

Environment Policy Development Group 08 March 2022

Briefing Report: Local Electricity Supply Networks

Cabinet Member(s): Cllr C R Slade - Cabinet Member for the Environment and Climate Change.

Responsible Officer(s): Andrew Busby - Corporate Manager Property, Leisure & Climate Change.
Jason Ball - Climate and Sustainability Specialist.

Reason for Report: To receive a briefing on local electricity supply networks and their role in supporting community and Council actions to address climate change.

Recommendation: That the Environment Policy Development Group (PDG) notes and accepts this report with regard to the Climate and Sustainability Programme.

Financial Implications: Financial implications associated with this report are the costs / budgets of the overall Climate and Sustainability Programme, specifically linked to the Council's Corporate Plan, Climate Strategy and Climate Action Plan (CAP).

Budget and Policy Framework: Budgets specifically linked to the Council's Corporate Plan, Climate Strategy and CAP.

Legal Implications: Full Council declared a Climate Emergency in June 2019 and as part of that commitment, the Council is to produce a carbon footprint in line with Environmental Reporting Guidelines published by HM Government. With regard to the Climate Emergency, the Environment Policy Development Group (PDG) is the initial owner of this policy activity and considers how best to determine the Council's own policy response(s) such as may then be subsequently recommended to Cabinet and Council. [Link to declaration decision](#).

Risk Assessment: Progress on Performance Indicators (PI) is provided separately on the regular Performance and Risk Reports. There are 2 main risks (to the Council): 1) that the Council does not take sufficient actions to enable it to meet its Climate Emergency declaration ambitions; and 2) that the financial implications of Climate Change are not adequately measured and reflected in the Council's decision making.

Equality Impact Assessment: There are no equality impact assessment implications associated with this report.

Relationship to Corporate Plan: Briefing report only.

Impact on Climate Change: The role of the Climate and Sustainability Specialist in support of the corporate officer team is central to the Council's Climate and Sustainability Programme by actions such as the development of strategic positions and delivery of projects through internal, community and partnership work.

1.0 Executive Summary

- 1.1.** The local electricity supply network's capacity to support actions to address climate change will depend on rapid and appropriate system transformation, infrastructure upgrades and maximal flexibility.
- 1.2.** Notes are provided on strategic context and the current approach to address the predicted growth and greater complexity of supply and consumption patterns.
- 1.3.** Can the local electricity system develop the right capabilities at sufficient pace to support Mid Devon's Net Zero aims? The simple answer is 'yes it can' but this report cannot forecast the future and relies on strategic assessments such as those by BEIS, noted later.

Assuming a strategically favourable environment for the Distribution Network Operator (DNO) this report's research suggests the local infrastructure system can accommodate renewable energy, decarbonisation and higher demand in a sound manner for the short-term and up to 2030; notably legislated and regulated mechanisms are in place to enable appropriate development 2030 to 2050.

- 1.4.** Accurate and timely information management is a primary factor in enabling local system development.
- 1.5.** Local authorities and communities / businesses can engage proactively with the DNO to influence and inform the future of the local electricity supply network: through consultation cycles; and by early communication about project / planning / development proposals, capacity assessments and connection applications.
- 1.6.** Local authorities and communities / businesses with their own project proposals e.g. renewable generation, can work directly with the DNO to inform design and identify benefits and any need for system flexibility / support / reinforcement.

