



Scottish & Southern
Electricity Networks

RIIO-ED2 Investment Decision Pack

Linear Assets

Investment Reference No: 32/SSEPD/IT/LINEAR_ASSETS



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Definitions and Abbreviations

AI	Artificial Intelligence
BPDT	Business Plan Data Table
CAD	Computer Aided Design
CAPEX	Capital Expenditure
CBRM	Condition Based Risk Management
CEG	Community Energy Group
CNAIM	Common Network Asset Indices Methodology
DAS	Distributed Acoustic Sensing
DER	Distributed Energy Resources
DG	Distributed Generation
DSO	Distribution System Operator
DWG/DXF	Standard drawing exchange formats
EJP	Engineering Justification Paper
EV	Electric Vehicle
FTE	Full Time Equivalent
GIS	Geographical Information System
IDP	Investment Decision Pack
LCT	Low Carbon Technology
LIDAR	Light Detection and Ranging
NARM	Network Asset Risk Metric
NEDWG	NARMS Electricity Distribution Working Group
NPV	Net Present Value
ODIF	Output Delivery Incentives - Financial
OPEX	Operational Expenditure
SCADA	Supervisory Control And Data Acquisition
SSMD	Sector Specific Methodology Decisions
WAM	Work and Asset Management

1. Executive Summary

Linear Assets are the core of our network, and ensuring their efficient management is critical to delivering a safe, resilient and responsive network. Sensors and analytics now offer the opportunity to proactively manage these assets, as well as access and provide far more granular details about them. This project provides the base for proactive linear asset management (for subsea, overhead, underground and telecom assets), and enables us and our Stakeholders to have ready access to key information, such as wayleaves. It also provides the asset management tools to efficiently manage our telecom assets, as these systems will become more complex in RIIO-ED2 to support Flexibility.

The project also provides for the necessary additions, modifications and changes required for the further development of NARM to increase the inclusion of more asset classification types for use in CBRM in preparation for the RIIO-ED3 requirement, in line with the Ofgem proposed development road map for Monetised Risk.

2. Investment Summary Table

Summary Table			
Name of Scheme / Programme	Linear Assets		
Primary Investment Driver	Safe, Resilient and Responsive Networks		
Scheme Reference / Mechanism or Category	32/SSEPD/IT/OT/LINEAR_ASSETS		
Output References / Type			
Cost (CAPEX)	■		
Delivery Year	RIIO ED2		
Reporting Table	C4		
Outputs Included in RIIO ED1 Business Plan			
Spend Apportionment	ED1	ED2 ■	ED3

3. Introduction and Background Information

Our linear assets represent our most critical assets, as they are as technically important as other parts of our network, and generally the most difficult to access, assess and maintain. This is particularly true of our underground linear assets, with some, in particular submarine cables, presenting very complex challenges. They also present commercial, social and environmental challenges. Communities and authorities are more often requiring that overhead assets, both new and existing, are placed underground. Whilst this improves visual amenity, it presents challenges for installation, both environmental and technical, and for maintenance. Moreover, all linear assets require legal agreements with landowners and authorities, such as wayleaves, easements and consents, that have to be managed throughout the life of the assets.



In RIIO-ED1 we made a number of investments in our IT systems to improve the management of linear assets. Principal of these was a new Work and Asset Management (WAM) system (IBM Maximo), a new Geographical Information System (GE Smallworld Electric Office), and EA Technologies' Condition Based Risk Management (CBRM) system that is now being upgraded. Several other new systems were installed, including upgraded modelling tools (e.g. DigSilent PowerFactory) and improved tools to manage existing wayleaves and easements. We also were involved in a number of Innovation projects, such as the SubSense project for real-time monitoring of subsea cables.

In the SSMD, Ofgem set out a planned roadmap which had been discussed with the NEDWG Technical Working Group on the development of CNAIM during RIIO-ED2 to introduce current Non-NARM assets into the NARM classification which will require further modelling development to drive further CBRM updates. For SSEN this will also require further developments and modifications to the Asset Management (WAM) system as well as the data collection tool, both mobile and in office processing. This work needs to conclude prior to any Business Planning work for RIIO-ED3 and therefore needs to be delivered on early in RIIO-ED2.

