Consultation

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Consultation on Scottish Hydro Electric Transmission's MSIP Re-opener (Beauly Dynamic Line Rating Project)

Subject	Details
Publication date:	27 June 2022
Response deadline:	25 July 2022
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We[1] are consulting on the needs case and preferred option for Scottish Hydro Electric Transmission's (SHET's) proposal to install a Dynamic Line Rating system on the 275kV north of Beauly circuit from Beauly to Loch Buidhe to Dounreay. We would like views from people with an interest in electricity transmission and distribution networks. We would also welcome responses from other stakeholders and the public.

This document outlines the scope, purpose and questions of the consultation and how you can get involved. Once the consultation is closed, we will consider all responses. We want to be transparent in our consultations. We will publish the non-confidential responses we receive alongside a decision on next steps on our website at Ofgem.gov.uk/consultations. If you want your response – in whole or in part – to be considered confidential, please tell us in your response and explain why. Please clearly mark the parts of your response that you consider to be confidential, and if possible, put the confidential material in separate appendices to your response.

[1] The terms 'we', 'us', 'our' refer to the Gas and Electricity Markets Authority. Ofgem is the office of the Authority.

Contents

Executive Summary

The RIIO-ET2 price control runs from 1 April 2021 until 31 March 2026. It includes a range of Uncertainty Mechanisms (UMs) that will allow us to assess further funding during RIIO-ET2 as the need, cost or timing of works becomes clearer. This ensures that consumers fund projects only when there is clear evidence of benefit and we have clarity on likely costs. These mechanisms also ensure that the RIIO-ET2 price control has flexibility to adapt as the pathways to Net Zero become clearer.

Where possible, we have set automatic UMs, such as the Generation and Demand Connection Volume Drivers, which provide Electricity Transmission Owner (ETOs) with immediate funding when they are required to undertake new customer connection works. In other areas, where the degree of uncertainty is too great to allow for an automatic mechanism, we set "re-openers" which will allow us to robustly assess ETO proposals once information with sufficient accuracy is made available.

The Medium Sized Investment Projects (MSIP) re-opener provides ETOs with an annual opportunity to request additional funding for sub-£100m projects, many of which may be critical for achieving Net Zero targets. It was developed to ensure that ETOs are able to undertake necessary investments in the transmission network, funding for which has not been provided in RIIO baseline allowances.

An ETO can submit a request for additional funding for activities outlined in Special Condition (SpC) 3.14.6 of its Electricity Transmission Licence[2] via the MSIP re-opener during specific "windows" (each regulatory year between 25 January and 31 January) where it considers a project to be atypical in scope and where the forecast costs are expected to be less than £100m. Projects that meet the criteria will be eligible for consideration and scrutiny by Ofgem, who will assess the needs case and the level of efficient costs.

This document summarises the MSIP submission received from SHET for the installation of a Dynamic Line Rating system on the 275kV north of Beauly circuit between Beauly and Dounreay (henceforth referred to as the Beauly DLR project) and sets out our minded-to view

[2] Decision on the proposed modifications to the RIIO-2 Transmission, Gas Distribution and Electricity System Operator licence conditions - 1 April 2022 | Ofgem

to approve the needs case and preferred option to address that needs case. If the project is approved, Ofgem will undertake an assessment of the efficient costs following SHET's submission of detailed costs in January 2023. Final approval of the project is subject to approval of the efficient costs.

We welcome views from stakeholders on our minded-to views on the project outlined in Chapters 3 to 5.

1. Introduction

What are we consulting on?

1.1. We are consulting on the needs case and optioneering for the installation of a Dynamic Line Rating (DLR) system[3] in the north of Beauly, submitted by Scottish Hydro Electric Transmission (SHET) under its Medium Sized Investment Project (MSIP) re-opener submission in January 2022.

1.2. SHET regards this project as having met criterion 3.14.6(i).ii of its Electricity Transmission Special Licence Conditions[4] as a project 'relating to protection projects that are needed following system studies by the System Operator or the licensee showing a need for dynamic line ratings'.

1.3. This project aims to develop and install DLR systems on the 275kV north of Beauly circuit from Beauly to Loch Buidhe and from Loch Buidhe to Dounreay. SHET states that the work being undertaken is to mitigate network constraint ahead of planned reinforcement and to provide technical and operational learnings for future DLR projects.

1.4. SHET provided engineering reports and other documentation in support of its submission in January 2022. Since then, SHET has provided additional information through a combination of meetings with Ofgem and responses to our Supplementary Questions (SQs).

Consultation approach

1.5. SHET provided Ofgem with information to justify its proposed option for addressing the needs case for this project as well as the detailed costs associated with its preferred option.

[3] Dynamic Line Rating systems measure high-voltage transmission line capacity in real time, as opposed to relying on more conservative static measurement, with a view to reducing line congestion and increasing capacity.
[4] Decision on the proposed modifications to the RIIO-2 Transmission, Gas Distribution and Electricity System Operator licence conditions - 1 April 2022 | Ofgem

1.6. This consultation sets out our minded-to position on the following areas of the Beauly DLR project:

- The needs case for the project
- Assessment of options to meet the needs case

Context and related publications

1.7. Information on this project can be found in SHET's Beauly DLR MSIP Submission.[5] This document is intended to be read alongside:

- SHET Special Licence Conditions 3.14 and 9.4[6]
- RIIO-2 Re-opener Guidance and Application Requirements Document[7]
- RIIO-2 Final Determinations: ET Annex paragraphs 4.49 – 4.58[8]
- RIIO-2 Final Determinations: SHET Annex paragraphs 3.72 – 3.75[9]

1.8. SHET submitted two MSIP re-opener applications for DLR projects in the January 2022 submission window. It regards the projects as being related. A consultation on the needs case and optioneering for the installation of a DLR system on the 132kV Skye circuit between Edinbane and Broadford, referred to as the Skye DLR project, has been published alongside this consultation.[10]

Consultation stages

1.9. This consultation will close on 25 July 2022. We intend to published all consultation responses 10 working days after this date. We aim to publish our decision by 18 August 2022.

[5] North of Beauly Dynamic Line Rating (DLR) (ssen-transmission.co.uk)
[6] RIIO-2 Transmission, Gas Distribution and Electricity System Operator Licence Conditions
[7] Re-opener Guidance and Application Requirements Document (ofgem.gov.uk)
[8] RIIO-2 Final Determinations – ET Annex (pg. 79, para. 4.49 – 4.58)
[9] RIIO-2 Final Determinations – SHET Annex (pg. 42, para. 3.72 – 3.75)
[10] Consultation on Scottish Hydro Electric Transmission's MSIP Re-opener (Skye Dynamic Line Rating Project)

How to respond

1.10. We want to hear from anyone interested in this consultation. Please send your response to riioelectricitytransmission@ofgem.gov.uk.

1.11. We've asked for your feedback in relation to each of the questions in Chapters 3 - 5. Please respond to each one as fully as you can.

1.12. We will publish non-confidential responses on our website at www.ofgem.gov.uk/consultations.

Your response, data and confidentiality

1.13. You can ask us to keep your response, or parts of your response, confidential. We'll respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000, the Environmental Information Regulations 2004, statutory directions, court orders, government regulations or where you give us explicit permission to disclose. If you do want us to keep your response confidential, please clearly mark this on your response and explain why.