2.0 Context and guidance notes

- 2.1.** As indicated further in this report, please note that the report largely comprises information from publications by WPD www.westernpower.co.uk with other sources used to provide local and national context. Key sources include: WPD web pages, publications and stakeholder workshop notes. For members' ease, the report focuses on those parts of those publications which it is considered will be of most interest to PDG members given the group's climate policy development role.
- 2.2.** All sampled graphics, charts and tables are acknowledged. All rights e.g. copyright remain with the originators.
- 2.3.** Content herein is intended as guidance only, and do not constitute technical or legal advice.
- 2.4.** No proposals or recommendations are given.
- 2.5.** Abbreviations
 - BEIS = The Department for Business, Energy & Industrial Strategy
 - DNO (IDNO) = Distribution Network Operator (Independent DNO)
 - DSO = Distribution System Operator
 - ESO = Electricity System Operator
 - EV = electric vehicles (ULEV = ultra-low emissions vehicles)

- LCT = low carbon technology (to replace fossil-fuel technology)
- MW = megawatt (one million Watts)
- V2G = vehicle-to-grid (power drawn from charged vehicles onto the local grid as part of a smart system)

3.0 Local electricity supply networks

3.1. Structure and operation.

3.1.1. Western Power Distribution (WPD) is the Distribution Network Operator (DNO) including a Distribution System Operator (DSO) for our local electricity supply network, which connects electricity meters, the national level Grid Supply Point, and the regional / local generation and storage plants.

3.1.2. WPD is the UK's largest electricity distribution business, covering 90,000km of overhead cables, 135,000km of underground cable and 188,000 transformers, serving nearly 8 million customers across the South West of England, the Midlands, and South Wales. WPD recently became part of the [National Grid group](#).

3.2. Network Strategy.

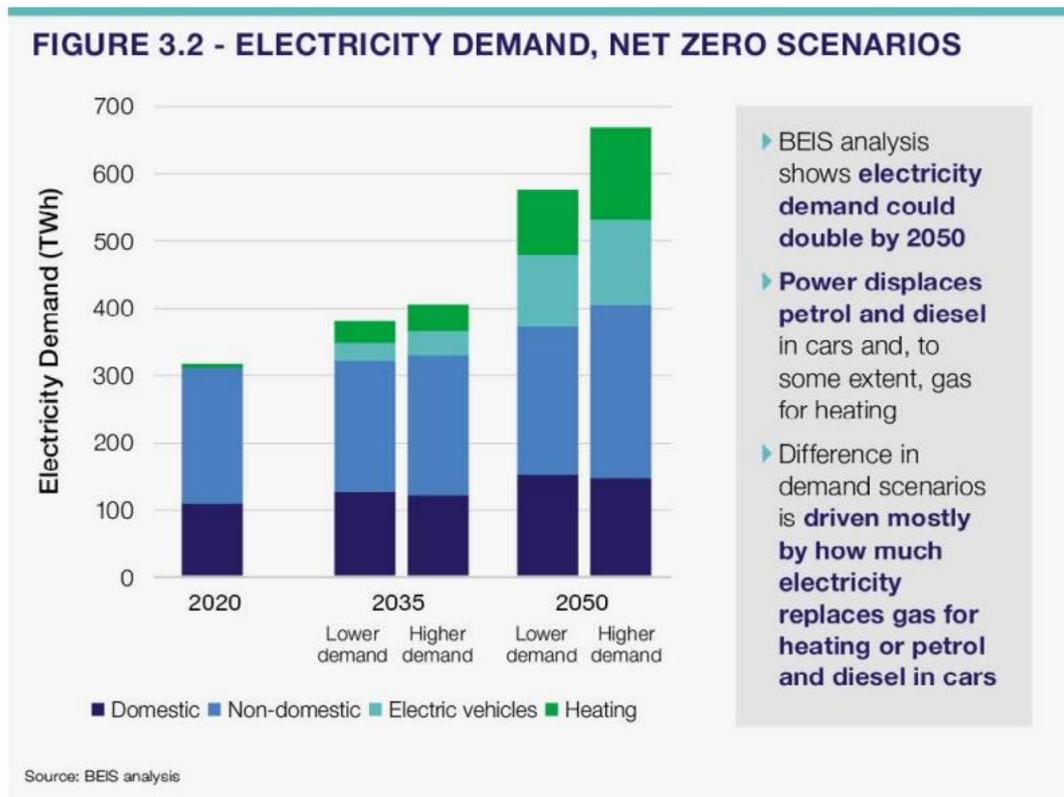
3.2.1. Network development strategy is closely related to the [UK's Net Zero Strategy](#). National strategic context calls for innovation and upgrade in electricity networks. Legally-binding targets, such as cutting Greenhouse Gas Emissions by 78% compared with 1990 levels by 2035, trigger a need for rapid change.

