By email to: YmatebionYnni-EnergyResponses@gov.wales

21 March 2025

Request for Information from the Welsh Government

Dear Eleanor,

Thank you for your request and opportunity to feed into the Independent Advisory Group on Future Electricity Grid for Wales.

The UK has one of the fastest decarbonising electricity grids in the world. Electricity networks are at the heart of the Net Zero transition. The scale of decarbonisation means that by 2050 the peak demand on our distribution networks is forecast to double, and we could likely see a four-fold increase in connected generation and storage. At the same time, the UK Government has set out an action plan to transition to a clean power system by 2030.

We are committed to working with Welsh Government and industry to establish network options to facilitate the long term needs of our customers in Wales.

A countrywide effort over the next decade is needed to upgrade the network in a coordinated manner, to minimise impact on communities, and to facilitate a Just Transition – ensuring that no one is left behind in the energy transition.

Our network planning processes ensure we provide the capacity our customers need, in the locations they need it, and be ready in time for when they need it. This includes the detailed designs and decisions on how best to deliver that capacity for each individual requirement.

Your query touches on a key point that is at the heart of enabling customers and society to decarbonise – how best to deliver network capacity.

Our response covers the following three requests:

1. Technical data relating to network topology archetypes, as well as environmental and community impacts.
2. Additional resources on design, planning, construction, operation, and maintenance of the network.
3. An overview of innovation being explored to meet electricity needs.

We look forward to continuing to engage on the needs of a zero carbon system and infrastructure in Wales. Please do not hesitate to contact me further should you have any queries in relation to this response.

Yours sincerely,

Malcolm Bebbington
Head of Network Planning

Request 1

Network topology archetypes, environmental and community impacts

In Tables 1-5 below, we provide information based on the most common type of infrastructure installed across our network.

We have split the information for overhead lines (OHL) and underground (UG) cables by 132kV tower OHL, 132kV wood pole OHL, 132kV UG cable, 33kV wood pole OHL and 33kV UG cable.

We have used the following assumptions when populating archetype information in Table 1:

Maximum Continuous Distribution Capacity (MVA):

This is based on typical (most populous) conductor type on our SP Manweb (SPM) network as follows:

- 132kV tower OHL: 200 mm^2 AAAC (twin conductor)
- 132kV wood pole OHL: 200 mm^2 AAAC (single conductor)
- 132kV UG cable: 1200 mm^2 3-core XLPE
- 33kV wood pole OHL: 150 mm^2 ACSR (single conductor)
- 33kV UG cable: 150 mm^2 single-core XLPE

Maximum Technically Feasible Route Lenth (km):

We considered circuits based on the most typical conductor type, fully loaded and without reactive compensation. Underground cable route length is usually limited by capacitive charging current, and voltage rise.

Life-span (years):

This is based on the Normal Expected Life from the Ofgem approved Common Network Asset Indices Methodology (CNAIM) v2.1.

The Normal Expected Life is defined as "The time (in years) in an asset's life when it would be expected to first observe significant deterioration (Health Score 5.5), taking into consideration location or duty, in addition to the asset type."

This means that the values provided in Table 1 are indicative of the point where different asset types are expected to start to deteriorate. This point may not correlate to the point at which the assets are replaced as inspection and maintenance may lengthen their usability.

Note that 132kV pole is not covered in CNAIM v2.1. The value for 33kV pole has been used. Similarly, pole OHL is not covered in CNAIM v2.1 so the value corresponding to tower OHL has been used.

Infrastructure Operational Footprint:

For tower and pole OHL, we have provided a range of typical support structure (i.e. L4m tower or pole) dimensions, as well as OHL corridor length and clearance requirements. For UG cable, we have provided cable trench range, joint bay dimension, and depth of cover.

