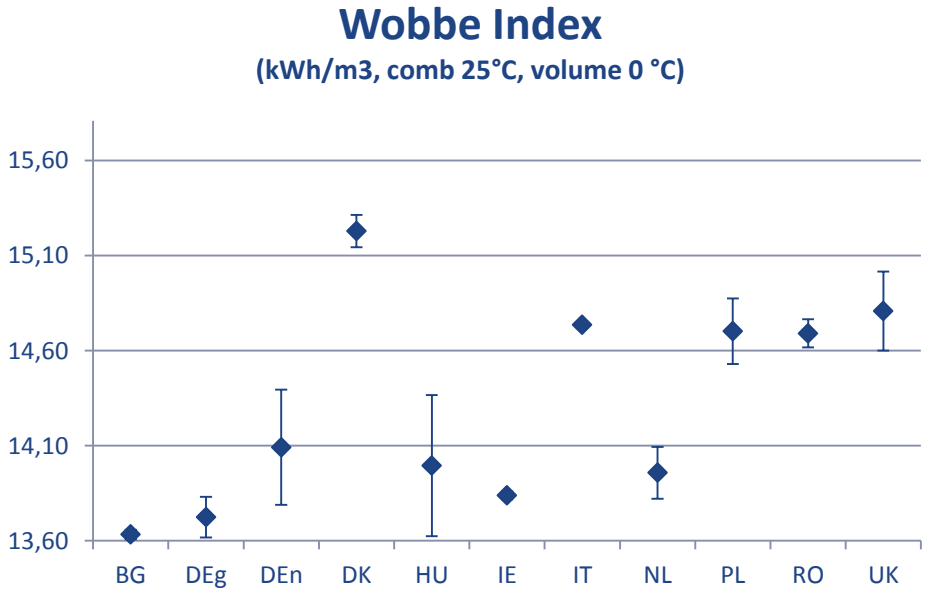


Supply	Avg	U (k=2)
LNG	15,25	0,25
LNG*	14,44	0,18
RU	14,81	0,05
NO	14,91	0,37
DZ	14,68	0,13
LY	14,38	0,19
AZ	14,37	0,84
NP	14,46	0,85

> Notes:

- LNG* represents an estimate of the output of terminals in the UK after ballasting based on national specs
- LNG represents a wider range covering all LNG qualities potentially arriving to the rest of EU
- For the indigenous national production (NP) different national values will be used
- Azeri gas (AZ) values are derived from specifications rather than measured values

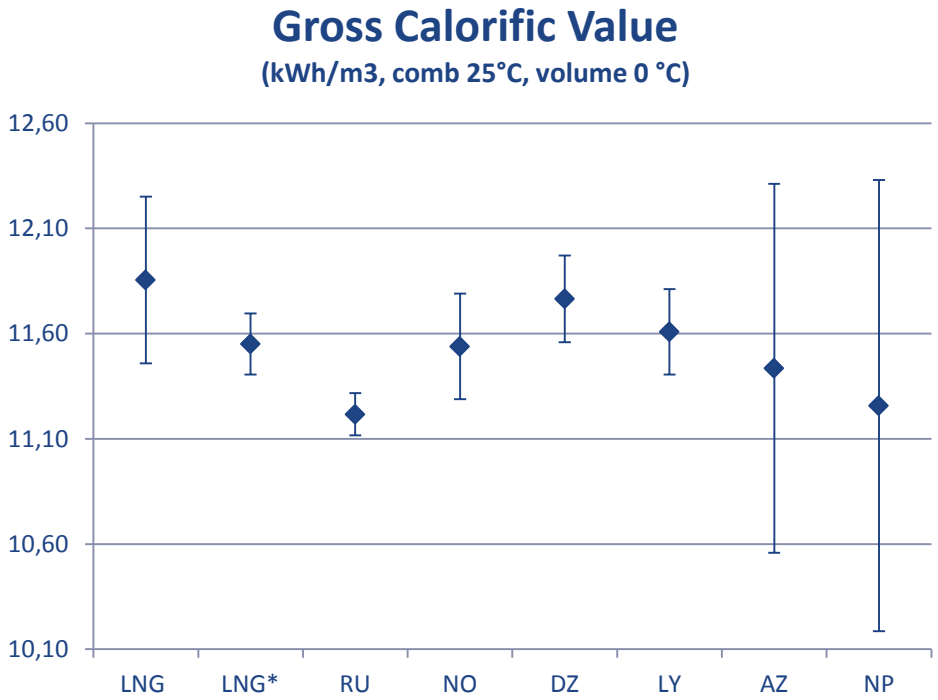
Wobbe Index reference values - NP



Country	Avg	U (k=2)
BG	13,63	0,03
DEg	13,72	0,11
DEn	14,09	0,30
DK	15,23	0,08
HU*	13,99	0,37
IE	13,84	0,02
IT	14,74	0,02
NL	13,96	0,14
PL	14,70	0,17
RO*	14,69	0,07
UK*	14,81	0,21

