



CUMBRIA

ELECTRICITY GRID REVIEW

Delivering an electricity grid system to enable the
Clean Energy Transition in Cumbria.

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INTRODUCTION

The provision of affordable and reliable electricity to households and businesses underpins our entire economy and the quality of life for all of our citizens, with Cumbria being no exception to this. There is now significant focus on the source of the energy generated with a desire to phase out traditional fossil fuel generation in favour of clean generation technologies in line with the UK's commitment to achieve net zero by 2050. This transition to clean sources of energy for heating, transportation and businesses depends on the ability of our electricity network to accommodate a much higher and more dynamic supply and demand mechanisms.

The clean energy transition presents significant opportunities for Cumbria, which has excellent potential to become a key clean energy generation region for the UK across a wide range of different technologies at both large and small scale including nuclear, wind, solar, hydrogen, hydro and bio-energy. Cumbria's energy intensive industries also need to move away from fossil fuels for process heating. The delivery of these ambitions are predicated on investment and improvements to the electricity network. This is not unique to Cumbria and needs to be considered as part of the wider national and regional context.

This document is designed to provide a summary of the organisations involved with the electricity network spanning generation, national transmission and local distribution, an overview of current infrastructure improvements and activity to improve the pace of connections for businesses. The role of the new Energy System Operator and Regional System Operator to oversee the entire energy supply and demand as the UK transitions to clean energy is also outlined as are the capacity requirements for large clean energy projects such as nuclear and offshore wind.

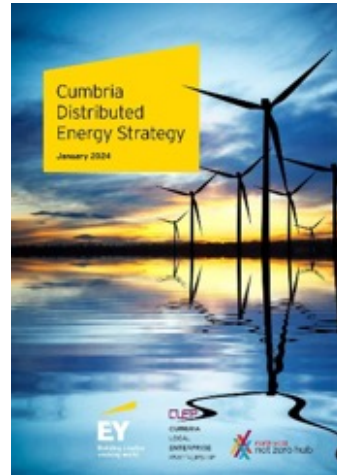
It is intended that this document will be used by businesses, local government and wider stakeholders in Cumbria as a basis to understand the potentially complex electricity network and to help inform their own plans for transition to a low carbon energy future. Whilst focusing on the electricity network it is important to note that the new Energy System Operator function will also address the gas network, which will become important as the UK transitions away from natural gas and asset are used for either hydrogen or CO₂ capture and storage.

In 2021, Cumbria Local Enterprise Partnership issued a Cumbria Grid review document with the prime purpose of assessing the potential to accommodate new large clean energy developments. This concluded that that the planned improvements at the time could accommodate a moderate scale of new clean energy projects at small scale, including a Small Modular Reactor plus a range of community level projects but significant new investment would be needed for larger scale nuclear and offshore wind projects. This update provides an updated understanding of the Cumbria Electricity network, whilst recognising that simple numeric quantification is difficult.

Section 1 Components of the Electricity Network System

Essentially there are three components of the Electricity Network System

- 1. Generation Assets** – These can be at a national, regional or community level and the drive to clean energy is seeing the transition from large coal and then gas continuously powered stations to a wide range of clean energy types, which results in greater fluctuation in capacity. Generation assets are typically owned and operated by a range of private sector companies dominated by multi-national companies with some smaller and community providers. The recently announced Great British Energy provides a pathway to public ownership of new clean energy generation assets. The potential for clean energy generation in Cumbria is addressed in the CLEP Clean Energy Strategy and Distributed Energy Systems supplement and is therefore not detailed further in this document.



- 2. National Transmission** – This is owned and operated by the National Grid to provide the 'motorway' network to transfer electricity at a national level. Historically, this has been based on transferring electricity at bulk scale from large coal and nuclear powered stations across the country. For Cumbria, the national grid has a main 400KV high voltage transmission line down the M6 corridor with sub-stations at Harker in the north and Hutton in the south of the county.



3. Regional Distribution – The role of distributing electricity from the national grid at a regional level is undertaken by “Distributed Network Operators” (DNO’s). Electricity North West Limited (ENWL) is one of 6 DNOs across the country and responsible for distributing electricity to Cumbria as well as Lancashire and Greater Manchester. Sub stations at Harker and Hutton feed a “Cumbria Ring” at 132KV around the west coast and central spine of the county with further lower voltage network and substations reaching into the centre of the county and further stepping down to the 415/240V systems that feeds Cumbria’s homes and businesses.

