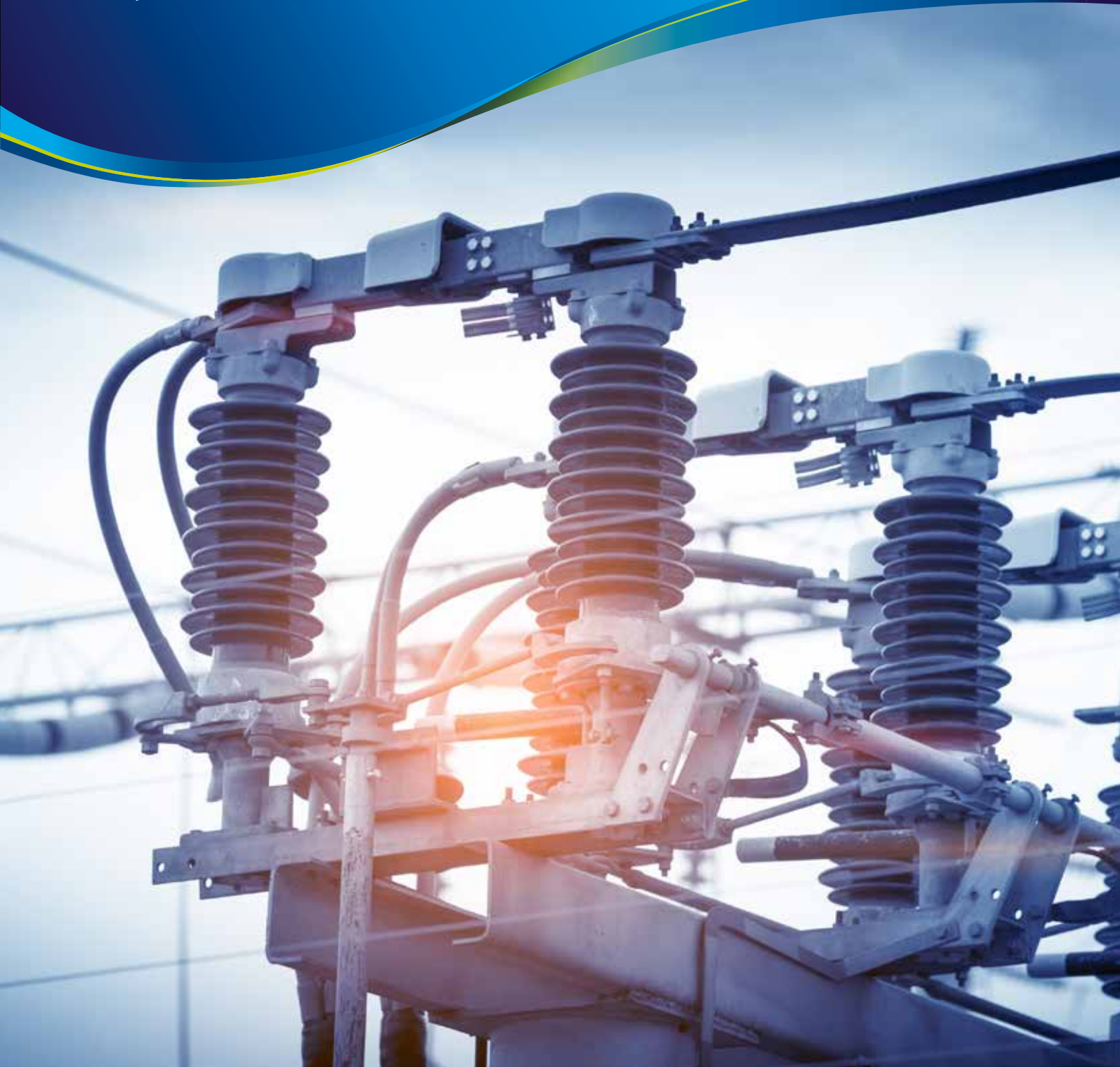


FLEX

Innovation Project

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Contents

1. Background	3
2. Project Summary	3
3. Objectives	4
3.1 Overall Justification	4
3.2 Project Outcomes	4
4. Project Technique	5
5. Method	5
5.1 Market Evaluation	5
5.2 Technology Assessment	6
5.3 Commercial Terms	6
5.4 Site Selection	7
5.5 Marketing and Procurement	7
5.6 Installation	8
5.7 Trial	8
5.8 Analysis of Results	8
5.9 Customer Experience	8
5.10 Transition to Business as Usual	8
6. Project Timeline	9