Note that building beneath OHLs, and building or excavations within UG cable swathes are permanently discouraged, though many agricultural/rural land uses can resume. Periodic cutting/management of vegetation will be required to prevent the vegetation getting too close to the OHL. Additionally, industry wide requirements[1] for storm resilience further increase the requirement for trees and vegetation management where these are within falling distances to OHL.

Future Scalability for Long-Term Planning:

The operating temperature of the conductor is specified as part of the construction of the circuit, which is chosen in order to provide a suitably high rating for the circuit without risking infringing on the conductor clearances set out in the Electricity Safety Quality & Continuity Regulations (ESQCR) 2002.

In certain cases an overhead line can be "reprofiled" to a higher maximum operating temperature in order to increase the rating. To undertake this work the line must be surveyed to ascertain if there are any infringements due to conductor sagging that may arise, and these issues solved by using taller poles/towers or diverting the circuits.

Uprating can, in some instances, be easier for OHL subject to line construction and conductor sizes. Although not covered in Table 1, diversions are usually more difficult for OHL and tend to be more challenging at higher voltages.

[1] *ENA ETR 132 provides guidance for Network Operators on how to improve network performance under abnormal weather conditions.*

Table 1: Network archetype description

Characteristic	132kV			33kV	
	Tower OHL	**Pole OHL**	**UG Cable**	**Pole OHL**	**UG Cable**
Maximum Continuous Distribution Capacity	272.1 MVA (per circuit)	136.0 MVA	266.1 MVA	27.9 MVA	22.4 MVA
Maximum Technically Feasible Route Length	30 - 50 km	30 - 50 km	25 - 30 km	10 - 15 km	10 - 15 km
Life-Span	Tower: 80 years OHL: 60 years Fittings: 40 years	Pole: 55 years OHL: 60 years	100 years	Pole: 55 years OHL: 60 years	100 years
Infrastructure Operational Footprint	Tower base: 4.0 - 4.8 m sq. Tower height: 26 m OHL corridor: 8.4 - 8.7 m Clearance to ground and roads: 6.7 - 14.6 m Clearance to objects: 1.2 - 1.4 m Normal and passing clearance: 1.4 - 3.6 m	Pole diameter: 0.34 - 0.37 m Pole length: 10 - 17 m OHL corridor: 4 - 5 m Clearance to ground and roads: 6.7 - 14.6 m Clearance to objects: 1.2 - 1.4 m Normal and passing clearance: 1.4 - 3.6 m	Cable trench: 0.6 - 1.2 m Joint bay: 8 x 2 m Depth of cover: 0.8 - 1.4 m	Pole diameter: 0.29 - 0.31 m Pole length: 9 - 16 m OHL corridor: 2.4 - 4.0 m Clearance to ground and roads: 5.2 - 14.0 m Clearance to objects: 0.6 – 0.8 m Normal and passing clearance: 0.8 - 3.0 m	Cable trench: 0.4 - 0.9m Joint bay minimum: 2.7 x 1.5 m Depth of cover: 0.8 - 0.9 m
Future Scalability for Long-Term Planning	In some cases, OHLs may be reconducted (depending on existing conductor sizes and OHL construction).		New underground cables would need to be installed to provide additional capacity.	The same as 132kV Pole OHL.	The same as 132kV UG Cable.

We have used the following assumptions when populating Table 2, which covers deliverability and operability considerations.

Planning and Consents:

We have omitted substations. Nevertheless, for information, a 132kV substation typically covers 1 hectare of land when accounting for Biodiversity Net Gain. As for a 33kV substation, this is from 0.1 hectare of land upwards depending on the requirements for Biodiversity Net Gain and additional screening.

Some of the frameworks we use require reviewing and changing if we are to support the ambitious Net Zero targets being set by policymakers. For instance, building or reinforcing a line over private land requires land access negotiations with landowners or undertaking a lengthy Section 37 process through DESNZ. We also have to follow the Section 37 process even to add an additional cable to our existing infrastructure. These can be onerous and lengthy processes for what can be minor works.

