

# Innovation Summary Report

31<sup>st</sup> July 2024



# 1 Foreword

Welcome to our summary report of Innovation Summary Report for the initial year of RIIO-ED2. In this document we set out all our innovation projects from this regulatory period, along with those ED1 project that were closed down during this time, and share their learning outcomes, benefits and proposed implementation.

We also draw out those innovation activities from reporting period 1 April 2023 to 31 March 2024 for the Electricity North West license area.

We seek to innovate every day across all our business activities to ensure that we can respond to the evolving needs and expectations of our customers in an increasingly uncertain energy future. Over ED2 we will look to deliver projects that support a just transition to net zero, whilst ensuring that none of our customers get left behind.

## NIA

Our NIA activities are centred around the early-stage technology development, application of research and network demonstration trials. We have received £8.4m to spend across ED2, with a review to be carried out in 2026. This funding is in line with our ED1 funding levels, and lines up with our commitment to continuing innovation.

The ED1 period saw us deliver a portfolio of 32 projects, providing significant learnings and the accelerated benefits to customers with 13 notable projects being deployed rapidly into BAU. We will look to continue this record of success through the ED2 price control.

- Our Sentinel project provided key learnings on improving the safety of our overhead network by providing additional visibility and the ability to remotely detect and locate faults. The deployment of the Sentinel equipment is a key part of our ED2 business plan as the bespoke deliverable, Linesight.
- Another project focused on safety was the Neutral Conductor Integrity project (NCI), which looked to detect early signs of degradation in the LV neutral allowing for early intervention before hazardous situations arose. The solution has been tested on live equipment on a test network and shows great promise. We are looking to follow up on this with a further project in ED2 to
- The Advanced Transformer Monitoring System (ATMS) project expanded our data capture capabilities on our monitoring equipment, providing additional functionality in the form of through fault current (TFC) assessment. Additionally, the analytics carried out on this data were refined and enhanced and the data portal is being integrated into our IT systems to give a near real-time view of asset condition.
- Enhanced LFDD sought to build on the outputs of the ESO's SHEDD project which looked at options to redesign the LFDD scheme to better account for the increase in distributed generation. Building on two of the recommendations that came out of the project Enhanced LFDD demonstrated that existing AVC relays could be upgraded to carry out frequency based tripping at the primary substation level.

We recognise how collaboration can be a key ingredient in successful innovation and we remain committed to continuing and increasing third-party contributions to our Innovation programme. Over the ED1 period we ran eight calls for innovation, either standalone or in conjunction with the ENA, with the last call receiving 27 responses from 15 organisations. We took forward from this several ideas and they formed two new projects in 2022: Hyperspectral Imaging and A Statistical Model for

Determining Cut-Out Failures. We have made a commitment in our ED2 business plan to continue this pro-active approach to sourcing ideas and partners.

Across the NIA portfolio our work with third parties is an essential component of innovation at Electricity North West and we consider it central to the successful delivery of our projects. Third parties are actively involved in all our innovation projects, either as a partner or a supplier, and are selected for their expertise or via competitive tender.

In the coming year we look forward to growing our ED2 innovation programme. At the core of our ED2 business plan is our commitment to net zero, innovation and efficiency, and we will focus our innovation ambitions on the key areas of net zero system transition and supporting vulnerable customers. Gathering new ideas, wider collaboration and stakeholder feedback will be crucial to the success in ED2 and we will continue to update on our progress of NIA projects throughout.

## **SIF**

The start of RIIO-ED2 marked our entry into the SIF process, where we have enjoyed notable success, winning £1.7m of funding across 7 projects delivered during the year alongside collaborating of a further 3. This portfolio of projects has highlighted the flexibility of the SIF process in allowing projects to develop in stages. The benefits of this phased approach can be seen in the outputs of our various projects.

- Across the Discovery and Alpha projects Retrometer created a methodology to quantify the benefits of applying retrofit energy efficiency measures. This will allow for a more accurate assessment of the impact of various measures for both the consumer and the DNO. As this had fully explored the idea a Beta phase project was not deemed appropriate.
- The Rewire project investigated the feasibility of domestic level seasonal storage to increase network resilience and help defer reinforcement needs. Following the Discovery project, it was clear that whilst the idea had merit, the technology was not yet commercially viable, so it was not progressed to an Alpha project.
- Net Zero Terrace looked into ways to decarbonise entire terrace streets using a combination of individual and communal LCTs to tackle the particular challenges associated with these properties. This has drawn widespread interest from various sources, including a number of local authorities. Across the Discovery and Alpha projects significant progress was made on both the technical side and, more critically, the customer engagement side. In order to further refine the methodology prior to a widespread demonstrator we have set up a NIA project to ensure we are best placed for a potential future Beta application.
- The LDES Node project sought to provide a way to optimise the siting of long term energy storage systems on the network. The Discovery project determined the necessary outputs to allow a visual representation of locations that met both local authority and DNO requirements. We have now paused this project to provide time to refine the scope before a potential Alpha submission.
- CoolDown explored the impact on the network of increasing uptake of cooling due to the changing climate. The Discovery project also investigated the use of this demand to provide a new source of flexibility. We have submitted an Alpha application for this project

A further key impact of the SIF process is that it has broadened the range of partners we have collaborated with. Across the portfolio of projects, we have run to date we have had eighteen project partners of which seventeen were new to ENWL. This has ensured that our SIF innovation has a wider range of ideas and engagement.