> Notes:
- Values marked with* are inferred from GCV values rather than based on actual measurements

GCV reference values

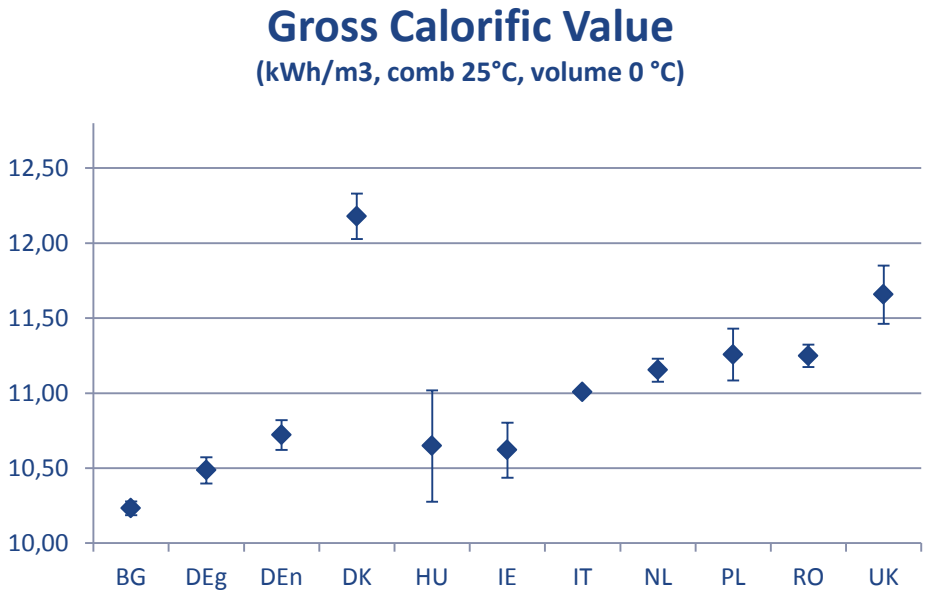


Supply	Avg	U (k=2)
LNG	11,86	0,40
LNG*	11,52	0,18
RU	11,22	0,10
NO	11,54	0,25
DZ	11,76	0,21
LY	11,61	0,20
AZ	11,44	0,88
NP	11,26	1,07

> Notes:

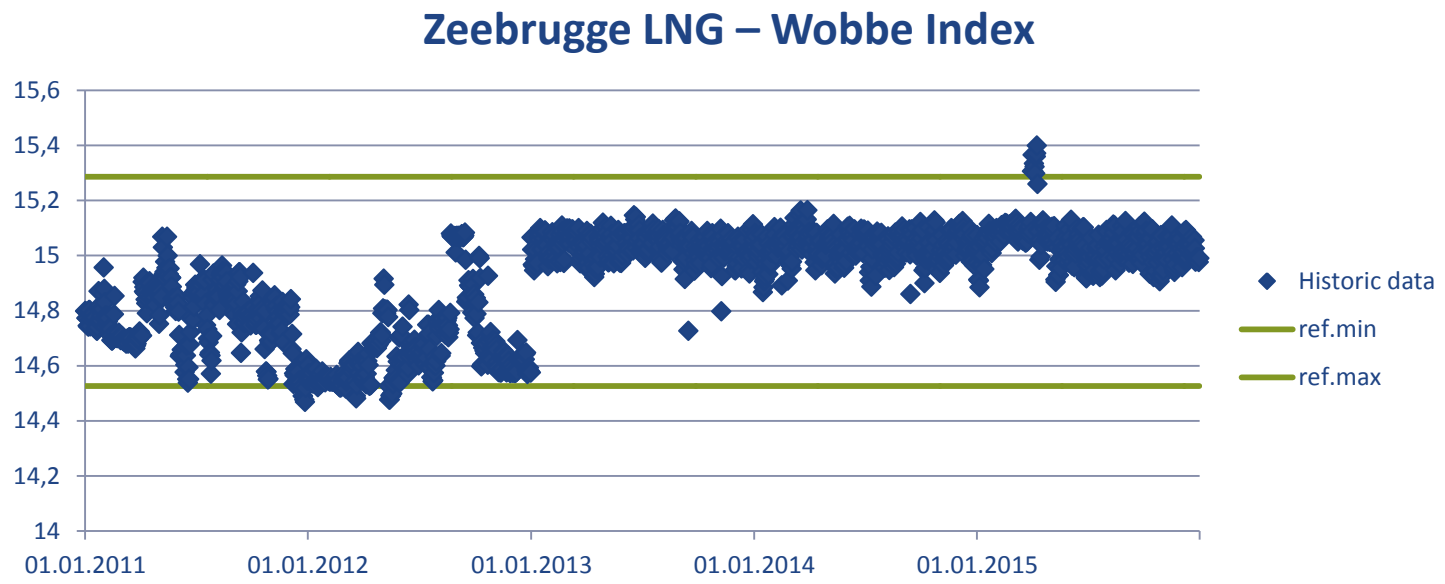
- LNG* represents an estimate of the output of terminals in the UK after ballasting
- LNG represents a wider range covering all LNG qualities potentially arriving to the rest of EU
- For the indigenous national production (NP) different national values will be used
- Azeri gas (AZ) values are derived from specifications rather than measured values