In RIIO-ED2 we will build on our RIIO-ED1 foundations to ensure that we can continue to provide a safe, resilient and responsive network, and that these assets can even further support our progress to Net Zero. This will include additional subsea monitoring, improved management of our telecom assets to support Flexibility, improved management of consents to meet Stakeholder expectations, as well as the updates to CBRM and related systems to add Non-NARM assets.

4. Business Plan Fit

This project can be mapped to following strategic themes:

Progress to Net Zero	Safe, resilient and responsive networks	A trusted and valued service to customers and communities	Positive Impact on Society
✓	✓	✓	✓

5. Optioneering

As stated above, this project will build on the strong IT foundations established in RIIO-ED1. It covers 4 main areas, namely updates required to manage the non-NARM categories, management of Subsea cable risk, improved management of Consents and a new GIS system to manage SSEN telecom assets (used to service OT and SCADA). Some of the specific deliverables in RIIO-ED2 are expected to be:

- Update CBRM and linked systems to ensure that they can deliver all the requirements of the NEDWG Technical Working Group for current Non-NARM categories, and in line with the Ofgem proposed development road map for Monetised Risk.
- Ensure all our projects, whether for new or existing assets, are assessed and mitigated to deliver minimal environmental impact.
- Provide the same level of detailed asset records for our telecom assets (serving our instrumentation, OT and SCADA networks) as is currently provided for all of our other assets, by the use of a GIS system designed for such assets:
 - This will enable far simpler management of these assets, both in maintenance and on any upgrade or replacement work.
 - It will also allow far better risk management of assets that will become increasingly important as the Flexibility Markets develop (e.g. monitoring and control).
- Continuing monitoring of terrestrial and marine assets once operational, utilising advancements in surveying and monitoring technologies to manage these requirements (e.g. SubSense, CBRM, Ground Probing Radar, Infrared surveys, LiDAR, Drones).
 - Visualisation of the results of surveys and asset condition (e.g. CBRM) to aid management.
 - Use of AI tools linked to sensors to map 'normal' asset behaviour and flag 'abnormal' (proactive asset management): this will be delivered as part of our MDM, Data Lake and Analytics project.
- Where appropriate the tool(s) would allow:
 - Complex 3D analysis of marine topology (e.g. slopes).
 - Ability to share data in common formats e.g. GIS in 2D (shapefiles and similar).
 - Multiple levels of access, such as 2D views for all and 3D/analysis for specialists.
- Wayleave, Easement, Permit and Consent management for all linear assets, including:
 - Processing documents from agreements to the Wayleaves system using metadata.
 - Linking Wayleaves system to Electric Office to enable map-based search functionality.
 - Updated document system for holding wayleave and property documents.
- Allow on-site audits to be circulated to authorised recipients with supporting information, including pictures and videos. This would include providing adequate data storage and remote viewing facilities (e.g. at local offices, securely from home) for the large files produced in surveys (e.g. submarine cable inspection videos).
- Links to our Contract Risk Management Tools (see Capital Investment and Work Management 2 projects), and to our Document Management tools.
- Provide data to our Analytics and Investment Optimisation tools to enable efficient analysis and reporting.
- Use of additional data in analysis, both internal (e.g. drone surveys) and external (e.g. satellite), to provide better insights on assets and external influences (e.g. trawl damage to submarine cables/anchor strikes).
- Access to marine charts and related mapping information for our submarine assets.
- Meet the legal requirements from local and national government, including the Department for Environment, Food and Rural Affairs, Natural England, Scottish Natural Heritage, Marine Scotland, Crown Estates, Scottish Environment Protection Agency, Scottish Fishermen's Federation and the Environment Agency.

We will build on the SubSense Innovation project to ensure that a permanent real time monitoring system utilising Distributed Acoustic Sensing (DAS) is available on selected subsea cables that have single mode fibre optics embedded in the cable. The outputs from this system will be utilised in day to day management through our Analytics project, and to inform our future planning through the Investment Optimisation project. The tool(s), in conjunction with other projects (e.g. Open Door, Tailored Insights), will allow the team to work more collaboratively and efficiently with

external parties to ensure compliance and industry best practice. This would include stakeholder engagement, such as supporting any work on linear assets, whether existing or new.