1.14. If you wish us to keep part of your response confidential, please clearly mark those parts of your response that you *do* wish to be kept confidential and those that you *do not* wish to be kept confidential. Please put the confidential material in a separate appendix to your response. If necessary, we'll get in touch with you to discuss which parts of the information in your response should be kept confidential, and which can be published. We might ask for reasons why.

1.15. If the information you give in your response contains personal data under the General Data Protection Regulation (Regulation (EU) 2016/679) as retained in domestic law following the UK's withdrawal from the European Union ("UK GDPR"), the Gas and Electricity Markets Authority will be the data controller for the purposes of GDPR. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. Please refer to our Privacy Notice on consultations, see Appendix 4.

1.16. If you wish to respond confidentially, we'll keep your response itself confidential, but we will publish the number (but not the names) of confidential responses we receive. We

won't link responses to respondents if we publish a summary of responses, and we will evaluate each response on its own merits without undermining your right to confidentiality.

General feedback

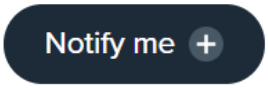
1.17. We believe that consultation is at the heart of good policy development. We welcome any comments about how we've run this consultation. We'd also like to get your answers to these questions:

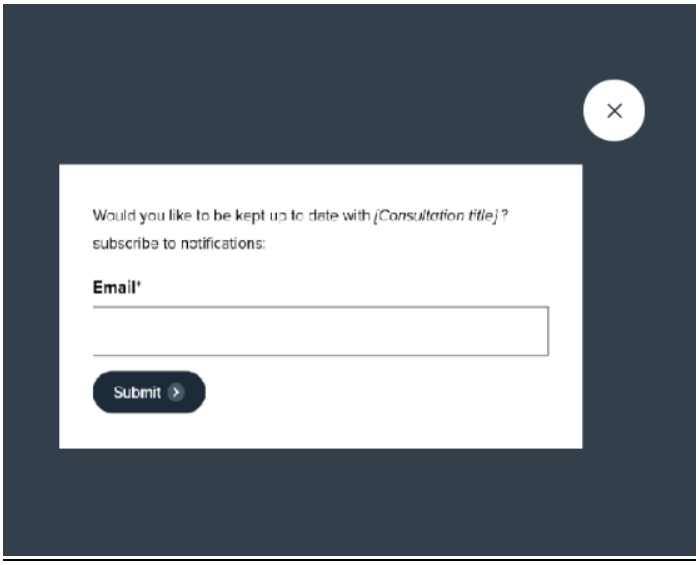
1. Do you have any comments about the overall process of this consultation?
2. Do you have any comments about its tone and content?
3. Was it easy to read and understand? Or could it have been better written?
4. Were its conclusions balanced?
5. Did it make reasoned recommendations for improvement?
6.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

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

How to track the progress of the consultation

You can track the progress of a consultation from upcoming to decision status using the 'notify me' function on a consultation page when published on our website. Ofgem.gov.uk/consultations.





Once subscribed to the notifications for a particular consultation, you will receive an email to notify you when it has changed status. Our consultation stages are:

Upcoming	▶ Open	▶ Closed (awaiting decision)	▶ Closed (with decision)

2. Assessment against Re-opener Requirements

Section summary

In this chapter, we set out our assessment of SHET's application against both the general re-opener application requirements and the specific requirements for MSIP re-opener applications.

Table 1: Re-opener application requirements

Document	Requirement	Has the requirement been met?
SpC 3.14	To relate to one of the activities defined in SpC 3.14.6	Yes
	To include a statement setting out which MSIP the application relates to (SpC 3.14.8(a)).	Yes
	To give details of the associated amendments to the outputs, delivery dates or allowances and an explanation of the basis of the calculation for any amendments requested to allowances (SpC 3.14.8(b)).	Yes
	To provide such detailed supporting evidence as is reasonable in the circumstances to justify the technical need including cost benefit analysis, impact assessments, risk mitigation, and engineering justification (SpC 3.14.8(c)).	Yes
	To provide an application with expected costs exceeding the Materiality Threshold but less than £100m. Costs must be limited to those incurred on or after April 2021. (SpC 3.14.9).	Yes

SpC 9.4	To prepare applications for re-openers in accordance with the Re-opener Guidance and Application Requirements Document.	Yes
RIIO-2 Re-opener Guidance and Application Requirements Document	Assurance requirements: - To provide applications that are accurate, unambiguous, complete and concise - To provide written confirmation from a suitable senior person of the same - To provide a point of contact for each application. (Paragraph 2.1 – 2.3)	Yes
	To publish applications within 5 working days of submitting it to Ofgem with only necessary redactions; unless this would pose a risk to national security. (Paragraph 2.4 – 2.6)	Yes
	To provide clear answers on: - Why an adjustment is justified - What that adjustment should be (Paragraph 3.1)	Yes
	To contain: - Alignment with overall business strategy and commitments - Demonstration of needs case/problem statement - Consideration of options and methodology for selection of the preferred option - The preferred option - Project delivery and monitoring plan (Paragraph 3.9 – 3.15)	Yes
	To contain an explanation of how stakeholder engagement contributed to the identification and design of the preferred option (Paragraph 3.16 – 3.18)	Yes
	To follow a style and structure that clearly and concisely sets out the evidence that licensees wish to present in support of their request (Paragraph 4)	Yes

2.1. SHET initially requested that costs associated with the installation of 7 DLR systems across its network be included in its baseline RIIO-2 funding. This request was rejected in our RIIO-2 Final Determinations due to uncertainty over the costs of SHET's proposal and its dependency on the Transmission Communication Upgrade works.[11]

2.2. Ofgem decided that an uncertainty mechanism would be more appropriate and that SHET could apply for funding once sufficient progress on the Transmission Communications upgrade had been made and the cost and benefits can be clearly demonstrated.

2.3. Ofgem considers that the January 2022 submission from SHET has met all of the requirements set out in both the applicable Special Licence conditions and the detailed re-opener application criteria set out in the RIIO-2 Re-opener Guidance as listed in Table 1 above.

2.4. In the following chapters, we set out our assessment in more detail and our minded-to position based on the evidence submitted by SHET.

[11] RIIO-2 Final Determinations – SHET Annex (pg. 41, para. 3.72 – 3.75)

3. Needs case for the proposed project

Section summary

This chapter summarises the needs case for the Beauly DLR project and sets out our minded-to view thereon.

Question 1: Do you agree with our view on the validity of the needs case for the Beauly DLR MSIP project?

Project background

3.1. A significant quantity of renewable generation is contracted to connect in the Caithness region of SHET's network, north of the Beauly substation. This falls within the B0 boundary. This boundary separates the upper north area of SHET's licence area from the rest of the GB system and is comprised of the north of the Highlands, Caithness, Sutherland, and Orkney. See 'Appendix 2 – Transmission network north of Beauly' for further details.

3.2. A total of 1111MW of generation capacity is currently connected in the Caithness area. An additional 2714MW of renewable generation is scheduled to be connected. It is intended that 222MW of this 2714MW will be tidal generation located in the Pentland firth. The remainder (2492MW) is intended to be onshore wind located in Caithness (1716MW), Shetland (685MW) and Orkney (91MW). The complete list of scheduled generation can be found in 'Appendix 3 – Contracted Generation North of Beauly'.

3.3. Current capacity is insufficient to facilitate these new connections without leading to additional constraints. SHET therefore considers that a significant proportion of the generation schemes are contingent upon circuit reinforcement.

