Lime Down
Solar Park

Statement of Need

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Executive summary

ES1 Lime Down Solar Park Limited (the Applicant) is seeking a Development Consent Order (DCO) for the construction, operation and maintenance and decommissioning of Lime Down Solar Park (hereafter referred to as the Scheme). The Scheme comprises a solar photovoltaic (PV) electricity generating station with a total capacity exceeding 50 megawatts (MW) and associated development comprising a Battery Energy Storage System (BESS), grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance and decommissioning phases. The Scheme proposes to connect to the National Electricity Transmission System (NETS) at the existing Melksham 400kV substation.

ES2 This Statement of Need for solar generation describes how and why the Scheme addresses all relevant aspects of government policy.

ES3 The Secretary of State must have regard to the current suite of National Policy Statements (NPSs) for energy as relevant NPSs (specifically EN-1 (Ref 1) and EN-3 (Ref 2)) and must decide the application for development consent for the Scheme under the Planning Act 2008 (Ref 3) in accordance with those NPSs.

ES4 The NPSs confirm that substantial weight should be given to the need for low carbon generation schemes to which the NPSs are of relevance, such as the Scheme.

ES5 The NPSs confirm that large-scale ground mounted solar farms have a critical role to play in achieving the government's energy policy aims of delivering a secure, low carbon and low-cost electricity supply for consumers on the way to delivering Net Zero carbon emissions by 2050. The NPSs establish a critical national priority (CNP) for low carbon infrastructure, including for large-scale solar farms, because of the decarbonisation, energy security, and affordability benefits that they deliver.

ES6 The NPSs also confirm that assets which provide flexibility to the national electricity system, or to the energy system generally, are also needed to achieve national decarbonisation and energy security aims. The NPSs state that government is supportive of solar that is co-located with storage to maximise the efficiency of land use. The Scheme, which consists of a large-scale solar farm with associated energy storage, is therefore fully aligned with the government's aims.

ES7 The NPSs explain that the availability of grid connection, suitable irradiance levels, and local topography are key inputs to the selection of sites suitable for large-scale solar generation developments. The number of locations within the UK at which large-scale solar generation is suitable is therefore likely to be limited, and this is a material issue when considering how the UK is to meet the urgent need for low carbon generation as is set out in the NPSs.

ES8 Whilst the NPSs establish that the Secretary of State is not required to consider the specific contribution of any individual project to satisfying the need established in the NPSs, this Statement of Need provides relevant legal, policy, and industry evidence on the urgent need for decarbonisation and action to support the security of electricity supplies in the UK.

ES9 This Statement of Need also provides evidence on the substantial benefits brought forward by large-scale ground mounted solar electricity generation generally, and the Scheme specifically, towards meeting the UK's critical strategic needs.

ES10 This Statement of Need concludes that the decarbonisation, security of supply, and affordability benefits delivered by the Scheme to the national urgent need for low carbon generation should be accorded substantial weight when assessing the planning balance.

ES11 Urgent and unprecedented actions are required on a global scale to halt climate change. A rapid increase in the supply of low carbon electricity is needed for the UK to meet its legally binding climate change targets. Solar generation is a critical part of the UK's strategy to achieve net zero by 2050, a key step towards which is the decarbonisation of the UK's electricity system, which is to be delivered through the government's national mission for 'Clean Power by 2030'.

ES12 The government's Clean Power 2030 Action Plan, published in December 2024 (Ref 4), reinforces the urgent need for additional low carbon generation schemes to come forwards to pave the way to decarbonising the wider economy by 2050 as the country pursues the electrification of heat in buildings, transport, and industry.

ES13 However, the Clean Power 2030 Action Plan also confirms that the need for new clean power will not stop at 2030. The continued delivery of low carbon generation facilities beyond 2030 is necessary to meet future electricity demand growth and achieve essential wider societal carbon savings. 'Clean Power by 2030' prepares the UK for the rapid growth in power demand expected over the 2030s and 2040s. It is also important to continue to bring forward schemes as a precaution against the possibility that 'Clean Power by 2030' is not achieved.

ES14 The capacity ranges set out by government in its Clean Power 2030 Action Plan (Ref 4) provide a foundation to prioritise the most critical infrastructure to achieve the Clean Power target. They are a framework for the National Energy System Operator (NESO) to work with Transmission Owners and Distribution Network Operators to prioritise connection offers for strategically aligned projects that can demonstrate they have the means to deliver. They are not a target nor a cap for pipeline developments.

ES15 Draft NPSs were published for consultation in April 2025, to incorporate the material policy changes brought forward in the Clean Power 2030 Action Plan (Ref 4) into the planning system. Under section 104(2)(d) of the Planning Act 2008, the Applicant considers that the draft NPSs are important and relevant considerations in the decision-making process for this DCO Application. Section 3.5 of this Statement provides an overview of the draft NPSs.

ES16 Progress has been made in recent years in the development of different low carbon electricity generation technologies. However, many of the technologies with potential to play a role in the delivery of a net zero energy system have uncertain delivery timescales. Developments with the proven ability to achieve carbon savings comfortably within in the next decade are essential to keep the UK on its legally binding carbon reduction path. Large-scale solar is one of the most likely technologies to be deliverable at scale against the timeframes required to support net zero.

ES17 Many factors are important in the design of a large-scale solar project within the context of a particular location, and flexibility in design is important to allow for any project to be designed in order to optimise its benefits. Optimising the use of existing and available grid infrastructure is necessary in the next decade to achieve the government's national mission for Clean Power by 2030' and to meet future electricity demand growth and achieve essential wider societal carbon savings beyond 2030.

ES18 Subject to NESO's ongoing Connections Reform process, the Scheme has a connection agreement for up to 500MW of export capacity to the National Electricity Transmission System (NETS) from July 2029. The proposed connection point is suitable, and the Scheme will not cause any grid constraints or curtailment in this area of the NETS as a result of connecting at the existing Melksham Substation.

ES19 The location of the Scheme enables it to deliver against the urgency of need, in relation to decarbonisation, security of supply, and affordability.

ES20 Solar generation contributes to security of supply. Aggregated generation output from portfolios which consist of multiple different renewable technologies, including solar, is more predictable and less variable than single-technology portfolios. Solar generation is needed to support a high level of generation adequacy and generation dependability within the Great British electricity system. Storage facilities also contribute to security of supply by storing energy when it is generated in abundance and releasing it to the grid when it is needed. Storage facilities also provide grid balancing services which are essential for the continued safe and secure operation of the NETS by helping to address any impacts arising from increasing intermittent renewable generation on the grid.

ES21 Solar facilities are already among the cheapest form of electricity generation in the UK and previous government department forecasts indicate that costs will continue to reduce in the future (see Figure 32 of this Statement). By generating low carbon electricity at a low marginal cost, thereby reducing the energy required from more expensive and more carbon intensive forms of generation. Solar therefore decarbonises the electricity system and lowers the wholesale market price of electricity.

ES22 In summary, an unprecedented capacity of low carbon solar generation is urgently needed in the UK. The Scheme will, if consented, contribute to the achievement of government objectives to deliver sustainable development that enables decarbonisation. By doing so, the Scheme will help to address the climate change emergency that affects everyone’s lives and the environment, by ensuring our energy supply is secure, low carbon and low-cost.

1 Overview

1.1 Document purpose

1.1.1 Lime Down Solar Park Limited (the Applicant) is seeking a Development Consent Order (DCO) for the construction, operation and maintenance and decommissioning of Lime Down Solar Park (hereafter referred to as the Scheme). The Scheme comprises a solar photovoltaic (PV) electricity generating station with a total capacity exceeding 50MW and associated development comprising a Battery Energy Storage System (BESS), grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance and decommissioning phases. The Scheme proposes to connect to the National Electricity Transmission System (NETS) at the existing Melksham 400kV substation.

1.1.2 This Statement of Need for solar generation describes how and why the Scheme addresses all relevant aspects of government policy, in particular the Overarching National Policy Statement for Energy EN-1 and the National Policy Statement for Renewable Energy Infrastructure EN-3 (NPS EN-1 and NPS EN-3). These Statements were published by the previous government in November 2023 and designated on 17 January 2024 (Ref 1, Ref 2). The decision to consent the Scheme must be taken in accordance with the NPSs. NPS EN-1 confirms that there is a demonstrated urgent need for the infrastructure covered by the NPS and establishes a critical national priority (CNP) for nationally significant low carbon infrastructure, the definition of which includes solar PV.

1.1.3 Paragraph 3.3.63 of NPS EN-1 (Ref 1) explains that:

"The urgent need for CNP Infrastructure to achieving our energy objectives, together with the national security, economic, commercial, and net zero benefits, will in general outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy. Government strongly supports the delivery of CNP Infrastructure and it should be progressed as quickly as possible."

1.1.4 This Statement of Need demonstrates the important contribution the Scheme will make to the three national energy policy aims:

- Net zero and the importance of urgently deploying low carbon generation assets at scale;
- Security of supply (geographically and technologically diverse supplies); and
- Affordability and reducing exposure to volatile international markets.

1.1.5 This Statement of Need for the development of large-scale solar generation demonstrates why the Scheme is urgently needed at the scale proposed; why the proposed location is appropriate for the Scheme; and how the Scheme addresses all relevant aspects of established and emerging government energy and climate change policy and commitments.

1.1.6 The government's Clean Power 2030 Action Plan (Ref 3) describes how an unprecedented capacity of homegrown low carbon generation assets is urgently required to pave the way to a decarbonised economy which offers increased security over a system dependent on internationally sourced fossil fuels. Further information on the Clean Power Action Plan is included at **Chapter 3** of this Statement. The delivery of large capacities of low carbon generation, including large-scale solar generation, is a critical part of the government's plans.

1.1.7 Delivering 'Clean Power by 2030' is an important step towards delivering the UK's legally binding target of national net zero carbon emissions by 2050. **Chapter 4** of this Statement provides evidence that delivering net zero requires electricity demand to grow as transport, heat, and industrial energy demand is decarbonised with clean power.

1.1.8 However, the government's Clean Power 2030 Action Plan (Ref 3) describes that the need for new clean power does not stop at 2030. The continued delivery of low carbon generation facilities beyond 2030 is necessary to meet future electricity demand growth and achieve essential wider societal carbon savings. It is also important to continue to bring forward renewable energy schemes, in the event that 'Clean Power by 2030' is not achieved.

1.1.9 This Statement of Need therefore provides evidence that solar is a key part of the government's strategy for low-cost decarbonisation of the energy sector. It calls on established and emerging primary analysis and opinion by qualified third parties, to support the need case for the Scheme. The Scheme is required to ensure that the UK remains on track to meet its legally binding carbon emissions reduction targets, while enhancing national security of supply, and at a cost which, in relation to other electricity generation infrastructure developments, provides value for money for end-use consumers.

1.2 Document overview

1.2.1 This Statement of Need provides relevant legal, policy, and industry evidence in support of the urgent need for decarbonisation and action to support security of electricity supply in the UK.

1.2.2 This Statement of Need also provides evidence in support of ground mounted solar electricity generation generally, and the Scheme specifically, in relation to the benefit brought towards meeting the UK's critical strategic needs.

1.2.3 This Statement of Need should be read in conjunction with the international and national policy context relevant to the need for and benefits of the Scheme, which is described in the **Planning Statement [EN010168/APP/7.2]** and **Annex A: National Policy Accordance Tables** of the **Planning Statement**

[EN010168/APP/7.2] which sets out how the Scheme meets the various tests in the NPSs.

1.2.4 **Chapter 2** of this Statement of Need explains that urgent and unprecedented actions are required on a global scale to halt climate change. A critical step in the strategy to fight climate change, is a full decarbonisation of the GB electricity system as described in the Clean Power 2030 Action Plan (Ref 3).

1.2.5 **Chapter 3** of this Statement of Need summarises those National Policy Statements (NPSs) which 'have effect' in relation to the Scheme. The decision to consent the Scheme must be taken in accordance with those NPSs. The NPSs provide that there is a critical national priority (CNP) for nationally significant low carbon infrastructure, including solar development, for both energy security and Net Zero, and that grid connection, irradiance, and site topography are key inputs to the selection of sites suitable for large-scale solar generation developments.

1.2.6 **Chapter 4** provides evidence that decarbonisation will increase demand for electricity and describes the policies and strategies already in-flight which are increasing, or are set to increase, electricity demand.

1.2.7 **Chapter 5** provides an overview of progress in the development of different technologies with potential to play a role in the delivery of a net zero energy system. It highlights the uncertainty of delivery timescales for many technologies, and the opportunity brought forward by developments with the proven ability to achieve carbon savings comfortably within the next decade. Storage assets will support the operation of low carbon generators to achieve carbon savings.

1.2.8 **Chapter 6** provides evidence on technical considerations associated with the development of solar in the UK including principles associated with the siting and location of large-scale solar schemes and describes factors which are important in the design of a scheme within the context of a particular location.

1.2.9 **Chapter 7** sets out the benefits of the location of the Scheme in relation to decarbonisation, security of supply, and delivering against the urgency of need. The chapter also provides evidence on the suitability of the proposed location from a grid operability and connection availability perspective. This chapter should be read in conjunction with The Applicant's **Environmental Statement (ES) Volume 1, Chapter 4: Alternatives and Design Evolution [EN010168/APP/6.1]** which provides an explanation of the site selection process undertaken for the Scheme.

1.2.10 **Chapter 8** provides evidence that solar generation contributes to security of supply as part of a multi-technology aggregated generation portfolio. While **Chapter 5** provides evidence for the need for storage facilities to be developed as renewable generation capacity grows, **Chapter 8** describes how co-located solar plus storage schemes can deliver flexibility.

1.2.11 **Chapter 9** provides evidence that solar facilities are already among the cheapest form of electricity generation in the UK and the development of more solar schemes will help to reduce the cost of wholesale electricity.

1.2.12 **Chapter 10** provides the overall conclusions of this Statement of Need which are that a significant capacity of low carbon solar generation is urgently needed in the UK. Delivering this Scheme will be an essential step towards meeting the governmental objectives of delivering sustainable development to enable decarbonisation. By doing so, the Scheme will address the climate change emergency that affects society as a whole and the environment, by ensuring the country's energy supply is secure, low carbon, and low-cost.

1.3 Description of the Scheme

1.3.1 A full description of the Scheme is included in **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**. A non-technical summary of the Scheme and its environmental impacts is provided in the **Environmental Statement Non-Technical Summary [EN010168/APP/6.4]**.

2 Legal and policy background supporting the need for urgent decarbonisation

2.1 Chapter summary

2.1.1 This chapter describes the global context of international climate change aims, commitments, and actions taken to date, and future actions needed to limit global temperature increase to 1.5°C above pre-industrial levels.

2.1.2 It is important to emphasise the urgency of the need to decarbonise UK energy generation to meet national climate change target and climate budgets.

2.1.3 The urgency required of actions to deliver decarbonisation globally is increasing. Carbon has a cumulative warming effect, and it is well understood that decarbonisation progress to date must accelerate in all countries to limit the temperature increase to 1.5°C above pre-industrial levels.

2.1.4 Actions to deliver a zero-carbon UK society must accelerate for the UK to keep on track with meeting its five-yearly carbon budgets, its 2030 and 2035 Nationally Determined Contribution (NDCs), and its net zero target by 2050.

2.1.5 The need for and the scale of future carbon reduction actions is increasing. The only way that need and scale will decrease in the future, while still limiting global temperature increases, is by delivering actions like the Scheme without undue delay.

2.2 Global decarbonisation

2.2.1 The Paris Agreement (Ref 4) is a legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4th November 2016.

2.2.2 The overarching goal of the Paris Agreement is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels".

2.2.3 In October 2018, following the adoption by the UN Framework Convention on Climate Change of the Paris Agreement, the Intergovernmental Panel on Climate Change (IPCC), which is the United Nations body for assessing the science related to climate change, published a Special Report (Ref 5) on the impacts of global warming of 1.5°C above pre-industrial levels. This report concluded that human-induced warming had already reached approximately 1°C above pre-industrial levels, and that without a significant and rapid decline in emissions across all sectors, global warming would not be likely to be contained, and therefore more urgent international actions to decarbonise are required.

2.2.4 NDCs are at the heart of the Paris Agreement and the achievement of its long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. Article 4, Paragraph 2 of the Paris Agreement requires each Party to prepare, communicate, and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

2.2.5 The IPCC Working Group III (IPCC WG3) published its Summary of Climate Change as part of the IPCC's Sixth Assessment Report in April 2022 (Ref 6). The IPCC WG3 report notes that although the rate of growth of average global annual greenhouse gas (GHG) emissions was lower between 2010 and 2019 than in the previous decade, average global annual GHG emissions during the last decade were higher than in any previous decade on record.

2.2.6 The IPCC WG3's global GHG emissions for four modelled scenarios are included in **Figure 1** of this Statement. The red band shows global annual GHG emissions considering global decarbonisation policies which at the time of writing the report had been implemented. Implemented policies are likely to slow the historical increase in annual emissions but are not yet sufficient to reduce them. In other words, policies which have already been implemented will keep global GHG emissions continuing at their current level through to 2050, rather than reducing them.

2.2.7 The purple, green, and blue bands show the IPCC's conclusions on different decarbonisation pathways, which must be followed to meet three scenarios of global temperature increases.

2.2.8 The purple band shows the decarbonisation path achieved by NDCs to 2030 followed by the decarbonisation path required to limit temperature increase to 2°C above pre-industrial levels with a probability of at least 67%. The red band is higher than the purple band, which implies that policies implemented to date are not sufficient to meet 2030 NDC commitments.

2.2.9 The green band shows the decarbonisation path which will achieve the same outcome as the purple path, by increasing actions in the 2020s and overshooting current NDCs. By urgently increasing decarbonisation actions now, future year-on-year carbon reductions to meet the same outcome can be lower and therefore are likely to be more achievable.

2.2.10 The cumulative warming effect of carbon means that not delivering against plans set out for the 2020s will lead to a greater scale and urgency to future plans and their delivery in order to meet the temperature increase limit set by the Paris Agreement. Delaying decarbonisation actions increases the risk of losing the fight against climate change, whilst in the meantime ongoing climate change events and impacts are unlikely to slow or decrease, putting lives and livelihoods at risk.

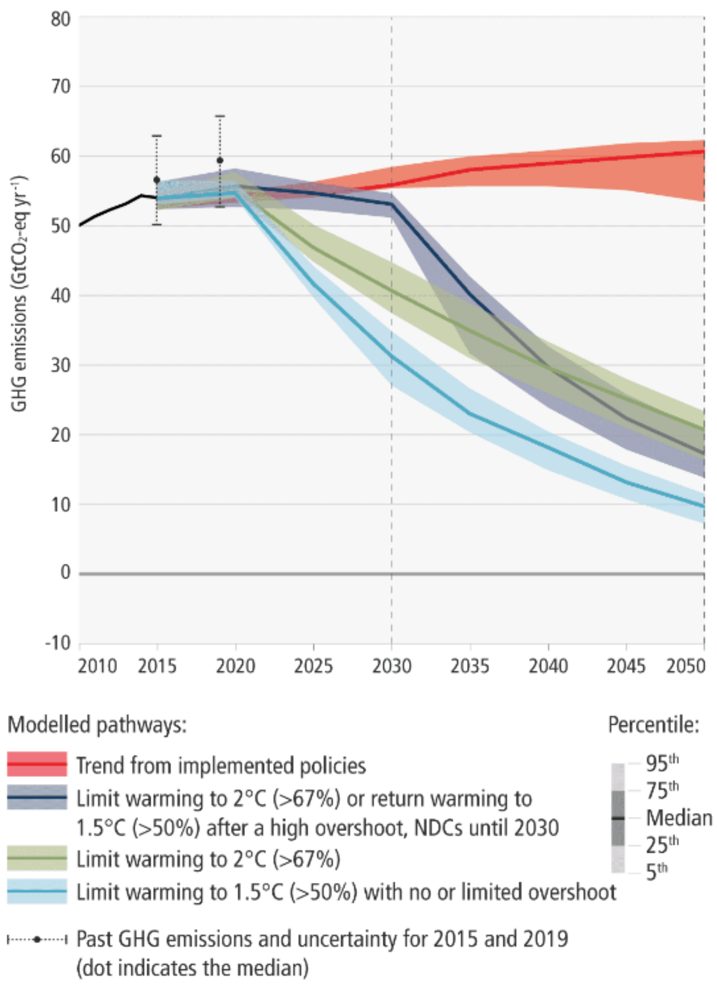

Figure 1: Representation of global GHG emissions of modelled pathways

[(Ref 6), Figure SPM.4]

2.2.11 The blue band shows the decarbonisation path which will meet the commitments of the Paris Agreement with a probability of 50%.

2.2.12 Conclusions arising from **Figure 1** are:

- Global climate change commitments are not yet sufficient to meet nor sustain a (likely) successful track towards containing global temperature rise below 1.5°C;
- Policies implemented to date fall short even of those commitments; and
- The delivery of measures will be required beyond 2030 to ensure that the 2050 target is met and sustained.

2.2.13 The IPCC WG3 report findings also imply that mitigation after 2030 can no longer establish a pathway which will likely not exceed 1.5°C global temperature increase vs. 1990, during the 21st Century.

2.2.14 The compelling need for global action to decarbonise continued to be reinforced through the IPCC's 20 March 2023 publication of its 2023 assessment of global climate change (Ref 7) The report concludes that the world is likely to pass a dangerous temperature threshold within the next 10 years, pushing the planet past the point of catastrophic warming — unless nations drastically transform their economies and immediately transition away from fossil fuels.

2.2.15 The Synthesis Report of the IPCC's Seventh Assessment Report will be produced after the completion of the Working Group reports and released by late 2029.

2.2.16 In a June 2024 news report which accompanied the publication of its Global Annual to Decadal Climate Update (2024 – 2028) report, the World Meteorological Organisation (WMO) stated that "There is a 47% likelihood that the global temperature averaged over the entire five-year 2024-2028 period will exceed 1.5°C above the pre-industrial era" (Ref 8). This implies that sufficient progress on fighting climate change has not yet been made and more needs to be done in both mitigation and adaption.

2.2.17 WMO have published news reports in 2025 which tell of the continuing effects of climate change. They: confirm that 2024 was likely the first calendar year with a global mean temperature of more than 1.5°C above the 1850-1900 average; report on the extreme weather events experienced in the last year from as far afield as South America and Europe; and confirm that record-setting global temperatures have continued into 2025 despite a (normally cooling) La Niña event.

2.2.18 The 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28) was held in Dubai in December 2023. COP28 achieved agreement among the parties, to "tripling renewables and doubling energy efficiency". On a global basis, COP28 concluded the requirement for action to abolish carbon emissions is more urgent now than it has ever been.

2.2.19 The same is true for the UK (Ref 9), and in July 2024, the Secretary of State for Energy Security and Net Zero met with past and future COP Presidents to discuss the need for greater urgency in tackling the climate crisis while underlining "the UK's determination to act as a global leader and reliable partner on climate action" and "the importance of the UK's renewed domestic leadership in encouraging ambitious action abroad. Climate and clean energy are at the heart of the new government's agenda. The UK is taking immediate action to unlock investment in onshore wind [and] begin a solar revolution" (Ref 10).

2.2.20 COP29 closed in November 2024. At the conference, a new finance goal was agreed which will help countries to protect their people and economies against climate disasters. COP29 was reminded that in 2025 stronger national climate plans (measured through NDCs) become due from all countries. These new climate plans must cover all greenhouse gases and all sectors, to keep the 1.5°C warming limit within reach. The UK delegation clearly signalled at COP29 that the UK plans to ramp up climate actions which are entirely in the interests of the UK economy and peoples (Ref 12).

2.3 Decarbonisation in the UK

2.3.1 As a result of its commitments to the Paris Agreement, in June 2019 the UK became the first major economy to legislate for a 2050 net zero GHG emissions target through the Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Ref 12).

2.3.2 Decarbonisation is therefore a UK legal requirement.

2.3.3 In December 2020, the UK communicated its NDCs under the Paris Agreement to reduce GHG emissions by at least 68 per cent from 1990 levels by 2030. In April 2021, the then government legislated for the Sixth Carbon Budget (CB6), which requires the UK to reduce GHG emissions by 78 per cent by 2035 compared to 1990 levels.

2.3.4 UK governmental objectives are to ensure the supply of energy to the national energy system always remains secure, reliable, affordable, and consistent with meeting legally binding GHG emissions including the NDC. NPS EN-1 states that government has identified that this will require a step change in the decarbonisation of the UK's energy system [(Ref 1), Para 2.3.3], and large-scale ground mounted solar has an important role to play in the UK.

2.3.5 The Climate Change Committee (CCC), a national independent advisory committee, made clear in its Progress Report to Parliament in 2025 [(Ref 13)(2025)] that the UK is not on track to meet its fifth (2028-2032) or sixth (2033-2037) carbon budget commitments:

"Credible plans are in place to overachieve the Fourth Carbon Budget (CB4), as required to be on a sensible path to Net Zero. Plans that are either credible or have some risks attached cover three-fifths of the emissions reductions required to meet the UK's 2030 NDC and the Sixth Carbon Budget (CB6). But there remain significant areas in which plans are currently insufficient." [(Ref 14)(2025), p18].

And:

"To achieve the Government's ambition in the Clean Power 2030 Action Plan, total operational capacity of renewables will need to more than double by 2030 … This will require a tripling in annual installations of both offshore and onshore wind and a four-fold increase in solar compared to the average rate seen since the start of this decade … Solar capacity is judged to be off track" [(Ref 14)(2025), p15].

2.3.6 Emissions in the UK have steadily fallen over the last three decades and the UK met its first three carbon budgets covering the period 2008 - 2022 [(Ref 14)(2024), p18]. In 2024 emissions were 50.4% below 1990 levels according to provisional estimates [(Ref 14)(2025), p24].

2.3.7 In February 2025 the CCC published their proposal for a Seventh Carbon Budget (CB7) covering 2038 to 2042. The CCC's proposal is for UK emissions to fall to 87% below 1990 levels [(Ref 15), p60].

2.3.8 **Figure 2** shows historical emissions and performance against historical Carbon Budgets. The CCC's Carbon Budget Delivery Plan (CBDP, yellow) for Carbon Budgets CB4, CB5, and CB6 are also shown, as are the UK's NDCs for 2030 and 2035 (black line).

2.3.9 The reduction in carbon emissions required from CB5 to achieve CB6 is significant, as is the next reduction to achieve CB7. The delivery of new low carbon electricity generation beyond 2030 is essential for progress to towards the government's 2050 Net Zero legally binding target to continue to be made. "As with the Fourth Carbon Budget, the Fifth Carbon Budget will need to be overperformed to be on a sensible pathway to Net Zero" [(Ref 14)(2025), p76]. The Scheme will meet the urgent need for new low carbon generation to be brought online to contribute towards meeting government's 2050 target.

2.3.10 The CCC concluded that the main carbon emission reductions in 2024 were from the electricity supply and industry sectors. Surface transport sector emissions also reduced however emissions from residential buildings increased year-on-year. Electricity supply emissions reduced with the total phase out of coal now complete, and with imports reducing UK gas generation. "An increase in renewable generation capacity … should increase displacement of fossil generation by renewables, which is required to continue the reduction of emissions from electricity supply" [(Ref 14)(2025), p30]. The annual carbon emissions reduction required to meet the UK's 2030 NDC increased year-on-year to 19 MtCO2e per year (2025-2030) and the CCC conclude that this pace must then be maintained over the Sixth Carbon Budget period. The average annual rate over the previous eight years was only 13.4 MtCO2e per year.

2.3.11 The CCC conclude that "This will increasingly require focus on transport, buildings, agriculture, and aviation" [(Ref 14)(2025), p22]. **Chapter 3** shows that decarbonisation of other sectors is largely reliant on the availability of sufficient quantities of low carbon electricity as a source of energy to substitute for carbon-emitting fuels currently used within those sectors. Therefore, the development of new low carbon electricity generation infrastructure must also accelerate.

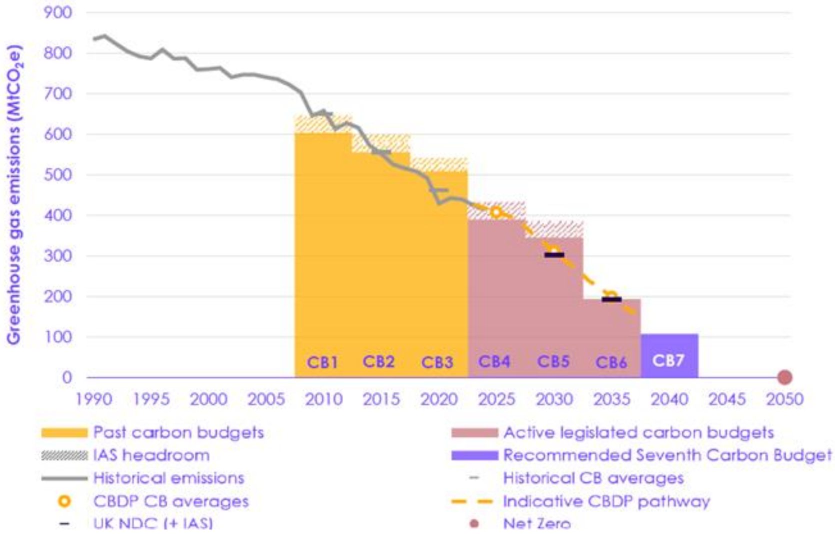

Figure 2: UK historical emissions, the Balanced Pathway and the UK's Carbon Budgets

[(Ref 14)(2025), Figure 1.1]

2.3.12 Without adequate supply of low carbon electricity, the urgent requirement for a rapid decarbonisation of other sectors (as will be required to meet future Carbon Budgets) is unlikely to be achieved.

2.4 The UK's strategic plan for decarbonisation

2.4.1 The UK chose to largely decarbonise its power sector by adopting low carbon sources quickly, and invited industry to bring forward new low carbon developments to meet the twin challenge of energy security and climate change [(Ref 1), Para 4.2.2].

2.4.2 Implementing this strategy by closing generation capacity with high carbon emissions and replacing it with low carbon renewable energy has delivered significant decarbonisation benefits in the UK to date.

2.4.3 **Figure 3** shows that carbon emissions associated with the UK's electricity system (green dashed line) have reduced by approximately 70% between 2005 and 2022 (the most recent year for which data is available from this source). Non-electrical emissions have also reduced but by a lower percentage.

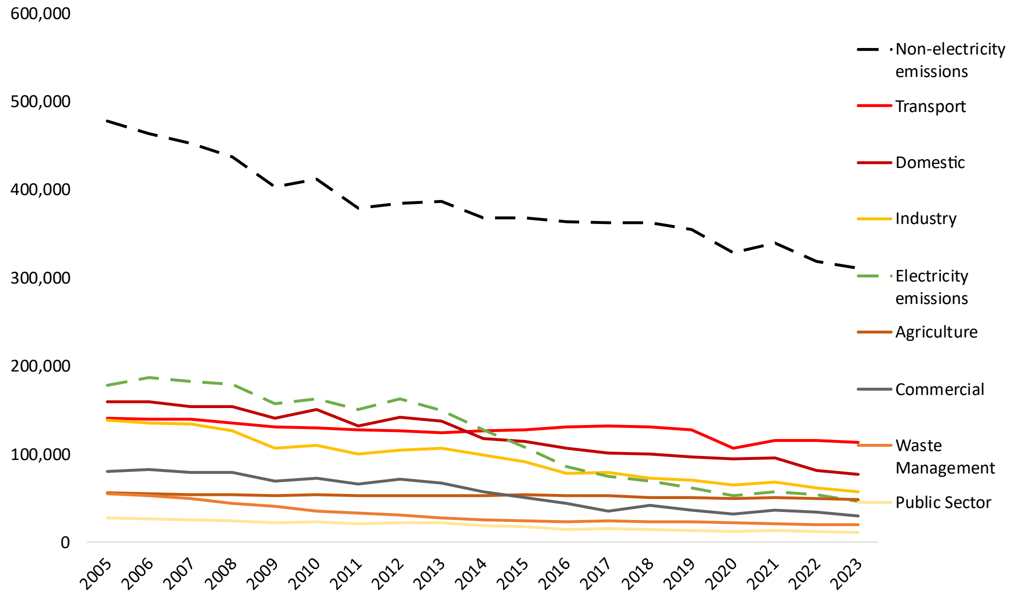

Figure 3: National (UK) GHG emissions 2005 – 2023

(LULUCF net benefits small and not shown) [(Ref 16)(4), Author Analysis]

2.4.4 The transport and domestic sectors had the highest carbon emissions in 2023. Fossil fuels remain a major source of energy to these sectors. Critically, the percentage reductions of emissions in those sectors between 2005 and 2023 were significantly lower than national average emission reductions, at 19% and 51% respectively. Emissions from the domestic sector had also reduced by just 35% when measured excluding reductions in emissions from electricity.

