

Gas
Transmission

Gas Operational Forum

The Clermont Hotel & MS Teams

25 November 2021

9.32am

Questions

MS Forms (link in the chat)

Teams Chat

nationalgrid



Gas
Transmission

Introduction & Agenda



George Killick
Senior Operational Liaison Officer

national**grid**



Presenters

National Grid

George Killick – Senior Operational Liaison Officer

Martin Cahill – Senior Operational Liaison Officer

Malcolm Montgomery – Senior Codes Change Lead

Tom Wilcock – Emergency and Compliance Manager

Haroon Khan – FutureGrid Project Supervisor

Chris Williams – Network Analyst

ICE Endex

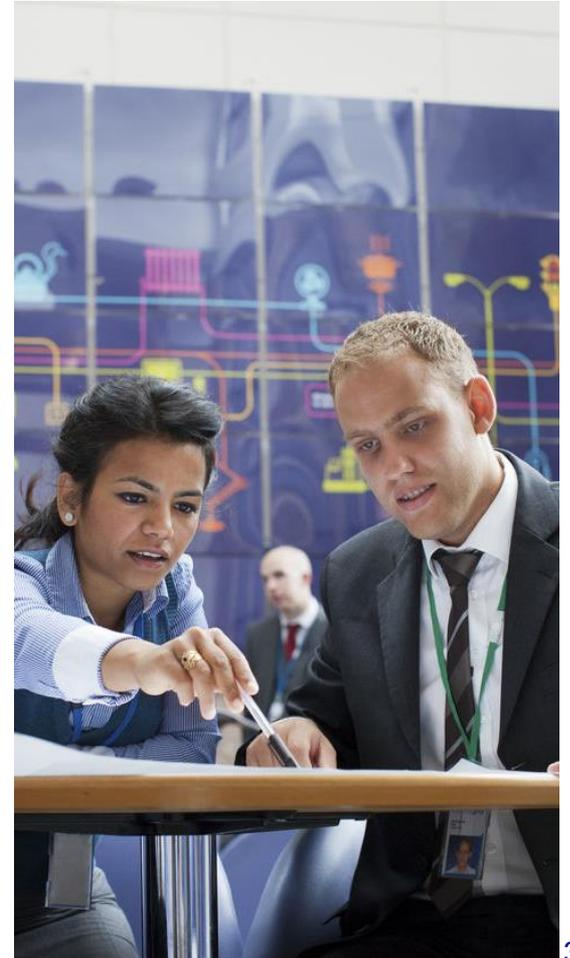
Wouter de Klein – Director Utility Markets

South Hook Gas

Tu-Vi Ta – Commercial Operations

Adam Bates – Commercial Operations

National Grid



Calendar year 2022 Operational Forums

All forums will be hybrid via Microsoft Teams and at the Clermont Hotel, London.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Clermont & Online	Clermont & Online	Clermont & Online	X	Clermont & Online	Clermont & Online	X	X	Clermont & Online	Clermont & Online	Clermont & Online	X
20/01	24/02	31/03		19/05	30/06			15/09	20/10	24/11	

Please note that dates are still being finalised.

**Registration is open for the
January 2022 event at:**

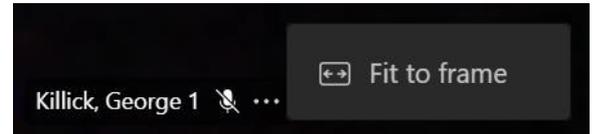
<https://www.eventbrite.co.uk/e/january-gas-operational-forum-2022-online-tickets-217004184357>

The Clermont Hotel
Charing Cross
London
WC2N 5HX

Housekeeping for Hybrid Forums

During our Teams events;

- Attendees will be automatically muted on dial-in and cameras will be unavailable.
- You can use the 'raise a hand' function if you would like to speak and we will enable your camera and microphone options.
- You will then need to un-mute yourself and turn your camera on to ask your question.
- We will be taking questions via the chat function, or if you would like to remain anonymous please use Microsoft Forms (link in the chat)



Key resources available to you

Gas Ops Forums

Throughout the year, we hold regular Operational forum meetings. This forum aims to provide visibility and awareness for our customers and stakeholders to help understand and discuss the operation and performance of the National Transmission System (NTS). We also proactively invite any suggestions for operational topics that would promote discussion and awareness.

Registration is open for all events at:

<https://www.nationalgridgas.com/data-and-operations/operational-forum>

Gas Distribution List

<https://subscribers.nationalgrid.co.uk/h/d/4A93B2F6FAF273DE>

Join the conversation

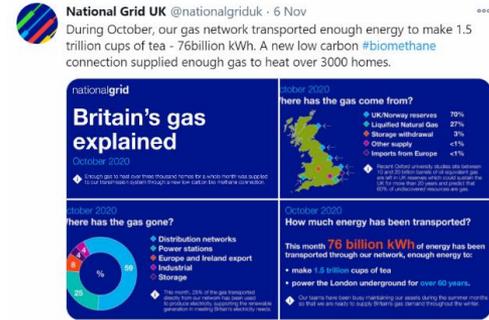
Registering for the site will enable you to access further content and take part in discussions and voting. We are keen to ensure that we hear the views of all market participants, and registration will help us to ensure that relevant content can be developed for discussion.

Register for access

For updates and interaction with National Grid please visit;
<https://datacommunity.nationalgridgas.com/>

For the National Grid Gas Website, please visit;
<https://www.nationalgridgas.com/about-us>

Maintenance Planning
<https://www.nationalgrid.com/uk/gas-transmission/data-and-operations/maintenance>



For the monthly Gas Explained information please visit;
<https://twitter.com/nationalgriduk>

Or follow our personal accounts on LinkedIn

Modernising energy networks data

We're modernising data from the energy networks, bringing together gas and electricity networks to address data issues, access new datasets and identify opportunities in existing datasets.

Energy Data Request Tool:
[Microsoft Forms Link](#)

How to contact us

Operational Liaison Team

Joshua Bates: Joshua.Bates@nationalgrid.com

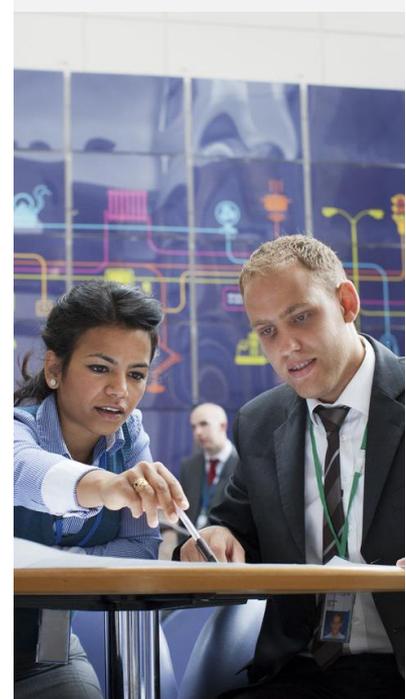
Martin Cahill: Martin.Cahill@nationalgrid.com

George Killick: George.Killick@nationalgrid.com

Operational Liaison Email:
Box.OperationalLiaison@nationalgrid.com

For updates and interaction with National Grid please visit;
<https://datacommunity.nationalgridgas.com/>

For the National Grid Gas Website, please visit;
<https://www.nationalgridgas.com/about-us>



Agenda for Today

01	Welcome and Introduction	09:32
02	Operational Overview	09:40
03	South Hook Gas Guest Presentation	09:50
04	Bacton Exit IPs	10:10
05	ICE Endex Guest Presentation	10:20
06	Emergency Exercise Celsius	10:40
07	FutureGrid	10:55
08	Hydrogen Blends in the NTS	11:05
09	Commercial Tools	11:15
10	Updates & Close	11:25

Please ask any questions using the chat function, or through Microsoft Forms (link in the chat).

Questions will be covered at the end of each agenda section.

Gas
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Operational Overview



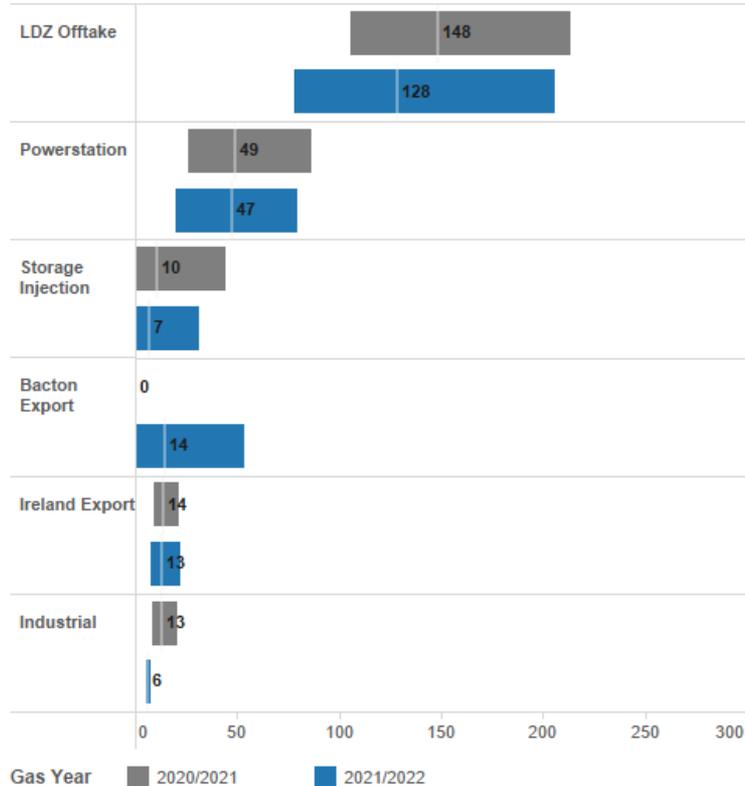
George Killick
Senior Operational Liaison Officer

nationalgrid

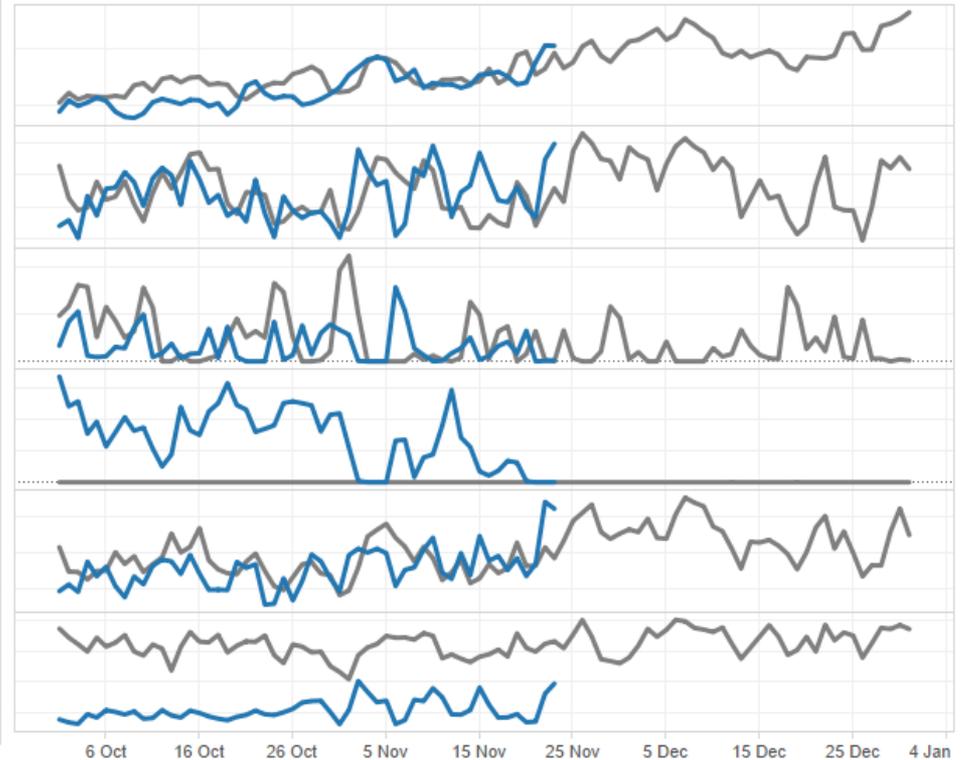


Components of NTS Demand

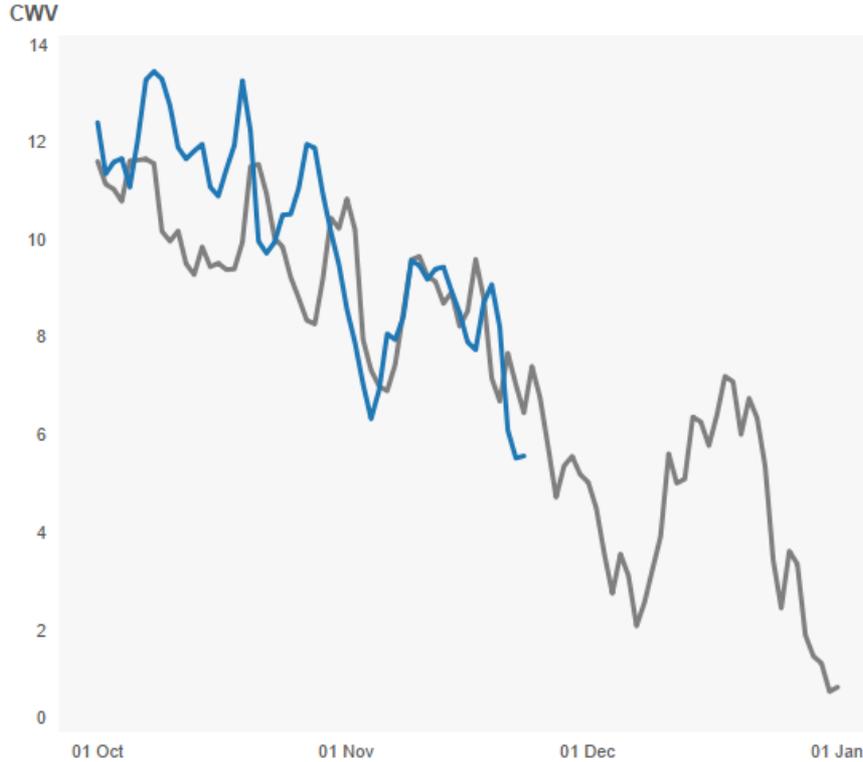
Average Daily Volume and Range (Winter)



