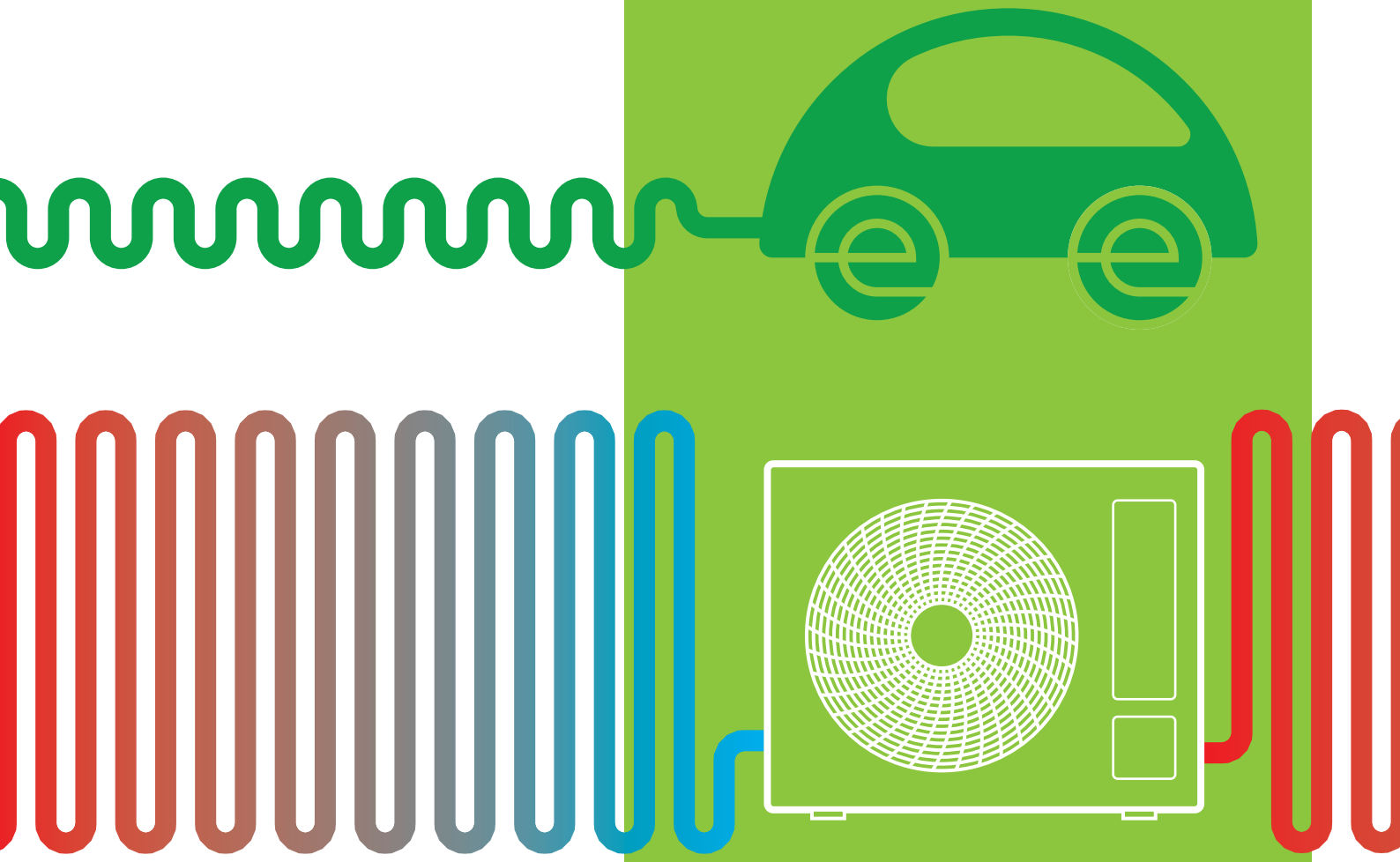
DNO RIIO-ED2
Draft Business Plans

Threepwood Overview and Areas of Expertise



Threepwood Consulting

Helping to Improve the Performance of Electricity Networks

Contents

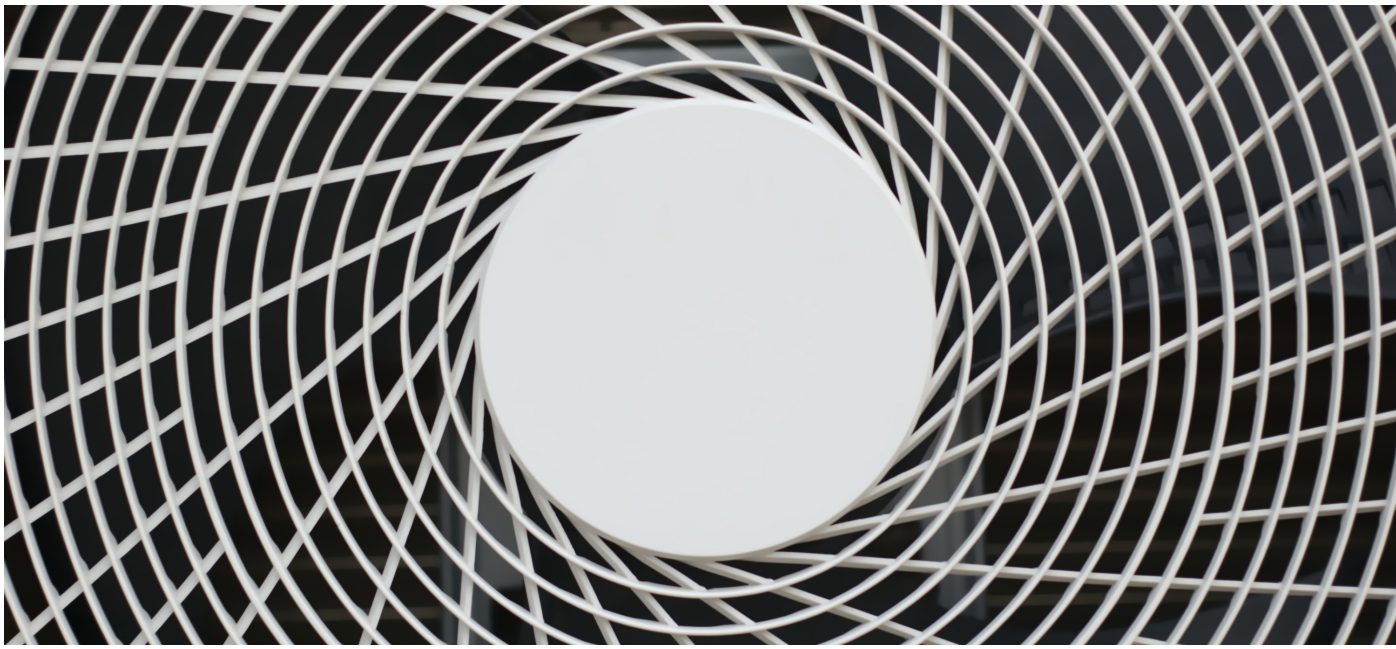
1 Introduction

The purpose of this document is to provide a summary/brief overview of the DNO RIIO-ED2 Draft Business Plans that were submitted by the 6 GB Distribution Network Operators (DNOs) to Ofgem and made publicly available in July 2021[1] for stakeholder consultation prior to final Business Plans being submitted on 1 December 2021. In developing their plans, it is essential that companies carry out robust and high quality engagement with their stakeholders.

RIIO-ED2 will last for five years, starting on 1 April 2023. This will be a critical period in supporting the decarbonisation of the energy system, the wider economy and vital for the UK's ambitions to hit net zero targets[2].

The focus of this document is to provide an overview of the key themes from the Business Plans impacting the industry and customers during RIIO-ED2. Key themes and areas of interest to and where Threepwood Consulting can add value are highlighted. It also highlights areas of interest to and where Threepwood have experience and expertise to help delivery of the Business Plans' objectives. The key themes are:

- Network Resilience
- Net Zero – DSO Strategies
- Environment
- Data
- Innovation



1 DNO Draft Business Plans available on websites
2 https://www.gov.uk/government/publications/net-zero-strategy

2 Key Themes from the Six Business Plans

2.1 Introduction

All six Business Plans have been reviewed in detail. There are five key themes which Threepwood have discerned. A brief commentary on themes is presented, summarising what the Business Plans intend, and areas where Threepwood may be able to add value to the DNOs and industry as a whole. These areas will be built in to our five year business plan, and are discussed in further detail in the following sections.