GCV reference values - NP



Country	Avg	U (k=2)
BG	*10,23*	*0,05*
DEg	10,49	0,09
DEn	10,72	0,10
DK	12,18	0,15
HU	10,65	0,37
IE	10,62	0,18
IT	11,01	0,01
NL	11,15	0,08
PL	11,26	0,17
RO	11,25	0,07
UK	11,66	0,19

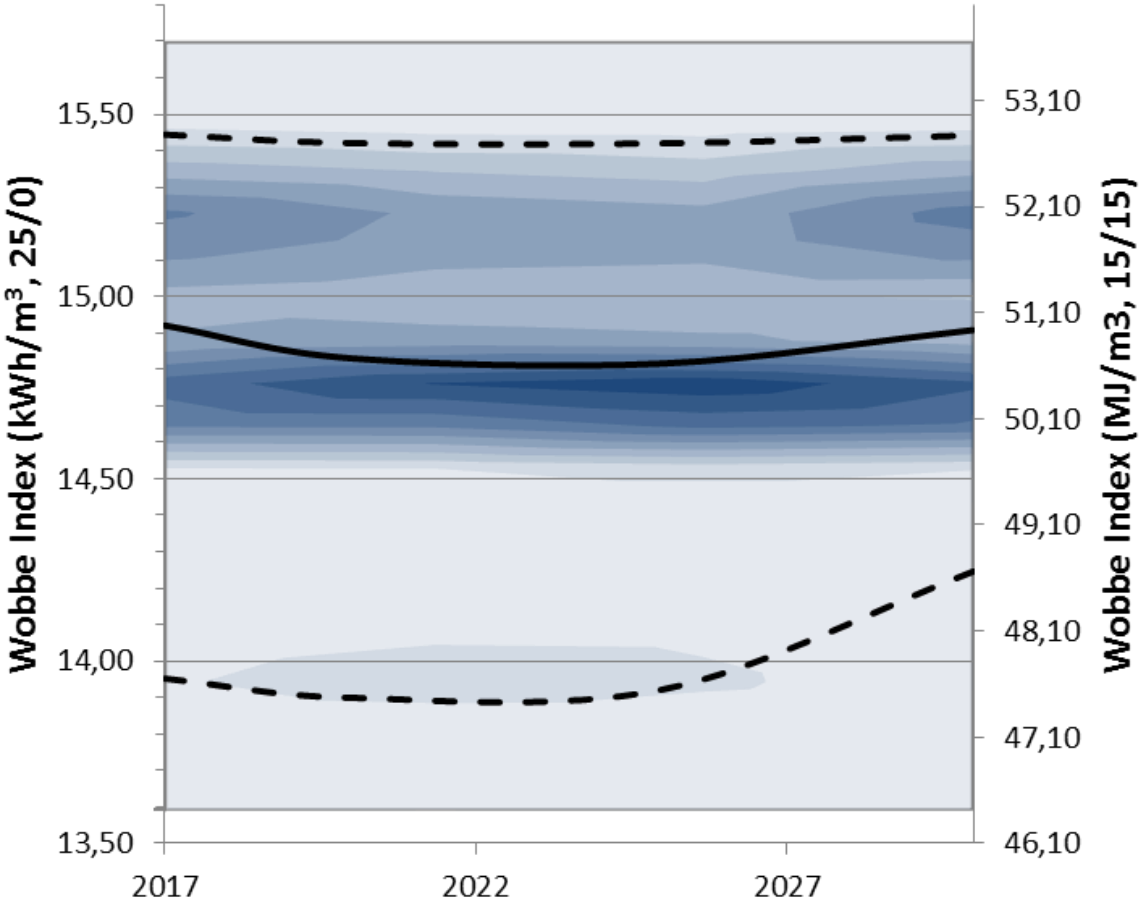
Example analysis of historical data



> Reference values represent a given interval confidence built on historic data

> Additional views on the evolution of gas quality parameters presented above for the different supplies can be send via e-mail to antonio.gomez@entsog.eu

Example regional outlook



8. Panel discussion: potential gas quality issues and possible solutions

(CEFIC, IOGP, Marcogaz, EASEE-gas)

9. Questions and answers

Closure

Hendrik Pollex, System Operations Business Area Manager
hendrik.pollex@entsog.eu

Thank You for Your Attention

Antonio Gómez Bruque
Interoperability adviser/System Operations

ENTSOG -- European Network of Transmission System Operators for Gas
Avenue de Cortenbergh 100, B-1000 Brussels

EML: Antonio.gomez@entsog.eu
WWW: www.entsog.eu