

# A New IGEM Gas Quality Standard for Net Zero Emissions

UNC Transmission Group  
5<sup>th</sup> March 2020

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IGEM, Head of Technical and Policy

# Content

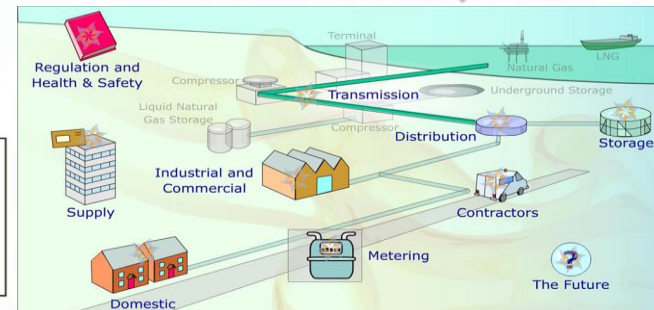
- IGEM – Background
- Standards Development Process
- Gas Quality Standards – Reasons Why?
- Gas Quality Working Group
- Aims of Working Group
- Evidence Gathering
- Summary of Changes
- Next Steps
- Discussion

# About IGEM - Our Heritage

- Formed in 1863
- Awarded Royal Charter 1929
- Global Membership Individuals and Organisations
- Registered Charity
- Licensed by the Engineering Council for the award of professional titles
  - Engineering Technician (EngTech)
  - Incorporated Engineer (IEng)
  - Chartered Engineer (CEng)
- Standards for:
  - Transmission and distribution
  - Safety
  - Legislation
  - Measurement
  - Utilisation
  - General
  - Industry Guidance



Founded 1863  
 Royal Charter 1929  
 Patron: Her Majesty the Queen

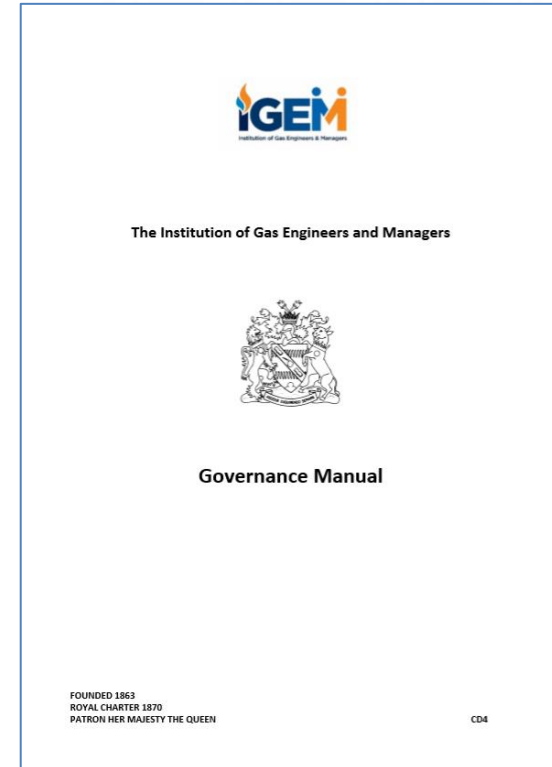
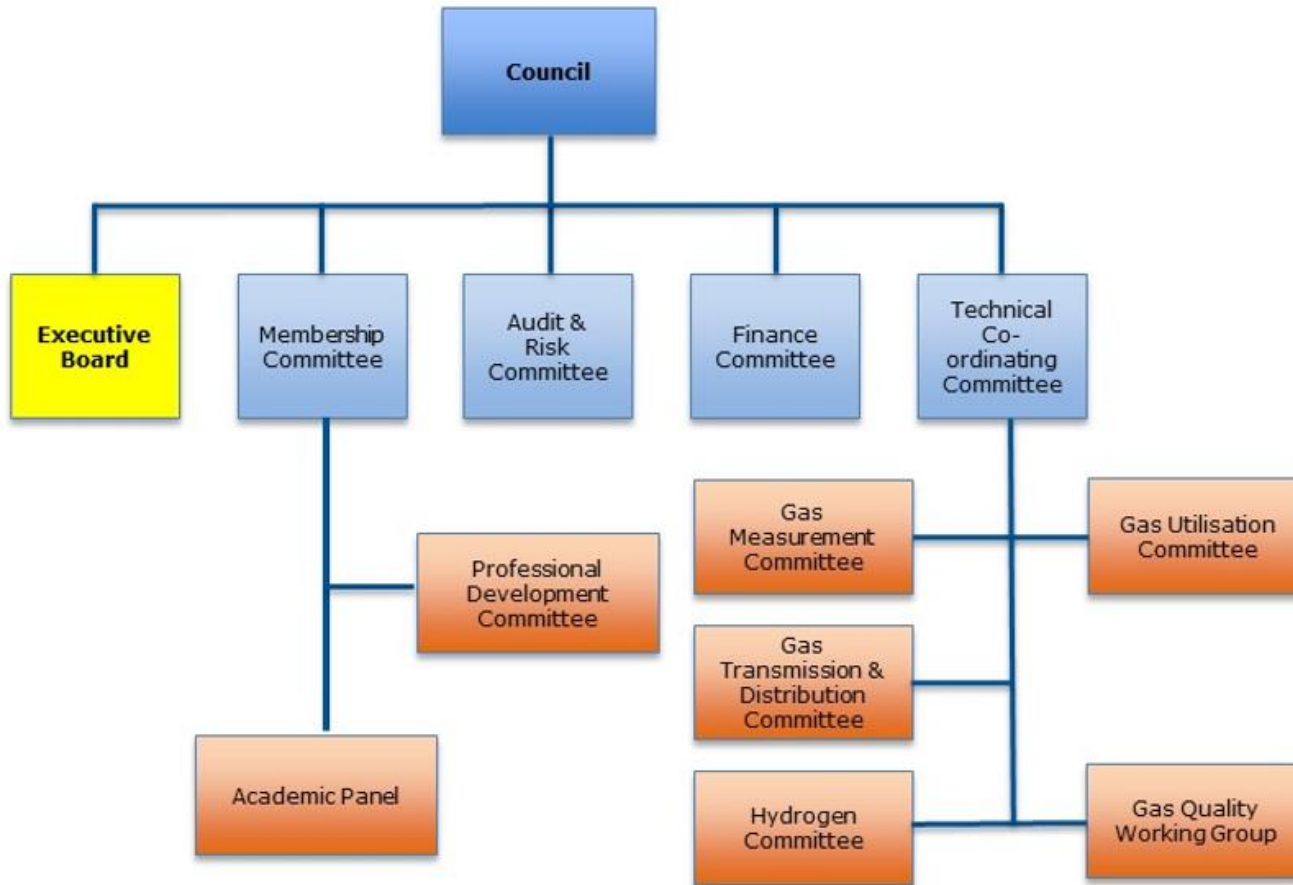