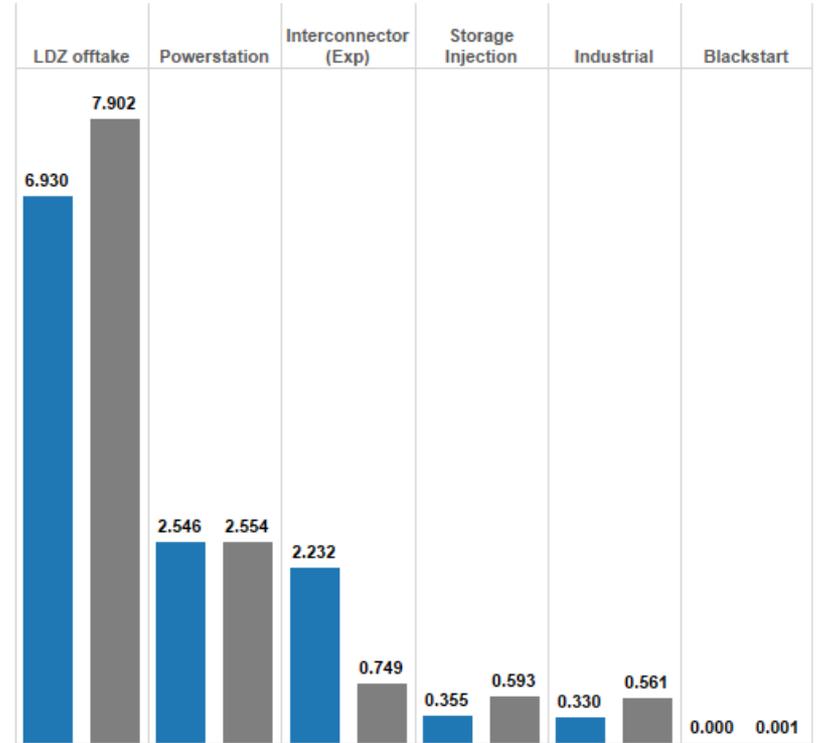
Trend Vs Previous Year



Demand – CWV & Components

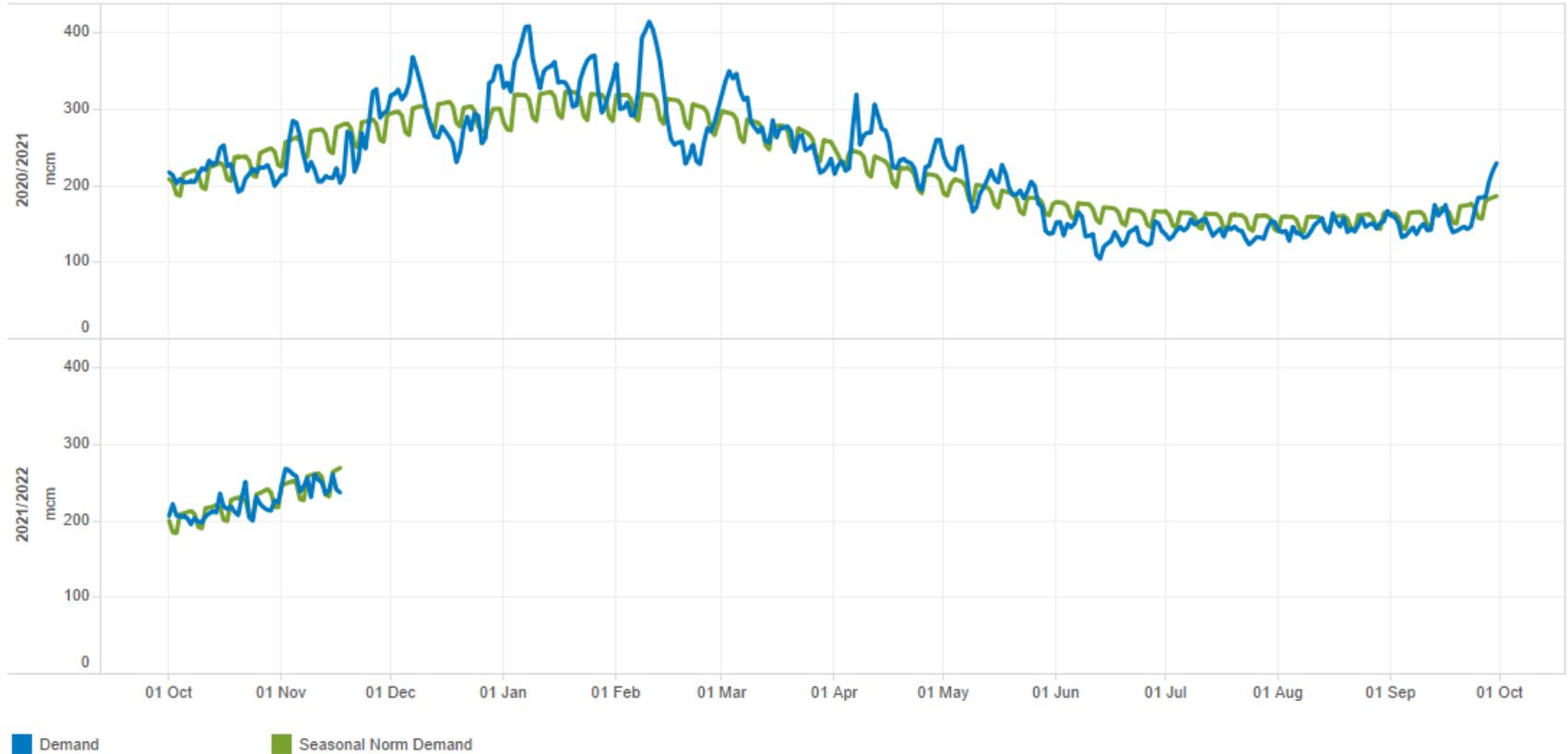


Demand (BCM, Winter)



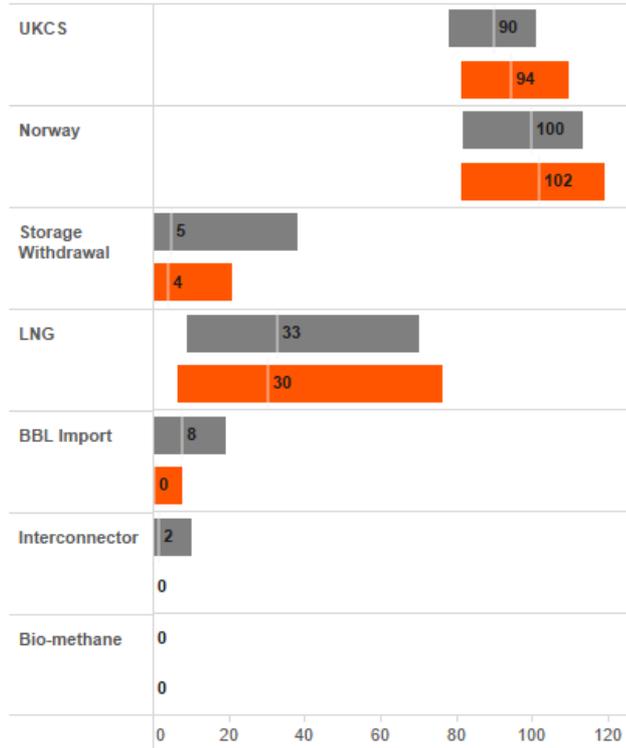
Gas Year
■ 2021/2022
■ 2020/2021

Demand – Comparison to seasonal norm

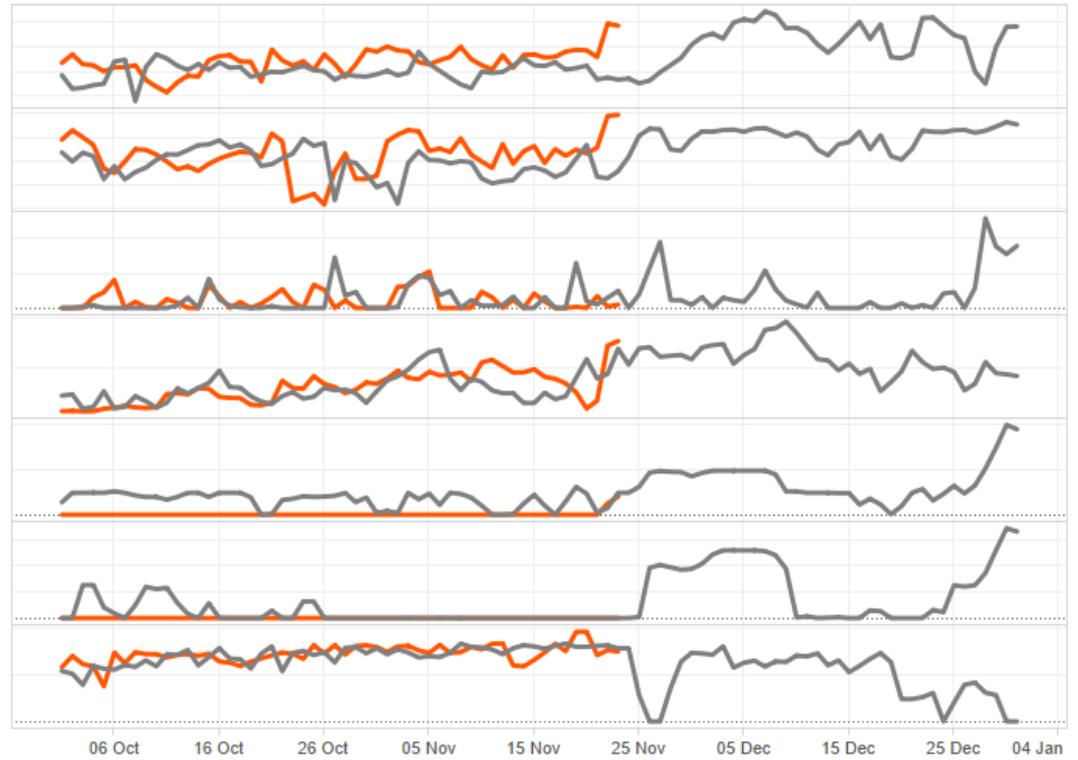


Components of NTS Supply

Average Daily Volume and Range (Winter)



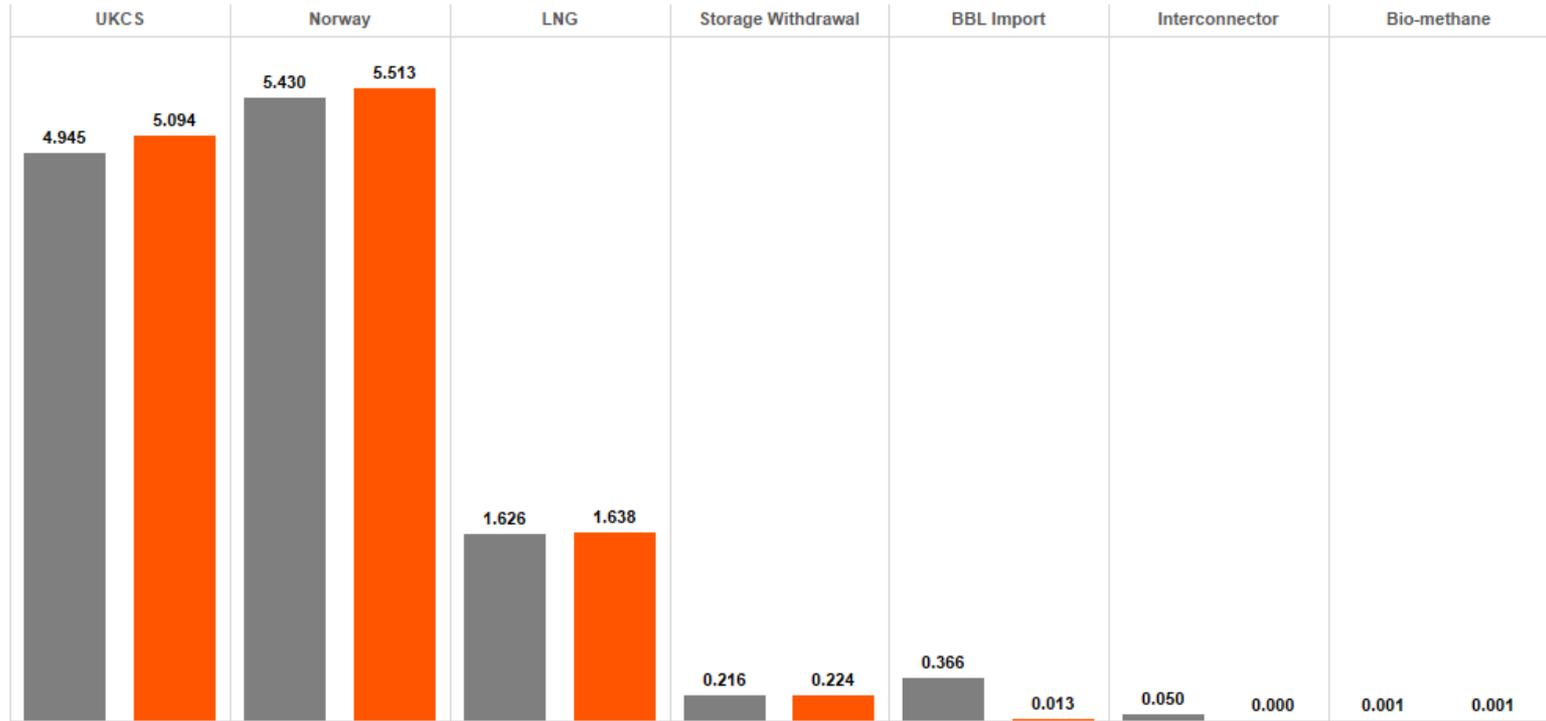
Trend Vs Previous Year



Gas year 2020/2021 2021/2022

Supply - Components

Supply (BCM, Winter)



