

UNC Final Modification Report	At what stage is this document in the process?
<h1>UNC 0712S:</h1> <h2>Amending the oxygen content limit in the Network Entry Agreement (NEA) at the St Fergus SAGE plant</h2>	<div style="display: flex; flex-direction: column; gap: 5px;"> <div style="border: 1px solid #ccc; padding: 5px; display: flex; align-items: center; gap: 10px;"> 01 Modification </div> <div style="border: 1px solid #ccc; padding: 5px; display: flex; align-items: center; gap: 10px;"> 02 Workgroup Report </div> <div style="border: 1px solid #ccc; padding: 5px; display: flex; align-items: center; gap: 10px;"> 03 Draft Modification Report </div> <div style="border: 1px solid #ccc; padding: 5px; display: flex; align-items: center; gap: 10px;"> 04 Final Modification Report </div> </div>
<p>Purpose of Modification:</p> <p>This enabling Modification will facilitate an increase to the current oxygen content limit at the St Fergus SAGE System Entry Point through modification of the SAGE Network Entry Agreement / Provision</p>	
	<p>The Panel determined that this self-governance modification be implemented</p>
	<p>High Impact: None</p>
	<p>Medium Impact: None</p>
	<p>Low Impact: Transporters, Consumers</p>

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Timetable		
Modification timetable:		
Pre-Modification Discussion	07 November 2019 and 05 December 2019	
Modification consider by Panel	19 December 2019	
Initial consideration by Workgroup	09 January 2020	
Workgroup Report presented to Panel	20 February 2020	
Draft Modification Report issued for consultation	21 February 2020	
Consultation Close-out for representations	19 March 2020	
Final Modification Report available for Panel	25 March 2020	
Modification Panel decision	16 April 2020 (<i>considered at short notice</i>)	

 Any questions?

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1 Summary

What

This is an enabling Modification that seeks to facilitate an increase in oxygen limit in the Network Entry Agreement at the SAGE Terminal between National Grid Gas Plc and SAGE North Sea Limited (SNSL). It is proposed to increase the limit from 0.001 mol% (10 ppm) to 0.01 mol% (100 ppm).

In Great Britain, there are two oxygen limits that are pertinent to network entry requirements. The first, 2000ppm (0.2mol%) is a safety limit specified in Schedule 3 Part 1 (regulation 8) of the Gas Safety (Management) Regulations, (GS(M)R). The second is a guideline limit of 10ppm (0.001mol%) contained in National Grid's Gas Ten Year Statement, which is currently in place in the SAGE Network Entry Agreement, which governs gas export specification from the St Fergus SAGE Terminal.

Why

SNSL is seeking to bring new Norwegian gas volumes into the National Grid via the St Fergus SAGE gas terminal. OMV Gas Marketing and Trading GmbH's Norwegian affiliate is co-owner of these gas volumes. OMV Gas Marketing and Trading GmbH, as a UNC shipper, is therefore seeking the Modification while SNSL's gas licence application progresses. Processing this gas to meet the current GS(M)R (1996) defined Incomplete Combustion Factor ("ICF") specification will require ballasting with nitrogen gas. Available Pressure Swing Absorption ("PSA") nitrogen generation units produce nitrogen with a minimum 99.5% vol. purity. Analysis of SAGE Terminal export composition shows that this will result in an Oxygen content range of 50 to 70 ppm (0.005 to 0.007 mol%) in gas exported to the NTS.

The 10ppm limit as currently applied will prevent the SAGE terminal from being able to process these new gas volumes. The Proposer believes this limit is unnecessary and restrictive to the SAGE terminal's ability to access new gas supplies for the UK.

How

The Proposal is to increase the limit for oxygen, as defined within in the SAGE Network Entry Agreement from the current limit of 0.001 mol% (10 ppm), to 0.01 mol% (100ppm). The proposed value falls well within the Gas Safety (Management) Regulation limit of 0.2 mol% (2000ppm). Pursuant to UNC TPD Section I paragraph 2.2 (Amendment of Network Entry Provisions) this Modification, if approved, will enable a change to the St Fergus SAGE Terminal export specifications.

It should be noted that three similar enabling Modifications (0561S, 0581S and 0645S) were approved by the UNC Modification Panel in 2015, 2016 and 2018.

2 Governance

Justification for Self-Governance

Based on three previous Modifications enabling a change to the same oxygen limit, (0561S, 0581S and 0645S) the Proposer believes this proposed change is not likely to have a material effect on the self-governance criteria.