# Producing Technical Standards

- Produced Guidance and Standards on Natural Gas/ LPG/ LPG Air Mix since 1960s
- Independent from commercial effects. Safety outweighs cost.
- Robust peer review and approval process
- Drafted by practising, qualified, engineers (Members and non-members)
- Continually reviewed.
- Standards widely respected throughout the gas industry and by regulatory bodies



# Producing Technical Standards



# Producing Technical Standards

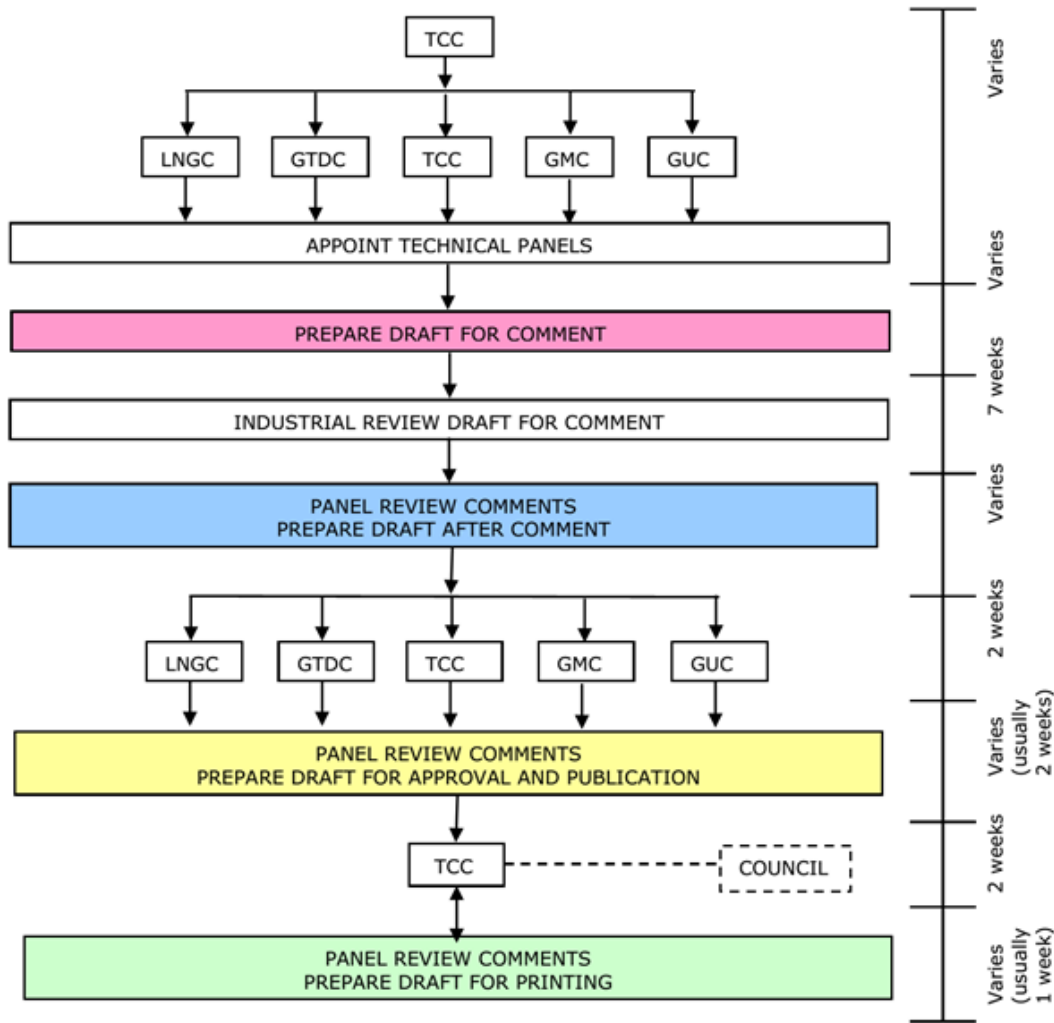
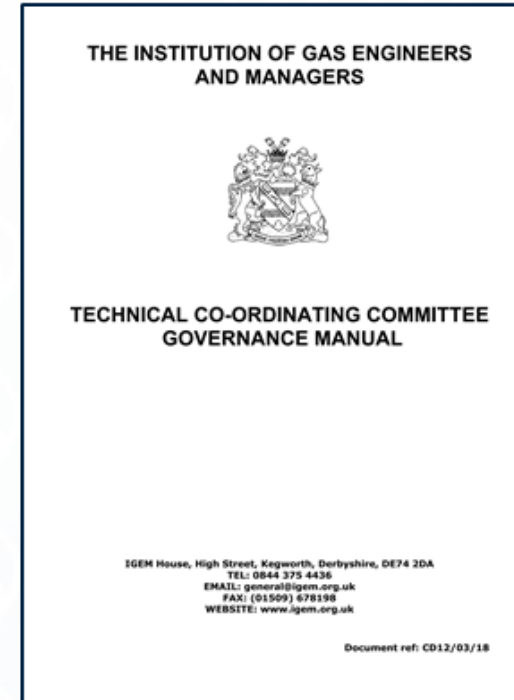
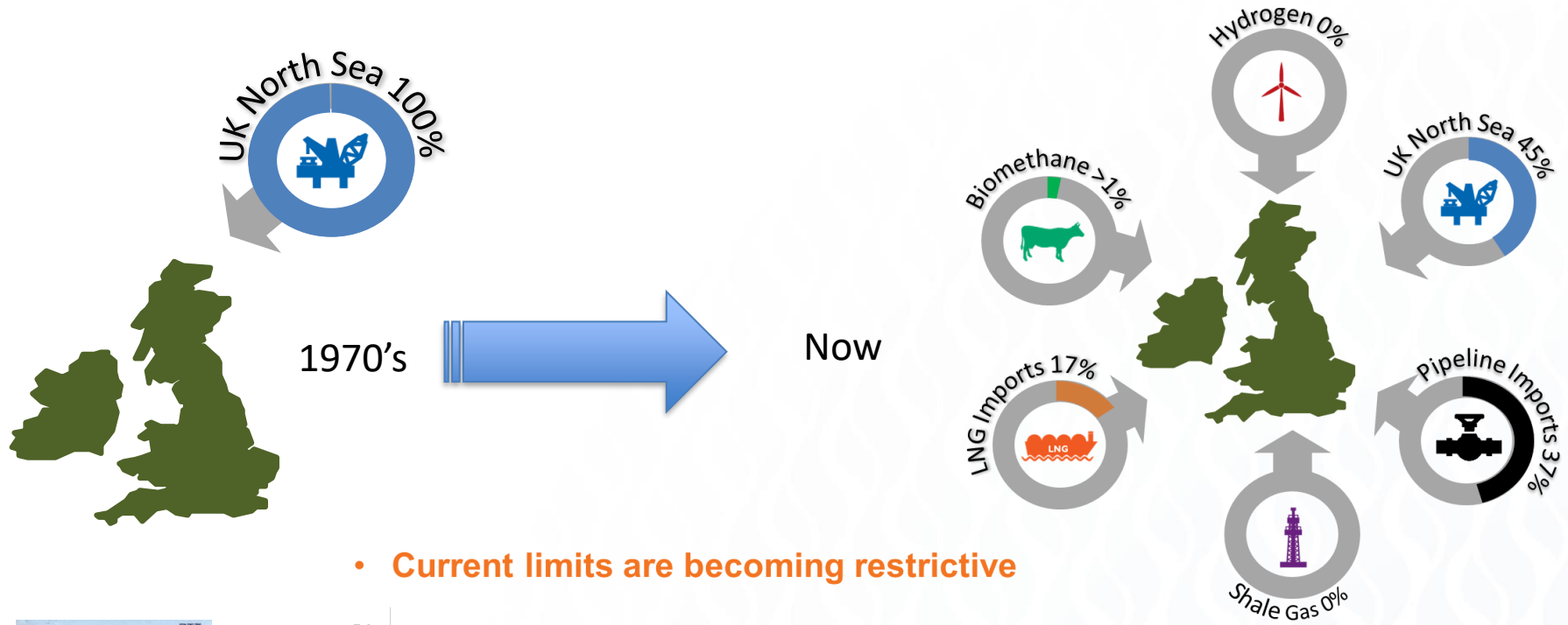