- Electricity is key to decarbonise heating. The BEIS Heat Team requires networks to be ready in advance of demand so residential and business users can switch heating systems from fossil fuel to heat pumps in a timely manner.
- Decarbonisation of transport and [the 2030 ban on new fossil-fuel cars](#) means the ULEV market will grow rapidly. A household's annual electricity demand could be doubled by the need to power an electric car.
- WPD predicts over 3 million electric vehicles, just within their operational area, by 2030.
- WPD predicts that, just within their operational area, around 500,000 new connections for low carbon technology (LCT) will be required every year; or around 2,000 per working day.
- WPD expects overall demand could exceed "original design assumptions" of the network.

3.2.2. Alongside [the 2020 Energy White Paper, Powering Our Net Zero Future](#), the BEIS report [Modelling 2050 – Electricity System Analysis](#) sets out the scale of the challenge: "Electricity will be increasingly important in supporting delivery of net zero, potentially providing around half of final energy demand as its use for heat and in transport increases."

To help understand how the system can produce more power whilst cutting greenhouse gas emissions, the *Modelling 2050* report assessed 2050 electricity system requirements and costs (using 2 Net Zero 2050 scenarios). However, it did not assess the cost of the transformations required to get there.

3.2.3. Figure 3.2.3 – Energy White Paper 2050 Net Zero scenarios. Taken from the UK Government 2020 [Energy White Paper, Powering Our Net Zero Future](#).



3.2.4. Legislation at national level requires regular capacity assessment. The National Grid’s annual [Electricity Capacity Report](#) is subject to scrutiny by a [Panel of Technical Experts](#) to assist the [BEIS](#) Secretary of State to set the parameters for Capacity Market auctions.

3.2.5. Ofgem [programmes](#) include regulation of the Electricity System Operator (ESO).

3.2.6. WPD publishes key strategic information [online](#) e.g. Distribution Future Energy Scenarios (DFES) to outline a range of credible futures; an operability framework to assess technical issues facing DNOs as they become DSOs; and flexibility commitments (evolution and adaptability).

3.3. Network Capacity.

3.3.1. The WPD online [network capacity map](#) illustrates data from the 6-monthly updated Long Term Development Statement (LTDS) to indicate the capability to connect large-scale developments to major substations. The “generation headroom” is the amount of generation available on the network without needing reinforcement (upgrade). The “reverse power capability” is the amount of generation that can go back through the transformer.

3.3.2. Map users e.g. planners and developers can view Mid Devon data by selecting from a list of local authority areas.

3.4. Growth strategy.

3.4.1. WPD announced plans for a [£6billion transformation and investment programme](#) and their [Green Recovery](#) web pages earmarked an extra £60m for development investment during 2021-2023. WPD devises plans alongside the regulator [Ofgem](#), the [Energy Networks Association](#) (ENA) and the industry.

3.5. Strategic analysis and stakeholder engagement.

3.5.1. Growth strategy is informed by WPD's continuous cycles of consultation from national to local levels in all sectors. Special projects e.g. [EPIC](#) include research into appropriate use of information from different sources.

3.5.2. The Council and other local / regional stakeholders receive invitations to participate in WPD consultation workshops and other events.

3.6. Implementing change.

3.6.1. The WPD [2023-2028 Business Plan](#) identifies commitments that include:

- "Drive the achievement of net zero across our regions sooner than 2050 in line with stakeholder plans (some areas as early as 2028), by ensuring network capacity is available."
- "Ensure customers are able to connect low carbon technologies quickly and easily, with the network being ready to support at least an additional 1.5 million electric vehicles and 600,000 heat pumps by 2028."
- "Actively support the expansion of green, renewable energy generation and help local communities to decarbonise and lower their bills, by connecting at least 30 community energy groups to the network each year."
- "Unlock capacity / avoid the need for reinforcement, by stimulating the development of flexibility markets."

