Scottish & Southern Electricity Networks

Dynamic Line Rating

Engineering Justification Paper

1 Executive Summary

SHE-Transmission has received detailed feedback from Ofgem and their consultants at draft determination stage. As an outcome of this feedback, and through the questions asked and responses provided in the SQ process this EJP has been revised. Options have been refined, the scope amended and limited to fewer named circuits. The original EJP scope has been split into two separate papers since the original submission, with the substation related aspects of condition monitoring being presented in the original paper, T2BP-EJP-0012. This paper now deals solely with the Dynamic Line Rating aspect of condition monitoring.

This Engineering Justification paper sets out the need for Dynamic Line Rating (DLR), which we aim to install on seven overhead transmission lines (OHLs) projects. This is in line with SHE Transmission's Innovation and Digital Strategies to deliver innovation into Business as Usual (BaU) to support the transition to a low carbon economy and using data to understand, predict and get the best from our network.

The funding requested through this paper would cover the installation of monitoring technologies as part of our Operational Technology (OT) architecture. This would bring signals back from sensors on the circuits to show the real time rating and potentially allow extra network capacity. The Digital Strategy and IT Investment Plan cover the centralised Information Technology (IT) platform costs.

SHE Transmission has outlined the following deliverables for this approach.

- Installation of OHL DLR sensors.
- Enabling communication between the DLR sensors and SHE Transmission Supervisory Control and Data Acquisition system (SCADA).
- Using OHL real time thermal ratings in operating the SHE Transmission network.

The cost to deliver the work is [redacted]. Installation of DLR would be a first for SHE Transmission and as such we do not have tendered frameworks to use for costing. Instead we have completed a Networks Innovation Allowance (NIA) project (NIA SHET 0004 Dynamic Line Rating CAT 1), which has allowed us to learn what the costs of designing, installing and operating DLR might be. These costs have been provided to us by the SSEN Active Solutions team who have already deployed a number of SHE Transmission's smart/flexible network solutions. Further engineering assumptions have been taken from SPENs LCNF T1 Project SPT1001[1].
This project is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

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[1] https://www.ofgem.gov.uk/publications-andupdates/first-tier-low-carbon-network-fund-project-implementation-real-time-ratings-submitted-scottish-power-spt1001

Name of Scheme/Programme	Dynamic Line Rating
Primary Investment Driver	Security of Supply and Network Resilience
Scheme reference/ mechanism or category	SHNLT2044
Output references/type	NLRT2SH2044
Cost	[redacted]
Delivery Year	Within the RIIO-T2 period
Reporting Table	C2.25
Outputs included in RIIO-T1 Business Plan	No

2 Introduction

This Engineering Justification Paper sets out our plans to install and deploy DLR sensors on seven overhead lines. Once those circuits are complete with DLR installed, then any subsequent load applications, depending on the connection application size, will be able to connect in advance of necessary reinforcements. This will defer the subsequent reinforcements creating value. The information from the sensors will be gathered and transferred to SHE Transmission's SCADA during the RIIO-T2 period (April 2021 to March 2026).

The Engineering Justification Paper is structured as follows:

Section 3: Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the "need".

Section 4: Optioneering

This section presents all the options considered to address the "need" that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for Detailed Analysis in Section 5.

Section 5: Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgements, contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

Section 6: Conclusion

This section provides summary detail of the selected option. It sets out the scope and outputs, costs and timing of investment and where applicable other key supporting information.

Section 7: Price Control Deliverables and Ring Fencing

This section provides a view of whether the proposed project should be ring-fenced or subject to other funding mechanisms.

Section 8: Outputs included in RIIO-T1 Business Plan

This section identifies if some or all the outputs were included in the RIIO-T1 Business Plan and provides explanation and justification as to why such outputs are planned to be undertaken in the RIIO-T2 period.

Changes from our December Submission

We received feedback through the SQ process, the Draft Determinations and the Atkins findings, which can be broken down to the following main challenges.

- Atkins identified that DLR provides clear benefits to overhead line operation.
- However, Ofgem felt that there was no clear unambiguous need for DLR identified.
- No clear benefits of deploying DLR.
- No specific detail on where the DLR systems were to be located.

