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Decision

Kings Lynn Compressor Emissions – Final Preferred Option

Subject	Details
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We are publishing our decision on the Kings Lynn Compressor Emissions – Final Preferred Option. This decision has been informed by the responses we received following publication of our consultation on 19 May 2023. Alongside this document we are publishing the non-confidential responses we received in response to our consultation

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Executive summary

Kings Lynn Compressor Emissions – Final Preferred Option

In compliance with Special Condition 3.11 (Compressor Emissions Re-opener and Price Control Deliverable (CEP_t and $CEPRE_t$)) of National Gas Transmission's Gas Transporter Licence, National Gas Transmission (NGT) submitted a Final Option Selection Report in January 2023 which identified the Final Preferred Option for compliance with the Medium Combustion Plant Directive (the Directive) at the Kings Lynn Compressor Station. The Directive requires that existing gas turbines, between 1MW and 50MW net thermal input, must not exceed an emissions limit of 150mg/m³ Nitrogen Oxide (NOx) beyond 1 January 2030. The Kings Lynn Compressor Station has three gas turbine driven compressor units, one of which (the Siemens Avon installed in 1971) is not compliant with the Directive. A decision is required as to the future of the Avon compressor unit post 1 January 2030.

Special Condition 3.11 requires that a Final Option Selection Report is submitted in advance of any funding request. The Final Option Selection Report must contain a Final Preferred Option along with supporting evidence necessary for the Authority to make a determination. The Authority can

- Approve the proposed Final Preferred Option;
- Reject the proposed Final Preferred Option on the basis that the Authority considers no further work should go ahead at this time;
- Reject the proposed Final Preferred Option and approve one of the other options in the Final Option Selection Report; or
- Reject the proposed Final Preferred Option and set out additional information that should be provided to identify the best option before a resubmission of the Final Option Selection Report.

Our Decision

In accordance with Special Condition 3.11.9, we have decided to reject the Final Preferred Option identified by National Gas Transmission in the Final Option Selection Report, and instead approve one of the alternative shortlisted options.

In reaching our decision we have assessed the evidence presented in the Final Option Selection Report submitted by National Gas Transmission. Our assessment was set out in our Final Preferred Option consultation published on 19 May 2023. We have also taken account of the two consultation responses received in reaching our decision.

The Final Preferred Option is the counterfactual 'do nothing' option, with the existing Avon retained under the 500-hour Emergency Use Derogation (EUD) allowed for in the Directive, with significant asset health investment to improve unit availability. To ensure operation mapping alignment across all site compressors, this option will also consider the case for a re-wheel of the existing SGT-400s during the next phase of the project. Also included is the decommissioning of unit A, which was removed form service in 2017.

Separately, should National Gas Transmission identify a cost effective retrofit that will permit unrestricted operation of the existing Avon compressor unit, then we would expect National Gas Transmission to implement that solution and seek funding as part of the next price control.

1. Introduction

Context and related publications

1.1. In compliance with Special Condition 3.11, National Gas Transmission submitted a Final Option Selection Report in January 2023 which identified the Final Preferred Option for compliance with the Medium Combustion Plant Directive (the Directive) at the Kings Lynn Compressor Station. The Directive requires that existing gas turbines, between 1MW and 50MW net thermal input, must not exceed an emissions limit of 150mg/m^3 Nitrogen Oxide (NOx) beyond 1 January 2030. The Kings Lynn Compressor Station has three gas turbine driven compressor units, one of which (the Siemens Avon installed in 1971) is not compliant with the Directive. A decision is required as to the future of the Avon compressor unit post 1 January 2030.

1.2. Special Condition 3.11 requires that a Final Option Selection Report is submitted in advance of any funding request. The Final Option Selection Report must contain a Final Preferred Option along with supporting evidence necessary for the Authority to make a determination. The Authority can

- Approve the proposed Final Preferred Option;
- Reject the proposed Final Preferred Option on the basis that the Authority considers no further work should go ahead at this time;
- Reject the proposed Final Preferred Option and approve one of the other options in the Final Option Selection Report; or
- Reject the proposed Final Preferred Option and set out additional information that should be provided to identify the best option before a resubmission of the Final Option Selection Report.

Our decision making process

1.3. We published our proposed Final Preferred Option for consultation on 19 May 2023. This document provides a summary of the responses received and our consideration of these responses. Following publication of this decision, National Gas Transmission may in accordance with Special Condition 3.11.11 submit a Re-opener application seeking a funding direction in April 2025.

