![Scottish & Southern Electricity Networks]

RIIO-ED2 Investment Decision Pack

Investment Optimisation

Investment Reference No: 27/SSEPD/IT/OPTIMISATION

CONTENTS

Definitions and Abbreviations

ADMS	Advanced Distribution Management System
AI	Artificial Intelligence
BPDT	Business Plan Data Table
CAPEX	Capital Expenditure
CBA	Cost Benefit Analysis
CBRM	Condition Based Risk Management
CEM	Common Evaluation Methodology
CI	Customer Interruption
CIM	Common Information Model
CML	Customer Minutes Lost
CO2	Carbon Dioxide
DER	Distributed Energy Resources
DG	Distributed Generation
DSO	Distribution System Operator
EJP	Engineering Justification Paper
FTE	Full Time Equivalent
GIS	Geographical Information System
IDP	Investment Decision Pack
IT	Information Technology
NPV	Net Present Value
ODIF	Output Delivery Incentives - Financial
OPEX	Operational Expenditure
PCB	PolyChlorinated Biphenyl
SF6	Sulphur hexafluoride
SSSI	Site of Special Scientific Interest
WAM	Work and Asset Management

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1. Executive Summary

This project builds on our significant ED1 investment in asset management based IT. It will utilise CBA, CEM, AI and advanced modelling, coupled with granular static and dynamic data, to give a prioritise view of optimal investment.

2. Investment Summary Table

Summary Table			
Name of Scheme / Programme	Investment Optimisation		
Primary Investment Driver	Safe, Resilient and Responsive Network		
Scheme Reference / Mechanism or Category	27/SSEPD/IT-ASSET/OPTIMISATION		
Output References / Type			
Cost (CAPEX)	■		
Delivery Year	RIIO ED2		
Reporting Table	C4		
Outputs Included in RIIO ED1 Business Plan	Investment Optimisation		
Spend Apportionment	**ED1**	**ED2** ■	**ED3**

3. Introduction and Background Information

Investment Optimisation describes "being able to select the most efficient set of activities that will deliver the right level network outputs at the best cost for customers. These activities include standard asset management activities such as proactive or reactively replace, refurbish, proactively maintain, or do nothing, but also emerging solutions from a range of flexibility sources such as EV charging or heat storage. As network activities are all interconnected, such an optimisation should consider the broadest set of activities and network outputs possible simultaneously."

In RIIO-ED1 we made many improvements to our Asset Management systems. These included a new Work and Asset Management (WAM) system, based on IBM Maximo, a new Geographical Information System (GIS), based on GE Electric Office, and a New Condition Based Risk Management (CBRM) system, using EA Technology Limited tools. These ED1 investments will give us an excellent base for investment optimisation in RIIO-ED2.

In the next period the Flexibility market will expand exponentially, and we will start to operate in a Distribution System Operator (DSO) world. This will require a paradigm shift in our Investment decision making tools. Some of this will be derived from AI based Analytics (see our Analytics project). However, some will require specialist design and modelling tools, that until now tended only to be used in higher voltages. These tools will need to be able to consider in detail factors such as harmonic analysis and 2-way flows, and maximise the use of new dynamic data sources, particularly smart meters and LV monitoring. We will also need to undertake far more analysis and investment optioneering, as more participants engage in the Flexibility market. We will therefore need to automate, as far as practicable, our core design and Cost Benefit Analysis (CBA) tools. Investment decisions will need to consider all possible interventions, including operational planning, and be based on the Common Evaluation Methodology (CEM), so that we have a prioritised view across our portfolio. Our investment decisions will need input from a lot more external data. Moreover, we need to ensure that as much data as feasible is made available to other participants, subject to security, privacy and commercial considerations.

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, our investment decisions will become increasingly more complicated as the Flexibility market expands. Currently the market is largely based around higher voltages, but throughout RIIO-ED2 it will move into local areas and lower voltages. We will have more people charging electric vehicles, installing local Distributed Energy Resources (DERs) and heat pumps, flows will be far peakier and more bi-directional. Our investment decisions will need to take account of this variability, and hence the tools we use must provide us with the information we need to make efficient investments. These tools will have to:

- Provide scenario modelling, including cost, regulatory outcomes (risk point returns, etc.), impacts, risks, for example covering:
  - Different phasing technologies, such as single-wire earth return, two phase, bi-phase or classical three-phase systems.
  - Assessing reverse power flows, voltage dips and swells, varying fault levels and equipment loading.