To address this feedback, we have refined this proposal, amended the scope and limited it to fewer named circuits. This has allowed us to apply CBA to directly identify the benefits that could be achieved.

We also propose to install DLR on the Skye circuit first, as a retrofit, to ensure subsequent installations on the remaining six circuits benefit from lessons learned. By limiting installation to these circuits, we reduce the uncertainty associated with the original submission. If circuits beyond those listed in this paper are identified for DLR application, i.e. circuits in the likely view, then DLR costs will be applied as part of those circuit designs. This will reduce overall uncertainty and risk.

This paper will explain those changes.

The remainder of the elements contained within the original T2BP-EJP-0012 are now contained by themselves, exclusive of DLR, in the resubmitted paper T2BP-EJP-0012.

3 Need

The north of Scotland and its islands have a significant renewable energy resource from onshore and offshore wind, hydro and (potentially) marine and tidal. At the end of 2018, 15% of the UK's installed renewable generation capacity was located in the north of Scotland.

By the end of the RIIO-T2 period, we expect 8.1 GW of generation to be connected to the north of Scotland transmission system[2]. Our modelling of the requirements to meet net zero emissions targets indicates that connected generation will increase to between 13.6 GW and 15.7 GW by the end of RIIO-T2.

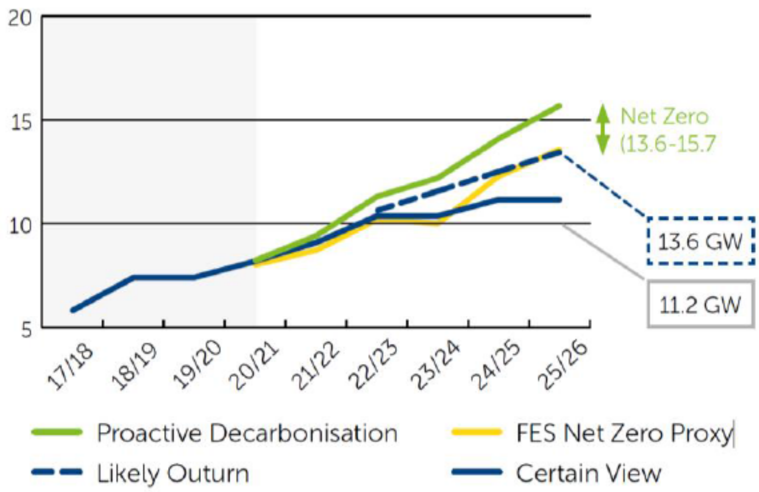


Figure 1 - Net zero emissions pathways for generation connected

In order to connect this increased generation to the grid, overhead line construction, or reinforcement, is usually required. The cost for this construction work is often significant, which SHE Transmission forecasting to [redacted] on overhead line Shared Use Reinforcement in RIIO-T1. Dynamic Line Rating (DLR) can help through increasing the current carrying capacity on an overhead line, either as a retrofit or as part of new circuit builds, and can therefore, allow generators to connect earlier than would otherwise be possible, and defer significant capital expenditure.

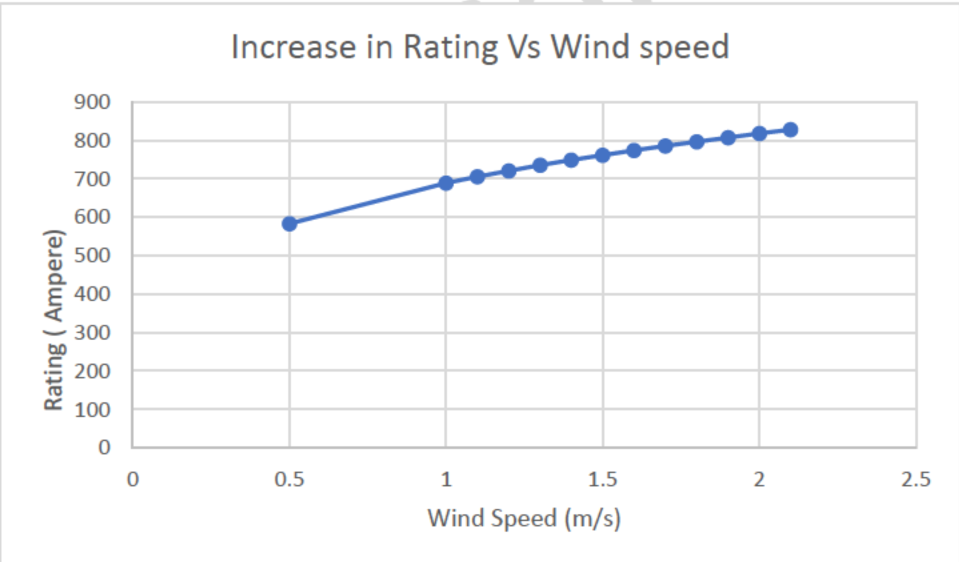
Traditional operational limits of a transmission line are established through "static" transmission line rating methodologies. The common practice for transmission line rating is to select very conservative values for the environmental operating conditions of the line. Static thermal ratings are defined as the maximum current carrying capacity of OHL at a given conductor temperature, which doesn't