Land right consents are usually acquired through negotiation however with an increase in objections, there is an expectation that in the future, statutory powers may be used more often.

Reliability, Availability and Maintainability:

This is based on Probability of Failure (PoF) from the industry and Ofgem approved CNAIM v2.1. As detailed in the methodology, the PoF is derived based on three failure modes, which are incipient, degraded and catastrophic failures.

Note that 132kV pole is not covered in CNAIM v2.1. The value for 33kV pole will be used. Similarly, pole OHL is not covered in CNAIM v2.1 so the value corresponding to tower OHL will be used.

Also worth noting that physical damage is normally repaired within hours or days (except when excessive damage is found, which could take weeks).

Flexible Circuit Rating:

We provide a range, based on the typical conductor type used when populating Table 1.

The range will be dependent on material, size and temperature rating of the conductor for 132kV tower OHL, 132kV pole OHL and 132kV UG cable.

As for 33kV pole OHL, the range will be governed by material, size and single/multi circuit consideration.

Finally for 33kV UG cable, the range is influenced by material, size, core number, presence of armour, laid direct or ducted, with the assumption of continuous operation.

Provision of Restoration Services:

OHL and cable are passive network components that transfer power. Nevertheless, with the availability of generation, OHL and cable circuits can be switched to transfer power where it is needed.

It is known that due to the significant charging currents that are required for cables, switching of cable circuits for system restoration can be more complex and challenging.

Table 2: Deliverability and operability considerations

Characteristic	132kV			33kV	
	Tower OHL	Pole OHL	UG Cable	Pole OHL	UG Cable
Planning and Consents	Min 2 km associated with generating station will require Infrastructure Consent. As for <2 km associated with generating station, Infrastructure Consent is needed if so directed by Welsh Ministers. Also dependent on when the Infrastructure Wales Act 2024 will be in force in its entirety.		Permitted development for licenced statutory operators unless Environmental Impact Assessment (EIA) is required, which then requires planning permission under Town and Country Planning Act (TCPA) regime.	The same as 132kV Pole OHL.	The same as 132kV UG Cable.
Reliability, Availability, and Maintainability	Tower PoF: 1.6 - 4.1 % Conductor PoF: 0.2 - 0.6 % Fittings PoF: 0.3 - 0.7 %	Pole PoF: 0.8 - 2.1 % Conductor PoF: 0.2 - 0.6 %	Solid Cable PoF: 1.9 - 4.9 %	Pole PoF: 0.8 - 2.1 % Conductor PoF: 0.2 - 0.6 %	Solid Cable PoF: 1.9 - 4.9 %
Flexible Circuit Rating	224.1 - 272.1 MVA	112.0 - 136.0 MVA	243.9 - 266.1 MVA	19.8 - 27.9 MVA	20.0 - 22.4 MVA
Provision of Restoration Services	Switching is a proven technique for restoration.		Longer lengths may be more complex due to significant charging currents that are required.	The same as 132kV Pole OHL.	The same as 132kV UG Cable.

For Table 3 and Table 4, which cover environmental and community impacts respectively, we have broadly distinguished between permanent and temporary impacts where applicable. To mitigate these impacts, we implement controlled measures through the Construction and Environment Management Plan (CEMP) and the Traffic Management Plan (TMP). Besides that, our policy for managing impacts is set out in our Approach to Routeing document. We also actively review projects and embed learnings to further reduce impacts of our network on the environment and the communities that we serve.

Table 3: Environmental impacts

<table>
<tr><th rowspan="2">Characteristic</th><th colspan="3">132kV</th><th colspan="2">33kV</th></tr>
<tr><th>Tower OHL</th><th>Pole OHL</th><th>UG Cable</th><th>Pole OHL</th><th>UG Cable</th></tr>
<tr><td>Construction</td><td colspan="2">Permanent nature:
Loss of ground cover, trees, hedgerows and habitats in ground preparation. Potential impact on biodiversity, and greenhouse gas emissions.