In particular, the Proposer considers that this Modification will not result in discrimination between parties because an equivalent change could be sought in respect of any other NTS System Entry Point. Gas quality

limits vary at different entry points and given the above mentioned Modifications have been approved, this Proposal isn't expected to materially change the current position in relation to discrimination between parties.

Requested Next Steps

This Modification should:

- be subject to self-governance
- be implemented

3 Why Change?

Security of supply

The ability of a Delivery Facility Operator (“DFO”) to deliver gas to the NTS at an entry point (or subterminal) is limited by the Network Entry Provisions contained in the relevant bilateral Network Entry Agreement between the DFO and National Grid NTS. Amongst other things, the NEA currently sets a limit on the oxygen content of the gas to be delivered to the gas transporter’s system, which is currently set at 0.001 mol% in the SAGE Terminal’s Network Entry Agreement.

As illustrated in National Grid FES scenarios (which can be found here: <http://fes.nationalgrid.com/>), import dependency is expected to increase and with this, GB can expect greater diversity in the gas composition brought in by or for future new Shippers. The current limit at SAGE is at risk of being too restrictive to allow processing of future Norwegian gas sources to meet existing regulatory ICF limits with available technology. Therefore, it is in the interest of the GB gas market to better facilitate the delivery of Norwegian gas sources via SAGE.

The short-term solution to achieving this is to allow a relatively modest increase to 0.01mol% in the oxygen limit at the St Fergus SAGE Terminal. The second step, removal of the ICF specification, is currently being addressed in the current IGEM Gas Quality Standard Working Group (which can be found here: <https://www.igem.org.uk/technical-services/gas-quality-working-group/>)

Consistency with other entry points O2 limit

The table below is a summary taken from Ofgem’s letter to industry titled Establishing a gas quality Review Group dated 20 September 2004 (which can be found here:

https://www.ofgem.gov.uk/sites/default/files/docs/2004/09/8395-21904_0.pdf)

The proposed new limit of 0.01mol% for the St Fergus SAGE Terminal sits towards the lower end of the of the total number of 21 entry points cited in 2004.

O ₂ Content Limit (mol%)	# Entry Points	Cumulative # Entry Points
0.001	7	7
0.100	9	16
0.200	4	20

It should be noted that similar enabling Modifications 0561S, 0581S and 0645S were approved by the UNC Modification Panel in November 2015, July 2016, and April 2018 respectively and were all implemented under self-governance arrangements. A higher 0.02 mol% oxygen content limit was agreed for all three. Therefore, this Modification Proposal is consistent with similar change requests to NEAs in the past and in accordance with UNC Transportation Principal Document Section I paragraph 2.2.3 (a), a Code Modification has been chosen as the means by which to effect the changes to the oxygen content limits for the St Fergus SAGE terminal.

What the effects are, should the change not be made

If the change is not made, the SAGE Terminal will not be able to provide the required service to bring the new Norwegian gas volumes into NTS. This will be detrimental to future security of supply to the GB gas market. SAGE may also be disadvantaged in effective competition between other shippers and suppliers that are not subject to such a strict oxygen content limit.

4 Code Specific Matters

Reference Documents

The following links direct to similar enabling Modifications seeking increase to the Oxygen limit.

- Modification 0561S: *Amendment to the oxygen limit within the BBL / NTS Interconnection Agreement:*

<http://www.gasgovernance.co.uk/0561>

- Modification 0581S: *Amending the Oxygen content limit specified in the Network Entry Agreements at Grain LNG:*

<http://www.gasgovernance.co.uk/0581>

- Modification 0645: *Amending the oxygen content limit in the Network Entry Agreement at South Hook LNG:*

<http://www.gasgovernance.co.uk/0645>

Knowledge/Skills

No additional knowledge/skills required

5 Solution

Increase the maximum oxygen limit in the SAGE Network Entry Agreement.

The solution to the issue raised in this proposal is to increase the permitted oxygen content of the gas in the SAGE Network Entry Agreement from 0.001 mol% to 0.01 mol%. This increased level would remain well within the level of 0.2 mol% allowable under the Gas Safety (Management) Regulations. It would also appear to be significantly lower than the limits permitted at several other NTS entry points.

6 Impacts & Other Considerations

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

Not applicable.

Consumer Impacts

NTS offtakes in the vicinity of St Fergus include Peterhead power station and the Shell “Backhaul” facility located downstream of the mixing point within the St Fergus NTS terminal. The following table illustrates the effect of blending between the three sub-terminals at St Fergus based on export volumes at the current date assuming the maximum proposed O₂ content from SAGE and 10ppm limit at the Shell and NSMP plants.