[2] Includes non-renewable generation, the total connected renewable generation is expected to be 6.8 GW

infringe the ground clearance standards. Conductors sagging and resultant clearances are dependent on conductor design tension and temperature. While design tension doesn't vary, real time conductor temperature is influenced by many factors, such as line current, ambient temperature, solar emissivity, solar absorption, wind speed and direction. For the static rating the most conservative conditions for these factors are assumed. Since all these parameters vary independently of each other, the conservative values are almost never reached at the same time, and the resulting static line rating is similarly very conservative. Using DLR sensors that measure conductor temperature, sag and clearance will allow us to measure the resultant clearances, in real time. This will allow the static rating to be exceeded if the conditions are right.
DLR is a transmission line's actual real-time or forecast power carrying capacity. It is based on the conductor's operating temperature using real-time line behaviour data and weather conditions. Dynamic Line Rating (DLR) is the natural and logical extension of the seasonal and ambient adjusted ratings trend.

Typical example of Lynx conductor Operating at 132 kV with all other parameters remaining the same indicates the increase in capacity.

- Wind Speed (m/s): 0.5
- Emissivity: 0.5
- Solar absorptivity (α): 0.50
- Max. allowable conductor temp. (Ts) [°C]: 75
- Ambient air temp. (Ta) [°C]: 15



Numerous studies have shown this additional capacity provides opportunities in economic dispatch, trading, operations, and congestion mitigation. Application of DLR is also a powerful tool for improving contingency planning, cost effectively addressing lines with slow load growth, and deferring or eliminating the need for line upgrades or reconductoring.

The main driver for the application of DLR comes from GBs transition to a low carbon economy. With the legislative requirements of Net Zero to be in place by 2045 in Scotland, a vast amount of renewable energy will need to connect in addition to the 8GW forecast to connect to our network by the end of RIIO-T1. This growth is aided in part by subsidy, namely the Contracts for Difference competition. Auction Round 4, to be tendered in 2021, will see onshore wind now being able enter the competition in Pot 1 for the first time since 2015, driving a large increase in potential connected generation. A large proportion of that generation will come from SHE Transmission's area.

To enable this growth, new and innovative solutions are required to operate and respond to the challenge.

3.1 Investment Planning and Deferral of Capital Expenditure

A key driver for capital expenditure on overhead lines is the reinforcement or replacement of existing circuits to increase available capacity on circuits. In RIIO-T1, SHE Transmission has spent [redacted] to deliver 2,090MVA of additional capacity.

Given the conservative nature by which a line's static rating is determined, it is highly likely that reinforcements have been carried out in the past where the deployment of DLR would have provided the capacity required, at minimum as a temporary measure.

Incremental OHL capacity made available using DLR will allow us to use our network more fully, deferring some of the investments necessary to accommodate increased load. This will improve in increase asset life, particularly for OHLs that are still in a good condition but require rebuild or upgrade because of their thermal capacity limitation.

When the DLR capacity is fully utilised then subsequent network reinforcement will be further justified, as the existing static capacity would have been exceeded.

3.2 Connection of Renewable Generation

Generators of renewable generation often have to wait several years to become connected to the grid as the existing circuits to not have the capacity for them to be connected. This has become a more frequent issue over RIIO-T1 and will continue in RIIO-T2 due to the increasing volume of connected generation (See Figure 1).