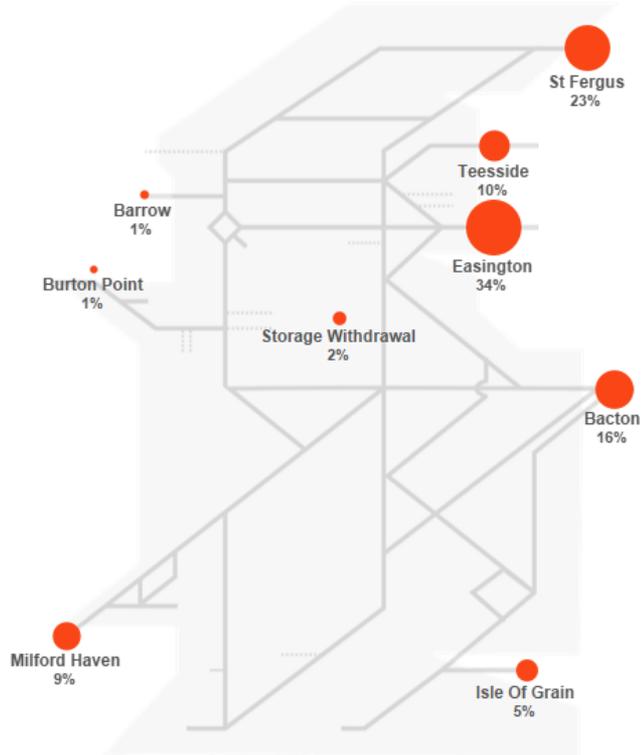
Gas Year

2021/2022

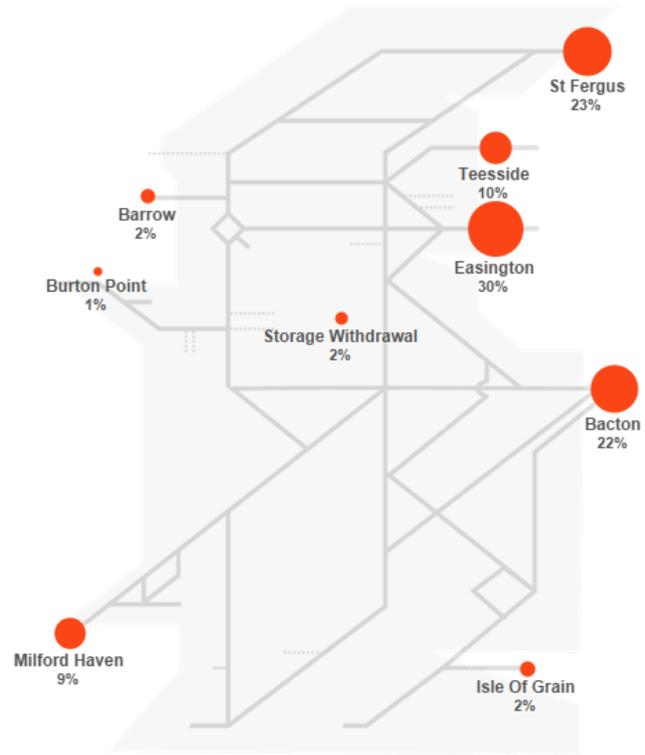
2020/2021

Supply Location

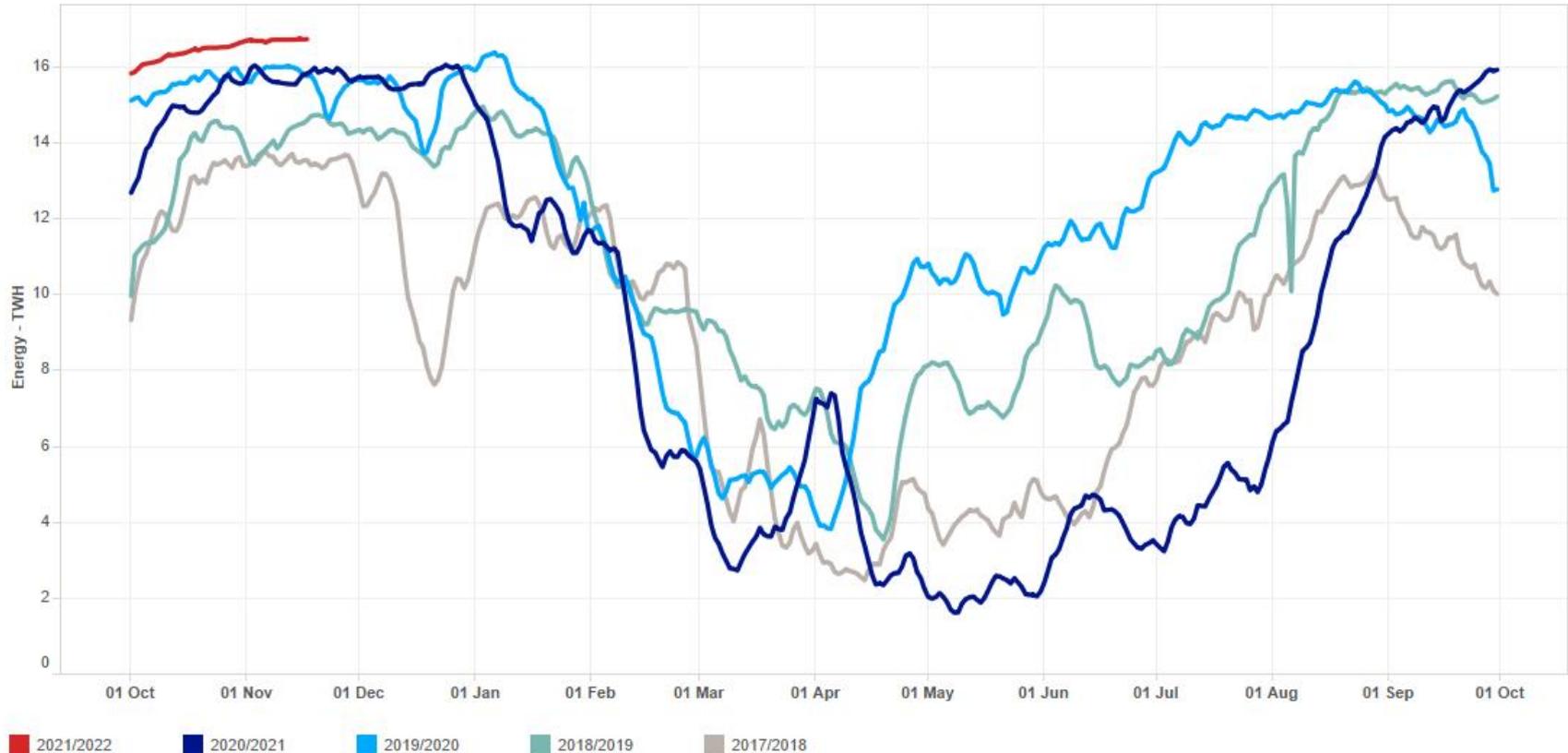
2020/2021 Percentage of total supply (Winter)



2021/2022 Percentage of total supply (Winter)



Medium Range Storage Stocks (MRS)



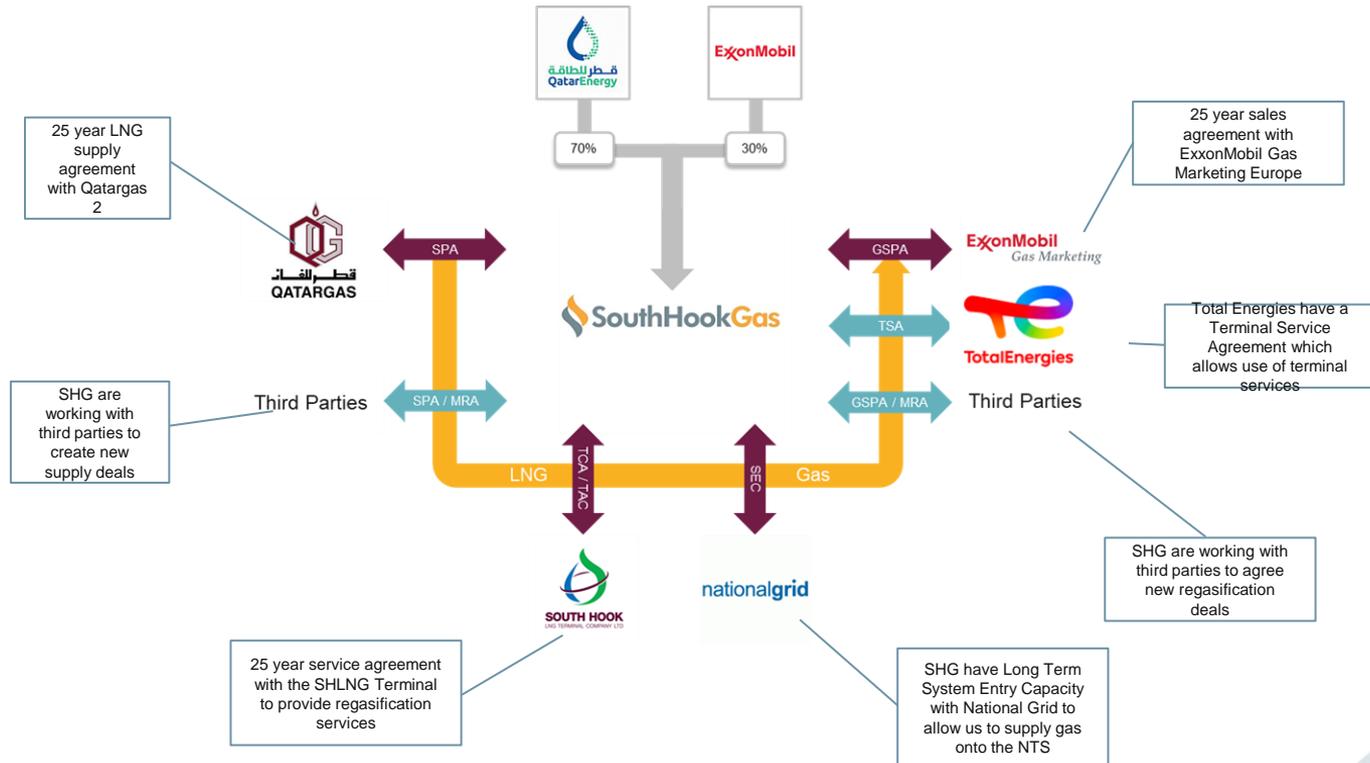


An Introduction to South Hook Gas

November 2021 Tu-Vi Ta & Adam Bates

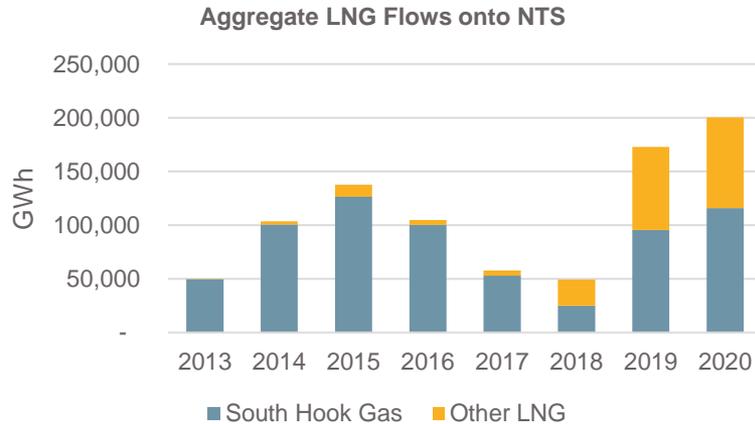
SHG Business Model

- » South Hook Gas (SHG) is a joint venture between QatarEnergy and ExxonMobil, forming part of the Qatargas 2 value chain
- » SHG own 100% regasification capacity at the South Hook LNG (SHLNG) Terminal



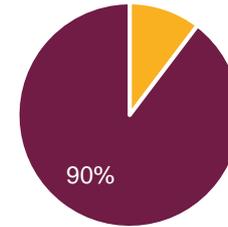
Contribution to GB Gas

- » SHG has made a significant contribution to the UK's energy supply
 - SHG has the capability to send gas out at 650 GWh/day
 - Expansion plans to increase the terminal capability to 813 GWh/day
 - Since commissioning in 2009 SHG has supplied GB with gas every day



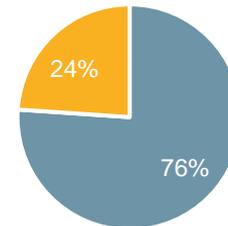
source: NGG MIPI data

NTS Supplies (since 2013)



■ South Hook Gas ■ Other NTS

LNG Supplies onto NTS (since 2013)



■ South Hook Gas ■ Other LNG

South Hook LNG Terminal



- » South Hook LNG Terminal Company Ltd own and operate South Hook Terminal (www.southhooklng.com)

South Hook Non-QG cargoes

- » SHG market unused capacity at SHLNG Terminal to third parties as berthing slots and send out schedules
 - To date we have imported cargoes from USA, Russia as well as Qatar
 - LNG Quality varies across the world, our existing nitrogen facilities mean we cannot accept gas from everywhere
- » SHLNG Terminal is competing with other Terminals in North West Europe to attract cargoes.
 - SHLNG Terminal offers reliability and accuracy
 - SHLNG Terminal offers nomination flexibility



Secondary Capacity

- » Master Regasification Agreements (MRAs)
 - Customers pay a Capacity Fee and a Regasification Fee
 - SHLNG Terminal process their LNG and provide Gas at the Milford Haven Entry Point or NBP
 - Flexible gas delivery (dependent on operational parameters)
 - Send out profiles (i.e. flat month, front half, back half, etc...)
 - Advance release (e.g. send out in advance of vessel berthing)

- » Master Sales and Purchase Agreements (MSPAs)
 - SHG purchase LNG DES from suppliers

- » Master Gas Sales Agreements (MGSAs)
 - SHG utilises a service provider to sell gas at the Milford Haven ASEP or NBP

Gas
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Bacton Exit IPs



Malcolm Montgomery
Senior Codes Change Lead

nationalgrid



Bacton Exit IP (recap slide)

Following a public consultation, Ofgem have decided to implement a change to NGG's NTS Licence. The change will:

- Remove the existing **Bacton IUK** and **Bacton BBL** NTS Exit Points.
- Create a combined **Bacton Exit IP** NTS Exit Point.