2.4.5 **Figure 3** suggests that the transport, domestic, and industrial sectors require a significant intervention to reduce carbon emissions, and that the reduction of emissions from those sectors will be critical if net zero 2050 is to be reached.

2.4.6 The government's strategy to reduce these emissions is to increase low carbon electricity supplies such that electricity may be used to displace fossil fuels from those other sectors. The continued delivery of low carbon electricity generation facilities beyond 2030 is therefore necessary to reduce emissions from those sectors.

2.5 Climate Change Committee: Progress Report to Parliament, 2025

2.5.1 The CCC published the 2025 edition of their annual Progress Report to Parliament in June 2025. The report leads with the Committee's view that the UK's ambitious Nationally Determined Contributions are "within reach, provided the Government stays the course" [(Ref 14)(2025), p10].

2.5.2 The Committee summarised that "Progress to date has been primarily driven by decarbonisation of the electricity system, with renewables replacing both coal and, increasingly, gas. Future progress will require a broader change, especially using low-carbon electricity to replace oil and gas in surface transport, heat in buildings, and industry" [(Ref 14)(2025), p10].

2.5.3 Further, the Committee assessed that "Plans that are either credible or have some risks attached cover three-fifths of the emissions reductions required to meet the UK's 2030 NDC and the Sixth Carbon Budget (CB6). But there remain significant areas in which plans are currently insufficient" [(Ref 14)(2025), Figure 4].

2.5.4 The Committee set out priority actions to keep the UK on its course to Net Zero. These include an increase in industrial electrification and domestic heat, supported by a focus on reducing the cost of electricity to consumers and a rapid expansion of the low carbon electricity system, including generation schemes.

2.5.5 To deliver this, the Committee recommend that annual offshore and onshore wind installations must increase by at least three times, and solar four-fold, compared to the average rate seen since 2020.

2.5.6 These recommendations are consistent with a continuing move away from the use of fossil fuels and towards an energy system with electricity at its centre, either directly or with hydrogen, produced at least in part, by the electrolysis of water.

2.5.7 The CCC reported that, despite some encouraging signs of progress against their delivery indicators for current and future Carbon Budgets, "some key indicators remain off track. A significant increase in roll-out rates is needed in many areas" [(Ref 14)(2025), p14].

2.6 The government's energy strategy

2.6.1 The UK's 2030 NDC is a 68 per cent reduction in territorial emissions by 2030 on 1990 levels. The Sixth Carbon Budget (2033-2037) requires the UK to reduce GHG emissions by 78 per cent by 2035 compared to 1990 levels.

2.6.2 In October 2024, the Climate Change Committee provided advice to the government for the UK's 2035 NDC commitment to reduce greenhouse gas emissions to increase to 81% from 1990 to 2035. On 12th November 2024 at COP29, the Prime Minister announced the UK's ambitious and credible NDC target to reduce all greenhouse gas emissions by at least 81% by 2035, compared to 1990 levels (excluding international aviation and shipping emissions). The Applicant notes, however, that the newly recommended 81% reduction is consistent with the ambition legislated in the Sixth Carbon Budget, but has been updated to include International Aviation and Shipping emissions and for a change in accounting methodology (Ref 17).

2.6.3 In August 2024, the government requested advice on decarbonising the power sector by 2030 from the National Energy System Operator (NESO). NESO published their advice in November 2024, and it is summarised in **Section 2.8** of this Statement.

2.6.4 In December 2024, the Prime Minister reconfirmed the government's mission to make Britain a clean energy superpower. The government has taken onboard NESO's advice to achieve "at least 95% clean power by 2030, while accelerating the UK to net zero" [(Ref 18), p6] thereby staying on track to "secure our energy supply with home-grown, clean power" [(Ref 18), p40].

2.6.5 In December 2024, government published the Clean Power 2030 Action Plan (Ref 4). Achieving the Clean Power target is a step in the UK's journey to achieving its energy policy aims of delivering a secure, low carbon and low-cost electricity supply for consumers on the way to delivering net zero carbon emissions by 2050. This plan explains the need for a rapid expansion in the UK's low carbon electricity generation capacity and sets out the actions the government proposes to take to deliver that capacity against the timeframes required. See **Section 2.9** of this Statement for further information.

2.6.6 In March 2020, the Energy System Catapult's Innovating to Net Zero report observed that:

> *"Net Zero narrows the set of viable pathways for the future energy system. Where an 80% target allowed considerable variation in relative effort across the economy, with some fossil fuels still permissible in most sectors, Net Zero leaves little slack."* [(Ref 19), p5].

2.6.7 It is therefore logical that the government's proposed approach to achieve net zero shares many similarities with the approach taken by previous governments.

2.6.8 That said, the urgency of the need to implement measures which deliver decarbonisation is now greater because of the reasons described in **Section 2.2** of this Statement. The government's support for renewable generation going forwards is therefore no lower than the support set out in existing publications and strategies and if anything is emerging to be more supportive because of the unprecedented and urgent need.

2.6.9 The government has explained that achieving Clean Power by 2030 is of critical importance and the Action Plan delivers a mechanism to prioritise near-term actions in support of that aim. However, the need for new clean power does not stop at 2030. The continued delivery of low carbon generation facilities beyond 2030 is necessary to meet future electricity demand growth and achieve essential wider societal carbon savings. It is also important to continue to bring forward schemes in the event that 'Clean Power by 2030' is not achieved, as is also foreseen by flexibility included in the government's Action Plan.

2.6.10 Draft NPSs were published for consultation in April 2025, to incorporate the material policy changes brought forward in the Clean Power 2030 Action Plan into the planning system. Under section 104(2)(d) of the Planning Act 2008, the Applicant considers that the draft NPSs are important and relevant considerations in the decision-making process for this Application. **Section 3.5** of this Statement provides an overview of the draft NPSs which were published for consultation in April 2025, to incorporate the material policy changes brought forward in the Clean Power 2030 Action Plan into the planning system.

2.6.11 This chapter therefore summarises recent relevant publications by government and NESO to support the evidence base for the need for large-scale solar in the UK to deliver, with urgency, energy security, decarbonisation, and affordability benefits.

2.7 Connections Action Plan

2.7.1 Securing a timely grid connection is a critical enabler for low carbon infrastructure to contribute towards a zero-carbon electricity system in the 2030s. However, grid connection availability is currently constrained. Subject to NESO's ongoing Connections Reform process, the Scheme has a connection agreement to connect to the NETS in July 2029.

2.7.2 This section explains critical aspects of the current shortage of grid connections and the challenges with managing new connections to the UK's electricity system at the pace and scale required to meet government's targets. The Connections Action Plan describes actions proposed by NESO, Ofgem and the government to improve the near-term deliverability of new low carbon generation assets. The government's Clean Power 2030 Action Plan ((Ref 4), also see **Section 2.9**) builds on these proposals to provide a framework for the prioritisation of offers for projects which align with NESO's advice on connections which are deliverable by 2030, and which can demonstrate that they have the means to deliver, while maintaining a robust pipeline of deliverable projects beyond 2030.

2.7.3 In November 2023, DESNZ and Ofgem jointly published a Connections Action Plan which states:

"Nearly half of transmission generation projects have a connection date at least five years from now, with some scheduled to wait ten years or more. This is simply too slow and remains the biggest risk to our ability to decarbonise our power system by 2035 …

The Plan is aimed at getting a significant majority of projects connected by their requested connection date, up from 14 per cent today, and to reduce the average delay a project faces in connecting to the transmission network from five years to six months" [(Ref 21), p7].

2.7.4 The Connections Action Plan includes reforms to the connections process which have been designed to enable viable projects to connect in a timely and cost-effective manner. The reforms are:

- Raising entry requirements, including evidence of landowner permission, to deter speculative connection applications;
- Removing stalled projects to release capacity for more viable projects;
- Better utilising existing network capacity to reduce connection timelines; and
- Allocating available network capacity to connect projects that are more ready to progress and are able to make use of capacity sooner.

2.7.5 The Connections Action Plan explains that the efficient utilisation of existing networks can defer or negate the need for expensive new infrastructure, which takes time to deliver [(Ref 21), pp26 & 27] and that ensuring that existing and future capacity is allocated efficiently will allow timely connection offers, aligned with net zero objectives.

2.7.6 In relation to increasing network capacity, the Connections Action Plan describes that there are two approaches. The first is to increase network build and the second, which is described as “more efficient” and “typically lower cost”, is to “maximise the use of the currently available and planned network capacity” [(Ref 21), pp40 & 41].

2.7.7 Capacity allocation is defined in the Plan as an approach to “maximise the benefits of available capacity such that projects that are more ready and able to connect can do so ahead of those which are stalled, while maintaining appropriate opportunities for technologies with varying lead times, in line with net zero pathways” [(Ref 21), p44].

2.7.8 Projects which propose to develop technology which will support the move to net zero (such as solar and storage schemes) are aligned with the government’s aims and strategy. Schemes which propose to connect to existing and available grid infrastructure are aligned with the Connections Action Plan reforms.

2.7.9 Ensuring assets can connect to the electricity network where and when they are needed is crucial to achieving net zero, as well as to delivering affordability for consumers and maintaining security of supply.

2.7.10 However, there are currently insufficient existing transmission system or distribution network substations suitably located with the capacity available to connect new solar, onshore wind and offshore wind assets required to meet the government’s low carbon aims.

2.7.11 New substations will need to be proposed, designed and constructed to support the achievement of government’s Clean Power target, and other substations will need to be expanded to connect new schemes. The programme of work to deliver new and enhanced connection infrastructure will need to occur in parallel with connecting other schemes to existing and already available substations.

2.7.12 All schemes which are able to connect to the grid before 2030 are valuable to deliver the government's ambition to deliver 'Clean Power by 2030'. It is also important to continue to bring forward schemes which can feed the pipeline of connections beyond 2030s to continue to grow the UK's low carbon electricity generation capability, and also in the event that 'Clean Power by 2030' is not achieved.

2.7.13 Any positive interventions made by the government or other statutory bodies, such as those set out in the Connections Action Plan and in the government's Clean Power 2030 Action Plan (see **Section 2.9**), provide the possibility for prioritisation of schemes which are more ready to deliver, and which meet NESO's queue entry and prioritisation requirements as they evolve.

2.7.14 The Scheme is consists of solar farm and associated infrastructure including battery energy storage with a total capacity exceeding 50MW connecting to an existing section of the NETS at an existing substation at Melksham. Through the design of the Scheme, the Applicant seeks to maximise use of the connection capacity which is to be made available to it. The Scheme is therefore fully aligned with the direction of travel of relevant policy and action plans in support of achieving the government's ambition to deliver 'Clean Power by 2030'.

2.8 Advice on achieving clean power for Great Britain by 2030

2.8.1 In November 2024, following a request from government, NESO provided their input into the development of the government's plan for 'Clean Power by 2030' by publishing the Clean Power 2030 report [(Ref 22)].

2.8.2 NESO's advice not only addresses the importance of enabling the delivery of a clean power system by 2030 but also of "looking through 2030 to the 2030s and beyond" and continuing to deliver electricity infrastructure assets to keep the power system clean beyond 2030 "given the need to meet growing electricity demand through the 2030s" [(Ref 22), p6].

2.8.3 Clean power supports decarbonisation by providing consumers with low-carbon electricity to meet their current demand and also for the future electrification of their heating and transportation needs. This is needed to further displace imports of gas and oil, reducing overall reliance on imported energy in the British energy system and increasing protection for GB consumers from volatile international energy markets. [(Ref 22), p80].

2.8.4 NESO state that 'Clean Power by 2030' is the foundation for wider electrification and for achieving net zero [(Ref 22), p68]. Clean power is needed by 2030 and in preparation for the 2030s, to "ensure the [electricity] system is able to keep pace with accelerated electrification through the 2030s, which is expected to add approximately 19 TWh per year to demand" (terawatt hours (TWh), 1 TWh = 1,000,000 MWh). [(Ref 22), p67].

2.8.5 NESO state that: "With a short and shrinking window of time, pace must be the primary goal" [(Ref 22), p6], that "There is no path to clean power without mass deployment of offshore wind, together with onshore wind and solar," and that "Accelerating build rates now for renewables is crucial to enabling the continued growth of demand due to electrification" [(Ref 22), p68].

2.8.6 NESO's pathways "see a doubling of onshore wind capacity from 14GW in 2023 to 27 GW by 2030 and a trebling of solar from 15 GW to 47GW by 2030" [(Ref 22), p16]. Further, "Flexibility is vital in a system with more variable renewables" [(Ref 22), p7] and NESO pathways include "an increase in grid connected battery storage from 5GW to over 22GW" [(Ref 22), p8].

2.8.7 2030 is an important checkpoint on the path to Net Zero and NESO's advice has informed the government's policy position on the development of low carbon energy through the 2020s and into the 2030s, see **Section 2.9**. Crucially, NESO's advice aims to support getting Great Britain on track to achieve Clean Power by 2030 and also then staying on track by keeping power clean as demand grows in the 2030s and 2040s. It is also prudent for plans to consider how the UK will stay on track to achieve Net Zero if 'Clean Power by 2030' is not achieved. **Section 4.3** of this Statement provides evidence that even if 'Clean Power by 2030' is achieved, even greater additional capacities of low carbon generation must be delivered in the 2030s to meet electricity demand growth.

2.8.8 In this context, and to stay on track with its carbon reduction commitments, it is necessary for developments which aim to deliver in both the 2020s (such as the Scheme) and the 2030s to continue to progress to their project timeframes. Doing so will ensure that sufficient additional low carbon generation capacity is ready to minimise the potential for shortfalls in the delivery of capacity before 2030; to make up for any shortfalls which may arise in the delivery of that capacity; and enable and to meet future electricity demand growth expected in the 2030s and 2040s.

2.8.9 NESOs analysis demonstrates that to achieve 'Clean Power by 2030', "offshore wind, onshore wind, solar, batteries [and other key supply technologies] will all need to deploy more on average each year to 2030 than they have ever done in a single year before. This will inevitably stretch supply chains and require accelerated decision making in planning, permitting and awarding of contracts" [(Ref 22), p9].

2.8.10 NESO state that "Inevitably, some areas will underdeliver, but most investments are low regret, and the risk of over-building is low, given the need to meet growing electricity demand through the 2030s" [(Ref 22), p6].

2.8.11 Therefore, and in alignment with government's view (NPS EN-1, Para 3.3.10), NESO conclude that "to manage delivery risk, there is a high value in pursuing multiple options where they exist and encouraging competition between, not just within, different technologies" [(Ref 22), p7], recommending 'aiming high' on the deployment of critical technologies in any pathway to 'Clean Power by 2030' to reduce the risk of under delivery as a whole and also to reduce reliance on any single project [(Ref 22), p49].

2.8.12 A key enabler of achieving 'Clean Power by 2030', is a "connections queue … formed of ready-to-connect projects that align with the government's plan for clean power by 2030" [(Ref 22), p10]. Such a queue would help NESO speed up the "critical and challenging" delivery of essential strategic transmission infrastructure needed to achieve 'Clean Power by 2030' [(Ref 22), p34].

2.8.13 NESO observes that:

"The connections queue currently comprises a greater volume of projects than required for 2030 across our pathways. However: a) not all of those projects may be 'ready' or committed to progressing; and b) there may be projects with connection dates after 2030 that could usefully contribute to the 2030 system, for example with lower delivery barriers or lower costs" [(Ref 22), p61].

2.8.14 The Connections Reform process (see **Section 2.7**) seeks to re-order the connections queue by prioritising projects which are more 'ready' to connect and de-prioritising those which are at an earlier stage of development.

2.8.15 Subject to NESO's ongoing Connections Reform process, the Scheme has a connection agreement for up to 500MW of export capacity to the NETS from July 2029. As a key step in the Connection Reform process, the Applicant is submitting evidence to NESO of the Scheme's maturity to inform its position in the re-ordered connection queue.

2.9 Clean Power 2030 Action Plan

2.9.1 The government published their Clean Power 2030 Action Plan in December 2024. The Action Plan states that delivering Clean Power 2030:

"Paves the way to decarbonising the wider economy by 2050 as we pursue the electrification of heat in buildings, transport, and industry. By 2050, annual electricity demand is likely to at least double. Clean power by 2030 prepares us for the rapid growth in power demand expected over the 2030s and 40s" [(Ref 4), p11].

2.9.2 However, the government also states that "to get this right we need to act – and act quickly – because 6 years is a short time in building energy infrastructure" [(Ref 4), p18].

2.9.3 Critically, the Clean Power 2030 Action Plan confirms that the need for new low carbon generation will not stop at 2030. Therefore, the continued development of low carbon generation schemes which plan to deliver in both the 2020s (such as the Scheme) and the 2030s is also necessary to meet future electricity demand growth and achieve essential wider societal carbon savings.

2.9.4 Continuing to develop such schemes will reduce the risk of there being a shortfall in achieving the government's Clean Power target in 2030, and/or help to make up for any shortfall in Clean Power should it materialise.

2.9.5 Further, the Clean Power 2030 Action Plan reiterates the energy security and affordability benefits of pursuing a low carbon future:

"In an era of heightened geopolitical risk, switching fossil fuelled generation for homegrown clean energy from renewables and other clean technologies offers us security that fossil fuels simply cannot provide.

It is crucial we complement renewables with flexible capacity to ensure we can deliver clean power no matter the weather" [(Ref 4), p21].

2.9.6 To do so, the government has set up Great British Energy to "drive clean energy deployment to boost energy independence, create jobs, and ensure UK taxpayers, billpayers and communities reap the benefits of clean, homegrown energy. Great British Energy … will help support the Clean Power 2030 mission" [(Ref 4), p70].

2.9.7 The UK government's Clean Power target means that, in a typical weather year:

- Clean sources produce at least as much power as Great Britain consumes in total (in 2023, clean sources produced 56% of GB consumption, [(Ref 4), p26]); and
- Clean sources produce at least 95% of Great Britain's generation (in 2023, clean sourced produced 60% of GB generation, [(Ref 4), p26]).

2.9.8 Clearly therefore, when electricity demand grows to enable wider societal decarbonisation in the 2030s, the capacity of clean sources will also need to grow or else the Clean Power target will not continue to be met. Therefore, the government "will aim to deliver above this ambition where the system and consumer benefits align so that potential challenges in some areas of clean power delivery can be compensated by deployment elsewhere" [(Ref 4), p25].

2.9.9 To deliver above this ambition, the government "accepts the NESO advice on the infrastructure required for 2030 – decisions are required now to ensure the grid needed for the system in 2030 can be put in place" [(Ref 4), p31] and recognises that the grid connections process needs reform and the queue to connect must be reduced to "prioritise projects needed for 2030, while maintain[ing] a robust pipeline [of projects] beyond 2030" [(Ref 4), p11].

2.9.10 **Table 1** sets out government's 'Clean Power Capacity Range' compared to its December 2024 view of installed capacity (GW) for major generation technologies.

2.9.11 The Capacity Range provides a framework for the prioritisation of offers for projects which:

- Align with NESO's advice on connections which are deliverable by 2030; and
- Can demonstrate that they have the means to deliver.

Table 1: DESNZ 'Clean Power Capacity Range', and current installed capacity (GW)

[(Ref 4), Table 1 & Connections Reform Annex, Table 1]

Technology	Current Installed Capacity (*)	DESNZ 2030 'Clean Power Capacity Range'	2035 FES-derived Capacity Range (**)
Offshore wind	15	43-50	72-89
Onshore wind	14	27-29	35-37
Solar	17	45-47	45-69
Nuclear	6	3-4	4-6
Low carbon dispatchable power	4	2-7	Up to 25
Unabated gas	36	35	NA
Batteries	5	23-27	24-29
Other flexible assets	15	26-32	51-63

(*) Government's view of the publicly available data for Great Britain at the point of publication of the Clean Power 2030 Action Plan

(**) **Section 4.2** of this Statement provides a description of NESO's Future Energy Scenarios (FES)

2.9.12 Importantly, the government states that NESO's engagement with Distribution Network Operators indicates that an additional 9 to 10GW of rooftop solar projects could deploy before 2030. It is therefore possible that the 2030 Clean Power solar capacity range of 45 to 47GW could yield around 54 to 57GW of installed capacity by 2030, subject to solar PV pipeline of rooftop solar projects [(Ref 4), Connections Reform Annex, Table 1, Footnote 10].

2.9.13 Therefore, the government has:

"Set out national pathway figures for the capacity which should be prioritised for all technologies, and further regional breakdowns for the capacity which should be prioritised for solar, batteries and onshore wind.

These FES-derived ranges do not constitute a government pathway, but rather an established, public basis through which to provide longer-term certainty on connections" [(Ref 4), Connections Reform Annex, p5].

2.9.14 Critically, the Clean Power 2030 Action Plan does not seek to limit, constrain, or cap the capacity of low carbon generation assets which will be delivered over the coming years. Indeed, quite the opposite is true, and the Clean Power 2030 Action Plan seeks to de-clutter the front end of the connection queue to ensure that a sufficient capacity of low carbon generation assets is able to connect within suitable timeframes.

2.9.15 This is important because connection queues experience attrition; therefore, to ensure that a sufficient capacity of low carbon generation assets is delivered requires a greater capacity of low carbon generation assets to come forwards in development pipelines. **Section 5.3** provides more information on pipeline attrition in the UK.

2.9.16 Further, to ensure that the energy transition delivers value for money for consumers, competition must be enabled in commercial aspects of project delivery and contracting, for example through the Contracts for Difference mechanism (CfD) (see **Section 5.3**). Competition at contract award also requires a greater capacity of low carbon projects to progress through the planning system and achieve consent than are required to deliver government's targets.

2.9.17 Indeed, "Whilst the 'Clean Power Capacity Range' provides a foundation to guide rapid policy development and focus delivery, the scenarios developed now cannot be exhaustive or definitive, and it is only right that some optionality is retained" [(Ref 4), p31].

2.9.18 These factors combine to lead to the conclusion that government is "expecting an increase in planning applications with the Clean Power 2030 target" [(Ref 4), p55], and indeed planning applications will need to continue to be made if the Clean Power 2030 target is to be met.

2.9.19 The Clean Power 2030 Action Plan also paves the way for new strategic plans for development of the GB energy system. NESO has been tasked with developing a national-level Strategic Spatial Energy Plan (SSEP), a Centralised Strategic Network Plan (CSNP), and eleven Regional Energy Strategic Plans RESPs). Ofgem approved NESO's methodology for developing the SSEP in May 2025. Once approved, the SSEP itself will inform the requirements of the transmission network set out in the first CSNP and RESPs.

2.9.20 Together these plans will provide a "blueprint of energy requirements, setting out how energy needs will change, what this means for infrastructure needs and indicating critical areas for strategic investment" [(Ref 23)]. Plan methodology development commenced in 2025 and will proceed through a number of reviews and consultations prior to being finalised and coming into effect in or around 2027.

2.10 Solar Roadmap – United Kingdom powered by solar

2.10.1 In June 2025, the government published its Solar Roadmap [(Ref 24)]. The roadmap details government and industry actions that will be delivered to radically increase the deployment of solar in all its forms across the UK.

2.10.2 The ministerial foreword reconfirms that “Solar is at the heart of [the government’s] mission to make the United Kingdom a clean energy superpower. It is one of the cheapest and quickest to build power sources we have … Solar offers huge potential to boost our energy independence, bring down bills and tackle the climate crisis” [(Ref 24), p3].

2.10.3 The roadmap outlines practical actions for industry and government to overcome the challenges to delivering the Clean Power 2030 capacity ranges for solar as well as setting the stage for longer-term solar capacity growth beyond 2030.

2.10.4 In the roadmap, the government has set out plans to support the delivery of a ‘rooftop revolution’ for smaller scale solar, as well as deliver the large-scale projects which have been caught up in Connection Queue delays.

2.10.5 The roadmap includes an illustrative future capacity breakdown by size. This projection [(Ref 24), Figure 2] shows that under the current policy scenario, 60-65% of capacity installed by 2030 could be large-scale projects. The government estimates that by removing barriers to rooftop deployment, smaller-scale capacity could grow by a further c.5GW by 2030. Importantly, increasing smaller-scale deployment does not reduce the government’s projections for large-scale capacity installations.

2.10.6 “This Roadmap sets out how, alongside ground mount projects, we plan to drive forward deployment of solar across multifunctional uses of space such as rooftops, car parks and water bodies whilst maintaining planning protections for our best agricultural land.” [(Ref 24), p20].

2.10.7 Achieving the Clean Power 2030 range through the roadmap’s illustrative deployment scenario will require a doubling of current domestic and smaller scale commercial scheme capacities (estimated at c.10GW) in just 5 years. Any shortfall in the deployment of these schemes must be made up for my other technologies, including from large scale schemes, if the Clean Power 2030 range is to be achieved.

2.10.8 The Solar Roadmap makes clear that new large-scale solar schemes are urgently needed in the UK, both before and after 2030. The roadmap signposts policy and process streamlining opportunities to support such schemes, as well as seeking an additional increase in operational capacity through an acceleration of rooftop installations.

2.11 Energy Act 2023

2.11.1 In October 2023, the Energy Act 2023 (EA 2023) came into law. The EA 2023 aims to strengthen energy security and support the delivery of net zero and affordable energy bills for households in the long term.

2.11.2 The government press release at the time of Royal Assent (Ref 29) describes the key elements of the EA 2023.

2.11.3 The EA 2023 brings heat networks into the remit of the Office for Gas and Electricity Markets (Ofgem), further supporting the UK's whole-system approach to energy, and updates their remit further so that the Office considers net zero targets as part of its everyday decisions.

2.11.4 New measures will also support consumers in their transition to 'smart products' which will pave the way to the automatic response of UK electricity demand at times of abundance or potential scarcity – a key measure if households are to deliver flexibility to the UK's energy system.

2.11.5 On the energy supply side, the EA 2023 legislates for the regulation of nuclear fusion, an important enabler of the UK's prototype fusion ambitions for 2040.

2.11.6 The EA 2023 also introduces a new licensing framework for carbon dioxide and hydrogen transport and storage to help deliver the UK's first carbon capture and hydrogen production sites.

2.11.7 Further provision is made within the EA 2023 to support the growth of offshore wind while ensuring that compensation for any adverse environmental effects is delivered strategically as opposed to being delivered on a scheme-by-scheme basis.

2.11.8 The EA 2023 should therefore be seen as enabling legislation which will support the UK to deliver on technology development to achieve net zero by 2050. Further discussion on those technologies is included in **Chapter 5** of this Statement.

2.11.9 A forthcoming Energy Independence Act will establish the framework for the government's energy and climate policies.

2.12 Conclusions on decarbonisation policy context

2.12.1 Urgent and unprecedented action is needed on an international scale to meet the commitments established through the Paris Agreement to decarbonise society and limit global warming.

2.12.2 The UK has legally binding targets to decarbonise. The UK is developing new policies and is enhancing existing policies to ensure that those targets are met in a secure and affordable fashion.

2.12.3 However, policies are not yet sufficient to deliver to those national commitments, and delivery against those UK policies is further behind.

2.12.4 Without a rapid increase in the supply of low carbon electricity, the urgent requirement to decarbonise other sectors (as will be required to meet future Carbon Budgets) is unlikely to be achieved.

2.12.5 The Clean Power target is an outcome focussed target, defined in the Clean Power 2030 Action Plan. The Clean Power 2030 Action Plan recognises that there are multiple different possible pathways to achieving that target, and that future pathways will be informed as progress is made. The Capacity Ranges set out in the Clean Power 2030 Action Plan are “a foundation to guide rapid policy development and focus delivery” but “the scenarios developed now cannot be exhaustive or definitive, and it is only right that some optionality is retained” [(Ref 4), p31]. Therefore the flexibility in government’s plan allows that “potential challenges in some areas of clean power delivery can be compensated by deployment elsewhere” [(Ref 4), p25].

2.12.6 Therefore, government is not targeting specific capacities of specific technologies by specific future years but recognises that latitude is required to facilitate the development of sufficient future generation capacity to meet its Clean Power target.

2.12.7 The continued development of schemes which aim to deliver before 2030 and in the 2030s is a key enabler of governments plans to support delivery of its Clean Power target on the way to achieving Net Zero.

2.12.8 This is because, climate change will not 'stop' at 2030. As electricity demand continues to grow to decarbonise traditionally non-electrical sectors, achieving the characteristics of a Clean Power system in one year, does not secure that the characteristics of a Clean Power system will be maintained in any subsequent year, without a further growth in clean sources of electricity.

2.12.9 Solar generation is increasing in both scale and importance within emerging government policy. Not only for the benefits it delivers to decarbonisation, but also because of the need for secure and affordable energy supplies.

2.12.10 The government’s Clean Power framework has set a capacity range for large-scale solar schemes to be connected by 2030, alongside ambitious capacity ranges for onshore and offshore wind.

2.12.11 To deliver this capacity of solar generation, the equivalent of approximately one project the size of this Scheme would need to be switched on each and every month between the end of 2024 and 2030.

2.12.12 Projects such as the Scheme which are more ready to build with connection offers in the 2020s are valuable to deliver the government's ambition to deliver 'Clean Power by 2030'. It is important to continue to bring forward such schemes to meet future growth in electricity demand and also in the event that 'Clean Power by 2030' is not achieved.

2.12.13 The Scheme will, if consented, make an important and significant contribution towards achieving the government's Clean Power target and legally binding net zero target by 2050.

3 National Policy Statements

3.1 Planning policy for Nationally Significant Infrastructure Projects

3.1.1 The legal requirement to achieve net zero underpins the urgent need for the delivery of large capacities of consentable and affordable electricity generation schemes which make best use of GB's natural low carbon energy resources and available grid infrastructure.

3.1.2 The Energy NPSs were established against obligations made as part of the Climate Change Act 2008 (CCA2008) and were first designated in June 2011. Following a period of revision and consultation, a revised suite of NPSs were designated by the previous government on 17 January 2024.

3.1.3 The Overarching National Policy Statement for Energy (NPS) EN-1 (Ref 1) sets out national policy for energy infrastructure in England and Wales. It has effect, in combination with NPS EN-3 (for renewable energy infrastructure) (Ref 2) and NPS EN-5 (for electricity networks) (Ref 30), on recommendations made by the appointed Examining Authority (ExA) to the relevant Secretary of State (at the time of submission, the Secretary of State for Energy Security and Net Zero) on applications for energy developments that fall within the scope of the NPSs [(Ref 1), Paras 1.1.1 & 1.1.2].

3.1.4 NPS EN-1 states that the Secretary of State should assess all applications for development consent for the types of infrastructure included by the NPS (including solar) on the basis that there is demonstrated urgent need for them, that substantial weight should be given to this need, and that the Secretary of State is not required to consider the specific contribution of any individual project to be satisfied that need is established [(Ref 1), Paras 3.2.6 to 3.2.8].

3.1.5 The NPSs include the then government's conclusion that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure, which includes large-scale solar farms, because a combination of many or all types of such infrastructure is urgently required for both energy security and to achieve net zero [(Ref 1), Paras 4.2.4 to 4.2.5].

3.1.6 NPS EN-1, when combined with the relevant technology-specific energy NPS, provides the primary basis for decisions by the Secretary of State for developments that fall within the scope of the NPSs. NPS EN-1 is clear that the overarching need case and the substantial weight to be given to the need is the starting point for all assessments of applications for energy infrastructure types which are covered by the NPSs [(Ref 1), Para 4.2.6].

3.1.7 NPS EN-3 covers those technologies which, at the time of publication, were technically viable at generation capacities of over 50MW onshore and 100MW offshore. Critically, this includes solar generation, and as such the need for this technology is fully covered and established by the NPSs.

3.1.8 By virtue of intended generating capacity of the Scheme, the NPSs 'have effect' in relation to the Scheme and the application must be decided in accordance with them.

3.1.9 This Statement of Need for the Scheme reflects the national policy position that there is a demonstrated urgent need and critical national priority for nationally significant low carbon infrastructure, including solar generation, and that solar is a key part of the national strategy for low-cost decarbonisation of the energy sector. It builds upon the policy position established in the NPSs to further demonstrate why the Scheme is urgently needed at the scale proposed, why the proposed location is appropriate for such a development, and how the Scheme also addresses all relevant aspects of established and emerging government energy and climate change policy and commitments.

3.1.10 Section 104 of the Planning Act 2008 (PA2008) makes clear that where an NPS exists relating to the type of development applied for, the Secretary of State must have regard to it as a relevant NPS and must decide the application for development consent for the Scheme under PA2008 in accordance with those NPSs. The NPSs provide specific policy in relation to solar development, and the policies set out in NPS EN-1, EN-3, and EN-5 therefore apply as 'relevant' NPSs under section 104.

