

UNC Modification – 0607S

NSMP –Actions 0601, 0605 & 0605 and Suggested Amendments to Work Report 21st July 2017

Action 0601

Page 23 –Additional Wording for Legal Text - NSMP propose the following text

“2.3 Gas tendered for delivery by System Users to the System at the System Entry Point shall not contain any solid, liquid or gaseous material which would interfere with the integrity or operation of the System or any pipeline connected to such System or any appliance which a consumer might reasonably be expected to have connected to the System. In addition, all gas delivered to the System at the System Entry Point shall be in accordance with the following values:

(k) Carbon Dioxide Not More than 5.5mol% during the Modification Period and not more than 4.0mol% at all other times

(o) The aggregate content of CO₂ and N₂ in delivery gas shall not exceed 7mol% during the Modification Period”

It is proposed that the definition of the Modification Period within the NEA between NSMP and National Grid NTS will have the effect of limiting the duration of these changes to gas quality limits to the time for which they are required. It is currently envisaged that the Modification Period will be defined as being from the effective date of the amendment until 1st October 2024. To accommodate a situation where field life extends beyond the agreed date of 1st October 2024, it is also currently envisaged that at the end of each Gas Year from 2024 NSMP will be required to demonstrate to National Grid NTS that commingled gas with CO₂ concentrations in excess of 4 mol% has been received at the St Fergus plant through the FUKA pipeline during that year and if this cannot be demonstrated the Modification Period will end at 1st October of the following Gas Year. National Grid NTS would be obliged to notify all Users of the start and end dates of the Modification Period pursuant to UNC TPD Section I2.2.6.

Action 0605

Page 19 Carbon Cost Assessment - Suggested amended wording

The removal technology in this scenario remains the same as that considered in Modification 0498/0502 and the significant cost (c. £200m) and long lead time (c. 3 years) associated with the brownfield engineering modifications required for options 2 and 3, all of which remain unchanged from 0498/0502, renders these options non-viable for use here on an ad-hoc basis. In addition, the key conclusion of the Teesside carbon cost assessment is that significantly more CO₂ is emitted by removing CO₂ from the gas due to the fact that CO₂ removal using amine units, the optimal technology for CO₂ extraction given the CO₂ concentration, requires process heat which generates additional CO₂. The magnitude of expected CO₂ emissions here is similar to the Teesside modification.

It is important to recognise that the overall tonnage of CO₂ in Rhum gas entering the NTS on a day remains unchanged irrespective of the overall CO₂ concentration of the aggregate commingled gas entering the NTS from the terminal. On most days, there is sufficient blend gas to reduce the concentration of CO₂ to below the current spec of 4 mol% but the tonnage of CO₂ in the Rhum gas remains in the commingled flow. When there is insufficient blend gas, under this NEA modification, gas would enter the NTS with higher overall CO₂ concentration but (assuming constant flow rates) the

tonnage of CO2 in the Rhum gas would remain unchanged; it would just make up a bigger proportion of what is effectively a smaller volume leaving the terminal.

When this is considered together with the overall cost of mitigation and creation of additional emissions through mitigation, the conclusion for this Modification 0607s, based on data from the Teesside report that the least impact in terms of overall CO2 emissions is to allow the gas with high CO2 to flow into the NTS, is also valid for the proposed St Fergus modification.

Page 4 – Not a specific amendment - NSMP Comment on impact on competition for gas blending services & Self Governance

- (a) While some offshore pipeline operators may provide a blend service by virtue of the overall services they provide there is no market for commercial gas blending services in the UK since, as far as NSMP understand it, National Grid does not have a remit to provide blending commercial services
- (b) We suggest that any issue of competition between a producers and a shipper counterparty should be between those parties and is not an issue for the Work Group

We further believe that any commercial arrangements that the Rhum Owners may have entered into for the provision of Norwegian gas down Vesterled does not provide an argument for Authority direction as these arrangements are arguably in a different jurisdiction (Norway) and most certainly upstream of the NTS which is the primary consideration for this Work Group.

Page 5 – Suggested wording amendments (which in part addresses Action 0604 in conjunction with the amended Figure 1.1 provided by BP)

On occasions when the Laggan/Tormore fields trip and temporarily cease to export low CO2 gas into the FUKA pipeline, high CO2 content gas from the Rhum field can remain in the pipeline. Restarting gas export from the Laggan/Tormore fields then leads to a short duration increase in the CO2 content of gas arriving at the St Fergus NSMP sub-terminal above 4.0mol% as the increasing pipeline pressure from the Laggan/Tormore restart pushes the high CO2 Rhum gas along the pipeline and into the sub-terminal. In order to mitigate this intermittent risk of exceeding the 4.0mol% specification limit when Laggan Tormore restarts, a guaranteed daily flow of additional low CO2 blend gas is procured from Norway to the St Fergus NSMP sub-terminal via a commercial arrangement. This gas is transported daily to the St Fergus NSMP sub-terminal via the Norwegian Vesterled pipeline. The commercial mechanism with the Norwegian shippers is costly and Rhum cannot endure having to continually purchase blend gas to cover the brief periods when additional blending gas may be required.

In addition, gas with low CO2 content is exported into the NTS from the two other sub-terminals (SAGE & SEGAL) which are adjacent to the NSMP sub-terminal. Gas from these terminals allows “fortuitous” blending of gas within the manifold area of the NTS prior to gas entering the five NTS export pipelines from the St Fergus sub-terminals thereby reducing the combined CO2 content of the export gas before the gas reaches consumers.