General feedback

1.4. We believe that consultation is at the heart of good decision making. We are keen to receive your comments about this decision. We'd also like to get your answers to these questions:

1. Do you have any comments about the overall quality of this document?
2. Do you have any comments about its tone and content?
3. Was it easy to read and understand or could it have been better written?
4. Are its conclusions balanced?
5. Did it make reasoned recommendations?
6. Any further comments?

Please send any general feedback comments to stakeholders@ofgem.gov.uk

2. Background

Section summary

This section provides an overview of the RIIO-2 Re-opener mechanism and the King#s Lynn Compressor Emissions Final Option Selection Report.

Overview of the RIIO-2 Re-Opener mechanism

2.1. The gas transmission network in Great Britain is owned and operated by National Gas Transmission. Economic regulation of the network follows the RIIO (Revenue = Incentives + Innovation + Outputs) price control framework. The current RIIO-T2 price control period will last five years from 1 April 2021 to 31 March 2026. Prior to commencement of the price control period, we set out in our Final Determinations our policy on the economic regulation of the network during the period. These policy decisions were given effect by new Special Conditions in Part C of the National Gas Transmission Gas Transporter licence, which came into force on 1 April 2021.

2.2. In our RIIO-T2 Final Determinations, we accepted the 'needs case' for investment at several sites on the network, including Kings Lynn Compressor Station, to ensure compliance with the Medium Combustion Plant Directive. The Directive requires that by 1 January 2030 the Nitrogen Oxide (NOx) emissions of all gas turbines with a net thermal input of between 1MW and 50MW, do not exceed 150mg/m^3.

2.3. However, given the level of uncertainty at the time with respect to both the 'preferred option' and the level of funding required, we decided that this and other similar Compressor Emissions projects, should be funded through our Gas Transmission Project Assessment Process. This two stage process is set out in Special Condition 3.11 Compressor Emissions Re-opener and Price Control Deliverable.

2.4. At Final Determinations we provided £14.38m (2018/19 prices) of baseline funding in the form of a Price Control Deliverable for the Kings Lynn Compressor Emissions project. The required deliverables were a Final Option Selection Report in January 2023 followed by a Re-opener application seeking a funding direction in April 2025. The Final Option Selection Report must contain a Final Preferred Option along with supporting evidence necessary for the Authority to either accept the Final Preferred Option, or approve an

alternative as the Final Preferred Option, reject the Final Preferred Option on the basis that no further work should go ahead or ask for more information. The Re-opener application must be based on the Final Preferred Option approved by the Authority.

2.5. In compliance with Special Condition 3.11.7, in January 2023, National Gas Transmission submitted a Final Option Selection Report for investment at the Kings Lynn Compressor Station to ensure compliance with the Medium Combustion Plant Directive. Following consideration of the Final Option Selection Report, we published our proposed Final Preferred Option for consultation on 19 May 2023. The consultation period closed on 14 July 2023, by which time we had received two responses. In reaching our decision we have given due consideration to these responses.

Final Option Selection Report

2.6. King's Lynn Compressor Station comprises three operational gas turbine - driven compressor units – one Siemens Avon (Unit B) and two SGT400s (Units C and D). The Siemens Avon (Unit B) is not compliant with the Medium Combustion Plant Directive. There is a fourth non-operational compressor unit (Unit A), which has been disconnected and is due for decommissioning. Table 1 below summarises the key features of the compressor units at King's Lynn.

Unit	Engine	Fuel	Power Base (MW)	Installed	Minimum Operational Flow (mscm/d)	Nominal Capacity (mscm/d)
A Disconnected	Avon	Gas	12.34	1971	13	56
B	Avon	Gas	12.34	1971	9	56
C	SGT400	Gas	12.9	2000	15	42
D	SGT400	Gas	12.9	2003	16	42

Table 1 – King's Lynn Compressor Units

2.7. The scheduled re-wheeling of the two SGT400s (Units C and D) will align their operational envelopes with current and forecast flows, allowing them to take over the primary duty role by 2030. These two units, operating either separately or in parallel, will be capable of providing the required level of compression at King's Lynn. A third unit would (1) in the case of Unit B being retained, provide back-up should either of the SGT400s be

unavailable (2) in the case of Unit B being replaced, supersede one of the SGT400s as lead with the other becoming a back-up unit.