- In considering the electricity network system, these additional bodies and Plans are important:
- **Ofgem** – the Office of Gas and Electricity Markets, which acts as the regulator with a role to protect consumers by working to deliver a greener and fairer energy system.
- **Electricity System Operator/National Energy System Operator** – has the responsibility for strategic planning to ensure that the UK has a balanced electricity supply to ‘keep the lights on’ across the country and is currently provided by the Electricity System Operator as part of National Grid. The Energy Act of 2022 outlined the requirement for this to be replaced by a new National Energy System Operator (NESO) to deliver a net zero energy system balancing sustainability, affordability and energy security across Great Britain. NESO will be a public corporation independent from industry and government and will be regulated by Ofgem. It is expected to be formally launched in autumn of 2024. NESO will strategically assess both Electricity and Gas Networks.
- **Regional Energy Strategic Planning (RESP)** – As part of the NESO function, it is expected that RESPs will be set up by the end of 2025/26 to address this strategic planning at a regional level aligning national and local energy plans and to engender local legitimacy. It is anticipated that Cumbria will form part of a North West region RESP. Ofgem have issued a consultation that closes in October 2024 with the expectation of issuing a RESP policy framework by “winter 2024”.

Section 2 Grid Improvement Programmes

This section outlines the known and potential infrastructure improvements that are being delivered by both National Grid and ENWL that are relevant to Cumbria. These will not only increase capacity for demand and generation supply projects but also improve resilience and security of supply.

National Grid

Harker Substation - The Harker site is not only the north Cumbria interface with the national grid but also a key substation for Southern Scotland comprising of 132kV, 275kV and 400kV substations. The substation is undergoing a full rebuild on an adjacent greenfield site to the existing facility. This will address several interactive drivers, which includes the asset conditions of the electrical and civil infrastructures, multiple customer connections, wider network infrastructure investments and environmental aspects. Site works have commenced with the project expected to be complete by 2028.

The upgrade of the Anglo Scottish interconnector circuits will



improve network capacity across the northern transmission circuits. The substation works will allow greater thermal capacity at Harker so that ENWL can connect more customers in Cumbria for both generation and demand. Nationally, it will allow for better utilisation of the electricity generated by onshore wind developments in Southern Scotland. This will give significant boost to clean energy projects in Cumbria.

Future National Grid Improvements

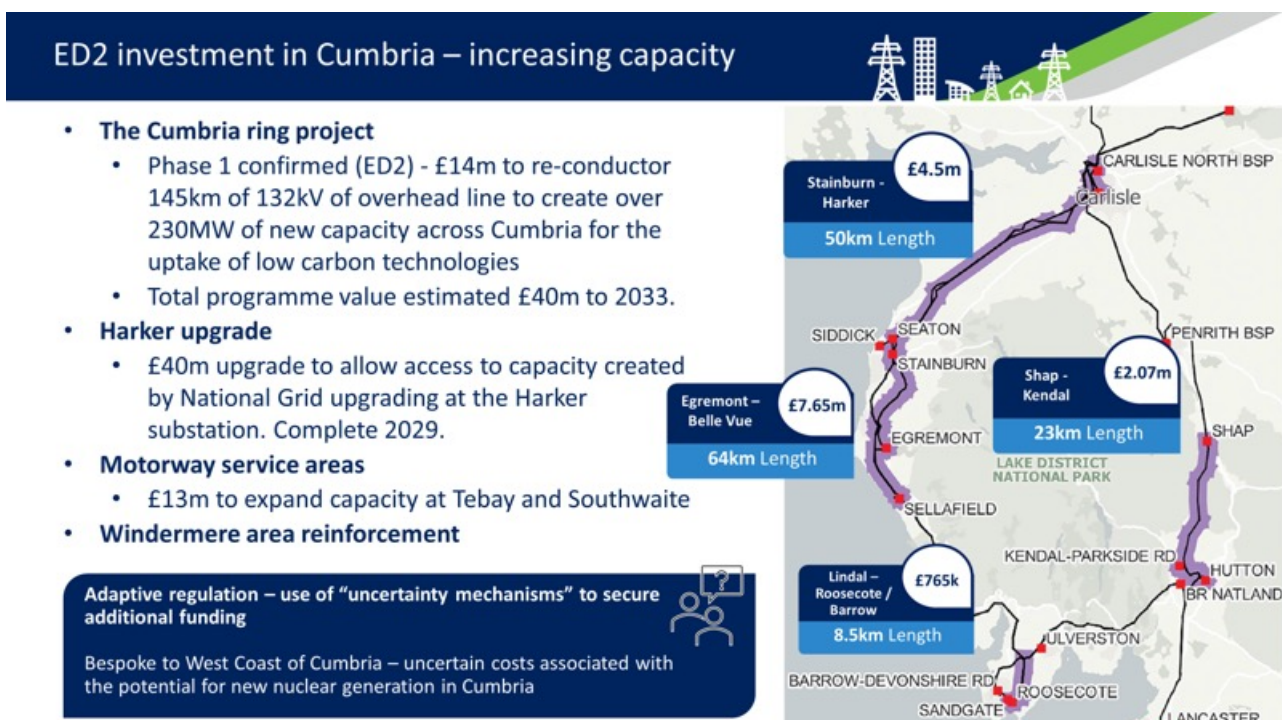
National Grid issued “Delivering for 2035” in May 2023, which provided an action plan to deliver a decarbonised electricity grid system for the UK. As well as calling for planning reform, highlighting the importance of communities and customers, building the UK supply chain, the plan highlighted the requirement for new national grid circuits. In Cumbria this would include a new main circuit in addition to the existing ‘M6 corridor line’ and upgrade the connection between Harker and the North East to deliver a higher voltage system. This with improved circuits in Scotland will allow increased capacity between wind farms in Scotland to consumers across England. These plans are at a very early development but the plan states these will be needed by 2036. A new high voltage transmission line through Cumbria could potentially bring both planning and environmental challenges.