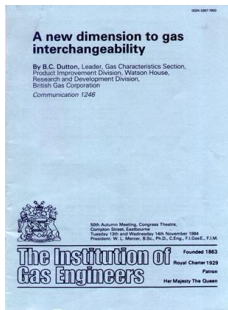
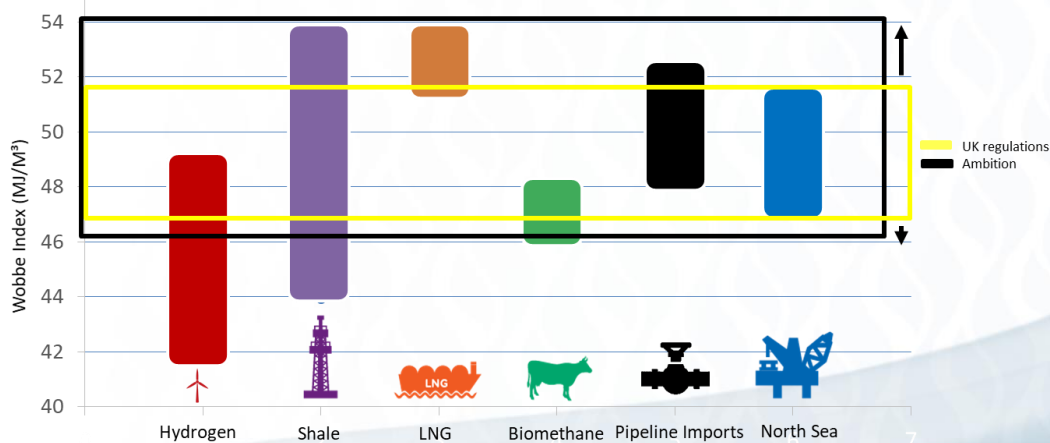
FIGURE 2 – DRAFTING PROCESS. IGEM OWNED STANDARDS.



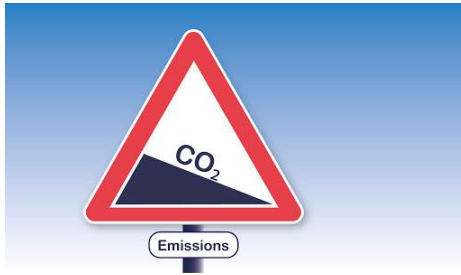
# Gas Quality Standard – Reasons Why?



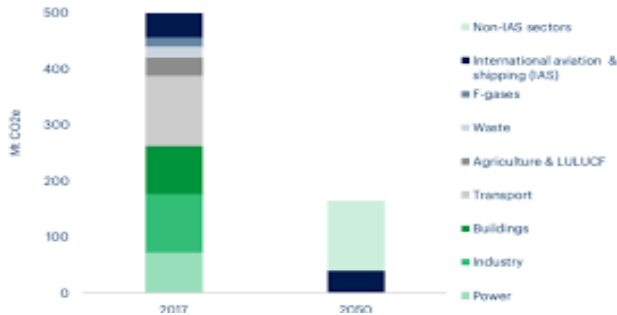
• Current limits are becoming restrictive



# Gas Quality Standard – Reasons Why?



UK emissions: now and in 2050



## The Industry Today

**GAS** HAS BEEN A SOURCE OF ENERGY IN THE UK FOR OVER **200 YEARS**

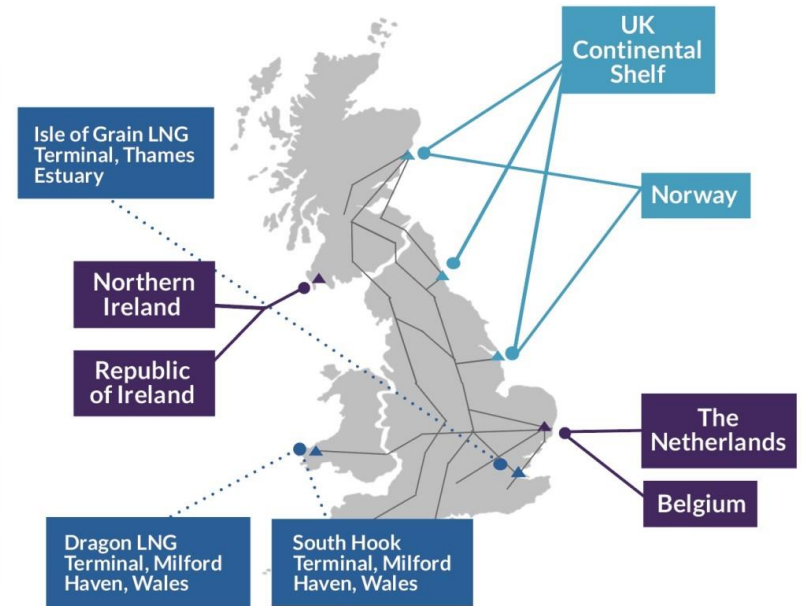
**1/3** OF ALL ENERGY CONSUMPTION IS FOR HEAT PROVIDED BY **NATURAL GAS**



GAS PROVIDES **4/5** OF TOTAL ENERGY DEMAND AT **PEAK TIMES**

THERE ARE OVER **23.2m** GAS CUSTOMERS ACROSS THE UK

## GAS SECURITY OF SUPPLY



- We have:
- Pipelines connecting us with the UK Continental Shelf and Norwegian gas fields.
  - TWO interconnectors linking us with continental Europe (the Netherlands and Belgium) and ONE with Ireland.
  - THREE terminals that import liquefied natural gas (LNG).

