



# Milestone 2

## 2.07 Power Systems Economics Roadmap

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# 1 Introduction

## 1.1 Background

The MERLIN project is working towards improving our understanding on how Distribution Network Operators (DNOs) or Distribution System Operators (DSOs) can effectively manage flexible services, such as energy storage and demand side response, among others. The goal is to improve our understanding on the economic impact these flexible services could have in a number of possible future world scenarios. MERLIN is also exploring the impacts of managing constraints through traditional reinforcement and alternative DNO controlled methods, which can be used to evaluate the cost-effectiveness of flexible services. Modelling allows us to understand possible positive and negative financial impacts of flexible services in a safe and risk free environment, with relevant learning passed to sister innovation projects TRANSITION and Project LEO. This can help us make better and more informed decisions in order to reduce customer costs and support the drive to net zero.

## 1.2 Aim

The aim of this report is to set out a roadmap for the development of power systems economics (PSE) research and development (R&D). The report will detail where GB Distribution Network Operators (DNOs) currently are in their ability to manage flexible services and set out a path for optimal management of these services.

## 1.3 Power Systems Economics Roadmap

The PSE Roadmap is split into three sections:



1. Present day: Details the current capabilities that GB DNOs have for managing and valuing flexible services.
2. Short-Term Future: Details the short-term future (<3 years) capabilities that GB DNOs could have for managing and valuing flexible services.
3. Long-Term Future: Details the Long-term future (>3 years) capabilities that GB DNOs could have for managing and valuing flexible services.

### 1.3.1 Present day PSE capabilities



This section details the present day capabilities for valuing and managing flexible services.

Available Flexible Service Valuation Tools:

- Baringa RIIO-ED2 CBA – Tool is integrated with the Ofgem RIIO-ED2 CBA and is designed to help with evaluating flexible services options vs traditional reinforcement options. The tool calculates the value of flexibility through the Net Present Value (NPV) deferral of Capex and

has additional options to include monetary values for losses and CO<sub>2</sub>e. The tool is able to forecast flexible service values against various Future Energy Scenario (FES) forecasts and also has a separate tool that allows losses to be calculated. The tool is Excel based requiring manual input.

- DNO owned CBAs – Each DNO will value flexible services using their own internal method. Typically this will involve NPV of deferred assets, Customer Interruptions (CI) and Customer Minutes Lost (CML). The tool is Excel based requiring manual input.
- Some DNO's use market-characteristics to determine different approaches to valuing flexibility, including paying fixed price ceilings to stimulate competition and market entry.

Available Flexible Service Management Tools:

- None – As flexible services are still relatively novel to GB DNOs there are not many currently active contracts. Management is typically done by staff within DNOs using existing systems. However, third party tools such as Piclo Flex and Flex Power do provide some support when advertising flexible services online.

Present day PSE summary:

**Tool Software:** Typically Excel-based

**Number of tools:** Few

**Calculations:** Simplistic, NPV, Losses, CI & CML,

**Contracts:** Managed by DNO team members

### 1.3.2 Short-Term Future PSE Capabilities

#### Short-Term Future

This section details the short-term (<3 years) capabilities that PSE tools could have.

Projects such as MERLIN will provide additional insight on how flexible services can be valued and managed. These learnings can be applied to enhance existing tools. Examples of enhancements include:

1. Additional factors included when valuing flexible services e.g. Including asset life cost in NPV calculations, including asset health and re-sale/use value of assets in calculations and utilising a wider number of societal costs e.g. losses, impact on land use, social disruption caused by building, etc.
2. Tools will likely remain Excel-based, but with new or enhanced formulas and access to data sets to perform calculations may be necessary.
3. Management of flexible services is still likely to be done within small teams as number of services remains low. However, as services increase it is possible that simplistic management tools are brought in to assist.
4. Project TRANSITION and the ENA ON-P are looking at different approaches to valuing flexibility such as willingness-to-accept type analysis (WTA) which is typically explored

through auctions mechanisms. The projects are also considering how service stacking can be applied to support business cases for flexibility.

5. Frontier Economics CBA – Tool uses real options analysis (ROA) to calculate the value of flexible services including optionality values. The tool uses decision nodes at four year intervals to provide a framework against which to understand the optimal decision around flexibility given various Future Energy Scenario (FES) forecasts. The tool is Excel based requiring manual input.

**Tool Software:** Typically Excel-based

**Number of tools:** Few

**Calculations:** Enhanced, Asset life costs, asset health, societal costs, optionality, CO2e

**Contracts:** Managed by DNO team members & possibly tools

### 1.3.3 Long-Term Future PSE Capabilities

#### Long-Term Future

This section details the long-term (>3 years) capabilities that PSE tools could have.

Part of the MERLIN project's objectives are to not only inform the wider industry on possible advancements to flexible service valuations but also to explore what kind of tool would be required to effectively manage and value a large number of flexible services.

If DNO's/DSO's are managing a large number of flexible services, it is likely that the following tool(s) will be required:

1. Power Systems Analysis tool with economic functionality – These will likely replace the current Excel tools that DNOs utilise to value flexibility. Excel tools are limited to manual input and do not have the analytical capabilities that power systems analysis tools have. Current power systems analysis tools are excellent at modelling physics but lack economic modelling capability. Integrating physics and economic modelling can provide significant benefit vs doing these activities in isolation. For example, the impact of losses can be modelled for various investment options (traditional reinforcement vs flexible services) and the additional financial cost of losses can quickly be seen between these options. MERLIN is utilising the Grid OS IDP system, which has this joint functionality (power system analysis & economic modelling) and the learnings from the project can assist DNO's to make this transition if desired.
2. Financial Management Tool (FMT) – With hundreds or possibly thousands of flexible services being utilised in the future it will be extremely labour intensive to manage. It will therefore be necessary to utilise a tool to assist with management of these services. More information on the tool can be found in the Milestone 2 report by CGI on the requirements and architecture of the FMT. To summarise here, the tool will:
  - a. Utilise a variety of data e.g. historic payments made to service providers, forecast payments to be made to service providers and estimated costs of traditional reinforcements.

- b. Perform calculations on a daily basis to understand optimal flexible contract period lengths/costs and/or determine when traditional reinforcement should start.
- c. Provide the user with a decision on when to start traditional reinforcement, how long to continue flexible services for and at what price.
- d. Have alarms in place when forecasts or payments alter, and an immediate investment decision needs to be made.
- e. Continually update itself with the most recent available data to ensure decisions output are as accurate as possible.

Tool Software: Power Systems Analysis Tools with Economic functionality

Number of tools: Few

Calculations: Enhanced and integrated with power systems analysis tool

Contracts managed by Financial Management Tool (FMT)



**Tool Software:** Typically Excel-based

**Number of tools:** Few

**Calculations:** Simplistic, NPV, Losses, CI & CML, Optionality, CO2e

**Contracts:** Managed by DNO team members

**Tool Software:** Typically Excel-based

**Number of tools:** Few

**Calculations:** Enhanced, Asset life costs, asset health, societal costs

**Contracts:** Managed by DNO team members & possibly tools

**Tool Software:** Power Systems Analysis Tools with Economic functionality

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