3.4. SHET submitted proposals to the Electricity Systems Operator[12] (ESO) to reinforce the existing transmission network by replacing existing 132kV overhead line between Beauly and Loch Buidhe with a higher capacity 275kV double circuit supported on steel lattice towers over a route length of approximately 65km.

3.5. The proposed Beauly to Loch Buidhe 275kV Overhead Line (OHL) Reinforcement (referred to henceforth as the Beauly Reinforcement project) was submitted to the ESO through the annual Network Options Assessment[13] (NOA) process under the reference BLN2. It received a 'Proceed' recommendation[14] from the ESO as part of the 2020/21 NOA,[15] who concluded that the proposed reinforcement should be progressed to maintain an earliest in-service date of 2030.

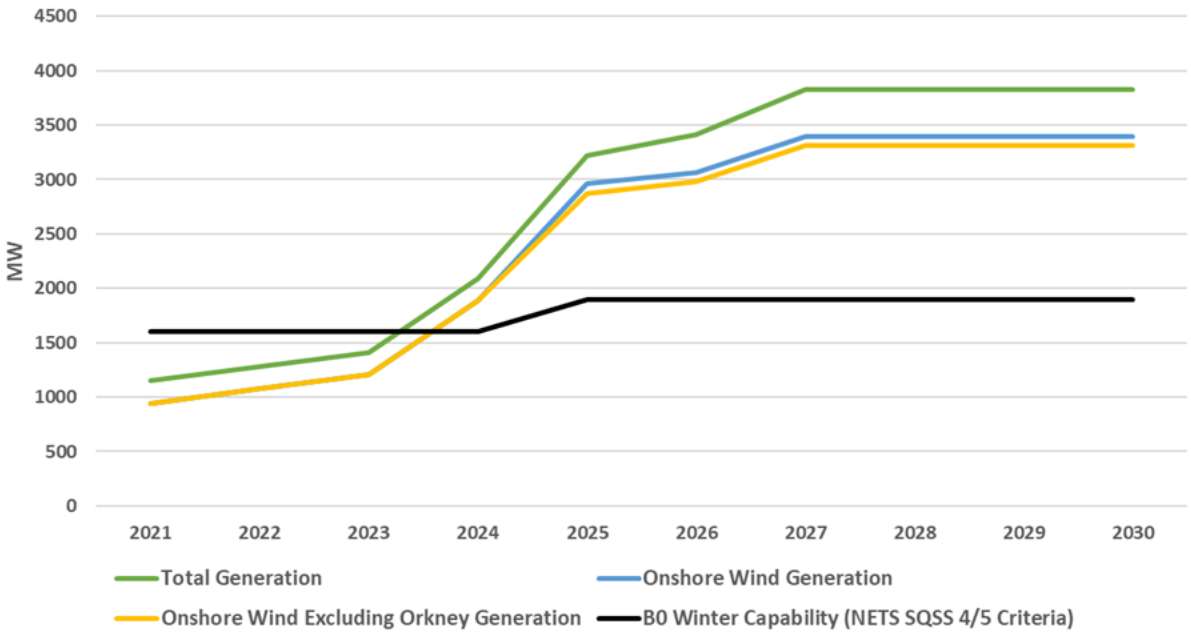
North of Beauly generation and B0 capacity

3.6. SHET states that the current winter capability of the B0 boundary as determined in the January 2021 NOA under Section 4 and 5 of the System Quality and Security of Supply Standard[16] (SQSS) is approximately 1.6GW, rising to approximately 1.9GW following connection of the Shetland HVDC link in 2024. SHET identifies the network limitation as the Beauly to Loch Buidhe 275kV double circuit OHL, following the fault outage of the Caithness-Moray High-Voltage Direct Current (CM HVDC) link, as this becomes the main corridor to transfer power south through Beauly following loss of the link.

3.7. Figure 1 below, provided by SHET as part of its MSIP submission, details both the current and contracted generation due to connect north of Beauly as compared to the capability of the B0 boundary according to year-round operational criteria.

[12] The Electricity System Operator (ESO) is the party with the responsibility for the second-to-second balancing of electricity supply and demand. It also has responsibilities relating to developing markets and advising on network investments.
[13] Each year the System Operator develops the Networks Options Assessment (NOA), which seeks to identify new transmission projects that may be required in the future. The NOA also identifies whether the funding of previously identified projects is still economic.
[14] NOA Investment Recommendations | National Grid ESO A 'Proceed' investment recommendation is defined as follows: "An option is critical to our future planning. Investment should be made in the next financial year to ensure the option's earliest in-service date remains on course."
[15] Network Options Assessment January 2021 | National Grid ESO
[16] Transmission licensees are required by their licences to comply with the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS), which sets out criteria and methodologies for planning and operating the GB Transmission System.

Figure 1: North of Beauly generation compared to B0 boundary capability



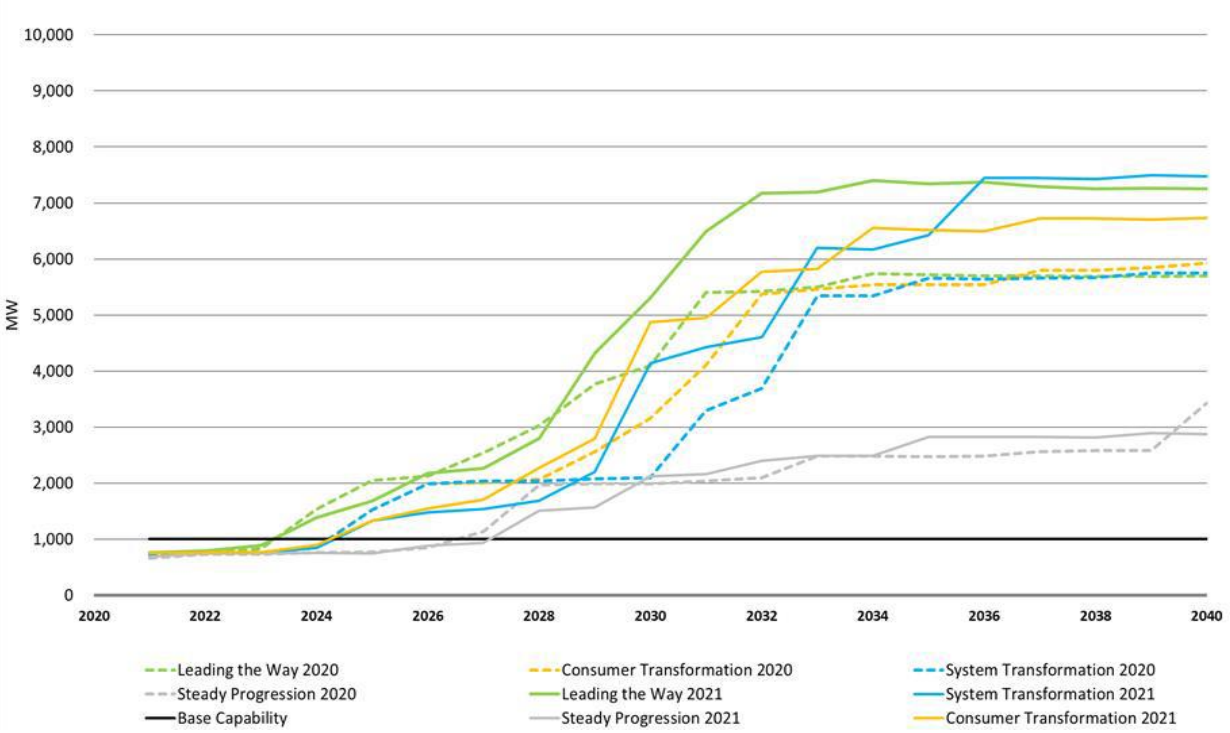
3.8. On the basis of this data, SHET predicts that total generation is predicted to exceed B0 capability in 2024. This would lead to increased annual network constraint costs. SHET consider that intervention is necessary to mitigate constraints before the earliest in-service date of the the proposed Beauly Reinforcement project (2030).