The deployment of DLR technology would allow these generators to connected earlier than would otherwise be possible, either as a temporary measure whilst reinforcement is carried out, or as a permanent solution.

This can be demonstrated by the analysis of previous reinforcement projects. If DLR had been deployed on Foyers-Knocknagael and Fort William-Fort Augustus, for example, 46.1MVA and

39.8MVA respectively of renewable generation could have been connected early[3]. Along with the early connection, the need for reinforcement may also have been delayed, thereby deferring capital expenditure.

	Original Capacity (MVA)	
Foyers - Knocknagael	195	
Contracted Schemes	Export Capacity (MVA)	Within 124%?
Corriegarth	69	No
[redacted]	94	No
[redacted]	39.1	Yes
[redacted]	39.1	No
[redacted]	5.0	Yes
[redacted]	2	Yes
CONNECTIONS DELIVERABLE THROUGH DLR	**46.1**	

Table 1 - Potential Renewable Generation connected early through DLR - Foyers-Knocknagael

	Original Capacity (MVA)	
Fort William - Fort Augustus (FFE/FFW)	195	
Contracted Schemes	Export Capacity (MVA)	Within 124%?
[redacted]	18.1	Yes
[redacted]	4	Yes
[redacted]	2.8	Yes
[redacted]	1.5	Yes
[redacted]	2.0	Yes
[redacted]	5	Yes
[redacted]	1.6	Yes
[redacted]	52	No
[redacted]	1.047	Yes
[redacted]	1.36	Yes
[redacted]	1.047	Yes
[redacted]	1.36	Yes
CONNECTIONS DELIVERABLE THROUGH DLR	**39.8**	

Table 2 - Potential Renewable Generation connected early through DLR – FFE-FFW

[3] Assuming 24% capacity increase as per SPEN DLR Project

3.3 Operational Compliance

DLR can be used to monitor and confirm compliance with ESQCR ground clearance whilst achieving enhanced ratings. This technology will enhance our capability to monitor weather events, including ice loading, and develop performance history for our existing overhead lines thereby increasing public safety.

Also, situations may exist where the clearance standards could be inadvertently violated. Detection of this through DLR would allow us to more quickly address the issue.

3.4 Sustainability

As DLR will allow asset life to be extended for existing OHLs through increasing network capacity, it further reduces embedded carbon associated with construction of new assets. Assuming lower connections and shorter connection lead times are taken up by renewable connections, DLR could also displace further carbon in the GB energy mix.

3.5 Research & Development

With the increase of renewables, having more granular information of power flows and associated capacity available will be essential. With DLR applied we will be better able to collect that data and analyse how power flows affect the performance of our network. Having accurate real time data related to conductor sags at a particular location will allow us to refine our existing algorithms.

There is the potential to open this data up to wider key stakeholders such as academia, manufacturers, developers and system operators and planners, with the goal to improve existing best practice.

3.6 Potential Future Benefits

On the successful deployment of DLR, other significant benefits to the consumer could be realised through the deployment of DLR to heavily constrained circuits within our network. There are a number of OHLs that, at certain times, cause generation congestion, which National Grid Electricity System Operator (NGESO) manages through their balancing markets. From August '19 till March '20 the ESO constraints costs to manage boundary transfer between our area and SPTs area, across the B4 boundary, totalled £[redacted] This will only increase, until larger reinforcements are completed, costing the end consumer more through balancing actions. Application of DLR will allow balancing actions to be reduced.

[4] https://data.nationalgrideso.com/constraint-management/thermal-constraint-costs/r/thermal_constraint_costs_19-20

There have been numerous examples on previous projects, where we have applied enhanced ratings to circuits to enables outages. However, there is a major factor of safety applied in these calculations. Application of DLR would provide further information which would allow increase capacity to be made available.

Also, limited thermal capacity of some OHLs reduces SHE Transmission's options when it comes to outage planning. Having a way of increasing capacity above static limits could result in connections being less affected by planned or unplanned outages.

