

Written evidence submitted by the National Grid (GRD0025)

National Grid sits at the heart of Britain's energy system, connecting millions of people and businesses to the energy they use every day. We are fully committed to playing a leading role in enabling the transition to net zero, by investing in and developing innovative solutions whilst protecting the environment and helping all regions of the UK to share the economic benefits presented by the energy transition.

Energy infrastructure is critical to delivering on the ambition for the UK to be net zero by 2050 as outlined through the Energy White Paper and associated strategies. Our business is focused on delivering this ambition through investing and innovating across a range of net zero infrastructure solutions, including: enabling an affordable hydrogen economy; supporting with the increase in electricity capacity required for EV charging and heat decarbonisation; and connecting 40GW of offshore wind by 2030 on the journey to a full zero carbon power system by 2035.

We welcome the opportunity to respond to Welsh Affairs Select Committee inquiry on the 'Grid capacity in Wales'. In responding to the inquiry, we set out how National Grid can support both the UK and the Welsh Government to achieve their respective ambitions and the key role electricity transmission has in facilitating the transition to a decarbonised Wales.

Executive Summary

- Grid capacity is a critical enabler to Wales and the UK more broadly meeting its net zero ambitions. Ensuring networks are in place in a timely manner is essential to connecting new zero carbon sources of generation as well as decarbonising transport, heating, and industry.
- Transmission infrastructure in Wales is currently limited to the north and south, with no direct transmission route linking the north and south Wales network. The capacity that is available for the connection of new generation / demand to this existing infrastructure is limited and the need for significant network reinforcement has been identified for recent connection applications in these areas. As there is no transmission infrastructure in mid-Wales today, connections away from here will require new circuits to be built.
- The current incremental approach to developing infrastructure is likely to result in inefficient developments with higher costs, later delivery, and greater environmental impacts, whilst also missing the opportunity for significant community benefits.
- We therefore welcome the Welsh Government's decision to establish a strategic group to focus on 'evolving the energy grid for net zero' and we are committed to playing our part in ensuring that the group's output provides solutions that help to enable the decarbonisation ambitions of Wales. Collaboration is key and it is important that the work of this group moves at pace and that its recommendations are championed and implemented by UK Government, Welsh Government and Ofgem.
- Furthermore, this strategic approach would be helped by both the UK and Welsh Government clarifying the scale of their ambitions for renewable energy development in Wales, by setting gigawatts (GW) targets of capacity by 2030, 2035 and 2050, alongside a stated ambition on whether their intention is to develop renewable energy to power Wales or for Wales to be an exporter of renewable power.
- Delivering net zero requires a step change in how industry plans, consents, consults and constructs infrastructure, therefore the current consultation on refreshing the Energy National Policy Statements (NPS), is most welcome. However, whilst the revised NPS makes progress on several factors required to decarbonise the UK, its current drafting does not provide the step change needed to deliver the scale and pace of nationally significant infrastructure development that is required to meet the UK's net zero ambition.
- It is essential that the journey to net zero is a fair transition which both minimises impact on and delivers benefits for communities which are asked to host this infrastructure, whilst ensuring value for consumers. UK and Welsh Government have an opportunity to set out clearly in policy what they require of developers and deem an appropriate approach to community benefits.

About National Grid

This response represents the views of National Grid Electricity Transmission (NGET) which owns the high voltage electricity transmission network in England and Wales and National Grid Gas (NGG), which owns and operates the high-pressure gas transmission system in England, Scotland and Wales.

Understanding electricity networks in Wales

The electricity grid was built in the 1960s and was designed to carry power from traditional coal power stations that generated the electricity, to the cities and towns where this electricity is used. NGET owns the high voltage electricity network - the overhead lines/pylons, underground cables and substations - that are the 'electricity motorways'. They move power in bulk from where it is generated to the lower voltage distribution network operators (DNOs), who then in turn move the power to homes and businesses. The distribution networks in Wales are owned and operated by Western Power Distribution (WPD) in South Wales (WPD was recently acquired by National Grid and is now being integrated into the National Grid Group) and Scottish Power Energy Networks (SPEN) in North Wales. The Electricity System Operator (ESO) is a legally separate entity within the National Grid Group, which utilises our infrastructure to balance the day-to-day electricity needs of the country to ensure that the right amount of electricity is where it's needed, when it's needed. ESO also plays a leading role in planning the electricity networks of the future.