The Licence change is effective from the 15th Dec however there will, from a practical perspective, be some delay before industry is ready to implement the change. Practical steps that need to be completed are:

- Complete a UNC modification - <https://www.gasgovernance.co.uk/0785>
- Complete Operational and System readiness.
- Co-ordinated implementation with adjacent TSOs.

We shall be communicating with industry and key stakeholders as we work to complete these steps. Key public forums will be Transmission Workgroup and Operational Forum.

UNC Modification 785

Process Area	Process	Individual or Aggregate Point	Comment
Capacity	Allocable (i.e. available for auctions)	Aggregate IP	Σ MNEPOR for UIOLI release.
Capacity	Auction - bundled	Aggregate / Individual IP	Bundled capacity is auctioned at an individual IP (e.g. a NG-BBL bundle), but within the context of the aggregate point. Individual bundled auctions are linked and may be competing for the aggregate amount of allocable capacity.
Capacity	Auction - unbundled	Aggregate IP	
Capacity	Sold Capacity - bundled	Aggregate / Individual IP	Bundled capacity is tagged to an individual IP (e.g. a NG-INT bundle), but has flexibility of use at the aggregate point via the overrun.
Capacity	Sold Capacity - unbundled	Aggregate IP	
Cap / Flow	Overrun	Aggregate IP	Σ (individual IP capacity) - Σ (individual IP allocations)
Flow	Nomination & matching	Individual IP	as is
Flow	Allocation & OBA	Individual IP	as is
Charging - cap	Charge Setting - reserve prices	Aggregate IP	Previously sold capacity will adopt the reserve price of aggregate point.
Charging - cap	Charge Setting - shorthaul	Aggregate IP	Shorthaul route is to aggregate point.
Charging - flow	IP Allocation Charges	Individual IP	as is

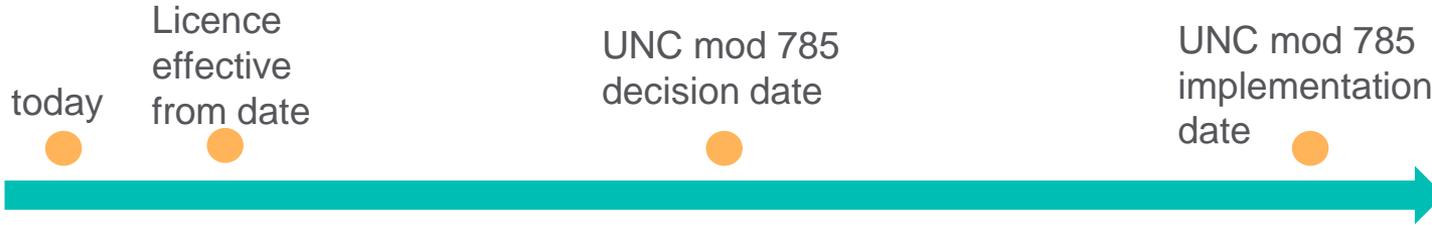
High Level UNC change

Amend/create definitions in EID* that can apply to the new aggregate exit point.

Review existing IP processes for combined IPs to ensure they work with the new/amended definitions.

*EID is a section of the UNC called the European Interconnector Document

Implementation Timelines



Key Dates

Licence effective from: 15th December 2021.

UNC mod 785 decision: under timetable proposed then modification proposal would be with Ofgem on 20th January 2022.

UNC mod 785 implementation: tbc - discussions to date suggest Sep 2022 as the most realistic date to achieve full system functionality.

Interim period between Licence being effective and UNC mod 785 implementation

We are currently reviewing capacity release options for Bacton exit IPs (using existing functionality), to evaluate how best to make firm capacity available to BBL and INT in line with the Licence obligation. We will keep you informed of any proposed changes asap as we work through the options available.



Ice

ICE OCM

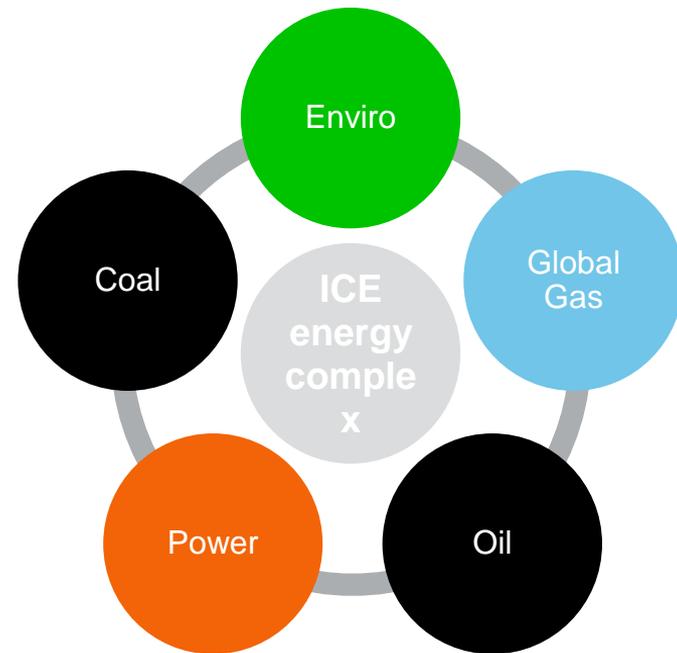
Commercial update

Wouter de Klein



Summary product portfolio

Global Gas	Global Gas	Enviro	Coal	Power	Oil
TTF	JKM	EUA	API2	German Power	Brent
NBP	NBP 1 st line	EUAA	gC Newcastle	Nordic Power	Dubai
Henry Hub	TTF 1st line	CER	API4	UK Power	Gasoil
PSV	GCM	CCA	gC Richards Bay	French Power	Fuel oil
VTP	WIM	RGGI	M42	Italian Power	Permian WTI
THE		RECs	gC Indonesian	Spanish Power	WTI
PEG		LCFS	API8	Dutch Power	
		RINs		Belgian Power	



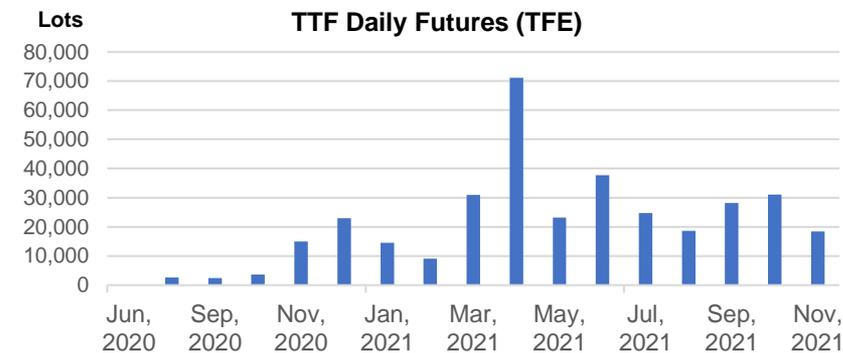
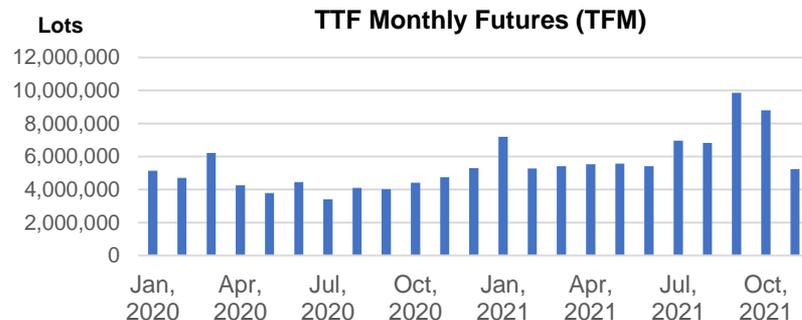
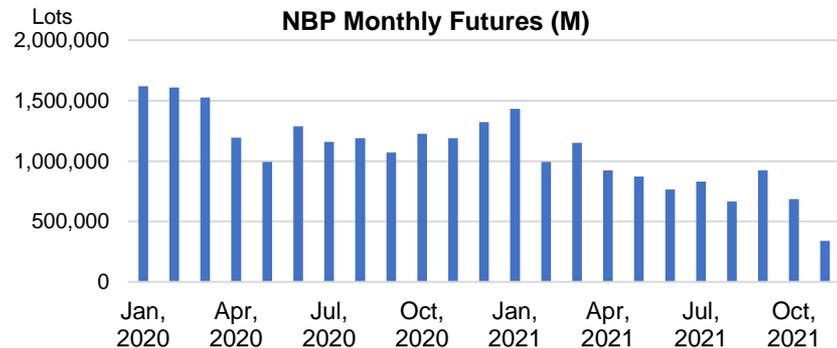
Summary futures portfolio

Based on 20-Day average October 2021

Product	Benchmark	BBG Code (months)	ADV lots	Average Daily Notional Value	Open Interest lots (31 OCT-21)	% volume on screen
Global gas	NBP	FNA	21,695	GBP 1,022 mln	428,600	81%
Global gas	TTF	TZTA	232,682	EUR 11,343 mln	1,918,905	85%
Global gas	JKM	n/a	4,506	USD 1,089 mln	118,832	5%
Enviro	EUA	MOA	46,512	EUR 2,465 mln	996,144	78%
Enviro	CCA	n/a	6,442	USD 181 mln	286,361	28%
Coal	API2	XAA	3,580	USD 472 mln	46,671	42%
Power	GAB	FPAA	872	EUR 32 mln	22,037	63%

ICE Global Natural Gas & LNG

- TTF Monthly Futures AMV 6.5 mln lots, up 52% YTD vs. LYTD; Open Interest at 1.918 mln lots, up to and incl. December 2028; 368 trading participants (+77); growth continues from 2020
- NBP Monthly Futures AMV 871K lots, down 30% YTD vs. LYTD; Open Interest at 428K lots, up to and incl. September 2026; 202 trading participants YTD (-2)
- TTF Daily Futures AMV 28K lots, up 1359% YTD vs. LYTD; 35 trading participants YTD (+20)
- Global Gas portfolio with Henry Hub, TTF, NBP and JKM and inter-product spreads available to trade with new Gas products gradually added during the year



ICE Gas Prompt portfolio

Gas Spot
Mon-Sun 04:00
to 03:40 (GMT)

Daily Futures
Mon-Fri 07:00 to
17:00 (GMT)

Next Hour (TTF)
 Within Day (TTF, UK
 OCM)
 Day Ahead (UK OCM)
 Locational Days (UK
 OCM)

Day Ahead
 Monday -Friday
 Saturday, Sunday
 W/END
 WK/DY NW
 BOW
 BOM
 Month (of daily futures)

	TTF	NBP	CEGH	THE	PSV	PEG
Physical	●	●	●	●	○	●
Financial	●	●	●	●	●	●
Balancing	●	●				
Existing	To be introduced					

Settlement

- Physically settled contracts are for physical delivery through the transfer of rights in respect of natural gas at the Virtual Trading Point.
- Financially settled contracts are cash settled against the midpoint between the bid and offer quotations for the relevant price assessment as published by ICIS in the European Spot Gas Market report.
- Trade-at-Index-Close (TIC) allows a market participant to place a bid or offer for a daily gas futures contract at a price expressed as a differential between that days midpoint of the bid and offer quotations for the relevant price assessment as published by ICIS and the daily futures price. Available for physically and financially settled contracts.



ICE OCM

Liquidity Update



ICE OCM products > refresher

ICE Endex Gas Spot Ltd is designated by OFGEM and appointed by National Grid Gas as the market operator of the independent market for balancing (OCM)

OCM Products

- OCM TITLE
- OCM PHYSICAL
- OCM LOCATIONAL
- OCM DSR LOCATIONAL

Physical and Locational

- Transfer of the title on natural gas from seller to buyer takes place at the National Balancing Point (NBP).
- A trade in an OCM Physical or OCM Locational product, results in an obligation on the market participant who placed the Originating Bid or Offer to alter the nominated rate of delivery or offtake of natural gas to or from a System Point (or specific Location).
- Physical delivery obligations are set forth in UNC-TPD-Section D (article D.2.3).

OCM DSR LOCATIONAL

- National Grid is the only party that can buy in the OCM DSR Locational markets. All other parties are only allowed to submit offers.
- OCM DSR Locational markets are only open during a DSR Period, as notified by National Grid.
- Only during a DSR Period live offers can be submitted. Outside a DSR Period non-live order can be submitted.