2.2 Maintaining a Resilient Network – Managing Risk

The DNOs' Business Plans set out views on asset health, criticality and replacement priorities, and the resulting risks posed to network assets and subsequent degradation over the price review period, with and without interventions.

DNOs have also explained their long-term risk objectives and strategy, as well as the long-term benefits delivered by their proposed interventions. The Threepwood Consulting team has the experience and qualifications to help the DNOs' asset management functions meet the ED2 requirements set out by Ofgem around asset inspection, maintenance and replacement including SF_6. **Areas that Threepwood could particularly add value for DNOs are:**

a Asset Replacement including alternatives to SF_6 via our Analysis and proposed innovation project
b LV Mains Cable Replacement
c LV monitoring
d Unlooping of services
e Reducing leakage for Fluid Filled Cables programmes via our proposed marker technology

Threepwood have the capability to optimise or develop a range of policies essential for successful asset management implementation, based on BS ISO 55001:2014 Asset Management requirements. Generic policies include:

- Asset and Risk management
- Audit and review policy
- Asset failure management policy
- Spares management policy
- Asset information policy

2.3 Responding to the Net Zero Opportunity – Distribution System Operation

2.3.1 Introduction

The need for additional capacity on the UK networks over the next decade to support net zero, is linked to greater use of existing connections and an increase in the number of new connections. For example, a significant increase in the number of connection applications for EV chargers and heat pumps is forecast between now and 2028.

As a DSO, the coordination and balancing of regional networks, maintaining and managing new connections, the procurement of flexibility services, whilst facilitating new neutral markets with maximum participation from innovators, Distributed Energy Resources (DER) providers and community groups is essential. This is in addition to gathering, processing, sharing and analysing network data from various sources (see section 3.4 below) whilst maintaining cyber-security.

Embedding DSO roles and responsibilities will enable the transition to net zero and better support net zero ambitions and the connection of these low carbon technologies.

As part of their Business Plans, DNOs have submitted a DSO Strategy, a minimum requirement setting out each company's proposed approach to delivering DSO capabilities. These include:

- Assessment of the issues transitioning to DSO and evidence of how this informs its proposed approach
- Setting out a vision for addressing these DSO transition issues, identifying links between the proposed deliverables and the outcomes and the benefits these will deliver
- Demonstrating how the standard of service outlined in the activities and baseline expectations in Ofgem's Guidance Document Appendix 4[3], Flexibility within households will be achieved in managing load curves and the networks

3 https://www.ofgem.gov.uk/publications/riio-ed2-business-plan-guidance

2.3.2 Flexibility

Flexible solutions such as Active Network Management (ANM) and Demand Side Management (DSM) will drive significant benefits along with freeing up network capacity for DER to be connected. It is essential a neutral market for the provision of flexibility is facilitated for all participants (providers and users) to be confident that they will be treated fairly and the visibility of DER on networks is accessible.

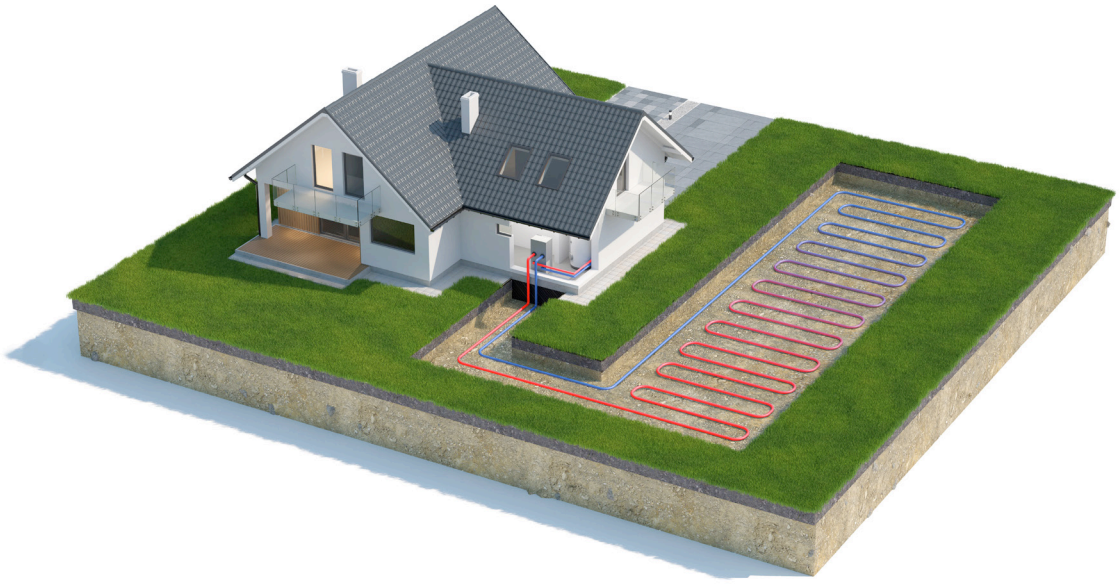
Unlocking network capacity by using flexibility services opens up new markets which will not only avoid the need for traditional network reinforcement but will also assist in the move towards a net zero future. As previously mentioned, flexibility also enables the connection and widescale roll-out of EVs, EV chargers and heat pumps. New figures from the Government's Smart Systems and Flexibility Plan[4] show that flexibility could also reduce annual energy system costs by £10bn a year by 2050, while also creating 24,000 jobs.