The increasing rollout of renewable energy generation such as wind and solar, which is often developed in rural areas or offshore, as well as the need to electrify and decarbonise other parts of the economy including transport, heating and industry, now mean that the electricity networks require significant development to connect this new generation to where the energy is needed.

National Grid Electricity Transmission infrastructure in Wales

North Wales: The onshore network in north Wales comprises a 400kV circuit ring connecting Pentir, Connah's Quay and Trawsfynydd substations. A 400kV double-circuit spur connects the now decommissioned nuclear power station at Wylfa to Pentir. A short 400kV double-circuit cable spur from Pentir connects Dinorwig pumped storage power station. A 275kV spur connects Trawsfynydd to Ffestiniog pumped storage power station. Most of these circuits are of double-circuit pylon construction. However, Pentir and Trawsfynydd within the Snowdonia National Park are connected by a single 400kV circuit, which is the main limiting factor for capacity in this area.

South Wales: The south Wales network is connected via two 400kV double circuits from Pembroke via Swansea North, Rassau and Cilfynydd towards Melksham and Walham 400kV substations. There is also a 275kV double circuit connecting the 275kV network from Swansea North via Aberthaw. The South Wales network connects several thermal generators including Pembroke and Severn Power gas powered stations. Some of the older power stations are expected to close in the future but significant amounts of new generation capacity are anticipated to connect, including generators powered by wind and tidal.

Mid Wales: There is not currently any National Grid transmission infrastructure within mid Wales and any new generation in this area would require development of new infrastructure to connect to the transmission and, or distribution networks

Please refer to Appendix Figure 1 for NGET network map for Wales.

Question 1. What are the current capacity issues facing the National Grid?

In north and south Wales some limited spare capacity for connecting was created by plant closures, however newly contracted generation will use up this spare capacity. We are working closely with ESO and Western Power Distribution (WPD) to alleviate some of the capacity constraints in south Wales, however current connection dates are set out to 2028, subject to ongoing work. The current network in north west Wales and would need significant major reinforcements to accommodate clusters of large generation projects.

There is not currently any transmission infrastructure in mid Wales, as the area traditionally only had a small demand for electricity which could be met through the distribution networks. However, with UK and Welsh Government's ambitions for developing renewables on the journey to net zero, mid Wales is seen as an ideal area to develop onshore wind and solar in particular, and any new generation in this area will likely require development of new electricity network infrastructure to connect this power, this could be distribution, transmission or both. New substantial generation in this area will likely need transmission infrastructure, with an uncoordinated approach providing potentially less optimal solutions, risking more network infrastructure is built compared with what would be needed if a holistic approach were taken.

Therefore, a strategic solution is required to ensure the future power requirements of Wales can be delivered at a pace that matches the ambitions of Welsh Government and developers, but this needs regulatory, planning and Government alignment to be deliverable. This will then ensure the grid infrastructure will not be a barrier to renewable development in the future.

Question 2. How are the constraints on Wales' grid likely to be exacerbated as demand for renewable energy surges?

As has been noted in our response to Question 1, networks are already constrained and would therefore require upgrades to facilitate new clean generation. Further build out of renewables in Wales will require development of electricity networks, both to connect the projects but also deliver deeper network reinforcement to move the power from where it is connected to where it is used. Additionally, where renewables are delivered in areas that are remote from major electricity infrastructure, such as mid Wales, networks will need to be extended into these areas to facilitate connections. Renewable energy developers can generally consent and construct their projects much quicker than traditional forms of generation, nuclear for example, therefore network development is urgently required to keep pace with these projects.

ESO's Network Options Assessment (NOA) outputs a view of the network reinforcements NGET should develop over the following 12 months. Importantly, the assessment is done on an economic basis only (looking at constraint costs vs. network costs) and looks only at particularly 'boundaries' across the network, and therefore may not trigger all the necessary transmission reinforcements that are highlighted by NGET network compliance studies. In this year's publication¹, the ESO acknowledge that there may be drivers for reinforcement works in Wales not included in the NOA process.

In addition to the NOA, further offshore leasing rounds for the development of offshore wind by The Crown Estate in the Celtic Sea will likely drive the need for electricity network development and reinforcement. BEIS' Offshore Transmission Network Review (OTNR) and specifically the Holistic Network Design (HND) are critical to establishing an onshore and offshore blueprint for the networks required to connect UK Government's ambition for offshore wind. OTNR is only considering offshore generation, its recommendations will not identify the network developments needed to connect new onshore generation or to support the higher demands associated with decarbonising transport and heat.