Temporary nature:
Loss of ground cover for tower/wood pole working area and construction corridor, all subsequently reinstated. Other impacts such as construction traffic on local roads, dust, noise and air quality.</td><td>Permanent nature:
Soil disturbance. Although working corridor can be reinstated, we will not be able to plant trees or shrubs on top. Potential impact on biodiversity, and greenhouse gas emissions.

Temporary nature:
Construction traffic on local roads, dust, noise and air quality.</td><td>The same as 132kV Pole OHL.</td><td>The same as 132kV UG Cable.</td></tr>
<tr><td>Operational</td><td>Impacts on landscape and visual amenity. Other impacts include acoustic noise and bird collision risk.</td><td>Similar to tower OHL, but lower environmental impacts.</td><td>Reinstatement avoids permanent environmental impacts. Cable access points will require vegetation clearance.</td><td>The same as 132kV Pole OHL.</td><td>The same as 132kV UG Cable.</td></tr>
</table>

Table 4: Community impacts

<table>
<tr><th rowspan="2">Characteristic</th><th colspan="3">132kV</th><th colspan="2">33kV</th></tr>
<tr><th>Tower OHL</th><th>Pole OHL</th><th>UG Cable</th><th>Pole OHL</th><th>UG Cable</th></tr>
<tr><td>Construction</td><td colspan="5">Permanent nature: Similar to the environmental impacts above. There will be land use disruptions, with higher impacts on urban areas than rural.

Temporary nature: Construction areas and construction traffic but can be managed by appropriate management mitigation measures. Storage of equipment and plant can be visually intrusive.</td></tr>
<tr><td>Operational</td><td colspan="2">Impacts are minimal, but can consist of: building on route denied, potential visual impact, potential electric and magnetic fields (EMFs) exposure, noise propagation, potential to depress property values.</td><td>Impacts are minimal, but can consist of: building on route denied, potential EMF exposure.</td><td>The same as 132kV Pole OHL.</td><td>The same as 132kV UG Cable.</td></tr>
</table>

Table 5 shows the cost magnitude comparison factors, with 132kV tower OHL as the reference for both the lifetime archetype and losses costs.

In terms of the lifetime archetype costs, where appropriate, we have used Ofgem's RIIO-ED2 Final Determination asset replacement unit costs for the asset categories that are involved. We have also considered that the full lifecycle cost for an underground cable option is a factor of 2.2 to 2.8 times more expensive than an overhead line option.

We have expressed losses as % of energy distributed as losses are sensitive to conductor length and loading. Losses are lower for shorter lengths and lower loadings, and so the great majority of the time losses are below the stated range. As guided by our Losses Strategy, we continue to design and operate our networks to ensure losses are as low as reasonably practicable.

Table 5: Cost magnitude comparison factors

Characteristic	132kV			33kV	
	Tower OHL	Pole OHL	UG Cable	Pole OHL	UG Cable
Lifetime archetype costs	x 1	x 0.2 – x 0.3	x 2.2 – x 2.8	x 0.1 – x 0.2	x 0.7 – x 0.9
Losses (%) (at maximum feasible length and loading)	4 - 6%				

Request 2

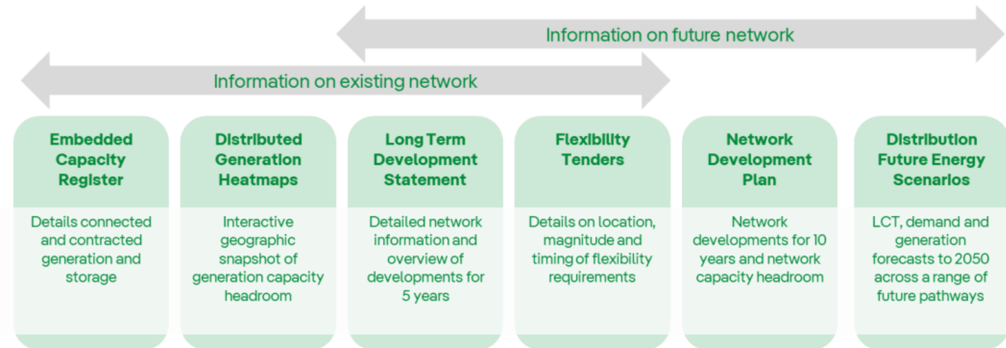
Additional resources on design, planning, construction, operation and maintenance of the network

