

Written Evidence Submitted by the Department for Energy Security and Net Zero (GRI0094)

Introduction

The Government expects annual electricity demand to increase from current levels by over 35% by 2035 and by over 70% by 2050. A new mix of secure home-grown electricity generation, such as renewables and new nuclear, is being developed to meet this demand; securing our energy supply, decarbonising our power grid and lowering bills for consumers.

This new generation will require the re-wiring of Great Britain to transport power from new generators to homes and businesses as new infrastructure is required to reinforce and modernise the National Grid. Around four times as much new electricity transmission network in Great Britain could be needed in the next seven years as has been built since 1990. To meet net zero, the onshore electricity network could require £100-240bn of investment by 2050 (above a baseline £70-120bn). However, unit costs are likely to stay constant because the investment will be spread over more consumers as we decarbonise transport and heating. New network build is financed by consumer bills, but failure to build also costs consumers through constraint costs, which National Grid Electricity System Operator (ESO) estimate could reach as high as £5bn per year in the late 2020s.

In recognition of the challenge, the Government appointed Nick Winser CBE as Electricity Network Commissioner. The [Electricity Networks Commissioner's recommendations](#) were published on 4 August 2023 and makes clear, there is a need to accelerate the delivery of transmission infrastructure to support the UK's dynamic renewable and nuclear energy sectors and ensure that new power they generate can be connected on time to deliver for consumers and the country.

Action is already underway to achieve this, including the development of the first [Holistic Network Design](#) (HND), and the delivery of the Ofgem-led [Accelerated Strategic Transmission Investment](#) (ASTI) process; as well as Government consultations on improvements to the National Policy Statements and on community benefits for network infrastructure. We are working with Ofgem, industry and other stakeholders to publish an Action Plan by the end of the year in response to the Commissioner's recommendations on how we can go further and increase our ambition.

As well as speeding up infrastructure build, Government is also working with Ofgem and network companies to release network capacity and improve the connections process, to accelerate connections. The 'queue' to connect to the transmission grid is extremely congested, with more than 345GW of generation projects in the connection queue as of June 2023 (compared to c.80GW of generation currently connected) Actions already underway by network companies are expected to see a reduction in transmission connection timescales of 2-10 years, for the majority of existing projects, and we will publish a Connections Action Plan later this year.

1. Does the current national and DNO grid deliver the capacity needed for the future and, if not, what are the solutions?

As set out above, across GB we need an unprecedented level of network investment over coming decades to support the energy transition. This is a significant focus for the Government in a range of work. Work is already underway across Government to improve the strategic planning of transmission network infrastructure, including the HND which was published in June 2022. We are also working to improve the planning and consenting process; reducing community impacts through the strategic approach to network design. We are also working closely with Ofgem to expedite regulatory approval process, for example through Ofgem's Accelerating Strategic Transmission Investment decision which accelerated nearly £20bn of strategic transmission investment last December.

However, we recognise that more needs to be done. In July 2022 the Government appointed Nick Winser to the role of Electricity Networks Commissioner. The Commissioner submitted his recommendations to halve the delivery time for transmission network infrastructure in June 2023. We will build on the momentum generated from this report and target specific priority areas for immediate focus. We recognise the fundamental change needed and have committed to publishing an Action Plan this year in response to the Commissioner's recommendations. Where recommendations have significant resource and delivery implications for the FSO, further engagement will be needed with the ESO and wider industry before making final decisions. As set out in the [letter from the Secretary of State for Energy Security and Net Zero to the Commissioner](#), the Government supports the direction of the package proposed and will give recommendations full consideration in the Action Plan.

Significant investment is also needed in the distribution networks. Under the current price control, Ofgem has allowed £22.2bn for network companies to invest in their distribution networks. Ofgem is considering strategic planning of distribution networks as part of its [Future of Local Energy Institutions and Governance consultation](#), including a proposal to create Regional System Planners responsible for delivering regional strategic cross-vector energy plans. Informed by local stakeholders to take into account regional priorities, this would help provide confidence to better inform network investment and ensure sufficient future capacity.