3.1.11 The urgent national need for energy generating stations set out in the NPSs is of critical significance to the determination of the application for development consent for the Scheme. The NPSs establish that:

"Subject to any legal requirements, the urgent need for CNP Infrastructure to achieving our energy objectives, together with the national security, economic, commercial, and net zero benefits, will in general outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy" [(Ref 1), Para 3.3.63].

3.1.12 There is a presumption under the NPSs that the urgent need for CNP infrastructure will outweigh any residual effects in all but the most exceptional cases. This presumption does not apply to residual impacts which present an unacceptable risk to, or interference with, human health and public safety, defence, irreplaceable habitats, or unacceptable risk to the achievement of net zero. Where no such residual impacts exist, the presumption weighs in favour of the need for CNP infrastructure [(Ref 1), Para 4.1.7].

3.1.13 Policies within NPSs EN-1, EN-3, and EN-5 are relevant to the Scheme and those in accordance with which this Application must be decided are set out in **Section 4.2** of this Statement.

3.1.14 The urgency of the need for nationally significant low carbon infrastructure established in the NPSs requires actions to be taken in the near-term for that need to be met and therefore the urgent need for the Scheme is demonstrated by the urgent need for new energy infrastructure as set out in NPS EN-1 [(Ref 1), Para 3.3.63].

3.1.15 The consent of multiple large-scale transmission connected ground mount solar schemes in the 2020s makes it clear that NSIP ground mount solar is supported by national policy because of the benefits it can bring towards delivering a secure and low carbon energy future.

3.1.16 The urgent national need for energy generating stations means that substantial weight should be attributed to the Scheme's ability to contribute to meeting that need, in line with EN-1 [(Ref 1), Para 3.2.7].

3.2 A synthesis of National Policy Statement EN-1 (2023)

3.2.1 The fundamental need for the large-scale infrastructure, which NPS EN-1 considers, recognises the UK's legal commitment to decarbonise to net zero by 2050 and so contribute to holding the increase in global average temperature due to climate change, to well below 2 degrees above pre-industrial levels. The NPS states that:

"Using electrification to reduce emissions in large parts of transport, heating and industry could lead to more than half of final energy demand being met by electricity in 2050, up from 17 per cent in 2019, representing a doubling in demand for electricity. Low carbon hydrogen is also likely to play an increasingly significant role" [(Ref 1), Para 2.3.7].

3.2.2 The national policy direction established by the previous government is to develop an integrated energy system which relies on low carbon electricity generation for a significant proportion of its supply. The government's election manifesto supports the continuation of this policy direction albeit with greater speed. As a consequence:

"Demand for electricity is likely to increase significantly over the coming years and could more than double by 2050 as large parts of transport, heating and industry decarbonise by switching from fossil fuels to low carbon electricity. The Impact Assessment for CB6 shows an illustrative range of 465-515TWh in 2035 and 610-800TWh in 2050" [(Ref 1), Para 3.3.3].

3.2.3 The stated policy objectives for the energy system are "to ensure our supply of energy always remains secure, reliable, affordable, and consistent with meeting our target to cut GHG emissions to net zero by 2050" [(Ref 1), Para 2.3.3].

3.2.4 Meeting this objective will require a step change in the decarbonisation of our energy system, in particular to deliver a dramatic increase in the volume of energy supplied from low carbon sources [(Ref 1), Para 2.3.5].

3.2.5 The security, reliability, and affordability of energy supplies is also of critical importance because of the role energy plays in delivering economic prosperity and social well-being [(Ref 1), Para 2.5.1].

3.2.6 Accelerating deployment of renewables, nuclear, hydrogen, Carbon Capture, Usage and Storage (CCUS), and network infrastructure will help address the UK's current vulnerability to international energy prices through the supply of clean, secure, and affordable UK-sourced power on a route to achieving net zero [(Ref 1), Para 2.5.6].

3.2.7 There is a need for significant amounts of new large-scale infrastructure to meet national energy objectives and the NPS establishes that the need for such infrastructure is urgent [(Ref 1), Para 3.1.1].

3.2.8 There must always be sufficient electricity to meet demand, with margin to accommodate unexpectedly high demand, unexpected plant closures, or extreme weather events and NPS EN-1 explains that the larger the margin, the more resilient the system will be with dealing with those types of events (Ref 1), Paras 3.3.1 & 3.3.2].

3.2.9 No single type of electricity infrastructure will be able to meet any UK government's objectives in isolation, so new generators of varied technology, assets that provide flexibility, and new networks will all be needed (Ref 1), Para 3.3.4]. However, the previous government concluded from its analysis that "a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar" [(Ref 1), Para 3.3.20]. The government's election manifesto also calls for significant increases in deployed capacities of wind and solar [(Ref 20), p51].

3.2.10 The NPS states that decentralised and community energy systems, which by definition would include rooftop solar installations, could lead to some reduction in demand on the main transmission system, but "the government does not believe they will replace the need for new large-scale electricity infrastructure to meet our energy objectives." NPS EN-1 goes on to explain that the connection of large-scale generation facilities via high voltage transmission systems enables the pooling of generation and demand and enables the efficient bulk transfer of power between areas with surplus and areas in deficit [(Ref 1), Para 3.3.12] and therefore demonstrates support for large-scale ground mount solar schemes alongside the development of smaller decentralised and community energy schemes including on rooftops.

3.2.11 The government's election UK Solar Roadmap (Ref 24) explains that ramping up of the deployment of both ground-mount and rooftop solar generation in the UK is crucial because rooftop schemes have potential to "reduce bills for households" and "Ground-mounted solar is one of our cheapest electricity sources to build and operate at scale." Further, "Speed of deployment is also a huge benefit of solar" for both ground mounted and rooftop schemes [(Ref 24), p15].

3.2.12 NPS EN-1 states that "it is prudent to plan on a conservative basis to ensure that there is sufficient supply of electricity to meet demand across a wide range of future scenarios" [(Ref 1), Para 3.3.10].

3.2.13 To achieve a decarbonised power sector by 2035 (Ref 34), the NPSs conclude that it is necessary to bring forward new renewable electricity generating projects as soon as possible. The need for new renewable electricity generation projects is therefore urgent.

3.2.14 To achieve the government's ambition of delivering and maintaining its Clean Power target, the need for a robust pipeline of new renewable electricity generation projects for delivery both before and beyond 2030 becomes more urgent still.

3.2.15 The NPS establishes that substantial weight should be given to this need when considering applications for development consent under the PA2008, and the Secretary of State is not required to consider separately the specific contribution of any individual project to satisfying the need established in the NPS [(Ref 1), Paras 3.2.7 & 3.2.8].

3.2.16 NPS EN-1 explains that large capacities of low carbon generation will be required to:

- Ensure that there is sufficient electricity to meet increased demand;
- Replace output from retiring plants;
- Ensure there is sufficient margin in our supply to accommodate unexpectedly high demand; and
- Mitigate risks such as unexpected plant closures and extreme weather events [(Ref 1), Section 3.3].

3.2.17 The NPSs conclude that national energy security and net zero ambitions will only be delivered through the development of new low carbon sources of energy at speed and scale [(Ref 1), Para 4.2.2] and therefore that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure [(Ref 1), Para 4.2.4]. Low carbon electricity generation infrastructure is described as "all onshore and offshore generation that does not involve fossil fuel combustion" [(Ref 1), Para 4.2.5] and as such large-scale solar generation is classified as CNP infrastructure under NPS EN-1.

3.2.18 The NPS sets the expectation that "For projects which qualify as CNP Infrastructure, it is likely that the need case will outweigh the residual effects in all but the most exceptional cases" [(Ref 1), Para 4.1.7].

3.2.19 The Scheme meets the definition of CNP Infrastructure because it is for the development of greater than 50MW capacity of a low carbon source of energy. As CNP infrastructure, the urgent need for the Scheme to assist in achieving the UK's energy objectives, together with the national security, economic, commercial, and net zero benefits, will in general outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy [(Ref 1), Para 3.3.63].

3.2.20 In noting the crucial national benefits of increased system robustness through new electricity network infrastructure projects, NPS EN-1 also recognises the particular strategic importance in the next decade of the role of solar generation in the UK's generation mix:

"As part of delivering [a secure, reliable, affordable, net zero consistent system in 2050], government announced in the British Energy Security Strategy an ambition to deliver up to 50GW of offshore wind by 2030… and the requirement in the Energy White Paper for sustained growth in the capacity of onshore wind and solar in the next decade" [(Ref 1), Para 3.3.21].

3.2.21 The siting of new solar capacity is therefore important and the location of points of connection to existing networks to enable that capacity to come forward is an important consideration.

3.2.22 In relation to integration technologies, NPS EN-1 states that:

"New generating plants can deliver a low carbon and reliable system, but we need the increased flexibility provided by new storage and interconnectors (as well as demand side response) … to reduce costs in support of an affordable supply. Storage and interconnection can provide flexibility, meaning that less of the output of plant is wasted as it can either be stored or exported when there is excess production." [(Ref 1), Paras 3.3.5 & 3.3.6].

3.2.23 NPS EN-1 goes on to explain that storage is needed to reduce the costs of the electricity system and increase reliability by storing surplus electricity in times of over-supply, to provide electricity when demand is higher. **Section 6.9** of this Statement explains that storage can achieve the benefits set out in the NPS from stand-alone facilities or facilities co-located with renewable generation facilities.

3.2.24 The local and national benefits which storage assets can provide are also referenced in NPS EN-1 [(Ref 1), Para 3.3.6], being:

- Maximising the usable output from intermittent low carbon generation;
- Reducing the total amount of generating capacity required to meet peak demand;
- Reducing the need for new network infrastructure;
- Providing a range of balancing services to help operate the electricity system; and
- Reducing constraints on the electricity network.

3.2.25 The role of 'low carbon hydrogen' is also signalled as likely needed in the UK's future energy system. Low carbon hydrogen will be produced from the electrolysis of water, using low carbon electricity. **Section 5.8** of this Statement provides further detail on the role of hydrogen. The electricity generated by the Scheme will support low carbon hydrogen to play an increasingly significant role in the national energy system [(Ref 1), Paras 2.3.5 – 2.3.7].

3.3 A synthesis of National Policy Statement EN-3 (2023)

3.3.1 NPS EN-3 (Ref 2) covers nationally significant renewable energy infrastructure which includes solar photovoltaic (PV) at more than 50MW in England and more than 350MW in Wales [(Ref 2), Para 1.6.1].

3.3.2 NPS EN-3 bolsters the support for solar development in the UK that was previously provided in the draft 2021 versions, now stating that it has "committed to sustained growth in solar capacity to ensure that we are on a pathway that allows us to meet net zero emissions. As such solar is a key part of the government's strategy for low-cost decarbonisation of the energy sector" [(Ref 2), Para 2.10.9].

3.3.3 The statement goes on to reiterate the contribution that solar generation is expected to make to achieving the UK's net zero targets and energy security goals. "The British Energy Security Strategy states that the government expects a five-fold increase in combined ground and rooftop solar deployment by 2035 (up to 70GW)" [(Ref 2), Para 2.10.10].

3.3.4 The Clean Power 2030 Action Plan establishes a capacity range for solar of 45-47GW by 2030 and 45-69GW by 2035, implying a consistent rate of deployment with that described in the currently designated NPSs.

3.3.5 Because "Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation" [(Ref 2), Para 2.10.13], solar is also expected to bring forwards affordability benefits for consumers.

"Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the efficiency of panels, large-scale solar is now viable in some cases to deploy subsidy-free" [(Ref 2), Para 2.10.14].

3.3.6 NPS EN-3 states that:

"Government is supportive of solar that is co-located with other functions (for example, agriculture, onshore wind generation, or storage) to maximise the efficiency of land use" [(Ref 2), Para 2.10.10].

3.3.7 NPS EN-3 also establishes that energy storage, if proposed as part of a solar farm proposal, may be treated as associated development to that proposal [(Ref 2), Para 2.10.16].

3.3.8 Grid connection, and in particular the likely proximity of schemes to suitable connection points on the electricity network, is also addressed:

"The connection voltage, availability of network capacity, and the distance from the solar farm to the existing network can have a significant effect on the commercial feasibility of a development proposal."

"To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure or biodiversity and reduce overall costs applicants may choose a site based on nearby available grid export capacity." [(Ref 2), Paras 2.10.24 & 2.10.25].

3.3.9 NPS EN-3 also lists irradiance and site topography as key inputs to site selection [(Ref 2), Paras 2.10.19 & 2.10.20].

3.3.10 NPS EN-3 suggests anticipated levels of land efficiency for solar generation, recognising both the land take which schemes such as this one require, but also that evolution in the technology is anticipated, and this may bring about efficiency benefits through the life of the Scheme:

"Along with associated infrastructure, a solar farm requires between 2 to 4 acres for each MW of output. A typical 50MW solar farm will consist of around 100,000 to 150,000 panels and cover between 125 to 200 acres. However, this will vary significantly depending on the site, with some being larger and some being smaller. This is also expected to change over time as the technology continues to evolve to become more efficient." (Ref 2), Para 2.10.17].

3.3.11 The degradation of solar efficiency over time is addressed in NPS EN-3 [(Ref 2), Paras 2.10.55 & 2.10.67], suggesting that developers may need to account for the light-induced degradation effects on solar panels by overplanting solar panel arrays, although overplanting is not a requirement for schemes. Overplanting may not be technically deliverable at some locations.

3.3.12 The design life of solar panels should also be considered "when determining the period for which consent is required. An upper limit of 40 years is typical, although applicants may seek consent without a time-period or for differing time-periods of operation." [(Ref 2), Para 2.10.65]. The Applicant notes that a number of solar DCOs recently granted have a 60-year time limit, which is the proposed time limit for the Scheme.

3.4 A synthesis of National Policy Statement EN-5 (2023)

3.4.1 NPS EN-5 covers new, non-exempt above ground electricity lines over 2km in length whose nominal voltage is expected to be 132kV or above, and other kinds of electricity infrastructure in England which is constituted as associated development for which consent is sought along with an NSIP [(Ref 30), Para 1.6.2].

3.4.2 NPS EN-5 explains that "significant amounts of new electricity networks infrastructure is required" [(Ref 30), Para 2.2.3], something with which the government agrees [(Ref 20), p55].

3.4.3 NPS EN-5 acknowledges that the siting of new electricity transmission infrastructure is determined by "the location of new generating stations or other infrastructure requiring connection to the network, and/or system capacity and resilience requirements determined by the Electricity System Operator" [(Ref 30), Para 2.2.2].

3.4.4 If the UK's Centralised Strategic Network Planning process (currently under development by NESO with consultation held in Q3 2025) identifies strategic investments intended to facilitate achieving net zero and decarbonisation targets, "the Secretary of State should have regard to the need case for new electricity networks infrastructure set out in Section 3.3 of NPS EN-1" [(Ref 30), Paras 2.8.2 & 2.8.3].

3.4.5 The Scheme is to connect to the existing Melksham 400kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Scheme will generate to local and national consumers. This is a key benefit of the Scheme.

3.5 April 2025 draft National Policy Statements EN-1, EN-3 and EN-5

3.5.1 In April 2025, the government published a suite of draft NPSs. The revisions are intended to ensure that the NPSs reflect current energy policy, such that the investment required to achieve Clean Power by 2030 and Net Zero by 2050 can be delivered.

3.5.2 Draft NPS EN-1 (Ref 31) explains that:

"… For any application accepted for examination before the final publication of the approved 2025 amendments, the 2024 suite of NPSs should have effect in accordance with the terms of those NPSs.

… Any emerging draft NPSs (or those designated but not yet having effect) are potentially capable of being important and relevant considerations in the decision-making process." [(Ref 31), Paras 1.6.2 & 1.6.3].

3.5.3 **Section 2.6** of this Statement explains that the government's support for renewable generation going forwards is no lower than the support set out in existing publications and strategies and in the current NPSs, and if anything is emerging to be more supportive because of the unprecedented and urgent need.

3.5.4 Paragraph 3.3.19 of draft NPS EN-1 incorporates government's aim to deliver its Clean Power target by 2030 in place of previous policy and strategy aims.

3.5.5 Draft NPS EN-1 confirms that government's "objectives for meeting the Clean Power 2030 Mission are to ensure our supply of energy always remains secure, reliable, affordable, and consistent with meeting our target to cut GHG emissions to net zero by 2050 … Meeting these objectives necessitates a significant amount of new energy infrastructure, both large nationally significant developments and small-scale developments determined at a local level" [(Ref 31), Para 2.3.2].

3.5.6 Draft NPS EN-1 explains that renewable technologies will for the foundation of the UK's clean power system and that a rapid increase in low carbon generation, flexibility infrastructure and electricity transmission infrastructure must be delivered through the 2020s and 2030s to achieve and maintain the Clean Power target [(Ref 31), Para 2.3.6], especially as demand for electricity "could more than double by 2050" to reach net zero [(Ref 31), Para 3.3.3].

3.5.7 Draft NPS EN-1 therefore re-introduces onshore wind technology to the definition of nationally significant energy generating stations from when the Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025 takes effect, currently proposed for 31 December 2025.

3.5.8 The currently designated NPSs establish the policy position that there is a critical national priority (CNP) for infrastructure which delivers decarbonisation and energy security benefits. This policy applies to solar and other low carbon technologies of nationally significant scale. Designation of the draft NPSs as written would increase the threshold for nationally significant solar projects from 50MW to 100MW.

3.5.9 Further, although draft EN-1 still includes Energy from Waste plant in the definition of nationally significant energy generating stations, Energy from Waste projects will no longer benefit from CNP policy as they do not meet the definition of a clean power technology. This change effectively reduces the list of technologies available to deliver Clean Power.

3.5.10 Aside from these two proposed policy amendments, CNP policy as included in the April 2025 NPSs is unchanged from the November 2023 (designated) NPSs (see **Paragraphs 3.2.17 – 3.2.19** of this Statement).

3.5.11 The government's Clean Power Mission includes the development of large-scale solar generation projects. These projects, including the Scheme, are by definition low carbon generation projects and CNP policy extends to such projects.

3.5.12 The government's Clean Power Capacity Ranges, as set out in **Table 1** of this Statement, covering generation and flexibility technologies, establish a framework to support that delivery and reflect that "there is no singular path to achieving clean power, but instead, that there are a range of scenarios that could get us there" [(Ref 31), Para 3.2.3].

3.5.13 Indeed, at Para 3.3.22 of draft NPS EN-1, government state that the capacity ranges "reflect that there is no singular path to achieving clean power, but instead, that there are a range of scenarios that could get us there". Some technologies may be more successful than others in delivering low carbon generation infrastructure in the coming years. Progress (or otherwise) in delivering projects across all technologies will help to refine future capacity needs. However, in all cases, a robust pipeline of development projects across many technologies is needed to provide options for the efficient and timely delivery of the unprecedented capacity of low carbon generation needed to achieve, and keep achieving, the government's Clean Power target.

3.5.14 However, government has reconfirmed its view that "a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar" [(Ref 31), Para 3.3.23] and supported by energy storage, which will reduce the costs of the electricity system, increase its reliability and provide services to the electricity system on a local and national basis [(Ref 31), Para 3.3.27 & 3.3.28].

3.5.15 Draft NPS EN-1 also clarifies that the government "does not consider it appropriate for planning policy to set limits on different technologies but planning policy can be used to support the government's ambitions in energy policy and other policy areas" [(Ref 31), Para 3.2.4]. Indeed, Para 3.2.6 of the same document clarifies that the Capacity Ranges included in the documents are not intended to propose limits on any new infrastructure that can be consented because of the affordability benefits arising from competition within and between clean power technologies.

3.5.16 Paras 3.2.9 and 3.2.10 of draft NPS EN-1 (Ref 31) confirm that, consistent with the (designated) November 2023 NPSs, the Secretary of State has determined that substantial weight should be given to the need for projects to come forwards for development consent under the Planning Act 2008, and that the Secretary of State is not required to consider separately the specific contribution of any individual project to satisfying the need established in the NPS [(Ref 31), Paras 3.2.9 & 3.2.10].

3.5.17 Draft NPS EN-3 (Ref 32) mirrors the update of policy aims included in draft NPS EN-1 and, similar to the November 2023 (designated) EN-3, applies to solar generation above the nationally significant threshold. Notably, government states that the UK has huge potential for solar power and that solar energy is at the heart of the Clean Power 2030 Mission [(Ref 32), Paras 2.10.1 & 2.10.2]. Other aspects discussed in **Section 3.3** of this Statement, are consistent between the November 2023 (designated) EN-3 and the April 2025 draft NPS EN-3.

3.5.18 **Paragraph 2.9.19** of this Statement lists the strategic planning activity in flight for development of the GB energy system, including the CSNP. The CSNP process will enable the delivery of a long term, holistically designed network plan and will be subject to a Strategic Environmental Assessment. The CSNP would establish the need case and technological solution for projects which adhere to the recommendations of the CSNP. Endorsement of the CSNP through the NPS, as is proposed in draft NPS EN-1, would mean that the need case and technology type for projects that adhere to the recommendations of the CSNP would be established and not questioned during the consenting process [(Ref 31), Paras 3.3.78 & 3.3.79]. Draft NPS EN-5 (Ref 33)] includes updates to maintain its consistency with draft NPS EN-1 on relevant points.

3.6 Conclusions on national policy

3.6.1 As set out in **Paragraph 3.1.10** of this Statement, section 104 of the PA2008 makes clear that where an NPS (e.g. NPSs EN-1, EN-3 and EN-5) exists relating to the type of development applied for (e.g. the Scheme), the Secretary of State must have regard to it as a relevant NPS, and must decide the application in accordance with that NPS. The draft NPSs are potentially capable of being important and relevant considerations in the decision-making process.

3.6.2 Solar generation is expected to make an important contribution to the UK's renewable energy generating capacity towards 2050, and the government has placed solar at the heart of its Clean Power 2030 Mission [(Ref 32), Para 2.10.2] because of its huge UK potential.

3.6.3 The NPSs demonstrate that:

- The need for solar technology (as a renewable source) in GB is urgent and significant and has increased, with nationally significant solar technology now defined as CNP infrastructure;
- Large-scale solar is technically and economically feasible;
- Large-scale solar can and will bring benefits for the UK; and
- Flexibility is also needed.

3.6.4 Integration technologies, which provide flexibility, will play an essential role in achieving the full decarbonisation of the whole GB energy system, enhancing the benefits brought by low carbon generation. NPS EN-1 supports the need for integration technologies, and Battery Energy Storage Systems (BESS) is a suitable and beneficial integration technology.

3.6.5 NPS EN-3 provides policy support for developments, such as this Scheme, which include co-located solar and storage technologies because both technologies are needed and co-location maximises the efficiency of land use. Co-location also maximises utilisation of the grid connection.

3.6.6 These factors manifest in the material contribution brought by solar and storage schemes to the UK's legal decarbonisation targets, the enhancement of security of supply, and the affordability of electricity for GB consumers.

3.6.7 NPS EN-3 provides that grid connection, irradiance and site topography are key inputs to the selection of sites suitable for large-scale solar generation developments.

3.6.8 Therefore, the number of locations at which large-scale solar generation is suitable is likely to be limited, and the number of locations at which co-located large-scale solar plus storage generation is suitable is likely to be limited even further.

3.6.9 This is a material issue when considering how the UK is to meet the urgent need for low carbon generation as is established in the current NPSs.

3.6.10 The draft NPSs have been revised to support the achievement of government's Clean Power target, as described in **Section 2.9** of this Statement. The draft NPSs include Capacity Ranges to support the achievement of government's Clean Power target. The NPSs clarify that the Capacity Ranges included in the draft NPSs are not intended to propose limits on any new infrastructure that can be consented.

4 Electricity demand will increase on the path to net zero

4.1 Chapter summary

4.1.1 This chapter provides information to support and quantify the policy position that future electricity demand will need to grow by a very significant amount in order to achieve net zero. As set out in NPS EN-1:

"[Government] analysis suggests that even with major improvements in overall energy efficiency, and increased flexibility in the energy system, demand for electricity is likely to increase significantly over the coming years and could more than double by 2050 as large parts of transport, heating and industry decarbonise by switching from fossil fuels to low carbon electricity" [(Ref 1), Para 3.3.3].

4.1.2 Energy final consumption in the UK in 2023 was 1,542TWh, with 17.6% (272TWh) in the form of electricity [(Ref 35), Table 1.1au]. Electricity demand is expected to grow significantly in the future as carbon-intensive sources of energy are displaced by electrification of other industry sectors, or production of non-carbon energy vectors, such as hydrogen, by use of electricity. Energy efficiency measures may mean that total UK energy consumption decreases in the future, but an increasing share of that consumption will come from electricity generated by low carbon sources.

4.1.3 The annual National Energy System Operator (NESO) Future Energy Scenarios (FES) documents provide important and relevant information on these points. The FES are discussed in more detail in the following sections. On 1st October 2024, the former National Grid Electricity System Operator (NGESO) became the NESO. This Statement references reports and data published before the organisation's name change and therefore refers to the organisation as either NGESO or NESO, depending on context.

4.2 Introducing the FES

4.2.1 The FES documents (Ref 36) are NESO's annual publications which explore strategic, credible choices to propel GB on the route to decarbonisation.

4.2.2 The FES are an important point of view, which contributes to an objective assessment of the need for, and scale of, how much energy GB might need and where it could come from, to build a picture of the ways in which net zero could be reached.

4.2.3 The pathways included in the 2025 FES show the scale of work still ahead in Great Britain to achieve net zero, particularly "beyond the power sector and beyond 2030." NESO pathways follow a rapid acceleration in energy transition built on the foundations delivered to date, followed by growth throughout the

2030s, provided that the foundations for future growth are laid now. [(Ref 36)(2025), p5].

4.2.4 Three of the FES 2025 pathways meet net zero in 2050. A counterfactual that does not meet net zero is presented alongside the pathways.

4.2.5 The national legally binding commitments to achieve net zero by 2050 and the interim commitments made through the NDCs and Carbon Budgets underpin the urgency for new low carbon generation infrastructure to be built and commissioned, and government support for such developments is critical.

4.2.6 A key FES 2025 observation, which is consistent with previous FES publications, is that in all lower-carbon futures, the electricity sector will not operate in isolation from other energy sectors. Rapid decarbonisation is required across all areas of demand – including residential, transport, industrial, and commercial. Deep electrification of all those areas is required in order to meet net zero, and until widespread electrification is achieved, the need for urgent electrification will increase year-on-year.

4.2.7 Importantly, FES 2025 also makes a new key observation: the need for the concurrent delivery of two 'waves' of activity prior to 2030.

4.2.8 The first wave includes completing initiatives which are planned prior to 2030. For example, consenting and delivering schemes with connection dates prior to 2030 (including this Scheme) and reducing fossil fuel demand in the heat and transport sectors through electrification.

4.2.9 The second wave, is preparing for expanded energy infrastructure beyond 2030, including both networks and generation assets, to deliver energy security, resilience and carbon reductions, to unlock the opportunities of a clean energy system for the future [(Ref 36)(2025), pp7-11].

4.2.10 The FES 2023 Energy Background Document (Ref 37) stated that:

"A range of technologies with different characteristics can, in combination, help deliver secure, affordable low carbon electricity supplies and harness the potential of domestic renewable resources. More electricity from wind and solar is vital to help UK meet its target for net zero by 2050" [(Ref 37), p15].

4.2.11 While FES 2025 states that "Pathways [to Net Zero] are narrowing but optionality and uncertainty on the route to net zero remain" [(Ref 36)(2025), p20], NESO remain consistent with their view on the critical future role of wind and solar: "As demand and renewable generation grow, our pathways use new forms of flexibility to ensure security of supply. All pathways see substantial increases in renewable wind and solar generation to supply low carbon power" [(Ref 36)(2025), p47].

4.2.12 The increased electrification of demand increases linkages between electricity, gas, hydrogen, bioenergy, and carbon. However, based on currently known and deliverable technologies, the need for low carbon renewable electricity generation capacity is broadly unaffected by of the scale of hydrogen adoption in Britain.

4.2.13 For example, the Scheme would connect directly to Britain's electricity transmission system, meaning that the energy generated by the Scheme may be used either directly by consumers (as electricity), or by grid-connected hydrogen electrolysers which store energy for later dispatch (as either hydrogen or electricity), so supporting the delivery of a flexible energy system.

"Producing hydrogen via electrolysis can create additional demand when needed to avoid curtailing wind and solar generation and this hydrogen can then be used to generate power at times of peak demand or low renewable output" [(Ref 37), p18].

4.2.14 Consumer engagement in demand side flexibility and demand reduction measures across the pathways is a key component of what makes the pathways differ from each other. All net zero pathways include increased take-up of Zero Emission Vehicles (ZEV) and hydrogen use in home heating (as opposed to electrical heating methods) however there are differences between the pathways.

4.2.15 In FES 2024, NESO stated that "a high usage of renewables is enabling the carbon intensity of electricity generation to continue to fall," [(Ref 36)(2024), p15].

4.2.16 From their look-back at previous years, NESO found that "Decarbonisation of the power sector has driven most of the progress on emissions reductions to date" and also explain that "as more sectors electrify, low carbon electricity will continue to enable widespread emissions reduction across Great Britain" [(Ref 36)(2025), p29].

4.2.17 In FES 2025, NESO state that solar generation is a cheaper source of clean power and will play an important role in meeting demand. Therefore, all FES 2025 pathways foresee a significant role for new solar generation in the UK with at least 55GW of solar capacity [(Ref 36)(2025), pp77 & 133-134].

4.2.18 **Chapter 9** of this Statement provides additional evidence that, based on current economics, solar generation is likely to be one of the cheapest sources of electricity in both the 2020s and 2050 energy mix. A diverse mix of low carbon generation will be required to meet national decarbonisation targets.

4.2.19 The FES 2024 pathways were considered by government in its Clean Power 2030 Action Plan. FES 2025 further develops those pathways based on the ambition and pace of the Clean Power target while accelerating progress across the whole energy system and looking beyond 2030. [(Ref 36)(2025), p11].

4.3 Trends in UK electricity demand

4.3.1 In the 1990s and early 2000s, GB electricity demand grew only slowly, but from 2005 electricity demand has fallen year-on-year due to:

- A decline in economic growth rate (particularly with the recession of 2009);
- A reduction in the level of electricity intensity as the economy has shifted to less energy-intensive activities;
- The introduction of energy efficiency measures including more efficient lighting and technology development more generally [(Ref 38), p28 & (Ref 39), p48]; and
- The COVID-19 pandemic (2020-2021) and cost of living crisis (from 2022).

4.3.2 Today's view of future GB electricity demand is, however, one of returning growth, through:

- The switching of sources of final-use power for heating and transport from carbon-intensive sources to electricity, the generation of which can be decarbonised using technologies already available today;
- The least-cost energy efficiency measures, such as introduction of low-voltage LEDs for lighting, have now been implemented across business and domestic sectors; and
- Economic restructuring in GB away from manufacturing to a service-based economy has largely occurred, however the growth of new high-technology and highly skilled manufacturing, both contributing to national economic growth and prosperity, is likely to place additional pressures on the electricity sector.

4.3.3 The FES shows that achieving net zero requires electricity demand to grow. Consequentially, low carbon electricity supply will need to increase further to meet that demand, including the potential for increased anticipated demand for green hydrogen, which could be produced using renewable electricity to electrolyse water with zero carbon emissions.

4.3.4 The majority of industry projections of GB electricity demand to 2050 are for a significant increase from today's level of circa 300TWh. The amount by which forecasts increase varies according to the level of decarbonisation of non-energy sector demand, and the source of that decarbonisation. For example, hydrogen is an important energy vector which may be able to help decarbonise hard to reach sectors of transport, space heating and heavy industry. Off-grid hydrogen production would require the generation of low carbon power that would be measured outside of transmission system demand (i.e. in addition to the views included in the following list of electricity system demand by 2050):

- The NPSs and draft NPSs state that current levels of demand are expected to double [(Ref 1), Para 2.3.7 and (Ref 31), Para 2.3.7], i.e. to circa 600TWh;
- The Clean Power 2030 Action Plan anticipates a doubling of demand, with rapid growth expected over the 2030s and 2040s [(Ref 4), p11];
- NESO presents a range from 559TWh for their counterfactual pathway to between 705 and 797TWh for their three net zero pathways [(Ref 36)(2025), Table 2];
- The National Infrastructure Commission (NIC) forecasts 465 to 595TWh [(Ref 39), p35];
- The Energy Systems Catapult forecasts 525 to 700TWh [(Ref 19), pp23 & 27];
- The CCC's sixth carbon budget presents a range from 550 to 680TWh [(Ref 40), Table 3.4.a];
- The government's impact assessment for Carbon Budget 6 (CB6) presents a range from 610 to 800TWh [(Ref 1), Para 3.3.3 and (Ref 41), p29];
- The 2020 Energy White Paper presents a range from 575 to 665TWh [(Ref 25), p42];
- Mission Zero suggests that "electricity demand by 2050 could be roughly double today's level of total electricity demand" [(Ref 27), Paras 287 & 299]; and
- The Connections Action Plan projects electricity demand of between 570 to 770 TWh by 2050 depending on how net zero is met [(Ref 21), pp68 – 70].