Notably, there are no current plans for new national grid infrastructure to the west of Cumbria as would have been required when the Moorside NUGEN gigawatt power station was being developed. This is further discussed in Section 3.

Electricity North-West Limited Improvements

ENWL is responsible for operating and maintaining over 57,000km of electrical network and thousands of substations across the North West region distributing electricity to 2.4 million homes and businesses. ENWL is regulated by Ofgem. Every 5 years ENWL submits an investment plan to Ofgem which, when approved, determines the price that ENWL can charge customers in five year periods. The current plan is termed RII0-ED2 (Revenue, Incentives, Innovation & Outputs) and covers the period 1 April 2023 to 31st March 2028. In this period, ENWL will invest £2bn in the region’s infrastructure to improve resilience and meet the increasing electrification needs to transition from fossil fuels.

As part of this ED2 investment, the improvements being delivered in Cumbria are aimed at increasing capacity, reliability and resilience as well as investing in innovation across the North-West. These plans are summarised in the tables below;



Importantly, there is a specific “uncertainty mechanism” in the ED2 business plan, which provides the opportunity for ENWL to go back to Ofgem to seek further funding to allow for new nuclear generation capacity in West Cumbria. This is further addressed in Section 3.

ED2 investment in Cumbria – reliability and resilience

Numerous programmes to replace assets across Cumbria to improve reliability including:

- **Worst-served customers programme** - £20m to improve reliability for customers receiving poorest service
- **Storm resilience programme** - £35m submitted for additional funding to improve network resilience to storms including Alston and Coniston areas
- **Borrowdale transformers** - £9m programme to replace over 200 small rural substations
- **Undergrounding** - £5m to replace most visually intrusive overhead lines with underground cables
- **Investment in key substations** – e.g. £5m upgrade to Egremont
- **Tree cutting and maintenance**

Adaptive regulation – use of “reopeners” to secure additional funding – Storm Arwen