Source: ofgem



[www.igem.org.uk](http://www.igem.org.uk)



# Gas Quality Working Group



2016 Review gas quality in the UK

Set the parameters for Wobbe Index initially upper end

Examine further widening for lower Wobbe

Examine the case for change of other parameters

Review process examine previous and current studies

Assess impact on Industrial and Commercial equipment



# Gas Quality Standard - Aims

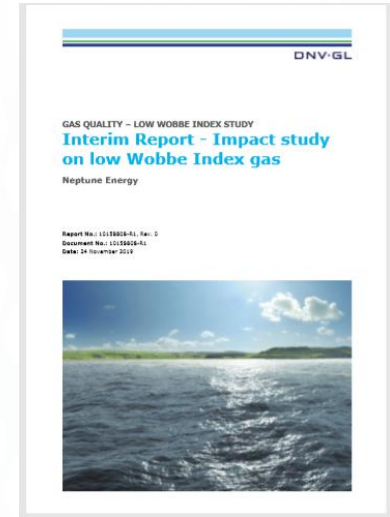
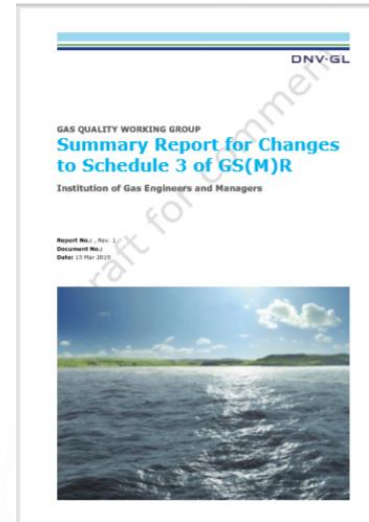
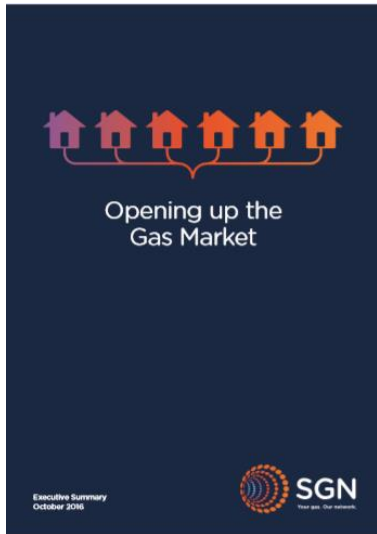
<b>Gas quality standard aim</b>	<b>Securing UK gas supplies</b>	<b>Deep decarbonisation</b>
<b>Facilitating the safe injection of a wider range of gases</b>	UKCS gas	Reducing processing emissions
	LNG imports	
	Interconnectors	Biomethane
		Hydrogen

**It is important to remember that the GS(M)R are primarily intended to ensure the safety of the public – this will continue to be the primary aim of the new gas quality standard**

# Gas Quality Standard – Evidence Gathering

- The gas quality specified for the UK should be underpinned by relevant, up-to-date, safety evidence.
- Extensive evidence gathering exercise over three years.
- The trade bodies represented on the Working Group have also shared output from the Working Group and provided regular feedback.
- Supported by practical projects to test wider gas quality parameters with domestic and industrial customers, including, but not limited to:
  - SGN SIU Gas Quality demonstrating and rolling out a wider range of gas quality to about 8000 domestic and small commercial customers
  - The Industrial and Commercial Gas Quality project which engaged widely with large gas users including power generators, manufacturers of combustion equipment, storage operators and industrials
  - Academic journals that published the original interchangeability work by Dutton
  - The GSMR Review carried out by the Energy Networks Association

# Gas Quality Standard - Key gas network innovation projects



davelanderconsulting

Project number:	0133
Report number:	BIG0133
Title:	Review required: An alternative approach to specifying the natural gas interchangeability
Author:	Dave Lander
Revisor:	A
Date:	04/02/2016
Client:	NGM

Revision History:

0	Built for comment (25/11/2015)
A	Following comments from SGL, BREC (24/02/2016)

Link to Distribution:

Issue 1.0 (21/02/2016)

Approved in England and Wales, 04/02/2016 by: Dave Lander, Director, Institution of Gas Engineers & Managers, 477-479, 4th Floor, 25 Abchurch Lane, London, EC4N 3DF

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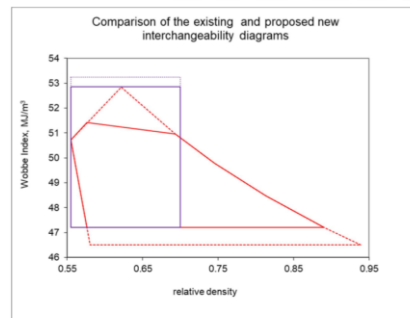


Figure 13: Final form of the proposed new interchangeability diagram, compared with the existing diagram of the GSMR

DNV-GL - Comparison of pipeline fracture propagation risk for natural gases of differing Wobbe index

davelanderconsulting

Project number:	0145
Report number:	BIG0145
Title:	Comparison of pipeline fracture propagation risk for natural gases of differing Wobbe index
Author:	B.F Lander
Revisor:	A
Date:	14/02/2016
Client:	NGM