Question 1: How is your network designed? Looking at circuit design considerations, any explanation of how resilience is planned for in design, and future proofing etc.

Electricity networks are at the heart of the Net Zero transition. The scale of decarbonisation means that by 2050 the peak demand on our distribution networks is forecast to double, and we could likely see a four-fold increase in connected generation and storage. Over recent years we have seen strong appetite from renewable generation and large-scale batteries, and a steady increase in connection rates of domestic, low carbon technologies (e.g. electric vehicles and heat pumps). These trends are expected to continue, and we forecast that our customers are likely to connect up to eight million electric vehicles and heat-pumps by 2050.

Our Decision Making Framework transparently explains how we provide the distribution network capacity our customers need in a safe, efficient and timely manner. There are five key stages: forecasting, network assessment, options assessment, flexibility tendering and intervention decision.

We also annually publish a suite of documents that provide more details into how we plan and operate our network. These are summarised below. All these publications are searchable and freely available on our website.



Our most regularly requested and downloaded policies, procedures and specifications documents can also be found here.

Question 2: What does electricity grid infrastructure consist of and what are the variables? Looking for information about pylon types and their sizes and functions, sub-station requirements and what they do, lines and cables and their sizes, types and requirements, converter stations and what they do, cable sealing end compounds and what they do etc.

We provide general information on What We Do. An overview and basic information on the technical aspects of our electricity grid can also be found in our Long Term Development Statement (LTDS), published annually. Part 2 of this document summarises the power supply system and design philosophy. For more detailed information, Part 3 of the LTDS can be useful, providing details on circuit data, transformer data, system loads, fault levels, embedded generation, connection activity and system schematics.

We have also provided typical sizes and footprints of our circuits in Table 1: Network archetype description, which is part of Request 1: Network topology archetypes, environmental and community impacts.

Besides that, we recognise data is a key enabler to a decarbonised, decentralised and digitalised energy future. To facilitate the sharing of our data with customers and stakeholders, we have developed and launched our Open Data Portal.

In addition, our requirements for power system design and components can be found from our policies, procedures and specifications documents, which can be accessed here.

Question 3: What are the processes associated with creating new grid? Looking at what is physically involved in creating new grid, particularly out on sites e.g. access requirements, equipment, easements, health and safety, temporary or long-term impacts etc. There is also interest in supply chain processes and jobs.

We can generally split the process into project development, delivery, and completion as follows:

Project Development

- We conduct pre-construction surveys (newts, birds, etc.) to assess the environment where the new grid will be.
- Easements will be agreed so we can maintain and operate the network under statutory obligations. If applicable, we also agree minor alterations with landowners.
- We will coordinate and develop the engineering resources required for the project. If suitable resources cannot be identified, based on workload and experience, then external support will be sought.
- All supplies and equipment to be used will be procured.
- We will set up the compound area, which includes ground works and vegetation clearance, as well as temporary hedgerow removal. The compound area will be decontaminated if necessary.

Project Delivery

- We then arrange for the delivery of equipment and mobilisation of workforce. Temporary roads will be installed. Site areas will also be secured according to Health and Safety Executive (HSE) regulations.
- We arrange for the movement of construction plant and equipment to site.
- We will prepare all safety and method statement documents to ensure a construction plan is feasible.
- The new grid gets constructed. Once the works are complete, the new grid will be commissioned and brought online.