3.7 Interdependencies

The works identified in this paper are dependent upon the completion of the work outlined in "Transmission Communications Upgrade" (T2BP-EJP-0006), which will provide a communications network capable of providing a prompt and reliable exchange of information between electrical installations and decision platforms. Whilst some aspects of DLR could be delivered without the comms upgrade, the full benefits cannot be realised without this work taking place.

4 Optioneering

When reviewing our options in this area, we have used a three-tier approach to our development, including a "Do Nothing" option.

- Do nothing
  - The bare minimum required to "keep the lights on" & maintain legal/regulatory compliance. This scenario looks at our usual course of network development to meet network load drivers.
- Responsible Operator
  - A more resilient network for longer term customer benefit through application of DLR. This scenario looks at the option previously submitted in December 2019.
- Progressive Network Enabler
  - An adaptable, sustainable and flexible network providing enhanced value to current and future customers.

The scope of each option, its purpose and how it is progressed are laid out below.

4.1 Do Nothing

We have a license obligation to offer connections to anyone who wishes to connect to our network. If they accept our offer, then we develop those designs and construct them. This approach to "reinforce now" is the basis of the 'do nothing' option. It will provide the counterfactual to the application of DLR and is taken as the baseline option when it comes to the CBA. It will focus on the six OHL projects included within our RIIO-T2 Certain View, plus the Skye reinforcement.

PROGRESSED TO DETAILED ANALYSIS

4.2 Responsible Operator

This option was what we submitted in our RIIO-T2 December submission, a proposal to apply DLR technology to 40 circuits within the SHE Transmission area. This would have involved the deployment of less powerful technology, albeit at a lower per circuit cost. In line with Ofgem Draft Determination feedback and our refined approach to manage risk associated with a larger deployment, as well as clarifying benefits associated with a staged implementation, this option has not been further developed.

PROGRESSED TO DETAILED ANALYSIS

4.3 Progressive Network Enabler

This option looks to take a measured approach to implementing DLR on our network. Retro fitting a system to the existing Skye circuit will allow us to learn a lot about installation and subsequent operation. That learning, if it shows that DLR can provide benefits, can then be applied to the six Certain View projects. This will allow us build up experience of DLR that in turn will allow us to offer it to connection applicants, where it makes sense to do so.

PROGRESSED TO DETAILED ANALYSIS

Based on the optioneering, table 2 summarises the benefits of each option:

	Do Nothing	Responsible Operator	Progressive Network Enabler
Defer Capital Expenditure	✗	✓	✓
Early Connection of Renewables	✗	✓	✓
Improve system operation with better data, constraint and outage management	✗	Partial	✓
Ability for Real Time decision making	✗	✓	✓
Support safety and compliance	✓	✓	✓
Improved Sustainability	✗	✓	✓
Support research and development	✗	✓	✓

Table 3 - Options Benefits

5 Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section.

5.1 Do Nothing

The 'do nothing' option maintains our existing approach to managing circuit capacity and there is no expenditure involved additional to reinforcement costs.

5.2 Responsible Operator

The costs of this option were obtained from discussions with the SSEN Future Networks team and was based on an average estimated cost [redacted] circuit. As this option has not been developed further, no quantifiable benefits have been included within the CBA.

5.3 Progressive Network Enabler

5.3.1 Costs

The costs of applying DLR were defined using actual estimated costs from SSENs Active Solutions team for the retrofitting of DLR on the existing Skye circuit. This was based on learning we took from our previous NIA project that installed DLR units on our existing network. Using the quoted figures, we then derived the equivalent DLR costs for the other six circuits as shown in Table 4.

Reinforcement 1 Scheme Name	DLR Cost (£m)
T2BP-STR-0006 Skye OHL Reinforcement Strategy	[redacted]
East Coast 275kV Upgrade	[redacted]
Port Ann - Crossaig 132kV OHL Works	[redacted]
North East 400kV Upgrade	[redacted]
Lairg - Loch Buidhe	[redacted]
Whistlefield - Dunoon 132kV OHL Works	[redacted]
East Coast 400kV Incremental Upgrade	[redacted]
Total	[redacted]

Table 4 - DLR Costs

We made allowances for the reduced cost of installation of DLR on a circuit that was being constructed already, as opposed to retrofitting, because staff would already be on site. We also reduced the costs of DLR installation over time, making the assumption that we would get more efficient as our experience increased. We recognise that this adds uncertainty to the total costs over T2 and is part of the reason we have asked for a ring-fenced pot with a close out mechanism.