1. Background

Distribution networks are becoming increasingly strained due to growing demand and a high penetration of distributed generation (*DG*). These rising levels result in a growing number of thermal, voltage and fault level constraints, typically restricting the uptake of additional demand including low carbon technologies (*LCTs*) or *DG*. Such constraints could be alleviated by traditional network reinforcement, but this would require substantial investment by the network operators, which would in turn be borne by customers in the form of increased network charges.

Smart and market based solutions that extend beyond current practice can prove to be a cost effective solution to this problem. Development of such solutions to maximise the capacity of the existing network is supported by an assessment that thermal constraints are one of the most prevalent future network constraints.

With greater *DG* and *LCTs* connected to the distribution network, the network must become more flexible, ultimately offering network users and operators the ability to control or schedule demand and generation. The managed control of these flexible technologies can help resolve network congestion, releasing additional capacity, in a timelier manner allowing the connection of further *LCTs* and *DG*. The ability to manage demand and generation on the distribution network is central to the role of a Distribution System Operator (*DSO*) and offers a *DSO* the ability to more actively manage network constraints and defer expensive traditional network reinforcement.

2. Project Summary

The FLEX project will evaluate the ability of Flexibility to overcome network constraints and defer reinforcement requirements. Flexibility is defined as network users modifying their generation and/or consumption patterns in reaction to an external signal (*such as a change in price*) to provide a service within the energy system.

A primary use case for Flexibility is the provision of 'demand turn down' service by customers which could be achieved by increasing onsite generation, reducing demand or through the use of energy storage to avoid network overloads. The project will seek to develop competitive local markets for Flexibility in Northern Ireland to manage distribution network constraints, addressing any relevant technical, operational, commercial and regulatory barriers in line with the steps laid out in the Energy Network Association's (*ENAs*) Flexibility Commitment.

There are feasibly many types of Flexibility that could be offered based on different customers and control principles. This project will mainly focus on Industrial and Commercial (*I&C*) customers and seeks to contract for Flexibility services both through aggregation and directly with customers.

The Low Carbon Network Fund (*LCNF*) projects and subsequent Business as Usual (*BaU*) developments by *DSOs* in GB have shown that Flexibility can be used to cost effectively manage network constraints and facilitate new connections including *LCT* uptake.

Learnings from GB have led to recommendations on how to mitigate the technical, commercial and regulatory barriers to the application of Flexibility. The FLEX project will review these recommendations in respect of and along with any Northern Ireland specific barriers that may exist. This will identify potential issues for further consideration to effectively bring Flexibility into *BaU* in Northern Ireland.

3. Objectives

The key objectives of the FLEX project are to:

- Improve the overall utilisation of the distribution network through the use of Flexibility by contracting with customers (*or aggregators*) to manage network constraints.
- Evaluate the current market for Flexibility in Northern Ireland, the existing and potential level of interest from potential Flexibility Service Providers and develop a strategy to increase participation.
- Evaluate the potential cost benefit for using Flexibility to defer network reinforcement for both NIE Networks and the Northern Ireland customer base.
- Identify conflicts between existing contracted services in existing markets including DS3 System Services and NIE Networks procuring customer Flexibility.
- Design and trial technical and commercial solutions for utilising Flexibility.
- Develop a template for commercial Flexibility contracts and establish a:
 - Signposting process for required Flexibility.
 - Platform for registering Flexibility.
 - Standard template for procuring Flexibility.
 - Strategy for promoting competition and efficiency in the delivery of Flexibility services.
- Develop the internal NIE Networks' processes to procure and operate Flexibility.