Plant	Rate (mcmd)	Assumed O2 content (ppm)	Comment
SAGE	14.2	100.0	Flowrate from entry zone graphs @ 24/10/19 but assuming maximum proposed O2 content
Shell	20.2	10.0	Flowrate from entry zone graphs @ 24/10/19
NSMP	24.0	10.0	Flowrate from entry zone graphs @ 24/10/19
Blended effect	58.7	31.7	

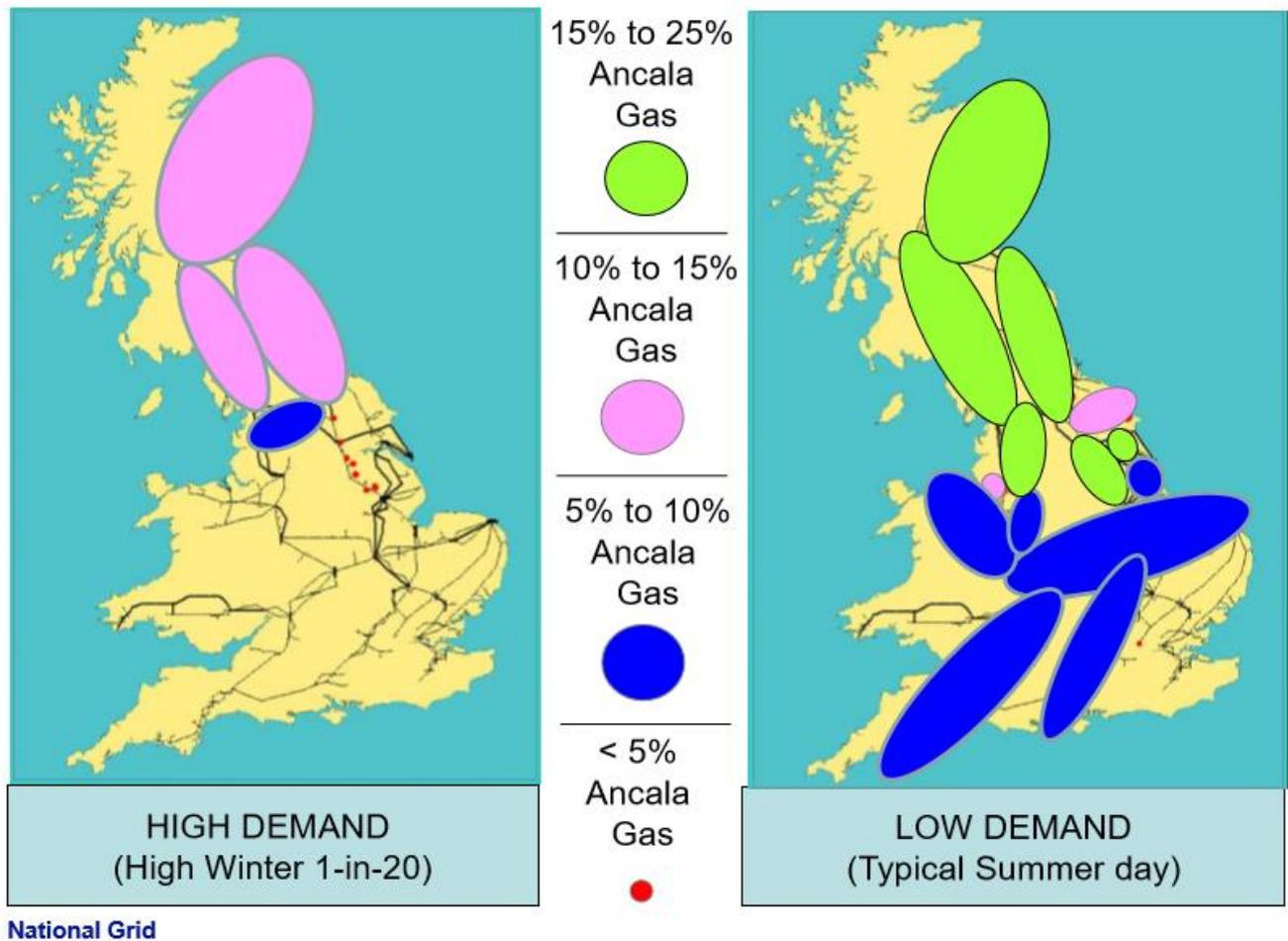
In order to better understand the extent to which this particular stream of gas could vary gas composition across GB, the Workgroup asked National Grid to produce appropriate analysis showing penetration of St Fergus SAGE gas across the NTS. National Grid produced four ‘heat maps’, (two for a summer day (low) flows and two for a winter day (peak) flows), which show the degree of penetration of St Fergus SAGE gas into the NTS based on the latest Future Energy Scenarios (FES) data. A similar approach was adopted for a previous modification proposal to vary the oxygen content at South Hook, (Proposal 645, linked above in Section 4).