For Information; NSMP gas including Rhum is GS(M)R compliant with or without Laggan/Tormore flows from the Shetland Gas Plant. Bruce/Rhum gas on its own is GS(M)R compliant.

If Rhum gas flows at normal export rates and is commingled with all FUKA sources excluding Laggan/Tormore, the composition of the combined export gas is ~4.5mol% CO2. With

Deleted: If higher CO2 slugs of gas were to enter the NTS, downstream customers would be liable for the inherent CO2 cost, however small. When the fact that the CO2 would already flow to the NTS is taken into account

Deleted: , effectively contributing blending gas. This

Deleted:

Laggan/Tormore fields flowing and Rhum at peak rates, the CO2 content of the commingled gas in the FUKA pipeline is <2.7mol%.

Page 7 - Suggested wording amendments

Consumer Impacts (National Grid NTS and BP/NSMP inputs into this section)

Consumers can currently receive gas with CO2 content of 4mol% from both the SAGE and St Fergus NSMP sub-terminals. In the event of a CO2 excursion by a sub-terminal, fortuitous commingling of gas within the manifold area of the NG terminal can prevent the gas entering the five NTS export pipelines from the St Fergus sub-terminals from exceeding 4mol% although this is not routinely utilised by NSMP. BP's analysis to support this Modification showed that such commingling could be expected to maintain gas entering the NTS at St Fergus at below 4mol%.

Deleted: gas entering the
Deleted: NTS

Page 8 - Suggested wording amendments

Consumer Impacts

What Costs and benefits...

Though the gas may still be within GS(M)R spec and therefore legally and contractually compliant, a slug of CO2, which might be associated with a rate of change of Wobbe index, could result in a risk of Peterhead CCGT trip and a subsequent cash out on gas and electricity markets. However, we understand that Peterhead CCGT is not in continuous operation as a baseload plant so the risk of CCGT trip should be considered in the context that the occasional export of high CO2 gas from the NSMP Sub-terminal would need to coincide with a period during which Peterhead CCGT is in operation.

Any Other Consumer Impacts

The overall amount of CO2 entering the NTS over the life of the Rhum field will remain unchanged (unless the field were to cease production early) whether the gas is blended with gas of lower CO2 concentration or allowed to flow unblended. However, if higher CO2 slugs of gas were to enter the NTS, downstream customers would be liable for the inherent CO2 cost (however small) at that time rather than paying for the same quantity of CO2 but over a longer period. Please refer also to Carbon Cost Assessment

Deleted: I
Deleted: ,

Page 9 - Suggested wording amendments

Problems arise when an unplanned trip occurs at Laggan/Tormore and there is insufficient blend gas to manage the requirement to reduce the CO2 limit to 4mol% before reaching the NTS entry point. There are no CO2 removal systems at the NSMP terminal so the system operator (NSMP) manages the risk by requiring the Rhum owners to procure sufficient quantities of Norwegian gas via the Vesterled pipeline on a daily basis to ensure there is a sufficient supply of gas available for blending should Laggan/Tormore experience an unplanned trip. If this safeguard were not in place then the whole FUKA system would have to be shut down while the high CO2 gas within the pipeline was removed in some way (e.g. flared). This would impact all of the offshore fields exporting gas via the FUKA system also shutting in oil export from those fields producing associated gas. The FUKA system handles around 10% of total UK daily gas supply.

Deleted: if
Deleted: could not be exported to the NTS or removed
Deleted: other
Deleted: ing

Page 10 - Suggested wording amendments

This would result in the shut in of all UKCS fields exporting gas via the FUKA pipeline system (not just the Rhum flows), until such gas could be removed from the pipeline and terminal. This would also impact oil production from these fields (e.g Buzzard which is one of the UK's largest oil producers).

Deleted: in

Deleted: and

Page 11 - Suggested wording amendments (which in part addresses Action 0604 in conjunction with the amended Figure 1 provided by BP)

An example of operational flows at the St Fergus NSMP terminal can be found in Appendix 1. SAGE and SEGAL have separate entry points into the NTS and are downstream of the compression station (see Figure 1); this allows "fortuitous blending" within the NTS mixing area in the NTS terminal before the commingled FUKA, Vesterled, SAGE and SEGAL gas enters the five NTS export pipelines carrying gas away from the terminals.

Deleted: the blending happens within the NTS terminal. Frigg gas blends with Vesterled and then further with SAGE and SEGAL before entering the NTS terminal

Pages 15/16 - Suggested wording amendments

In answer to questions from the Workgroup relating to CO2 concentrations in liquids export and maintaining water dew point, NSMP has stated that, in theory, there is some impact on the water dewpoint of export gas through increased CO2 content however, this is taken care of by the gas dehydration system and in all cases modelled, the sales gas remains well within spec (by a margin of over 40°C). With respect to CO2 concentrations in liquids export, NSMP does not believe that this is relevant to a debate on NTS gas specification but it remains NSMP's responsibility to ensure that all products exiting the terminal meets the appropriate specifications.

Deleted: For background information only and

Deleted: i

Deleted: has run a number of HYSYS simulations with gas compositions up to 6 mol% CO2 and can confirm that at higher concentrations of CO2 within the pipeline gas, the CO2 content of the NGL does increase. However, in all modes of operation required to maintain the NTS gas specifications, the CO2 content of the NGL remains less than 0.001 mol% which is well below the specification limits for NSMP's NGL export. In