## NIC

Alongside our work on NIA and SIF project we also have two ongoing NIC projects in QUEST and BiTraDER. Over the year we have spent over £3m delivering these flagship innovation projects.

The £9m QUEST project builds on our highly successful CLASS and Smart Street projects by looking to create a whole system voltage optimisation system to further drive the efficient running of our network. In addition, the new holistic voltage control methodology will:

- Ensure the network operates as efficiently as possible, optimising the system voltage to connected customers and minimising losses.
- Further boost the benefits available from existing voltage management techniques.
- Facilitate the increased connection and use of LCTs.
- Maximise benefits to all customers through demand reduction at High Voltage (HV) and Low Voltage (LV).
- Explore the potential of reactive power absorb in supporting NG flexible services.

The project is currently about to enter the live trial phase where we will prove the viability of the system on our network. Despite some challenges around the IT design following a change in the cybersecurity environment early in the project we are on track to close down the project by July 2025.

BiTraDER is an £8.4m four year project that is looking to explore the operation and desire for a bilateral trading market through which connected customers can trade their position in the merit order stack. This allows them flexibility in how they meet their curtailment obligations during network constraints, and the additional revenue stream facilitates the connection of flexibility to the network.

Currently, we are developing the components that have been designed be built into a working model to enable customers to trade in BiTraDER. Over the next six to eight months, we will develop:


- The trading platform programmed with the agreed market algorithms.
- Upgrades to the ENWL IT systems to enable interfaces with the BiTraDER platform.
- The scenarios and methodology for carrying out the simulation trials.

We will also continue to conduct further customer engagement and recruitment to ensure we have the right mix of customers for the live network trials. The project remains on track to complete on schedule in 2026.

## 2 Key Facts




7 ENW projects  
delivered and 3  
supported



100% of awarded  
funding spent



4 projects in  
transition to BaU



Over £8.4m NIA  
funding to invest  
over the price  
control



Over 50 partners  
and suppliers  
engaged of which  
17 are new to  
ENWL



£4.6m spent in  
FY24 across NIA,  
NIC and SIF

### 3 Innovation Strategy

Our Innovation strategy sets out the focus areas for our programme of works across the price control, which reflect the challenges of the industry and the company. It is linked to the ENA national strategy to ensure that we support the GB networks as a whole, but which is also tailored to our unique challenges. Following an update to the ENA document we will be updating our strategy to ensure that we remain aligned to the national priorities.

Our strategy originally formed part of our ED1 business plan and was a living document throughout the price control, being updated to reflect changes in the national picture along with learnings developed through our projects. This provided a foundation for us to build on in our focus areas for ED2, where we will continue to follow the same philosophy.

*Figure 3: Our challenges*



Core to the principles of the [RIIO framework of electricity regulation](#), is that network operators must continue to provide and plan for a reliable and efficient network, whilst preparing for the net zero future, keeping costs low and ensuring that all our customers are included and treated fairly and equitably. Successfully delivering against our RIIO objectives presents several challenges right across the organisation, and it's in these areas that we aim to focus our innovation efforts.

For ED2, innovation can be categorised into three areas:



*Embedded innovation* – proven innovation which is considered the default solution to a problem.



*Business-as-usual innovation* – short-term, lower risk innovation funded by our base revenue allowance.



*Ofgem innovation stimulus* – innovation funded by our customers under a mechanism agreed by Ofgem, which demonstrates long-term value for customers with a focus on energy system transition and customer vulnerability.

Taking innovation into BAU is considered essential to our undertaking a project. After all, it's only when the innovation has been adopted across our business (i.e., embedded and considered the default solution) that our customers realise the benefits. To ensure a consistent approach and, crucially, a smooth and successful transition to BAU, all innovation projects follow our innovation lifecycle.

### ***Our innovation lifecycle***

Innovative ideas can come from a variety of sources, including diverse stakeholders such as academia, customers, partners, our supply chain, and our people, and are assessed against our strategy and business plan.

An idea will not be taken forward unless the value for customers is clear and there are appropriate linkages to at least one of our innovation themes.

Ideas are then turned into projects, which describe the aims, objectives and expected outcomes. Once partners are identified, together we will discuss the project scope to understand the value and cost.

During project delivery, we rely on our proven project management skills to ensure projects are delivered on time and to cost. We also engage with the wider business to ensure that the scope includes all elements required to support the transfer to BAU.

Once the project is complete, we share learning. This is essential to avoid duplication and extend the benefits from our work to others, before the transfer to BAU.

Figure 4: Innovation lifecycle





## 4 NIC Project Highlights

### QUEST

NIC

Using a novel application of proven technology combined with innovative software, QUEST will build an overarching system which operates a holistic voltage control methodology to co-ordinate existing and future voltage management techniques, establishing efficient network operation, promoting low-cost connection and use of LCTs.



