National Grid Electricity Transmission Response to Welsh Government Independent Advisory Group on Future Energy Networks

Introduction

National Grid Electricity Transmission (NGET) has been invited to respond to a questionnaire from the Welsh Government's Independent Advisory Group on Future Energy Networks. This document provides our response, on behalf of NGET, to that questionnaire. The questions have been included, as set out by the Independent Advisory Group, and answers have been developed taking into consideration the supporting commentary within the questionnaire.

NGET owns and maintains the high-voltage electricity transmission network in England and Wales, taking electricity generated from power sources and transporting it through our network of pylons, overhead lines, cables, and substations. It then goes on to separate lower voltage local distribution networks, which connect directly to homes and businesses. One of these distribution networks is National Grid Electricity Distribution (NGED), a separate company within the National Grid Group who we understand are providing a separate response.

National Grid sits at the heart of Britain's energy system, connecting millions of people and businesses safely, reliably and efficiently to the energy they use every day. The way we generate and use electricity in the UK is changing rapidly and over the next five years National Grid is investing across the network in England and Wales, to support this energy transition. To do this, we need to make changes to the network of overhead lines, pylons, cables, and other infrastructure that transports electricity around the country.

We are regulated by the electricity market regulator, Ofgem, who require us to provide value for money for consumers, and to satisfy our legal duties. These duties are set out in the Electricity Act (1989) and require us to develop and maintain an efficient, economic and coordinated energy transmission system and have regard to the desirability of preserving amenity.

How is our network designed?

The UK's electricity grid was originally designed to connect the coal and gas-fired power stations that were built on the coal seams that predominantly ran down the centre of the England, through the industrial heartlands of the North, the Midlands and South Wales. As we transition to net zero, more of our energy is coming from renewable sources and therefore significant new infrastructure is needed to connect this energy from where it's generated to where it's required. In particular, the renewable energy that's generated offshore will need to be brought inland for us to use, which means new and upgraded electricity transmission lines are needed to connect the offshore energy to UK homes and businesses.

Not only are Britain's methods of generating power changing, but energy use is rising dramatically – with demand for electricity expected to increase by 50% by 2035 and double by 2050. This is largely driven by changes to the way we heat our homes and power our cars as well as the growing electrification of industry

and rollout of datacentres. Without the Great Grid Upgrade, the grid may also struggle to support the things we take for granted in our daily lives, including the use of personal technologies, electrical appliances and the critical infrastructure that keeps us all connected. We therefore need to ensure our grid networks have the capacity to meet demand and transport the volume of energy generation coming online.

Additionally, the UK Government's ambition to deliver a clean power energy system by 2030 means we need the grid in place to support this.

National Grid works with the National Energy System Operator (NESO), the publicly owned independent system operator and planner, which controls the daily movements of electricity through our assets whilst also planning the future energy system. NESO is ultimately responsible to the UK Government.

When we develop our proposals we must always undergo a thorough process of assessing all the options and demonstrating to our regulator that we have taken steps to discount options based on a number of factors, including impacts on the environment (including landscape and visual, biodiversity, cultural heritage), socioeconomic factors and on local communities.

We seek to develop a reliable and resilient network that can support the changing energy system, while keeping bills low and caring about the communities and environment where we work.

What does electricity grid infrastructure consist of and what are the variables?

There are a number of different technologies that can be used to provide transmission connections. These technologies have different features which affect how, when and where they can be used. As part of our Strategic Options assessments, National Grid publishes a report setting out the options that have been considered, including the technology. A recent example of a Strategic Options Report can be found here for the North Humber to High Marnham and Grimsby to Walpole project in England. Appendix C of this report provides a technology overview and Appendix D provides an Economic Appraisal of the technologies.

Alongside transmission circuits which transport energy across the country, and more rarely via subsea cables and convertor stations, the energy ultimately connects together at substations. Substations form three functions as a point where multiple circuits connect and energy flows to different parts of the country; A place where generation connects to the system to send energy to consumers and business; A location where energy is taken off the transmission system to the distribution system via transformers to supply our cities, towns, villages and ultimately our homes. A substation can perform one, two or all three of these functions, depending upon its location and the need of the system at that point. More information can be found here here.