Red dots indicate planned investment locations in ED2

ED2 investment in North West – innovation

<p>Smart Street Using innovative voltage control technology, Smart Street will enable our networks and customers’ appliances to perform more efficiently and make it easier for low carbon technologies to connect to the electricity network in the future. Improving energy efficiency and reducing bills for 250,000 customers.</p>	Investment £64m	Savings up to £70 per year	Customers Impacted 250,000
<p>LineSIGHT Faults on rural networks can sometimes cause overhead power lines to hang low whilst remaining live, which also creates a public safety hazard. New technology developed by Electricity North West will enable the detection of damaged equipment earlier and help us to pinpoint the location of faults, enabling more efficient despatch of repair crews.</p>	Investment £34.5m	Overhead Line Impacted 800km	Estimated Completion March 2028
<p>CLASS Our award-winning CLASS project uses innovative voltage control to reduce demand for electricity without customers noticing a difference to their service. CLASS (Customer Load Active System Services) is a low-cost solution which uses voltage control to manage electricity consumption at peak times. By installing cutting edge ‘voltage controllers’ in our substations we could save customers in the North West around £100 million over the next 25 years</p>	CLASS revenue shared with customers 50%	North West customer savings £100m	Fully installed and operational
<p>Dig, Fix and Go A bespoke incentive mechanism that aims to drive a transformational change to reduce the disruption our emergency street works cause to our customers and stakeholders. This is a proposal formed and led by our customer and stakeholder feedback. Reducing disruption by accelerating emergency street works to below 5 days on average.</p>	Investment annually £5m	Average duration emergency street works 5.8 days	1 day reduction benefit per year £21m



Section 3 Capacity for New Clean Energy Projects in Cumbria

The improvements outlined in Section 2 will create additional capacity in Cumbria to deliver a wide range of generation projects in the hundreds of MW size that could provide capacity for new solar, onshore wind and other renewable sources. These could be for supply of clean electricity to the grid or for bespoke systems for industrial sites. The process for connections and timescale improvement initiatives are addressed in Section 4.

The Cumbria Clean Energy Strategy outlines the case for the county to be a major contributor of clean energy to the nation and to stimulate economic growth in the county. This can only be achieved with investment in Cumbria's grid system.

It is considered that schemes of <100MW scale, which would cover onshore wind, bio energy and solar, could be addressed through the existing investment plan as outlined in Section 2. However, bespoke consideration would be needed for new larger scale nuclear and offshore wind projects.

Nuclear – When the NUGEN gigawatt nuclear power station was being planned at Moorside a feasibility study showed that a new national grid supply from both the north and south would be required to provide duplicate circuits as required by the nuclear safety case. The cost of this was estimated to be up to £5bn in 2015 monetary value, with an estimated 10 year completion date. The Department of Energy Security and Net Zero (DESNZ) issued a New Nuclear Roadmap in 2023 recommending a combination of new gigawatt and Small Modular Reactors (SMR - Up to 500MW per unit) to meet an overall target of 30GW of new nuclear capacity in the UK by 2050. Great British Nuclear has been established to deliver this target, with a down-selection on SMR technology and site selection expected in late 2024. Moorside remains a key national asset for deployment of new nuclear capacity either at Gigawatt or SMR scale. The previous assessment completed by CLEP identified that there is potential to accommodate 1 and potentially 2 Small Modular Reactors with minimal capital investment.

Grid requirements will be a challenge for any large scale nuclear project at Moorside but would need to be formally assessed in relation to any specific proposal. Whilst project delivery inflation will have certainly impacted on the costings prepared for the NUGEN proposal, it is important to recognise that newer reactor designs have reduced the need for duplicate circuits and innovation improvements in the delivery of new transmission systems, will offset this. Under ED2, ENWL has the ability to seek further investment for new nuclear under the current business plan period. This would need to be addressed for any large scale nuclear development project.



Offshore Wind - Cumbria has approximately 1.8GW of existing offshore generation capacity off the Cumbria coast. The majority of turbines are in the Furness area, where the electricity generated coming onshore in Lancashire. Robin Rigg is an exception to this, with its capacity of 180MW entering the ENWL Cumbria ring at Workington. The Cumbria Clean Energy Strategy makes the case for further offshore wind expansion off the Cumbria coast. New offshore developments are typically in the range of 500-3000MW so as with nuclear, bespoke consideration will be needed for any new development supplying to the grid via Cumbria. It is worth noting that the new BP and Flotation Energy offshore developments in Morecambe Bay will be connected to the national grid near Preston.

Off-Grid Uses for New Clean Energy Projects – A benefit of new clean energy projects is the ability to attract new industry or decarbonise existing industry using localised clean energy generation. This is important as the Cumbria grid is characterised by high generation supply with a relatively small demand side, in comparison to Greater Manchester in the ENWL region, which has high demand and comparatively small generation capacity. Therefore, securing more of these projects could reduce the demand for grid export and bring new economic growth.