Consumer  
vulnerability



Net zero & energy  
system transition



Optimised assets  
and practices



Flexibility and  
commercial evolution



Whole energy  
system

#### Benefits



Optimise system voltage



Facilitate LCT uptake



Maximise use of low carbon  
generation



Boost benefits of existing techniques



Easily adopted by other DNOs



Timescales

Start:  
**Jan 2021**

End: **Apr 2025**  
**LIVE PROJECT**



What next

We are in position to begin the live trials of the system to prove the operation of the QUEST software.

<http://www.enwl.co.uk/quest>

Using extensive engagement with connected resources, culminating in their participation in a real-life trial, BiTraDER will demonstrate how access to a neutral market allows connected resources to trade their curtailment obligations bilaterally, encouraging more of them to participate in flexibility markets.

 Consumer vulnerability		 Net zero & energy system transition	 Optimised assets and practices	 Flexibility and commercial evolution	 Whole energy system	
<b>Benefits</b>		 <b>Timescales</b>	Start: <b>May 2022</b>			
	Increase availability of flexibility					
	Reduce barriers for low carbon generation					
	Offers more choice and reduces risk to flexible connection customers					
	Increases competition through a transparent neutral market					
	More effective network management		 <b>What next</b>	We have developed and published the market trading rules and we are working on the detailed design for the end to end system. We are continuing to sign up some customers to assist the market design and take part in the trials which are due to start in August 2024.		
<a href="http://www.enwl.co.uk/bitrader">http://www.enwl.co.uk/bitrader</a>						