Revision History:

0	Built for comment (15/01/2016)
A	Amended plots with wider case ranges, added figure 4 (24/02/2016)

Link to Distribution:

NGM Gas Quality Working Group

Issue 1.0 (21/02/2016)

Approved in England and Wales, 04/02/2016 by: Dave Lander, Director, Institution of Gas Engineers & Managers, 477-479, 4th Floor, 25 Abchurch Lane, London, EC4N 3DF

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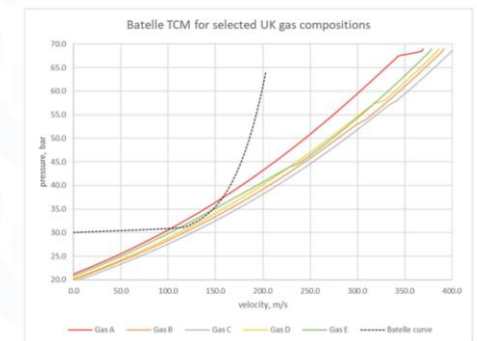
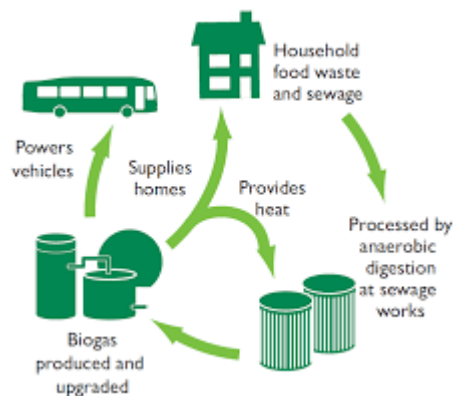
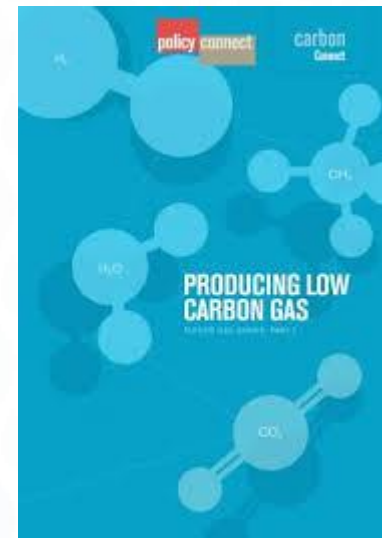


Figure 2: Battelle TCM plots for UK pipeline gases

# Gas Quality Standard - Key gas network innovation projects

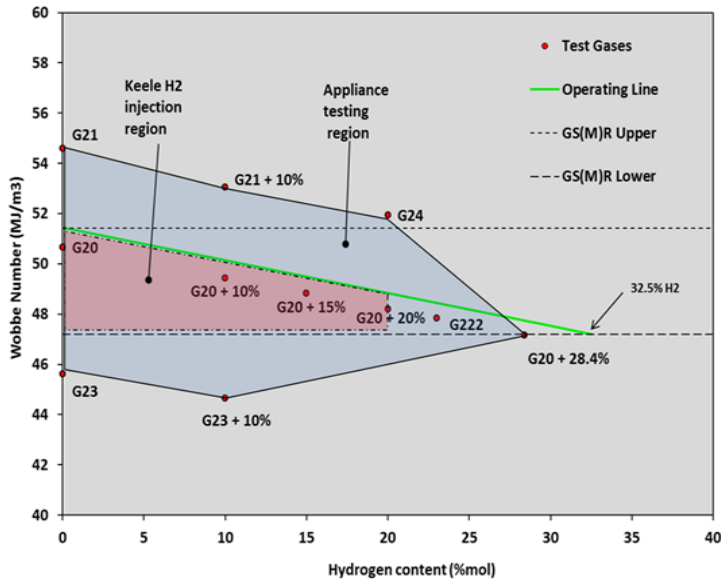


94 x Biomethane Sites in UK



# Gas Quality Standard - Key gas network innovation projects

## Hydrogen Blends



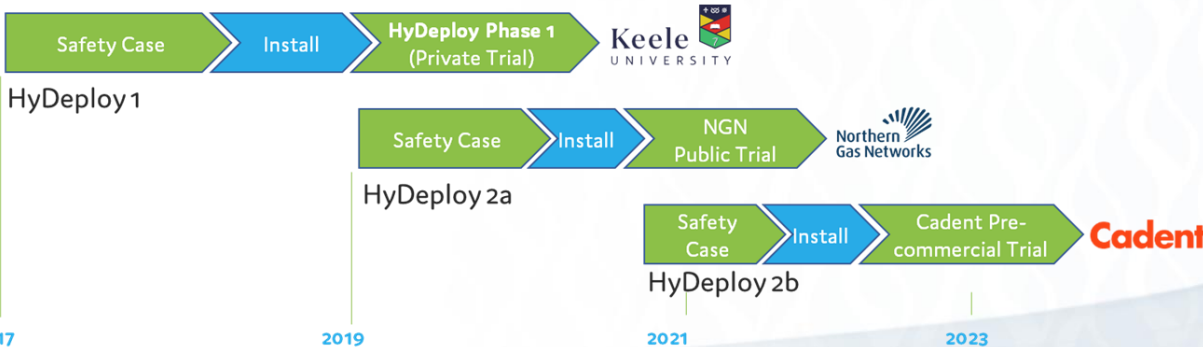
## HyNTS nationalgrid

HyNTS is a programme of work that seeks to identify the opportunities and address the challenges that transporting hydrogen within the National Transmission System (NTS) presents. This will unlock the potential of Hydrogen to deliver the UK's 2050 Net Zero targets.