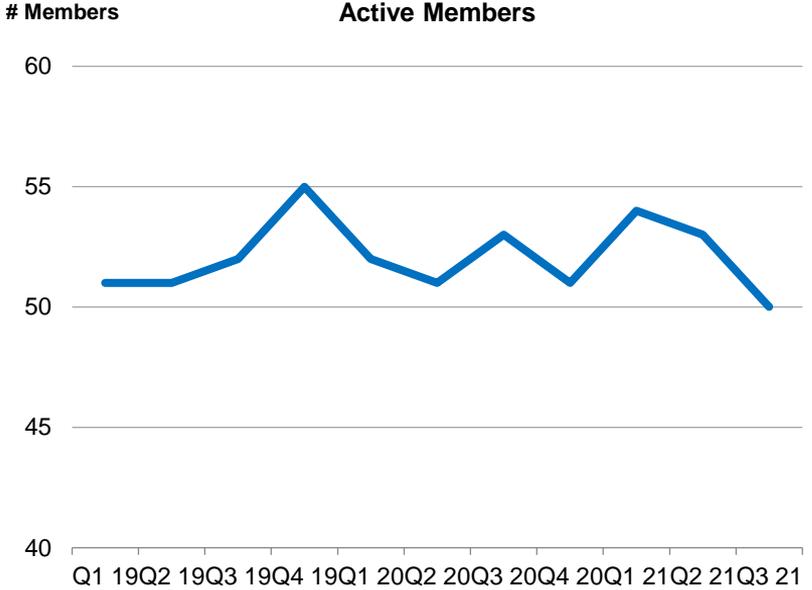
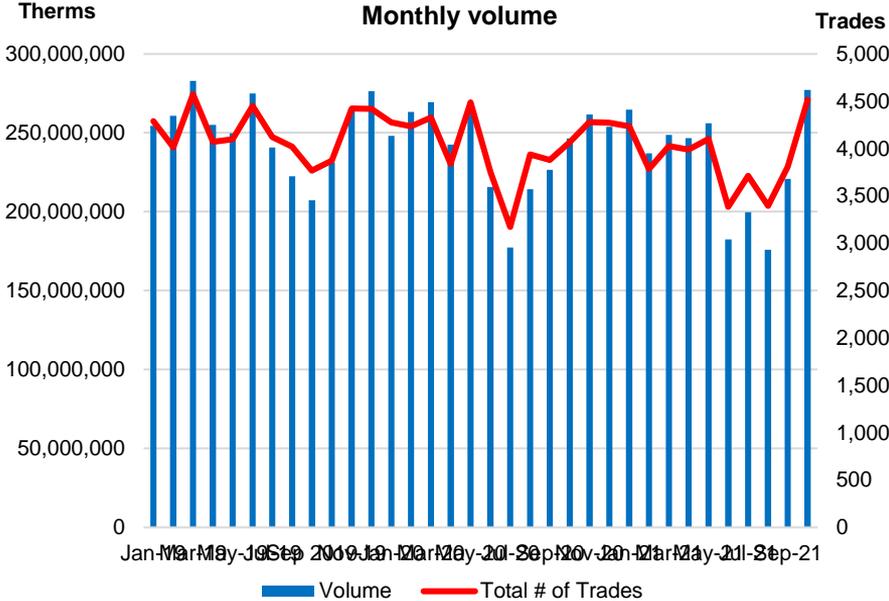
ICE OCM

January – October 2021

- Traded volume 2,308 mln therms, -2.5% YTD (Jan – Oct) vs. LYTD; 39,851 trades, -0.29% YTD
- October '21 with 277.9 mln therms (8.1 TWh) highest monthly volume since March 2019
- 50 active trading participants YTD; 4 new vs. LYTD
- 71 members (+5 since the start of the year)
- 388 individual users have traded YTD; 816 users with trading access

ICE OCM

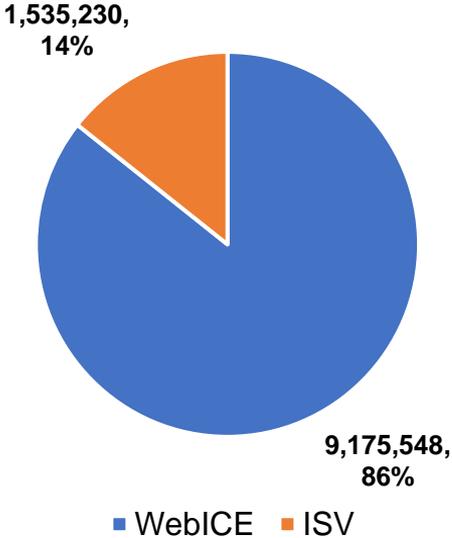
Monthly trading performance



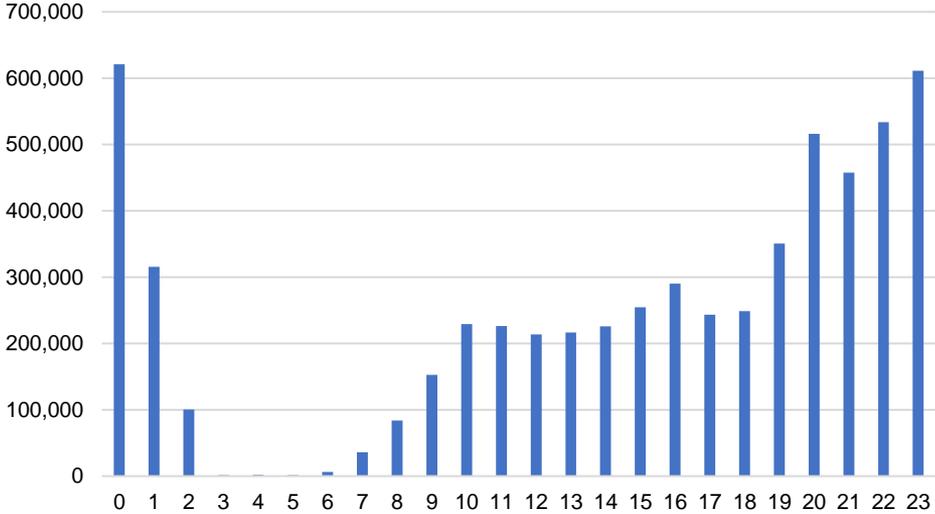
ICE OCM

Traded volume – distribution by technology and time past 24 months

Traded volume by technology / mln therms



Therms Traded volume by hour 2019-2021 (GMT)

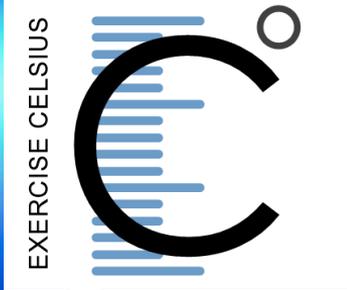


About Intercontinental Exchange

Intercontinental Exchange (NYSE:ICE) is a Fortune 500 company that operates a leading network of global futures, equity and equity options exchanges, as well as global clearing and data services across financial and commodity markets. The New York Stock Exchange is the world leader in capital raising, listings and equities trading.

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Key Information Documents for certain products covered by the EU Packaged Retail and Insurance-based Investment Products Regulation can be accessed on the relevant exchange website under the heading “Key Information Documents (KIDS)”.



Exercise Celsius Initial Findings

Network
Emergency
Co-ordinator
Tom Wilcock



Scope / Emergency Framework

Warning Notices:

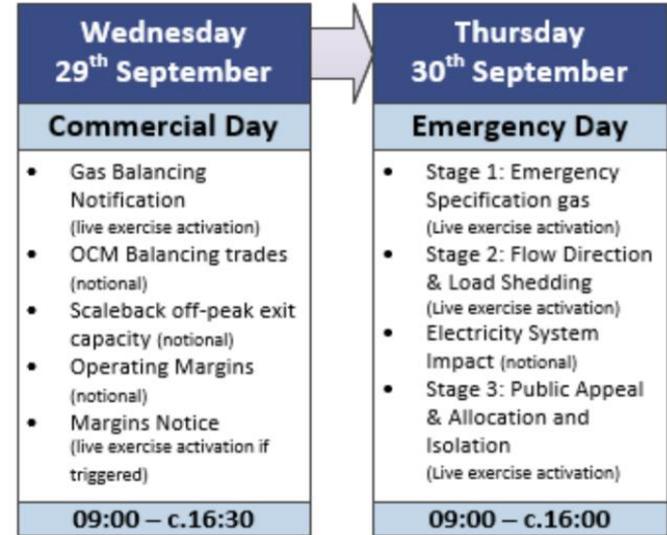
- Margins Notice
- Gas Balancing Notification

Pre Emergency Tools:

- Scale-back off-peak exit capacity
- OPN rules and rejection
- Restrict capacity sales
- Operation Margins
- Demand Side Response

Network Gas Supply Emergency:

- Stage 1 – NTS linepack, DN utilisation Emergency Specification gas
- Stage 2 – Maximise Supplies & Load Shedding
- Stage 3 – Allocation and isolation
- Stage 4 – Restoration



Post Exercise Report Process



Initial findings

Participation in this year's exercise was the broadest to date, allowing the opportunity to exercise a wider set of processes and interactions across the energy sector. The wide participation allowed a greater understanding of reality.

- There is an opportunity to enhance some specific communication processes which was highlighted through the broader participation
- An industry wide media response was tested which highlighted areas for further enhancements to whole system media management
- The use of new bespoke applications, actioned from Exercise Baltic, supported the NEMT's pace in undertaking their processes
- There is an opportunity to further optimise the administration of the declaration of an NGSE.

Initial findings

- The process of determining emergency pressures benefited from predetermined planning assumptions being shared. Other processes would benefit from this improved level of pre-response collaboration.
- Materials to support public appeals have matured but there continues to be ambiguity in the suitability, timing and industry co-ordination for issuing a formal appeal
- The interactions between GSO and ESO benefited greatly from the use of the prototype dashboard to inform a common understanding of the situation on both networks. The embedding of this process will be achieved through the implementation phase of the RIGSSE Project with an oversight of what can be delivered this winter.
- There is an opportunity for further interactions between GDNs and DNOs regarding distribution level concerns.
- There is a solid commitment to broaden understanding of the restoration process in 2022

Exercise Disrupt

A series of industry events, sponsored by the E3C Gas Task Group, to examine and assure preparedness for the restoration of the gas network following an NGSE

- Industry Workshops Jan-Feb '22
- ECQ workshop Feb '22
- Tabletop Exercise Mar-Apr '22
- Process enhancements Jun '22
- Simulated Exercise July '22



Restoration Workshops
Network Entry Facilities (incl. Storage & LNG)
Shippers
Electricity Generators (Gas Fired)
ESO/DNOs
Public Interest Groups i.e. Citizens Advice/Local Resilience Fora
Governance: HSE, Ofgem, BEIS

The background features a complex geometric pattern of overlapping squares and diamonds in various shades of blue (light, medium, and dark) and white. The shapes are arranged in a way that creates a sense of depth and movement, with some shapes appearing to recede into the background while others come forward.

FutureGrid
nationalgrid

FutureGrid

National Grid FutureGrid Team



Antony Green
Hydrogen Director &
FutureGrid Project Sponsor



Tom Neal
FutureGrid Programme
Manager



Shaun Bosomworth
Senior Delivery Engineer



Haroon Khan
Project Manager



Lloyd Mitchell
Hydrogen Engineer –
Materials



Dan Harrison
Hydrogen Engineer –
Asset Integrity



Dan Knowles
Hydrogen Engineer –
Electrical &
Instrumentation



FutureGrid

An ambitious programme to build a hydrogen test facility from decommissioned assets at DNV's facility in Cumbria to demonstrate the National Transmission System (NTS) can transport hydrogen.

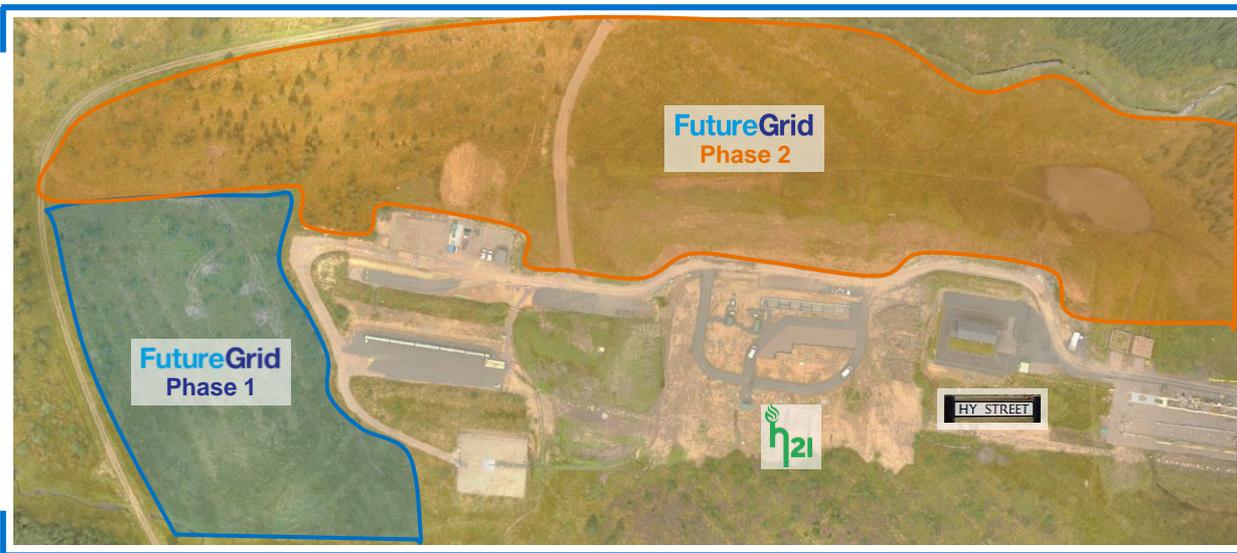


DNV

DNV Engineering
Research &
Development Centre
– Spadeadam,
Cumbria

FutureGrid

Collaborative Hydrogen Test Facility



DNV are our main delivery partner, responsible for building the test facility and developing the comprehensive master test plan across the range of decommissioned assets.



HSE Science Division are supporting the development of the test facility and subsequent master test plan, providing technical assurance and validation across the project.



Northern Gas Networks are collaborating on the project to drive closer links with the H21 project which is building a distribution test facility at DNV GL's Spadeadam Facility.



Fluxys are the equivalent Gas Transmission Operator in Belgium and are contributing a substantial level of hydrogen research, to ensure an internationally collaborative approach.



Durham University will be sponsoring a secondment student to study the NTS asset gaps, focusing on the development skills and training courses along with Phase 2 & 3 of FutureGrid.



Supporting the trials and developing technical papers and research from the project to enable dissemination, linking the H100 activities and FutureGrid/H21 activity to prevent duplication.



Represent the NTS



Follow Relevant Standards



Platform for Further Innovation



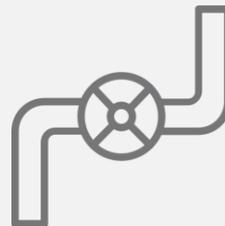
Future Expansion & Development

Key Focus of FutureGrid



NTS Safety Case

Risk assessment and new safety case development



Materials Considerations

Pipelines and mechanical assets considering hydrogen embrittlement and welds



Flow Characteristics

Understanding how hydrogen will move around our network



Network Management

Understanding how we can manage a hydrogen network

FutureGrid

Test Facility Set Up

Work Package

1A Build & Commission

Work Package

1B

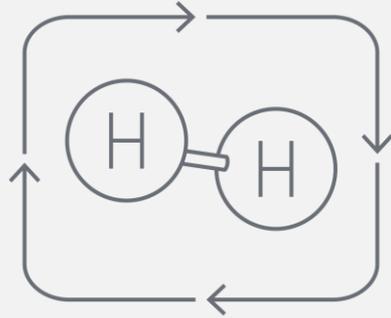
Work Package

1C

Work Package

1D

nationalgrid

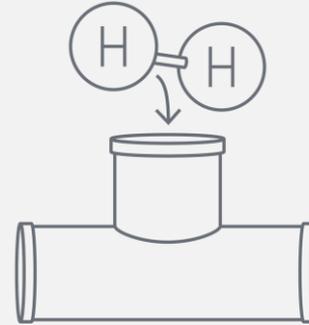


Offline Hydrogen Test Facility

A representative range of NTS assets of different types, sizes, and material grades are being supplied from decommissioned assets to build the hydrogen test facility.