- o Use outputs from our condition tools (e.g. CBRM) and newer assessment such as photogrammetry.
- o Use current connectivity models, both designed and operational.
- Enable us to design and compare multiple options, single schemes, combined schemes, operational planning, network re-configurations, etc.
- Model the cost options of all proposed schemes including:
  - o Cost Benefit Analysis
  - o Common Evaluation Methodology
  - o Standard Costs
- Manage the complete portfolio of proposed schemes, being able to prioritise based on cost and other benefits.
- Form and implement effective strategies to address identified issues (e.g. replacement programme for Consac cable, tree cutting strategy), whilst aligning with other ongoing work (such as inspection and maintenance activity), so that we can:
  - o Utilise LV Monitoring and other operational technologies to improve fault finding and digitise reporting processes.
  - o Ensure fault and remedial action records are logged centrally in our asset management systems.
  - o Perform root-cause analysis (where practicable) or data analytics on faults to better understand the extent of issues on our network and implement efficient solutions
- Use external datasets (such as soil profiles and meteorology, including real-time) for planning.
- Exploit other utility and local authority data (e.g. Streetworks) and seek to plan our maintenance / refurbishment in tandem with other companies. Cross sector co-ordination tools for investment, decision making and work scheduling.
- Allow polygoning of areas planned for development (internal and external).
- Provide integrated planning e.g. whole system planning.
- Integrate Sustainability optioneering and reporting into the design package.
- Enable tracking of investments through life of works (cross system).
- Ensure any physical constraints (e.g. flooding, SSSIs) are fully considered in designs.

- Incorporate into design optioneering:
  - o Load Disaggregation Models.
  - o Trend analysis (e.g. equipment, locations, etc.).
  - o Deterioration and age of assets.
  - o Whole Life Cost (e.g. polymeric cables).
  - o Ground types, etc.
- Ensure we invest when necessary, align with load related drivers, and ultimately balance network cost against customer cost and broader societal cost.
- Digitalise our asset management systems as per our Digital Strategy to enable faster, more coordinated data access and overall data reliability.
- The analysis will make use of multiple information sources, both internal and external, including:
  - o Work and Asset Management.
  - o Geographical Information System.
  - o Asset Investment Management (condition and risk management).
  - o Advanced Distribution Management System (loads, incidents, etc.).
  - o LiDAR and other survey data.
  - o Meteorological data.
  - o Development data, both building and any projected Low Carbon Technology.

These future tools will make it simple to understand the impact of any activity or combination of activities (replace, refurb, employing flexibility) on outputs that maximise customer value, and help us asses CIs, CMLs, losses, Monetised

Risk, bill impact, environmental factors (CO_2, oil, SF_6 etc). This must be set against the technical feasibility of the considered solutions that have been pre-optioneered for the available schemes, which is when detailed physical analysis tools (such as that predict harmonics) are deployed.

Our new tools must therefore enable us to deliver Investment Optimisation as an ongoing activity with investment plans associated with assets. They must also provide strategic investment capability and plans , both for our own works, and to assist our Stakeholders. They must have the ability to run analytical processes to optimise asset investment, understand and optimise networks unit costs, with tools to run different scenarios for asset investment and combine schemes. They must allow us to determine whole system reinforcement charges.

In order to deliver these functions efficiently, the tools will need to 'automate' many of the tasks typically associated with such optioneering. This will mean near real time information from most of our core systems, including WAM, GIS, our Advanced Distribution Management System (ADMS – PowerOn Advantage), the new DSO toolsets (see the DSO projects for details), and many of the other analyses we will be undertaking (see Analytics Project), such as LV Monitoring, Smart Meter Data and Forecasting. Certain changes (e.g. new data fields) will be needed in these existing tools to incorporate this integration, and in some cases additional functionality, such as future investment 'plans' in GIS and WAM. They will need to use data standards (e.g. the Common Information Model – CIM), and be transportable to our Stakeholders, subject to appropriate considerations. The output from these tools must be able to be incorporated into our core Asset Management tools, in particular WAM & GIS.

To deliver these outcomes will require valuable input from our supply chain, as the current development of these tools is rapid. The use of Open Data (subject to security, privacy and commercial considerations) will be a major factor in allowing our supply chain, and indeed competitors, to ensure that the industry rapidly develops best practice in the investment optioneering of electricity networks in the new and complex Flexibility Markets.

5.1.1   Alternative Options

ED2 will demand far more complex analysis of our network, with 2-way flows, local LCT, and much more peaky demands. Without more comprehensive analysis the opportunities for Flexibility will be constrained, and there will be increased risk of network failures. Doing nothing is therefore not an option.

The alternative for this project would be to continue to assess asset optimisation using existing modelling tools and manual analysis. The costs for delivering some of the outcomes set out in this project are in the Benefits section. Using modern Analytics and AI tools will enable us to deliver far better value, and potentially may offer additional saving that we are not able to accurately assess at this time.