Government is already reforming the governance of the energy system by establishing a new Future System Operator (FSO). The FSO will be a first of a kind expert body, that will take a joined-up whole systems approach to GB's energy system, acting as a trusted voice at the heart of the energy sector and advising government. The FSO will take on key roles in electricity and gas and take a whole energy system approach when operating, planning and developing the network. This includes delivery of the Central Strategic Network Plan, which will include a longer-term strategic assessment of network needs to deliver the capacity that may be needed in future. The FSO is also being considered as an option to take on Regional System Planner roles.

2. Has the organisation of the National Grid proved a barrier to the installation of renewable energy sources, and if so what could be done to remedy this?

Years of investment in new renewable power has put pressure on the electricity network. As any existing 'spare' capacity in the network has largely been used to connect new renewables, and as the pace of renewable deployment continues to increase, the historical model based on incremental upgrades is no longer appropriate. We want to go further and faster on renewable generation, so we're taking steps to rapidly bring more online. Having connections available only post-2030 for renewables development poses significant challenges. We are also keen to ensure that the role of National Grid in supporting Distribution Network Operators (DNO) in awarding distribution connections, via ESO's determination of consequential transmission reinforcements, does not add cost and delay to projects. We will keep working with Ofgem to keep this under review.

A whole sector transformation is underway, including to the framework within which National Grid operates. We are accelerating plans to reform the connection process and reduce connection timescales, working with key partners, such as Ofgem and network companies such as National Grid Electricity Transmission (NGET). The way in which the network is planned is also being transformed through the HND, and this model for strategic planning will be developed into the Centralised Strategic Network Plan (CSNP) to be delivered by the Future System Operator, once established. Ofgem, as regulator, has introduced the ASTI framework, amending the way in which funding for certain projects is unlocked. Where appropriate, Government action will support this delivery, for example through changes to the Energy National Policy Statements. In response, NGET will need to adopt a renewed focus on delivery.

Ofgem have also allowed £22.2bn of upfront funding for distribution network owners to invest in low-voltage networks, including £3.2bn for network upgrades. This will help support uptake of low-carbon technologies, including renewable generation.

Concerns from the sector about timely grid connections in relation to offshore wind are also well known. The Government undertook an [Offshore Transmission Network Review](#) (OTNR) looking at the way the offshore network is designed and delivered. This concluded in May 2023 and the organisations involved are now implementing its findings to deliver a coordinated offshore transmission regime for Great Britain. OTNR outcomes will facilitate the transition to strategic delivery of transmission infrastructure for the UK's offshore wind sector and the wider national grid, supporting our transition to Net Zero, to energy security and low energy costs for consumers. Through the OTNR the HND was published in July 2022. The HND sets out a single, integrated design for the electricity network to support the connection of an additional 23GW of power from offshore wind onto the Grid by 2030.

The ESO has concluded an important phase of the HND Follow-Up Exercise which will provide recommended connections for 21GW of Scottish offshore wind. This will

be published at the end of 2023. This publication will be followed by an update to include projects in the Celtic Sea. In time, the ESO will build on the approach taken for the HND to deliver CSNP, which will take a whole system approach to designing the transmission network. Once established, we intend for the Future System Operator to take on responsibility for the CSNP.

Finally, the Government recently set up the [UK Solar Taskforce](#) to drive forward the actions needed to deliver the ambition of 70GW solar power by 2035. The Taskforce has identified the need to address issues relating to network capacity and grid delays as a priority. Therefore, it has established a specific Electricity Networks Subgroup to focus on this area.

3. Should there be more innovation and devolution in the development of the Grid?

There are various ways in which innovation could be used to increase capacity and resilience in the future UK electricity grid. The Government is already undertaking research on the smart grid through the Net Zero Innovation Programme and Ofgem is undertaking research in several of these areas through the Strategic Investment Fund. UK Research and Innovation and the research councils have also funded research projects in this area. The Government, jointly with Ofgem, published the 2021 Smart Systems and Flexibility Plan and Energy Digitalisation Strategy outlining how we will deliver the flexibility and innovation needed for a net zero system. Flexibility from technologies such as electricity storage, smart charging of electric vehicles, flexible heating systems and interconnection could save up to £10 billion per year by 2050 by reducing the amount of generation and network needed to decarbonise.