The facility will initially run on 100% natural gas to collect baseline data for the equipment and then move through 2%, 10% and 20% hydrogen / natural gas mixtures and then 100% hydrogen.

The facility will have a maximum flow of 1.76 MSm³/day generated by the use of a gas compressor.



Standalone Hydrogen Test Modules

Standalone hydrogen test modules will operate alongside the main test facility, to provide key data required to feed into the main facility including:

- (1) Material Permeation Testing
- (2) Pipe Coating & CP Testing
- (3) Fatigue Testing
- (4) Flange Testing
- (5) Asset Leak Testing
- (6) Rupture Testing

FutureGrid Phase 1 Delivery & Phase 2 Development

FutureGrid

Phase 1 Overview

Total Project Cost

£12.7m

Project Start

April '21

Project Duration

2 years

nationalgrid

Work Package

1A

Build &
Commission

Starts: July 2021
Completes: October 2022

Work Package

1B

2, 20 & 100%
Hydrogen Testing

Starts: October 2022
Completes: June 2023

Work Package

1C

QRA &
Safety Case

Starts: June 2021
Completes: June 2023

Work Package

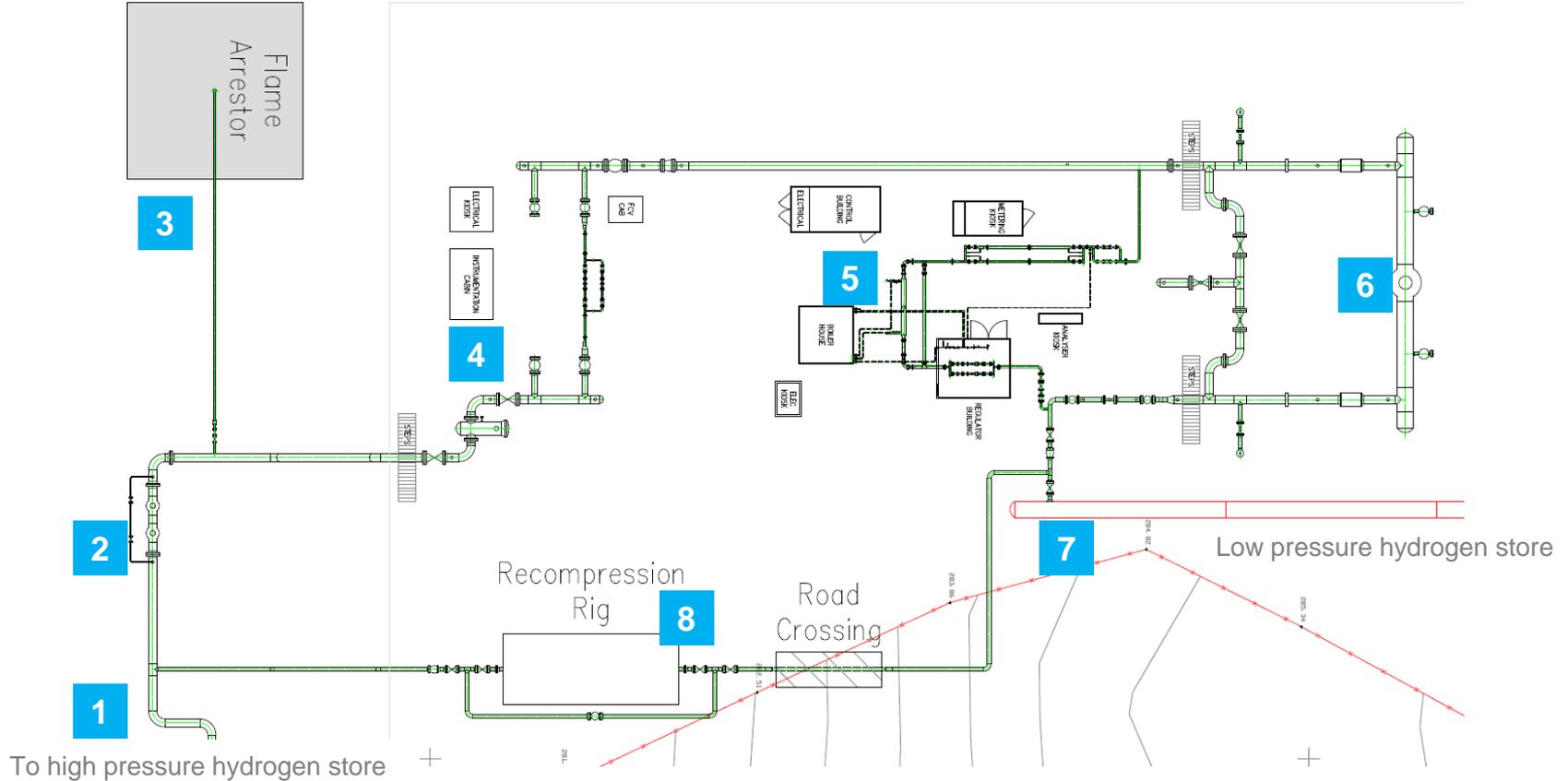
1D

Dissemination &
Reporting

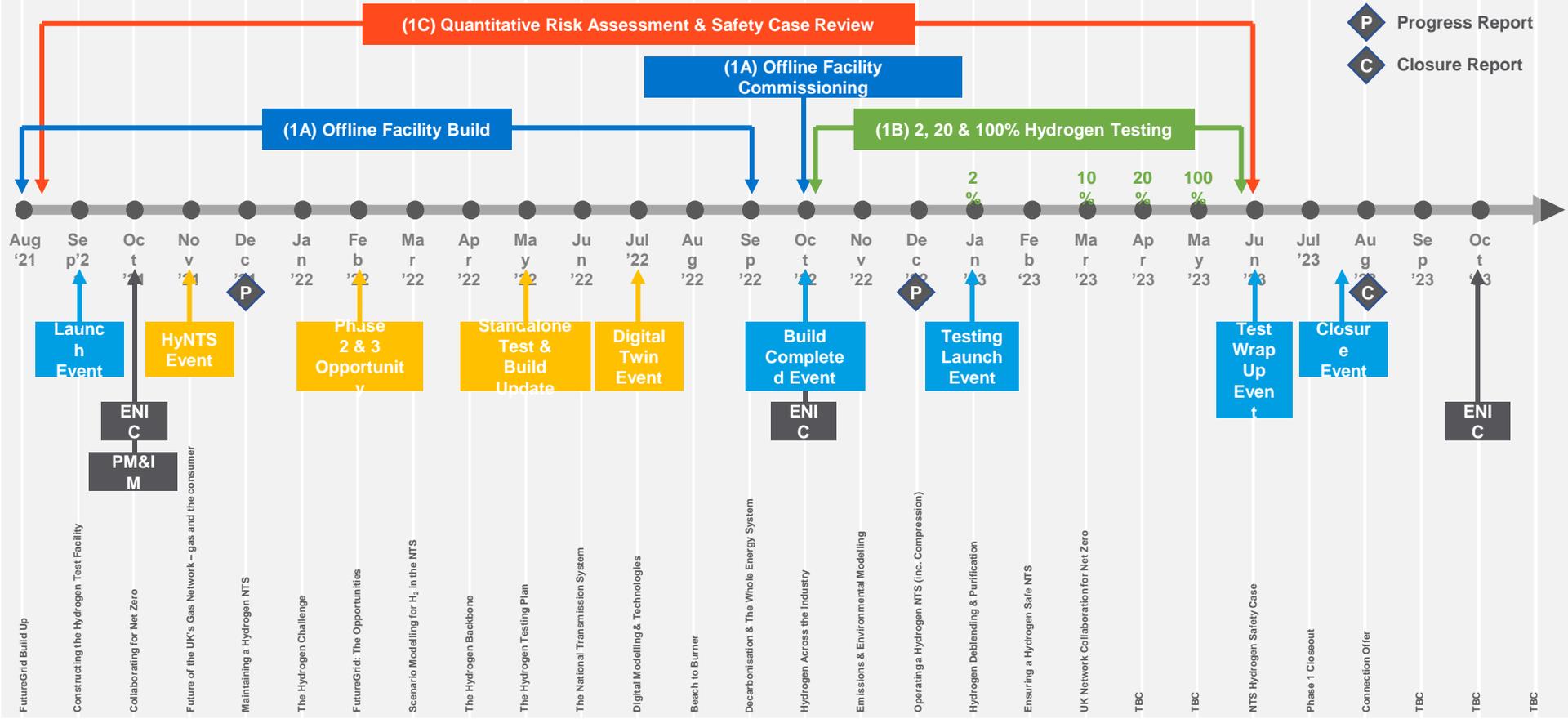
Starts: July 2021
Completes: July 2023

FutureGrid Phase 1 Delivery & Phase 2 Development

General Arrangement – Phase 1



FutureGrid Phase 1 Timeline





Material Permeation Testing



This test will determine the rate at which hydrogen permeates through the pipe wall in a pressurised hydrogen environment. This will inform the soak time required for full saturation on other tests.

Pipe Coating and CP Testing



These tests will assess the impact of hydrogen on external pipe coatings as well as the cathodic protection system to identify any issues.

Fatigue Testing



To demonstrate the NTS can endure tens of thousands of pressure cycles in hydrogen service.

Flange Testing



To assess the effect of hydrogen on RF and RTJ flanged joints.

Asset Leak Testing



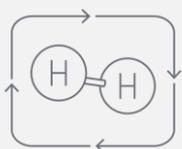
Hydrogen is significantly more prone to leaking than natural gas. We need to understand the extent of this to determine if additional mitigations are required.

Rupture Testing



Investigate overpressures caused by delayed ignition of ruptures on a buried line containing 100% hydrogen. 36" NB gas storage array to provide the necessary gas flow.

Master Test Plan – Offline Hydrogen Test Facility



Offline Hydrogen Test Facility Master Test Plan

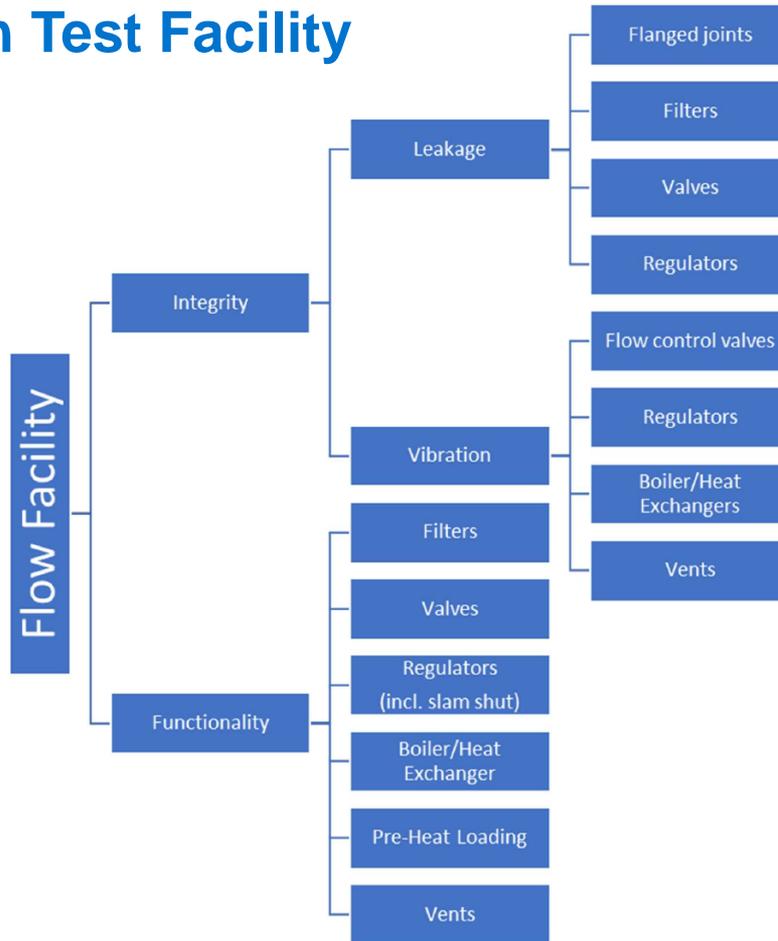
Flow Facility tests will focus on the functionality and the operational integrity of the assets with hydrogen and hydrogen blends at 70 barg.

Integrity of Assets

Monitoring vibration on valves, regulators, heat exchangers. Assessing leakage at flanges, filters, valves. Measuring hydrogen flux through steel at various locations.

Functionality of Assets

Monitoring pressure drop across filters, valve operation, accuracy and performance of meters, slamshut sensitivity, validating pre-heat package, functionality of venting



Safety and Risk Management

There is a fundamental difference between how natural gas and hydrogen behaves. We must be able to understand the impacts of different concentrations of hydrogen and develop our safety standards:

Procedure Review



Categorisation of NG procedures as high, medium, low impact with a report detailing the methodology findings and next steps for each.

Hazard Assessment of the Transmission System (HATS)



Assess impact of hydrogen on MAPD. Provide an updated HATS for the NTS pipelines, based on the network transporting hydrogen instead of Natural Gas.

Quantitative Risk Assessment (QRA)



Record and update the Hazard Assessment Methodology Manual (HAMM) where deviations are required for assets transporting Hydrogen.

Hazardous Area Impact



Hazardous Area Drawings will be produced for each asset type at 20% & 100% hydrogen and compared to existing Natural Gas drawings.
IGEM also working on SR/25 update for hydrogen.

Overpressure Risk (OR)



Identify whether the existing methodology can be adapted for 100% hydrogen. If needed, develop an appropriate methodology for risk analysis and emergency planning purposes.