This flexibility has so far freed up to 1.6GW (July 2021) over the past couple of years of capacity on the electricity networks during peak periods across GB, the equivalent of connecting 32,000 rapid EV chargers (50kW) or half the size of the proposed nuclear power station at Hinckley Point C (3.2GW). As per the Government's Smart Systems and Flexibility Plan and the DNOs' Business Plans, flexibility is anticipated to increase significantly (3 to 4 times) during RIIO-ED2.

2.3.3 Analysing Flexibility

Flexibility in the future will not just be about commercial or industrial organisations providing ANM or DSR services to the network companies. Once a neutral market is firmly established, domestic users should be able to provide flexibility through the contracted use of:

- Electric Vehicles
- Solar Panels
- Heat Pumps



4 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003778/smart-systems-and-flexibility-plan-2021.pdf

Threepwood can help DNO/DSOs to analyse the flexibility factor within a street and therefore the LV circuit, as the uptake of these technologies increases during RIIO-ED2, and therefore prevent circuit overload.

By analysing network data and modelling, this will enable the DNO to flatten the load curve by taking the Demand Side Management approaches below:

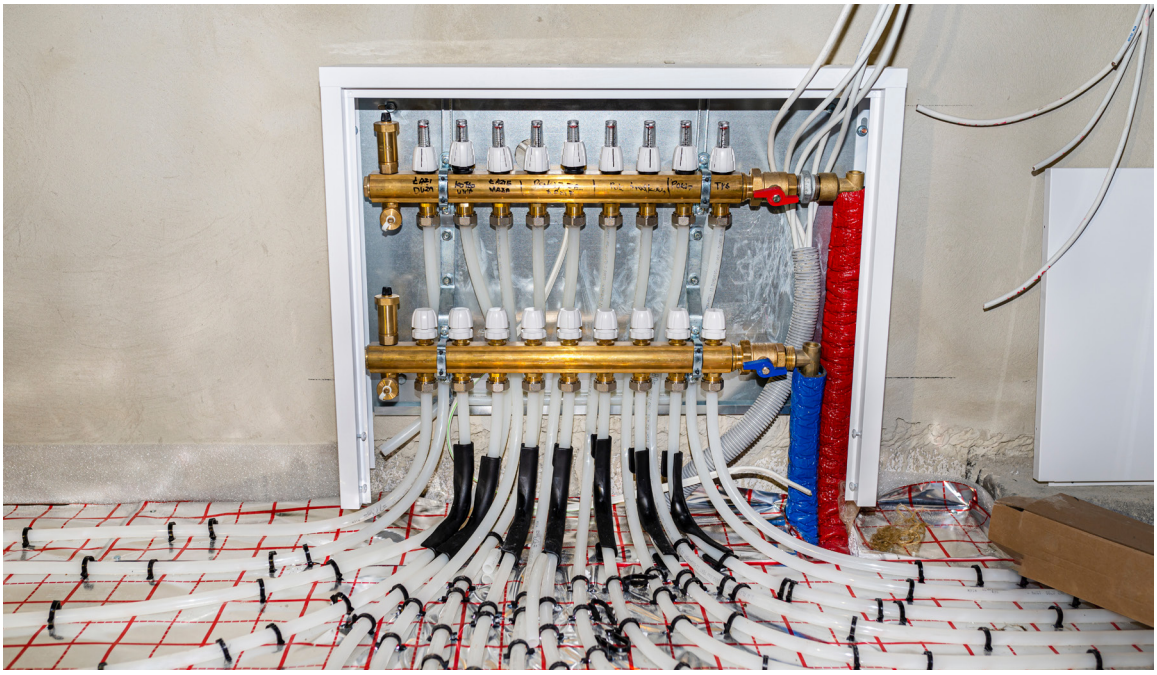
- Probabilistic – act on the probability the circuit may overload
- Deterministic – Pay Someone to take action and prevent circuit overload
- Last resort – Step in to take action and prevent circuit overload