The proposed solution has been based on the best value IT solution that is currently available. However, given the pace of IT development, the market will be re-examined throughout its lifecycle to ensure the best value solutions at that time are chosen for delivery.

6.   Stakeholder Evidence

In almost all of our stakeholder workshops, the highest priorities of our stakeholders are value for money, and a safe and reliable network. The primary purpose of this project is to deliver investments more efficiently, replacing assets just before the end of their useful life (and hence potentially avoid high maintenance costs), and to maximise the use of assets before deploying reinforcements through the use of Flexibility, The project is therefore a prime tool to aid meeting the high priorities of our stakeholders.

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

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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 for the IT and manual options. As the project will be delivered as a rolling programme of Agile improvements, both Opex and Benefits have been deemed to start in Year 3 of ED2.

7.1   Cost Profile

This project has the following cost profile, rounded to 2 decimal places for simplicity. The bulk of work will be undertaken in the early years of the period, with updates in subsequent years. Costs and benefits have been set out in the years they are expected to occur. The NPVs have been developed using the standard CBA spreadsheet. 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	■		■	■	■	■
ED2 OPEX	■			■	■	■
ED2 Benefits	■			■	■	■
5 Year OPEX	■					
5 Year Benefits	■					
NPV 5 Year (Recommended Option)	■					
NPV 45 Year (Recommended Option)	■					
NPV 5 Year (Alternative Option)	■					
NPV 45 Year (Alternative Option)	■					

Our recommended investment is more economic than the alternative business as usual approach, as shown by the higher NPV.

7.2   Benefits

7.2.1   Financial Benefits

	Total	Year 1	Year 2	Year 3	Year 4	Year 5
Reduction in the number of new specialists that would need to be employed to deliver the additional optioneering required to support the	■	■	■	■	■	■

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Flexibility market. 10 FTE assumed, SS09 rate.						
Reduction in the number of new specialists that would need to be employed to provide Open Data around optioneering. 3 FTE assumed, SS09 rate.	■	■	■	■	■	■
Avoidance of 2 FTE who would undertake refinement and CBA's due to work volume increases in ED2 – based on SS09 rate	■	■	■	■	■	■

A number of other financial and consumer benefits have been identified, that cannot currently be accurately forecasted, these include:

- Optimisation of investment decisions, offering a potential reduction in the overall investment cost.
- More accurate financial forecasting, budget vs planned spend vs actual spend
- Visibility to DSO, connections, portfolio managers and designers to consider load growth in decisions to replace transformers, circuit breakers, overhead line conductors and underground cables
- Up to date information to identify the right, cost effective solution at the right time. It may not be the cheapest option, we pay more/do more, but don't need to go back in 2-5 years' time, less customer interruption, more environmental benefits (less mobile generation), cost savings, and anticipating the uptake of electric vehicles/heat pump storage to avoid future issues like voltage complaints
- Reduction in the number of new specialists that would need to be employed to deliver the additional optioneering required to support the Flexibility market.
- Reduction in the number of new specialists that would need to be employed to provide Open Data around optioneering.
- Help in optimisation of investment decisions, offering a reduction in the overall investment cost.
- Maximise customer value.
- Optimisation of customer scores.
- Reduction of data mining to support investments opportunities.
- Increased capability to cross reference TOTEX investment programs across the networks.

Note that the benefit does not necessarily have to be a cost reduction, but rather could be "for the same budget, deliver a higher level of outputs customers care about" which can be monetised through Willingness to Pay figures. The benefit would not be limited to the Load folio, as Non-Load decisions can also be optimised to reduce risk, potentially reducing fault spend. Similar quantification of percentage points of efficiency would exist across the portfolio. These questions will form part of our 'Willingness to Pay' workshops with our Stakeholders over the next few months.

7.2.2 Non-Financial Benefits

The prime non-financial benefit is support to the Flexibility market. Other benefits include an increase in staff motivation, as more time will be spent on studies, and less on sourcing and refining data.

There is also a Reputational benefit tied to transparency, as a good asset investment system can explain our decisions clearly with credible, available evidence.

7.2.2.1 Foundation to other Projects/Initiatives

This project will provide the backbone to proactive asset management in ED3.

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

In order to deliver full benefits, this project will be dependent on a number of other RIIO-ED2 projects, notably MDM & Data Lake, Analytics, and the various DSO projects.

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 ensure that we can build on our ED1 investments to move to full proactive asset management in ED3. It will allow the more complex analysis that is necessary to support Flexibility, and well as giving better understanding of asset lifecycle, and offers better value than manual alternatives. It will potentially help to deliver asset management to an ISO 55000 maturity level of 3.