NGGT Safety Case



Assess and update the NGGT safety case (policies, procedures and work instructions) depending on the impact of hydrogen.
Review will involve SMEs.

Project Milestones



Events to launch the project, showcase the build and update on the testing programme

Creating Event Opportunities



Such as the UK / EU event and other collaborative opportunities to showcase FutureGrid & partners

Industry Events



Energy Networks Innovation Conference, Utility Week and other key Hydrogen / Net Zero Events

Site Tours



Tours for internal promotion and key external stakeholder engagement and promotion

SME Development & Knowledge

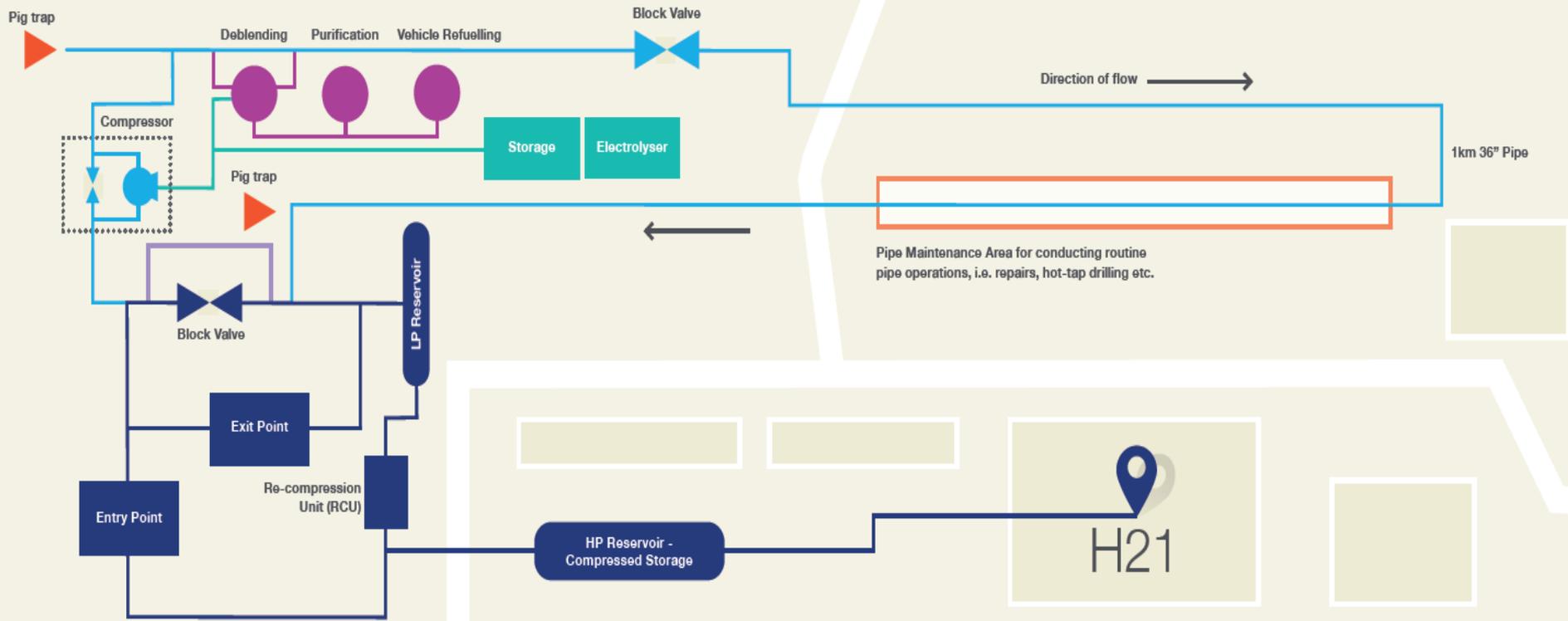


Active programme of activities and workshop / events to engage and update the SMEs (Subject Matter Experts)

Public Perception & Education



Public facing events and opportunities to educate and promote hydrogen – supporting local events



KEY

- | | |
|---|---|
| Phase 1 Assets | Proposed Phase - Storage |
| Proposed Phase 2 - Compression | Proposed Phase - Operational & Maintenance |
| Proposed Phase 2 - Deblending & Purification | Proposed Phase - LTS Futures Connection |

Questions?



Gas
Transmission

Hydrogen Blends in the NTS



Chris Williams
Gas Transmission Network Analyst
(Strategy)



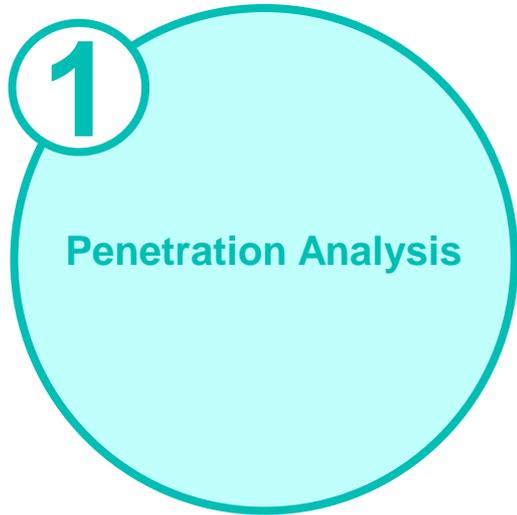
nationalgrid

Hydrogen Blends in the NTS – A Theoretical Exploration

Continuation of the GFOP series of thought pieces related to network operability.

See <https://www.nationalgrid.com/uk/gas-transmission/insight-and-innovation/gas-future-operability-planning-gfop> for other publications in the series

Three themes



Theme 1 – Penetration Analysis

- Scenario
 - Blended gas supplied at entry terminals St Fergus and Bacton
 - Hydrogen percentages by volume of 2%, 5% and 20%
 - Compared Winter and Summer typical conditions
- Key Observations
 - Distance of penetration is consistent regardless of entry blend percentage
 - Changes in the blend percentages in the NTS are dependent on the operating strategy and flow levels of non blended gas coming from other supply terminals

Blend scenario: Summer and Winter

[How to use this document >](#)

[Welcome and introduction >](#)

Penetration analysis >

[Impacts of deblending >](#)

[Ability to maintain consistent entry blends >](#)

[Continuing the conversation >](#)

Figure 5
20% hydrogen blend at St Fergus and Bacton on a summer day

**20%
Summer**



Figure 6
20% hydrogen blend at St Fergus and Bacton on a winter day

**20%
Winter**



Theme 2 – Impacts of deblending

- Scenario
 - Impact of offtakes only taking natural gas with hydrogen re-injected into the NTS
 - Scenario at Irish Interconnector and Peters Green DN Offtake

- Key Observations
 - Re-injection of deblended hydrogen could lead to localised higher concentrations of hydrogen

Deblend scenario: Potential localised concentration increases

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Welcome and
introduction >

Penetration
analysis >

Impacts of
deblending >

Ability to
maintain
consistent
entry blends >

Continuing the
conversation >



Figure 7
The NTS depicting the various blends



- The green pipes are areas of the NTS between **21–30%**
- The white pipes are areas between **15–20%**
- The orange pipes are areas between **10–15%**
- The yellow pipes are areas between **5–10%**
- The red pipes are areas between **1–5%**
- The black pipes are areas between **0.1–1%**
- The purple pipes are areas between **0–0.1%**

The diagram above shows the NTS and the various blends in the network.



Theme 3 – Ability to maintain consistent entry blends

- Scenario
 - Investigation of the challenges of maintaining a consistent entry blend over a range of demands (winter / summer)

- Key Observations
 - Achieving a consistent entry blend may require:
 - Adaptation of the production profile
 - The use of hydrogen storage

Continuing the conversation

There is a lot more work to do to prepare for a potential hydrogen economy in Great Britain and blending will play a big part.

Considering the Government's Hydrogen Strategy and the growing momentum behind the role hydrogen could play in a net zero Great Britain, it is important that we find a blending pathway.

We would like you to share your thoughts on our findings and further discuss with you.

We have shown that reinjecting debleded hydrogen could be a challenge. However, we believe there are many pathway options for hydrogen debleded from the gas network such as:

- It could be re-injected back into the gas networks at a more suitable blending location.
- It could go into the distribution network.
- It could be used in a different way like being sold to a transport or industrial customer or where 100 per cent hydrogen is required.

We have shown that maintaining a consistent blend could be a challenge if Hydrogen production is static throughout the year. However, we believe hydrogen storage and adapting production profile are options that could be considered.

Please contact the [GFOP team here](#) to tell us your thoughts on the findings we have posed in this document.

Please contact the [Gas Markets Plan team here](#) to tell us your thoughts on commercial solutions for hydrogen blending on the NTS that could enable net zero. Your feedback will support the development of the Hydrogen Gas Market Plan.

Please contact the [FutureGrid team here](#) to tell us your thoughts on the assets as pertaining to blending in the context of the NTS.

A much broader programme of works is currently ongoing within National Grid which encompasses asset requirements, markets and the commercial arrangements on blending in the context of the NTS. This will unlock the potential of Hydrogen to deliver on the pathway to the UK's 2050 Net Zero targets.



How to use
this document >

Welcome and
introduction >

Penetration
analysis >

Impacts of
deblending >

Ability to
maintain
consistent
entry blends >

Continuing the
conversation >



Feedback

- Contact Details
 - GFoP Team – box.GFoP@nationalgrid.com
 - Gas Markets Plan Team – box.FOGForum@nationalgrid.com
 - FutureGrid Team – FutureGrid@nationalgrid.com

Gas
Transmission

Commercial Tools



Martin Cahill
Senior Operational Liaison Officer



national**grid**

Constraint Management Objectives

Managing Financial Risk & Reward

To manage the constraint with **minimum costs to the community.**

To use market based mechanisms to manage constraint situations whenever possible.

Maintaining Transporter Reputation

Ensuring UNC and Licence compliance

Where actions are taken they are consistent and auditable and any Forecasting / Capability Assessments are repeatable.

Optimising Customer Service

Ensuring Users can offtake gas as per ALL contractual and capacity obligations.

Minimising the impact on Users when taking actions

Driving Continual Improvement in Processes

Understanding lessons learned to **improve operating efficiency.**

Feedback – what is going well/how could we improve?



Commercial Tool Overview

Key:



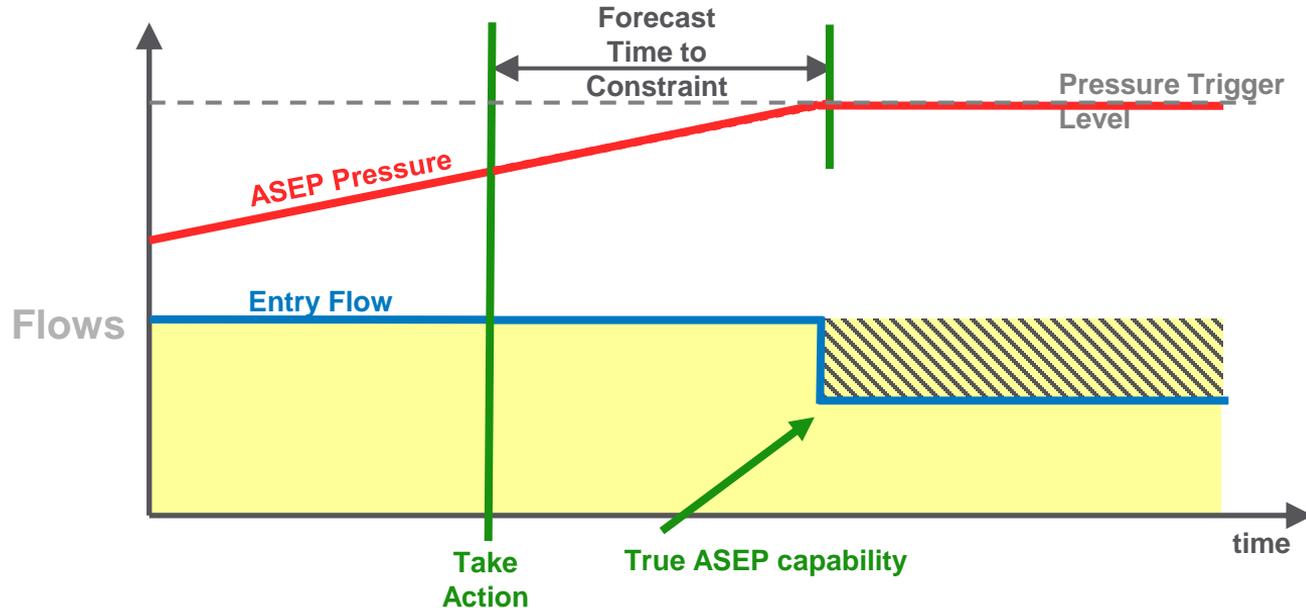
NOTE: Sequence indicative not exact

Managing the Network

Operational tools (internal)	Operational tools (external)	Commercial tools	Network Integrity
<p>Reconfigure Network</p> <p>Optimise Compressor Fleet</p> <p>Manage Outages</p>	<p>Agree Pressures (Distribution Network Operator (DNO) Only)</p> <p>Flow Swaps (Distribution Network Operator (DNO) Only)</p> <p>Enforce Contractual Offtake Rules</p>	<p>Scale-back Capacity (Entry Interruptible & Exit Off peak)</p> <p>Restrict Daily Capacity</p> <p>Locational Energy Actions</p> <p>Capacity Surrender</p> <p>Offtake Flow Reductions</p> <p>Initiate Constraint Management Agreements</p>	<p>Operating Margins</p> <p>Terminal Flow Advice (TFA) (Entry)</p> <p>Critical Transportation Constraint</p> <p>Gas Balancing Notification</p>
<p>Information Provision (MIPI <i>(Market Information Provision Initiative)</i> / Website / Gemini / ANS <i>(Active Notification System)</i>)</p>			