3.1 Overall Justification

Although GB learning is relevant to the application of Flexibility in NIE Networks' system, this project is required to enable NIE Networks' application of Flexibility.

The following points, specifically relating to NIE Networks application of Flexibility, need to be addressed:

- Integration of Flexibility operation within NIE Networks' existing control systems.
- Recruitment of Flexibility Service Providers within constrained areas of NIE Networks' distribution network and coordination with TSO markets and contracts.
- The magnitude of Flexibility over-procurement required to guarantee a required service delivery.
- Evaluation of suitable Flexibility operational models and development of capabilities to predict dispatch occurrences.

3.2 Project Outcomes

It is anticipated that this project will deliver:

- Customer benefits and financial savings through the utilisation of Flexibility.
- Scalable innovative learning to enable Flexibility to be transitioned to BaU.
- A commercial Flexibility contract template and processes to procure and operate it.

4. Project Technique

There are potentially many types of Flexibility based on different customers and control principles. Based on GB learning, the FLEX project will focus on I&C customers, for both generation and demand responses. Contracting via aggregators or directly with the customer will be considered.

At least two forms of Flexibility will be specifically evaluated:

- Pre-fault Flexibility manages demand and generation to ensure that the power flows do not exceed the firm capacity of the network with an outage. Flexibility will be dispatched when power flows exceed network firm capacity or an agreed threshold below network firm capacity.
- Post-fault Flexibility is only called upon after a network fault has occurred and hence depends on the fault rate of the associated network elements. It is likely to be called upon on fewer occasions but will need to respond very quickly.

The speed of response required for each service must reflect the requirements and network risks. Post-fault Flexibility is likely to require a faster and higher reliability than pre-fault Flexibility. The necessary speed of response will depend on network voltages and thermal characteristics of the affected network assets. It is important to understand these temporary conditions to avoid any further outages as a consequence. A scheduled Flexibility service will also be considered.



5. Method

The FLEX project aims to address the aforementioned problems by focusing on lessons learnt from previous innovation projects and current good practice. The work within the FLEX project will focus on two main areas:

- Customer - investigating all aspects of Flexibility associated with potential Flexibility Service Providers, including their capabilities and needs through customer engagement.
- Technical and Commercial - involving specification of services and systems, site selection, commercial structure development, procurement and operations through live trials.

5.1 Market Evaluation

NIE Networks will assess the methods employed by GB DSOs to procure Flexibility, collecting all relevant information on technical, commercial and operational requirements including assessment of Flexibility Service Provider bids. Learning shall be taken from the ENA's Open Networks project, GB DSOs and any relevant international examples, identifying good practice and areas where there is variation in approach.

The location of existing TSO System Service providers and potential Flexibility Providers will be geographically mapped in relation to the distribution network, highlighting the extent of services provided, which will support site selection. Learning from GB projects on strategies to increase the number of Flexibility Providers, as it is still an emerging market, will also be reviewed.

Market Evaluation will consider and evaluate the procurement, or development, of a platform which allows NIE Networks to advertise areas in which there are Flexibility opportunities and signpost possible future needs. The evaluation shall consider the integration of this package with NIE Networks' existing capacity map. This will allow the development of a strategy covering the most suitable customer types, use of aggregators, how best to engage with customers, suitable commercial terms etc.

An important aspect of market evaluation is the investigation of any potential conflicts between proposed Flexibility contracts and existing TSO markets and system service contracts. It will be assessed whether contracting with the same asset affects their availability and the degree to which revenues can be stacked.

Customers and aggregators already participating in the TSO markets and contracts will already be acquainted with the process of testing compliance, reporting availability, receiving instructions and to provide the contracted response. This familiarity is expected to be beneficial in recruiting Flexibility Service Providers for distribution network services.

5.2 Technology Assessment

This project will investigate the use of both pre- and post-fault Flexibility and compare the technology requirements and operation of each. The parameters of these services shall be compared with ENA Flexibility product definitions and common parameters adopted where appropriate.