Future Energy Scenarios

3.9. SHET states that under the criteria relating to winter peak demand, found in Section 4 of the SQSS, the current capability of the B0 boundary is approximately 1GW. This is lower than the capability calculated under the year-round operational criteria, due to the requirement to secure the system under Section 4 winter peak demand criteria against the fault outage of a double circuit OHL. Under year-round operational criteria, the system only needs to be secured against the fault outage of a single circuit.

3.10. SHET also supplied Figure 2 below, which details the winter peak required transfers across the B0 boundary for the GB Future Energy Scenarios[17] (FES) for 2020 and 2021 in accordance with Section 4 of the SQSS (Economy Background).[18]

Figure 2: Required Transfer (MW) according to FES across the B0 boundary



3.11. Similar to Figure 1, which shows that total generation exceeds B0 capability around 2024, Figure 2 indicates that the required transfers exceed B0 capability around 2024 in all GB FES for 2020 and 2021, with the exception of the Steady Progression scenario.

3.12. The three FES scenarios which achieve the target for net zero by 2050 are the Leading the Way, Consumer Transformation and System Transformation scenarios. By 2030, the proposed delivery date of the Beauly Reinforcement project, the required transfers for these

[17] Future Energy Scenarios (FES): National Grid publishes a range of plausible and credible pathways for the future of energy, from today out to 2050.
[18] GB Security and Quality of Supply Standard (nationalgrideso.com)

three scenarios increase to between 2.1GW and 4.2GW in FES 2020 and between 4.1GW and 5.3GW in FES 2021.

Summary of needs case

3.13. SHET states that Figure 1 and Figure 2 evidence the high likelihood of network constraints within the B0 boundary from 2024, ahead of the proposed Beauly Reinforcement project in 2030. It also states that this constraint will require minimum build solutions to help the ESO manage the system north of Beauly and mitigate said constraints in the event of a fault or other event on the network.

3.14. We have summarised the needs case for the approval of the Beauly DLR project below:

- The need to enhance existing circuit capability for the B0 area north of Beauly in advance of long-term reinforcement to facilitate new generation connections and avoid constraint costs.

Our minded-to view of the needs case

3.15. We consider that SHET has demonstrated the needs case for the North of Beauly DLR project.

3.16. We view that there is a need to mitigate constraints in the Caithness area in advance of long-term reinforcement. Following assessment of the level of generation that is scheduled to connect relative to the current circuit capability, we consider that there is clear indication that there will be significant constraint within the B0 boundary before the earliest in-service date of the Beauly Reinforcement project in 2030.

3.17. We also recognise the potential benefits for consumers that DLR systems have in mitigating constraint costs across the GB system. SHET has stated that it intends to introduce DLR to the rest of the network as business as usual. Given that this technology is innovative in its application on SHET's network, we consider that there is additional benefit in gaining further deployment experience with DLR technology through the Beauly DLR project. Lessons learned and efficiencies identified through the Beauly DLR project can be applied to future DLR projects.

4. Assessment of options

Section summary

This section outlines the technical justification for the Beauly DLR Project, along with a consideration of the alternative solutions reviewed by SHET. It also includes our minded-to position regarding these options.

Question 2: Do you agree with our technical assessment of the range of solutions to meet the needs case?

Question 3: Do you agree with our minded-to view on the solution proposed by SHET?

SHET's high-level assessment of options

4.1. To address the needs case drivers discussed in the previous chapter, SHET considered the following options:

- Do nothing
- Re-profile[19] Beauly to Loch Buidhe
- Re-profile Loch Buidhe to Dounreay
- Apply DLR on Beauly to Loch Buidhe to Dounreay
- Combine application of DLR and re-profiling

4.2. We undertook a technical review of the solutions considered by SHET based on the information it provided to us in its pre-submission engagement presentation materials,

[19] Conductors sag when they are required to transfer greater amounts of power due to the increase in operating temperature. Re-profiling describes work where the clearance height between conductor and ground is adjusted to ensure that safe clearance can be maintained. This can involve the changing of tower fittings, removal of vegetation or alterations to the tension of the conductor.

January 2022 MSIP submission and its responses to our SQs. Each option is discussed in further detail below.

Do nothing

4.3. SHET considered a 'do nothing' option as part of its optioneering. This would involve no solutions being implemented to mitigate constraint in advance of the proposed Beauly Reinforcement project. The conductor on the existing 275kV Beauly circuit would continue to operate at 70ºC and the seasonal OHL post-fault rating would remain at 599MVA, 665MVA and 702MVA for summer, spring/autumn and winter respectively.

4.4. SHET rejected this option as it would not mitigate constraint and therefore fails to address the needs case. However, it was used as the counterfactual option in the Cost Benefit Analysis (CBA) that was undertaken as part of the optioneering.

Re-profiling Beauly to Loch Buidhe

4.5. SHET considered whether it would be appropriate to re-profile the OHL between Beauly and Loch Buidhe. This would involve works to remove ground to conductor clearance infringements which would result from the additional sag caused by an increased operating temperature along the OHL. SHET estimate that this would result in a seasonal OHL post-fault rating of 714MVA, 777MVA and 814MVA for summer, spring/autumn and winter respectively.

4.6. SHET assessed this option as being technically viable and took it forward for detailed analysis. They conducted a light imaging, detection, and ranging (LIDAR) survey of the OHL from Loch Buidhe to Dounreay which was used to model the Beauly to Loch Buidhe section of the OHL, on a pro rata basis, for operation at 90°C and to identify clearance infringements.

4.7. SHET noted that it looks to fund any re-profiling solution through the Generation Connections RIIO-2 volume driver mechanism (SpC 3.11) as the rating increase would be static rather than dynamic. This would therefore disqualify it for consideration under SpC 3.14.6(i).ii, which is only applicable to dynamic ratings.

Re-profiling Loch Buidhe to Dounreay

4.8. SHET considered whether it would be appropriate to re-profile the OHL between Loch Buidhe and Dounreay. The work involved in this solution would be the same as the work

outlined in the option to re-profile the OHL between Beauly and Loch Buidhe discussed in paragraph 4.5.

4.9. SHET rejected this option. After conducting power system analysis to assess the impact of this option, the network limitation remained the Beauly to Loch Buidhe 275kV double circuit OHL. SHET considered that there would therefore be no B0 boundary benefit in the near term and therefore did not take it further for detailed assessment.