4.3.5 The increasing level of future demand is relevant to the need for low carbon generation capacity because sufficient capacity must be developed to meet that demand. Further, as indicated in Mission Zero and borne out historically by industry data, in the future, demand on Winter days "could be double that of milder days" [(Ref 27), Para 299]. Therefore, timing demand to periods of high supply, or with supply, will be important, as will building sufficient generation capacity to meet demand under a variety of weather conditions. NPS EN-1 states that "it is prudent to plan on a conservative basis to ensure that there is sufficient supply of electricity to meet demand across a wide range of future scenarios" [(Ref 1), Para 3.3.10].

4.3.6 **Figure 4** shows how NESO's electricity demand pathways for Great Britain developed from 2019 (prior to the UK's 2019 commitment to net zero), and 2023 to 2025. Each pathway is represented as a shaded area ranging from the lowest pathway demand scenario to the highest scenario per delivery year, for those scenarios which met the 2050 climate targets of the time.

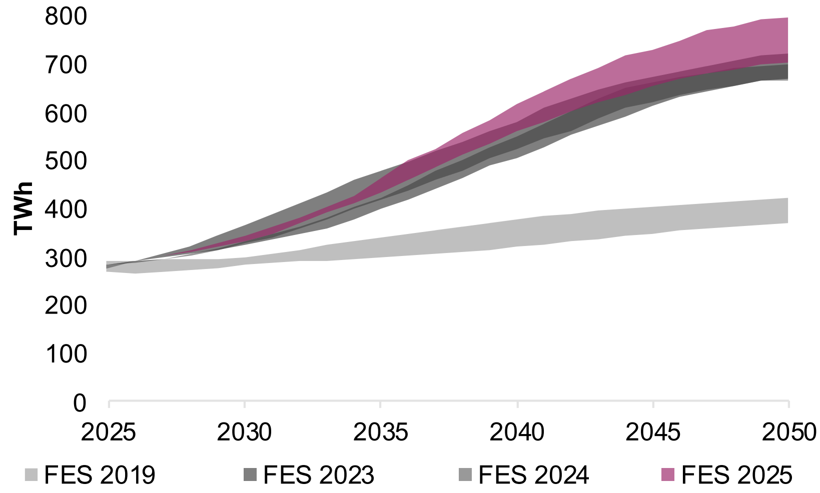

Figure 4: Evolution of GB electricity demand projections

[(Ref 36)(2019, 2023, 2024 & 2025), Table ED1, Author Analysis]

4.3.7 Current pathways for future GB electricity demand have increased significantly. Increased electrification of transport, heat, and industrial demand is essential for the achievement of net zero and is a key driver for the increase in future electricity demand.

4.3.8 Moving energy consumption from fossil fuels to low carbon electricity can also deliver cost savings. For example, the running costs of electric vehicles are significantly lower than the running costs of petrol and diesel vehicles (Ref 45).

4.3.9 **Section 2.8** of this Statement also explains that an increase in UK-based low carbon electricity generation provides price protection for GB consumers by shielding them from the effects of volatile international energy markets. Such a shield may also help encourage consumers away from fossil fuels and towards electricity in other sectors, for example home heating and cooking, providing that those supplies are plentiful, reliable and secure.

4.3.10 The range of demand provided by recent sources shows a shallow increase in forecast GB electricity demand over the coming five years as the aforementioned policies start to take hold. The forecasts then ramp up significantly around the end of the 2020s and thereafter. In FES 2025, NESO's pathways have shifted consumer demand away from hydrogen and towards electrification versus 2024 pathways. An increase in forecast population growth and less optimistic views on energy efficiency improvements have led to higher electricity demands across all pathways compared to FES 2024. The GB electricity demand pathways shown include the use of electricity in the production of hydrogen.

4.3.11 FES 2025 electricity demand pathways also increase the pace of switching to low carbon technologies vs. FES 2024, with overall greater uptake of heat pumps and electric vehicles (EVs) alongside the decarbonisation of industrial and commercial sectors. The use of hydrogen across multiple sectors is included in later years. Progress in 2024 and 2025 in developing hydrogen production in the UK has been slower than was anticipated in the FES 2024 pathways.

4.3.12 Since the UK made its 2019 commitment to net zero, GB electricity system demand projections for 2050 have converged towards 700TWh. Achieving net zero in the UK will require a significant increase in electricity demand in all recent FES pathways.

4.3.13 It is implicit that the trajectories shown in **Figure 4** can only be met (and therefore net zero achieved) if there is sufficient operational low carbon electricity generation capacity to generate the low carbon energy demanded by consumers.

4.3.14 FES 2025 reports that, in 2024, consumer electricity demand was 267TWh. Low carbon generation contributed 194TWh and unabated fossil fuel generation contributed 93TWh. Interconnector flows and system losses balanced supply with demand. Consumer demand across the three net zero FES pathways in 2030 averages 310TWh, excluding electricity requirements for hydrogen production by electrolysis (**Section 5.8** of this Statement provides further information on methods of hydrogen production). Therefore, annual low carbon generation will need to increase by approximately 116TWh to deliver ‘Clean Power by 2030’.

4.3.15 Consumer demand across the three net zero FES pathways in 2040 averages 487TWh, again excluding electricity requirements for hydrogen production by electrolysis. Therefore, low carbon generation will need to increase by approximately a further 177TWh between 2030 and 2039 to keep power clean through the 2030s. Hydrogen electrolysis demand will increase this further.

4.3.16 The capacity of new low carbon schemes which will need to come online prior to 2030 to achieve ‘Clean Power by 2030’ is unprecedented. However, an even greater capacity of new low carbon schemes will need to come on-line in the 2030s to keep power clean through to 2040 as the growing need to decarbonise other sectors is also met.

4.3.17 This provides evidence for the need for new low carbon generation facilities to continue to come online into the 2030s, to meet that anticipated growth in demand.

4.4 Transport policies underpin a growth in future electricity demand

4.4.1 Surface transport is currently the largest source of UK GHG emissions. Surface transport accounted for just under one quarter of the UK’s 2022 emissions [(Ref 14)(2024), Figure 1.3, Charts and Data). Continuing the shift to low emission vehicles will give a significant boost to UK decarbonisation.

4.4.2 Growth in the use of EVs is expected to create significant new demands on the electricity network. The ZEV mandate was introduced on 1 January 2024. It demands that at least 22% of all cars and 10% of all vans sold in Britain in 2024 are fully electric, rising to 80% of cars and 70% of vans by 2030, and 100% of each by 2035.

4.4.3 Following a consultation on the phase-out of sales of new petrol and diesel cars from 2030, government announced that they would maintain their commitment to delivering “the phase out the sale of new internal combustion engine (ICE) cars by 2030 in a sustainable manner, with all new cars and vans being fully zero emission by 2035” and that they “remain fully committed to delivering the ZEV Mandate, in line with existing trajectories” (Ref 45).

4.4.4 The Society of Motor Manufacturers and Traders (SMMT) reported a 17.8% increase in Battery Electric Vehicle (BEV) registrations in the UK in 2023 versus 2022, and 16.5% of all new vehicle registrations in the UK in 2023 were BEV (Ref 42).

4.4.5 In 2024, BEV registrations were up a further 21.4% year-on-year, to 19.6% of all new vehicle registrations in the UK. BEV registrations have continued to gain ground in 2025. Year-to-date BEV registrations to the end of July 2025 were up 31% year-on-year, achieving a market share of 21.5% (Ref 42).

4.4.6 Reducing costs and improvements in the range of EVs, inter-brand competition encouraged by the ZEV mandate and improving charging infrastructure are expected to encourage consumers to choose EVs over petrol and diesel cars.

4.4.7 The eventual and necessary transition of all cars from fossil fuels to support net zero will continue due to their lower running costs, improving performance, increasing model choices, and zero emission capability.

4.4.8 The net zero FES pathways include an increase in annual electricity demand of approximately 25TWh in 2030 and 111 to 126TWh by 2050 [(Ref 36)(2025), Chart F.07]. A growing use of hydrogen in the surface transport sector could further increase electricity demand through the need to produce hydrogen via electrolysis.

4.4.9 The Electric Vehicle Infrastructure Strategy (March 2022) (Ref 43) facilitates the adoption of electricity into transport and sets the expectation, by 2030, of there being around 300,000 public charge points as a minimum in the UK, up from just 82,002 on 1 July 2025 (Ref 44). The government’s April 2025 response to an earlier consultation on phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition confirms actions to ensure that the rollout of domestic and on-street charge points for electric vehicles continues at pace (Ref 45).

4.4.10 The UK has put leadership of a low carbon transport revolution at the heart of its Industrial and Clean Growth strategies and regards EVs as a critical new technology which will be vital in the fight against climate change. Commitments by government to invest in 'gigafactories' for the mass production of batteries and EV supply chain, [(Ref 46, Ref 47, Ref 48), and (Ref 20), p30] provide evidence that there is strong political support for the rapid development and rollout of EVs, with which will come significant additional electricity demand. Indeed, as the SMMT data shows, the rollout of EVs has already begun.

4.4.11 To support efforts in the decarbonisation of heavier transport (e.g. road freight, rail, shipping and air), government pledged to invest £140 million in 2021/22 across hydrogen-powered freight trials and the delivery of 4,000 zero emission buses [(Ref 25), p94]. The application of hydrogen as a fuel for flight rail and shipping, and in industrial energy-intensive processes, is also progressing.

4.5 Energy policies for homes underpin a growth in future electricity demand

4.5.1 In 2024, the domestic sector accounted for approximately 36% of the UK's electricity demand and 61% of the UK's demand for natural gas [(Ref 36)(2025), Tables F.07].

4.5.2 Government-backed energy efficiency schemes seek to improve the insulation of the UK's homes as well as reduce demand from lights, appliances, and services.

4.5.3 Reducing UK domestic electricity demand will support the move to a zero-emissions electricity system. Flexibility in consumption, either through variable 'time of use' tariffs or demand flexibility schemes may allow consumers to support the flexibility needs of a low carbon electricity system.

4.5.4 Improved insulation and improved boiler efficiency may help reduce domestic demand for gas and thereby reduce carbon emissions associated with the use of gas in the home. However, the domestic use of gas must be substituted out for either electricity or hydrogen for domestic carbon emissions to fall to zero or very close to zero. The CCC's key indicators imply that, by 2035, "approximately 30% of homes in the UK will need to be heated by a heat pump, compared to only approximately 1% today" for the UK to reach its Carbon Budget commitments [(Ref 14)(2025), Figure 2.2].

4.5.5 The Energy White Paper sets out an aim to increase the rate of installation of home electric heat pumps from 30,000 per year to 600,000 per year by 2028. The British Energy Security Strategy aims to ensure that by 2050 all UK buildings will have low carbon heating, and reconfirmed [(Ref 26), p12] the then government's intent to phase out the sale of new and replacement gas boilers by 2035 – an intent which was replicated in Powering Up Britain and confirmed by the then government in September 2023. Beyond 2035, certain gas boiler replacements will no longer be permitted.

4.5.6 The government has proposed measures to reduce home energy demand, including:

- A Warm Homes Plan to offer grants and low interest loans to support investment in insulation and other improvements such as solar panels, batteries, and low carbon heating;
- Work with the private sector to provide further private finance to accelerate home upgrades and low carbon heating; and
- Ensuring that private rented homes meet minimum energy efficiency standards by 2030.

4.5.7 FES 2025 pathways are for residential demand to remain flat against 2024 levels until the mid-2030s when it then increases as the domestic use of gas is systematically reduced and replaced by electricity. Net zero pathways in 2050 show increases in residential electricity demand of between 52% and 87% versus 2024 levels, primarily due to the electrification of home heating and cooking [(Ref 36)(2025), Table F.07].

4.6 Peak electricity demand is also expected to grow

4.6.1 The future daily profile of electricity demand is less easy to forecast into the future, but estimated peak demand (its highest instantaneous level) remains a key determinant of required installed generation capacity.

4.6.2 **Figure 5** shows the range of peak GB electricity demand (using NESO’s Average Cold Spell (ACS) methodology) from 2025 to 2050. In the three net zero pathways, peak demand is anticipated to range between 62GW and 65GW by 2030 (2024, for comparison, was 58GW); between 97GW and 112GW in 2040, and between 120GW and 144GW in 2050 [(Ref 36)(2025), Figure F.54].

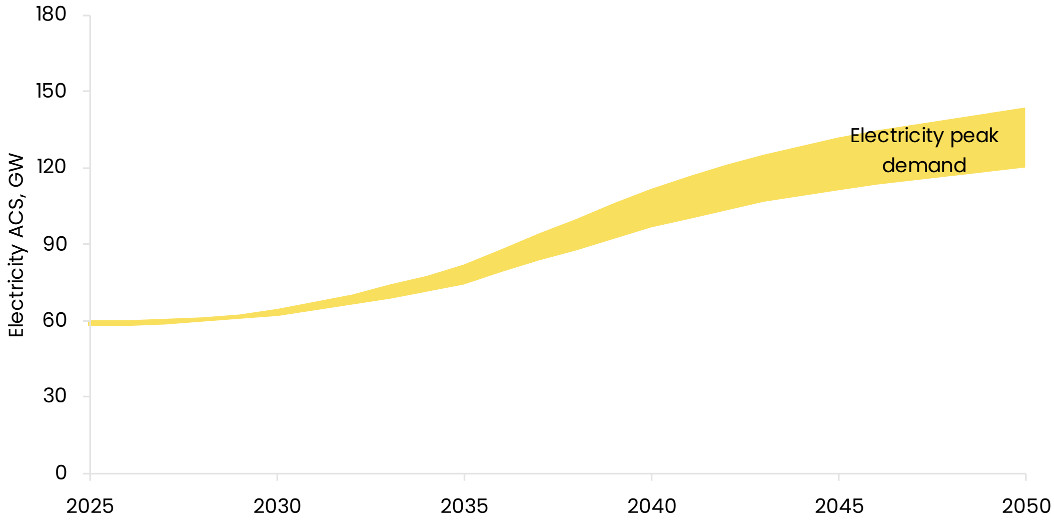

Figure 5: Electricity average cold spell peak demand

(GW, including losses) [(Ref 36)(2025), Figure F.54]

4.6.3 All net zero pathways show an increase in peak demand from the late 2020s, driven by underlying industrial and commercial demand growth (through substitution of other energy sources) and the electrification of heating and transport.

4.6.4 Historically, electricity peak demand has tended to occur on Winter weekday evenings, when industrial and commercial demand overlaps with residential. However, NESO stated that "as the share of renewable electricity supply increases, electricity peaks could occur at other times" [(Ref 36)(2024), p101], an important point relating to security of supply, which is discussed in **Chapter 8** of this Statement.

4.6.5 EVs and hydrogen vehicles will require the deployment of additional electricity generation capacity and may also act as integration measures for renewable and baseload generation, capable of shifting load from when demand is high, to periods where supply is higher.

4.6.6 Sufficient electricity generation capacity will need to be deployed to be able to meet instantaneous demand, as well as forecast annual demand, under normal and unfavourable weather conditions, supporting the need for significant growth in UK low carbon electricity generation capacity.

4.7 Conclusions on future electricity demand

4.7.1 Policies are already in place to substitute electricity for fossil fuels as a source of energy in non-traditional sectors in the UK, and many of those policies have started to deliver both on a national and local basis.

4.7.2 GB electricity demand will increase during the 2020s as a result of this substitution, supporting the urgent need for new low carbon electricity generation facilities to come forward to meet demand.

4.7.3 Peak electricity demand is uncertain but is likely to grow. Significant capacity of new, low carbon generation will be required to meet both peak demand and electricity needs across a wide range of weather conditions. This may increasingly occur outside of the traditional Winter peak periods due to the anticipated increase in electricity consumption through electrification of non-traditional sectors and the increased share of electricity supplies from a range of renewable generation technologies.

4.7.4 The capacity of new low carbon schemes which will need to come online prior to 2030 to achieve ‘Clean Power by 2030’ is unprecedented. However, an even greater capacity of new low carbon schemes will need to come online in the 2030s to keep power clean through to 2040 as other sectors also decarbonise.

4.7.5 **Chapter 9** of this Statement explains that the cost and carbon content of electricity generated in the UK will reduce as the share of electricity generated by low carbon technologies increases.

4.7.6 Lower cost and lower carbon energy supplies will incentivise other sectors to move away from fossil fuels to electricity through running cost efficiencies and by providing a shield for GB consumers from volatile international energy prices and reducing GB security of supply.

4.7.7 Without a rapid increase in low carbon supply, the decarbonisation of other sectors is less likely to occur due to potentially unfavourable commercial factors, and potentially heightened supply risk amid growing demand. This could place at risk progress which needs to be made on decarbonising other sectors to achieve national carbon reduction targets in 2030 and beyond.

4.7.8 The Scheme will contribute to meeting GB’s growing electricity demand and will therefore be a critical enabler of achieving the UK’s decarbonisation and energy security aims.

5 Delivering net zero through clean electricity supplies

5.1 Chapter summary

5.1.1 This chapter reviews selected current policy support and development / delivery in technologies which are being tasked to support the delivery of net zero.

5.2 Current and future generation mix

5.2.1 Meeting the government's Clean Power target means that clean power will need to be generated in sufficient quantities to meet total annual electricity demand under typical weather conditions with carbon-emitting generation as a backup but used only when essential. The government has established a target to deliver a clean power system by 2030 and to keep power clean thereafter [(Ref 4), p25].

5.2.2 Decarbonisation of the electricity sector, and growth of that sector to enable electricity to decarbonise other (non-traditional) sectors is a key strategy to deliver wider decarbonisation in the UK. The decarbonisation of all sectors is essential for the UK to meet net zero [(Ref 14)(2024), p8].

5.2.3 Clean Power must be sustained thereafter to ensure that carbon emissions from all sectors continue to reduce.

5.2.4 It is important to clarify that this Statement of Need does not seek to justify or promote the exclusion of any other generation technologies from the future GB generation mix.

5.2.5 **Figure 6** shows historical electricity generation in the UK from 1996 to 2024 by fuel source, measured in TWh, and the resulting average grid carbon intensity, measured in gCO2(e)/kWh.

5.2.6 Low carbon generation, including renewable wind and solar, increased from near zero in 1996 to over 50% of UK generation in 2023 and 2024.

5.2.7 **Figure 6** shows that Coal and Oil generation reduced from approximately a one-half share of UK generation in 1996 to nearly zero in 2024. The last UK oil fired power station closed in March 2015, and the last coal fired power station closed in September 2024.

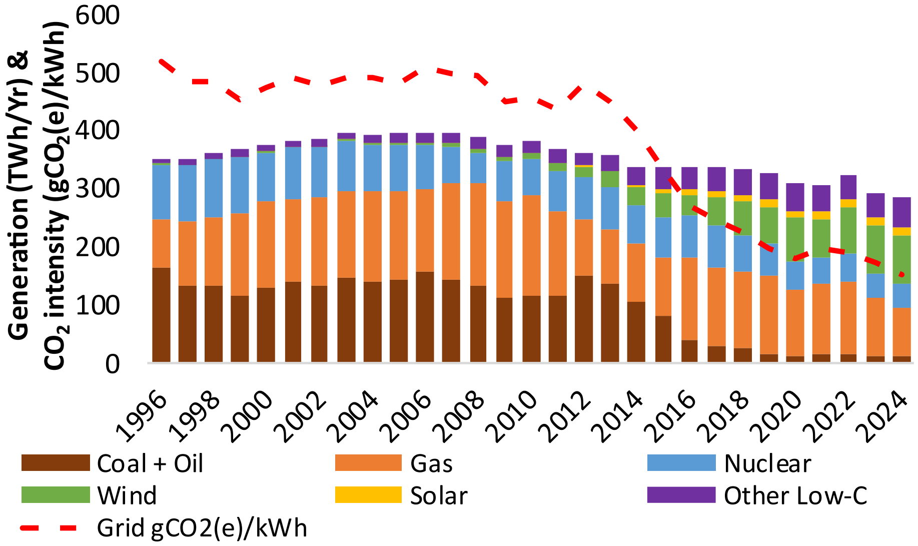

Figure 6: Historical annual electricity generation and carbon intensity

(Generation: TWh/Yr. Carbon intensity: gCO2(e)/kWh) [(Ref 35), Tables 5.6 & 5.14]

5.2.8 Nuclear generated over one quarter of the UK's electricity needs in 1996 but contributed just 14% in 2023 and 2024 as existing plant have closed. Gas has contributed approximately 40% of UK generation each year throughout much of the period shown but contributed just 35% in 2023 and 30% in 2024 as it has been replaced by renewable generation and imports.

5.2.9 GB Grid carbon intensity reduced from over 500 gCO2(e)/kWh in 1996 to 154 gCO2(e)/kWh in 2024, a reduction of 70%, while electricity generation reduced by just 19% over that period. [(Ref 35), Tables 5.14].

5.2.10 The carbon intensity of the GB Grid has reduced since 1996 due to a regulatory increase in the cost of emissions from high-carbon intensity generation assets, the subsequent closure of oil and coal plants in the UK, and a significant increase in low carbon, low-marginal cost generation (predominantly wind and solar) since 2010. **Section 9.2** of this Statement of Need explains how GB electricity market arrangements support this essential shift.

5.2.11 As well as providing views on future national electricity demand, the FES pathways provide projections for how that demand could be met. **Figure 7** shows projected electricity generation in the UK from 2024 to 2050 by fuel source, measured in terawatt hours under NESO's 'Holistic Transition' pathway, and the resulting average grid carbon intensity, measured in gCO2(e)/kWh.

5.2.12 The 'Holistic Transition pathway (**Figure 7)** shows wind generation increasing from 91TWh in 2024 to 493TWh in 2050. Nuclear generation more than doubles from 43TWh to 94TWh over the same period. Solar generation increases approximately four-fold, from 19TWh to 83TWh and by a similar factor 2050 in all three pathways.

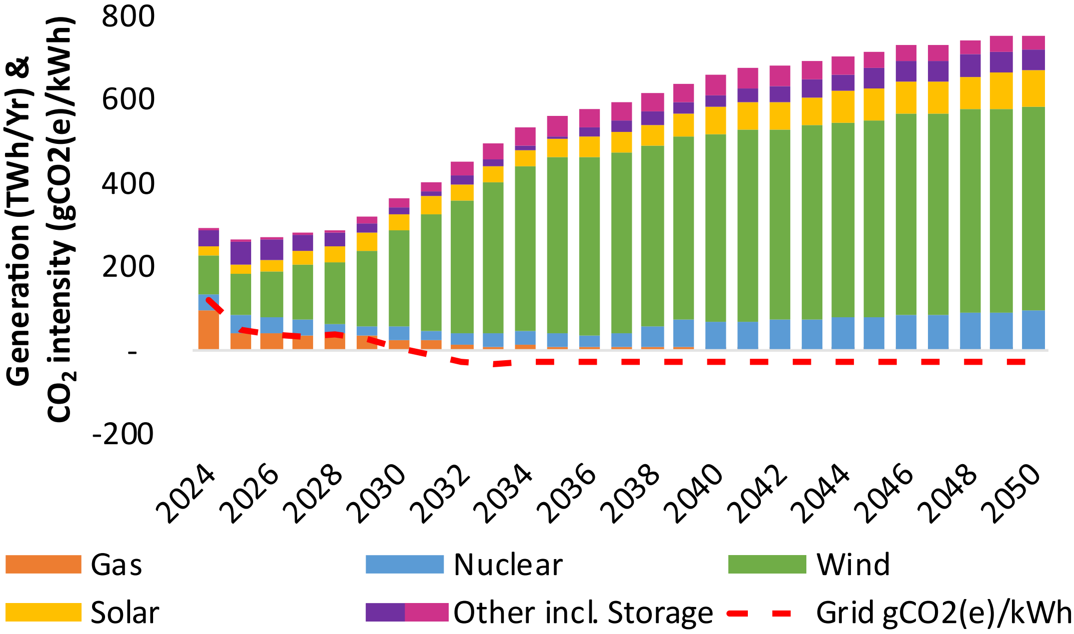

Figure 7: Projected annual electricity generation and carbon intensity

(Generation: TWh/Yr. Carbon intensity: gCO2(e)/kWh) [(Ref 36)(2025), Tables F.13 & ES1 – 'Holistic Transition']

5.2.13 These low carbon generation sources, if delivered, will provide the much-needed electricity required to reduce grid carbon intensity from current levels to zero or lower in 2035, aligned with government decarbonisation targets. To achieve the government's mission to deliver its Clean Power target, the rollout of low carbon and negative carbon emissions generation will have to be similar in pace and scale to that included in NGESO's current net zero pathways.

5.2.14 Critically, grid carbon intensity reaches zero at the same time as unabated gas generation ceases. Carbon Capture, Usage, and Storage (CCUS) technology must be deployed at scale and integrated into the existing gas generation network, for gas technology to have a role in the future electricity system. Abated gas generation (i.e. gas plus CCUS) is included in the purple 'Other' category in **Figure 7**. **Figure 7** also shows only the generation and not the power consumption of storage assets (e.g. Pumped Storage (Hydro), batteries, and other energy storage technologies).

5.2.15 The UK is also pursuing a strategy of interconnection with other markets. Interconnectors are physical cables through which energy can flow in either direction. Market forces determine which direction the energy flows, from lower priced to higher priced markets. Interconnectors can therefore support energy security and affordability.

5.2.16 However, as the British Energy Security Strategy states, "If we're going to get prices down and keep them there for the long term, we need a flow of energy that is affordable, clean and above all, secure. We need a power supply that's made in Britain, for Britain" [(Ref 26), p3].

5.2.17 The government's Clean Power 2030 Action Plan is consistent with this point and states that "By accelerating the switch to domestic renewable electricity sources and accelerating the application of clean electricity to the wider energy system, we will be able to reduce our reliance on fossils fuels faster. This enhances energy security, making the UK less vulnerable to global market disruptions or geopolitical tensions that affect energy prices" [(Ref 4), p21]. The government's Clean Power target (as described in **Paragraph 2.9.7** of this Statement) aims to ensure that the capacity of clean electricity sources in Britain is sufficient to meet annual British electricity consumption in normal weather conditions.

5.2.18 The UK has traditionally been an importer of energy from European markets. However, NESO FES pathways show the UK being a net exporter of energy from the 2030s. However, interconnectors may play an important role in meeting UK electricity demand at certain times of the day or year. For simplicity, interconnector flows have been excluded from **Figure 7**.

5.2.19 The share of UK electricity generation which is to be met by onshore and offshore wind power increases in all NESO's net zero pathways from 39% in 2024 to approximately 70% by 2050. However, the UK's multi-technology approach to electricity supply as proposed by the government and incorporated in NESO's FES pathways will be more resilient to, and more secure against, variations in the weather, technical failures, and market forces.

5.2.20 NPS EN-1 states that "We need to ensure that there is sufficient electricity to always meet demand; with a margin to accommodate unexpectedly high demand and to mitigate risks such as unexpected plant closures and extreme weather events" [(Ref 1), Para 3.3.1].

5.2.21 The government's Clean Power 2030 Action Plan is consistent with this and states that "Our 2030 mission will grow the UK's overall generation capacity and expand our network infrastructure so that we can safely and securely meet changing demand patterns in 2030 and beyond…" [(Ref 4), p24] by ensuring that by 2030 and in typical weather years afterwards, "Clean sources produce at least as much power as Great Britain consumes in total" (2023: 56%) [(Ref 4), pp25 & 26].

5.2.22 The expected growth in electricity demand leads to a need for increased capacities of electricity generation. The national shift from dispatchable carbon-emitting generation to low carbon renewable generation also implies a growth in electricity generation capacity.

5.2.23 **Section 4.3** of this Statement describes the scale of electricity demand required to be met by new generation facilities to achieve 'Clean Power by 2030' and then maintain clean power through to 2050.

5.2.24 To improve the likelihood of being able to ensure system adequacy from renewable generators in all but the most unlikely of meteorological situations, a large capacity of interconnected assets from as broad as possible a range of technologies and geographies may be beneficial.

5.2.25 **Figure 8** shows, for the same 'Holistic Transition' pathway, the significant increase in installed capacity of each technology required to meet the output projections shown in **Figure 7** above.

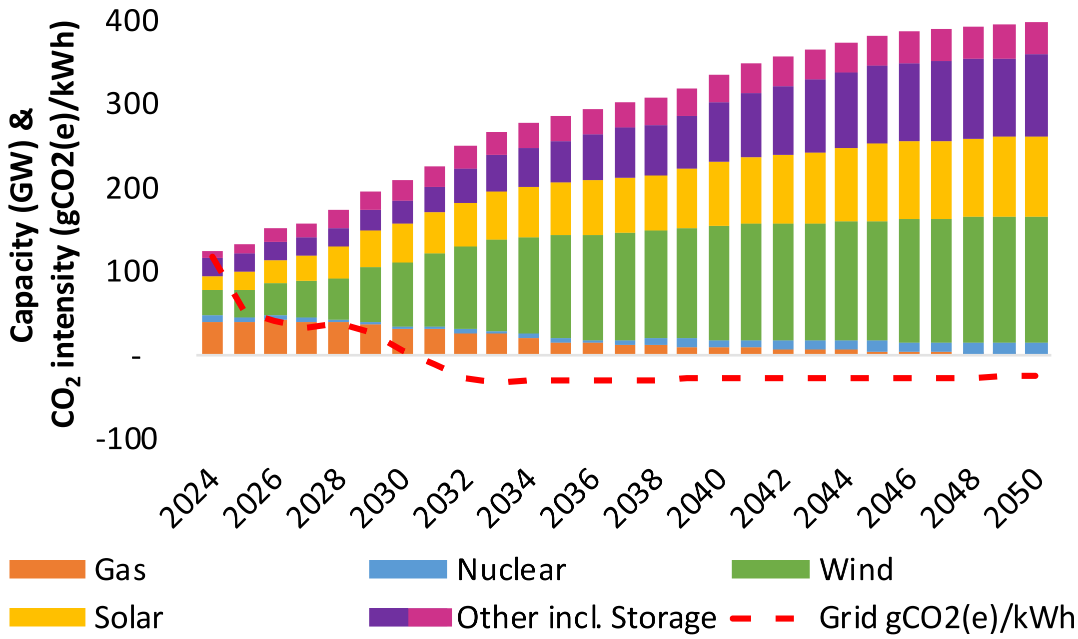

Figure 8: Projected electricity generation capacity and carbon intensity

(Capacity: GW. Carbon intensity: gCO2(e)/kWh) [(Ref 36)(2025), Tables F.13 & ES1 – 'Holistic Transition']

5.2.26 **Figure 8** shows that electricity generation capacity must increase to three-fold current installed capacity in order to generate sufficient output to meet demand in 2050. NESO's Net Zero consistent pathways to 2035 are consistent with the capacity ranges set out by the government in its Clean Power 2030 Action Plan [(Ref 4), Table 1].

5.2.27 To provide some points of comparison further along the UK's route to net zero, the NIC anticipate that 129 to 237GW of renewable capacity must be in operation by 2050, including 56 to 121GW of solar, 18 to 27GW of onshore wind, and 54 to 86GW of offshore wind [(Ref 39), p19].

5.2.28 Energy Systems Catapult (ESC) projections are comparable capacities. 165 to 285GW of capacity will be required in 2050, including 18 to 80GW of solar [(Ref 19), pp23 & 27]. The ESC includes higher expectations of future nuclear capacity than other analyses, anticipating 20 to 38GW of nuclear versus 11 to 22GW (NGESO) and just 5GW (NIC).

5.2.29 Approximately ten percent of NGESO's 'Holistic Transition' capacity pathway in 2050, or 44GW, is expected to be short duration storage, shown in pink in **Figure 8**. Long Duration Storage, including Pumped Hydro and hydrogen, is included within the purple 'Other' data series. Further information on electricity storage is included in **Section 5.11** of this Statement.

5.2.30 The quantity of new generation capacity required in the UK to meet its net zero targets is enormous, and unprecedented in relation to capacity growth seen at any previous time. Yet such projections have been broadly consistent between different expert bodies and between years, since the net zero target was written into law in 2019.