3.6.2. WPD published interlinked [Business Plan documents](#) include a Connection Strategy, Climate Resilience Strategy, Innovation Strategy, Major Connections Strategy, Network Visibility Strategy, and a Net Zero Communities Strategy.

3.6.3. Operational tactics for upgrades include "touch once for 2050" as the motto for substations, aiming to address each in sequence with network redesigns triggered by high volumes of LCT connections.

3.6.4. Low Voltage mains upgrades will use thicker cables with a larger cross-section area. Cables of 70mm² were used in the 1930s-1960s, then 185mm² cables were used more recently, and the next stage of Low Voltage mains will use 300mm² cables. (Source: ©WPD workshop slides 17 November 2021.)

3.7. Flexibility and smart systems.

3.7.1. Flexibility of the electricity supply network enables efficient development and smart energy management. Flexibility means [making the best use of the existing network capacity](#), and by designing and optimising interactions between different elements of the interconnected generation, storage, distribution and consumption.

3.7.2. The Carbon Trust report [Flexibility in Great Britain](#) found:

- Flexibility will enable the development of a safe and secure net zero energy system that can operate cost-effectively in diverse situations such as dark, cold and windless days in winter or hot summers.
- A fully flexible energy system has the potential to deliver material net savings of between £9.6 billion and £16.7 billion per annum in 2050.

3.7.3. Examples of flexibility technologies include:

- Electricity storage
- Electric vehicles (EVs) – smart charging and vehicle-to-grid (V2G)

- Thermal energy storage (TES)
- Demand side response (DSR) from domestic smart appliances and the non-domestic sector
- Hydrogen electrolyzers and storage

3.7.4. Network development and investment is an opportunity to add flexibility to improve performance and resilience. WPD has published commitments to [increased future flexibility](#). WPD's Major Connections Strategy aims to provide an increasing number of flexible connection offers (core commitment 32) and to provide data to enable a better understanding of flexibility opportunities.

3.7.5. WPD's online [Network Flexibility Map](#) indicates where it seeks flexibility / may seek it in the future. The mapped status for all Mid Devon areas is 'closed' for years 2021, 2022, and 2023 (viewed December 2021).

3.7.6. National Grid ESO has launched a mobile app to help users time their consumption to match [low carbon intensity supply](#).

3.8. The process to identify need and to secure connections.

3.8.1. WPD has a comprehensive [Connections](#) section online plus [resources](#) to aid the process. Consents / consultations might be required in some situations ([example](#)).

3.9. Enabling the shift to low carbon technology (LCT).

3.9.1. WPD has published strategies and supporting guides at www.westernpower.co.uk/smarter-networks for LCTs e.g. heat pumps and EV.

3.9.2. WPD proposes to: simplify the process for LCT connections; to utilise flexible assets to improve prioritisation of connections; to facilitate co-creation of connection agreements. WPD will launch an improved customer portal to enable interactive work scheduling and progress monitoring.

3.10. Capacity for electric vehicles (EV).

3.10.1. WPD and the industry are watchful of technological innovations and markets to inform likely future network needs. For example, the emergence of Megawatt Charging Systems (MCS) for battery powered Heavy Goods Vehicles, and the possible range of formats of vehicle charger hubs at different locations such as neighbourhoods or motorways.

3.10.2. WPD's [EV guidance section](#) includes a capacity [map](#) to indicate readiness for EV chargepoint connections. Map data for Mid Devon showed quantities of substations with different levels of capacity as follows: Extensive Capacity Available = 128; Capacity Available = 109; Some Capacity Available = 20 (*some capacity available which may need managed charging*). (Data updated May 2019 according to map; viewed December 2021.)