In order to effectively facilitate the trial, a suitable, scalable communications system/platform may be required to dispatch Flexibility and collect performance data to verify service delivery. During the Technology Assessment task, thorough research will be carried out into the technologies (hardware and software) considered necessary to utilise pre-fault and post-fault Flexibility solutions. This trial will aim to establish the most suitable method for dispatching Flexibility Service Providers and monitoring performance including any necessary failsafe measures. This information will feed into the procurement specifications and site selection.

NIE Networks' Network Management System (*NMS*) will need to evaluate the network configuration including real time and forecast network demand and generation to predict when issues would be apparent if an outage occurred and plan for the integration of Flexibility dispatch functionality.

5.3 Technology Assessment

The commercial arrangements for Flexibility must be realised within the project. A structure for payments, which may comprise of availability and utilisation fees, performance assessment and the settlement process, will be developed. To assist, a review of the GB markets, ENA Open Networks

Project outputs and the TSO system services arrangements will be carried out to identify good practice. The inclusion of a performance scalar to penalise/incentivise higher levels of performance shall also be considered when developing the payment structure.

Considering good practice demonstrated elsewhere, the development of the baselining methodology for Flexibility Service Providers is an essential part of this project. Baselining allows Flexibility service delivery to be measured, performance determined and payment calculated in line with contractual terms.

A review of TSO markets and contracts will be carried out identifying potential conflicts and synergies with proposed Flexibility contracts. Where conflicts arise, mitigation measures will be proposed. The TSO market rules must also be assessed to ensure these do not unnecessarily preclude stacking of revenues from providing multiple services where technically possible.

5.4 **Site Selection**

NIE Networks will complete site selection supported by the learnings from previous tasks. This will involve a desktop exercise to identify the location of existing or future distribution network constraints and the availability of Flexibility Service Providers in those areas. The location of the potential Flexibility Services Providers mapped under the Market Evaluation task will support this task. The technical capability of potential Flexibility Service Providers will be evaluated in terms of the suitability of assets for pre- or post-fault Flexibility. Factors such as the availability of communication systems at these locations will also be taken into account.

A sufficient number of prospective trial sites will be selected and advertised to ensure a successful trial allowing locational characteristics to be factored out of trial results analysis. It is envisaged that more locations of Flexibility needs will be advertised than will be progressed through to service delivery.

Subject to the outcome of the Flexibility procurement, NIE Networks plans to trial the utilisation of Flexibility with a minimum of 4 Flexibility Service Providers comprising a variety of customer types and installation conditions; pre-fault and post-fault via aggregator or directly with customers.

5.5 **Marketing and Procurement**

NIE Networks will procure Flexibility from Flexibility Service Providers who are in the correct location to alleviate network constraints identified during Site Selection i.e. electrically downstream from a distribution network constraint. Therefore, NIE Networks will complete pre-procurement customer engagement to establish locations, interest and technical capabilities from potential Flexibility Service Providers. This will involve presentations to and surveys of the customers identified during the Market Evaluation task to determine their interest, technical capabilities and availability.

The project will develop the end to end procurement process including all new documentation requirements e.g. tender documents, tender assessment methodology and a standard Flexibility contract. Consideration will be given to the different approaches used for the procurement of Flexibility by DSOs in GB and outputs from the Open Networks Project such as the development of a common Flexibility contract. This procurement task will also develop a pre-delivery test methodology to verify Flexibility Service Providers' capabilities in line with contractual obligations, prior to commencement of the service delivery period.



5.6 Installation

Both forms of Flexibility, pre-fault and post-fault, may require the development and installation of control and communications systems at customer premises. Following installation of equipment, communication channels between the monitoring points, the network management system and Flexibility Service Providers will be established and verified.

If required, Site Acceptance Tests (SATs) will be conducted to confirm that system performance meets the functionality requirements and technical specifications. This will involve testing the communications systems as well as the delivery of Flexibility from each contracted Flexibility Service Provider.

Note, the final communications and control architecture may not require the installation of equipment at customer premises.