Threepwood can also assist flexibility providers by helping them to understand where the DNOs' network constraints are, and what services/ connections would be required to alleviate.

2.3.4 Digitalisation of Networks

To enable the transition to a DSO environment and a larger and fairer flexibility market, the networks are required to digitalise and produce a Digitalisation Strategy. Transparent, consistent and visible access to network data is required in a secure and consistent manner across all the DNOs (and ESO) with a consistent data transfer format, content, governance and frequency between the ESO and DNOs. Sharing of data and agreed visibility mechanisms between gas and electricity networks will also be required.

Threepwood can help customers and network companies understand their data requirements, what is required and subsequently what the network is doing.



2.4 Environmentally Sustainable Networks

DNOs have submitted Environmental Action Plans (EAPs) to reduce the wider impact of network activities on the environment during ED2. Four particular areas within the DNO plans are:

2.4.1 Reducing SF_6 Emissions

DNOs are committing to the installation of non-SF_6 switchgear (where suitable alternatives are identified at all voltage levels) and harnessing innovation to help manufacturers develop and deploy non-SF_6 assets.

Threepwood can assist DNOs with studies/work on SF_6 leak detection, prevention, leak containment methods and repair. We have also carried impact studies (life cycle analysis) on SF_6 alternatives.

2.4.2 Removal of assets contaminated with PCBs

Due to a change to European legislation for polychlorinated biphenyls (PCBs)[5], under the Persistent Organic Pollutants, (POP) Regulations, DNOs are committing to remove all contaminated PCB equipment from their networks by 2025.

PCBs are now known to be highly toxic industrial compounds which during legacy manufacturing processes have led to contamination of some pre-1989 transformers and a small range of other equipment.

Threepwood have assisted DNOs with analysis and studies in this area.

5 https://www.gov.uk/guidance/using-persistent-organic-pollutants-pops

2.4.3 Fluid Filled Cables

DNOs are committing to reduce the volume of oil leakage from fluid filled cables by replacing the worst leaking circuits with non-oil alternatives or proactively injecting fluid filled cables that have significant leaks with a perfluorocarbon trace, (a benign chemical that allows quick location and repair of leaks).

Threepwood are in the process of developing a tracer technology with DNA capabilities that will assist in the detection and location of leaking cables, effecting a prompt repair.

Introducing the use of compounds that can seal leaks on fluid filled cables can further reduce loss of oil to the environment, reducing the impact of assets and reducing the costs associated with leaks.

2.4.4 Network Losses

Threepwood can assist in the analysis of technical losses where the amount of energy that enters the network is greater than the amount that is delivered to customers. **To reduce technical losses Threepwood can carry out analysis and standardisation of:**

- Network modelling and analysis.
- The most efficient and low loss transformers in line with the EU Eco Design Regulations. Losses from these are 40% lower than with traditional transformers.
- Installing cables with larger cross sectional areas, as standard – (larger cable cross section areas allow easier power flow from one end to the other and therefore reduce losses).

2.5 Network Data Analysis

Digitalisation and Data Management is key to enabling a net zero Network and therefore DNOs have to produce a digitalisation strategy stating how they will manage data etc.

DNOs can gather and analyse data by the following means.