What are the processes associated with creating new grid?

The process undertaken for creating new transmission infrastructure can vary. It will depend on many factors including: what the new asset is, whether it is required as part of maintaining existing assets that we own, if it is on land we own, if it is new infrastructure, the type of project, the drivers for that project, and the planning requirements.

For new network planning, Britain's strategic energy planner, National Energy Systems Operator (NESO) recommends which reinforcements should receive investment - and when - to deliver a sustainable energy system at best value to consumers. As the transmission owner in England and Wales, NGET inputs to system design and planning processes to help identify which network reinforcements will be needed over coming years.

NGET undertake a thorough process of developing strategic optioneering and will seek to obtain consents required for these projects. However, some projects may be subject to an open competition process led by the regulator, Ofgem. For many of these projects, our plans are still at an early stage of development, and still subject to further detailed design assessments. We're currently reviewing what is required to ensure we bring forward proposals that are efficient, coordinated and economical, to bring value to consumers.

For a new substation for a customer connection, we will, wherever possible, always make use of existing assets. When a new substation is required or an existing one needs replacing or upgrading, our engineers and designers develop the electrical, civil and mechanical designs to maximise the use of the land so that the design is safe to construct, operate and maintain.

Planning permission may be required for any new substation depending on the scale and location of the development. Good design is at the centre of the planning process, identifying opportunities to avoid, reduce and mitigate impacts, which is collaboratively developed with landowners, communities and other stakeholders. Whatever NGET plans to build, whether it is at an existing site or on a new site, we ensure that environmental issues and the impact on the surrounding area are fully considered, carefully minimising impacts on the environment and communities and incorporating good design. For new sites, National Grid will explore opportunities to reduce visual impacts by making the substation as unobtrusive as possible within the local surroundings and we work with the local community, elected officials and statutory consultees, to minimise impact from construction activities for when the site becomes operational. Planning, designing and building a new substation can take several years, depending on the complexity of the project.

For more information on processes of building substations please see here: https://www.nationalgrid.com/electricity-transmission/document/119636/download and on pylons here: https://www.nationalgrid.com/electricity-transmission/document/82681/download

What are the impacts from grid installations on communities, landscapes, biodiversity and environment?

At NGET, we understand that all infrastructure projects have impacts and benefits locally and nationally. We are committed to engaging with communities as we develop our proposals, as well as their representatives and critical stakeholders through all stages of the planning and construction process to limit impacts from the point of design. Our aim is always to limit negative impacts and maximise benefits for local communities.

In developing projects, we will always seek to reduce impacts by first considering where the existing network can be optimised to reduce or avoid the need for new infrastructure. Where this is not possible, and there will be a need for new infrastructure, strategic options are established taking into account technical requirements, as well as urban areas or national landscapes. We identify and appraise strategic options to consider the possible impacts of each, including on landscape and environment. We then undergo further routing and siting processes to further mitigate impacts where possible. We engage stakeholders and communities throughout the development of the project to grow our understanding, and help us further refine the design to consider, avoid, reduce, and mitigate impacts.

Where a development as defined by the Environment Impact Assessment Regulations requires an Environmental Impact Assessment (EIA), we use the EIA process to identify likely effects in detail and consider how we can mitigate these. This information is detailed in the Preliminary Environmental Information Report (PEIR). An Environmental Statement will be prepared in accordance with the EIA Regulations and will accompany the application (for a project under the Nationally Significant Infrastructure Projects (NSIP) regime or sometimes under the Town and Country Planning Act regime).

At NGET, we also want to leave a lasting *positive* impact where we build our projects to help those areas and communities thrive and to support a sustainable future. National Grid believes that communities should be rewarded for hosting new electricity transmission infrastructure, which is essential to delivering homegrown, cleaner, and more affordable power and we are pleased to see the publication of updated community benefits guidance from the UK Government in March this year. We look forward to continuing to work in partnership with communities to deliver long-lasting, meaningful benefits alongside the delivery of critical infrastructure.