Project Completion

- We submit the required data management forms, ensuring assets are correctly added to our corporate IT systems.
- We undergo site reinstatement following completion of works to minimise any impacts on the environment and the community.
- We will also carry out subsequent environmental improvement works, e.g. planting more trees or planting more hedgerows.
- We will review the project (typically within 6 months of project completion) and record any learnings in a lessons learned register. Any relevant points are fed back to the appropriate business area.

Question 4: What are the impacts from grid installations on communities, landscapes, biodiversity and environment? Looking for information you hold about what can be expected at or around electricity grid infrastructure during both installation and operation. What will be visible, what will be disturbed either temporarily or permanently, what mitigations are used and where, for instance. Considering both OH and UG.

Environmental impacts will be determined on a site-by-site basis subject to requirements of Environmental Impact Assessment (EIA) scoping approvals and subsequent assessments. Where an EIA is not required, potential impacts are assessed by relevant ecological assessments. Note that international and national sites of ecological importance are subject to habitat regulation assessment reporting.

In addition, cultural heritage assessments are undertaken when sites potentially affect sites of historical importance. We are aware of our Schedule 9 obligations in the Electricity Act 1989 regarding preserving natural and heritage environments.

National policy guidance specifically related to networks, against which proposals have to be considered by Secretaries of States in England and is a material consideration for Ministers in Wales, is provided in National Policy Statement (NPS) EN-5. It refers to the need to consider biodiversity and geological conservation, landscape and visual, noise and vibration, and electric and magnetic fields (EMFs).

National policy on generic impacts for all infrastructure projects is also set out in the overarching NPS EN-1. We consider other national and local planning policy requirements.

Our policy for managing impacts is set out in our Approach to Routeing document. We also carefully consider undergrounding sections in line with policy set out in NPS EN-5.

The primary mitigation measure is achieved through identifying the preferred route and the secondary measure consists of tree and hedgerow planting. Construction and Environment Management Plans (CEMPs) are prepared to manage mitigation measures during construction and operation. Environmental improvements through net gain provisions are also included in the project designs and implemented by project partners such as local wildlife trusts.

Note that we also detailed the impacts from grid installations on environment and community in Table 3 and Table 4 respectively, which are part of Request 1: Network topology archetypes, environmental and community impacts.

Question 5: Have you used cable ploughing at all? If so, where did you use it, why did you choose it for this work, and what advantages/drawbacks did it present?

We currently do not use cable ploughing, but we acknowledge that cables or ducts may be installed using ploughing techniques. Cable ploughing is an installation method for laying cable in the ground, i.e. it does not affect the wider merits/drawbacks of cable systems in comparison to overhead lines. For example, in terms of ongoing maintenance and fault repair, the drawbacks of underground cabling remains the same regardless of whether a cable has been ploughed or laid via trench.

We are aware, when it comes to installation, cable ploughing can be efficient in reducing the time and labour required, while also reducing the environmental impacts (e.g. minimising ground disturbance), but this method is very heavily reliant on suitable depth and width that are needed, as well as favourable soil conditions. There are also challenges with monitoring and controlling the cable tension during installation.

Regardless of whether cable ploughing is used or not, it is far more difficult and disruptive to investigate, monitor and find faults on underground cables. There are additional financial and carbon costs associated with excavation needed to find and fix faults. Similarly, this can involve disruptive street works if cables like on or near the public highway.

Moreover, underground cables are more likely to be subject to third-party damage and the disruption this causes – e.g. a landowner or third-party contractor accidentally digging through a cable, particularly in areas where the underground services (broadband, gas, water pipes) are congested. Underground cables also are not immune to the impacts of extreme weather – land movements, sinkholes and erosion will affect an underground cable in much the same way they will affect water or gas pipes.

Overhead lines remain the most efficient option when it comes to building, inspecting, maintaining and monitoring power networks.

Question 6: How are faults found and maintenance / repair carried out? Looking at how issues are identified, the impacts at the site of a repair or routine maintenance, access and easements required, time frames or both access and repair. Considering both OH and UG.