Application of DLR on Beauly to Dounreay

4.10. SHET considered the application of DLR from Beauly to Loch Buidhe to Dounreay. Adoption of DLR on this section of circuit would mean that SHET would have the ability to use sensors that measure conductor temperature and sag and would allow it to measure the resultant clearances in real time, enabling the conservative static rating to be exceeded if the conditions are suitable. Further details can be found in section 3.1.1 of SHET's Beauly DLR MSIP application.[20]

4.11. This option would involve the installation of two fleets of sensors: one set of weather sensors to provide instantaneous weather conditions and one set of line or tower mounted sensors to measure conductor sag and temperature. Data from these two sources would be fed into an Active Network Management (ANM) system, which would in turn provide an updated OHL rating to the ESO and to SHET every 15 minutes.

4.12. Its current assumption is that there would need to be at least one sensor every 7.5km. This would mean that approximately 21 sensors would be needed to cover the approximately 154km of OHL length from Beauly to Dounreay. SHET has not yet conducted a detailed assessment of the surrounding geographical topology and orography to support this assumption.

4.13. SHET assessed this option as being technically viable and took it forward for detailed analysis. SHET estimated that this would result in a seasonal OHL post-fault rating of 714MVA, 777MVA and 814MVA for summer, spring/autumn and winter respectively.

[20] Beauly Dynamic Line Rating (DLR) (ssen-transmission.co.uk) (pg. 15)

4.14. SHET noted in its outlining of this option that the cost difference between installing DLR on the Beauly to Loch Buidhe and installing DLR on the Beauly to Loch Buidhe to Dounreay was relatively small (<£1m). It anticipated that the majority of the DLR costs would be associated with the ANM system and that ANM coverage could be extended with relatively inexpensive additional monitoring points. SHET went on to conduct detailed analysis on the assumption that the two sections of circuit would provide data to the ANM.

Application of DLR and re-profiling Beauly to Loch Buidhe

4.15. SHET considered whether the OHL re-profiling between Beauly to Loch Buidhe and DLR application between Beauly and Dounreay would be appropriate to address the needs case. This would involve the type of work outlined in the DLR option above being carried out in addition to the work associated with the Beauly to Loch Buidhe re-profiling discussed in paragraphs 4.5 to 4.7.

4.16. SHET assessed this option as being technically viable as the constituent elements were both deemed to be technically viable. The option was taken forward for detailed analysis as part of a CBA.

Cost Benefit Analysis

4.17. SHET requested that the ESO investigate proposals for the reinforcement options which it deemed to be suitable for further analysis, namely the implementation of DLR technology on the Beauly to Loch Buidhe to Dounreay sections and the re-profiling of the Beauly to Loch Buidhe section of the 275kV circuit. A 'do nothing' option and a combination of both reinforcement options were also included in the analysis.

4.18. The reinforcement options considered as part of the CBA were as follows:

- Option 1: Do nothing
- Option 2: Application of DLR between Beauly and Dounreay only
- Option 3: Re-profiling between Beauly and Loch Buidhe only
- Option 4: Combination of options 2 and 3 i.e. both DLR and re-profiling

Calculating capability uplifts

4.19. To provide sufficient data for the CBA, SHET conducted studies to determine the seasonal capability uplifts[21] for the B0 boundary that would be provided by each of the options considered as part of the CBA, all of which are minimal build solutions. The results from these studies were presented as part of SHET's MSIP submission and have been included below in Table 2.

Table 2: Seasonal uplifts on the B0 boundary provided by the options

Option	Delivery Date	Uplift (MW)			
		Winter	Spring/Autumn	Summer	Summer Outage
1	N/A	-	-	-	-
2	2024	+210	+130	+70	+70
3	2025	+210	+140	+120	+120
4	2025	+230	+140	+160	+160

4.20. The re-profiling option (i.e. Option 3) would provide a static rating[22] increase of 112MVA, 112MVA and 115MVA per circuit for the winter, spring/autumn and summer seasons respectively, amounting to a total rating increase of 224MVA, 224MVA and 230MVA for the double circuit OHL. SHET stated that due to the network thermal limitation, this does not always translate to an equivalent capability uplift. As an example, SHET referenced the uplift on B0 during spring/autumn and summer, which is given as 140MW and 120MW respectively. It expects this issue to be resolved by the Beauly Reinforcement project.

4.21. For the DLR option (i.e. Option 2), where the calculated rating has the capacity to change every 15 minutes depending on the resolution of the system, SHET carried out statistical analysis on an internal rating calculation model of the Beauly to Loch Buidhe to Dounreay double circuit OHL using Met Office weather data from 2019 and 2020.

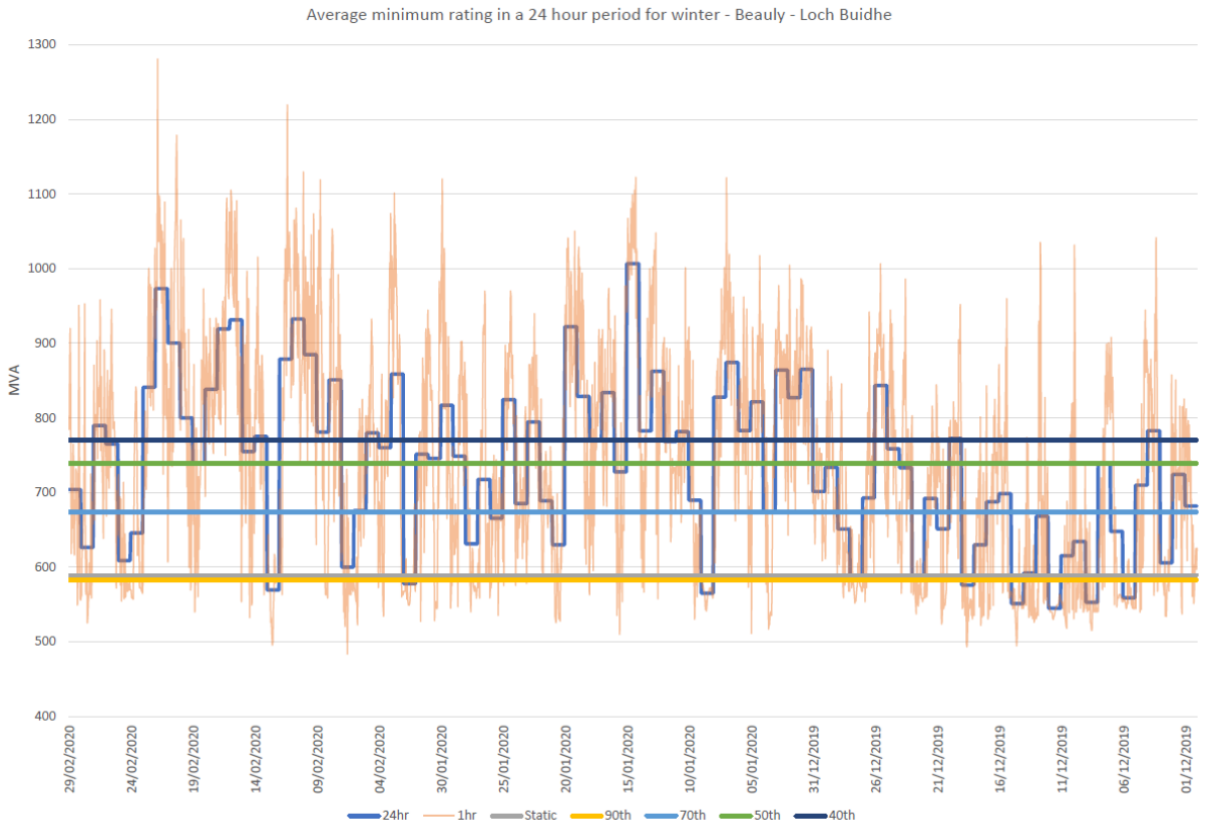
4.22. For each day of winter 2019/2020 and of summer, spring and autumn in 2020, SHET calculated the average minimum rating (across multiple sections of the OHL) for DLR and

[21] Capability uplifts refer to an increase in circuit capability where capability is the the limit on the volume of electricity which can be transmitted safely.
[22] Static ratings refer to the maximum current which can be safely transmitted via an overhead line i.e. a level of transmitted current which will not lead to an infringement of ground clearance standards. This varies based on the operating temperature of the conductor. Ratings change throughout the year due to seasonal differences in ambient conditions.

determined different ratings for different percentiles, before deciding to use the 50th percentile rating as in its view, this is a rating which is neither overly optimistic nor pessimistic on the potential application and benefit of DLR.