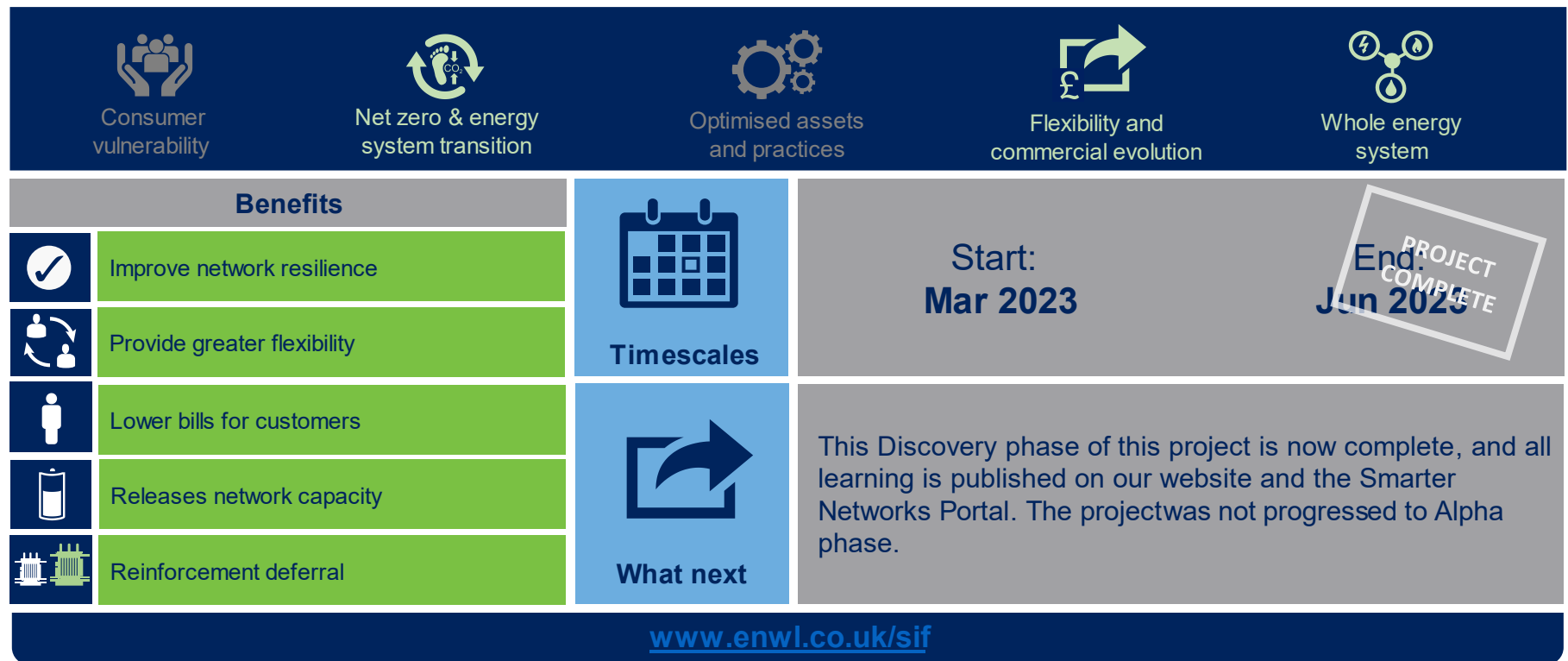
**LIVE PROJECT**  
 End: **Jul 2026**

## 5 SIF Project Highlights

### REsidential Whole system Integrated REsilience (REWIRE)

SIF

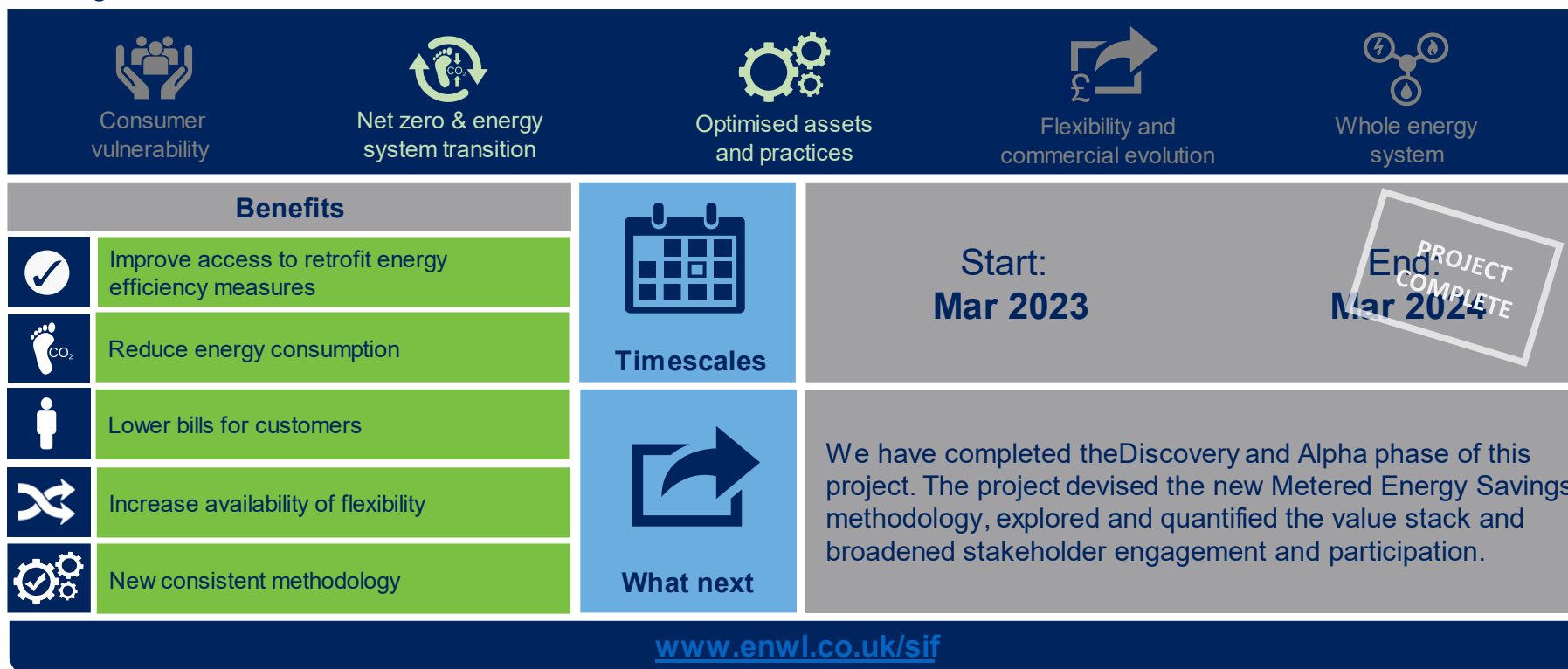
The REWIRE discovery phase began investigations into whether networks could use domestic level solutions to improve wider network resilience.



## RetroMeter

SIF

RetroMeter will provide and demonstrate a consistent methodology to accurately meter the energy and cost savings benefits of retrofit energy efficiency measures unlocking pay -for-performance financing, increasing uptake and leading to reduced costs for consumers and additional flexible services for the DNO.
















## Net Zero Terrace

SIF

Net Zero Terrace will demonstrate how to decarbonise an entire terraced street using a smart local energy system that is integrated with the network but is also optimised, affordable to consumers and easily replicable across Great Britain.

 Consumer vulnerability	 Net zero & energy system transition	 Optimised assets and practices	 Flexibility and commercial evolution	 Whole energy system
<b>Benefits</b>		 <b>Timescales</b>	<div>Start: <b>Mar 2023</b></div> <div>End: <b>Mar 2024</b></div> <div>PROJECT COMPLETE</div>	
 Improve access to LCTs for terraced streets				
 Reduce carbon emissions		 <b>What next</b>	<p>We have now completed Discovery and Alpha, which demonstrated that integration of a SLES into our network is possible. Looked at how best to accommodate the solution, conducted further investigation into maximising the benefits of flexibility for customers, and undertook community engagement through the Fairer Warmth app. We plan to develop this further under an NIA project before looking at a Beta application</p>	
 Support a just energy transition				
 Opportunity for active participation in local energy market by customers				
 Replicable across GB network				
<a href="http://www.enwl.co.uk/sif">www.enwl.co.uk/sif</a>				