3.11. Capacity for heat pumps (HP).

3.11.1. WPD has published [online resources](#) including its HP strategy and guidance on HP connections. WPD's approach to heat pump installation as outlined in its 2021 Heat Pump Strategy states:

- "With new build infrastructure the network is designed to cater for the necessary load so heat pump demands can be built into our initial network designs."

- “With retrofit installations of heat pumps the overall demand on the network will increase, perhaps to a level that was higher than the original design assumptions. Mains cables and transformers may need to be updated.”
- “A legacy design approach where service cables were looped and shared between two properties will need to be re-configured so that the house or building being installed with a heat pump will have its own unique service cable supply. Where this is the case and a HP is to be connected the looped service will be removed at no cost to the customer.”
- “It is expected that as old housing estates transition from fossil fuel heating to HPs that the existing circuits ... could be constrained, especially if HPs were to cluster. **This is why it is of the utmost importance that the DNOs are informed of HP installations** so as remedial action can be taken ahead of need.”

3.12. Enabling local renewable energy.

- 3.12.1. Please refer to the points on growth strategy, connection issues, and the need for early communication.
- 3.12.2. WPD is not responsible for generation but its work is essential to generation, storage and flexibility.
- 3.12.3. Regen’s 2020 report, [Local leadership to transform our energy system](#), suggests ways that DNOs, local authorities and other economic actors can work in partnership to invest strategically e.g. by funding upgrades in advance to enable greener future developments. The report also cited examples of Nottingham City Council using a levy to fund greener transport, and Swindon Borough Council investing in renewables via its subsidiary.
- 3.12.4. The power supply mix / carbon intensity in Mid Devon will simply follow the national / regional average unless Mid Devon and nearby districts host new and improved installations of renewable and low carbon generation and storage.
- 3.12.5. At a micro scale, both [storage](#) and renewable energy [generation](#) can be installed at existing and new built development, where network capacity exists or is capable of being upgraded to accommodate them.

3.13. Enabling community energy projects

- 3.13.1. Community experts and partnerships are seen as important for their roles in e.g. supporting and leading a wide range of beneficial activities, from better energy use and efficiency campaigns to low carbon tech adoption and renewable energy projects. The term ‘community energy projects’ refers to community-led renewable energy generation, demand reduction and supply projects, whether wholly owned / controlled by communities or through partnerships.
- 3.13.2. WPD’s operational area has 100MW of community-owned renewable generation capacity. Those interested in community energy should visit www.westernpower.co.uk/customers-and-community/community-energy for information and resources such as [animations](#).

4.0 What is the Local Authority role?

- 4.1. The Council has a duty to deliver on targets linked to the national Net Zero Strategy (Climate Change Act 2008).
- 4.2. Clear principles applied to Council policy and decision-making can help to realise and prioritise appropriate changes. (For example, applying the ‘fabric first’

principle to improve energy efficiency in buildings will tend to lower workloads for heating / cooling systems, which lessens pressure on local power systems.)

4.3. As a Local Planning Authority (LPA) the Council could:

4.3.1. Optimise planning policy and practices to make a difference to electricity supply networks at a local level. Prioritise and empower energy efficiency, energy decarbonisation and locally-generated renewable energy.

4.3.2. Utilise the Local Plan to set progressive ambitions and expectations. (Climate Change will be the overriding priority for the 2023-2043 Local Plan.)

4.3.3. Facilitate the early flow of information to the DNO about the district's likely future needs. Collaborate to inform DNO future energy scenarios and local energy plans.

4.3.4. Encourage or require developers to submit, within relevant proposal packages, appropriate designs and DNO or IDNO assessments for the electricity network infrastructure requirements, in a timely manner.

4.3.5. Encourage the DNO and developers to fund and schedule network infrastructure upgrades in a timely manner.

4.3.6. Encourage or require local built developments to maximise energy efficiency and to include green power generation, future-proofing and smart infrastructure.