5.2.31 NPS EN-1 also articulates the view that it is prudent to plan infrastructure development on a conservative basis "to ensure that there is sufficient supply of electricity to meet demand across a wide range of future scenarios" [(Ref 1), Para 3.3.10]. Prudence would imply not over-relying on technologies which are yet to be proven, have long development lead-times, or which have historically experienced funding difficulties. For this reason, NGESO's pathways include major contributions from wind and solar generation rather than CCUS, hydrogen or nuclear generators. The government's Clean Power 2030 Action Plan is consistent with this and seeks major contributions from wind and solar [(Ref 4), Table 1].

5.2.32 Such an expansion of capacity, across many technologies, does not come without risk. It is very possible, if not probable, that one or more technologies will miss their targets. This would increase the need for technologies which are successfully being deployed to accelerate their deployment further, in compensation.

5.2.33 Challenges to deployment may include international competition in supply chains, technology, and labour markets, and also in grid connections. FES 2023 also reiterated that "sufficient electricity connection capacity is vital" to support the delivery of increased generation capacity [(Ref 36)(2023), p132].

5.2.34 This is a key point of the government's Clean Power 2030 Action Plan in which the government has stated that "we need to act – and act quickly – because 6 years is a short time in building energy infrastructure. We are not alone in wanting to rebuild our energy system and are competing with other countries for investment and to secure supply chains [and]… it can take over a decade to develop and build renewables projects" [(Ref 4), p18].

5.2.35 Grid is a finite but critical enabler to decarbonisation both in terms of absolute scale and timing to connect. NPS EN-3 recognises the benefit to decarbonisation and consumers of using already available grid infrastructure:

"To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure or biodiversity and reduce overall costs applicants

may choose a site based on nearby available grid export capacity" [(Ref 2), Para 2.10.25].

5.2.36 The CCC also continue to recommend the continued growth of low carbon generation "accompanied by rapidly expanding the transmission grid, upgrading the distribution network, and speeding up the grid connection process" [(Ref 14)(2025), Box 3.5].

5.2.37 Therefore, and consistent with the CCC's view, to fight climate change, the country needs to make the most of the infrastructure currently available and will need to build more. This context provides further support for the Applicant's proposal to develop a large-scale solar facility with co-located storage as associated development at an existing point of connection, which connects into existing and available section of the transmission system. **Chapter 7** provides more information on this point.

5.3 Development pipelines

5.3.1 The following sections in this chapter provide additional evidence in relation to the main categories of renewable generation technologies tasked to support the delivery of a low carbon and secure electricity system by 2035, and their contribution to decarbonisation, security of supply, and affordability.

5.3.2 New energy projects which are currently coming into the planning process have followed a uniform high-level development process:

- Step one relates to securing a grid connection offer and defining the project cognisant of technical, environmental, land, and planning constraints. Data on current and potential future connections for large-scale projects is available on NESO's Transmission Entry Capacity (TEC) Register [(Ref 49)];
- Step two relates to applying for and obtaining planning consent. The government's Renewable Energy Planning Database (REPD) [(Ref 50)] provides insight into determined and yet to be determined renewable energy projects at all scales nationally; and
- Step three relates to securing financial close. The government runs two electricity project support schemes, the Contracts for Difference scheme, and the Capacity Market. Eligible assets compete at annual auctions for agreements in either performance-based scheme. Private contracts may also satisfy requirements to achieve financial close.

5.3.3 Reforms to the grid connection process which are currently being implemented aim to address the bottleneck that Ofgem, NESO and the government have identified in near-term delivery. Hitherto, the barriers to obtaining a grid connection and the obligations on developers to progress subsequent development steps were low. This has led to a significant number of projects in the connections queue. Many of these are not sufficiently advanced to deliver to the timeframes to support government's Clean Power target, yet by holding their position in the connection queue they risk delaying other projects from coming to delivery which are able to support the Clean Power target.

5.3.4 The government's Clean Power 2030 Action Plan states that at the time of publication, the connections queue consists of nearly 750GW of projects. Connections reform seeks to reshape the connections queue to ensure that those projects which are more ready to deliver are prioritised.

5.3.5 To do this, government has set 'capacity ranges' to assess the 'strategic alignment' of projects with the capability to deliver a connection in the timeframes required to support delivery of its Clean Power target. However, "whilst the 'Clean Power Capacity Range' provides a foundation to guide rapid policy development and focus delivery, the scenarios developed now cannot be exhaustive or definitive, and it is only right that some optionality is retained… until more clarity on which scenario is most likely is available" [(Ref 4), p31].

5.3.6 Importantly, the capacity ranges for 2035 do not constitute a government pathway (Ref 4), Connections Reform Annex, p5] and therefore should not be interpreted as a cap or ceiling on the requirement for low carbon electricity generation capacity.

5.3.7 Net zero 2050 will require a very large capacity of low carbon generation to be delivered, which is much larger than the capacity ranges set out in the Clean Power 2030 Action Plan. The Action Plan is therefore a framework to support the rapid delivery of projects at the front end of the UK's critical journey to net zero, and the need for projects to come forwards to 'feed' the plan remains urgent and absolute.

5.3.8 Indeed, the government is "expecting an increase in planning applications with the Clean Power 2030 target" [(Ref 4), p55].

Mechanisms for supporting low carbon electricity generation

5.3.9 System adequacy is primarily managed through GB's Capacity Market. Wind and solar technology were first included as eligible technologies in the Capacity Market in 2019, however the Capacity Market is not open to assets which already hold Contracts for Difference (CfD) contracts (and vice versa). The inclusion of renewable technologies in the Capacity Market underlines the contribution renewable energy can make to system adequacy and system security:

"The system is typically better off with intermittent capacity than without it – wind farms, for example, can contribute to overall security of supply" [(Ref 51), p114].

5.3.10 The CfD scheme is the government's main mechanism for supporting low carbon electricity generation and was introduced under the Energy Act 2013 to incentivise investment in renewable energy by providing developers of projects with high upfront costs and long lifetimes with direct insulation from volatile wholesale prices. This means that CfDs also protect consumers during periods of high wholesale market costs.

5.3.11 Renewable developers with projects located in Great Britain that meet the eligibility requirements can apply for a CfD by submitting bids into CfD Allocation Rounds, in which a range of different renewable technologies compete for contracts.

5.3.12 The Low Carbon Contract Company's CfD Register (Ref 52) and the EMR Delivery Body's Capacity Market Registers (Ref 53) hold data on contract award to date under each scheme.

Attrition from project development pipelines

5.3.13 Although lists and registers provide important evidence towards current and future generation capacities, the listing of a project on any grid connection register, a planning database or a commercial contract register does not guarantee that the scheme will come forwards.

5.3.14 For example, in February 2023 NGESO shared their analysis that "only 30-40% of projects in the [connections] queue make it to fruition" (Ref 54). **Section 2.7** of this Statement describes reforms being taken under the Connections Action Plan to deter speculative connection applications and remove stalled schemes from the connections queue.

5.3.15 Of the 243GW of projects of all technologies listed on the Q1 2025 REPD, just 52.6GW are operational and 46.7GW will not move forwards due to having been refused planning consent, being abandoned (by the developer), or planning permission having expired.

5.3.16 Analysis of the CfD Register (Ref 52) shows that even schemes which have achieved consent and a revenue contract are not guaranteed to be delivered. 88 schemes with CfDs have had their CfD terminated or have registered a reduction to the capacity of the CfD Unit (although in some cases the reduced capacity may come forward under other commercial arrangements):

- Offshore wind: four schemes (1,408MW) terminated, 1,512MW reduction on 58 schemes still going forwards;
- Onshore wind, including Remote Island Wind: eight schemes (724MW) terminated, 102MW reduction on 74 schemes still going forwards;
- Biomass / Waste / CHP / Advanced Conversion schemes: thirteen schemes (292MW) terminated, 25MW reduction on five schemes still going forwards; and
- Solar PV: thirteen schemes (389MW) terminated, 134MW reduction across 199 schemes still going forwards.

5.3.17 Not all schemes which have been announced as not going ahead in their current form have been updated as terminated on the published CfD register, including the Hornsea Project 4 (2.4GW) (Ref 55).

5.3.18 Developers may elect to terminate CfD contracts for a variety of reasons, including change of ownership or commercial opportunities outside of the CfD framework. Reducing the capacity allocated to a CfD contract may also improve the commercial performance of a scheme under certain market conditions. However, the risk of non-delivery is higher for capacity which has not yet commenced its CfD contract, and which has dropped out of or been terminated from, its CfD contract.

5.3.19 NPS EN-1 states that it is the government's view that infrastructure development should be planned on a conservative basis [(Ref 1), Para 3.3.10], without over-relying on technologies which are yet to be proven, have long development lead-times, or which have historically experienced funding difficulties. NPS EN-1 also states that "a large number of consented projects can help deliver an affordable electricity system, by driving competition and reducing costs within and amongst different technology and infrastructure types" [(Ref 1), Para 3.2.4].

5.3.20 This data and corresponding analysis suggest that it is not prudent to assume the full delivery of pipeline projects listed on various registers, because it is unlikely that a significant proportion of that capacity will be commissioned.

5.4 Offshore wind

5.4.1 The UK is a world-leader in offshore wind technology and the government's Clean Power 2030 Action Plan capacity ranges seek to support the delivery of 43GW to 50GW of operational capacity by 2030, up from 14.8GW operational in Q2 2024 [(Ref 4), Table 1].

5.4.2 None of NESO's 2024 FES pathways meet the government's election manifesto target of quadrupling offshore wind capacity by 2030, and only one meets the previous 50GW target, highlighting the massive scale of renewable infrastructure required to meet net zero. Of the three net zero pathways, offshore wind capacity in 2030 ranges between 43.4GW and 53.6GW, generating between 165TWh and 192TWh of low carbon energy each year.

5.4.3 Offshore wind is expected to produce a significant proportion of the UK's future low carbon electricity needs, however the government's proposals (and those of the previous government) take a multi-technology approach to the future electricity system, in part to provide security of supply through variable weather conditions.

5.4.4 Offshore wind is not tasked with meeting and cannot be expected to meet future UK electricity needs on its own.

5.4.5 **Figure 9** shows FES pathway ranges for offshore wind capacity from 2019, 2023, 2024 and 2025, with each range shown as a shaded area covering the pathway with the lowest forecast capacity to the highest capacity in each year. Historic installed capacity is shown by the blue line in 2020-2023.

5.4.6 **Figure 9** shows that the range of different FES offshore wind capacity pathways increased from FES 2019 to FES 2023. The range of the pathways made in 2024 is narrower than the 2023 pathways and growth slows from the late 2030s in comparison to the 2023 forecast. The 2025 pathway is broadly consistent with the 2024 pathway.

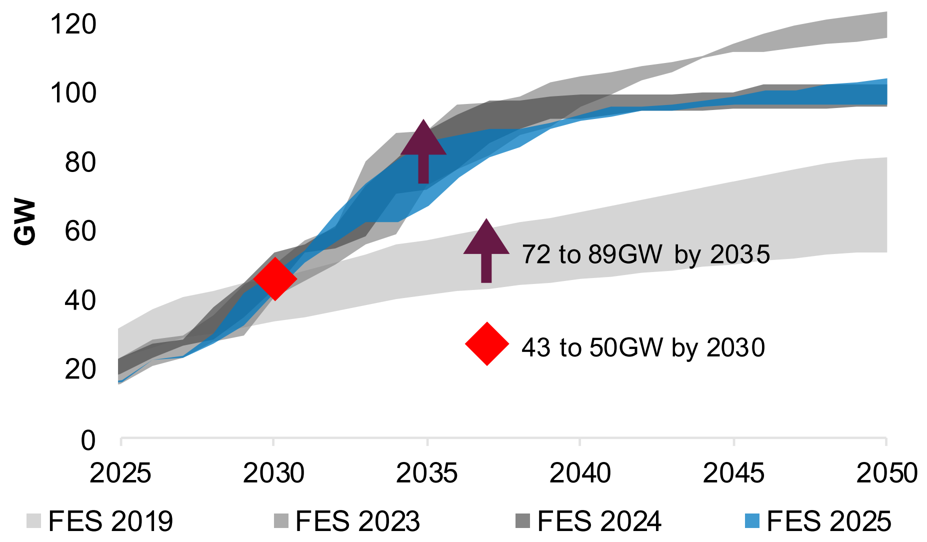

Figure 9: Current and potential future connected capacity of offshore wind technology

[(Ref 36)(2019, 2023, 2024 & 2025), Table ES1, Author Analysis]

5.4.7 The UK's net zero commitment in 2019 manifested in FES pathways as a further increase in offshore wind capacity, shown by the middle tone grey range in **Figure 9** (the 2023 pathways) being higher than the lightest grey 2019 pathways.

5.4.8 The purple arrow shows the top end of the 2035 capacity range and the red diamond shows the government's 2030 capacity range for offshore wind capacity, both sourced from the government's Clean Power 2030 Action Plan [(Ref 4), Connections Reform Annex, Table 1].

5.4.9 To achieve the top end of the 2035 capacity range, installations would need to exceed the most ambitious FES 2025 pathway over next ten years.

5.4.10 To achieve the top end of the 2030 capacity range, an even more ambitious deployment rate is needed over the next five years.

5.4.11 This underscores the need for offshore wind schemes to come forwards for delivery in the 2030s as well as to continue to come forwards beyond 2030 to deliver the ongoing need for the technology in the UK. However, the government's Clean Power 2030 capacity ranges do not underestimate the practical constraints associated with delivering offshore wind capacity over the next 10 years.

5.4.12 In May 2025 (prior to completion of NESO's connection reform proposals having been executed), the TEC register (Ref 49) listed a total of 29.2GW of offshore wind capacity not yet connected but scheduled to connect before 2030, bringing the UK's total operational offshore wind capacity to 45.9GW in 2030 should all of that pipeline reach delivery. This is broadly in line with both the most ambitious FES pathways and is within the government's current 2030 capacity range of 43GW to 50GW [(Ref 4), Table 1], but does not include project attrition and therefore cannot guarantee to deliver sufficient capacity to meet the government's ambition. Attrition will increase the need for capacity to come forwards to feed government's Clean Power 2030 Action Plan and to deliver beyond 2030 to keep the UK on track for net zero 2050.

5.4.13 Delivering the many schemes with connection agreements in the late 2020s and beyond will be dependent on a significant number of onshore and offshore transmission network reinforcement works. The Connections Action Plan makes clear the level of network development required to facilitate the connection of 43GW to 50GW of offshore wind to the UK electricity network by 2030. The risks associated with the delivery of these pipelines should not be understated.

5.4.14 While it is not a given, there is potential for any network development delays to affect multiple offshore wind schemes. This is important because NESO's approach to offshore transmission development is currently favouring a network of connections with transmission assets being shared by multiple schemes. Previously offshore transmission assets have been developed for individual schemes [(Ref 21), p62]. The impact of a delay on the delivery of an offshore transmission development may therefore be felt across more than one scheme.

5.4.15 Schemes which are preparing for planning consent submission appear on the government's Renewable Energy Planning Database (Ref 50). The relationship between projects listed on the TEC Register and projects listed on the REPD is not one-to-one because developers may take different approaches to planning and delivery, for example in the phasing of schemes for consent and delivery.

5.4.16 Data from the REPD (Ref 50) shows that 46 offshore wind farms took on average over 6 years from submitting their consenting applications, to achieving commercial operation. Achieving planning consent took on average approximately two years from submission to decision, leaving on average over 4 years to construct and commission each scheme.

5.4.17 The TEC Register lists 20 offshore wind schemes comprising 19.4GW proposing to connect in the period January 2024 – December 2028. To meet these dates, prior project development timelines suggest that it is likely that planning consent must have already been secured. The REPD lists 25 offshore wind schemes comprising 23GW in 'awaiting construction' or 'under construction' status. 4.4GW of these schemes are listed on the TEC register as built (therefore already operational) and developers have announced that projects totalling 2.4GW have been cancelled in their current form (Ref 55). The development of other projects totalling 4.2GW were paused and sold prior to development recommencing with new owners (Ref 56).

5.4.18 Therefore, the capacity of schemes which have consent, are not yet operational and which have not announced that they are not going ahead, is 18.2GW. All consented offshore wind capacity must deliver at historical development rates to keep on track with NESO's FES pathways (**Figure 9**), however not all capacity is commercially contracted.

5.4.19 On receipt of planning consent, offshore wind developers are currently eligible to compete with other projects for CfDs, CfD participation rules are changing to allow fixed bottom offshore wind facilities to participate in CfD Allocation Round 7 onwards before planning consent has been secured [(Ref 4), p57].

5.4.20 15.1GW of offshore wind schemes have secured but not yet commenced CfDs awarded up to and including CfD Allocation Round 6 (2024). While some projects are in construction phase, many have yet to start build, and as per **Paragraph 5.4.17**, 2.4GW of this will not start construction in its current form.

5.4.21 The data therefore suggests that c.17GW of offshore wind is not yet operational but has an agreement with NESO to connect in 2028 or earlier. A slightly higher capacity has secured planning consent but is not yet operational. However, only 12.7GW of that capacity has already secured a CfD. A CfD, or alternative funding mechanism, will be required for the balance of consented capacity to proceed to construction and operation – i.e. c.4.3GW with connection prior to 2029, and c.10GW in 2029.

5.4.22 However, the number of schemes which have secured funding and commenced construction still does not indicate a commitment by or obligation on the promoter to deliver that project at all or, if it does, at a particular generation capacity. Indeed, the government's Clean Power 2030 Action Plan recognises that a range of outcomes of negotiations and contract award processes is possible for assets with long development lead-times, including offshore wind. Therefore, the government has retained optionality in its prioritisation framework until there is further clarity on progress towards delivering the capacity ranges indicated [(Ref 4), p31].

5.4.23 CfD Allocation Round 5 (AR5) was held in Summer 2023. All CfD Allocation Rounds follow a competitive process, so information on project prequalification for the allocation round is not published. When AR5 results were published in September 2023, however, no contracts had been awarded to offshore wind projects.

5.4.24 The Allocation Round Price Cap for AR5 was £44/MWh in 2012 money (equivalent to approximately £61.40/MWh in 2024). One possible conclusion of the AR5 result, is that developers required a strike price of more than £61.40/MWh to make their projects economically viable yet could not be awarded a contract at a higher value than the Price Cap and therefore no contracts were awarded to offshore wind projects in AR5.

5.4.25 In November 2023, the then government increased the Administrative Price Cap for offshore wind in advance of CfD AR6 which opened in March 2024.

5.4.26 AR6 results were published in September 2024. 3.4GW of new offshore wind secured contracts for delivery in 2028/29 at a strike price of £58.87/MWh (2012 money, equivalent to approximately £82.10/MWh in 2024) (Ref 52).

5.4.27 The backlog of offshore wind projects not contracted through AR5 may have contributed to an over-subscription in future Allocation Rounds as schemes unsuccessful in previous rounds and schemes which have recently secured planning competed for contracts. Greater competition in allocation rounds may drive price down, but only to a level of commercial acceptability.

5.4.28 The UK's current offshore wind pipeline shows great potential to deliver significant decarbonisation and energy security benefits. However, it is clear from recent scheme and contracting progress that delivery of the pipeline should not be taken for granted.

5.4.29 The next CfD Allocation Round, AR7, is planned for late 2025 and AR8 is planned to follow in 2026. Based on project development rates, these two allocation rounds may represent the last opportunity to contract new UK offshore wind capacity which has a chance of delivering before 2030.

5.4.30 It is therefore not a given that the government's ambition for 43GW to 50GW of offshore wind by 2030 will be met, or even that NESO's FES pathways for the technology class will be achieved by 2030.

5.4.31 Any shortfall in the delivery of offshore wind projects against NESO's pathways will need to be made up for instead by other technologies prior to 2030 and / or adds to the need to develop schemes which will deliver in the 2030s to make up for any shortfalls prior to 2030 as well as continuing to keep power clean beyond 2030.

5.5 Onshore wind

5.5.1 FES 2025 reports that 14.6GW of GB onshore wind capacity was operational in 2024 [(Ref 36)(2025), Table ES1].

5.5.2 In 2015 the then government placed an effective moratorium on further onshore wind development in England. According to the REPD, operational onshore wind capacity in England increased by just 0.7GW between the end of 2015 and January 2025.

5.5.3 FES net zero consistent pathways cover a range from 27GW to30GW of onshore wind operational by 2030, increasing to 43GW to 51GW by 2050 [(Ref 36)(2025), Table ES1]. The government's Clean Power 2030 Action Plan has set a capacity range of 27GW to 29GW for operational onshore wind in 2030 [(Ref 4), Table 1].

5.5.4 In September 2023, a proposed lift on the ban on onshore wind in England was announced, by introducing changes to the National Planning Policy Framework (NPPF).

5.5.5 The government reversed the moratorium in July 2024 by revising planning policy to place onshore wind on the same footing as other energy development in the NPPF. This is to support the delivery of the Clean Power 2030 Action Plan. The April 2025 draft NPSs include the re-introduction of onshore wind technology to the definition of nationally significant energy generating stations when the Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025 takes effect, proposed for 31 December 2025.

5.5.6 With the moratorium having been in place for such a long time, onshore wind development pipelines in England are currently thin. Re-establishing a pipeline of onshore wind schemes in England may take some time.

5.5.7 NESO's TEC Register (Ref 49) shows that no new onshore wind schemes in England and Wales have agreements to connect to the Transmission system before 2026, and only 4GW hold agreements to connect before 2030. Other smaller schemes have been accepted to connect to the English and Welsh electricity distribution networks, however, the REPD shows that just 45 applications for a total of 800MW of onshore wind have been made but are not yet determined in England and Wales. 50 schemes for a total of 500MW are awaiting or under construction. Just one 35MW development in Wales secured a CfD as part of AR5, and a total of 80MW of capacity in England and Wales (four sites) secured CfDs in AR6, mainly for delivery in 2027/28.

5.5.8 Data from the REPD also shows that onshore wind schemes that achieve planning consent in Great Britain have taken between five and seven years to pass through the planning system (average duration between commercial operations date and planning application submission date, for successful onshore wind schemes listed on the REPD). Pre-application development may last for two or more years beforehand although this will be highly scheme-specific.

5.5.9 It is therefore not a given that the changes to the NPPF will deliver the required generation capacity to meet even its share of NESO's least optimistic projections for the technology class, or the government's ambition to double onshore wind capacity by 2030.

5.5.10 The UK will therefore need to look to Scotland to support an increase in onshore wind capacity through the next circa five years.

5.5.11 The REPD pipeline for Scotland shows 6.8GW of consented schemes which are not yet operational (just 1.4GW of these are listed as under construction) as well as 8.1GW of applications in Scotland which have not yet been determined.

5.5.12 The REPD also shows that of the total capacity of Scottish onshore wind schemes listed in the REPD as having been determined, only 55% have been consented (16.2GW consented of 29.2GW determined). If historical consent rates continue with a pace consistent to that of the past, the Scottish pipeline of onshore wind schemes alone is not of a sufficient scale to deliver the range of onshore wind required by 2030 in NESO’s net zero compatible scenarios.

5.5.13 Therefore, relying solely on Scottish onshore wind to deliver against NESO’s projections is also not a prudent approach to delivering progress against the UK’s decarbonisation and energy security targets.

5.5.14 The UK’s CfD Allocation Round 6, results of which were published in September 2024, allocated contracts to 1GW of onshore wind, predominantly in Scotland and predominantly delivering in 2027/28.

5.5.15 Any shortfall in the delivery of onshore wind schemes against government’s Clean Power capacity range will need to be made up for instead by other technologies.

5.6 Nuclear

5.6.1 GB operational nuclear capacity is, at the time of submission of application, at 6.1GW, down from over 9GW in 2020. Two stations (2.4GW total capacity) are due to close in March 2027 +/- one year, and a further two stations (also 2.4GW total capacity) are due to close in 2030 +/- two years (Ref 57).

5.6.2 The government has committed to “extending the lifetime of existing plants” [(Ref 20), p52], but operational lifetime is limited at these four stations by irreversible engineering processes deep inside the reactor cores and any extension is not a guarantee of operation up to that date.

5.6.3 It therefore remains highly unlikely that any significant lifetime extension commitments will be made by the operator in these stations’ final years of operation. An ongoing programme of inspection and testing will continue to inform the operator, with oversight from the UK’s independent nuclear regulator, on the ability of these stations to operate safely until their next programmed inspections and towards their current estimated closure dates.

5.6.4 Therefore, by as early as 2028, it could be the case that only one currently operational nuclear power station, Sizewell B (1.2GW) will be operating in the UK. Operator EDF is likely to seek permission to extend the life of this reactor by 20 years to 2055. A 60-year operational lifetime is common for the nuclear technology in use at Sizewell B.

5.6.5 Nuclear power is a low carbon power source, therefore the likely closure within the next five years of 4.8GW of capacity, which has historically generated circa 30TWh/year of low carbon electricity, will need to be made up by other low carbon sources of electricity, just to prevent an increase in grid carbon intensity over the next five years. The government's Clean Power 2030 Action Plan includes a capacity range of 3GW to 4GW for nuclear power in 2030 [(Ref 4), Table 1].

5.6.6 New nuclear has been a part of every government's energy strategy since the mid-2000s and many barriers to nuclear development have been removed over the last decade. For example, site selection (via a new National Policy Statement for Nuclear Energy Generation which was consulted on in Q1 2025), early regulatory approval of reactor designs (the Generic Design Assessment (GDA) process) and revenue and back-end cost certainty through the CfD, a key element of the 2013 Electricity Market Reform, and the Funded Decommissioning and Waste Management Plan. The Energy Act 2013 also created a body corporate, the Office for Nuclear Regulation (ONR), to regulate all nuclear licensed sites in Great Britain.

5.6.7 The nuclear development process is neither easy, nor short. Nuclear projects have long development and construction lead times with many regulatory and commercial approvals and decision points along the way. Hinkley Point C development started in earnest in the late 2000s, and civil site construction commenced in 2016. Hinkley Point C is still under construction.

5.6.8 The government has committed to "get Hinkley Point C over the line" [(Ref 20), p52], but it was announced in January 2024 that the plan to start commercial operations has already been further delayed to between 2029 and 2031 [(Ref 58)], due to construction delays. The government's Clean Power 2030 Action Plan advises that the first unit at Hinkley Point C (1.6GW) is scheduled for completion between 2029 and 2031, however "there are uncertainties associated with having Hinkley Point C online by the end of the decade, given delays in the past few years" [(Ref 4), p81].

5.6.9 Sizewell C, which is proposed to be a replica of Hinkley Point C, received a Development Consent Order in July 2022 and the government announced on 22 July 2025 that a Final Investment Decision (FID) had been taken to proceed with Sizewell C, with government retaining 44.9% of the project. (Ref 59).

5.6.10 If formal construction commences soon afterwards, overlaying Hinkley Point C's construction programme would see first commercial operation at Sizewell C well into the second half of the 2030s. Construction efficiencies may be secured through replication of construction methods from Hinkley Point C to Sizewell C but are not guaranteed.

5.6.11 Great British Nuclear (GBN) was launched in 2023, as an 'arms-length body' with its first priority being to "administer a competitive process to select the best small modular reactor (SMR) technologies from around the world. This SMR technology selection process will underpin government's commitment to two nuclear Project Final Investment Decisions during the next Parliament [i.e. the parliament sitting at the date of writing this Statement], with at least one of these being into an SMR project" (Ref 60).

5.6.12 SMRs are nuclear facilities which are proposed to achieve economies of scale through multiples of projects, rather than the size of a single project. Modular construction of nuclear facilities is largely anticipated to be factory-based, requiring only the installation of prefabricated components in situ. In this way, learning can be applied during subsequent manufacturing in a controlled environment, delivering anticipated rewards in terms of construction duration, cost, and quality.

5.6.13 The first three SMR designs are now being assessed under GDA by the ONR, a process which has previously taken three or more years. SMRs will require the construction of approved manufacturing facilities prior to delivery of the first unit. Although SMRs may bring decarbonisation and energy security benefits to the UK, the first SMR unit is very unlikely to be operational in the UK within this decade.

5.6.14 In October 2023, GBN down-selected six companies through the initial stage of a nuclear technology competition. Successful companies were considered to "offer the greatest confidence in being able to make a final investment decision in 2029" and be "most able to deliver cutting-edge technology by [the] mid-2030s" (Ref 61).

5.6.15 In February 2025 the government proposed reforms to the planning regime to incorporate small reactors and enable developers to identify the best sites for their projects, rather than constraining development to just eight sites previously identified (Ref 62).

5.6.16 In June 2025, the government announced that a preferred bidder had been selected to build the UK's first SMRs. The government has pledged £2.5 billion to support the development of new SMRs, aiming to allocate a site later in 2025, and to "connect projects to the grid in the mid-2030s" (Ref 63).

5.6.17 The long timeframe to commercial operation of the UK's first SMRs reflects the need for projects to conclude on GDA and site selection, secure a Development Consent Order and connect to the grid. Offsite manufacturing facilities may also require nuclear-level consenting and approval. Reactor operating companies will need to secure a Nuclear Site Licence and become both intelligent customer and controlling mind of the end-to-end design, operation, and decommissioning of the site.

5.6.18 Revenue mechanisms will also need to be developed, funding secured, and then the process of construction and installation commenced, and facilities commissioned.

5.6.19 Nuclear development does not come without risk. In the 2010s, three mature GW-scale reactor projects progressed towards Financial Investment Decision, but only one, Hinkley Point C (EDF, 3.2GW) has been taken forwards to construction. The other two (Wylfa and Moorside) were discontinued in 2019 and 2017 respectively, due primarily to commercial matters.

5.6.20 It is therefore not yet the case that the existence of a governmental plan for nuclear, and companies currently participating in that plan, can be relied upon to deliver the potential benefits of such a plan.

5.6.21 In the FES 2024 net zero pathways, NESO assumes the closure of two existing nuclear stations prior to 2030 and the commissioning of Hinkley Point C reactor between 2029 and 2031, in line with developer announcements. SMRs appear from 2034 at the earliest, and Sizewell C commissions in the second half of the 2030s.

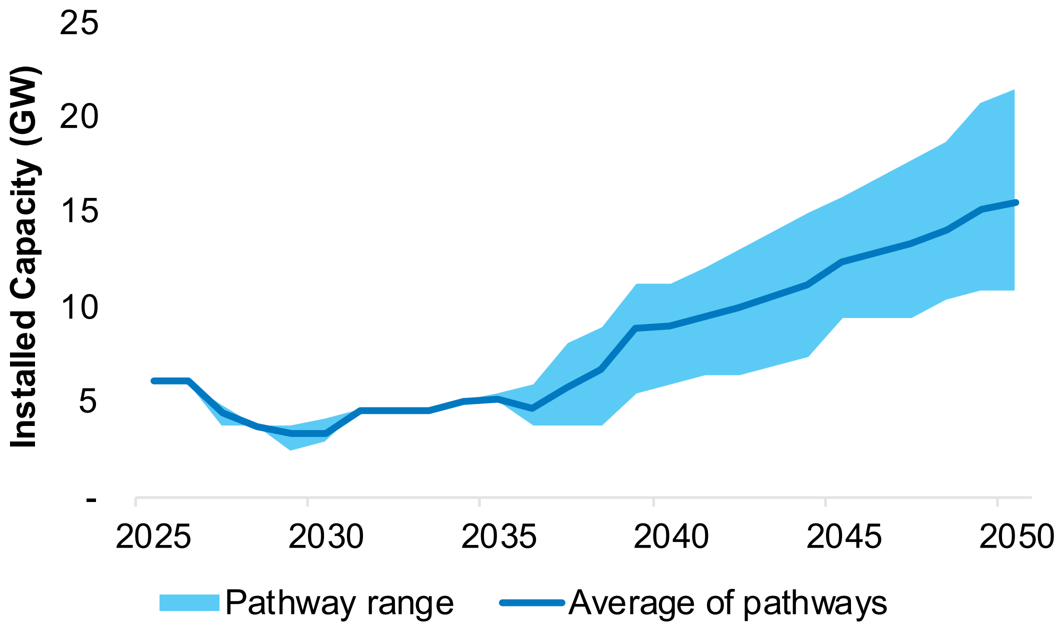

Figure 10: FES nuclear capacity pathways 2025-2050

(GW) [(Ref 36)(2025), Table ES.21, Author Analysis]

5.6.22 No nuclear facility other than Hinkley Point C is sufficiently advanced in its development to be able to join the existing Sizewell B reactor on the grid before the mid-2030s. Further, the closure of 4.8GW of existing nuclear power before 2030, the year by which the government aim to have first delivered clean power, may also be inevitable. The delivery of government's Clean Power target therefore must rely on the delivery of other clean sources of electricity with shorter development timescales than new nuclear power.

5.6.23 In October 2023, the then government also published 'Towards Fusion Energy 2023', the next stage of the UK's nuclear fusion energy strategy (Ref 64).

5.6.24 The UK’s nuclear fusion strategy sets out two objectives. Firstly, a UK demonstration of commercial viability of fusion from a UK prototype plant which delivers net energy, and secondly the development of a world-leading fusion industry.