4.23. The median seasonal post-fault rating determined for DLR is 853MVA, 742MVA and 667MVA for the winter, spring/autumn and summer seasons respectively. The outcome of SHET's analysis is a rating increase of 151MVA, 77MVA and 68MVA respectively (this totals 302MVA, 154MVA and 136MVA for the double circuit OHL), with DLR therefore providing a higher rating increase in the winter, but a lower rating increase in the spring/autumn and summer seasons. This translated in the boundary capability studies to DLR providing an equivalent capability uplift to the re-profiling option in winter, but a lower capability uplift in the other seasons. An example of this analysis has been included below in Figure 3.

Figure 3: Statistical analysis undertaken to determine seasonal DLR rating for CBA



4.24. For the combination of DLR and re-profiling option (i.e. Option 4), SHET applied the rating increase calculated through the statistical analysis exemplified in Figure 3 in addition to

the rating increase provided by the re-profiling option. This resulted in a seasonal rating of 965MVA, 854MVA and 782MVA for winter, spring/autumn and summer respectively.

CBA summary

4.25. The CBA aimed to calculate the regrets associated with each of the minimum build solutions. The counterfactual for the CBA was 'do nothing', i.e. to not install the DLR system or do the re-profiling and so to not incur their capital outlays.

4.26. SHET requested that the following scenarios be considered as part of the CBA. The full list of scheduled connections can be found in 'Appendix 3 – Contracted Generation North of Beauly'.

- Scenario 1: Connection of all contracted generation
- Scenario 2: Connection of contracted generation excluding Orkney onshore wind (90.8MW) and marine generation (222MW). Referred to as scenario 4 in the CBA.

4.27. The CBA study considered the 'do nothing' counterfactual with no changes from FES 2020, each of the minimum build solutions, and the contracted scenarios proposed by SHET. In all instances, the combined reinforcements of DLR and re-profiling had the least worst regret. The results of the CBA have been included below in Table 3, which shows the regrets for the two individual reinforcements (application of DLR between Beauly and Dounreay, re-profiling between Beauly and Loch Buidhe) and their combination.

Table 3: Regrets (£m) for the FES 2020 base case and the two contracted scenarios studied for the reinforcement options (price base 2018/19)

Option	FES 2020				SSENT contracted scenario 1				SSENT contracted scenario 4				Worst regret
	LW	CT	ST	SP	LW	CT	ST	SP	LW	CT	ST	SP	
Base case (no build) (£m)	230	71	70	21	447	234	236	84	323	141	142	45	447
DLR (£m)	158	35	34	8	351	168	170	56	240	89	89	25	351
Re-profiling (£m)	154	33	32	7	345	164	165	55	235	86	86	24	345
DLR + re-profiling (£m)	147	27	26	4	335	156	158	50	227	80	80	20	335

4.28. As a result of the CBA, the ESO recommended that SHET proceed with both the DLR and re-profiling options. This recommendation was based on the combined schemes having the least-worst regret in all scenarios in each distinct generation background.

Ofgem's view of the potential options

4.29. Having considered the range of solutions presented by SHET, we are satisfied that SHET considered an appropriate range of options to address the needs case.

4.30. We do not consider the 'do nothing' option is viable. Given the projected increase in constraint within the B0 boundary, in our view, minimum build solutions must be implemented to ensure that constraint costs are minimised and that there is no delay to the connection of further renewable generation in the north of Scotland.

4.31. We view the option of re-profiling the Beauly to Loch Buidhe section of the circuit as being technically viable. By increasing the static rating increase of the OHL, constraint on the circuit would be mitigated.

4.32. We view the option of re-profiling the Loch Buidhe to Dounreay section of the circuit as being ineffective in addressing the needs case. As there would be no no B0 boundary benefit conferred in the near term, we consider that it was appropriate for SHET to omit this option from its detailed CBA.

4.33. We consider the DLR-only solution to be technically viable. It would enable the mitigation of constraint by 2024 which aligns with the estimated point at which the generation connections are projected to exceed existing circuit capability.

4.34. Of the solutions considered by SHET, we are minded to agree that the installation of DLR technology on the Beauly to Loch Buidhe to Dounreay in combination with static line rating increase for the Beauly to Loch Buidhe section of the circuit is the optimal solution as it enables SHET to maximally mitigate constraints with the least-worst regret. We explain our rationale for this view in the next section.

Our minded-to view of SHET's preferred option

4.35. Our review concluded that both the DLR and re-profiling solutions are technically feasible. However, our minded-to view is that SHET's proposal to combine both re-profiling and installation of DLR represents the optimal solution. It offers the greatest mitigation of constraint of all the proposed solutions at the least-worst regret.

4.36. Additionally, this solution provides the opportunity for SHET to gain experience of how DLR operates on its network. This technology has not been implemented on SHET's network before now and could reduce constraint costs for consumers if applied on other areas of its network.

4.37. As stated in paragraph 4.7, re-profiling cannot be funded as part of this application as applications under SpC 3.14.6(i).ii relate only to dynamic ratings. This consultation therefore only presents our minded-to position in relation to the DLR element of SHET's proposal. SHET look to fund the re-profiling work through the Generation Connections RIIO-2 volume driver mechanism (SpC 3.11).

5. Cost assessment of the proposed project

Section summary

This section outlines our proposed approach to the assessment of the submitted costs associated with the Beauly DLR project and our rationale for this approach.

5.1. At the time that the Beauly DLR project was submitted in the January 2022 MSIP submission window, SHET was seeking approval of the efficient costs in addition to approval of the needs case and optioneering.

5.2. Following an initial review of the submitted costs, we consider that it would be more appropriate to adopt a two-stage approach instead, i.e. a decision on the needs case and optioneering followed by a decision on the costs of the project after more detailed costs are submitted in the January 2023 MSIP submission window in the event that the needs case and optineering is approved. We have set out the rationale for this view below.

Initial cost submission

5.3. SHET submitted estimated costs for the Beauly DLR project as part of its January 2022 MSIP submission. SHET stated that this estimate has been developed in line with its costing methodology and in accordance with its Large Capital Project (LCP) Governance process. The project components have been included below in Table 4.

5.4. As we are not consulting on the efficient costs of the project at this stage, specific costs of the project components have not been included in Table 4. Indicative costs are subject to change following the submission of detailed costs in the January 2023 MSIP submission window in the event that the project progresses to the second stage of the approval process.