- Network Monitoring Data
- Behavioural Data
- Smart Metering Data – ½ Hourly Settlement (MHHS) to be introduced October 2025[6]

6 https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/electricity-settlement-reform

DNOs are looking to 'manage' LV networks via flexibility and not reinforce until a 'limit' is reached. **To assist the DNOs, Threepwood through various modelling tools can:**

- Determine the network limits – statutory (voltage), thermal and power quality (including Harmonic Analysis)
- HV and LV design optimisation – asset life cycle analysis based on network limits
- Determine acceptable operating scenarios based on the desired asset management
- Determine how the operating scenarios might be established (connection of LCTs, network configuration etc)
- Low Voltage Planning
- Determine data required to establish the operating scenarios

In addition, it is anticipated ADMD legacy LV network planning approaches will be redundant, and the use of analysis tools which incorporate LCT uptake and flexibility scenarios become business as usual within 5 years. By analysing the above, network needs can be determined, especially at low voltage where flexibility can be used and when exhausted, if and when any reinforcement is required and justified.

2.6 Innovation

'BAU innovation' is any innovation that is not dependent on, or funded via, ringfenced innovation stimulus funds. DNOs are funding BAU innovation in RIIO-ED2 using their totex allowance as part of their BAU activities, rather than relying solely on innovation stimulus funds.

The DNO Business Plans show a strong strategic focus on innovation including how they are developing and embedding a culture of innovation throughout their businesses. The plans also describe the steps taken to ensure that previously proven innovation is rolled out into business as usual in to RIIO-ED2 and how the related benefits are reflected in the proposed expenditure for ED2.

DNOs believe that NIA funding is still necessary for RIIO-ED2 and have set out and justified a level of NIA funding in addition to the BAU innovation mentioned. This NIA funding totals approximately £150m across the 6 DNOs over the RIIO-ED2 period and is an area that Threepwood could assist with and add value, with the potential to deliver financial benefits to consumers while meeting UK decarbonisation targets.

Threepwood has worked with DNOs and industrial clients to develop new guidance for the design of LV networks, using learnings from various innovation projects and can produce all associated training material. **Areas where Threepwood can add value and knowledge for the industry and clients include:**

- Heat pumps and Electric Vehicles
- HV and LV design optimisation
- HV and LV generation
- Network optioneering
- Energy Storage
- Windfarms and their electrical networks

Mention is also made to other areas of funding that Threepwood could explore including:

1 BEIS competition funding

2 Innovate UK

3 Calls and initiatives connected to the Energy Systems Catapult

4 Calls and initiatives connected to other national and international schemes

Threepwood will also be exploring partnering innovation opportunities with the following where appropriate with:

- Energy Innovation Centre
- Power Networks Demonstration Centre
- Ideas Portals
- ENA Innovation Portal/Forum

ENA's Electricity Innovation Forum is a vehicle for energy innovators to find out more about energy network projects created through the Network Innovation Allowance. The projects provide benefits across the whole UK energy industry which continues to be the most innovative in the world. As the current RIIO price control continues and as we begin discussions about the format of the new RIIO-ED2 price control, network companies will continue to play a leading role in delivering network innovation projects through the NIA, with that work being co-ordinated through the forthcoming Electricity Network Innovation Strategy.

3 Abbreviations & Conventions

3.1 Abbreviations

The following abbreviations and terms are used in this report.