4.3.7. Encourage or require retrofit and new energy installations (domestic and non-domestic) to include and appropriate flexibility technologies such as smart meters, responsive appliances and storage (both for heat and electrical power).

4.4. Other ways the Council could promote progress toward a greener, smarter, more flexible local electricity network.

4.4.1. Keep WPD informed, and encourage others to do so, by participation in stakeholder engagement cycles.

4.4.2. Consult with WPD, developers, businesses and communities to identify and adopt ways to accelerate progress.

4.4.3. Seek partnership solutions to achieve strategic investment. This might include e.g. making infrastructure resilient to climate change impacts such as higher flood risk.

4.4.4. Lead by example, and demonstrate with data, through the Council's approach to asset management.

4.5. Council project management - looking ahead to check pricing and feasibility.

4.5.1. Checks on capacity are essential for new generation e.g. solar photovoltaic panels, or new demand e.g. heat pumps. Council officers should proactively investigate the costs and feasibility of installations likely to require connection or reinforcement, and must register applications for network connections as far in advance as feasible (e.g. connection assessment and prices recently requested from WPD for EV chargepoint locations).

4.6. Proactive dialogue and participation in consultation.

4.6.1. The Council engages proactively with WPD about strategically important local needs as they emerge e.g. through Planning and economic development, community feedback and local projects - with particular regard to renewable power generation, energy storage, low-carbon technologies and flexibility (smart networks). Previously the Climate and Sustainability Specialist also responded to

the WPD's [Green Recovery](#) call for evidence in March 2021. WPD has been informed of major potential connection needs e.g. hydroelectric power.

- 4.6.2. The Climate and Sustainability Specialist recently attended connection workshops. A suggested improvement: for WPD capacity maps to provide more finely-resolved data, to indicate connection constraints and potential.
- 4.6.3. Officers should coordinate internally to manage the Council's relevant data and engagement. A quarterly internal cycle should enable a regular 6-monthly cycle of information requests and feedback to WPD (e.g. March and September).
- 4.6.4. An officer group call with our local WPD Distribution Manager will take place in Spring 2022: to work together to build a joined-up energy plan; to establish ongoing dialogue to help future-proof the local electricity network.

5.0 Challenges

- 5.1. The Climate Change Committee (CCC) advising the UK Government [has noted](#) that the UK Net Zero Strategy is well aligned with national targets, but gaps and uncertainties remain e.g. the funding frameworks necessary to realise them.
- 5.2. [The Climate Change Committee specifically noted](#) a number of relevant key issues to be resolved for the UK Net Zero Strategy including: "demand measures" i.e. reducing demand for high carbon activities; "price distortions that currently favour gas over electricity"; improving home energy efficiency; the rate of heat pump installations. [Article by the CCC](#).
- 5.3. Some recent consultee feedback to WPD (WPD: Local Investment Workshops: Summary Report. September / October 2021) highlighted concerns and challenges such as:
 - the timescale between applying for capacity and securing investment from developers with planning proposals;
 - the cost of connections for large-scale renewable energy (citing a shelved local authority project);
 - potential impacts due to a lack of capacity (citing experience of projects having to scale back or uninstall);
 - a perceived lack of clarity about how to identify and agree / verify local reinforcement needs;
 - potential for a lack of faith in capacity (whether founded on fact or myth) to discourage local investment in LCT and renewables; the need for informative outreach and resources such as more detailed online maps;
 - concerns that upgrades might be too reactive / proposal-led, rather than pre-emptively enabling development.

6.0 Caveats

- 6.1. The subject is complex and often highly specialised. Statements, evaluations and estimates are reported as found, and details are not fact-checked. Therefore this report relies to a great extent on the need for this industry to withstand external scrutiny by investors, government and the regulator [Ofgem](#).
- 6.2. Data and statistics are liable to change, as this field is highly dynamic.

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List of Background Papers: None.