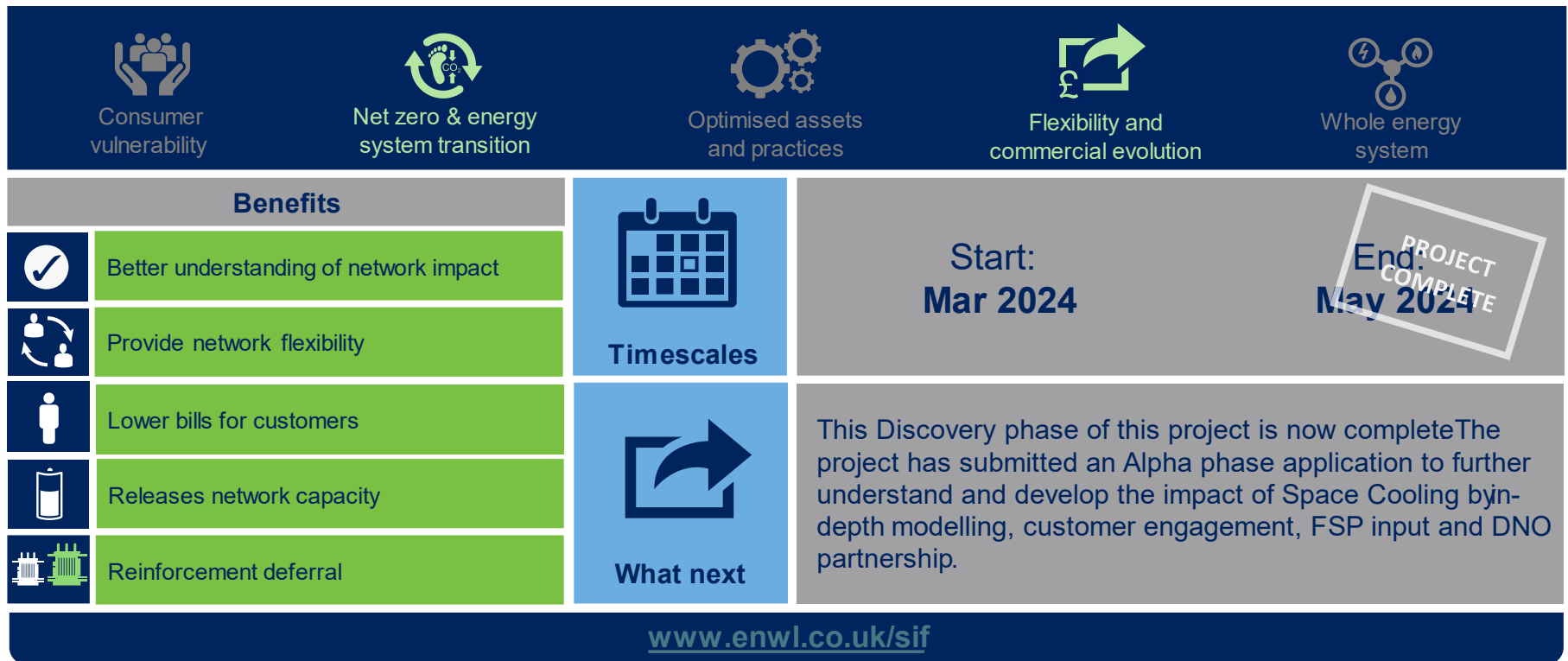
Long Term Duration Energy Storage (LDES) Node investigates the optimal locations to deploy LDES technology to reduce network constraints and maximise output from renewable generation along with providing flexible services.

 Consumer vulnerability	 Net zero & energy system transition	 Optimised assets and practices	 Flexibility and commercial evolution	 Whole energy system	
<b>Benefits</b>		 <b>Timescales</b>	<b>Start:</b> <b>Mar 2024</b>		
 Highlights optimal locations for LDES technology deployment					
 Assists with alleviating local network constraints					
 Reduces CO2 emissions by maximising the output of renewable generation					
 Provides cost savings for users of network services					
 Feeds into Local Area Energy Plans	 <b>What next</b>	We have now completed Discovery, which highlighted the visual outputs to optimally situate LDES technologies to meet Local Authority and network requirements. All learning is published on our website and the Smarter Networks Portal. We have paused here to review the project prior to a potential Alpha submission			
<a href="http://www.enwl.co.uk/sif">www.enwl.co.uk/sif</a>					

## CoolDown

SIF

CoolDown explored the impact of cooling on network capacity by producing improved cooling uptake and demand projections. We then developed novel commercial models to incentivise and unlock flexibility from space cooling, reducing required network reinforcement and optimising value for consumers.
















## 6 NIA Project Highlights

### ENWL006: Sentinel

NIA

The project will trial new fault location techniques on overhead networks. By developing novel fault location sensors which enable earlier detection and response to broken or damaged conductors, Sentinel will improve the quality of supply for customers and improve safety on the network.

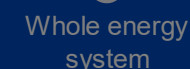
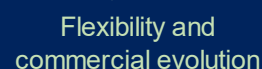
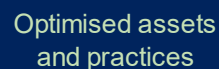
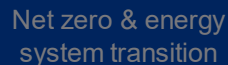
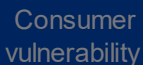
 Consumer vulnerability		 Net zero & energy system transition	 Optimised assets and practices	 Flexibility and commercial evolution	 Whole energy system			
Benefits		 Timescales	Start: <b>Sep 2015</b>			End: <b>Mar 2024</b> 		
	More precise fault location							
	Detects emerging faults							
	Detects high impedance faults							
	Reduction in CMLs							
	Real time condition monitoring		 What next	The fault location sensors are being deployed as part of BaU and are providing notifications to our Control Room We have successfully shown that the system can automatically generate incidents in response to triggers.				
<a href="http://www.enwl.co.uk/nia">http://www.enwl.co.uk/nia</a>								



## ENWL027: Enhanced LFDD

NIA

This project will explore the use of SuperTAPP SG relays, currently installed at the majority of ENWL's primary substations, to provide a more granular LFDD service. In addition, by using the relays in conjunction with measuring equipment the direction of the power flows can be taken into account, allowing net exporters to remain connected.



