

EIP040

How can we introduce flexibility to distribution networks?

Problem Statement Details

The electricity network in the UK is experiencing significant changes in the way energy is generated and consumed due to the growing integration of LCTs. The UK government's intention to electrify the transportation and heating sectors have resulted in an increase in network demand, despite improvements in energy efficiency. The growing connection of distributed generation (DG) is also causing an additional strain on the distribution networks from LV (400 V) to HV (11 kV, 33 kV) and EHV (132 kV).

The combination of additional LCT demand and generation may drastically increase the chance of voltage variation on the distribution networks, resulting in both voltages outside statutory limits. Increase in electricity demand also increases the chance of thermal stress on assets. The level and time horizon of the changes in demand and generation due to LCT integration are sometimes difficult to predict as they depend on customer behaviour, technology maturity, costs of LCTs and also government policies. Conventional network designs are passive and designed for the worst demand and generation conditions. However, this conventional approach requires significantly expensive and time-consuming network reinforcement.

Some of the key challenges are:

- Can we control voltages locally closer to customers?
- Can we better utilise our assets by sharing capacity between them?
- How can customers provide flexibility in demand and generation when grid is under stress?
- How power quality will be affected by more converter connected loads/generation?
- What are the solutions to maintain the quality of supply within ESQCR requirements?

Key Stakeholders

Electricity customers, UK Distribution Network Operators, Grid Assets manufacturers, Ofgem, Network Service Providers, academics and research centres.

Target Market

The Electricity Networks industry is a multi-billion-pound industry (set to have over £20bn investment only during ED2 price control). Market opportunity for rolling out effective solutions that can be competed with conventional reinforcement is significant in this wide market.

Enablers and Constraints

Enablers:

- Power electronic technologies (such as STATCOM, UPFC, Soft Open Points...) can provide grid control flexibilities in LV and HV networks, however, there constraints over their costs, service lifetime and reliabilities.
- Creating local energy and a flexibility market,
- LV and HV fault allocation for underground cable circuits.

Scalability and Target Implementation Date

The scale of the problem covers all DNOs, and we aim to reduce the scale of this challenge through the ED2 price control period and beyond.

Innovation Strategy Target Areas

Innovation Theme	Target Area	Primary or Secondary
Data and Digitalisation	<p>The shift to data-driven, digitally-enabled networks is critical as we move towards Net Zero.</p> <p>We need your help to drive standardisation, interoperability, security and digital skills whilst accelerating our transformation to data-driven networks by the mid 2030s.</p>	Primary
Flexibility and Market Evolution	<p>Energy networks must quickly and efficiently respond to the rapidly evolving needs of the energy system transition. We need your support to eliminate barriers to new market entrants, deploy novel commercial and network management solutions whilst ensuring fair participation and eliminating regulatory barriers within the RIIO-2 price control periods.</p>	Primary
Net zero and the energy system transition	<p>In order to meet the UK net zero targets of 2050 we must start converting our networks to deliver low carbon fuels today. We want to work with you to develop the role of our gas networks into the future by investigating, trialling, implementing and delivering safe, low carbon alternatives to natural gas such as Hydrogen.</p> <p>Net Zero requires connection of more low and zero carbon sources of energy generation, storage and demand to both the transmission and distribution networks. We need your innovative methods for effective network management and accessing flexibility to improve visibility, forecasting and modelling of low carbon technologies.</p>	Secondary
Optimised assets and practices	<p>Innovation has a key role to play in ensuring our networks continue to remain reliable, safe, secure and resilient to our changing climate. We are constantly looking to improve and welcome support to identify methods to prevent interruptions, ensure resilience, reduce climate impact and future-proof our networks.</p>	Primary
Supporting Consumers in Vulnerable Situations	<p>Equality and fairness are the foundations of a just transition to Net Zero. We hope you can provide insight into the transient and situational nature of vulnerability and how we can overcome the impact the energy system has on consumers, building strong relationships for the future.</p>	Primary
Whole Energy System Transition	<p>The energy system must consider the full range of opportunities, risks and interdependencies that exist across the energy networks to integrate and optimise them in a way that best serves the consumer. We are looking for ways to improve visibility of the networks and transitional options, co-ordinate approaches and collaborate across the UK.</p>	Primary