The full presented analysis may be found here: [Ancala Oxygen Penetration Modelling](#), but as an informational highlight, the analysis that showed the greatest penetration was the map for the current year, shown below. FES modelling suggests that the penetration for gas years 2025/26 and 2030/31 would reach less of GB than the current year flow-pattern scenario.

The modelling assumptions adopted are detailed below:

- Ancala entry flows contain 100ppm of oxygen content: and
- NSMP and Shell entry points flow with no oxygen content

Heat Maps: Gas Year 2019/20



This flow scenario results in a comingled stream of gas in the NG terminal of

- ~15ppm oxygen (peak case); and
- ~25ppm oxygen (low demand case)

would enter the NTS pipelines at St Fergus.

In terms of discussion at workgroup, there were conducted in two parts.

First, prior to going to Panel, the proposal was circulated at the Transmission Workgroup as pre-modification discussions over a two-month period, during which time the penetration modelling was commissioned,

Secondly, at the January Workgroup, the resulting oxygen concentration modelling analysis, (detailed above), was presented.

A concern was raised at the January Workgroup that parties and specific classes of user, potentially affected by this proposal, should be made aware of this incremental gas composition change and be specifically advised of the forthcoming consultation.

The Workgroup also noted that over the past 4 years there have been 3 proposals relating to oxygen content at Entry Points across GB, and the workgroup requested National Grid NTS to consider providing cumulative analysis of the individual / incremental increased levels of oxygen across the NTS to assess the materiality of the changes in aggregate.

At the February Workgroup, National Grid provided cumulative Oxygen concentration 'heat maps' for two scenarios:

- a) Each Entry Point flowing at its contractual maximum values; and
- b) Each Entry Point set at the actual average observed values

With respect to this GB-wide analysis, the conclusion was that, even Ancala flowed to its contractual maximum, against a scenario of all other flows at maximum concentration, an increase up to 100ppm by Ancala would have no material effect on potential maximum Oxygen concentrations on the NTS.

Against an average flow scenario, the conclusion was that, given the relatively low level of proposed increase in Oxygen at St Fergus SAGE, when overlaid on observed actual flow compositions, the maximum concentration of Oxygen at any point on the NTS would be just above 100ppm, although for offtakes in Scotland the value would be lower at around 12ppm, (GS(M)R limit 2000ppm)

The full presentation can be found here: [Cumulative Oxygen Concentration 'Heat Maps'](#)

Impact (if any) on Greenhouse Gas Emissions

Installation of the Pressure Swing Adsorption devices (PSAs) will not generate additional greenhouse gas emissions. Electricity from the National Grid will be used to power the PSAs. Electricity utilisation is estimated to be one (1) megawatt per day.

Cross Code Impacts

None

EU Code Impacts

None

Central Systems Impacts

None

7 Relevant Objectives

Impact of the modification on the Relevant Objectives:	
Relevant Objective	Identified impact
a) Efficient and economic operation of the pipeline system.	None
b) Coordinated, efficient and economic operation of (i) the combined pipe-line system, and/ or (ii) the pipe-line system of one or more other relevant gas transporters.	None
c) Efficient discharge of the licensee's obligations.	None
d) Securing of effective competition: (i) between relevant shippers; (ii) between relevant suppliers; and/or (iii) between DN operators (who have entered into transportation arrangements with other relevant gas transporters) and relevant shippers.	Positive
e) Provision of reasonable economic incentives for relevant suppliers to secure that the domestic customer supply security standards... are satisfied as respects the availability of gas to their domestic customers.	None
f) Promotion of efficiency in the implementation and administration of the Code.	None
g) Compliance with the Regulation and any relevant legally binding decisions of the European Commission and/or the Agency for the Co-operation of Energy Regulators.	None

Positive Impact of Increasing Oxygen Limits

The positive impacts can be identified for Relevant Objective *d) securing of effective competition between various parties*.