5.3.2 Benefits – Deferred Capital Expenditure

This scenario examines the benefits realised if the projects shown in Table 5 had DLR installed at the time of circuit construction.

Ofgem Scheme Reference	Reinforcement 1 Scheme Name	Current Capacity (MW)	New Circuit Capacity (MW)	Output Delivery Year	Cost (£m)
Skye	T2BP-STR-0006 Skye OHL Reinforcement Strategy	67	348	2025	357
SHT2007	East Coast 275kV Upgrade	640	780	2023	12.9
SHNLT200	Port Ann - Crossaig 132kV OHL Works	67	556	2023	138
SHT2001	North East 400kV Upgrade	780	1500	2023	59
SHT20018	Lairg - Loch Buidhe	89	348	2024	31
SHNLT202	Whistlefield - Dunoon 132kV OHL Works	67	176	2025	41
SHT2009	East Coast 400kV Incremental Upgrade	640	1500	2026	139

Table 5 - RIIO-T2 Certain View Overhead Line Projects

Benefits would accrue from deferment of Future Reinforcements (Table 6), which are beyond the scope of the Certain View, as they largely would occur in RIIO-T3.

In order to determine the capacity increase achieved through deployment we referred to SPENs DLR project where they installed DLR on eight 132kV circuit in their SPM region. From this trial they assessed that DLR had delivered between a 1.24 to 1.55 capacity increase, or 24% to 55% above the existing firm rating of the circuits. We used the 24% value to remain conservative in our estimates.

To assess the benefit, we then took all of the information above and calculated the benefit based on deferring the Future Reinforcement projects by one, two and three years. Due to only knowing the costs for four of the Future Reinforcement projects, the NPV benefits may be higher as more investment could be deferred, making this a conservative assessment.

RIIO-T2 Reinforcements Scheme Name	Future Reinforcement Scheme Name	New Circuit Capacity (MW)	Output Delivery Year	Cost (£m)
T2BP-STR-0006 Skye OHL Reinforcement Strategy	Skye	600	2025	[redacted]
East Coast 275kV Upgrade	Eastern Subsea HVDC link	2000	2029	[redacted]
Port Ann - Crossaig 132kV OHL Works	North Argyll – Crossaig 275kV operation	990	2026	[redacted]
North East 400kV Upgrade	Second East Coast HVDC link	2000	2031	
Lairg - Loch Buidhe	No reinforcement identified			
Whistlefield - Dunoon 132kV OHL Works	No reinforcement identified			
East Coast 400kV Incremental Upgrade	Eastern Subsea HVDC link	2000	2029	[redacted]

Table 6 – Future Reinforcement Projects

Note the following.

- The detail of the Future Reinforcement Projects is not as well defined as for the first set of Projects, i.e. the schemes haven't been developed past an initial costing basis. This is due to them largely likely to occur in T3.
- There are seven blank cells in the table above. This is due to two of the projects not having subsequent reinforcements identified (Lairg and Whistlefield) and the Second East Coast HVDC not having costs identified at this stage.
- The cost and volumes associated with the Eastern Subsea HVDC link are in twice as it is the follow-on reinforcement for two RIIO-T2 projects. To avoid double counting, the CBA only assess the costs and volumes once against the second set of reinforcements.

5.3.3 Carbon Saving

In addition to the deferment benefit there could also be benefits from displacing carbon-based generation from the GB energy mix. Using the same DLR capacity uplift value of 24%, the 2018/19 carbon prices from the CBA template 'fixed data' tab and the figures from https://www.gov.scot/publications/renewable-and-conversion-calculators/ on displacement data, the carbon benefits could be as follows. These are calculated as arising if the increased DLR capacity deferred the reinforcement 2 projects by one, two or three years.

Years Deferred	Carbon Benefit (£m)
1	20.21
2	42.09
3	65.42

Table 7 - Carbon Benefits

The NPV results from our assessment are as follows in Table 8.