2.8. Table 2 below summarises the eight shortlisted options considered in the Final Option Selection Report. The high-level options considered included:

- Doing nothing to reduce emissions from the non-compliant Avon unit (counterfactual) with the unit operated under the Emergency Use Derogation (EUD) i.e., limited to 500 run hours per year beyond 2030;
- Retrofitting of the non-compliant Avon unit with emissions abatement technology, Control System Restricted Performance (CSRP), Dry Low Emissions (DLE); and Selective Catalytic Reduction (SCR).
- Replacement of the non-compliant Avon unit with a new low-emission high efficiency gas turbine driven unit.

Option Shortlist	Unit A	Unit B	Unit C	Unit D	Unit E	Unit F
1 – Counterfactual	Decommissioned	500Hr EUD	Compressor Re-Wheel	Compressor Re-Wheel	/	/
2 - 1 x CSRP	Decommissioned	CSRP Retrofit	Compressor Re-Wheel	Compressor Re-Wheel	/	/
3 - 1 x SCR	Decommissioned	1533 SCR Retrofit	Compressor Re-Wheel	Compressor Re-Wheel	/	/
4 – 1 x DLE	Decommissioned	1533 DLE Retrofit	Compressor Re-Wheel	Compressor Re-Wheel	/	/
5 - 1 x New Unit	Decommissioned	Decom.	Compressor Re-Wheel	Compressor Re-Wheel	New Unit (Brownfield)	/
6 - 2 x New Units	Decommissioned	Decom.	Compressor Re-Wheel	Compressor Re-Wheel	New Unit (Brownfield)	New Unit (Brownfield)
7 - 1 x New Unit + EUD	Decommissioned	500Hr EUD	Compressor Re-Wheel	Compressor Re-Wheel	New Unit (Brownfield)	/
8 - 1 x Decom	Decommissioned	Decom.	Compressor Re-Wheel	Compressor Re-Wheel	/	/

Table 2 - Options build up summary

2.9. Table 3 below sets out the output from the Cost Benefit Analysis. The option with the highest Net Present Value (in this case the lowest negative) is the one that delivers compliance with the Directive at least cost over the assessment period. In the case of Steady Progression and System Transformation the lead option is Option 1 (Counterfactual), whereas in the case of Leading the Way and Consumer Transformation it

is Option 8 (1 x Decom), which sees Unit B decommissioned with no replacement. In addition to capital investment and ongoing asset health costs, constraint management, compressor fuel and carbon emission costs were included in the Cost Benefit Analysis

NPV £m (2018/19 prices)	Steady Progression	Consumer Transformation	Leading the Way	System Transformation
1 - Counterfactual	-£114 m	-£31 m	-£29 m	-£49 m
2 - 1 x CSRP	-£116 m	-£34 m	-£32 m	-£52 m
3 - 1 x SCR	-£124 m	-£42 m	-£40 m	-£60 m
4 - 1 x DLE	-£121 m	-£36 m	-£34 m	-£54 m
5 - 1 x New Unit	-£145 m	-£71 m	-£69 m	-£87 m
6 - 2 x New Unit	-£186 m	-£120 m	-£118 m	-£135 m
7 - 1 x New Unit + EUD	-£151 m	-£83 m	-£81 m	-£99 m
8 - 1 x Decom	-£160 m	-£23 m	-£19 m	-£49 m

Table 3 - Cost Benefit Analysis Outputs

2.10. The Final Option Selection Report also included a Best Available Technique assessment. All shortlisted options were assessed as being Best Available Technology.

2.11. The output from the Cost Benefit Analysis was subject to a sensitivity analysis based on what National Gas Transmission described as security of supply case studies. These assumed that the level of exports and gas prices observed in 2022 persisted over the entire assessment period. Table 4 below sets out the output from this sensitivity analysis. Under this analysis Option 7 (1 new unit + EUD) had the highest Net Present Value.

NPV £m (2018/19 prices)	High Export Scenarios	
	BEIS Forecast 60p/th	Current Prices 150p/th
1 - Counterfactual	-£270 m	-£415 m
2 - 1 x CSRP	-£270 m	-£414 m
3 - 1 x SCR	-£278 m	-£423 m
4 - 1 x DLE	-£286 m	-£450 m
5 - 1 New Unit	-£277 m	-£380 m
6 - 2 New Units	-£296 m	-£358 m
7 - 1 New Unit + 1 x EUD	-£264 m	-£330 m
8 – 1 x Decommission Avon	-£478 m	-£931 m

Table 4 - Cost Benefit Analysis Outputs – High Export Scenarios

2.12. National Gas Transmission also reviewed the three retrofit technologies. Determining that none provided a viable basis for compliance.