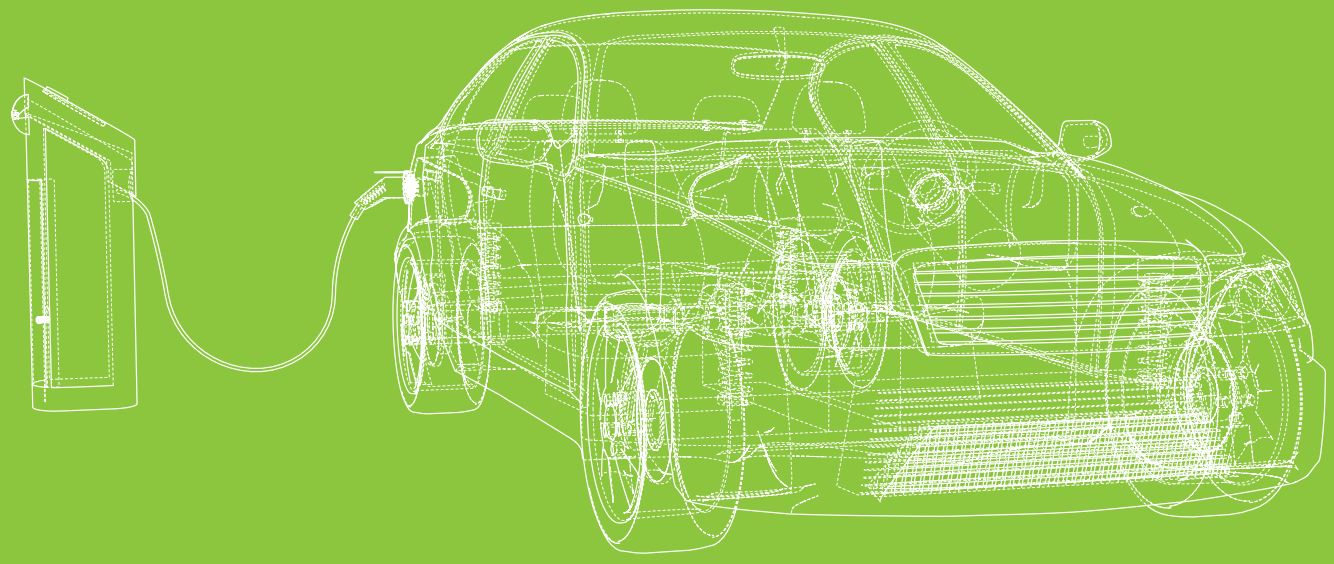
Table 1 – Abbreviations & Terms

Abbreviation	Description
ANM	Active Network Management
BAU	Business as Usual
DNO	Distribution Network Operator Note: DNOs being: ■ Electricity North West Ltd (ENWL) ■ Northern Powergrid (NPg) ■ Scottish and Southern Electricity Networks (SSEN) ■ ScottishPower Energy Networks (SPEN) ■ UK Power Networks (UKPN) ■ Western Power Distribution (WPD)
BEIS	Department for Business, Energy and Industrial Strategy
DER	Distributed Energy Resource
DSO	Distribution System Operator
DSR	Demand Side Response
EAP	Environmental Action Plan
ED	Electricity Distribution
ESO	Electricity System Operator
EV	Electric Vehicles
GW	Gigawatt
HP	Heat Pump
HV	High voltage – typically 11 kV and above
kW	Kilowatt
LV	Low voltage – less than 1 kV
NIA	Network Innovation Allowance Note: The NIA is a set amount that each RIIO network licensee receives as part of their price control allowance. Network licensees make the decisions as to which innovation projects they take forward with their NIA. In the RIIO-2 price control, NIA provides limited funding to RIIO network licensees to enable them to take forward innovation projects that have the potential to address consumer vulnerability and/or deliver longer–term financial and environmental benefits for consumers, which they would not otherwise undertake within the price control. For projects to be eligible for NIA funding, the projects must comply with the requirements in the RIIO-2 NIA Governance Document.
PCBs	Polychlorinated Biphenyls Note: a class of organic man-made chemicals which were used extensively in a wide range of products because they are chemically inert, stable at high temperatures and flame resistant. PCBs have been widely used in electrical equipment, such as wire and cable coatings and insulation, but this method is now banned and the industry has committed to removing by 2025.

RIIO	Revenue=Incentives+Innovation+Outputs Note: An Ofgem performance-based model to put stakeholders at the heart of DNOs decision-making, innovating and delivering a low-carbon energy system, whilst investing efficiently to deliver value for customers).
RIIO-ED1	Revenue=Incentives+Innovation+Outputs Electricity Distribution Price Control 1 Note: Ofgem price control setting out the outputs that DNOs need to deliver for their consumers and the associated revenues they are allowed to collect for the eight-year period from 1 April 2015 to 31 March 2023.
RIIO-ED2	Revenue=Incentives+Innovation+Outputs Electricity Distribution Price Control 2 Note: Ofgem price control setting out the outputs that DNOs need to deliver for their consumers and the associated revenues they are allowed to collect for the eight-year period from 1 April 2023 to 31 March 2028.
SF_6	Sulphur hexafluoride Note: A gas with good electrical insulation and other properties, leading to its widespread use in electrical switchgear. However, there is concern over the SF_6 leaking into the atmosphere since it is a potent greenhouse gas. As a result, the industry has agreed a set of actions to reduce emissions of the gas to the atmosphere.

Document History

Version	Date	Amendment	Issued by	Authorised by
1	02/11/2021	First issue	Paul Fidler Principal Consultant	Gary Eastwood Managing Director/ Richard Parke Principal Consultant



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