In his report, the Electricity Networks Commissioner Nick Winser explains how outage plan optimisation is essential to maximise the amount of system access that can be granted at any single point in time and minimise the cost to consumers. A more firmly settled outage plan built across short, medium and long-term time horizons, for all foreseeable outages, will be a key enabler of the transformation of the power system.

In addition, the Commissioner has recommended that an Electricity Transmission Design Principles (ETDP) document should be created by the FSO working closely with the TOs, under regulatory oversight by Ofgem. The rationale for this proposal would be to give a clear basis for communities and other stakeholders to understand proposals and a clear foundation for the Planning Inspectorate's consideration. Developing a set of design standards equipment required to build new or reinforce existing infrastructure could allow solutions to be built that accommodate genuine differences in requirements but provides access to the benefits of consistency within GB and with other markets. These potential benefits include speed of supply, diversity of supply, lower cost through economies of scale, and introduction of innovation, amongst others.

Increased grid capacity is needed to aid electrification of transport and heating and alleviate grid congestion to enable renewables to come online with minimal wait times. While more transmission lines are the simple answer, in practice, environmental regulations, visual impacts, planning permission times and economics affect how quickly and easily these can be added. Investing in innovation to maximise the utilisation of the present infrastructure to increase grid capacity, without immediately investing in new lines, could potentially offer a solution. This approach can be quicker, more cost-effective, and presents a short-term solution to meet increased demand while longer-term plans for transmission expansion are developed. As the current grid rarely runs at its maximum capacity, leveraging innovation can help sweat current assets to their maximum potential. The Government is aware of various methods that, once fully innovated and demonstrated in the UK, can optimise grid capacity. These can be divided into solutions that require innovation in system hardware and those that require the development of the software controlled and monitored “smart grid”. These technologies are not widely deployed yet in the UK grid, and more innovation is needed to understand their potential and which combinations can be utilised in conjunction to achieve the best results.

There are a range of potential opportunities for innovation that encompass both hardware upgrades and smart grid advancements. Hardware enhancements include high emissivity and composite cables which can increase grid capacity; as well as the deployment of high-voltage direct current (HVDC) transmission lines that can reduce energy losses. Additionally, AC reactive and active power can be better managed through cutting-edge technologies known as Flexible Alternating Current Transmission Systems (FACTS) to enhance grid performance and stability. On the smart grid front, innovations can include grid management systems that facilitate real-time data and predictive analytics to enable dynamic line ratings and dynamic phase balancing. Furthermore, energy storage solutions (such as large-scale batteries) can be integrated intelligently within the grid, bolstering grid resilience.

In addition, the Government is supporting supplementary innovation in the development of a flexible, efficient, and low carbon grid through the £1bn Net Zero Innovation Portfolio with innovation programmes supporting the development of the smart grid. Specifically, the Flexibility Innovation Programme and the Longer Duration Energy Storage Innovation Programme are bringing forward more innovative solutions (technologies, systems, and processes) that can help realise a smart and flexible grid to unlock the benefits this can provide to the energy system, by providing grant funding for innovative solutions to be developed and demonstrated up to March 2025.

4. What changes should be made to the planning system to enable it to increase the use of renewable energy?

In February 2023, the Government published its [Action Plan for reforming Nationally Significant Infrastructure](#) planning and, in July, a consultation on [operational reforms to the Nationally Significant Infrastructure Projects](#) (NSIP) consenting process, which

sets out the detailed proposals that the Government intends to make to reform the end-to-end process.

In addition, DESNZ published [five revised energy National Policy Statements](#) (NPS) for consultation on 30 March 2023, the consultation covers EN-1 – the overarching NPS for energy - and four technology-specific NPSs covering electricity networks, gas fired generation, renewable generation, and gas and oil pipelines and storage. The consultation closed in June and Government is now going through the responses. We remain on track to publish final Energy NPSs in autumn, presenting them to Parliament and bringing them into effect by the end of 2023. The new NPSs have been updated to reflect new developments such as the HND approach and are clearer on both the Government's commitment to Net Zero and to maintaining energy security for the UK.