2.13. To determine the Final Preferred Option, the various assessments presented in the Final Option Selection Report were combined into a single assessment matrix as set out in Table 5 below.

Option	Emissions Compliance	BAT Assessment	CBA	Security of Supply / Case Study	Technology Risk	Capital Investment
1 – Counterfactual	Achieves MCPD Compliance through **Derogation** **Note**: No NOx emissions abatement.	Lead Configuration: BAT Back-Up Score: 51% Versatility: 9/15%	**Modelling based on FES does not capture key use cases of the site and risks resulting from loss of capability**	**Ruled Out** Unrestricted backup necessary in event of parallel running		
2 - 1 x CSRP	Achieves MCPD Compliance through **Abatement** **Note**: No NOx emissions abatement.	Lead Configuration: BAT Back-Up Score: 57% Versatility: 9/15%		Provides Unrestricted Running	**Ruled Out** Avon exceeds original design life which risks critical site operation. Additional risk of CSRP permit rejection from EA	
3 - 1 x SCR	Achieves MCPD Compliance through **Abatement**	Lead Configuration: BAT Back-Up Score: 57% Versatility: 9/15%		Provides Unrestricted Running	**Ruled Out** Avon exceeds original design life which risks critical site operation. Requires new HSE procedures to handle ammonia on site and introduces new failure mode onto NTS.	
4 – 1 x DLE	Achieves MCPD Compliance through **Abatement**	Lead Configuration: BAT Back-Up Score: 66% Versatility: 9/15%		Provides Unrestricted Running	**Ruled Out** Avon exceeds original design life which risks critical site operation. Additional risk that solution not yet commercially proven.	
5 - 1 x New Unit	Achieves MCPD Compliance through **New Unit Build**	Lead Configuration: BAT Back-Up Score: 89% Versatility: 15/15%		Provides Unrestricted Running	New Compressor Technology proven on NTS	
6 - 2 x New Unit	Achieves MCPD Compliance through **New Unit Build**	Not Assessed (4 Unit Site)		Provides Unrestricted Running	New Compressor Technology proven on NTS	**Ruled Out**
7 - 1 x New Unit + EUD	Achieves MCPD Compliance through **New Unit Build / Derogation**	Not Assessed (4 Unit Site)		Provides Unrestricted Running **Note**: Avon exceeds original design life but any risks are balanced out by new unit	New Compressor Technology proven on NTS	**Ruled Out**
8 - 1 x Decom	Achieves MCPD Compliance through **Decommission**	Not Assessed (2 Unit Site)		**Ruled Out** back-up required for parallel running		

Table 5 – King's Lynn Assessment Matrix

2.14. Based on these various analysis National Gas Transmission's Final Option Selection Report identified Option 5 (1 New Unit) as the Final Preferred Option.

Our proposed Final Preferred Option

2.15. On 19 May 2023 we published a consultation setting out our assessment of the evidence presented in the Final Option Selection Report. We proposed rejecting the option identified by National Gas Transmission as the Final Preferred Option (Option 5) and approve one of the other shortlisted options (Option 1) as the Final Preferred Option.

2.16. Separately, should National Gas Transmission identify a cost effective retrofit, that will permit unrestricted operation of the retained Avon compressor unit (Unit B). Then we would expect National Gas Transmission to implement that solution and seek funding as part of the next price control

2.17. The consultation period closed on 14 July 2023, with two responses being received. Those not marked as confidential have been published alongside this decision.

3. Summary of responses and our view

Section summary

This section contains a summary of the responses we received and our views on the various issues raised.

Responses to specific questions

Question 4.1: Do respondents agree with our assessment of the evidence presented in the Final Option Selection Report?

3.1. One respondent (BBLC) broadly agreed with our assessment but challenged it on several points.

- While the 2022 price spreads were exceptional, the actual flow direction and gas volumes are less atypical of future flow expectations. There has been a fundamental shift in the prevailing direction of European gas flows from East-West to West-East
- The successful response of the market to the events in 2022 relied heavily on the King's Lynn site's capabilities. This resulted in significant additional revenues from capacity sales which in turn offset the revenue requirement from other gas consumers.
- Future Energy Scenarios are not a robust tool for forecasting future imports and exports through the Bacton Interconnectors as such flows are predominantly market led.