We are committed to working with local residents and stakeholders as we develop our plans, and the introduction of this guidance sets a clear framework for working in partnership with communities and their representatives to deliver meaningful, legacy benefits.

Regarding biodiversity, we are committed to ensuring there is at least a 10 per cent biodiversity net gain (Biodiversity net Benefit in Wales) from our projects. This means our work needs to result in more, or better quality, natural environment than before development. This presents opportunities to use development to enhance our wild spaces and provide new habitats.

Beyond the efforts we make during the design and development of *new* projects to protect the landscape, we do also have schemes to reduce the impact of *existing* infrastructure. The Visual Impact Provision is a £465m provision by Ofgem to carry out work that reduced the impact of existing transmission lines in English and Welsh National Landscapes (formerly AONBs) and National Parks. An example project in Wales is the Eyri VIP project that aims to reduce the visual impact of National Grid's overhead line across the Dwyryd Estuary from Minffordd to Llandecwyn. More information can be found here: https://www.nationalgrid.com/electricitytransmission/network-and-infrastructure/visual-impact-provision/eryri

At National Grid we are passionate about playing our part in conserving and enhancing the natural beauty, wildlife and cultural heritage of the landscape. The most important task for us is to use this provision to achieve the maximum enhancement to our nation's precious landscapes while avoiding unacceptable environmental impacts. To ensure that we get this right and maximise the potential of the Visual Impact Provision project, National Grid is working closely and collaboratively with stakeholders.

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 have experience of using cable ploughing technology when installing HVDC cables in the seabed, but we have not used this technique on land. Whilst cable ploughing may be a useful technique for some elements of a cable project and may have some cost benefits over other installation techniques, our assessment indicates that the cost, environmental and technical implications of cables remains more challenging than the overhead line alternative.

From a cost point of view, cable ploughing does not relieve costs from installing cables across road, rail, waterways, hedges and ditches, or the costs of the cable itself. There are also potentially visual impacts from large above-ground installations, with reactors and switches, which would be required every 20-30 km to allow operation of long cable systems to be possible. Furthermore, ploughing would result in some environmental impacts with some areas where it may be technically challenging, given geological and topographical considerations in Wales. That said, that does not mean that we would not consider it as a technique where appropriate - just that it does not change many of the fundamental challenges and costs of cables compared to overhead lines.

How are faults found and maintenance / repair carried out?

For both our overground and underground assets, we undertake regular patrols to look for damage or activity that may damage assets above or below ground. We undertake regular inspections of all our assets to determine if there is any degradation of our assets that might lead to failure in the future and then take action to remedy the situation.

Faults which occur on the network cause the circuit breakers at each end of a circuit to open, therefore making the circuit safe. Two types of faults can occur on our system: Transitory (temporary in nature, normally caused by lightning) and permanent (a fault caused by the failure of equipment).

Temporary faults can affect any electrical equipment which experience a lightning strike. NGET's overhead lines are designed to provide shielding from lightning but occasionally a strike will cause a temporary fault which is restored immediately following a strike. Underground cables also have protection from lightning strike. However, should a strike cause a fault on underground or transformer equipment, these cannot be returned to service automatically, without inspection.

Permanent faults occur when equipment is damaged and the system locks the circuit out until the fault can be identified and fixed. Identification of a fault on above ground equipment is often visible and therefore easier to fix. For example, a failed switch, circuit braker or isolator would be visible and accessible for repair.

Underground equipment can be more challenging. To locate a fault, we perform an aerial inspection. If it cannot be identified, a number of tests, including examination of monitoring data, is made to try and locate the fault. This is followed by excavation to try and locate the actual point of fault and determine the type of fault. Failures to equipment such as underground cables, transformers, circuit breakers can take a long time to fix as it requires movement of heavy equipment, and specialist skills.

What can or should communities expect when it comes to remediation works following installation of maintenance of infrastructure?

We will always look to minimise the impact of our essential works on the local community by keeping them informed of our works. This involves sending letters and sharing details of our community relations team so they can speak directly to us if they have any concerns.