Table 4: SHET's project components and estimated costs for the Beauly DLR project

Project Components	Estimated Costs (£m)
DLR Equipment	[redacted]
DLR System Design	
DLR Installation	
DLR Commissioning	
ANM System	
Risk & Pre-construction	
Opex Escalator Allowance	

5.5. In its MSIP submission, SHET stated that the estimates provided were calculated by an internal Flexible Solutions Team (FST) and were based on 'high-level assessment, local knowledge and experience, the scope and site-specific information available, and the assumptions listed [in section 6.2]'.[23]

5.6. Following an initial review of the submitted materials, we did not consider that the process used to derive the estimated cost of the project was laid out clearly within the MSIP submission. Sources used by the FST to support the estimates were not included within the submission.

Revised project costs

5.7. A total of 16 SQs relating to project costs were sent to SHET. These SQs largely sought clarity on the process that the FST used in arriving at their estimates and a requested any supporting sources for these estimates.

5.8. Given the volume of SQs, SHET was given the opportunity to resubmit costs in their entirety which took into account the queries raised by the SQs and included appropriate details of the sources used to derive the estimated costs of the project. SHET engaged with a

[23] North of Beauly DLR MSIP Submission | SSEN Transmission

number of suppliers to obtain more robust and well-evidenced estimates for the project components listed above in Table 4.

5.9. Following SHET's engagement with the suppliers, a revised set of cost estimates were obtained. However, SHET noted in a subsequent bilateral with us that the estimates were more varied than initially expected.

Revised cost assessment approach

5.10. We consider that it would be in the interests of consumers to assess the costs of the Beauly DLR project as part of a further detailed cost submission in the January 2023 MSIP submission window.

5.11. In our view, the variation in estimates obtained by SHET from the third-pary suppliers has the potential to leave consumers exposed to potential gains and losses. Taking an average DLR unit cost which has been calculated using highly varied estimates to drive an allowance could lead to outperformance or overspend for SHET. It would therefore be preferable to assess costs once greater cost certainty can be achieved.

5.12. SHET noted that a two-stage approval process will enable it to undertake a trial of DLR technology. This trial could inform subsequent cost estimates and ensure that they are more robust. Details of any proposed trials have not been supplied by SHET at this stage.

6. Consultation proposal summary

6.1. We are proposing to accept the needs case for the Beauly DLR project and the preferred option presented by SHET to address this needs case.

6.2. Table 5 below details the project components of the Beauly DLR project as identified by SHET. Specifics of the work packages have been redacted for commercial sensitivity. For the reasons outlined in Chapter 5, indicative costs are subject to change following the submission of detailed costs in the January 2023 MSIP submission window in the event that the project progresses to the second stage of the approval process and therefore have not been included at this stage.

6.3. Allowances and adjustments to the funding requested by SHET will be proposed following the assessment of the efficient costs of the project. This assessment will be undertaken following the submission of detailed costs in the January 2023 MSIP submission window in the event that the needs case and optioneering are approved. Final approval of the project is subject to approval of the efficient costs.

Table 5: Requested allowances for SHET's Beauly DLR project

Project Components	SHET Request (£m)	Ofgem Proposed Adjustments (£m)	Ofgem Proposed Allowances (£m)
DLR Equipment	[redacted]	N/A	N/A
DLR System Design		N/A	N/A
DLR Installation		N/A	N/A
DLR Commissioning		N/A	N/A
ANM System		N/A	N/A
Risk & Pre-construction		N/A	N/A
Opex Escalator Allowance		N/A	N/A

7. Next steps

7.1. We welcome your responses to this consultation, both generally, and in particular on the specific questions in Chapters 3, 4 and 5. Please send your response to riioelectricitytransmission@ofgem.gov.uk. The deadline for response is 25 July 2022.

7.2. We aim to conclude our assessment of SHET's Beauly DLR project with a decision on the needs case and optioneering in August 2022. If our initial view does not change through the consultation and re-opener assessment processes, our decision will confirm our provisional view that the needs case and preferred option in addressing this have been approved.

7.3. If our minded-to views are confirmed, we will progress to the second stage of the review process with an assessment of the efficient costs of the project. This will be undertaken after a secondary cost submission provided by SHET in the January 2023 MSIP submission window.

7.4. In the event that we view SHET should be funded for this project, it will be categorised as an evaluative Price Control Deliverable (PCD), in line with the conditions set out in SpC 3.14. We would then expect to initiate a statutory consultation to make the relevant changes to Appendix 1 of SpC 3.14 (the Medium Sized Investment Project Price Control Deliverable) in order to set explicit deliverables, timescale(s) for delivery and the profile of the project allowances for the PCD.

Appendix 1 – Consultation questions

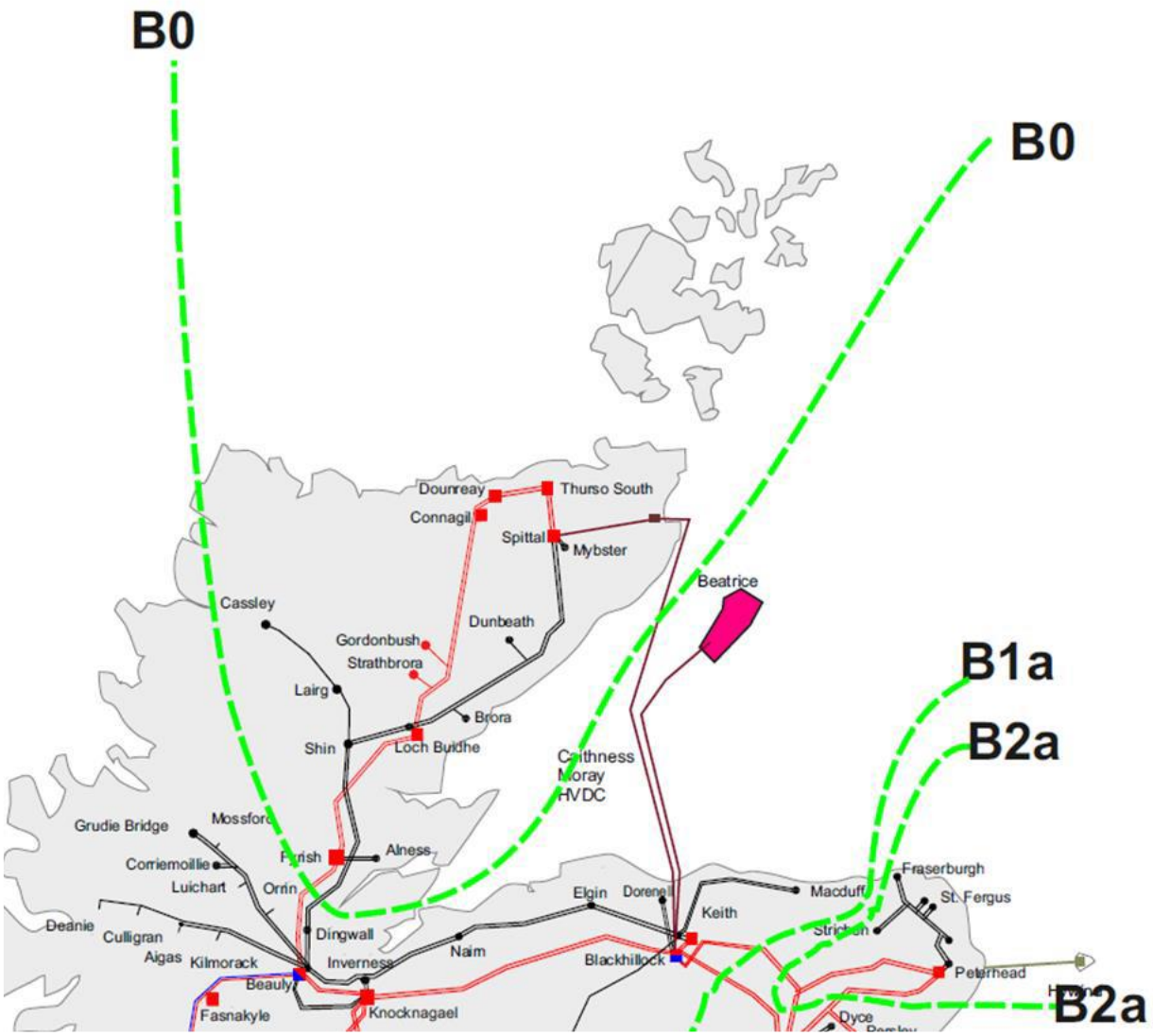
Question Number	Question
1	Do you agree with our view on the validity of the needs case for the Beauly DLR MSIP project?
2	Do you agree with our technical assessment of the range of solutions to meet the needs case?
3	Do you agree with our minded-to view of the solution proposed by SHET?