On 10 February 2023, the Government commissioned a new study from the [National Infrastructure Commission](#) (NIC) on infrastructure planning and this was published in April. The Government plans to respond to the report in the autumn around the same time as it responds to the Electricity Networks Commissioner's recommendations. In addition to the reforms already underway for planning, we are looking closely at recent changes to EU law in respect of how habitats requirements apply to essential renewable energy infrastructure, and considering a range of options to ensure our own home-grown system works more efficiently while retaining the key elements of environmental protection and engagement with local communities. In addition to the reforms already underway for planning, we are looking closely at recent changes to EU law in respect of how habitats requirements apply to essential renewable energy infrastructure, and considering a range of options to ensure our own home-grown system works more efficiently while retaining the key elements of environmental protection and engagement with local communities.

We want to see real benefits to the consenting process being delivered as quickly as possible, to make the system work more effectively for applicants, local authorities, and communities and to enable the consenting process to deliver against Government's ambitions for delivering new and improved infrastructure. Community benefits are crucial, and we need to address local concerns while recognising that it is a national priority to get new energy infrastructure built.

5. Is our planning system able to deliver more rapid development of new local infrastructure?

Streamlining the planning and consenting process to accelerate network infrastructure delivery and enable grid capacity is a priority for Government. We understand that securing land rights and consents can add time and cost to some projects. We are currently working closely with industry and other Government departments to consider options for improving land rights and consents processes with the aim of facilitating more timely connections.

Land rights and consents review

In Summer 2022, the Government published a call for evidence to establish how the land rights and consent processes for network infrastructure affect stakeholders and to inform whether reform is required. DESNZ are considering all responses and suggestions for improvement. We plan to publish a summary of responses to the call for evidence later this year. This response will outline conclusions and next steps in this area, including Government plans to consider short term and longer-term reform.

DESNZ process improvements

The Energy Infrastructure Planning team in DESNZ has made improvements to support more timely and legally robust application decisions, these include:

- **Digitalisation:** The energy portal - the IT system used to manage applications from DNOs – has recently been significantly enhanced. This has introduced more automation to the decision-making processes, improved the application structure and created a better user experience. The main enhancements include strengthening the pre-application stage, which ensures DNOs submit the right information and consult the correct statutory bodies; and a new two-track system (low risk applications which do not require statutory checks plus applications that do require statutory body consultation).
- **Efficiency:** we have also looked at our ways of working to enable us to make quicker decisions. This includes tracking the progress of applications, which provide better data on the types of applications we receive (such as network upgrades and in which areas of the country works are happening). We have also set internal deadlines for decisions - for all applications we have set a six-month deadline for decisions and for low-risk applications a deadline of three months has been set.
- **Stakeholder engagement:** to underpin the digitalisation and efficiency work, we are holding regular engagement sessions with DNOs, to understand the pipeline of applications they will be submitting and what their priority projects are. We are also holding regular workshops to demonstrate best practice regarding using the energy portal and submitting applications.

Alternative dispute resolution

Finally, the Electricity Transmission (Compensation) Act 2023 requires that Government brings forward proposals on alternative dispute resolution (ADR) processes in cases where land or land rights have been acquired for the build of electricity transmission network infrastructure and there is a dispute about compensation. The measures in this Act will help ensure landowners have access to alternative dispute resolution in cases where their land, or rights to access their land, have been acquired for the build of network infrastructure. This will help landowners avoid having to take a case to the Upper Tribunal, which can be an expensive and lengthy process. It will also help to ensure that we strike the right balance between protecting the rights of landowners and the urgent need for network infrastructure build in this country. During 2023, Government committed in Parliament during the passage of the Act to establish an ADR Taskforce, which would be responsible for generating proposals. We are currently engaging with network operators,

representatives of landowners and experts in acquisition of land and alternative dispute resolution to ensure the taskforce has the appropriate membership.