3.2. The other respondent (NGT) also broadly agreed with our assessment but challenged it on several points, as set out below:

<u>Shortlisted Options</u>

3.3. At this stage there is no material difference in estimated cost of installing either a new gas or electric powered compressor unit. It is therefore appropriate that this decision should be taken following Front End Engineering Design.

Security of Supply Case Studies

3.4. There are credible scenarios in which a major outage of one of the lead SGT400 units lasting more than three weeks when combined with a period of maximum flows across the interconnects would exhaust the available running hours of the standby unit operating under the 500 hour per annum Emergency Use Derogation.

3.5. During the period January 2015 to May 2023 there have been 164 outages that have lasted longer than 500 hours (three weeks) across the National Transmission System compressor fleet. Further detail on an illustrative sample of these unplanned outages was included.

3.6. Predicted run hours for the standby unit based on actual 2022 interconnector export flows, assuming no major outages on lead units, were 662 hours. Rising to 1,300 hours should one of the lead units suffer a three month outage. Restricting run hours to 500 hours would have reduced exports by 300 mscm with a value of up to £150m based on 2022 gas prices.

3.7. The transition to net zero as national demand declines the use of compression at Kings Lynn will evolve. It will become feasible to meet national demand without supply from Bacton and Isle of Grain together. In these scenarios King's Lynn will be required to support demand in the Southeast of England. If King's Lynn was not available, the network capability would be reduced to below 1-in-20 peak demand.

Availability

3.8. Availability data from the Reliability Availability Maintainability (RAM) study was not directly applicable to units operating under the Emergency Use Derogation reducing network resilience over time. Standby units need to be operated periodically to maintain their availability. Where total run hours are limited, this reduces the number of run hours available for standby operation is required. It also causes operational difficulties due to the need to carefully plan and husband the use of limited run hours.

3.9. There remains a risk that during the Front End Engineering Design phase major asset health issues will be identified on units planned to be retained under the Emergency Use Derogation increasing project scope and cost or undermine the viability of the option entirely. In addition, long term operation of an existing Avon increases risk due to age related fatigue, loss of engineering experience, dwindling support, lack of field service

capability, minimal OEM support, low spares availability (often refurb only) and an inability to purchase OEM long term support packages.

Our View

Response to BBLC

3.10. We recognise that the invasion of Ukraine is likely to have fundamentally altered the prevailing pattern of gas flows across continental Europe. Whether and how this will impact the use of the interconnectors at Bacton is much less clear. The construction of significant Liquified Natural Gas importation capacity in north-west Europe suggests that going forward, usage of the Bacton interconnectors will return to a more traditional pattern but the use of the interconnector will still be driven by the market.

3.11. Our proposed Final Preferred Option does not reduce the capability of either Kings Lynn Compressor Station or the Bacton interconnectors as there is no reduction in the number of compressor units or capacity.

3.12. We believe that Future Energy Scenarios provide a robust basis for Cost Benefit Analysis. We recognise that as trade across the Bacton Interconnectors is driven by market conditions in adjacent markets predicting the direction and volume of trade in any future period involves a great deal of uncertainty. However, over a longer forecast period market fundamentals will assert themselves and the volatility that can be observed between periods will be smothed out. Future Energy Scenarios do not attempt to predict future imports or exports but provide a range of outcomes based on plausible variations in market fundamentals.

Shortlisted Options

3.13. While we would have preferred that a decision on drive type would have been reached prior to submission of the Final Option Selection Report we recognise that in this particular case it is not material to the decision in front of us.

Security of Supply Case Studies

3.14. We note the data provided on unplanned outages since 2015. This and other relevant information has been reflected in the Cost Benefit Analysis through the Reliability Availability Maintainability (RAM) study and Site Availability analysis.

3.15. We do not believe it is appropriate for this assessment to assume that an outage of 21 days duration will exhaust available run hours under the Emergency Use Derogation. It is based on continuous operation for 21 days which is highly unlikely. It also ignores the provision in the Derogation which permits up to 750 run hours in any single year. A much longer outage is therefore likely to be required before available run hours are exhausted. How long an outage required to exhaust the available hours will be situation specific but it should be possible to develop more appropriate assumptions based on the models and data available to National Gas Transmission.