Description of Option	Total Forecast Expenditure (£m)	Total NPV	Delta (Option to baseline)	Total NPV inc. monetised risk
Reinforce Circuits with no DLR	[redacted]	[redacted]		[redacted]
Install DLR during construction - 1-year deferred reinforcement	[redacted]	[redacted]	[redacted]	[redacted]
Install DLR during construction - 2-years deferred reinforcement	[redacted]	[redacted]	[redacted]	[redacted]
Install DLR during construction - 3-years deferred reinforcement	[redacted]	[redacted]	[redacted]	[redacted]

Table 8 - NPV Benefits of Reinforcement Deferral

6 Conclusion

With the growth in renewable energy set to increase across GB, new and innovative solutions are required to operate and respond to the challenge.

The proposed DLR work incorporates the installation of DLR technologies and architecture, to bring signals from, seven OHLs. This will include installation of OHL DLR sensors, communications between the sensors and SHE Transmission SCADA. The first installation on Skye will increase confidence in costs and benefits for subsequent DLR applications. This understanding will also increase with each installation completed.

SHE Transmission will deliver this work for [redacted] during the RIIO T2 period and will realise the following outputs:

- Installation of sensors on seven OHLs enabling DLR.
- Using DLR in a near real time basis to better manage our networks performance.
- Expanding our knowledge and experience in the deployment and use of DLR, allowing us to look for further opportunities, including enabling DLR connections for generation.

To deliver these outputs we propose that we use a ring-fenced pot with a closedown mechanism that will mitigate this being our first BaU deployment of DLR. We also propose a materiality threshold of 10% to that ring-fenced pot before the closedown mechanism applies.

This project is not flagged as eligible for early or late competition due to it being under Ofgem’s £50m and £100m thresholds respectively.

7 Price Control Deliverables and Ring Fencing

As set out in our Regulatory Framework paper (section 1.12 and Appendix 3) we support a key principle from Citizens Advice – one that guarantees delivery of outcomes equivalent to the funding received - to ensure that RIIO-T2 really deliver for consumers. At the project level this means that if we don't deliver the output, or a materially equivalent outputs, we commit to returning the ex-ante allowance for the output not delivered.

We recognise that the costs associated with the work set out in this paper are immature as we have never installed DLR as part of Business as Usual (BaU) and therefore there is some uncertainty around the costs. The way we have structured the rollout plan to start with a single installation informing the subsequent deployments, with the confidence in the costs growing following each deployment, will help reduce this uncertainty. However, to aid with the initial uncertainty we propose that this project of work and the associated costs are ring fenced and the output becomes a PCD, this should then be subject to a T2 close out process, such as a true up mechanism with a 10% materiality dead band in which we will not adjust the figures as it is immaterial. Any under or over spend above or below the dead band would then be recovered, having provided suitable justification.

We feel this mechanism works best because the alternative approach would be to have a reopener mechanism to allow us to request for additional allowances once the costs become more certain. There are two main types of uncertainty mechanisms to deal with either (i) uncertain volumes, and (ii) need uncertainty or unknown external costs. This work does not fall into the volume and need uncertainty category as we have a clear and robust needs case and a fixed volume of OHL in which we want to install DLR. Therefore, this sits in the second category of "unknown external costs". This is normally dealt with via a reopener in which we have a "reopener window" to apply for additional funding for works when the costs are more certain. The issue with this is that it restricts you to only receiving funding half way through the price control, however we are clear on the need to undertake this work from the outset of the price control. It is more a case that the costs will become more certain with more experience and knowledge being gained as we undertake the installation projects and the costs may also differ from project to project. On this basis, we think the most logical approach which is in the interest of the consumer is to ring fence this work and funding, be granted a baseline allowance based on our cost estimates set out within this paper and include a RIIO-T2 close out mechanism to deal with any under or over spend against the baseline allowance. Any under spend will be returned in full to the consumer and any over-spend which we can justify should be granted further allowance for.

In line with the overall business plan, we have looked for funding to cover the Certain View. If further projects beyond that view are triggered, then the associated DLR costs will be embedded as part of those subsequent projects.

8 Outputs included in RIIO-T1 Plans

There are no outputs associated with this project included in our RIIO-T1 plans.