Implementation of this Proposal would permit no less Norwegian gas to be processed by SAGE and enter the GB market, maintaining liquidity, and will therefore help to promote competition between gas shippers and gas suppliers.

8 Implementation

As self-governance procedures are proposed, implementation could be sixteen business days after a Modification Panel decision to implement, subject to no Appeal being raised.

No implementation costs for other industry parties are anticipated.

9 Legal Text

As this is an enabling Modification, (in accordance with UNC Transportation Principal Document Section I paragraph 2.2.3 (a)), no UNC text changes are required; implementation would enable National Grid NTS and SNSL to amend the oxygen limit accordingly in the relevant Network Entry Provisions in their bilateral Entry agreement.

10 Consultation

Panel invited representations from interested parties on 20 February 2020. The summaries in the following table are provided for reference on a reasonable endeavours' basis only. It is recommended that all representations are read in full when considering this Report. Representations are published alongside this Final Modification Report.

Of the 6 representations received 5 supported implementation and 1 provided comments.

Representations were received from the following parties:

Organisation	Response	Relevant Objectives	Key Points
Ancala Midstream Acquisitions Ltd	Support	d) - positive	<ul style="list-style-type: none"> • Supports the proposal to enable additional gas volumes from Norway to be delivered into the National Transmission System (NTS) from the SAGE Terminal, promoting competition in the gas market and enhancing security of supply for the UK. • Understands the Modification will not be required if changes proposed by IGEM to the Gas Safety (Management) Regulations 1996 (GSMR) specification for the NTS are implemented. • Believes a self-governance status is applicable, as all prior Modifications relating to oxygen content have been self-governance and for reasons of consistency, this Modification should be dealt with in the same way. • Agrees implementation should occur on a timely basis following approval. • Understands additional equipment will be installed at the SAGE Terminal to ballast Norwegian gas volumes with nitrogen required to meet the ICF limit in the NTS entry specification. The selected technical solution, pressure swing absorption units, produce gaseous nitrogen from air. The nitrogen is between 99 to 99.5% pure. Limited oxygen carryover will result necessitating the UNC Modification. • Believes following analysis of the proposed Modification on a standalone and aggregated basis indicates that the impact of this proposal will not be material.

			<ul style="list-style-type: none"> • Understands on an aggregated basis oxygen within the NTS remains within the GSMR limit. • Supports the representation made by National Grid that the proposal is unlikely to be material. The current proposal is at a lower level of oxygen than previous Modifications.
Lundin Norway AS	Support	d) - positive	<ul style="list-style-type: none"> • Supports the proposed UNC Modification because it will enable increased volumes of Norwegian gas from the Utsira High area on the Norwegian Continental Shelf to be landed at the SAGE Gas Terminal and delivered into the National Transmission System (NTS). Addition gas delivered into the NTS promotes competition in the gas market and enhances security of gas supply in the UK. • Notes that other Modifications relating to oxygen dispensation are self-governance and believes that the proposed the Modification should be dealt with consistently. • Points out that a timely implementation would be appreciated. • Understands implementation will not involve additional cost on the Shippers. • Is of the opinion that the Modification enables the supply of gas from new sources to the UK Market and thereby increases competition, whilst also enhancing the security of supply for the UK.
National Grid NTS	Support	d) - positive	<ul style="list-style-type: none"> • Notes the Modification that this proposal seeks a modest increase in the oxygen limit at the Ancala NTS entry point for reasons which the Proposer has clearly explained. • Notes that the limit requested is lower than other recent requests from LNG terminals and the BBL interconnector and that the actual increment to oxygen content delivered to the NTS is expected to normally be materially below the contractual limit that would apply following implementation. • Understands the analysis produced for the Workgroup concerning the potential penetration of higher oxygen content gas into the NTS as a result of this Proposal has shown that the effect would not be material. • Agrees self-governance status is appropriate. • Is of the opinion that no particular lead-time is necessary because this is an enabling Modification that would result in an amendment to the relevant Network Entry Provision between National Grid NTS and Ancala Midstream. • Understands only minor works on site would be required but the costs are not expected to be material.