5.7 Trial

NIE Networks will develop a test schedule for the trial which ensures all possible outcomes are tested, in line with current standards. Live trials of Flexibility service delivery will be run in order to test, observe and analyse performance. Flexibility service delivery is expected to commence Q2/3 2021, and will run for a period of at least 12 months reflecting variations in network conditions throughout the year and analyse Flexibility Service Provide performance. In particular, it is important that the trial includes periods during winter peak demand when demand turn down Flexibility (*a primary use case*) is likely to be required most frequently.

5.8 Analysis of Results

Flexibility Service Provider performance will be monitored continuously by NIE Networks during the trial period. When the trial is complete, a detailed assessment of the impact on power quality, losses, thermal and voltage capacity headroom and any impact on existing assets (*asset lifespan, maintenance cycle etc.*) will be documented. The outputs from this task will feed into the cost benefit analysis (CBA) for the utilisation of Flexibility and BaU integration. Findings will include recommendations for BaU deployment for NIE Networks.

5.9 Customer Experience

All Flexibility Service Providers who expressed an interest or were involved in the project will be surveyed before and after the trial to understand their experience and collate feedback. The information gathered through the surveys will feed into the transition to BaU, future Flexibility market development, as well as streamlining procurement and operational processes.

5.10 Transition to Business as Usual

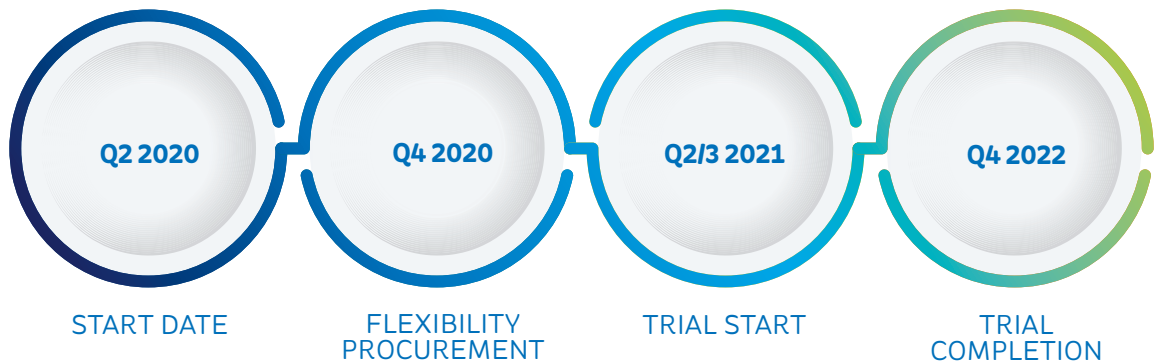
Subject to the success of the trial and a positive CBA for Flexibility, NIE Networks will advance deployment of Flexibility to BaU. This will include developing processes, policies and specifications as well as developing staff as required. A review of the Flexibility procurement and operation process will produce recommendations for streamlining and efficiency opportunities.

A report on the operational process for Flexibility dispatch, monitoring, performance assessment and settlement will be developed at the completion of the FLEX project to assist BaU transition. This review will feed into the development of future versions of NIE Networks' Network Management System with advanced functionality; and identify areas for automation or where additional functionality or platforms are required. Dissemination of project learning will take place upon completion and will include events hosted by NIE Networks.

The Transition into BaU encompasses a number of tasks:

1. Making a fully justified business case in order to demonstrate the benefits of using Flexibility and the learning stemming from the FLEX project.
2. Preparing the necessary documentation that would cover planning and operation policies, the specifications of the systems and the contract templates for Flexibility Service Providers.
3. Consider internal and external feedback, adapting technical and commercial requirements as well as procurement and operational processes to work more efficiently for all parties.
4. Determine the ownership of Flexibility within NIE Networks and provide NIE Networks' staff and the Flexibility Service Providers with support.

6. Project Timeline



As we move towards a net zero economy by 2050, NIE Networks is working on and trialing a range of innovation initiatives. If you would like to find out more about these projects and our plans for the future of energy in Northern Ireland please visit www.nienetworks.co.uk/futurenetworks