Section 4 Connection Timescales for New Clean Energy Projects

The last three years have seen unprecedented requests for new connections, especially in the major generation sector, both at a national and regional level.

ENWL has seen a ten-fold increase in the capacity of new connections joining the pipeline each year - from just under 400MW in 2020 to more than 4GW in 2023 across its geography.

The current pipeline of major connections is ~8.7GW, with approximately 1.7GW in Cumbria. Anecdotally, businesses in Cumbria have reported connection timescales of over 10 years for large solar schemes, which play a key role in their own net zero plans.

The industry is looking to address current connection lead-times and ENWL is supporting Government, Ofgem, the ESO, National Grid and other DNO's to reform the connections process.

Moving forwards, if projects are 'shovel ready,' they can move up the connection queue in certain situations. Significant improvements in timescales for robust projects have already been reported, following the removal of a number of projects that confirmed that their projects would not proceed.

It should be noted that any project less than 1MW is not subject to these connection queue arrangements.

Section 5 Engagement Mechanisms

Section One outlined the roles of the different organisations within the electricity network system and in a dynamic environment it is vital that there are robust governance and communications processes in place. Cumbria Local Enterprise Partnership has played a key role and it is important that this role transitions across to the new Enterprising Cumbria organisation acting for both Cumberland and Westmorland & Furness Councils and then into any future Combined Authority and devolution arrangements for Cumbria. .

CLEP has operated the following governance bodies, which have an important role in relation to grid connectivity:

- **Transport and Infrastructure Strategy Group** - with wide representation to address overall infrastructure strategy for Cumbria, which includes utilities as well as transportation and digital connectivity.
- **Clean Energy Sector Panel** – responsible for identifying and encouraging clean energy investment in Cumbria. The Panel consisting of a range of private and public sector partners is technologically agnostic and encourages energy generation opportunities in all technology types.
- **Business Decarbonisation Strategy Group** – bringing together Cumbria's most energy intensive industries to identify opportunities to decarbonise their business, share good practice and to identify how to extend this to suppliers and SMEs.

Additionally, the following engagement activity has taken place:

- ENWL has extensive stakeholder management arrangements with an independent advisory group reporting directly to the CEO, and advisory panels representing the voice of the consumer, region and businesses. Cumbria LEP's CEO currently chairs the independent stakeholder panel, with the Head of Sectors providing representation on the business panel.
- ENW and National Grid have readily provided updates to the CLEP Board and to the Clean Energy Panel underpinned with excellent informal engagement.
- CLEP staff, who have transitioned across to Enterprising Cumbria, are funded by a DESNZ grant to North West Net Zero Hub to promote net zero projects in the region. North West Net Zero Hub is playing a key role in engaging with the new NESO to establish the requirements of Regional Energy Strategic Planning.

Cumbrian businesses will also have their own engagement arrangements with ENWL . Alongside this there are also engagement processes for community groups and individual consumers.

Section 6 Forward Actions

The following actions are suggested to ensure a continued voice for Cumbria in the development of the national grid infrastructure to enable the transition to a clean energy network and deliver the investment needed to support clean energy projects across the county.

1. Establish the overall framework to replace Cumbria Local Enterprise Partnership's arrangements for engaging with National Grid, NESO and Electricity North West and to oversee overall infrastructure strategy for Cumbria as well as representing the voice of businesses across Cumbria.
2. Facilitate discussions between developers, ENWL and National Grid to determine grid requirements for major new clean energy projects, such as nuclear and offshore wind, and support the development of any uncertainty mechanism for this need.
3. Develop Cumbria's voice into the new NESO and RESP arrangements.
4. Track progress of current investments for the Cumbria Ring and Harker Substation, to promote completion and ensure that the benefits for clean energy projects are realised across the county.
5. Ensure that there is both sufficient labour and skilled people to deliver the clean energy transition.

Reference Sources

[Electricity North West \(enwl.co.uk\)](https://enwl.co.uk)

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[ESO | ESO \(nationalgrideso.com\)](https://nationalgrideso.com)

[Becoming the National Energy System Operator \(NESO\) | ESO \(nationalgrideso.com\)](#)

[Welcome to Ofgem | Ofgem](#)

[Net Zero | Cumbria LEP \(CLEP\) \(thecumbrialep.co.uk\)](https://thecumbrialep.co.uk)