Currently we have five projects live in our HyNTS programme:

Project Cavendish	Hydrogen Flow Loop	NTS Hydrogen Injection
A review of the potential of the Isle of Grain region to use existing infrastructure to supply hydrogen to London & the South East including generation, storage, transport and CCS.	Offline test loop to evaluate metallurgy changes on existing NTS steel pipe and new MASIP pipe when exposed to 30% hydrogen, identifying next steps to assess the NTS' suitability to transport hydrogen.	To identify the requirements to enable a physical trial of Hydrogen injection into the NTS, identifying the gaps in the safety case and indicating the most suitable NTS location for a live small-scale trial.
Hydrogen Deblending	H21 NIC bid	
To assess a variety of hydrogen recovery technologies and develop concept designs for selected options including a techno-economic review and identify the requirements for a demonstration project.	Supporting NGN's 2019 NIC Bid alongside the other GDNs to address the impact of 100% hydrogen distribution from LTS offtake to the consumers meter, encompassing the potential impact on current operational and maintenance activities, regulations and procedures.	
Two projects are now completed:		
Feasibility of Hydrogen in the NTS	Aberdeen Vision	
A feasibility study with the aim of determining the capability of the NTS to transport hydrogen. Includes a review of relevant assets, pipeline case study and draft scope for offline trials.	A feasibility study for the generation of hydrogen at St Fergus using the NTS (up to 2%) to supply the city of Aberdeen. Includes generation, injection, separation and transport.	

National Grid



HSE Health and Safety Executive

### Injecting hydrogen into the gas network – a literature search

Prepared by the Health and Safety Laboratory for the Health and Safety Executive 2016

RR1047 Research Report

# Gas Quality Standard – Summary of Changes

Content or characteristic	Current schedule 3 of GS(M)R	New IGEM standard
<b>Part I Requirements under normal conditions</b>		
<b>Hydrogen sulphide content</b>	$\leq 5 \text{ mg/m}^3$	No change
<b>Total sulphur content (including hydrogen sulphide)</b>	$\leq 50 \text{ mg/m}^3$	No change
<b>Hydrogen content</b>	$\leq 0.1\%$ (molar)	No change
<b>Oxygen content</b>	$\leq 0.2\%$ (molar)	$\leq 1\%$ (molar) at pressures below 38 barg
<b>Impurities</b>	Shall not contain solid or liquid material which may interfere with the integrity or operation of pipes or any gas appliance (within the meaning of Regulation 2(1) of the 1998 Regulations) <sup>1</sup> which a consumer could reasonably be expected to operate	No change
<b>Hydrocarbon dewpoint and water dewpoint</b>	Shall be at such levels that they do not interfere with the integrity or operation of pipes or any gas appliance (within the meaning of Regulation 2(1) of the 1998 Regulations) which a consumer could reasonably be expected to operate	No change
<b>Wobbe Index</b>	$\leq 51.41 \text{ MJ/m}^3$ and	$\leq 52.85 \text{ MJ/m}^3$
	$\geq 47.20 \text{ MJ/m}^3$	$\geq 46.50 \text{ MJ/m}^3$
<b>Incomplete combustion factor</b>	$\leq 0.48$	Removed

# Gas Quality Standard – Summary of Changes

Content or characteristic	Current schedule 3 of GS(M)R	New IGEM standard
<u>Sooting index</u>	≤0.60	Removed
Relative density	Not present	≤0.700
<u>Odour</u>	The gas shall have been treated with a <u>stenching agent</u> to ensure that it has a distinctive and characteristic <u>odour</u> which shall remain distinctive and characteristic when the gas is mixed with gas which has not been so treated, except that this paragraph shall not apply where the gas is at a pressure of above 7 <u>barg</u> .	
Pressure	The gas shall be at a suitable pressure to ensure the safe operation of any gas appliance (within the meaning of Regulation 14(1) of the 1998 Regulations) which a consumer could reasonably be expected to operate.	
<b>Part II Requirements for gas conveyed to prevent a supply emergency</b>		
<u>Wobbe Index</u>	≤52.85 MJ/m <sup>3</sup>	Removed
	≥46.50 MJ/m <sup>3</sup>	Removed
Incomplete combustion factor	≤1.49	Removed



# Gas Quality Standard – Summary of Changes

## Benefits of Changes

	UKCS gas	LNG imports	Reducing gas processing emissions	Biomethane	Hydrogen
<b>Higher Wobbe</b>	✓	✓	✓		
<b>Lower Wobbe</b>	✓		✓		
<b>1% oxygen</b>				✓	
<b>Relative density</b>	✓	✓		✓	✓
<b>Moving GS(M)R Schedule 3 to IGEM standard</b>	✓	✓	✓	✓	✓
<b>Removal of Incomplete Combustion Factor and Sooting Index</b>	✓		✓		