The proposals for developing CBRM further will require the potential of additional, less complex, modelling however this will be derived from the data on condition, inspections and testing options available on these asset categories. This will all be defined in conjunction with Ofgem to reduce the exposure of Non-NARM categories where NARM currently accounts for 76% of the assets replacement expenditure, the target is to increase this to over 90% for RIIO-ED3. The precise detail of the complexity and involvement here is unlikely to be defined until 2023 so this project needs to include a provision for this work, not only in CBRM development but also the other Asset IT systems which support the processes behind this modelling namely Asset Management and Mobile tools as well as potentially GIS.

5.1.1 Alternative Options

This project is split into 2 core deliverables. One is the updates to the CBRM system to add Non-NARM assets, the other is to take advantage of new sensor equipment and analytics to better manage asset risk.

For the updates to CBRM, no alternative is possible unless a completely new system were deployed. As at present there is not a comparable system on the market that meets all of these needs, and given the investment we have already made into CBRM, updating this system offers by far the best value to meet this new regulatory requirement.

With regard to taking advantage of the new sensors (e.g. SubSense) and analytics, these have good benefits (see the Benefits section) so are driven by good efficiencies (value for money, maximising asset life whilst reducing overall risk).

The proposed solutions have been based on the best value solutions that are currently available. However, given the pace of development in this area, the market will be re-examined throughout the project lifecycle to ensure the best value solutions at that time are chosen for delivery.

6. Stakeholder Evidence

Stakeholder engagement (see our Subsea and Asset Management consultations) confirmed the requirement to continually improve and develop the approach adopted for subsea cable condition assessment and monitoring. It was agreed that innovative systems and tools can allow us to plan and execute our asset replacement strategy to improve resilience and deliver increased value. Likewise, Stakeholders requested far better information about land based linear assets, in terms of constraints that these require (e.g. proximity limits for working), as well as more notice of planned works where feasible.

More details of overall stakeholder engagement are set out in the ***Digital Investment Plan (Annex 5.2)***.

7. Analysis and Cost

Costs have been built up using a bottom up approach and have been based on the best currently available solutions. However, IT is a rapidly changing area, so the market will be re-examined prior to delivery, and the best value option to meet the requirements set out above will be chosen. The project has been assessed over a 5-year lifecycle, with both Opex and Benefits equated for that operational period, as IT projects often need updating after 5 years. NPVs of both 5 and 45 years have therefore been quoted below.

7.1 Cost Profile

This project has the following cost profile and will be delivered as a mixture of waterfall and iterations. In simple terms the split between major elements of the works are:

- CBRM - [REDACTED]
- Consents - [REDACTED]
- Subsea - [REDACTED]
- Telecom GIS - [REDACTED]

The NPV below for the alternative option does not cover the work required to deliver risk management for Non-NARM assets. The full build up of costs is contained in the ED2 IT Investment Plan (Non-Op Capex) Cost Estimate spreadsheet.

	Total £'M	2023/24 £'M	2024/25 £'M	2025/26 £'M	2026/27 £'M	2027/28 £'M
CAPEX	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	
ED2 OPEX	[REDACTED]				[REDACTED]	[REDACTED]
ED2 Benefits	[REDACTED]				[REDACTED]	[REDACTED]
5 Year OPEX	[REDACTED]					
5 Year Benefits	[REDACTED]					
NPV 5 Year (Recommended Option)	[REDACTED]					
NPV 45 Year (Recommended Option)	[REDACTED]					
<i>NPV 5 Year (Partial Alternative Option)</i>	[REDACTED]					
<i>NPV 45 Year (Partial Alternative Option)</i>	[REDACTED]					

7.2 Benefits

The benefits for each category are in general terms:

- CBRM – Meet the requirements of managing Non-NARM assets and monetised risk, and aid asset planning.
- Consents – Meet the expectation of stakeholders, as well as deliver efficiencies.
- Subsea – Efficiently manage the risk of subsea assets.
- Telecom GIS – Efficiently manage our telecom assets to meet the increasing demands of Flexibility.

Some financial benefits relating to these are set out below.

7.2.1 Financial Benefits

Financial benefits will start after project 'go live'. The years for the benefits below therefore refer to the first 5 years of the new system in operation, and not to ED2 years.