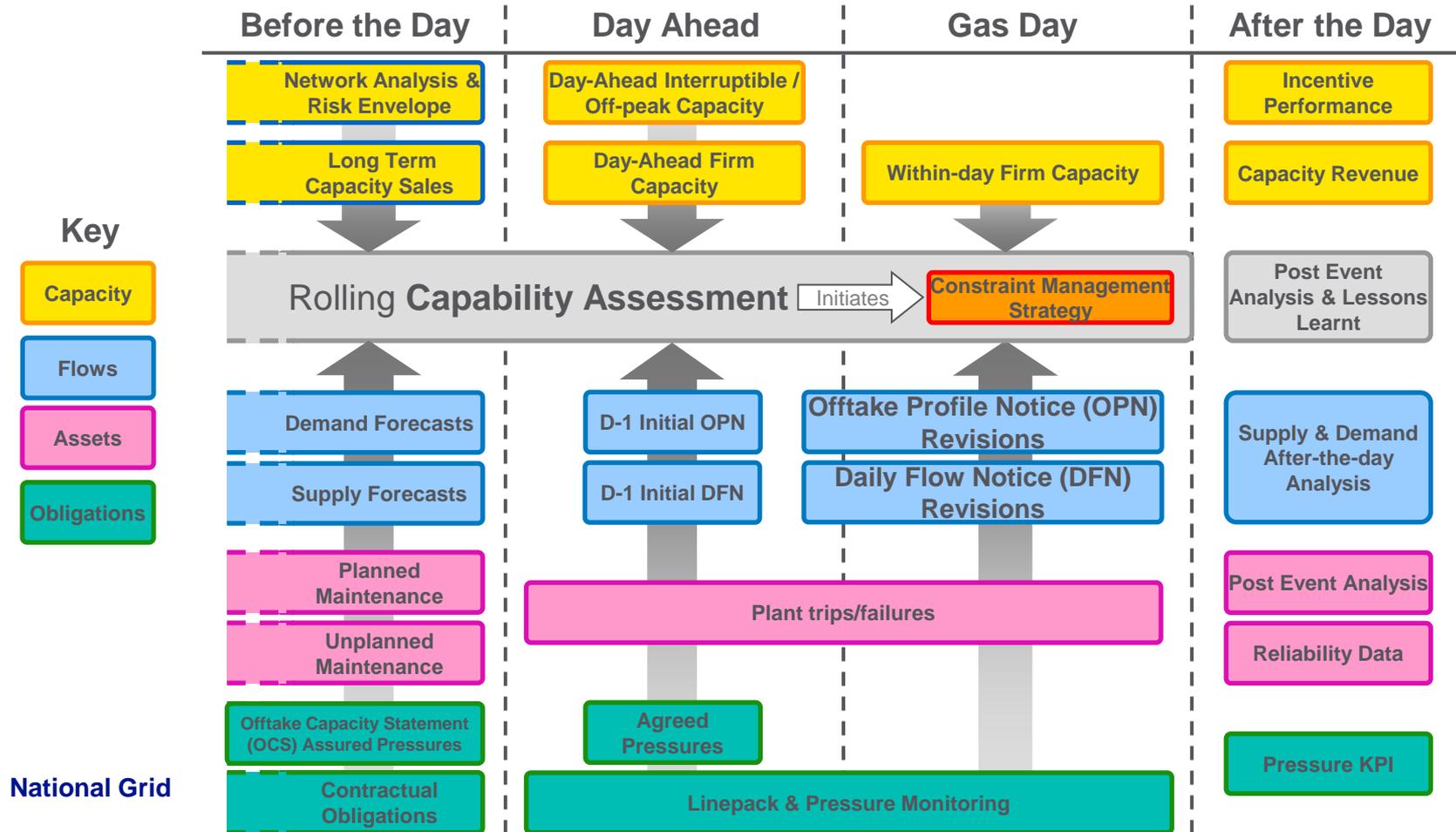
What Constitutes a Constraint?

Entry Example:



In constraint situations, National Grid will communicate with Users via the Active Notification System (ANS). It is therefore important to ensure that your contact details are up to date.

Monitoring the Network



Capacity Scaleback & Restoration

National Grid may scaleback up to 100% of Interruptible NTS Entry Capacity / Off-peak NTS Exit Capacity in areas of the NTS impacted by a potential constraint.

Scaleback parameters

Daily Interruptible System Entry Capacity (DISEC) or Daily Off-peak NTS Exit Capacity (DONEX) auctions are where Users request interruptible/off-peak capacity rights. This is booked at the day-ahead stage.

Overruns - Users are expected to manage their nominations in line with their (reduced) capacity entitlements in order to avoid overrun charges.

Timings and restoration

Entry – Hour Bar + 60 Mins (e.g. scaleback at 12:30, effective from 14:00)

Exit – HB + 4 hours (e.g. scaleback at 12:30, effective from 17:00)

(Scaleback timings could differ at IPs)

Restoration – when constraint has been resolved, scaled Interruptible/Off-peak Capacity may be partially or fully restored.

All restorations are applicable from the start of the next hour bar.

Notices – notifications issued by ANS

Restrict Daily Capacity

Restricting release of daily capacity in the Within Day Daily System Entry Capacity (WDDSEC) and Within Day Daily NTS Exit Capacity (WDDNEX) auctions.

When?

Where a constraint has been forecast and it is **assessed that releasing further firm capacity will exacerbate the constraint.**

If there is an existing constraint occurring and a high expectation that the constraint will continue into the following day, **National Grid may also restrict the release of day-ahead firm capacity** in the Day Ahead Daily System Entry Capacity (DADSEC) and Day Ahead Daily NTS Exit Capacity (DADNEX) auctions.

How?

Notified through ANS – before the auction is due to run.

A further ANS notice shall be issued when the constraint has been resolved allowing participation in the auctions.

Nominations - Users may need to adjust their nominations if daily auctions are restricted.

Locational Energy Actions

National Grid may trade gas at specific NTS Entry and Exit locations in the management of NTS constraints.

What?

Locational Energy Actions aim to increase or reduce actual flow rates without affecting capacity entitlements.

Users will be **notified via ANS** of any requests by National Grid for locational bids or offers.

Imbalance scenario - If large or multiple buy or sell actions are undertaken the system may become out of balance. Under this scenario, further locational actions may be required following resolution of a constraint in order to achieve system balance.

Process

Users post bids or offers to the Locational Energy Market within the WebICE Platform.

National Grid accepts bids or offers based on factors including **cost, location and lead-time** in line with the System Management Principles Statement.

User approves trade(s) in Gemini.

Acceptance of a locational bid or offer by National Grid will not automatically adjust capacity entitlements. Users may have to adjust their entitlements in line with their physical gas flow in order to avoid an overrun charge.

Capacity Surrender (Capacity Buyback)

National Grid may request to buy back Firm capacity rights in relation to a constraint, only after any Interruptible/Off-peak capacity has been scaled back.

What?

Capacity can be surrendered through **daily Surrender Auctions** - 'DBSEC' (Daily Buyback System Entry Capacity) and 'DBNEX' (Daily Buyback NTS Exit Capacity).

Capacity surrender at IPs will be processed in the same way. If a User has both bundled and unbundled capacity for surrender, unbundled will be selected first.

Requests to make Firm NTS Capacity Surrender Offers sent via ANS.

Process

User's Firm capacity entitlements will be adjusted in line with the accepted offer, post auction.

Posting offers – Users must post offers in the DBSEC / DBNEX auctions.

Acceptance – National Grid will review the surrender offers and make relevant allocations.

Nominations - Users are expected to manage nominations in line with their (reduced) capacity entitlements in order to avoid overrun charges.

Offtake Flow Reductions (OFR)

National Grid may require offtake Users to reduce demand for a set period of time by requesting offers for Offtake Flow Reduction at NTS Exit Points.

What?

If required, and in relation to a forecast NTS Exit Constraint, National Grid may initiate an **Offtake Flow Reduction invitation** via ANS notice.

The notice shall inform all NTS Users of the applicable NTS Exit Zone(s) where offers are requested and also the “Invitation Reference Number.”

Offer process

NTS Exit Users that wish to make an offer of flow reduction in relation to the invitation sent via ANS can do so by entering the offer details into Gemini Exit.

Offers need to include details of the **location, price and potential flow reduction** being offered by the User

Where National Grid accepts an offer, the relevant User must ensure that a revised Offtake Profile Notice (OPN) which reflects the accepted OFR offer is received no later than 30 minutes prior to the reduction period.

Constraint Management Agreements

National Grid may develop Contractual Agreements with one or more Parties to manage potential, enduring constraints.

What?

Where there is a prolonged period of perceived constraint risk on the gas network, and National Grid has sufficient notice, it may be considered efficient to tender for a Constraint Management Agreement.

An example of this could be a “turn-down agreement” where the User reduces flows on request, subject to pre-agreed contractual terms.

Process

Ad-hoc tender process, unless there is insufficient notice to do so.

Location and duration of any agreements would be dependent on the location, extent and duration of the perceived constraint risk.

Process is managed by our Contract Services Team, in collaboration with the Capacity Team.

Gas Transmission

Updates



Martin Cahill
Senior Operational Liaison Officer

national**grid**



Shaping the gas transmission system of the future – Have your say

Why?

- We are committed to undertake a **stakeholder-led decision making** approach. As part of this, in addition to our continuous engagement, we hold **annual engagement** to bring everything together for stakeholders. This allows a holistic conversation in one place.

What?

- A month long programme of **interactive webinars** and **roundtables** designed to get stakeholder **insight** across all our stakeholder priorities

When?

- The events kick off on **22nd November** with Jon Butterworth giving a round up of our performance against all our priorities. There are a further 13 webinars throughout **November and December**

How do I get involved?

- Each event has a **registration link** (see details on next slide)



What's on... 1 of 2

Name	Description	Details
Shaping the gas transmission system of the future - Key note speech	It's the most exciting time to be involved in the gas industry. We now have the potential to help develop a clean future for everyone. What does that mean for Gas Transmission? Join Jon Butterworth (CEO of National Grid Gas Transmission) as he explores some of the challenges facing the industry over the next 12 months.	Mon 22 nd Nov 09.00 – 10.00 Register here
Future of Gas	Join Martin Cook, Commercial Director, Gas Transmission, for a closer look at the future of gas. In this session, Martin will talk about the role of gas today, and the role gas can play in the energy transition.	Wed 24 th Nov 10.30 – 11.30 Register here
Innovation – broadening the horizon	Join Steven Vallender, Asset Director, Gas Transmission, as we explore how some unexpected innovations could unlock value for consumers.	Thu 25 th Nov 12.00 – 13.00 Register here
Gas Market Plan	As decarbonisation policy impacting the use of gas ramps up, the industry will need to come together to evolve the structure of the current gas market to facilitate low carbon and decarbonised gases. This session will explore the recent Gas Market Plan projects and recommendations.	Tue 30 th Nov 09.30 – 10.30 Register here
Transitioning to a hydrogen backbone	Join us to explore the key challenges we need to address to transition the transmission network to hydrogen together with an overview of the projects that look to answer them.	Thu 02 nd Dec 10.00 – 11.00 Register here
Managing methane emissions	With an increased focus from government on managing and reducing methane emissions, how are network companies responding?	Thu 02 nd Dec 13.00 – 14.00 Register here

What's on...2 of 2

Name	Description	Details
Supporting regional hydrogen transitions	Join us to explore the key challenges we need to address to transition the transmission network to hydrogen together with an overview of the projects that look to answer them. This session will focus on what's needed to transition different regions across GB to hydrogen transmission.	Fri 02 nd Dec 09.00 – 10.00 Register here
Understanding the skills needed for a net zero world	What does tomorrows workforce look like? How do we understand and then develop the skills needed to effectively achieve such a transition?	Mon 06 th Dec 13.00 – 14.00 Register here
Digital Strategy and Information Provision	Join Steven Vallender, Asset Director, Gas Transmission, as we take a walk through our digital strategy including how to have your say to ensure we continue to deliver your data and information needs throughout RIIO-2.	Tue 07 th Dec 13.30 – 14.30 Register here
Operating the network	Ever wondered how the gas gets from where it's produced to where it's used? Join us as we go back to basics on operating the gas system. During this session we'll cover the day to day running of the gas transmission system managing supply and demand and how hydrogen could impact this	Wed 08 th Dec 09.00 – 10.00 Register here
FutureGrid 2021 Progress report	Join the FutureGrid Team for the official launch of the FutureGrid 2021 Annual Progress Report. Ask us about the project, the progress we've made and hear what's coming up in 2022.	Tue 14 th Dec 10.00 – 11.00 Register here
Annual Network Capability Assessment Report	As part of the Annual Network Capability Assessment Review we welcome you to talk through the outputs of this years network capability review including potential areas of constraint.	Wed 15 nd Dec 10.00 – 11.00 Register here

Implementation of NTS Capacity related UNC Modifications 0752S, 0759S & 0755S

There is ongoing work to deliver the associated Gemini system changes required to implement the following 3 Modifications late April 2022.

Mod 0752S

Introduction of Weekly Entry Capacity Auctions

Mod 0759S

Enhancement to NTS Within-Day Firm Entry and Exit Capacity Allocations

Mod 0755S

Enhancement of Exit Capacity Assignments

Further details will be communicated at the beginning of 2022.

Communications

For further information please visit:

- XRN can be found here: [XRN 5393 | Xoserve](#)
- Xoserve website at [Gemini changes overview \(xoserve.com\)](#)

or contact Gas Market Change Team: Anna.Stankiewicz@nationalgrid.com

MIPI Actual Demands

- Automated updates to Demand to be provided
- Currently for individual sites these are done manually for significant errors, while supply has a D+6 update
- Will be published via same data item
- Expectation for change to be delivered in January

Data Item	Applicable For	Applicable At	Value
Site x Actual Demand latest	23/11/2021	24/11 12:01	1mcm
Site x Actual Demand latest	23/11/2021	25/11 10:00	1.1mcm

Gas Transmission

Close



Martin Cahill
Senior Operational Liaison Officer



Next Forum

The first Operational Forum for 2022 will take place on the 20 January at the Clermont Hotel and via MS Teams.

Please send any topic requests to:

Box.OperationalLiaison@nationalgrid.com

Register now at:

Online

<https://www.eventbrite.co.uk/e/january-gas-operational-forum-2022-online-tickets-217004184357>

In Person

<https://www.eventbrite.co.uk/e/january-gas-operational-forum-2022-in-person-attendance-tickets-217003612647>