The following explains how we find faults on our networks, and how we restore customers:

Fault Location

- We review alarms, indications and monitoring devices, as well as the location of power cut calls.
- We arrange patrols of affected circuits to assess damage.
- We confirm the faulted asset, the voltage level and the cause of the fault.
- We review network linking, perform network checks and data review, to confirm definitive scope of incident, including identification of vulnerable customers, confirmation of customer numbers, customer demographics and network running arrangements.
- We identify any access, safety and environmental issues.
- We identify resourcing requirements.

Customer Restoration

- We draft a restoration plan to complete required works and review restoration efforts in line with Guaranteed Standards.
- We identify and coordinate any temporary restoration options (e.g. network switching and/or deployment of temporary generation).
- We communicate with business units and customers affected, including coordinating welfare arrangement.
- We manage the need for overnight working, considering noise disruption.
- We complete the repair, returning the network to its pre-fault condition.
- We complete a fault report with repair details.

For more info, our EMP-04-008 Plan 1 – System Faults Emergency Procedures; as well as QUAL-10-202 Distribution Fault Management Policy can be provided on request.

Overhead lines are subject to ongoing routine maintenance and inspection regimes, which are not physically possible to replicate on underground lines. Typically, underground cables are repaired when we become aware of a fault, as this requires excavation, and possibly street works, to investigate and repair. We do use technology, such as ReZap, to monitor cable health and assist with locating faults, but this does not entail the same level and frequency of inspection that we are able to undertake on overhead lines.

Securing necessary street works permits and land access rights/wayleaves are issues that are particularly heightened when working on underground cables, in comparison to overhead lines. These all come with additional implications in terms of costs, time, inconvenience to road users, and increased carbon emissions.

Question 7: What can or should communities expect when it comes to remediation works following installation of maintenance of infrastructure? Considering both OH and UG.

After installation of grid infrastructure or any remediation works done, we continue to inspect, condition assess, repair, maintain, refurbish, replace assets where required to ensure a safe and reliable network.

Our assets will be subject to routine inspection and maintenance, with the frequency and scope of works guided by our policies, which are aligned with industry standards.

For underground cables, this depends on whether works are being undertaken on private land or in the public highway. Remediation on private land is typically undertaken in agreement with the landowner, but typically we will return land to its original condition as far as practicable. For remediation works in the public highway, we adhere to the Specifications for Reinstatement of Openings in the Highways.

For overhead lines, the need for remediation work is much more limited owing the conductors being overhead and any groundworks largely being confined to support assets, such as substations or the base of poles/pylons. Maintenance of overhead lines typically involves cutting trees near lines to reduce the likelihood of debris hitting the lines (which can result in customers losing their electricity supply).

Question 8: What is the expected lifespan of the different parts of the infrastructure and can or should communities expect when it comes to the end of infrastructure lifespans? Looking at what gets decommissioned or replaced, what are the physical impacts or the work and what restoration work can be expected.

Different components have different lifespans and over time the individual components of a circuit system may be replaced or modernised at different times.

Generally, circuits can be expected to last for around 60 years. We also provided the Normal Expected Life of overhead line and underground cable components in Table 1: Network archetype description, which is part of Request 1: Network topology archetypes, environmental and community impacts.

How long circuits remain in situ also depends on a number of factors. Overhead lines near coastal areas will depreciate faster than inland lines owing to the effects of exposure to the wind and sea. We usually build assets on the assumption that they will be replaced, given we provide a critical service and the need to distribute electricity to properties will unlikely diminish as the decarbonisation transition continues.

Upon approaching the end of an asset's life, we assess the demands on the network, look at expected growth in the area, account for any expected connections, and any other considerations (i.e. land access or whether the line would benefit from any change, like rerouting or undergrounding). Once we have taken into account all of the above, we will either upgrade, replace, or change the design of the network in order to continue providing the electricity capacity to the communities we serve.