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Offset additional resource that would be required to manually manage new Distribution telecom assets (Fibre) – a minimum of 1 FTE, SS05 rate.	■	■	■	■	■	■
Reduction in time for search for consent information. Based on studies, on average across the business ■ minutes a week are spent on this activity, as it currently requires searching through a file system not directly linked to assets. This equates to 1.25 FTE, which was be an offset on new staff (assumes an SS05 rate).	■	■	■	■	■	■
Reduction in time for search for submarine cable information Based on studies, on average across the business ■ minutes a week are spent on this activity, as it currently requires searching through a file system not directly linked to assets. This equates to 0.25 FTE, which was be an offset on new staff (assumes an SS06 rate).	■	■	■	■	■	■
Reduction in surveys of submarine cables due to better monitoring. Benefit is based on 1 major survey (■) avoided every 5 years	■	■	■	■	■	■
Reduction in additional staff required to design and analyse new submarine cables (due to increase in submarine cable portfolio). Benefit based on offsetting 1 FTE, SS08 rate.	■	■	■	■	■	■
Reduction in asset replacement due to better understanding of	■	■	■	■	■	■

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
linear asset life. Benefit based on a reduction of 0.25% of load and non-load work (this is part of overall efficiency savings).						

7.2.2 Non-Financial Benefits

The following Non-Financial benefits have been identified as part of this project proposal:

- Better quality data from sources:
 - The ability to track shipping, enabling improved negotiation with fishermen/shipping, as we could see if they were in the area, thus could also re-coup costs if they have caused damage.
 - Improved fault analysis
- Improved Trend Analysis (e.g. Cables lifecycle in varying ground types/conditions, impact of location on Overhead lines, shipping and fishing activity in new areas)

7.2.2.1 Foundation to other Projects/Initiatives

Supports Investment Optimisation and Analytics.

7.3 Key Assumptions

The current programme and costings assume that all planned RIIO-ED1 system changes will be complete before the start of RIIO-ED2. If some of the current planned application changes are not completed, this will increase the complexity, and hence cost and timescale, of this project.

7.4 High Level Dependencies

Some of the deliverables in this project depend on the completion of other RIIO-ED2 projects, e.g.

- MDM, Data Lake and Analytics, to provide a stable base for all data, and a platform for analysis.
- Capital Investment and Work Management 2, for Contract and Risk Management, as well as links for data (e.g. Wayleaves, Consents, videos).
- Open Door and Tailored Insights, for Stakeholder engagement.
- EnviroTrack, for all carbon and natural capital management and reporting.

7.5 Deliverability & Risk

Our **Ensuring Deliverability and a Resilient Workforce (Chapter 16)** describes our approach to evidencing the deliverability of our overall plan as a package, and its individual components. Testing of our EJPs has prioritised assessment of efficiency and capacity, and this has ensured that we can demonstrate a credible plan to move from SSEN's ED1 performance to our target ED2 efficiency. We have also demonstrated that SSEN's in house and contractor options can, or will through investment or managed change, provide the capacity and skills at the right time, in the right locations. This assessment has been part of the regular assessment of our EJPs, IDPs and BPDTs. Our **Deliverability Strategy (Annex 16.1)** and **Supply Chain Strategy (Annex 16.2)** are included in the Business plan Submission.

Our deliverability testing has identified a major strategic opportunity which is relevant to all EJPs.

- In ED2 SSEN will change the way Capital Expenditure is delivered, maximising synergies within the network to minimise disruptions for our customers. This is particularly relevant for a Price Control period where volumes of work are increasing across all work types.
- The principle is to develop and deliver Programmes of work, manage risk and complexity at Programme level and to develop strategic relationships with our Suppliers and Partners to enable efficiency realisation.

8. Conclusion

This project will enable us to maximise the use of asset condition and sensor information, so that we can move toward full proactive management of linear assets in ED3. It will ensure that we can more efficiently manage our telecom assets that will become increasingly important and Flexibility Markets build. It will provide us with quick and simple access to key information, such as wayleaves, in the office and field, and, where assigned by triage, access to this information for Stakeholders via Open Door. It will also allow us to comply with the necessary CBRM development which will be required from Ofgem to meet future NARM reporting requirements due to the increased scope of the asset register categories involved.