# Gas Quality Standard – Industry Peer Review

- Key Milestone Reached – Industry Consultation Period
- Evidence Reports supporting changes
- Existing Gas Quality Issues – Estimate Future Issues
  - Variations across UK
  - Impacts on Power Stations
  - Impacts on Gas Users
- Updated Dutton Interchangeability Diagram
- Case for Change Domestic Users
  - Increase Wobbe
  - Decrease Wobbe
  - Appliance Safety Devices
- Case for Change on Commercial Users
- Gas Network Safety
  - Explosion Risk
  - Pipeline Fracture Propagation

# Gas Quality Standard – Next Steps

Loop back if substantial changes are required following HSE clarifications

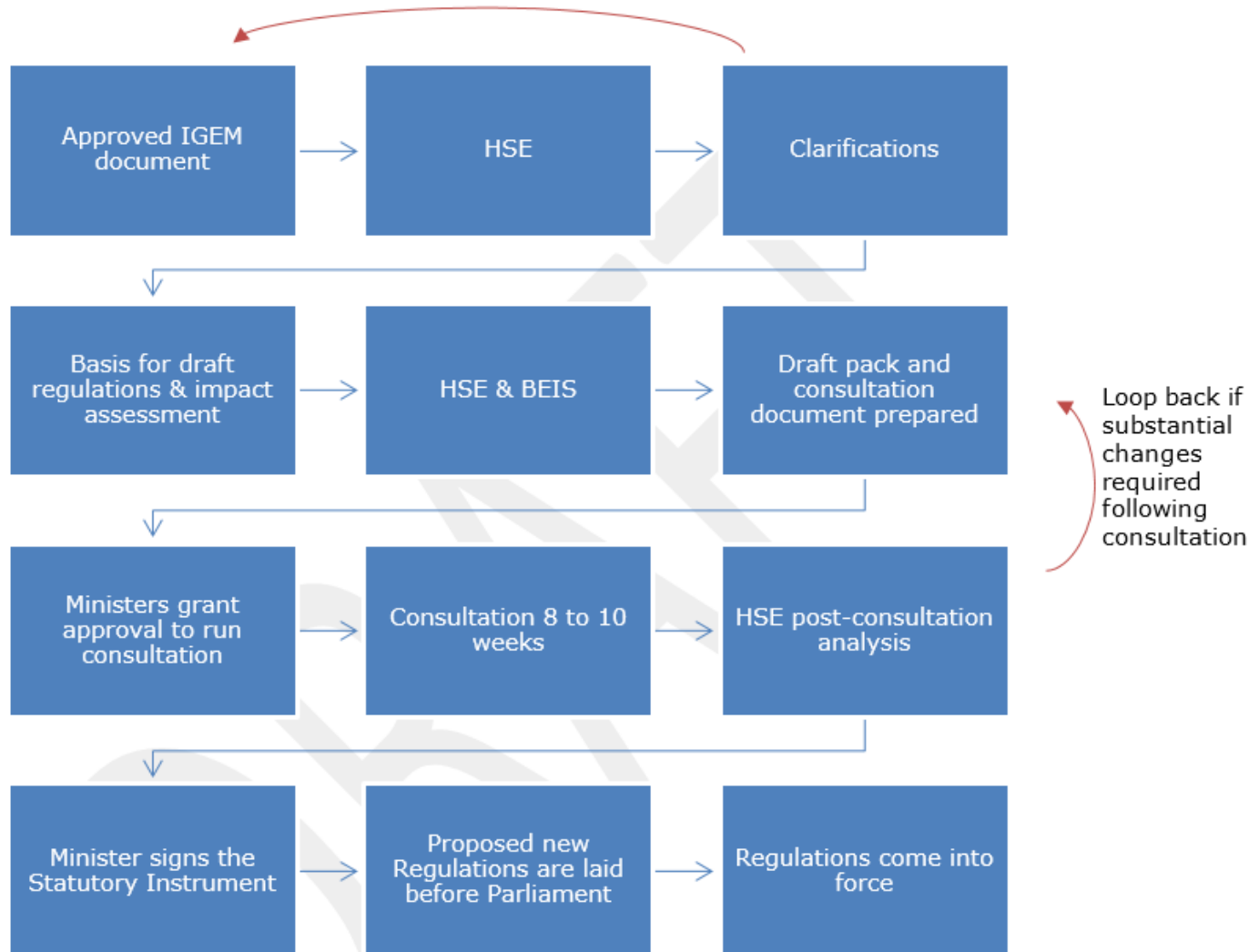


Figure 11 Summary of process to be followed by HSE following the IGEM consultation

# Summary

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- Standards Development Process
- Gas Quality Standards – Reasons Why?
- Gas Quality Working Group
- Aims of Working Group
- Evidence Gathering
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**IGEM/GL/10**  
**Communication XXXX**

**IGEM Standard for Gas Quality**

**Thank you**



Founded 1863  
Royal Charter 1929  
Patron: Her Majesty the Queen



[www.igem.org.uk](http://www.igem.org.uk)