6. Would regional, or nodal, pricing of energy facilitate a more flexible development of Grid infrastructure?

The Review of Electricity Market Arrangements (REMA) programme is considering various options for reform to the wholesale market which could send more efficient locational signals - from more transformational reform such as nodal and zonal (regional) pricing to more incremental changes such as reform to transmission charging, access rights, or introducing locational signals in the Contract for Difference (CfD) scheme. At present, no decision has been made on which of the potential options will be taken forward.

New renewable generation is increasingly being built far from demand (locating where it is most windy or sunny), which has led to increasing network congestion. Managing congestion carries a cost which is ultimately paid for by consumers. The options considered as part of REMA could send more efficient locational signals through electricity markets to incentivise generation and demand to locate in less congested parts of the network. Nodal and zonal pricing could also assist in the efficient operation of flexible technologies, such as batteries, interconnectors, and electrolyzers, so that these assets alleviate rather than at times exacerbate constraints.

Sending more efficient locational signals would ultimately lessen long distance transmission burdens, allowing the network to operate more efficiently and lower system costs. The price differential between zones or nodes should act as an indicator of system constraint, signalling the need for further infrastructure investment in specific regions. Sending more efficient locational signals should ultimately support the development of a smaller, more targeted, and flexible grid.

7. What can be usefully learned from power transmission systems in other countries?

We are working closely with developers and European partners to realise our ambition of increasing interconnection capacity by at least 18 gigawatts by 2030 and building our first Offshore Hybrid Assets (OHAs), which facilitate more coordinated connections from windfarms to shore whilst reducing capital and operational costs. Interconnectors also provide an important source of resilience and efficiency in our power systems. They allow us to import power at times of low renewable energy output and to export excess power at times of high renewable energy output, reducing costly curtailment. We are working closely with Ofgem, developers and our European partners to realise:

- An increase of interconnection capacity, with an ambition of realising at least 18 gigawatts by 2030, over double the current capacity of 8.4 gigawatts.

- The building of our first OHAs. These combine interconnection with direct connections to offshore windfarms, thus facilitating more coordinated connections from the windfarms to shore whilst reducing capital and operational costs.

We are also working to consider interconnection needs beyond 2030 and intend to set out an ambition for interconnection beyond 2030 before spring 2024.

Although we have bilateral discussions with our neighbours on individual projects, our main forum for exchanging views on transmission issues with other countries is the North Seas Energy Cooperation (NSEC) which groups together all the countries around the North and Irish Seas. The aim of NSEC is to facilitate the cost-effective deployment of offshore renewable energy and greater interconnection in the region, including through OHAs. It is therefore very much focused on the efficient and speedy delivery of the grid infrastructure needed to connect new renewable generation and facilitate the green transition. A new memorandum of understanding (MoU) was signed in December 2022, an agreement on renewable energy cooperation with EU and North Seas countries.

Cooperation with NSEC enables us to work with European partners who have the same Net Zero ambitions as the UK, through exchanging information and experience on a wide range of power transmission issues. They will be facing similar challenges to the UK so we can learn much from each other. The current NSEC work programme includes topics such as: exchange of best practice on onshore and offshore grid planning to facilitate increased deployment of offshore wind by 2050; discussion of different grid connection regimes and ownership models for connections to shore; exchange of best practice on communicating the societal value of grid expansion. However, there will be ample opportunities for sharing experience and best practice with European partners outside of formal meetings as we each prepare our transmission grids for the future.

Outside of Europe there are other opportunities to learn from other countries. Through the Green Grids initiative, we are identifying global best practice to feed into the Electricity Transition Playbook, a tool to help policy makers navigate the energy transition. An example of best practice includes India's Green Energy Corridors that have enabled large grid and renewables investments. Learning from this will feature in the UK – India Energy dialogue. Also, the ESO participates in the Global Power System Transformation Consortium that brings together leading system operators and academia to tackle the challenges of high renewable grids.

August 2023