## Benefits



Start:  
Jun 2021

End: **Mar 2024**

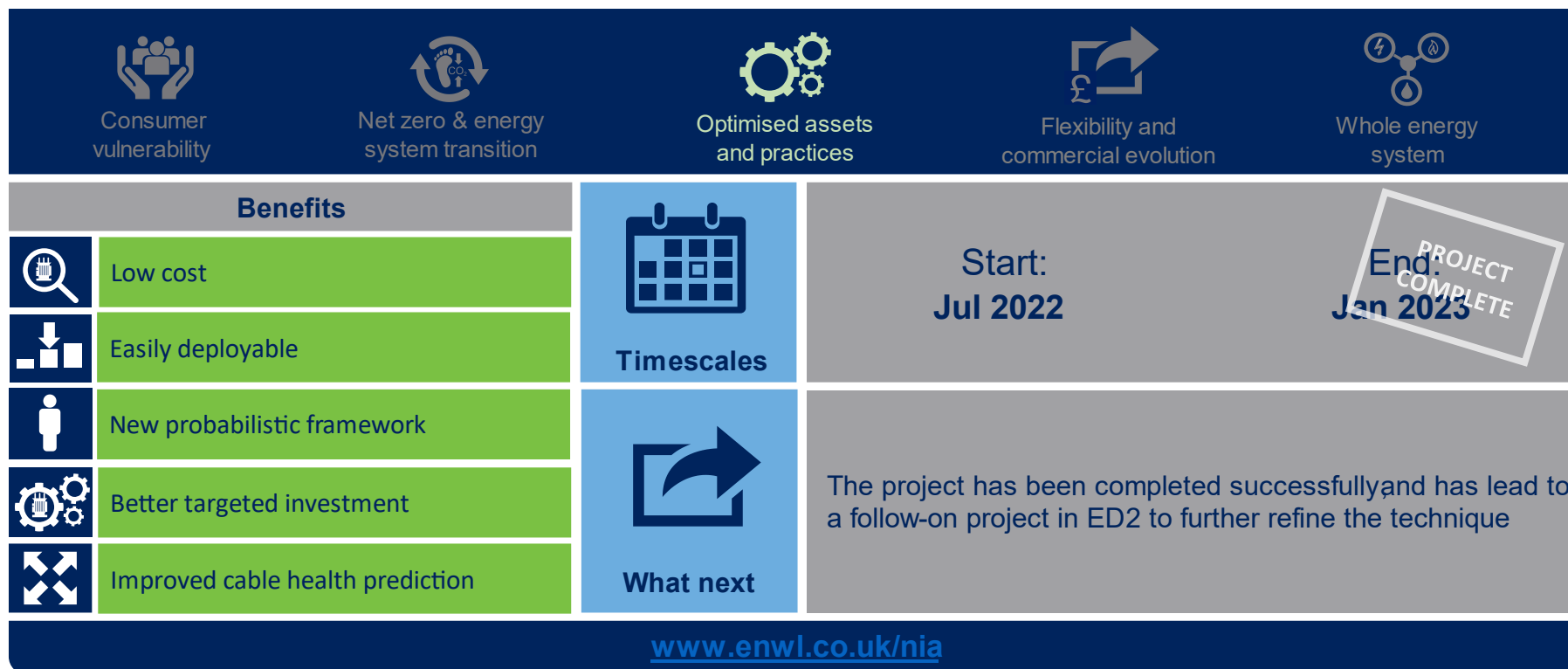
The Project successfully demonstrated that the SuperTAPP SG relay can deliver frequency based tripping, as well as discriminating based on load levels. There is further development required to ensure that it performs in line with the OC6 specification.

[www.enwl.co.uk/nia](http://www.enwl.co.uk/nia)