3.16. We note the analysis based on actual 2022 interconnector export flows with a three month outage to one of the two lead SGT400 units. Individually both events, high export flows and an 3 month SGT400 outage, have a low probability and the probability of both occurring simultaneously is even lower. In the unlikely event that both events do occur, interconnector exports are not interrupted entirely but are marginally reduced. The analysis indicates a reduction of 300 mscm, equivalent to less than 5 days of Bacton interconnector maximum export capability, or 0.15% of the over 20 bscm exported in 2022-231. The analysis assumes an upper limit of 500 hours for the standby unit however the Emergency Use Derogation provides for this to increase to 750 hours within any single year. The Final Option Selection Report included a Sensitivity Analys based on exports observed in 2022 continuing for the entire assessment period. This did not demonstrate that our proposed Final Preferred Option performed worse than that favoured by National Gas Transmission.

3.17. Regarding the possible future use of Kings Lynn Compressor Station to support demand in the Southeast – this scenario is highly speculative and should not be given substantive weight in this option selection process.

Availability

3.18. We would have expected that any reduction in availability over time would have been accounted for in the Reliability Availability Maintainability (RAM). We recognise that any standby unit will need to be operated in a way that ensures that it is available when required and that this will use up a proportion of restricted run hours. However, the standby unit at King's Lynn Compressor Station has very low predicted run hours under all

[1] Find gas data | National Gas Transmission Data Portal

Future Energy Scenarios. We are therefore content that this is not a significant concern in the case of King's Lynn Compressor Station.

3.19. We recognise that unforeseen asset health issues may be identified at the Front End Engineering Design phase. However, we have no reason to assume that these would be any greater for a machine currently operating for upwards of 1,000hrs/y than those associated with installing a new compressor unit. Nor would they be of sufficient magnitude to alter the outcome of the Cost Benefit Analysis. Regarding issues relating to long-term operation of an Avon compressor unit, we believe that the Avon market is sufficiently large that suitable support will continue to be available into the future. Should the risks identified crystallise at some point in the future, then there will be sufficient time to take mitigating action.

Question 5.1: Do respondents agree with our proposed Final Preferred Option?

3.20. Both respondents (NGT and BBLC) stated their preference for the Final Preferred Option identified in the Final Option Selection Report with the existing Avon unit being replaced by a new gas turbine driven compressor. This option would guarantee unrestricted operation post 1 January 2030 maintaining the existing level of network capability and security of supply.

Our View

3.38. Having considered the responses received we continue to believe the Final Preferred Option proposed in our consultation document was correct.

Question 5.2: Do respondents agree with our proposals approach to potentially removing restrictions on the operation of the retained Avon (Unit B)?

3.21. One respondent (NGT) agreed with our assessment that Dry Low Emissions technology maybe an effective way to reduce emissions and deliver compliance. It has therefore been included in the option selection process and included in the option selected at other compressor stations. However, retaining a legacy Avon unit at King's Lynn Compressor Station is not the right solution.

Our view

3.22. We recognise that the Emergency Use Derogation will reduce operational flexibility and in exceptional circumstances could result in additional network constraints. We believe that there are potentially viable cost-effective technologies which may become available in the next 5 years that would permit unrestricted operation. These should be pursued by National Gas Transmission for implementation during the next price control.

Other issues raised by respondents

3.23. One respondent (NGT) raised several broader issues as set out below:

3.24. Our apparent over reliance on Future Energy Scenarios when determining the Final Preferred Option. These scenarios are designed to reflect credible pathways towards net zero. This provides a challenge when putting the proper value on assets linked to security of supply, rather than net zero related growth sectors, within the Cost Benefit Analysis framework.

3.25. This underlying uncertainty that exists with respect to the decarbonisation of major sectors of the economy in particular domestic heating and questioned assumptions about how quickly this could be achieved given the slow take of heat pumps.