			<ul style="list-style-type: none"> • Believes the effects of this proposal are unlikely to be material, given the analysis provided to the Workgroup and that other entry points have in recent years been granted higher levels of permitted oxygen content.
OMV (Norge) AS	Support	d) - positive	<ul style="list-style-type: none"> • Supports the proposal as it will enable increased volumes of Norwegian gas from the Utsira High area on the Norwegian Continental Shelf to be landed at the SAGE Gas Terminal and delivered into the National Transmission System (NTS). Additional gas delivered into the NTS promotes competition in the gas market and enhances security of gas supply in the UK. • Understands the other Modifications relating to oxygen dispensation are self-governance and the proposed the Modification should be dealt with consistently. • Points out that a timely implementation would be appreciated. • Understands implementation will not involve additional cost on the Shippers. • Believes the proposal will enable the supply of gas from new sources to the UK market and increase competition, this proposal will also enhance the security of the supply for the UK.
SSE	Comments	d) - none	<ul style="list-style-type: none"> • Notes that the information provided from the Heat Maps indicates this particular change will not significantly affect the gas supplied to the Storage sites near Easington. Under all the 'Maximum Contractual' scenarios the predicted content is 100-300 ppm (.01-.03%). • Notes the modelling states that there is no material effect if Ancala flows at 100ppm and as the proposed increase is up to this level it is other supplies at existing limits moving into that range. • Notes that for the 'Average Actual' scenarios (which will be closer to what would be expected to see for extended periods) the levels are lower (40-80 ppm for high demand, and 80-120 ppm for low demand). The Low demand is probably more relevant during injection. • Points out that the main concern for SSE, is that if more modifications are brought in at more entry points, then the average O2 content will creep up over time. Underground gas storage is classified as sensitive to higher levels of O2 due to increased risk of corrosion within wet gas systems. • Observes that the general consensus seems to be that a level of 10ppm (the Ten Year Statement level) will not be an

			<p>issue in wet gas systems, therefore, as for other modifications, only offer support for changes above this level with the proviso 'where the gas can be demonstrated not to flow to installations sensitive to higher levels of oxygen, e.g. underground storage systems'.</p> <ul style="list-style-type: none"> • Suggests that should assets need to be replaced, then this would require long outage periods and several multi million pound projects. Given the current market conditions for Gas Storage it is unlikely that these projects would be economically viable and would result in curtailment. In the short term there could also be issues with elemental sulphur causing rapid blockage of Coalescer Filters, which would affect availability to withdraw gas from storage.
WintershallDea Norge AS	Support	d) - positive	<ul style="list-style-type: none"> • Supports the Modification as it will enable increased import of Norwegian gas from the Utsira High area to the SAGE Gas Terminal and the National Transmission System (NTS). Increasing gas deliveries to the NTS promotes competition in the gas market and enhances security of long-term gas supply to the UK. • Understands the other Modifications relating to oxygen dispensation are self-governance and the proposed the Modification should be dealt with consistently. • Points out that a timely implementation would be appreciated. • Believes that implementation of the Modification would not involve additional costs for Shippers. • Is of the view that the proposal will enable supply of gas from new sources to the UK market and increase the competition and would also enhance security of supply for the UK.

Please note that late submitted representations will not be included or referred to in this Final Modification Report. However, all representations received in response to this consultation (including late submissions) are published in full alongside this Report and will be taken into account when the UNC Modification Panel makes its assessment and recommendation.

11 Panel Discussions

Discussion

The Panel Chair summarised that this Modification should facilitate an increase to the current oxygen content limit at the St Fergus SAGE System Entry Point through modification of the SAGE Network Entry Agreement / Provisions. It should be noted that as it is an enabling Modification and as such, there will be no changes to the UNC and therefore Legal Text is not required.

Members agreed the Modification should facilitate additional gas volumes from Norway to be delivered into the National Transmission System (NTS) from the SAGE Terminal, promoting competition in the gas market and enhancing security of supply for the UK. Following consideration of the analysis, it was noted that the proposed increase in oxygen levels is small and should have no material impact on the wider network.

Members noted concerns that if more gas quality changes of this nature are allowed at other entry points, then the average oxygen content across the network may increase over time and impact underground gas storage, as it is considered to be more sensitive to higher levels of oxygen which increases the risk of corrosion within wet gas systems. Therefore, any similar modifications will be considered on a case by case basis and with further analysis required.

Consideration of the Relevant Objectives

Members considered the Relevant Objectives and agreed that there were positive impacts for Relevant Objective d) securing of effective competition between various parties. Implementation of this Proposal would permit no less Norwegian gas to be processed by SAGE and enter the GB market, maintaining liquidity, and should therefore help to promote competition between gas shippers and gas suppliers.

Determinations

Members voted unanimously to implement Modification 0712S.

12 Recommendations

Panel Determination

Members agreed:

- that Modification 0712S be implemented.