5.6.25 Not detracting from the important activity of fusion research and development, it is relevant for the purpose of examination of this scheme to place this exciting prospect in the UK into context. In support of the first objective:

“The STEP Programme will design, develop and build, by 2040, a prototype fusion power plant capable of delivering net energy” [(Ref 64), p20].

5.6.26 The EA 2023 legislates for fusion regulation, an essential pre-requisite for developers to plan prototype projects.

5.6.27 Any possible decarbonisation contribution from nuclear fusion will therefore not materialise in time to support the then government’s target to decarbonise the electricity system by 2035, and it is not yet clear that achieving the government’s fusion targets, including a successful demonstration Spherical Tokamak for Energy Production (STEP) project, will enable nuclear fusion to make a net contribution to decarbonisation from any facilities following STEP, prior to 2050.

5.7 Unabated fossil fuels and abatement technologies

5.7.1 NESO’s FES shows that 29GW of large-scale CCGT (Combined Cycle Gas Turbine) generation capacity was operational in the UK in 2024, contributing 28% of the UK’s total annual generation output. 10.3GW of other gas-fired generation capacity, including Open Cycle Gas Turbines, smaller gas reciprocating engines, and gas-fired combined heat and power was also operational in 2024 [(Ref 36)(2025), Table ES1].

5.7.2 Currently all UK CCGT (and other gas-fired) capacity is fully unabated, meaning that the CO2 emitted as a by-product of generating electricity is released to the atmosphere and contributes to UK carbon emissions. Progressing towards a zero-carbon electricity system requires the decarbonisation of these assets, or the replacement of their generation capacity with alternative low carbon sources. The most significant decarbonisation requirement is on the CCGT fleet.

5.7.3 However, it is important to note that the government’s Clean Power target allows for up to 5% of Great Britain’s electricity generation to come from unabated carbon emitting sources (down from 40% in 2023) [(Ref 4), pp25 & 26].

5.7.4 Capturing carbon emissions from thermal power generation and storing these emissions away from the atmosphere would also decarbonise these assets but is dependent on the successful deployment, at scale, of Carbon Capture Usage and Storage (CCUS).

5.7.5 Decarbonisation of the fuel used to generate electricity in the CCGT fleet could be achieved by burning low carbon hydrogen. **Section 5.8** of this Statement provides further detail on the role of solar and other renewable electricity generation in the production of low carbon hydrogen.

5.7.6 FES 2025 net zero pathways include the first CCGT schemes with carbon capture operating from 2029 at the earliest, reaching c.5GW in 2032. Deploying CCUS at the speeds indicated in the FES pathways would support government's ambition to deliver the Clean Power target however the risks associated with the CCUS delivery plan are significant.

5.7.7 The net zero FES pathways include 17.7GW to 23.3GW of dispatchable low carbon generation in operation in 2040, from a base of 0GW and via 1.3GW in 2030.

5.7.8 CCUS is also required to facilitate Bioenergy with Carbon Capture and Storage (BECCS).

5.7.9 As a first-of-a-kind low carbon dispatchable technology, CCUS has the potential to play a key role in the government's strategy to provide longer-duration power capacity for times where renewables are unable to meet demand [(Ref 4), p29]. Previous governments have recognised that "the technology has not been delivered at scale and significant risks remain" [(Ref 65), p53] but recent progress has been made in developing and consenting projects as well as developing a commercial framework to support the technology. The government's CCUS Deployment Pathway seeks to secure an option to deploy CCUS at scale during the 2030s, subject to costs coming down sufficiently.

5.7.10 The CCC noted in their 2025 Progress Report to Parliament that "Despite the progress on CCS infrastructure for removals to connect to … it is becoming increasingly challenging for engineered removals to deliver the emissions savings … in the CBDP by 2030" [(Ref 14)(2025), p106].

5.7.11 CCUS deployment is currently progressing under a cluster approach with Track 1 and Track 2 projects now identified and under development. The cluster approach aims to deliver four operational CCUS clusters to capture and store 20-30 million tonnes of carbon dioxide (MtCO2) by 2030 [(Ref 28)(1), p21].

5.7.12 Eight projects were selected from the Track 1 cluster sequencing process for CCUS to proceed to negotiations for government support. Three are part of the East Coast Cluster and five are part of the HyNet Cluster. Both clusters have previously been identified as funding recipients. Development Consent Orders have been granted for some but not yet all of the Track 1 projects aiming for operation in the late 2020s.

5.7.13 Progress has been made on project definition, design, and consenting in recent years. EA 2023 provides a licensing framework for CO2 transport and storage. In December 2024, government announced that financial close had been reached for East Coast Cluster projects with construction due to commence in 2025 ahead of operation from 2028 (Ref 66).

5.7.14 Both HyNet and East Coast Clusters provide the possibility of directly capturing and storing emissions from CCGT and Biomass electricity generation facilities located close to the clusters as well as the opportunity to decarbonise heavy industry in the areas local to the proposed pipelines.

5.7.15 The Cluster approach, when it is delivered, will provide abatement for a significant proportion of the UK's operational CCGT fleet and other industrial carbon emissions. However, an extension of the UK's CCUS or hydrogen pipelines will be required to take emissions out of the many CCGT facilities which are not near to an existing or proposed cluster.

5.7.16 A prudent approach to future energy supply would suggest that sufficient progress in decarbonising the existing UK CCGT fleet should not be assumed by 2030.

5.7.17 Therefore. other low carbon supplies may be required to make up for facilities which have by 2030 not yet been abated in order to secure the government's aim to deliver 'Clean Power by 2030', and keep power clean through to 2050 and beyond.

5.8 Hydrogen

5.8.1 The previous government's 2021 UK Hydrogen Strategy [(Ref 67), p2] explains that hydrogen has "the potential to overcome some of the trickiest decarbonisation challenges facing our economy", especially in enabling the decarbonisation of industry and land transport, and as a potential substitute for current carbon-intensive marine and aviation fuels.

5.8.2 Currently most hydrogen is produced by converting methane to hydrogen and carbon dioxide (this is known as 'blue hydrogen'). As blue hydrogen production emits carbon as a by-product, the development of blue hydrogen facilities is dependent upon the delivery of CCUS capability to achieve net zero carbon. CCUS clusters with hydrogen and carbon dioxide pipelines (see **Section 5.7**) are hoped to become operational in the second half of the 2020s.

5.8.3 Hydrogen can also be produced through the electrolysis of water (this is known as 'green hydrogen'). The 'green' label for electrolysed hydrogen presumes that the input electricity used in the hydrogen production process is itself low carbon, therefore, there are no carbon emissions associated with the process.

5.8.4 Green hydrogen production relies on considerable amounts of renewable energy to electrolyse water. Electrolysis currently accounts for approximately

1% of global hydrogen production. However, a growth in electrolysis capability and capacity opens out the prospect of using renewable generation to produce hydrogen, in potentially significant quantities.

5.8.5 The government has established Hydrogen Allocation Rounds (HARs) to deliver both electrolytic and CCUS-enabled hydrogen.

5.8.6 NESO's FES 2025 pathways include between 82TWh and 210TWh of annual electricity demand by 2050 to produce sufficient hydrogen through electrolysis to meet its many potential end-uses [(Ref 36)(2025), Table ED1]. The wide range of future demand estimates is due to different net zero compatible scenarios producing hydrogen in different ways. The Energy System Catapult foresee the need for "a new low carbon hydrogen economy … delivering up to 300TWh per annum, roughly equivalent to electricity generation today" and concluding that "electricity generation itself may have to double, or even treble if most hydrogen is to be produced by electrolysis" [(Ref 19), pp6 & 36].

5.8.7 Hydrogen continues to be an interesting and valuable technology to support net zero. Once hydrogen has been produced, it can be stored, transported, and used in a range of applications as a substitute for natural gas or other carbon intensive fuels. EA 2023 lays the foundations for a future which includes hydrogen technology by creating provisions for business modes for hydrogen production, transport, and storage.

5.8.8 The delivery of electrolytic hydrogen capacity requires significant supplies of low carbon electricity from the UK's electricity network. The Scheme (and other similar projects) goes towards meeting that requirement for low carbon electricity. Without the deployment of significant capacities of low carbon generation, including the Scheme, the UK's electrolytic hydrogen ambitions are unlikely to be met.

5.8.9 Progressing electrolytic hydrogen de-risks growth in this valuable energy technology from potential delays in the delivery of CCUS. If the government's hydrogen ambitions are not met, then more electricity will need to be used in place of hydrogen to decarbonise some sectors.

5.8.10 It is therefore clear that large capacities of low carbon electricity generation will be needed to support the future use of hydrogen as a way of reducing carbon emissions. However, hydrogen is not a substitute for low carbon electricity generation.

5.9 Biomass

5.9.1 FES 2025 stated that 4.3GW of Biomass generation was operational in the UK in 2024, producing approximately 12.4TWh of low carbon electricity [(Ref 36)(2025) Table ES1].

5.9.2 The UK Biomass Strategy, published in 2023 reaffirmed that "Only biomass use that complies with strict criteria is considered to be low carbon and to deliver genuine CO2 emissions savings" [(Ref 68), p6].

5.9.3 Building on the already green credentials of the technology, the Biomass Strategy sets a vision to continue to use sustainable biomass in power generation in the 2020s. The Biomass Strategy aimed to transition away from unabated uses of biomass by 2035 by incorporating, where possible and with priority, BECCS to make biomass use net negative carbon emissions.

5.9.4 Recognising that "Biomass can play a significant role in decarbonising nearly all sectors of the economy" the previous government also stated that "Biomass is not a silver bullet, and neither is carbon capture. We will rely on a range of solutions to achieve net zero" [(Ref 68), p4].

5.9.5 BECCS is not currently operating at scale in the UK, however demonstration and commercial scale plants are operational in other countries. Active work is therefore being undertaken in government and industry to develop business models which support biomass and the delivery of low carbon electricity as well as negative emissions through the deployment of CCUS to deliver BECCS in the UK.

5.9.6 Consideration is also being made within government as to whether new or refurbished biomass plants must, on commissioning, be fit to deploy carbon capture in the future.

5.9.7 Against the backdrop of national biomass capacity reducing as existing plants reach the end of their commercial life, FES net zero pathways include BECCS capacities coming online progressively from 2029 towards an operational capacity of between 1.2 and 4.2GW by 2035 with no other new capacity additions before 2050 [(Ref 36)(2025), Table ES1]. In January 2024, the then Secretary of State approved plans to convert two existing biomass units at Drax Power Station to BECCS with heads of terms agreed between Drax and government in February 2025.

5.9.8 BECCS will be dependent upon the delivery of CCS infrastructure to support the capture of emissions, and any shortfall in the delivery of BECCS schemes against the FES pathway projections will need to be made up for instead by other low carbon technologies.

5.10 Solar

5.10.1 The government's solar photovoltaics deployment information resource (Ref 69) records installed and operational solar capacity in Great Britain and the UK. The government's data shows that at the end of June 2025, Great Britain had 18.6GW of operational capacity. A further 0.4GW was located in Northern Ireland.

5.10.2 UK Solar has generated over 10TWh annually since 2016, rising to over 14TWh in 2023 [(Ref 35), Table 5.6]. UK solar generation makes an important and reliable annual contribution to meeting national demand. Solar is well placed to play the role it has been ascribed in recent government publications, including those summarised in **Chapter 2** of this Statement.

5.10.3 **Figure 11** shows how solar capacity has grown in the UK each year since capacity records began in 2010.

5.10.4 Growth in UK solar capacity has been characterised by two phases. The first was supported by the Feed in Tariff (FiT) scheme which entered into law through the Energy Act 2008 and took effect from April 2010. This phase is denoted by the yellow columns in **Figure 11**. The FiT scheme paid a guaranteed £/MWh revenue to owners of solar installations (and other renewable generation assets) with a capacity lower than 5MW.

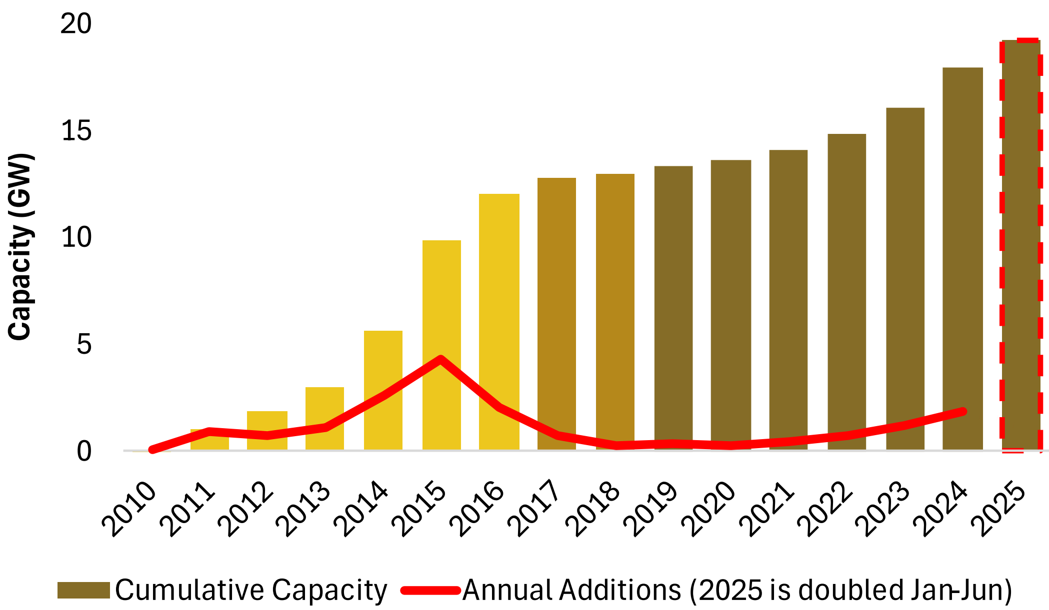

Figure 11: Cumulative and annual installed solar capacity in the UK

(GW, 2010 – June 2025) [(Ref 69), Author Analysis]

5.10.5 **Figure 11** shows that the scheme was effective in increasing solar capacity over the period 2010 to 2015. A tariff reduction was announced in December 2015, reflecting reducing installation costs and therefore less of a requirement to incentivise new installations. Annual installations reduced during 2017 and 2018 (shown by the light brown columns) as capacity accredited by the scheme before the 2015 tariff announcement dried up.

5.10.6 The FiT scheme closed to new applicants in 2019, and solar capacity growth since 2019 has been supported by market revenues only (shown by the dark brown columns). Annual installations are shown by the red line on **Figure 11**.

January to June 2025 additions have been doubled to indicate a possible year-end 2025 position.

5.10.7 Annual installations peaked at 4.2GW in 2015 and averaged 1.1GW over the period 2010 to 2024.

5.10.8 Solar has undergone significant technological advances in scale and commercial efficiency, and the UK has many areas of commercially viable solar irradiation. It is therefore important to make best use of this natural, renewable energy resource to meet the UK's legal carbon emission reduction obligations.

5.10.9 In its Clean Power 2030 Action Plan, the government has set a capacity range of 45 to 47GW for solar by 2030 and 45GW to 69GW by 2035 [(Ref 4), Table 1, (Ref 4), Connection Reforms Annex, Table 1].

5.10.10 Importantly, to achieve either of these aims, solar capacity (excluding rooftop capacity, see commentary to **Table 1** of this Statement) will have to increase by over 4GW each year starting from 2024, i.e. new installations in each year from 2025 to at least 2035 will have to be higher than the UK's previous single highest achieved annual installations.

5.10.11 The FES 2025 net zero pathways for solar consider 43GW to 47GW installed capacity in 2030, 69GW to 78GW in 2040, and 87GW to 101GW in 2050 (Ref 36)(2025), Table F.57]. In every scenario, a pathway to net zero includes a significant future increase in solar capacity beyond that which is installed or in development today, as shown in **Figure 12**.

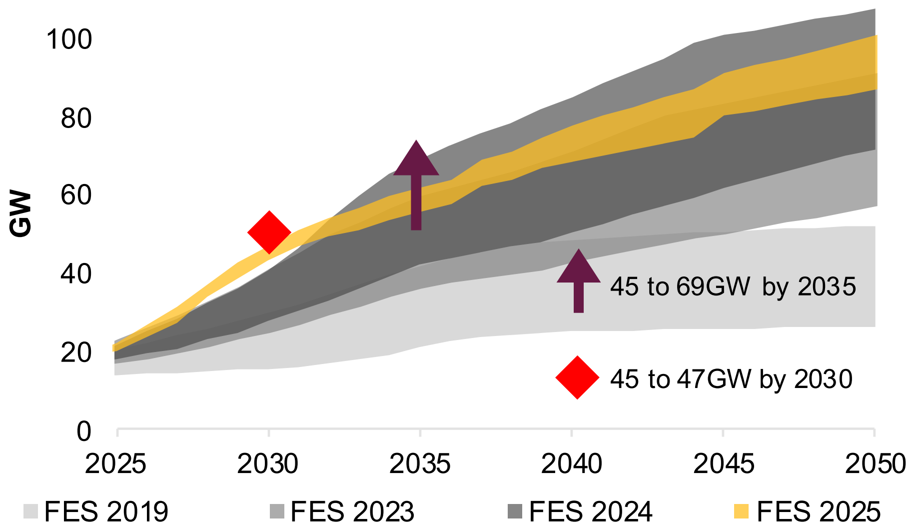

Figure 12: Evolution of future solar capacity forecasts in the UK

(GW) [(Ref 36)(2019, 2023, 2024 & 2025), Table ES1, Author Analysis]

5.10.12 **Figure 12** shows FES pathway ranges for solar capacity from 2019 and 2023 to 2025, with each range shown as a shaded area covering the range from lowest pathway capacity to the highest capacity in each year. Earlier years are shaded lighter grey with the 2025 pathway shaded yellow.

5.10.13 **Figure 12** shows that the range of future solar capacity pathways increased from FES 2019 to FES 2023, again to FES 2024, and reduced but narrowed in the most recent publication.

5.10.14 The UK's net zero commitment in 2019 manifested in FES pathways as a further increase in solar capacity, shown by the dark grey range in **Figure 12** (the 2023 forecast) being higher than the light grey 2019 forecast.

5.10.15 The blue arrow shows the 2035 solar capacity range and the red diamond shows the government's 2030 solar capacity range, both sourced from the government's Clean Power 2030 Action Plan [(Ref 4), Connections Reform Annex, Table 1].

5.10.16 To achieve the top end of the 2035 capacity range, installations would need to track the most ambitious FES 2025 pathway for the next ten years.

5.10.17 To achieve the 2030 capacity range, an even more ambitious deployment rate is needed over the next five years, and critically one which has not previously been achieved in the UK.

5.10.18 This implies that there is a risk to the delivery of government's 2030 Capacity Range.

5.10.19 Solar schemes must come forward for delivery in the 2020s as well as to continue to come forwards beyond 2030 to reduce the risk of the 2030 Clean Power target not being achieved, to deliver the ongoing need for the technology in the UK and also in the case that the 2030 Capacity Range is not met.

5.10.20 Year-on-year cost reductions have made solar technology progressively more attractive (and now preferential) compared to many other forms of electricity generation, promoting the commercial rationality for the UK to prioritise the development of solar capacity. The incorporation of a cost perspective in the 2024 and subsequent FES is therefore likely to be one reason why capacity installation pathways have increased from the 2023 forecast to the 2024 forecast. Solar capacity helps to address energy affordability challenges (see **Chapter 9**) as well as meet the already urgent need for schemes to come forwards to support decarbonisation and energy security aims.

5.10.21 Each of the annual ranges of future installed solar capacity in **Figure 12** may be explained by the extent to which other low carbon technologies including onshore and offshore wind, nuclear, CCUS, and BECCS are deployed in the UK. Delays or shortfalls in the deployment of any technologies versus their FES pathways will require a compensatory acceleration or expansion in the deployment of other technologies for the UK to remain on track to achieve net zero.

5.10.22 In this context, the urgent development of large capacities of technologies which are proven in development and operation is clearly a prudent approach and is consistent with the government's conservative approach to infrastructure development described in NPS EN-1 [(Ref 1), Para 3.3.10]. This is also consistent with the government setting capacity ranges to increase the deployment of different technologies by 2030 and 2035 which maintain some optionality until more clarity is available on achieved and forecast progress [(Ref 4), p31].

5.10.23 The solar sector is proven in operation with over 18GW of installed capacity already reliably delivering zero-carbon electricity to the UK's electricity system. The solar sector is also proven in delivery because of its short development duration and is therefore well placed to deliver to the urgent need for low carbon generation.

5.10.24 Data from the REPD (Ref 50) quantifies the average duration from planning submission to operation of a solar farm in the UK is 1.4 years (over an average of 1,308 projects) with a 1-year construction timeframe post-consent.

5.10.25 Larger projects may take longer to consent and construct. 14 solar projects with capacity over 40MW are listed as operational in the REPD. These projects took on average 2 years from planning submission to operation, of which construction lasted on average 1.4 years.

5.10.26 This data is in stark contrast to historical development timescales in the UK for onshore wind (see **Section 5.5**), offshore wind (see **Section 5.4**) and nuclear power (see **Section 5.6**).

5.10.27 However, many large-scale schemes have target operational dates which are determined by available grid connection dates. Large-scale schemes may therefore have commenced on-the-ground construction activities to coordinate with those dates. Physical construction for schemes which have already delivered may therefore have taken a shorter time than indicated through REPD data.

5.10.28 Larger schemes with a capacity greater than the threshold capacity required to apply for development consent under the PA2008, experience different statutory timelines to smaller schemes, and construction may take longer (because more construction is required). This may affect the time elapsed from planning submission to operation as NSIP schemes start to deliver.

5.10.29 Many solar schemes are listed on connection and planning registers. However, these development pipelines must be assessed with caution. Analysis included at **Section 5.3** of this Statement addresses the attrition of projects and capacity from pipelines and registers prior to commercial operation. The government's Clean Power target will be achieved and sustained only if a pipeline of credible and viable projects which are ready to proceed (such as the Scheme) continually feeds the connections and contracting process through the intervening years. This is consistent with NESO's FES 2025 insight, that it is necessary both to deliver schemes which are already advanced in development by 2030 while also bringing forward additional schemes with the potential to deliver in the 2030s to unlock the benefits of an affordable and secure, clean energy system.

5.10.30 Solar schemes can be developed as standalone schemes or co-located with storage or other generation technologies. Both standalone and co-located schemes play essential roles in contributing to the three pillars of energy policy: decarbonisation, security of supply, and affordability.

5.10.31 **Section 5.11** of this Statement explains that storage is an essential part of the future energy system. **Section 6.9** explains that the co-location of storage with renewable generation has benefits, however it is not necessary (and nor is it a policy requirement) that all renewable energy schemes are co-located with storage.

5.10.32 Standalone solar schemes (and schemes using other renewable generation technologies) are already prevalent and will likely continue to be prevalent in the UK's future electricity system.

5.10.33 **Figure 14** shows that in each of the three FES pathways which are compatible with net zero, the capacity of solar generation always outstrips that of storage. It is therefore anticipated by the Electricity System Operator that the future electricity system will consist of both standalone solar (and other renewable) projects, as well as co-located projects.

5.10.34 Standalone renewable schemes generate, from a renewable source, zero-marginal carbon electricity. Therefore, standalone schemes also provide an essential contribution to reaching net zero.

5.10.35 The TEC Register (Ref 49) lists 2.9GW of stand-alone solar and 29.2GW of co-located solar projects with connection dates prior to 2030, subject to as yet unpublished changes due to NESO's ongoing Connections Reform process. The TEC register does not record the capacity of individual technology types within an application. Therefore, it is more precise to state that solar technology is proposed to be installed at projects which comprise a total of 32.1GW of connection capacity to the NETS prior to 2030.

5.10.36 A point of connection is an absolute necessity for a developer to secure for a development to be viable to take forwards. In many cases, grid connections have been secured prior even to engaging local landowners. The current scarce nature of grid connections in GB, coupled with expectations of large capacities of connections being required in the future, has hitherto prioritised the procurement of grid entry connection capacity as a critical project development activity.

5.10.37 The cost of securing and holding a grid connection for a potential scheme has also not been prohibitive in relation to development costs as a whole. It is therefore understandable that the current capacity of projects in the 'connection queue' is very high. This does not however mean that all capacity in the connections queue will make it to commercial operation, and the Connections Action Plan resolves to de-prioritise less-ready schemes in the connections queue, and prioritise those which are more advanced in their development.

5.10.38 Planning consent is required for all schemes greater than micro-scale. The REPD lists 16.4GW of consented projects awaiting construction but only 2.4GW is currently under construction. Of the total 18.8GW with planning consent, 3GW of these schemes are of a nationally significant scale.

5.10.39 Applications totalling a further 7.7GW of solar capacity have been submitted to planning authorities to apply for consent outside of the PA2008 route but have not yet been determined. Given average development durations, it is possible that some of these projects, if consented, to deliver in 2025 or 2026, subject to their grid connection dates (which are not listed on the REPD).

5.10.40 Applications for a further 6GW of capacity in England, across 14 NSIP schemes, have been accepted by the Planning Inspectorate and are in examination.

5.10.41 A further 20 NSIP solar schemes, totalling approximately 8.7GW, are at the pre-application stage with the Planning Inspectorate, including the Scheme, with application submission dates estimated in 2025 or 2026. Grid connection dates for these schemes range as far into the future as 2033, subject to NESO's ongoing Connections Reform processes.

5.10.42 At best, therefore, between one half and two-thirds of the capacity of solar schemes with agreements to connect to the NETS prior to 2030 has so far engaged with the Planning Inspectorate. **Section 5.3** of this Statement provides evidence that it is not a given that all capacity with an agreement to connect will proceed to the development consent / planning stage, or will be successful in its planning application, or will proceed onwards through commercial contracting, investment decisions, construction and ultimately to operation.

5.10.43 In relation to revenue contracting, the pipeline is even further constrained although results of the government's recent CfD allocation rounds support solar's ability to deliver to shorter timeframes than other renewable generation technologies. Solar secured contracts to deliver the majority of contracted capacity in CfD Allocation Rounds AR4 and AR5 delivering in 2025 (1.6GW) and 2028 (1.1GW) [(Ref 52)].

5.10.44 A further 3.3GW of solar was awarded a CfD in AR6, delivering in 2026/27 (1.1GW) and 2027/28 (2.2GW).

5.10.45 However, data also suggests that an attrition or stall rate could be significant. Approximately only 10% of potential pre-2030 connected capacity has already passed through planning and secured a revenue contract.

5.10.46 If a significant capacity of solar generation is not built out to a scale comparable with the projections provided by NESO and others, then the UK will be highly unlikely to continue to reduce its carbon emissions over the coming decade and ultimately meet its legally binding net zero target.

5.10.47 The size of the pipelines for solar schemes is encouraging across all scales of development, but the data shows that the attrition of schemes through the development process is a real risk to the delivery of that capacity.

5.10.48 A significant proportion of low carbon schemes currently listed on registers will not become operational, and with that as context, bringing the Scheme forwards will be a critical step in the development and delivery of large-scale solar capacity in the UK.

5.11 Flexibility

5.11.1 The government's Clean Power 2030 Action Plan describes the need for flexibility in the UK's future energy system:

"As we build an energy system reliant increasingly on variable renewables, improving the flexibility of the wider electricity system is key… A significant increase in short-duration flexibility of 29-35 GW across battery storage, consumer led flexibility and interconnection capacity from 2023 levels will reduce the amount of more costly generation and associated network infrastructure that needs to be built, whilst maintaining security of supply" [(Ref 4), p14].

5.11.2 Flexibility is delivered through interactions between both supply (generation) and demand (consumption) to help the national energy system function safely and efficiently. The full operation of flexible assets within that system requires them to both store energy from (or save) and release energy to (or use more) the energy system in response to market drivers, as will subsequently be explained.

5.11.3 The overriding themes for the GB electricity market in the coming decade are those of decarbonisation through an increase in deployment of renewable generation, and higher demand due to the electrification of heat, transport, and industrial demand, while meeting Security of Supply standards and affordability aims.

5.11.4 This means a move away from dispatchable fossil-driven assets and towards renewable plant; a theme which will alter the needs of the GB electricity system. System security and Security of Supply will need to address:

- Changing patterns of, and variability in, residual demand (demand net of renewable output);
- A reduction in the proportion of synchronous plant connected and available to support system frequency; and
- A shift in the location of generation reflecting resource (wind and solar) distribution.

5.11.5 **Figure 13** illustrates the events, consequences, and value drivers over different timeframes for flexibility in the GB electricity market. Greater variability in residual demand (i.e. demand net of renewable generation supplied) will increase the need for flexibility solutions across multiple timeframes.

5.11.6 Flexibility is needed to maximise the use of renewables when there is an abundance of generation, and to fill the supply gaps in periods of shortfall.

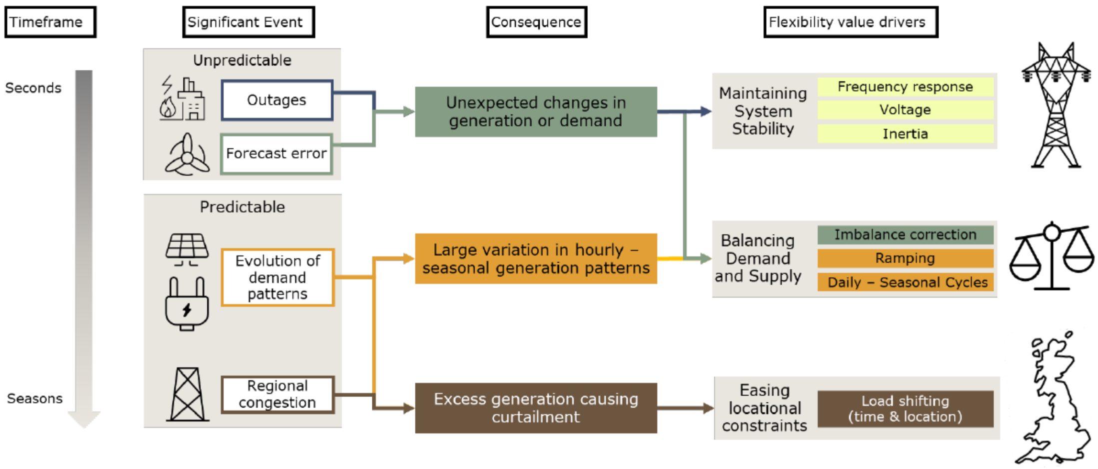

Figure 13: Drivers of flexibility requirements

(Ref 72)

5.11.7 Storage provides flexibility. Flexibility is the ability to shift in time or location the consumption or generation of energy. Flexibility is also the ability to shift energy from one medium (vector) to another, e.g. electrical energy to gravitational potential energy through Pumped Storage schemes, or to chemical energy through BESS, and back again.

5.11.8 NPS EN-1 sets out the policy position in favour of electricity storage:

“Storage has a key role to play in achieving net zero and providing flexibility to the energy system, so that high volumes of low carbon power, heat and transport can be integrated.” [(Ref 1), Para 3.3.25].

5.11.9 Storage facilities need to be able to import energy and export energy. Sources of energy import are discussed later in this section.

Types of flexibility

5.11.10 Storage has the capability to deliver flexibility over different timeframes and can be categorised as:

- Short Duration Storage (SDS) typically have durations of four hours or lower, and are more suited to addressing short duration balancing needs;
- Medium Duration Storage (MDS) typically have durations of between four and 12 hours, and are suited to addressing both short duration and within-day balancing needs; and
- Long Duration Storage (LDS) with durations of over 12 hours, are more suited to meeting multi-day and seasonal balancing needs.

5.11.11 Here, 'duration' refers to the amount of energy a storage facility can hold (i.e. the length of time that the storage facility could discharge at its full stated power) rather than the time for which energy can be efficiently stored between import (charge) and export (discharge).

5.11.12 SDS addresses the increasing need for flexibility in matching supply with demand within-day, i.e. balancing increasing levels of renewable electricity supply with demand and providing system services to support the operation of a high-renewable electricity system.

5.11.13 LDS addresses the view that, in the future, the electricity system is expected to exhibit greater seasonal variability and provide for the potential of periods of days or weeks where there may be prolonged excesses, or shortfalls, of renewable output.

5.11.14 All storage technologies are able to operate to meet market needs over different timeframes. However, some technologies will be better suited to meet needs over a particular timeframe. Key differentiators between storage technologies are not only how energy is stored but also how much energy can be stored, and for how long, from both a technical and commercial basis.