Beyond renewables, new nuclear projects which are proposed in North Wales at Wylfa and Trawsfynydd will most likely also lead to development of electricity networks in Wales.

When considering all these factors, it is therefore important that UK and Welsh Governments plan positively for networks giving equal weight to the projects they connect, to ensure that ambitions to advance these low carbon technologies which are essential on the journey to net zero are realised. A strategic plan that includes all drivers is most likely to minimise the cost and impact of any required infrastructure developments, and provide the certainty needed to speed up the realisation of their benefits.

Question 3. How can Wales unlock the grid and ensure that it is ready for future demand?

Taking a holistic approach to network planning is key. We welcomed Welsh Government's decision to establish a strategic group to focus on 'Evolving the energy grid for net zero', Energy Systems Catapult have recently been appointed to facilitate the work of this group. We are committed to play our part and ensure that the group's output provides solutions that enable the decarbonisation ambitions of Wales. It is important that the work of this group moves at pace and that its recommendations are championed and implemented by UK and Welsh Government.

Furthermore, this holistic approach would be aided by UK and Welsh Government articulating the scale of their ambitions for renewable development in Wales, through the identification of priority areas for development as was proposed under the National Plan for Wales, targets on GW of capacity by 2030, 2035 and 2050, and a stated ambition from Welsh Government on whether their intention is to develop renewables to power Wales or for Wales to be an exporter of clean power. This would provide developers clarity and stronger justification in the planning process for their projects, whilst informing NGET's and the DNOs' thinking on what shape of network to consider.

Planning reform will also be key to deploying grid infrastructure, it is important to note that development of transmission infrastructure in Wales falls under the remit of the Nationally Significant Infrastructure Projects (NSIP) process which is the responsibility of UK Government. Delivering net zero requires a step change in how industry plans, consents, consults and constructs infrastructure, therefore the commitment within the Energy White Paper to review and update the Energy National Policy Statements (NPS), was most welcome. However, whilst the revised NPS makes progress on a number

¹ <https://www.nationalgrideso.com/document/233081/download>

of factors required to decarbonise the UK, its current drafting does not provide the step change needed to deliver the scale and pace of nationally significant infrastructure development that is required to meet Government's net zero ambition. We agree with a number of the recommendations recently made by the BEIS Select Committee as part of its scrutiny of the revised NPS, particularly on the need for the NPS to place greater emphasis on the need and pace of delivery as well as a presumption in favour of Nationally Significant Infrastructure Projects (NSIPs) that are critical to net zero.

Our recent experience in developing options to connect mid Wales windfarms, and the Wylfa Newydd nuclear power station on Anglesey, to the transmission network reinforced that grid infrastructure is often viewed by the public as highly contentious. Therefore, the NPS should also reflect the need to bring communities, which host this infrastructure with us and look to provide clarity on the appropriate approach to community mitigation. We feel that the draft NPS currently misses the opportunity to set out clearly in policy what the Government requires of developers and deems an appropriate approach to community benefits.

When considering the future electricity network requirements for Wales it is important to also consider the entire energy system. We welcome the inclusion of the gas networks as part of Welsh Government's 'evolving the grid for net zero' group. National Grid Gas Transmission (NGG) are investigating solutions that repurpose existing gas transmission assets to supply hydrogen to South Wales. Project Union is exploring the opportunities in creating a hydrogen backbone, connecting the Grangemouth, Teesside and Humberside clusters, as well as linking up with Southampton, the North West and South Wales clusters. The research will explore how we can start to convert pipelines in a phased approach by the end of the decade, aligning with government ambitions of producing five gigawatts of low-carbon hydrogen by 2030.

Question 5. What should be done to ensure that the grid, particularly in rural areas, can cope with the extra demand that will be generated from the transition to electric vehicles?

It is important that no one is left behind on the transition to net zero, therefore consideration of rural communities is required as we decarbonise transport and heat in particular. Grid infrastructure is therefore becoming more essential to people's lives in rural areas. For example, distribution and transmission electricity networks will play an essential role in delivering power to where it is needed for the electric vehicle (EV) charging infrastructure required to enable rollout at scale. Whole system planning, coordination and collaboration will be critical across Government, local authorities, and industry. It is positive to see that Welsh Government's 'Evolving the grid for net zero' group acknowledges ambitions for renewables to power transport and heat and that this ambition 'needs a transformation of the existing electricity and gas networks.'