## ENWL028: LV Predict

NIA

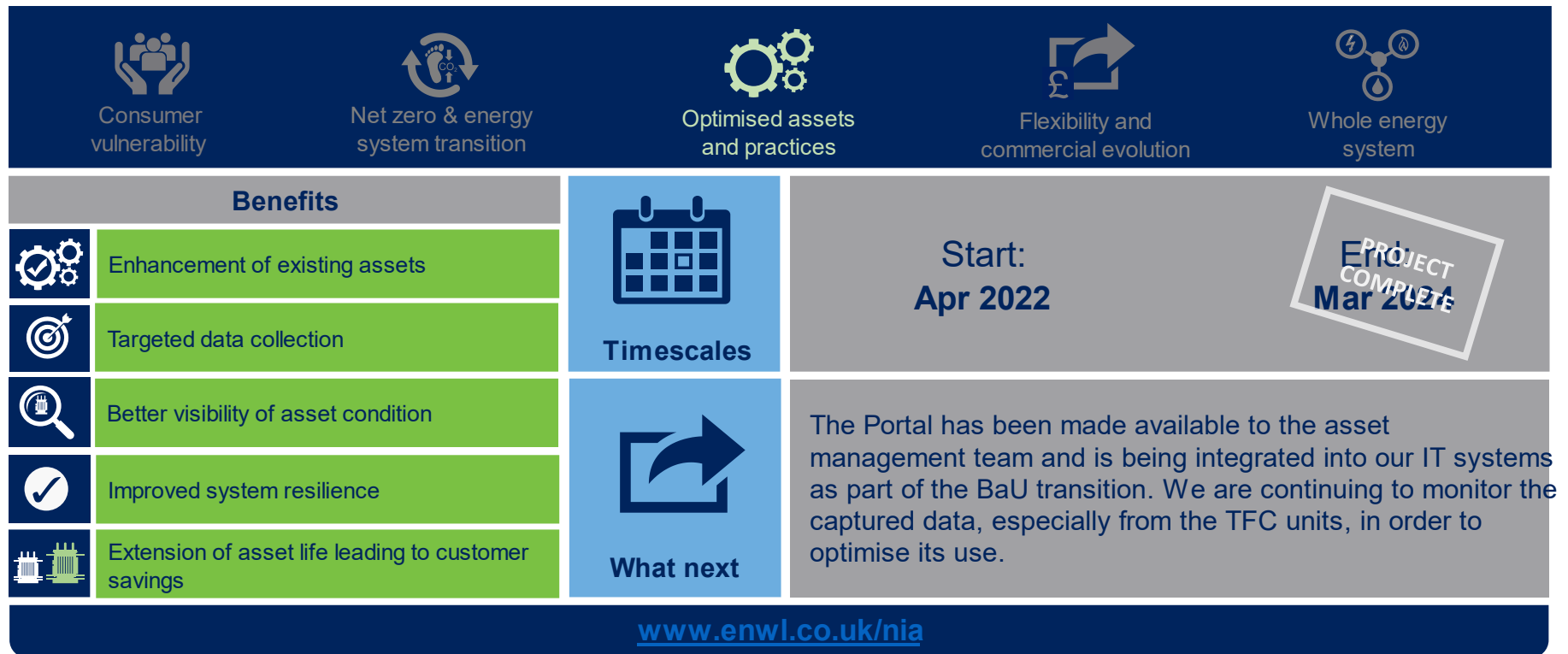
This project will develop a probabilistic framework which predicts the current state of the LV assets across a representative part of the network, most likely as a probability distribution of times to failure, or equivalently the probability of failure in a specific time interval.



## ENWL031: Automated Transformer Monitoring System (ATMS)

NIA

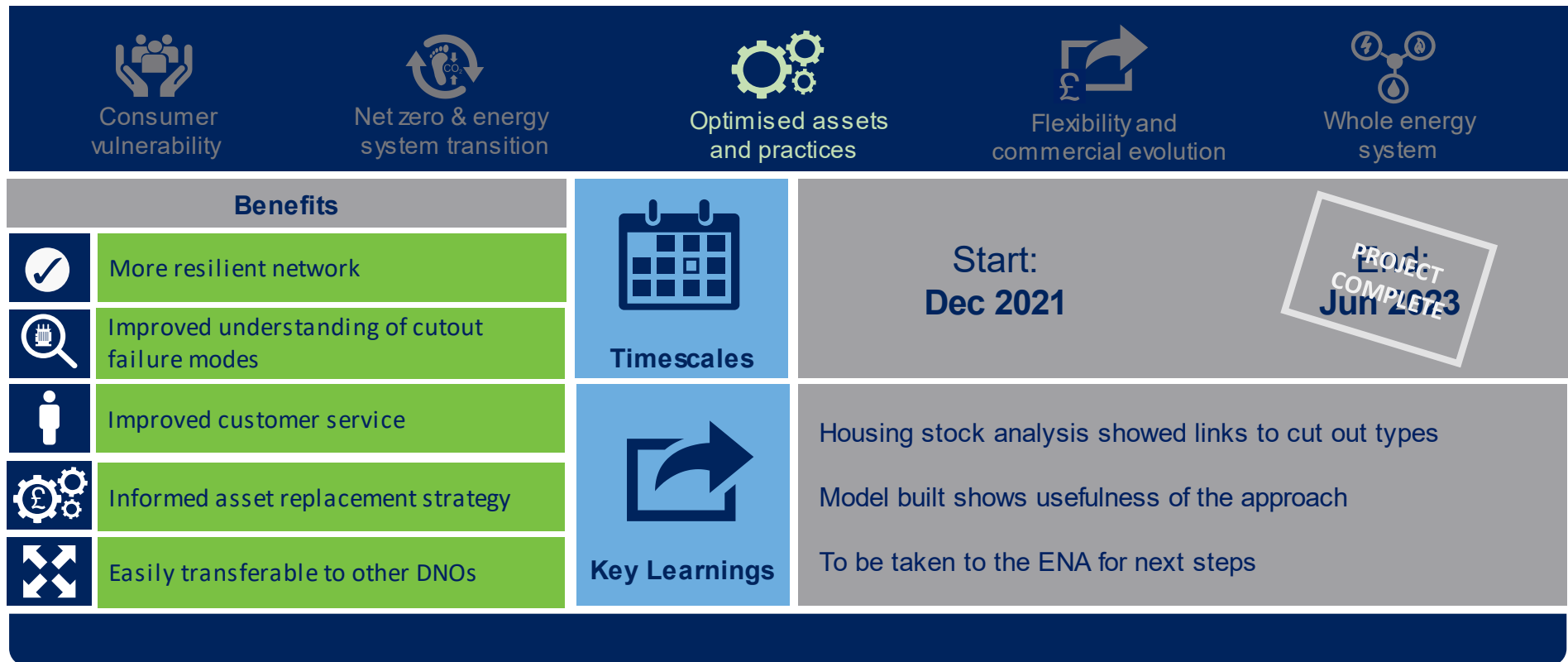
This project will see the upgrade of a number of Totus units and look to integrate the data gathered into ENWL's Chime database, which is used for management of our assets.