Only where it is identified for good planning reasons that network needs to be time limited can communities expect there to be controls in place to decommission the asset. In the event of decommissioning, the process is the same as construction but in reverse. This is rare and would normally be a return to current land use.

Question 9: What schemes or structures do you have or use for community benefits for schemes or for compensation payments to landowners?

We are committed to our social role and have therefore placed ourselves at the centre of the communities we serve, recognising these communities are also our customers.

In order to install, maintain and operate overhead lines, underground cables and substations, we require the use of land occupied by many individuals (known as Grantors). We seek to agree rights voluntarily with Grantors as much as possible for the majority of new routes and rely on compulsory rights only where voluntary agreements are not secured. We are currently reviewing our community benefit schemes.

The right of access to the land is granted through a Land Right which can be a personal agreement between ourselves and the Grantor (wayleave) or a permanent right to the land (servitude/easement).

Our Payment of professional fees in land compensation claims and the securing of land rights can be found in our Fee Scale.

Question 10: What guidance do you provide to communities when consulting on schemes in their area, and at what point in the process do you provide it?

We work closely with our stakeholders, whose land supports our assets. For information, our Land Code of Conduct can be found here (English / Welsh).

Our approach to consultation is also summarised in our Approach to Routeing document. This outlines key stages of broad route corridors and then feedback on the initial stage. It also includes further consultation on more detailed line alignment and any outcomes from environmental assessments.

We will continue to follow national guidance issued by the Planning Inspectorate.

Question 11: What evidence do you hold on the impacts of networks on health, both mental and physical?

We follow the guidance and advice made available by the Energy Networks Association (ENA) in relation to electric and magnetic fields (EMFs): https://www.energynetworks.org/assets/images/Resource%20library/EMF_The_Facts_250917.pdf

Question 12: Case studies for completed projects: circuit design, costing options, speed of delivery of projects, technical specifications, the investment in community liaison and costs from legal challenge, the projected costs of decommissioning.

Our £18 million project in North Shropshire constructed 22km of new 132kV network on wood poles from Oswestry 132kV substation tot Wem 132kV substation. This has provided additional capacity on the electricity network for new homes and business as well as uptake in Low Carbon Technologies like electric vehicles and heat pumps.

All the relevant information requested can be found from:

- Introduction and Proposals
- Construction Report
- Planning Statement
- Useful Documents

Request 3

Overview of innovation being explored to meet electricity needs

This may be exploring different ways of providing grid infrastructure, finding ways to circumvent the need for new grid, exploring different ways of meeting demand etc. All would be of great interest.

The following are some examples of our innovation in meeting electricity needs.

- Constraint Management Zones (CMZs) rollout which enables the use of Active Network Management (ANM). We use this to manage and accelerate customer connections into our network in advance of / instead of costly and time-consuming network reinforcements.
- Real-time fault level monitoring (RTFLM) and active fault level monitoring (AFLM) provide us with an accurate real-time understanding of network fault level (extra flow of electrical energy should a short circuit or fault happens on our network) and allows us to safely connect more renewable generation without triggering fault level reinforcements.
- Angle-DC created a controllable bidirectional direct current (DC) link between Isle of Anglesey and North Wales. Instead of building new infrastructure, this solution involved converting existing 33kV alternating current (AC) assets to DC, unlocking generation headroom.
- Real Time Thermal Rating (RTTR) can be used to enhance visibility of the thermal status of the network, while enabling an uplift in rating of existing infrastructure, facilitating the connection of more generation.
- LV Engine involves the design, construction and use of power electronics that enable optimum real-time phase voltage regulation in LV networks and capacity sharing between HV substations that facilitate uptake of Low Carbon Technologies on our LV network, deferring traditional reinforcements at this voltage level.
- We also continue to tender for and contract flexibility services to manage constraints operationally as well as in advance of any planned network reinforcements.