Appendix 2 – Transmission network north of Beauly

A diagram of the current transmission network north of Beauly. The 275kV infrastructure is shown in red, the 132kV infrastructure is shown in black and the HVDC link is shown in brown.

The B0 boundary cuts across the following circuits:

- Beauly to Fyrish to Loch Buidhe 275kV double circuit OHL
- Beauly to Shin 132kV double circuit OHL
- Caithness – Moray (CM) HVDC multi-terminal link (specifically the Spittal – Blackhillock link via Noss Head switching station)



Appendix 3 – Contracted Generation North of Beauly

Table 6: Contracted generation scheduled to connect to the north of Beauly substation

Generator Scheme	TEC (MW)	Generator Type	Connection Date
Gordonbush Extension	38	Onshore Wind	01/04/2021
Creag Riabhach	79.2	Onshore Wind	05/07/2022
Golticlay Wind	50.1	Onshore Wind	31/10/2022
Kilbraur South	27.2	Onshore Wind	15/04/2023
Strath Tirry Wind Farm	34.8	Onshore Wind	19/04/2023
Braelangwell Wind	68	Onshore Wind	31/12/2023
Limekilns Ph1	84	Onshore Wind	30/04/2024
Limekilns Ph2	22	Onshore Wind	30/04/2024
Viking	443	Onshore Wind (Shetland)	01/07/2024
Beinn Tharsuinn Extension Ph1	44.8	Onshore Wind	01/10/2024
Cairnmore Hill	36	Onshore Wind	31/10/2024
Camster 2 Wind	38	Onshore Wind	31/10/2024
Durran Mains	9.2	Onshore Wind	31/10/2024
Golticlay Wind Farm Ph2	7.9	Onshore Wind	31/10/2024
Beaw Field	72	Onshore Wind (Shetland)	01/04/2025
Meygen Ph1&2	56	Marine	01/04/2025
Mossy Hill	49.9	Onshore Wind (Shetland)	30/04/2025
Sallachy	50	Onshore Wind	30/04/2025
Glencassley	65	Onshore Wind	30/04/2025
Strathy Wood	54.4	Onshore Wind	01/05/2025
Finstown GSP Ph1, Orkney (220kV cable link)	50	Onshore Wind (Orkney)	30/05/2025
Hesta Head, Orkney (220kV cable link)	20.4	Onshore Wind (Orkney)	30/05/2025
Costa Head, Orkney (220kV cable link)	20.4	Onshore Wind (Orkney)	30/05/2025
Forss BP Wind Generating Station	9.8	Onshore Wind	31/05/2025
Hollandmey	49.5	Onshore Wind	31/05/2025

Generator Scheme	TEC (MW)	Generator Type	Connection Date
Strathy South Ph3	50	Onshore Wind	31/08/2025
Toftinghall Windfarm	25.2	Onshore Wind	31/08/2025
Cogle Moss Wind Farm	36	Onshore Wind	31/08/2025
Armadale Wind Farm	99	Onshore Wind	31/08/2025
Tacher Wind Farm	9.99	Onshore Wind	31/08/2025
Ackron Wind Farm	49.9	Onshore Wind	31/08/2025
OWF 100	100	Onshore Wind	31/08/2025
Stemster Wind Farm	55	Onshore Wind	01/09/2025
Lairg II Wind Farm	50	Onshore Wind	31/10/2025
Strathy South Ph1	132.6	Onshore Wind	01/12/2025
Strathy South Ph2	25	Onshore Wind	01/12/2025
Meygen Ph3 (Non-firm)	83	Marine	01/04/2026
Achany Extension	105	Onshore Wind	31/10/2026
Energy Isles	120.3	Onshore Wind (Shetland)	01/04/2027
Kintradwell Wind Farm	71.4	Onshore Wind	30/06/2027
Highview Spittal Cryobattery Ph 2	49.9	Onshore Wind	30/06/2027
Meygen Ph4 (Non-firm)	83	Marine	01/10/2027
Beinn Tharsuinn Extension Ph2	39.2	Onshore Wind	01/10/2027
Slickly Wind Farm	49.9	Onshore Wind	31/10/2027

Appendix 4 – Privacy notice on consultations

Personal data

The following explains your rights and gives you the information you are entitled to under the General Data Protection Regulation (GDPR).

Note that this section only refers to your personal data (your name address and anything that could be used to identify you personally) not the content of your response to the consultation.

1. The identity of the controller and contact details of our Data Protection Officer

The Gas and Electricity Markets Authority is the controller, (for ease of reference, "Ofgem"). The Data Protection Officer can be contacted at dpo@ofgem.gov.uk

2. Why we are collecting your personal data

Your personal data is being collected as an essential part of the consultation process, so that we can contact you regarding your response and for statistical purposes. We may also use it to contact you about related matters.

3. Our legal basis for processing your personal data

As a public authority, the GDPR makes provision for Ofgem to process personal data as necessary for the effective performance of a task carried out in the public interest. i.e. a consultation.

3. With whom we will be sharing your personal data

We do not intend to share your personal data with any third parties.

4. For how long we will keep your personal data, or criteria used to determine the retention period.

Your personal data will be held for six months after the project, including subsequent projects or legal proceedings regarding a decision based on this consultation, is closed.

5. Your rights

The data we are collecting is your personal data, and you have considerable say over what happens to it. You have the right to:

- know how we use your personal data
- access your personal data
- have personal data corrected if it is inaccurate or incomplete
- ask us to delete personal data when we no longer need it
- ask us to restrict how we process your data
- get your data from us and re-use it across other services
- object to certain ways we use your data
- be safeguarded against risks where decisions based on your data are taken entirely automatically
- tell us if we can share your information with 3rd parties
- tell us your preferred frequency, content and format of our communications with you
- to lodge a complaint with the independent Information Commissioner (ICO) if you think we are not handling your data fairly or in accordance with the law. You can contact the ICO at https://ico.org.uk/, or telephone 0303 123 1113.

6. Your personal data will not be sent overseas

7. Your personal data will not be used for any automated decision making.

8. Your personal data will be stored in a secure government IT system.

9. More information For more information on how Ofgem processes your data, click on the link to our "Ofgem privacy promise".