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?

For onshore assets, lifespan is assumed to be 40 years, while for offshore assets this is 25 years due to the harsher environmental conditions. The impact on communities in refurbishing or replacing existing assets will vary depending on the asset and the planning requirements. As with all our projects, we will always aim to keep communities informed, as outlined above.

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

We know that our responsibility as a business goes beyond safely building new energy infrastructure to enable a cleaner, fairer and affordable future. We want to leave a lasting positive impact where we build our projects to help those areas and communities thrive and to support a sustainable future. We will work with stakeholders and communities to understand their priorities and endeavour to deliver initiatives that support them.

NGET currently has a Community Grant Programme aimed at community organisations and charities in areas affected by our work. We provide information about how to apply for this programme which funds projects that meet local needs by providing a range of social, economic and environmental benefits.

National Grid firmly believes that communities should be rewarded for hosting new electricity transmission infrastructure, which is essential to delivering homegrown, cleaner, and more affordable power. We were therefore pleased to see the publication of updated community benefits guidance by UK Government this year and look forward to continuing to work in partnership with communities to deliver long-lasting, meaningful benefits alongside critical infrastructure.

We are committed to working with local residents and stakeholders as we develop our plans, and the introduction of this guidance sets a clear framework for working in partnership with communities and their representatives to deliver meaningful, legacy benefits.

We understand that construction can be inconvenient for landowners, therefore we want to work closely, fairly, and consistently with farmers and landowners across all our projects to reduce the impact of construction on their land. Proposals put forward to planning authorities and ultimately the government always consider this along with biodiversity and impact on the landscape.

For example, on the Norwich to Tilbury project we have a core team of 7-8 ecologists, and they are supported by up to 40 field surveyors, surveying the land, taking soil samples, assessing habitats, which will all form part of our Environmental Impact Assessment to be considered by the Planning Inspectorate.

Compensation payments for hosting new infrastructure are agreed and paid at different points during the construction timetable and compensated in accordance with The Compensation Code to ensure fairness and consistency across the country.

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?

Where new network reinforcements are needed, we consult communities early, at a stage where our proposals are not absolutely defined and ahead of when we are required to consult under the Planning Act 2008. We provide information in a variety of ways, designed to explain in simple, easy to follow ways, why network reinforcement is needed; the options we have considered; our early thoughts about potential proposals we are seeking local communities views on; how to engage and provide feedback; and next steps after the consultation closes.

In addition, we are currently exploring whether we can put in place with Planning Aid England and Planning Aid Wales, dedicated webinar sessions for community councils in Wales and parish councils in England, explaining the Development Consent Order and planning process. We will make those sessions available to community and parish councils potentially impacted by network reinforcements at key consultation stages on our projects and ahead of the examination stage of individual projects.

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

National Grid takes the issue of health and safety very seriously for its employees and contractors, as well as the public we serve and communities we operate within.

Where an Environmental Impact Assessment is required, the health and wellbeing of communities affected by construction will be assessed. We carry out noise and vibration assessments in line with the EIA process to identify areas of potential noise disruption – both during the construction and ongoing operation of any new infrastructure. Where needed, we will develop noise barriers to try to minimise this sound disruption as much as possible.

All of our machinery is compliant with industry standards and the limits on noise disruption that this entails. We have also included this in our routing and planning to try and avoid neighbourhoods, hospitals, and schools, to ensure that these places receive minimal noise disruption.

We rely on authoritative and independent scientific organisations, such as the World Health Organization (WHO) and the UK Health Security Agency (UKHSA), to review the worldwide body of scientific evidence on electric and magnetic fields (EMFs) and health, as well as reviewing the science ourselves.

We believe it is right that the decision on what is acceptable or not is made independently of industry. We ensure that all our assets comply with the guidelines set by Government on advice from the UK Health Security Agency (UKHSA).

A vast amount of research has been done into the possibility of health effects, leading to the current guidelines. These have been in place for many years now, and no risks have been identified that warrants a change in the levels set by them.