5.11.15 Extreme but rare extended periods of low renewable generation (sometimes referred to as 'Dunkelflaute' events), possibly lasting up to several weeks, have the potential to pose a security of supply risk. There is still considerable uncertainty around forecasting when these events will occur and how long they will last, so there is a need for both sufficient storage capacity and generation capacity to manage security of supply through these periods while also supporting decarbonisation targets.

5.11.16 Conversely, enduring periods of high renewable generation can better contribute to overall electricity system decarbonisation if abundant generation can be stored rather than curtailed.

5.11.17 LDS assets are an important part of the anticipated solution to help manage both types of events, but these are not the events which shorter duration assets, such as those which form part of the Scheme, are designed to address.

5.11.18 There are many technologies which have potential to provide grid scale electricity storage functions. These range from pumped storage hydro schemes to BESS, or more novel technologies such as liquid air storage, compressed air storage for shorter duration applications, or hydrogen with potential for application also over longer durations. Pumped storage hydro schemes have been in existence for over 50 years. BESS are becoming increasingly commonplace in the UK. Other novel technologies are now being designed and developed with varying timescales for deployment. Technical development in energy storage may further differentiate, or alternatively merge, the application of specific technologies to the timeframe categorisations listed above.

5.11.19 NPS EN-3 also describes the government's support for solar which is co-located with storage [(Ref 2), Para 2.10.32].

5.11.20 Storage systems which are co-located with solar in the UK have so far tended to be SDS systems because SDS systems complement the generation profile of solar facilities and provide system functions which support the operation of the solar facility by (among other functions) balancing supply with demand.

5.11.21 The co-location of MDS or LDS systems with solar has not yet been developed in the UK but future advances in technology may make this a viable possibility.

5.11.22 BESS are typically shorter duration electricity storage systems.

Quantifying future flexibility needs

5.11.23 FES 2025 net zero pathways show storage and interconnection (flexibility) capacity increasing (from 19GW in 2024) to between 35.2GW and 41.5GW in 2030, and 62.3GW to 81.4GW by 2050 to balance supply and demand both within the GB system and across borders. Net zero pathways show Short Duration Storage system capacity increasing from 6.8GW in 2024 to between 20.5GW and 25.2GW by 2030, between 28.3GW and 35.6GW by 2040, and to between 31.2GW and 40.4GW by 2050 [(Ref 36)(2025), Table ES1]. The government's capacity ranges for batteries and other flexible assets for deployment by 2030 and by 2035 are included at **Table 1** of this Statement.

5.11.24 As renewable generation capacity increases on the GB electricity system, so too will the total capacity of operational storage systems to balance an increasingly variable supply portfolio with demand across timeframes ranging from milliseconds to seasons.

"Storage and interconnection can provide flexibility, meaning that less of the output of plant is wasted as it can either be stored or exported when there is excess production. They can also supply electricity when domestic demand is

higher than generation, supporting security of supply. This means that the total amount of generating plant capacity required to meet peak demand is reduced" [(Ref 1), Para 3.3.6].

5.11.25 **Figure 14** shows FES 2025 solar and Short Duration Storage capacity pathways from 2024 to 2050. The annual projections for SDS capacity (y-axis) are plotted against the annual projections for solar capacity (x-axis) for each of the three FES net zero pathways. The data has been re-cast to show increases versus a 2024 baseline. **Figure 14** shows anticipated growth in SDS capacity as a function of increasing solar capacity.

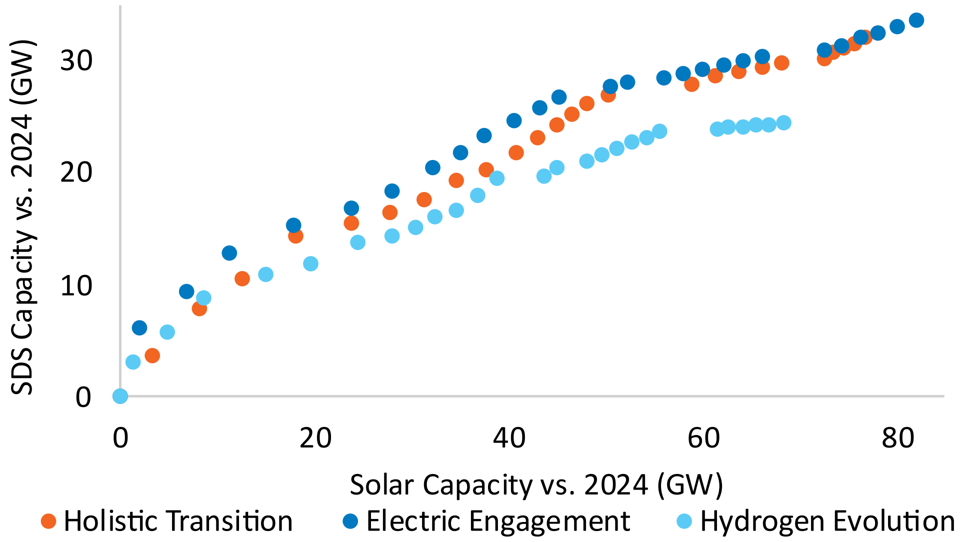

Figure 14: Growth in Short Duration Storage capacity vs. solar capacity

(GW, 2024 – 2050) [(Ref 36)(2025), Table ES1, Author Analysis]

5.11.26 Each pathway follows a similar trend. An increase of 10GW of solar (i.e. increasing GB installed solar capacity from c.19GW as at the time of submission to c.29GW) corresponds to an increase of c.10GW of SDS (i.e. increasing GB installed storage capacity to c.17GW). An increase of 40GW of solar capacity corresponds to an increase of c.20GW of SDS.

5.11.27 The data shows SDS capacity initially increasing by c.1GW per 1GW of solar capacity growth. NESO's pathways then show SDS growth settling to c.500MW per 1GW of solar capacity growth thereafter.

5.11.28 This analysis provides an indication of the scale of the need for SDS in the UK electricity system, however, it will not be solely a growth in solar capacity, but more likely a growth in the capacity of all renewable generation, which drives the requirement to increase capacity of many types of storage technology.

Co-location and stand-alone schemes

5.11.29 As both renewable generation capacity and storage capacity are expected to increase, projects which seek to connect to grid connection points which can accommodate storage facilities may propose to bring forwards co-located storage facilities as associated development to the main (renewable generation) development, as envisaged by NPS EN-3 [(Ref 2), Para 2.10.16].

5.11.30 As described in **Section 5.10** above, solar facilities may be developed standalone from any storage schemes. The opposite is also true, in that storage facilities may also be developed stand-alone from any renewable generation schemes.

5.11.31 Developments may identify location-specific reasons why storage schemes will not be co-located with renewable generation schemes, but it is important to recognise that standalone storage schemes are already commonplace in GB. Such schemes have already and are likely to continue to come forwards, delivering decarbonisation and energy security benefits as part of the UK's electricity system through their own grid connections. It is not necessary (nor is it a policy requirement) that all storage is co-located with a renewable energy scheme but as NPS EN-1 makes clear, co-location is an approach which is supported because it can help to maximise the efficiency of land used by a scheme.

5.11.32 **Figure 14** shows that in each of the three FES pathways which deliver net zero, the capacity of operational solar generation generally outstrips that of operational storage capacity, especially once solar capacity has increased by a further 10GW from current levels. It is therefore assumed by NESO, that the future electricity system will consist of both stand-alone solar schemes (and by extension other renewable schemes), as well as co-located schemes.

5.11.33 However, where grid connection offers enable the potential for co-location of renewable generation with storage, a scheme which includes both may be proposed and by doing so would, amongst other reasons, ensure that the greatest use can be made of the scheme's grid connection infrastructure and available land.

5.11.34 However, projects which are brought forwards as stand-alone renewable generation schemes would still play an essential role in contributing to the three pillars of energy policy: decarbonisation, security of supply, and affordability. This is because of their critical ability to generate, from a renewable energy source (RES), zero-marginal carbon electricity – which is something that storage cannot do on its own.

5.11.35 Alongside the export capacity secured through a scheme's grid connection agreement, the size of the import connection secured by connection agreement with NESO at the point of connection is also an important input into the maximum power capacity of the BESS proposed at a facility. Other physical parameters may limit specific elements of the scheme, including parameters which will have the effect of capping the energy capacity of the proposed BESS.

5.11.36 Given the need for flexible sources of generation to support the rollout of renewable generation capacities onto the NETS, it follows that where the deployment of storage facilities is acceptable in a planning sense, that the consent process does not impart any conflicting or arbitrary caps on either energy or power capacity of an installed storage facility. Developers may therefore approach consent in such a way that secures flexibility in design (by way of a ‘Rochdale Envelope’ approach) to allow provision in the DCO for technological innovation and improvements that may be realised at the time of procurement and construction.

5.11.37 This will ensure that a scheme may be constructed to incorporate future and as yet unknown innovation, safety improvements, and cost-efficiencies.

BESS provide flexibility

5.11.38 BESS provide flexibility to electricity networks because they are able to import power when national supply outstrips demand, and export power when demand outstrips supply. BESS are also able to provide Ancillary (Balancing) Services.

5.11.39 Typically, BESS (as opposed to other forms of storage, e.g. pumped hydro, or in the future hydrogen) are used to balance supply and demand over short time periods (e.g. milliseconds to days). BESS may import energy at times of low demand (e.g. overnight) or high supply (e.g. the middle of a sunny day, or when wind generation is high) and release that energy when demand is high.

5.11.40 In the UK, demand currently tends to be higher in the morning (e.g. 07:00 to 09:00) and in the early evening (e.g. 17:00 to 19:00) than it is at other times of the day, although it is conceivable that the daily shape of national demand will trend towards the daily shape of national supply through the implementation of smart meters, time of use tariffs, electric heating and transport needs in domestic and commercial properties.

5.11.41 Ancillary (Balancing) Services are procured by NESO and under these contracts, operators respond to NESO’s requests to import or export power. Ancillary (Balancing) Services are important because supply of and demand for electricity must be matched at all times, and the electricity system needs to be kept in balance and within statutory control parameters. Ancillary (Balancing) Services are used by NESO to do this and the need for Ancillary (Balancing) Services is projected to increase as the capacity of intermittent renewable generation on the UK’s electricity system increases.

5.11.42 **Section 6.9** describes the potential contributions made by a storage asset as part of the Scheme to the GB electricity market. This includes the role of the storage asset in supporting the operation of the solar asset by directing energy from times when generation is in abundance to times when it is needed. The storage asset would also be able to provide ancillary services which support the operation of the solar asset as part of a decarbonised GB electricity system and help to mitigate the impact arising from an increasing portion of the UK's electricity being supplied from intermittent renewable sources. Further explanation of the associated nature of the storage development is included in the **Planning Statement [EN010168/APP/7.2]**.

5.11.43 **Table 2**: describes on each row the different types of service, or commercial application, available to BESS. The second column provides an explanation of the service. The third column addresses the applicability of each service to either solar, storage or both (whether co-located or not).

5.11.44 The fourth column describes whether the service is an Ancillary Service, procured by NGESO for the proper functioning of the electricity system or has other purposes which help 'keep the lights on' but are not those services specifically described by the NIC as those which "support renewables and maintain the security of the electricity system" [(Ref 70), p6].

5.11.45 The fifth column describes whether in providing each Ancillary Service (as categorised in the fourth column), a co-located solar and BESS development would import, export, or both, power from/to the NETS.

5.11.46 BESS are needed to provide these services, because the assets which currently provide these services, being thermal (coal or CCGT) power stations, are either closing to reduce emissions associated with electricity generation to achieve net zero, or are expected to run less and less in the future as renewable energy sources grow, and the majority of these services can only be delivered by power stations which are already operating:

"Rapid progress will need to be made to ensure that the electricity system can be operated securely and cost effectively using zero carbon ancillary services…

NESO will continue developing short and medium-term balancing service markets, in order to help deliver a cost-efficient system: NESO's Roadmap outlines measures to enhance utilisation of batteries in providing flexibility services" [(Ref 4), p89].

Table 2: Storage asset operation in the GB electricity market

(Author Analysis)

Service	Explanation	Applicability	Service Type	Connection
Trading	Forward balancing of anticipated energy supply with energy demand	Solar assets generate energy. Storage helps by directing energy from when it is produced to when it is needed. Storage can be co-located with solar assets or developed independently	Other	
Balancing Mechanism	Being available to NGESO to balance supply and demand at delivery	Solar will provide downward flexibility, if needed, but at the 'cost' of low carbon energy unless that energy is instead stored. Co-located RES and storage can provide both upward and downward flexibility, and operating storage in support of a RES asset avoids the loss of any low carbon energy generated by that asset. Stored energy can be dispatched over milliseconds to days, depending on technology and need	Other	
Frequency Response / Dynamic Services	Changing output over seconds / minutes to help maintain national system frequency at the statutory level of 50Hz		Ancillary	Both
Reserve Operation	Changing output over minutes / hours to re-balance supply and demand following a fault or other event on the electricity system			
Reactive Power	Locational service which supports the 'flow' of power from source to destination	A mandatory service for all transmission-connected assets, delivered by solar, other RES and storage assets	Ancillary	Export
Inertia	Helps to slow the rate of change of the electricity system in response to an unforeseen event, stopping faults from escalating	Solar inverters are able to provide synthetic inertia. Storage also provides synthetic inertia	Ancillary	Both
Black Start	A locational service which would help 'turn back on the lights' if the national electricity system failed	Solar is unlikely to provide Black Start on a stand-alone basis. Stand-alone storage may be capable of providing limited Black Start support. A co-located asset is likely to be able to be more useful	Ancillary	Both
Constraint Management	Changing output in response to local energy supply, demand and transmission conditions, to ensure locational adequacy at all timescales	Solar can provide downward constraint management services. Co-locating solar and storage can allow for the provision of upward and downward constraint services	Ancillary	Both
Infrastructure	By connecting generation assets where they are needed and where infrastructure already exists, less new electricity transmission and distribution infrastructure needs to be delivered	RES and storage can help with reducing new infrastructure requirements, and sharing connection points by co-locating assets means that, ultimately, less connection points will be needed	Other	

5.11.47 Under an Ancillary (Balancing) Services contract, thermal plant would provide positive regulation (i.e. are ready to increase their output) by operating at a low level of power which can then be increased in very short order following instruction from NESO. Thermal assets which are already operating at higher levels of power are able to provide negative regulation (i.e. are ready to decrease their output) in a similar way by turning their output down following instruction from NESO.

5.11.48 BESS will be able to provide both upward and downward regulation by ensuring that they are entering their contracted period with a 50% State of Charge (SoC). This allows the BESS to import energy under instruction and store it until it is full (i.e. SoC reaches 100%), or export energy until it is empty (i.e. SoC reaches 0%).

5.11.49 **Table 2**: shows how the provision of many services requires both an import and an export connection, which allows for the upward and downward regulation as previously described.

5.11.50 Not all grid connections have available import capacity, so it follows that where export and import capacity is available at a particular grid connection point, BESS should be considered and assessed. If those available connections are not used, it is possible that storage will not be able to come forward to the capacity and timings required to support the full integration of low carbon power into the UK electricity system because new connection points will be needed to connect the scale of storage foreseen as necessary by NGESO.

5.11.51 A co-located BESS is foreseen to undertake the following five types of operation during its operational life:

- Importing from the co-located solar facility when local solar generation is high but national generation is higher than national demand;
- Exporting to the grid when co-located solar generation is low but national demand is higher than national generation;
- Importing from the grid when national demand is low but national generation is high;
- Exporting to the grid when national generation is low but national demand is high; and
- Importing or exporting from the grid under an Ancillary (Balancing) Service contract instruction from NESO.

5.11.52 BESS will operate in the electricity market in response to a market need. Market need manifests as a differential in market price at different times, driving the BESS to import or export accordingly. A greater market need will drive a greater price differential. Electricity is bought and sold ahead of time (based on operational forecasts of supply and demand, see following) and also by NESO much closer to (or at) delivery. Buying or selling ahead of time is called trading and commitments are then delivered through BESS operations, as is illustrated in **Section 6.9** of this Statement. Any other operation at delivery will be under an Ancillary (Balancing) Services contract arrangement.

BESS operational parameters

5.11.53 Two important operational parameters which describe the size of a BESS are its power capacity and its energy capacity. It has already been stated that the size of the import connection secured by connection agreement with NESO at the point of connection is an important input into the maximum power capacity of the BESS proposed at a facility.

5.11.54 The following examples describe how the Operational parameters for the size of the BESS are related to each other, using as an illustration, a 100MW, 200MWh Li-Ion system.

5.11.55 Power capacity is measured in megawatts (MW) and describes the maximum instantaneous level of power export or import achievable by the BESS. This is analogous to the power capacity of a conventional generator.

5.11.56 Energy capacity describes how much energy the BESS can store. Energy equals power multiplied by time. Energy capacity is measured in megawatt hours (MWh) and can be described as MWh, simply hours, or by a C-rate.

5.11.57 For clarity, energy capacity does not relate to how long energy can be stored for (elapsed time between charge and discharge) although different technologies may have different technical or commercial factors which provide a practical limit to that elapsed time.

5.11.58 A BESS with 100MW power capacity would, at any specific moment, be able to import, or export (but not at the same time) up to 100MW of electrical power.

5.11.59 If that BESS was able to store enough energy to export at full capacity for one hour, it would have an energy capacity of 100MWh (100MW x 1h).

5.11.60 A BESS with two hours of energy capacity would be able to store 200MWh (100MW x 2h). This energy could be exported to grid at its maximum power rate (100MW) for two hours.

5.11.61 Once fully depleted (i.e. all stored energy has been exported from the BESS), the BESS would take two hours at full import power rate (also 100MW) to reach a full state of charge. The SoC can be measured as an absolute number (e.g. when full, the SoC in this example would be 200MWh) or as a percentage of the energy capacity of the BESS (e.g. when full, the SoC would be 100%).

5.11.62 The battery C-rate describes the ratio of the power capacity and energy capacity, and the C-rate is the inverse of the number of hours required fully to charge the BESS from empty to full. This example describes a 0.5C BESS which takes at least two hours to discharge all of its energy from full (100% SoC) to empty (0% SoC).

5.11.63 In reality, BESS are not normally operated across the full 0% - 100% range of SoC, instead cycling across 80% to 90% of that range (i.e. from c.10% SoC to c.90% SoC) to preserve battery cell life. Neither are BESS 100% efficient, and a Round Trip Efficiency (RTE) measure describes the percentage of energy which has been imported to the BESS is then available for export. A current typical RTE value is 88%.

5.11.64 **Section 6.9** of this Statement shows how a co-located Solar and BESS scheme may operate and how the BESS may support the solar facility as well as fulfil additional functions to support high-RES electricity system operation in the UK energy market. In the examples given in that section, to simplify the explanation given on how BESS may operate, both round trip efficiency and the operational range of state of charge have been ignored.

5.11.65 **Section 9.2** of this Statement describes the commercial operation of the UK's electricity market and how changing levels of forecast supply and demand may affect electricity price. In summary, if over some future period of time, the national supply of electricity is expected to be higher than the national demand for electricity, then market price will be low. If national demand is forecast to be higher than supply over a different period of time, then market price will be higher.

5.11.66 A BESS which imports during lower price periods and exports that power during higher price periods will therefore help balance supply and demand in both periods.

5.11.67 Once charged, a lithium-ion BESS is able to hold its charge without significant depletion (charge leakage) for periods of days, meaning that BESS are able to import energy one day and export it the next.

5.11.68 In practice however, lithium-ion BESS are anticipated to provide short term balancing and electricity market operations and the long-term storage of imported energy in the BESS is not currently foreseen as a normal mode of operation for any lithium-ion BESS co-located with a solar facility.

5.11.69 Evidence on possible modes of operation of a co-located solar and BESS scheme are included at **Section 6.9**.

5.12 Conclusions on clean electricity supplies

5.12.1 This Statement of Need aligns with NPS EN-1 and concludes that many low carbon generating technologies are urgently needed to meet the government's energy objectives by:

- Providing security of supply;

- Providing an affordable, reliable system (through the deployment of technologies with complementary characteristics); and
- Ensuring the system is net zero consistent.

5.12.2 The government's Clean Power 2030 Action Plan sets out capacity ranges for key technologies for 2030 and 2035. The capacity ranges create a framework to help increase the pace of delivery of schemes which are more ready to be developed and can be connected to the grid in those timeframes. However, the capacity ranges do not constitute a government pathway [(Ref 4), Connections Reform Annex, p5] and therefore should not be interpreted as a cap or ceiling on the requirement for low carbon electricity generation capacity.

5.12.3 This Statement of Need describes progress made in the development of as yet unproven, unconsented, or unfunded schemes or schemes with long or uncertain development timelines.

5.12.4 Yet, to address the ongoing climate emergency, it is critical that the UK urgently develops a large capacity of low carbon generation.

5.12.5 The evidence shows that there are many significant uncertainties associated with the development of such schemes, particularly in relation to the timeframes in which material contributions to decarbonisation and security of supply must be made. Put plainly, such schemes cannot yet be relied upon to contribute to the delivery of net zero and many simply will not be ready to contribute in a meaningful way to decarbonisation before the 2030s. Achieving meaningful progress in decarbonisation during the 2020s is of critical importance in the fight against climate change.

5.12.6 The evidence therefore points to the development of proven technologies such as large scale solar as necessary to mitigate against the potential for non-delivery of other technologies. Such schemes should be brought forwards with urgency to make tangible and essential advances in decarbonisation in the near term.

5.12.7 The government's current policy of developing market-led frameworks to support the development of low carbon generation from diverse sources of energy remains important. Such schemes have the potential to complement the UK's growing renewable generation capacity to bring decarbonisation and security of supply benefits forward before 2030 and beyond into the next decade.

5.12.8 However, although an actual, potential, or aspirational pipeline for longer term low carbon generation schemes presents additional opportunity for future decarbonisation, that pipeline cannot legitimately be used as an argument against the consent and development of the Scheme, because that pipeline is not guaranteed to deliver.

5.12.9 The IPCC has stressed the importance of urgent action to decarbonise electricity generation, and the CCC have reported that the UK needs to commission more low carbon generation, and more quickly, to meet its net zero obligations.

5.12.10 The prompt development and deployment of proven technologies, such as solar, is a lower-risk pathway for delivering low carbon generation both now and for the longer term, than waiting for technologies which may not deliver.

5.12.11 This is consistent with the approach described in NPS EN-1 which articulates the prudence of planning infrastructure development on a conservative basis, including for scenarios in which the future use of hydrogen is limited [(Ref 1), Para 3.3.10].

5.12.12 Solar power generation has global momentum, and large-scale schemes are already being developed in GB. Solar is a proven technology. It is already delivering as part of the UK's electricity system and will continue to deliver further critical benefits to consumers through the urgent and continued decarbonisation, security of supply, and affordability because it is a beneficial, fundable, and deliverable technology.

5.12.13 Flexibility of supply is also necessary to maximise the use of renewables when there is an abundance of generation, and to fill the supply gaps in periods of shortfall. Storage capacity is needed to increase to support renewable electricity generation capacity growth. The Scheme seeks to bring forwards co-located storage facilities as associated development to the main (renewable generation) development.

5.12.14 The Scheme should therefore be recognised for the critical contribution it will make to the UK's journey to a net zero and secure energy system. Consenting the Scheme, such that it will be able to be constructed and operated as intended, will bring the UK closer to its required track through to meet its legally binding carbon emissions reduction targets. The delivery timing associated with current forward nuclear and CCUS projections strengthen this conclusion.

5.12.15 It is vital that the development of low carbon generation capacity occurs urgently in the near-term and also on an ongoing basis to facilitate wider necessary decarbonisation actions. It is important that schemes with long development timescales continue progressing their plans to achieve or sustain carbon reductions in decades to come.

5.12.16 Developments with the proven ability to achieve carbon savings comfortably within in the next decade are essential to keep the UK on its legally binding carbon reduction path.

5.12.17 An actual, potential, or aspirational pipeline for longer term low carbon generation schemes presents additional opportunity for future decarbonisation. However, the presence of such a pipeline cannot legitimately be used as an argument against the consent and development of the Scheme, which proposes to use proven technology and has short development timescales, thereby delivering dependable decarbonisation benefits.

5.12.18 The Scheme is a viable proposal, which, if consented, is currently planned to commission in the late 2020s. During operation, it will deliver significant carbon reduction benefits through the deployment of a proven, low-cost technology at a very suitable grid connection. As such, the Scheme possesses exactly those attributes identified as being required to deliver material carbon reductions in the UK electricity sector.

6 Technical considerations for UK solar schemes

6.1 Chapter summary

6.1.1 This chapter provides an overview of the characteristics of solar power and the delivery of large-scale projects.

6.2 Large-scale and small-scale generators

6.2.1 Generation assets can be 'centralised' (connecting to the NETS) or 'decentralised' (connecting to the distribution networks or 'behind the meter' in consumer premises).

6.2.2 Electricity transmission networks such as the network to which the Scheme will connect, operate at high voltages. High voltage operation reduces transmission losses and makes the bulk flow of energy over longer distances more efficient. Distribution networks operate at a lower voltage than the transmission networks and are located closer to points of final demand. A lower voltage connection means that generators that connect to distribution systems must be of a smaller capacity than those that connect to the NETS. Therefore, to connect the same total capacity of generators, more connections would be required at the distribution network level (at a potentially greater overall cost to consumers) than would be required directly into the NETS.

6.2.3 The NETS was designed to allow for the connection of large generating assets, but distribution networks were originally designed to transmit power to consumers. Distribution networks were not designed to connect significant capacities of electricity generation. Connecting generation assets of any meaningful size to distribution systems is becoming more difficult and more expensive (ultimately to the bill-payer). The Connections Action Plan includes an example of how distribution network constraints cause a significant delay to the installation of rooftop solar for an industrial consumer [(Ref 21), p79]. It is therefore not the case that the connection of renewable generation to the distribution networks is either quick, or cheap.

6.2.4 By virtue of their role in transferring power from the bulk NETS to businesses, built facilities and houses, many distribution networks are in built up areas, away from areas of large natural resource potential. Geographical and technical constraints may therefore arise as generators continue to be connected to these networks, applying upward pressure to the costs and durations required to grant a connection agreement. This may materialise as significant cost, timing, and complexity considerations both for asset developers as well as for consumers who ultimately pay for the developments and the operation of the complex distribution systems which result.

6.2.5 However, in 2024, 36% of all generation capacity was connected to the distribution networks. FES net zero pathways show that proportion decreasing until 2030, but thereafter increasing in some net zero pathways by 2050, up to 34% [(Ref 36)(2025), Table F.12].

6.2.6 The proportion of generation capacity in 2050 connected to the distribution networks in the 2020s has decreased year-on-year in NGESO's analyses since the UK's commitment to net zero by 2050 was made.

6.2.7 This reflects the increased and urgent need for renewable generation capacity to be developed, but with increasing complexity associated with connecting generation to distribution networks. An ongoing programme of work is seeking to increase the capacity of the NETS as affordably as possible (Ref 71).

6.2.8 The Clean Power 2030 Action Plan states that "Wherever renewables can connect to the distribution network, this should be encouraged for reasons of speed and efficiency" [(Ref 4), p63] but also that "Much of the generation capacity that will be deployed by 2030 is likely to come from large-scale, commercial energy infrastructure" [(Ref 4), p78].

6.2.9 FES 2025 net zero pathways more than triple the capacity of generation connected to the transmission network (2050 vs. 2024 capacity) to a total of between 248.4GW and 271.1GW. The capacity of generation connected to distribution networks is projected to increase by a factor of approximately 3 (2050 vs. 2024 capacity) to a smaller total of between 106GW and 130.3GW [(Ref 36)(2025), Table F.12].

6.2.10 A wholesale decentralisation of the UK's electricity system is not anticipated to occur before 2050. Even in NESO's most consumer-led FES pathway, the share of generation capacity connected to distribution networks rises to only 34%.

6.2.11 Decentralisation is not in itself a strategy or a requirement of the energy system but will go some way to delivering a flexible, low carbon, and affordable energy system. Distributed generation will contribute to meeting carbon emissions targets and improving energy security.

6.2.12 Whilst it is right to encourage local generation capacity growth, local generation alone will not replace the need for new large-scale electricity infrastructure to meet UK energy objectives [(Ref 1), Para 3.3.12].

6.2.13 Operating a mainly national electricity system (as current) will likely be more affordable than operating multiple distribution systems, connected by a 'light' transmission system.

6.2.14 By connecting more decentralised assets to distribution networks, less power will flow on the NETS and its unit cost of operation, which must be passed to consumers, will increase.

6.2.15 However, to ensure local as well as national adequacy of supply, the connection of more assets to distribution systems would also require either investment in power transfer capability between each separate distribution system and the

NETS, or a greater capacity of local low carbon generation on each distribution system to manage local peak power security of supply.

6.2.16 In contrast, a system with a high proportion of transmission-connected assets would offer “a number of economic and other benefits, such as more efficient bulk transfer of power and enabling surplus generation capacity in one area to be used to cover shortfalls elsewhere" [(Ref 1), Para 3.3.12].

6.2.17 Further, to accommodate more decentralised generation capacity, more investment will be required to reinforce distribution networks and provide more connection capacity.

6.2.18 Operating a primarily decentralised electricity system in the UK would also likely be significantly more complex than operating today’s primarily centralised system.

6.2.19 Electricity consumers, either directly or indirectly, through their energy bills, pay for all costs related to both transmission and distribution systems, including market inefficiencies, economic decision making, asset investments, balancing actions, and transmission and distribution system enhancements. Energy bills will rise if existing assets are underutilised and/or reinforcements are required on other systems.

6.2.20 The NETS remains an important measure to maintain interregional connectedness, support the meeting of national peak demand “reliably in all areas” from geographically disparate sources whatever the weather [(Ref 73), p182], and keep power flowing to consumers with the high levels of reliability consumers have come to expect and require.

6.2.21 The Applicant has accepted a Connection Offer from NESO to connect the Scheme to the NETS at the existing substation at Melksham. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Scheme will generate to both local consumers and across the country where it is required. This is a key benefit of the Scheme.

6.3 Large-scale, brownfield and rooftop solar

6.3.1 Decentralised solar may be installed on domestic or commercial rooftops or on brownfield land. In relation to brownfield locations, some may be suitable for solar deployment, but others will not.

6.3.2 Many decentralised sites may be unable to source a cost-effective and timely grid connection to support a stand-alone solar site. Distribution networks, which by 2024 were already straining with 41.1GW of distributed generation [(Ref 36)(2025), Table F.12], may also not be able to distribute the energy generated from new generators, even if connection points are found close to potential sites.

6.3.3 Many sites including brownfield sites and rooftops may simply not be suitable. They may be in areas of low solar irradiation, have unfavourable topography or be too small to develop effectively. Many brownfield sites, including those in more built-up areas, may be needed for other uses and may therefore already allocated in local plans for housing or commercial development. Others may have remediation issues which render sites unavailable for solar development given potential costs or liabilities associated with cleaning up after prior activities. Others may be located far away from existing grid infrastructure or refused planning consent.

6.3.4 Smaller decentralised and community energy schemes including on rooftops can make a valuable contribution to meeting on-site electricity demand for domestic and commercial users. NPS EN-1 [(Ref 1), Para 3.3.12] demonstrates government's view that such schemes are needed alongside, but not instead of, large-scale ground mount solar schemes. This is because the bulk generation potential of large-scale schemes and their connection to the NETS enables their benefits to be felt more widely.

6.3.5 In relation to roof space, larger commercial structures or buildings with shared roof space may have contractual issues relating to ownership, occupation, and upkeep which must be resolved prior to any solar development, or may not be resolvable in a timely and efficient way. Any roof space sloping to the north will be unsuitable for solar panels. Smaller buildings, listed buildings or those with period features are also unlikely to be suitable.

6.3.6 Other locations may be suitable from an engineering perspective but may be overshadowed by nearby taller structures or natural features which could significantly impact irradiation and output, and therefore yield and benefit. Shaded homes in built up areas may be a prime example.

6.3.7 Other roof space may need to be reinforced to accommodate the additional loading associated with solar infrastructure, all of which will add to installation costs for homes and businesses.

6.3.8 **Section 9.3** provides more information on the economics of solar power, and demonstrates that it is already among the cheapest forms of generation over its lifetime. However, the installation costs of small scale solar are significantly higher than that of large-scale solar on a £/kW (installed capacity) basis.

6.3.9 Very small installations, such as those on domestic roof spaces, may not be large enough to make solar installation viable once the 'fixed' costs of installation (e.g. design, scaffolding, cabling, and commissioning) have been accounted for. This is important because it is for bill payers to pay for the installation of small-scale generation at their properties, and installation costs for small-scale solar have increased both on an absolute scale and in relation to governmental estimates for the installation costs of large scale solar.