3.26. The need to make investment designs that maintain the existing resilience of the National Transmission System. Clearly demonstrated by the disruption in global gas markets following the Russian invasion of Ukraine which saw a four fold increase in gas exports from Great Britain during 2022-23. Such uncertainties are not captured in Future Energy Scenarios. It was noted that the invasion of Ukraine has led to a Government focus on 'commodity security' and that the British Energy Security Strategy (April 2022)2 includes a regular gas security assessment expected to be based on a peak demand scenario. Ongoing discussions between Ofgem, National Gas Transmission, Department of

[2] https://assets.publishing.service.gov.uk/media/626112c0e90e07168e3fdba3/british-energy-security-strategy-web-accessible.pdf

Energy Security and Net Zero and the System Operator on the topic of network resilience were also highlighted as potentially impacting the economic assessment of infrastructure investments.

3.27. Standard Condition 16 Pipe-Line System Security Standards of National Gas Transmission's Gas Transporter licence sets the primary design standard for the National Transmission System. The ability to supply a level of firm peak aggregate daily demand is likely to be exceeded (whether on one or more days) only in 1 year out of 20 years, taking account of weather data derived from at least the previous 50 years and other relevant factors. The respondent was of the view that the standard should be extended to include network resilience, that is how often the network is capable of meeting the 1 in 20standard with all necessary assets available.

3.28. Special Condition Transmission Planning Code of National Gas Transmission's Gas Transporter licence requires National Gas Transmission to have in place, implement and comply with such a code that has been approved by the Authority. The latest version of this code was approved in 2021. Section 6.17.6 of this code which relates to standby compression states that:

Compressor failure (non-availability) is more likely to occur than a 1-in-20 demand day. Hence within or prior to a 1-in-20 demand day a compressor may have failed. Therefore, we need compressor standby to comply with our obligation to develop the network to meet the 1-in-20 security standard. Standby is identified to ensure that the required transmission capability is maintained in the event of a credible loss of any single compressor unit.

Our view

3.29. We believe that Future Energy Scenarios provide a robust basis for Cost Benefit Analysis. A robust Cost Benefit Analysis will also include an appropriate Sensitivity Analysis. In our Consultation we stated that:

Although Cost Benefit Analysis and Best Available Technology assessments are key decision making tools, they are not the only considerations that should be given weight, nor should they be used in isolation.

3.30. The Final Option Selection Report included an assessment matrix (Table 5 above). In our Consultation we stated that:

We believe it provides a clear articulation of the various considerations that contribute to the overall decision-making process

3.31. Our Final Preferred Option decision has been reached following due consideration of all the relevant factors including Security of Supply and we do not accept that our decision contained any over reliance on Future Energy Scenarios.

3.32. We note the concerns expressed with respect to the underlying uncertainty that exists with respect to the decarbonisation of major sectors of the economy. We encourage National Gas Transmission to use the established annual Call for Evidence mechanism to present their arguments to assist National Grid Electricity System Operator in preparing Future Energy Scenarios.

3.33. We recognise that the issue of network resilience has gained increased attention since the invasion of Ukraine. We are actively participating in the ongoing discussions with other relevant parties. Until firm conclusions have be reached it is not possible to assess the impact (if any) on the methodologies used in the assessment of network investments.

3.34. We do not accept that the Transportation Planning Code requires that standby compression is available at every individual Compressor Station. The point of an integrated network is that individual assets are mutually supporting which reduces the absolute scale of the network required to deliver a specified level of capacity and resilience. In any case our Final Preferred Option does not reduce the number of Compressor Units at King's Lynn Compressor Station with the retained Avon unit being used primarily for standby in support of the two lead SGT400 units.

4. Conclusion

Our decision

4.1. In reaching our decision we have assessed the evidence presented in the Final Option Selection Report submitted by National Gas Transmission. Our assessment was set out in our Final Preferred Option consultation published on 19 May 2023. We have also taken account of the two consultation responses received in reaching our decision.

4.2. In accordance with Special Condition 3.11.9, we have decided to reject the proposed Final Preferred Option identified by National Gas Transmission in the Final Option Selection Report and approve one of the other options.

4.3. The approved Final Preferred option is the counterfactual 'do nothing' option. Under this option, the existing Avon compressor unit will be retained under the 500-hour Emergency Use Derogation allowed for in the Directive, with significant asset health investment to improve unit availability. To ensure operation mapping alignment across all site compressors, this option will also consider the case for a re-wheel of the existing SGT-400s during the next phase of the project. Also included is the decommissioning of unit A, which was removed form service in 2017.

4.4. Separately, should National Gas Transmission identify a cost effective retrofit that will permit unrestricted operation of the existing Avon compressor unit then we would expect National Gas Transmission to implement that solution and seek funding as part of the next price control.