As the transport sector is currently the largest contributor to the UK's carbon emission, accounting for 27% of overall emissions in 2019, strategic thinking is required to accelerate decarbonisation of the sector at pace. Decarbonising transport also brings wider societal benefits such as clean air, cleaner supply chains and economic growth across Britain.

EVs will be charged in many different locations, including at home, at work, at other destinations such as shops and at ultra-rapid EV charge points. It is important that the output (voltage and volume) of the chargers at these destinations, and therefore the underlying network capacity, reflects the amount of time that the vehicle is stationary there and that these are visibly rolled out to give current and future EV users confidence and remove range anxiety.

This will also drive requirements to develop grid infrastructure to support the charging infrastructure, either distribution or transmission connections. It is important that these grid solutions are future proofed, so they are only delivered once, this will be the least disruptive and most cost-effective way forwards. It was when considering this that the Office for Zero Emissions Vehicles (OZEV), established Project Rapid, including the Rapid Charging Fund of £950m to ensure that the capacity required for full EV rollout is in place along the strategic road network (SRN) in England. A similar scheme for Wales will be necessary to ensure that sufficient charging infrastructure is in place along the Welsh SRN as more and more consumers transition to EVs.

We would also recommend factoring in considerations on what capacity will be required for wider road transport such as HGVs and buses, as regardless of technology choice for decarbonising these heavier road vehicles, whether that be powering catenary lines, charging batteries, or producing the green hydrogen required for transport through electrolysis, electricity networks will play a critical role in providing this capacity. Therefore, reinforcing the need for a strategic solution for networks which is guided by the requirements of Wales' transport decarbonisation plans and ensures rural communities also share in the benefits of clean transport.

Question 6. What level of anticipatory investment in grid capacity is required by the UK Government in order to ensure that Wales can deliver its decarbonisation roadmap?

Taking a holistic approach to network planning is key, see our response to Question 3 for detail and recommendations on this. The current framework requires parties to make connection applications to initiate investigations for connection and wider works to export power from regions of generation to those where it is consumed. The cost and lead time for these works can be prohibitive for generation projects, whereby they would need to invest in the connections significantly ahead of development before they would have financial close for their project.

Within NGET, we are seeing significant volumes of requests from numerous developers of different technologies seeking to connect their projects to our network at the earliest opportunity. The optimal transmission infrastructure from a group of generation projects will be significantly different from that of one or two individual projects. It would be inefficient and create significant consenting challenges to plan incremental network reinforcements to accommodate individual projects as they apply or receive financial close. Therefore, policy and regulatory mechanisms need to support a holistic anticipatory design to accommodate generation to meet net zero ambitions. Focussed anticipatory investment in networks has the potential to drive low regret optimal solutions that are efficient, minimise impact on communities and deliver long term value for consumers.

Question 7. How can the UK Government, the Welsh Government and Ofgem work together to improve grid capacity?

As has been mentioned in our answers to other questions, collaboration across Governments, Ofgem, developers NGET, DNOs, ESO and communities will be key. Certainty on the ambition of both UK and Welsh Government for deployment of renewables, other zero carbon sources of generation as well as wider decarbonisation of the Welsh economy are critical to then planning and developing the electricity networks required to enable this ambition. With collaboration across these stakeholder groups, markets and networks will be able to address issues, by developing and delivering solutions which minimise impact on communities that host infrastructure whilst delivering value for consumers.

Ofgem's role, responsibilities and duties will need to evolve. We believe that strengthening Ofgem's statutory duties to specifically support the delivery of the UK's emissions reduction targets would help to ensure net zero receives sufficient focus. This will enable Ofgem to focus on the long-term value of investments for consumers by sanctioning investment in the already mentioned holistic solutions required to connect the scale of renewables required to decarbonise Wales' and the wider UK's economy.

The work of the strategic networks group is also critical in creating a whole system plan for networks in Wales, Governments and Ofgem should align with the outputs of the group and look to accelerate delivery of these outputs by recognising the importance of the plan to delivering a decarbonised Wales, planning decisions, and sanctioning the regulatory funding and anticipatory investment required to guarantee the construction of networks. This in turn will give confidence to developers that grid capacity will in place in time for the delivery of their projects, as they themselves reach key decision milestones on planning approval and final investment decisions.

Broader consideration should be given to how Government's plan for and invest in the wider supply chain which will be required to deliver on decarbonisation ambitions for Wales and presents a real opportunity to drive investment and jobs in all regions throughout Wales and the UK.

Appendix:

Figure 1: Transmission Network Map



Note: The datasets contain electricity transmission data only and is to be used for illustrative purposes only.

March 2022