## ENWL029: Statistical Model for Cutout Failure

NIA

This project carried out a combination of literature review and data analysis around modes of cutout failure to generate a condition assessment model which allows targeted replacement of cutouts in a controlled manner.



NIA

Consumer vulnerability

Net zero & energy system transition


























Optimised assets and practices


























Flexibility and commercial evolution


























Whole energy system

[www.enwl.co.uk/nia](http://www.enwl.co.uk/nia)


























## 7 Overview


























Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">Celsius</a>	NIC						Complete
<a href="#">Capacity to Customers</a>	LCNF 2						BAU
<a href="#">CLASS</a>	LCNF 2						BAU
<a href="#">Smart Street</a>	LCNF 2						BAU
<a href="#">Respond</a>	LCNF 2						BAU


























Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">QUEST</a>	NIC						In progress
<a href="#">BiTraDER</a>	NIC						In progress
<a href="#">ENWL001: Demand Scenarios with Electric Heat &amp; Commercial Capacity Options</a>	NIA						BAU
<a href="#">ENWL002: Distribution Asset Thermal Modelling</a>	NIA						Complete
<a href="#">ENWL003: P2/6 Rewrite</a>	NIA						BAU


























Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL004: Combined Online Transformer Monitoring</a>	NIA						Complete
<a href="#">ENWL005: Asset Risk Optimisation</a>	NIA						BAU
<a href="#">ENWL006: Sentinel</a>	NIA						BAU
<a href="#">ENWL007: Reliable Low Cost Earth Fault Detection for Radial OHL Systems</a>	NIA						BAU
<a href="#">ENWL008: ATLAS</a>	NIA						BAU





















































Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL009: Cable Health Assessment</a>	NIA						Complete
<a href="#">ENWL010: Value of Lost Load (VoLL)</a>	NIA						Complete
<a href="#">ENWL011: Enhanced Voltage Control</a>	NIA						BAU
<a href="#">ENWL012: Investigation of Switchgear Ratings</a>	NIA						BAU
<a href="#">ENWL013: Detection of Islands</a>	NIA						Complete

Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL014: Optimisation of Oil Regeneration</a>	NIA						Complete
<a href="#">ENWL015: Tapchanger Monitoring</a>	NIA						Complete
<a href="#">ENWL016: Future Network Modelling Functions</a>	NIA						Complete
<a href="#">ENWL017: Electricity and Heat</a>	NIA						Complete
<a href="#">ENWL018: Avatar</a>	NIA						Complete

Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL019: Interface</a>	NIA						Complete
<a href="#">ENWL020: Artificial Intelligence &amp; Machine Learning</a>	NIA						Complete
<a href="#">ENWL021: VoLL 2</a>	NIA						Complete
<a href="#">ENWL022: Reflect</a>	NIA						BAU
<a href="#">ENWL023: Intelligent Network Meshing Switch</a>	NIA						BAU

Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL024: Smart Heat</a>	NIA						Complete
<a href="#">ENWL025: On-line Assessment of Neutral Conductor Integrity</a>	NIA						In Progress
<a href="#">ENWL027: Enhanced LFDD</a>	NIA						In Progress
<a href="#">ENWL028: LV Predict</a>	NIA						Complete
<a href="#">ENWL029: A Statistical Model for determining cut out failures</a>	NIA						Complete

Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">ENWL030: Hyperspectral Imaging</a>	NIA						Complete
<a href="#">ENWL031: Advanced Transformer Monitoring System</a>	NIA						Complete
<a href="#">ENWL032: A Needs based segmentation of low income and vulnerable customers</a>	NIA						Complete
<a href="#">Net Zero Terrace Discovery</a>	SIF						Complete
<a href="#">Net Zero Terrace Alpha</a>	SIF						Complete

Project	Funding	Themes					Status
		Consumer vulnerability	Net zero & energy system transition	Optimised assets & practices	Flexibility & commercial evolution	Whole energy system	
<a href="#">Rewire Discovery</a>	SIF						Complete
<a href="#">Retrometer Discovery</a>	SIF						Complete
<a href="#">Retrometer Alpha</a>	SIF						Complete
<a href="#">LDES Node Discovery</a>	SIF						Complete
<a href="#">CoolDown Discovery</a>	SIF						Complete