6.3.10 **Figure 15** of this Statement shows cost information relating to the installation of domestic solar panels from the government's Microgeneration Certification Scheme (MCS) (Ref 74), benchmarked against the capital cost range for small scale (domestic) solar PV and large-scale solar from the government's Cost of Electricity Generation report [(Ref 75)(2023)]. Capital cost includes development, construction, and infrastructure costs where appropriate.

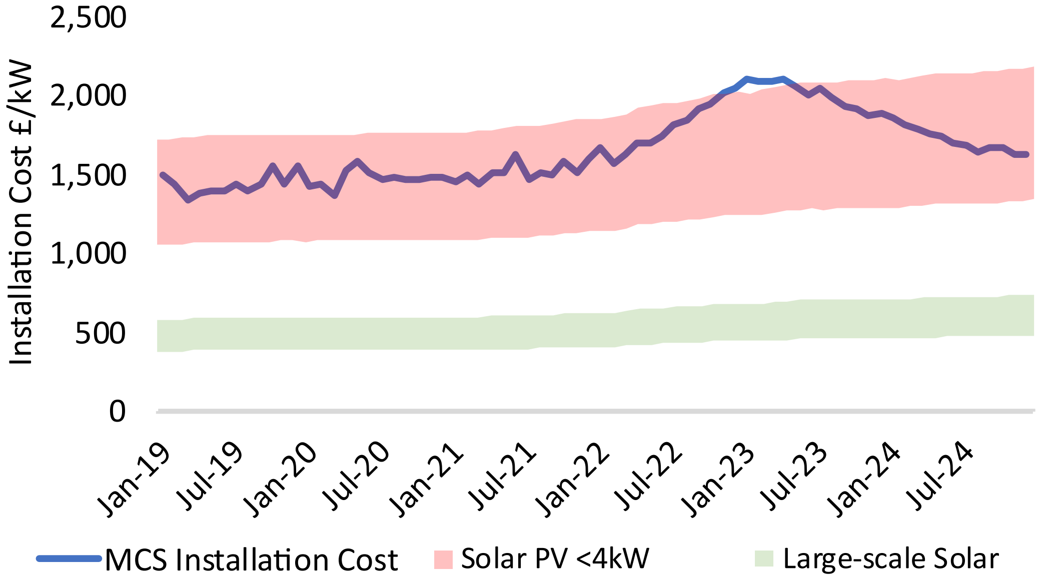

Figure 15: Reported and estimated small-scale and large-scale solar capital costs

(£/kW) (Ref 74, Ref 75)

6.3.11 The data shows that small scale solar (shown by the red area) to be two to four times more expensive to install than large scale solar (shown by the green area). During the period 2019 to 2021 inclusive, MCS data shows that actual installation costs were comfortably within the governmental estimated range. However, in mid-2022 installation costs rose to above the top of that range.

6.3.12 The reported installation cost for small schemes started to reduce again from a peak in early 2023 back into the government's range, but it remains significantly higher than government's range for large-scale solar.

6.3.13 Many home or business owners may not have the capital reserves to pay for the installation of solar panels on their roof areas and others may not want them. Since the wind-down of the Feed in Tariff scheme, which was introduced on 1 April 2010 but closed to new applicants from 1 April 2019, previous governments have been silent on measures to support domestic and small commercial solar installations, other than the removal of VAT from installation costs.

6.3.14 The implication of these factors is that the real potential for decentralised solar in the UK is likely to be much lower than any gross potential identified when the suitability, availability, practicality, and economics of such developments are taken into account.

6.3.15 Further, the installation of many thousands of separate small systems is likely to take longer than the installation of a smaller number of larger ground-mount systems to achieve the same capacity. This is an important point in relation to the required urgency for solar generation.

6.3.16 Data from the government's MCS scheme shows that the rate of small-scale installations increased near the end of 2022. The average installation rate from October 2022 to December 2024 inclusive was 77MW per month. The average installation rate from January 2019 to September 2022 was just 23MW per month [(Ref 74), Author Analysis].

6.3.17 To achieve the top end of the government's capacity range of 45GW to 69GW of operational solar by 2035 [(Ref 4), Connections Reform Annex, Table 1] through microgeneration schemes alone, installation rates would need to increase by a factor of more than six, from their already record current level. This increase would need to start immediately and be maintained throughout the next 11 years.

6.3.18 Installation rates would need to reach and sustain an even higher level to meet the top of government's capacity range of 45GW to 47GW of solar by 2030 [(Ref 4), Connections Reform Annex, Table 1] from microgeneration alone.

6.3.19 Therefore, it would not be feasible to reach the government's solar capacity ranges through only solar and small-scale schemes. Therefore, large-scale solar schemes are also required in order to achieve net zero.

6.3.20 Decentralised generation has an important role to play in decarbonisation, however on its own, smaller scale solar, including rooftop solar, is not likely to deliver a sufficient total capacity at the required pace and at an affordable cost to meet the government's targets.

6.3.21 This information shows that smaller scale solar, including rooftop solar, must be considered as additional to, as opposed to instead of, the need for large-scale solar.

6.3.22 The government has clarified that its capacity ranges for solar do not seek to prioritise or constrain rooftop solar deployment and are applicable to schemes of over 1MW in England and Wales. The threshold in Scotland is lower [(Ref 4), Connections Reform Annex, p5 & Table 1, Footnote 10].

6.4 Site selection for large scale solar

6.4.1 This section sets out, in general terms, the assessment process for sites for large-scale solar generation in the UK. Scheme-specific site selection is set out in the **ES Volume 3, Appendix 4-1 Site Selection Assessment Report [EN010168/APP/6.3]**.

6.4.2 Suitable sites will be:

- Capable of delivering to the required scale (in relation to the need for the scheme);
- Technically and environmentally feasible within the stated timeframes, including grid connection; and
- Commercially attractive to the developer.

6.4.3 Site selection utilises a staged approach to identifying possible suitable locations. Because of the required urgency of low carbon development in the UK, locations which are more likely to be able to meet the intended aims of the project, including timescales for delivery, may be assessed as more suitable than locations which are less likely to proceed, or to later timescales, due to technical, commercial, or other reasons.

6.4.4 Solar developments require three fundamental technical attributes, and these are an important input to site selection. These attributes (which are consistent with NPS EN-3 [(Ref 2), Paras 2.10.18 to 2.10.48]) are:

- The existence and availability of sufficient land to deliver to the project to meet the scale set out in the scheme's aims;
- The availability of a suitably placed point of connection to the NETS and/or local Distribution Network; and
- Solar irradiation levels which support the potential for the development to produce an energy yield which is both useful and economic.

6.4.5 Other attributes will also apply later in the site selection process, for example those environmental attributes described in NPS EN-3 paragraphs 2.10.27 to 2.10.48 and the potential for environmental impacts as described in NPS EN-3 paragraphs 2.10.73 to 1.10.126. However, a site which does not possess all three fundamental attributes is less likely to be a suitable location for large-scale solar generation than a site which does possess these attributes.

6.4.6 The UK's approach to the energy sector provides that "It is for industry to propose new energy infrastructure projects that they assess to be viable within the strategic framework set by government" [(Ref 1), Para 3.2.3]. It is important therefore to acknowledge that an individual developer's approach to site selection may not be rigid and inflexible but instead may be sensitive to local variability and indeed developer approach. Developers may therefore weigh the importance of one or more criteria in their site selection approach differently for different schemes to accommodate and incorporate the needs and benefits of different geographies and local characteristics.

6.4.7 The site selection process also considers other factors which will not be a simple pass/fail for taking forward a site for development, but sites which are environmentally, technically, operationally, and commercially suitable will likely score favourably on a majority of important characteristics.

6.4.8 For example, adjoining land parcels may be both suitable and available for development, resulting in an increased density of solar deployment and an environmental footprint over a more focussed area of the countryside. Other proposals may consider separate land parcels which do not border each other but instead combine to an integrated scheme which is more dispersed within a countryside setting.

6.4.9 Further, the connection of separate parcels of suitable land together into a single scheme may, subject to analysis, enable those parcels of land to connect economically to the electricity system, whereas if developed as stand-alone schemes they may not be able to carry the associated costs of connection and therefore may never be developed.

6.4.10 Large-scale solar schemes, because of their scale and the area of land required for their development, are more likely to be sited in more rural areas of the country. In order to enhance the energy delivered from the installed capacity, schemes are also more likely to be sited in areas of higher solar irradiation levels.

6.4.11 **Figure 16** shows a map of PV power potential in the UK. Areas of higher irradiance are identified by colours towards the red end of the spectrum, while areas of lower irradiance are towards the blue end of the colour spectrum.

6.4.12 The approximate location of the Scheme is shown in **Figure 16** by the green circle.

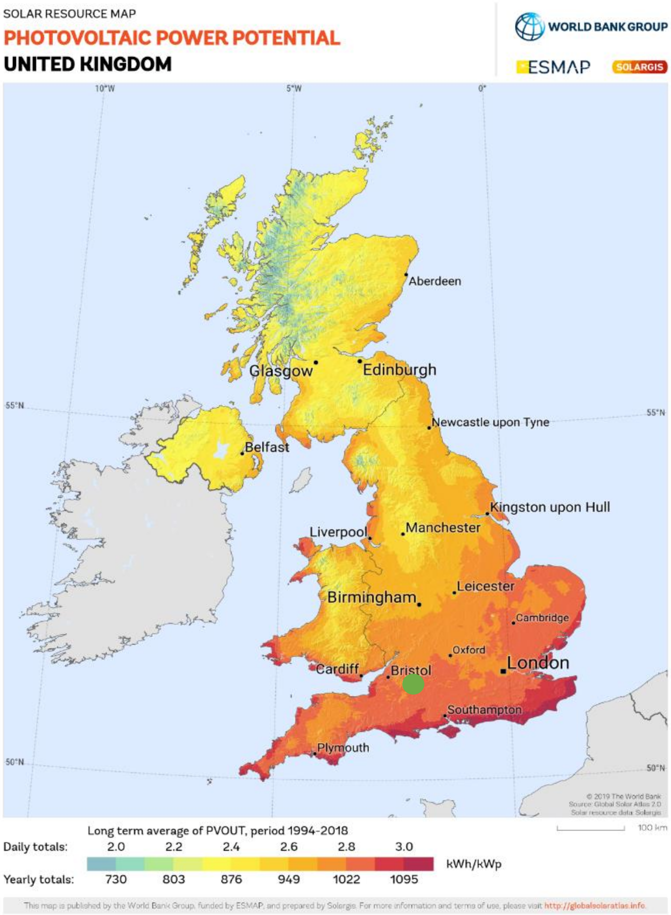

Figure 16: UK solar irradiation

(Ref 76)

6.4.13 The government's Digest of UK Energy Statistics (DUKES) [(Ref 35), Table 6.2] shows that the installed capacity of solar generation in the UK rose above 10GW in 2016.

6.4.14 The load factor of a generation scheme or technology is a measure of the annual generation per unit of installed capacity. It is generally reported either as a percentage or as energy per unit capacity. Load factors can be historical, or future projections.

6.4.15 The average load factor of the UK's aggregated solar generation assets since 2016 is 10.4%. This means that, on average UK solar has generated 911kWh/kW(p) (911 = 10.4% x 8,760 hours per year). The lowest annual achieved load factor was 9.9% (867kWh/kWp) in 2021, and the highest was 11.1% (972kWh/kWp) in 2018. On the scale in **Figure 16**, the UK's average load factor of 10.4% lies between the yellow to the right of 876kWh/Yr/kWp and the darker yellow to the left of 949kWh/Yr/kWp.

6.4.16 Early experience in panel efficiency, system efficiency, site layout, and scale effects may mean that the load factor of existing solar in the UK is not as high as it would be if all existing solar facilities were re-powered with panels of a current specification and technical performance. However, from **Figure 16** it can be seen that any solar facility developed to the east of a line between Aberdeen to Manchester, and south of Manchester, could be expected to experience a higher load factor than the current UK average.

6.4.17 However, there may be reasons that developers bring forward schemes for consent which lie to the north and the west of those lines as they may also be beneficial to decarbonisation and energy security aims.

6.4.18 **Figure 16** shows that the solar resource at the Scheme's location is higher than the UK average.

6.4.19 Large-scale solar schemes are expected to connect to the NETS. The NETS is an existing national infrastructure asset which is designed specifically for the bulk transmission of energy from its point of generation to consumers both nationally and locally, through existing connections between the NETS and the local distribution grid.

6.4.20 NPS EN-3 states that:

"The capacity of the local grid network to accept the likely output from a proposed solar farm is critical to the technical and commercial feasibility of a development proposal" [(Ref 2), Para 2.10.22].

"Larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure" [(Ref 2), Para 2.10.23].

"To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure or biodiversity and reduce overall costs applicants may choose a site based on nearby available grid export capacity" [(Ref 2), Para 2.10.25].

6.4.21 To enhance the overall benefit of the scheme in terms of environmental impact, efficiency, and timeframes for connection, schemes may elect to make use of existing and available points of connection to the NETS insofar as such connection points exist, in preference to building new connections or increasing the available connection capacity at existing locations.

6.4.22 However, this is not always possible and new substations will be needed to facilitate the connection of schemes which are not located near existing substations. Such instances have already occurred for offshore wind.

6.4.23 **Figure 17** shows data from NGET's online ConnectNow Research Assistant (Ref 77). The tool is a useful but sombre reflection of the challenge faced by the UK to bring new large-scale generation developments online in timelines which will support the urgent need for decarbonisation and energy security in the UK.

6.4.24 Each numbered circle on the map shows the number of connection points in that broad geography, and the colour represents NGET's view (dated March 2025, frozen for Connections Reform) of when a new connection might be achieved at each of those locations. The map shows that connecting any new assets (i.e. those which have not already secured a connection agreement with NESO) to the NETS before 2032, is not currently possible.

6.4.25 It is important to recognise therefore, and as evidenced by the data shown in **Figure 17**, that connection to the electricity network, which is an essential element of project development, is currently a constraint to many schemes which are coming forwards.

6.4.26 This issue has also been acknowledged by Ofgem who in May 2023 issued an open letter launching a policy review on reforming the electricity connections system (Ref 78) by NGESO, who are now (as NESO) working with the industry to undertake a review of the connections queue (Ref 79), and by the then government which published, in November 2023, a Connections Action Plan which explains these sets of actions and how together they will work towards delivering quicker connections for low carbon generation assets (Ref 21).

6.4.27 The UK will therefore need largely to look to those schemes which already have connection agreements to deliver the low carbon capacity required to support the delivery of net zero and energy security aims until the mid-2030s. Indeed, NESO paused connection applications received after 29 January 2025 to "enable resources to be dedicated to delivery of connections reforms at pace across 2025" (Ref 80).

6.4.28 Existing substations and existing transmission cables with spare transmission capacity, provide the opportunity to repurpose existing, therefore largely sunk-cost, infrastructure to connect new schemes to the NETS earlier than would be possible at entirely new connections.

6.4.29 The utilisation of existing and available infrastructure to meet the urgent need for new large-scale solar generation is an important factor in the site selection for the Scheme. The existing Melksham 400kV substation has available grid connection capacity which the Scheme has contracted to use. Further, the Melksham substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Scheme will generate to consumers nationally as well as into local distribution networks.

6.4.30 Therefore, the Scheme will make efficient use of existing infrastructure and this a key benefit of the Scheme within the context of the significant national need for new electricity networks infrastructure. The Scheme is also located away from areas of the NETS which are currently experiencing flow constraints and generation curtailment, as described in **Section 8.4** of this Statement. This is a key benefit of the Scheme's proposed location.

6.4.31 Further, in light of the urgent need to decarbonise the electricity system and the current lack of available connection points for low carbon generation assets, developers may make use of different ways of maximising the generation potential from available and accessible land resource through any limited yet available grid connection capacity the project has secured.

6.4.32 Large scale solar schemes must connect to the grid via high voltage electrical cables. Locating solar schemes close to grid connection points will reduce electrical losses (which rise in proportion to cable length) and may also result in a scheme with a lower environmental footprint than a scheme located further away from the point of connection, which would have longer cable routes.

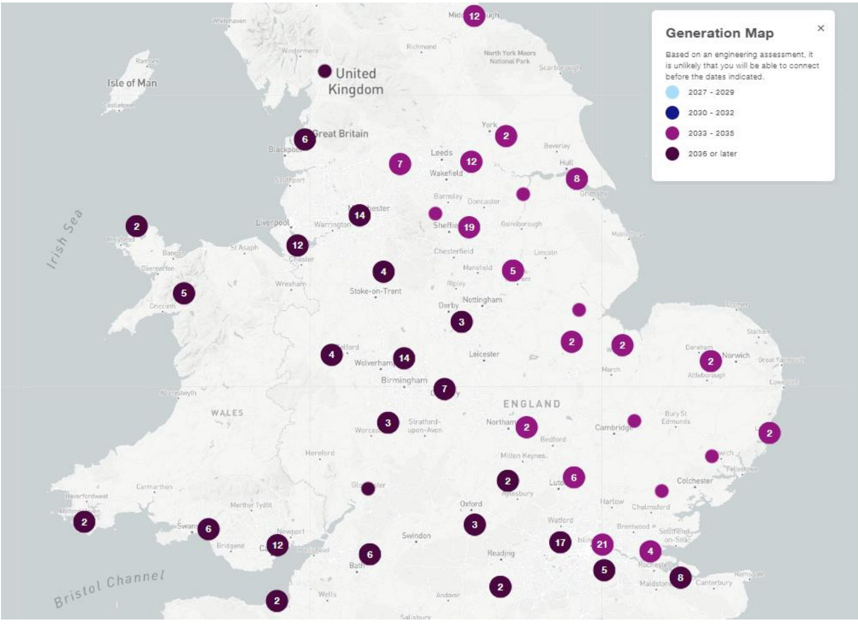

Figure 17: Transmission system connection points and potential connection dates

(Ref 77)

6.4.33 The location and capacity of an available point of grid connection is therefore a firm driver for site selection for large-scale solar schemes. However, due to the finite number of existing substations, and the smaller number of those substations with available capacity, it is also anticipated that:

- New grid substations may be needed to connect the anticipated capacity of solar required to meet net zero; and
- Sites may be located at greater distances from existing grid substations than previous developments.

6.4.34 The number of locations in the UK which satisfy all three core site selection requirements (land availability and suitability, feasible irradiation levels, and grid connection availability) is limited. For example, high population density and a large extent of land subject to planning or environmental designations limits opportunities for large-scale solar development in the south-east of England (where **Figure 16** shows that irradiation is highest), and the need for proximity to existing and available grid connection capacity limits opportunities in the south-west and East Anglia (where **Figure 16** shows that irradiation is also high).

6.4.35 It should therefore not be expected that large-scale solar is located only where irradiation is highest in GB, nor only where suitable land is available, nor only in close proximity to existing grid substations with available capacity. Developments will be proposed in locations with the blend of characteristics which is assessed as suitable for each scheme, and each scheme may have unique features which are particular to its proposed location.

6.4.36 Further evidence supporting the suitability of the location of the Scheme is included in **Chapter 7** and further information on site selection for the Scheme can be found in **ES Volume 1, Chapter 4: Alternatives and Design Evolution [EN010168/APP/6.1]**.

6.5 Technology selection / orientation

6.5.1 NPS EN-3 provides guidance that, along with associated infrastructure, a solar farm typically requires between 2 to 4 acres for each MW of output [(Ref 2), Para 2.10.17].

6.5.2 There are currently three main configurations of solar panel used in the UK; each has different physical and operational characteristics:

- Fixed South Facing (FSF) panels are installed in rows stretching from east to west, with the receiver side of the panel facing south. The panels will be fixed on frames at an angle to the ground (dependent on latitude and ground slope) which will have been optimised prior to installation;
- Single Axis Trackers (SAT) are installed in rows stretching from north to south. A single table of panels rotates about the north-south axis so that the panel is perpendicular to the incident irradiation from the sun for as long as possible; and
- East-West (E-W) panels are installed in rows stretching from north to south, with panels facing both east and west and an apex between them. As with FSF, the panels will be fixed on frames at a set (immovable) angle to the ground.

6.5.3 Panels may be orientated vertically (portrait) or horizontally (landscape) and may be mounted with one or more above (or next to) the first.

6.5.4 Different configurations have different benefits and disbenefits, and some configurations may be better suited to some locations than others.

6.5.5 As the sun tracks through the sky, both throughout each day and throughout the year, the inbound irradiation on the panels will vary and frames, axes and panels will be oriented to best optimise irradiation at that location, for that configuration, across the year.

6.5.6 A characteristic which is common to all three configurations is the potential for there to be a shadowing effect of one panel on another panel from time to time. Site designers will seek to optimise output given the specific location, the available land, and a known grid connection capacity and this will include reducing panel-on-panel shadowing effects where possible.

6.5.7 For example, latitude will impact on the effects of shadowing and site-specific mitigations for all layouts, but especially so for FSF schemes. At higher latitudes, rows of FSF panels on flat land may be spaced further apart to reduce shadowing effects, while at lower latitudes spacing on flat land may not be as large. This is because the sun tracks lower in the sky when seen from higher latitude locations, casting longer shadows.

6.5.8 Spacing FSF panels further apart increases the ratio of acres per MW for the installation but also increases the expected generation from each of the panels and therefore has the potential to increase the ratio of energy generated over capacity installed (MWh / MW(p) / Year) for a scheme.

6.5.9 A similar analysis can be carried out for SAT and E-W configurations. However, it should be noted that generally:

- SAT requires more land per MW(p) but has the potential to generate more MWh/MW(p) than FSF; and
- FSF requires more land per MW(p) but has the potential to generate more MWh/MW(p) than E-W.

6.5.10 Other local characteristics such as location and land topography may determine which configuration or combination of configurations delivers the greatest benefit in terms of annual MWh generation from a project while considering the land area used, cost of installation and ongoing cost of operation and maintenance of specific developments.

6.5.11 The Applicant's **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]** describes that the Applicant is bringing forward a scheme which optimises use of the available grid connection capacity from the suitable land available to the scheme through the installation of panels in a SAT orientation while retaining the flexibility to install FSF panels at the detailed design stage.

6.5.12 SAT is currently preferred for the Scheme because of its enhanced lifetime MWh generation potential at the proposed location, given appropriate layout parameters and local constraints, including the availability of suitable land.

6.6 Overplanting

6.6.1 This section describes key aspects of overplanting. The Applicant has included, at **Figure 8-15** of the **Environmental Statement**, an **Indicative Masterplan [EN010168/APP/6.2]** for the Scheme. The Masterplan indicates that the Scheme is coming forward without significant overplanting. The Applicant has responded to feedback received during the consultation process, particularly in line with the landscape-led design principle. This has reduced the land area upon which the Applicant proposes to install solar panels and limits overplanting for the Scheme.

6.6.2 However, the impacts of the Scheme have been assessed including the Applicant's reasonable assessment of the capacity deliverable at the scheme at the point of final design.

6.6.3 Although the Scheme does not propose significant overplanting, this Statement provides a brief explanation of what overplanting is, to provide further context to the references made to overplanting in the NPSs.

What is overplanting?

6.6.4 NPS EN-3 describes 'overplanting' as:

"The situation in which the installed generating capacity or nameplate capacity of the facility is larger than the generator's grid connection" [(Ref 2), Para 2.10.55, Footnote 92].

6.6.5 NPS EN-3 also sets out that reasonable overplanting at a scheme should be considered as acceptable in a planning context as long as it can be justified and its impacts have been assessed through the planning process on the basis of the full extent of the scheme including any overplanting [(Ref 2), Para 2.10.55, Footnote 92]. However, overplanting is not a requirement of a scheme.

6.6.6 Solar panels degrade as they age. As they do, the same irradiation levels may produce less energy year-on-year. Degradation is caused by physical processes relating to weather effects including the effects of light on the panels over time. Overplanting provides an opportunity to increase the quantity of valuable low carbon, zero-marginal cost MWh of electricity transmitted from a solar scheme to the grid over its lifetime.

6.6.7 Schemes which are overplanted generate more low carbon electricity than unitary schemes for the same grid connection capacity but will generally require panels to be installed on a greater land area. Therefore, overplanting strategies are primarily dependent on the availability of sufficient suitable land for installing solar panels. Overplanting is commercially rational on all types of schemes subject to the availability and suitability of a sufficient area of land for overplanting.

6.6.8 Overplanting is commercially rational for both standalone schemes and schemes which include co-located storage facilities, although the optimum extent of overplanting at each type of scheme (including those with or without co-located storage) is likely to be different.

6.6.9 Indeed (and further subject to the availability of land and selection of co-located storage technology, if applicable) different schemes may take different overplanting strategies.

6.6.10 However, there may also be rational reasons why a particular developer, at a particular location, does not pursue an overplanting strategy for their scheme.

6.6.11 It is possible that, at the application stage, applicants may not be sufficiently informed to commit to an overplanting strategy for their scheme. In these circumstances, at the detailed design phase (i.e. post-consent) the developer must judge the appropriate trade-offs to make to optimise a scheme at a specific location, subject to any requirements set out in the DCO. Some constraints may require judgement rather than pure quantitative analysis to resolve, and for that reason applicants often seek flexibility in their DCO application.

The benefits of overplanting

6.6.12 Overplanting increases the generation potential of a scheme through a fixed capacity network connection, including when the effects of panel degradation are considered. Overplanting implies that when irradiation is high and panels have not yet degraded, sites may be forced to self-curtail because, at those times, they will be generating more power than they are able to export. At these times, inverters will limit the amount of energy exported to the grid, and excess energy must be stored (see **Section 6.9**) if it is not to be lost. This is sometimes called clipping.

6.6.13 However, when irradiation is lower, such that panels are not generating to their maximum potential, an overplanted scheme will generate more than a scheme which is not overplanted. This is because at those times output will not be limited by the grid connection capacity. This is illustrated in **Figure 18**.

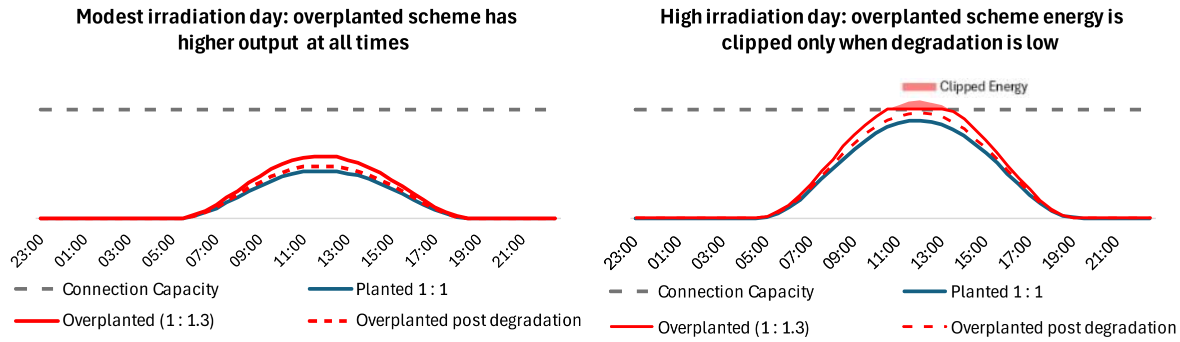

Figure 18: Clipped and optimised generation on overplanted vs. unitary solar schemes

(Author Analysis)

6.6.14 The blue line in **Figure 18** shows the output of a unitary (1:1) solar scheme and its grid connection capacity (grey dotted line) on a modest irradiation day (as shown by the left-hand graph) and on a high irradiation day (right-hand graph). Note that the term 'unitary' is here intended to describe any scheme where the total capacity of the panels installed (MW(p), in DC) equals the export capacity of the scheme (MW, in AC).

6.6.15 The red line on each graph shows the output of a solar scheme which is identical to the representative scheme, except that it has been overplanted (i.e. it has more panels, but no more grid capacity, than the unitary scheme).

6.6.16 On a modest irradiation day, no less energy is exported from the overplanted scheme than the unitary scheme on every hour, and no energy is clipped.

6.6.17 However, on a high-irradiation day, more energy is exported each hour from the overplanted scheme until the grid capacity limit is reached. At this time, the overplanted scheme is clipped. The output from the overplanted scheme therefore 'flatlines' at the grid connection capacity until incident irradiation reduces, causing the overall output of the scheme to reduce back below the grid export limit. Later on, more energy is exported each hour from the overplanted scheme than the unitary scheme until the sun sets.

6.6.18 As solar panels degrade, clipped energy volumes will reduce because the peak output from a degraded scheme is lower than the peak output from a scheme which has not yet degraded. Therefore, under the same irradiation conditions, the maximum generation from the degraded scheme would be lower than the maximum generation from the scheme before degradation.

6.6.19 In time, the maximum achievable generation from solar schemes may fall below the grid export limit. This case is illustrated by the red dotted lines in **Figure 18** which show overplanted schemes always export no less energy than unitary schemes.

6.6.20 Schemes which are overplanted therefore generate more low carbon electricity than unitary schemes for the same grid connection capacity but will generally require panels to be installed on a greater land area.

6.6.21 Degradation of solar panels may mean that panels need to be replaced during the operational life of solar schemes. Other than in instances of the premature failure of individual panels (which would likely be replaced under a warranted maintenance arrangement) panel replacement is likely to be guided by data gathered through monitoring panel performance throughout the life of the solar scheme. This may be carried out on a rolling or programmed basis subject to any parameters which defined the assessment of the solar scheme's impacts on the environment.

6.6.22 The extent to which a proposed location can be overplanted, if at all, cannot be determined in isolation. There is an intrinsic relationship between available land area, cable access routes, grid connection capacity, panel orientation, and local irradiation levels and overplanting which must be considered in the design of all developments in relation to optimising the benefits of the scheme, while respecting the planning balance. Further, local characteristics of a site, such as topography, archaeology, land, and other environmental factors which may influence the scope for overplanting.

6.6.23 Overplanting supports developers to increase the volume of low carbon energy transmitted to the grid over the lifetime of the scheme. However, there are limits to the benefits of overplanting because the level of overplanting determines the overall balance between clipped generation during times of high irradiation, and incremental generation at times of lower irradiation.

6.6.24 The output from any illustrative design may be based on different ways in which panels may be laid out within the parameters which define the extent of schemes, including an effective overplanting ratio where overplanting is achievable. The final design and layout will reflect the available technology (and overplanting ratio) arranged in accordance with the assessed parameters.

6.7 Land use associated with large-scale solar

6.7.1 NPS EN-3 indicates that along with associated infrastructure, a solar farm typically requires between 2 to 4 acres for each MW output [(Ref 2), Para 2.10.17]. Different configurations have different performance characteristics in terms of acres/MW(p). The illustrative design for the Scheme lies within that range. However, while MW(p) is an important measure in relation to the maximum power which can be generated from a scheme, it is not the only metric by which the decarbonisation and energy security benefits brought forwards by solar schemes can or should be measured.

6.7.2 Lifetime average annual generation is another metric which can be maximised to provide the greatest lifetime decarbonisation and energy security benefit from the scheme. For a given scheme, lifetime average annual generation depends upon any overplanting ratio while taking into account the potential shading effects of panels on each other.

6.7.3 In extremis, it is possible for two panels to be located sufficiently far away from each other for neither to ever be in the shade of the other. In contrast, moving one of those panels to be directly in front of the other, would not change the total installed capacity (two panels) but would halve the annual output because the second panel would always be shaded by the first. The in-extremis example would however use significantly more land area than the contrasting example.

6.7.4 In reality, optimising lifetime average annual output across a large array of solar panels while respecting a finite land area and a finite grid connection capacity requires iteration and judgement and is a non-trivial task.

6.7.5 The inclusion of co-located storage as part of a scheme may also change that scheme’s land-take ratios.

6.7.6 Large-scale solar schemes are also efficient in comparison to other technologies in terms of the energy they generate over their lifetime on a per unit area basis.

6.7.7 Solar technology can also generate more energy per hectare of land than other existing low carbon electricity generation technologies. For example, solar can generate between 25 and 50 times the energy output per unit area of growing crops for energy. By following good design principles, solar schemes can generate a similar amount of energy per hectare of land as onshore wind.

6.7.8 For example, a Guardian article (Ref 81) reported that 450ha of crop is required to provide fuel for a 1MW biogas plant, implying that a biogas plant may generate 20MWh per year per hectare of land used. A biogas plant which is fully available may therefore produce 2GWh/Yr/km2 of clean energy.

6.7.9 An academic study published in 2020 (Ref 82) indicates that the installed capacity density of onshore wind farms in Europe is 19.8 (6.2–46.9) MW/km2, which is equivalent to 0.2 (0.06-0.47) MW/ha.

6.7.10 Guidance on industry norms for onshore wind farm developments in the UK suggests that turbine towers should be placed between six and ten rotor diameters apart from each other in order to optimise the output of each turbine. This separation is sufficient to ensure that no turbine lies within the ‘wind shadow’ of any other turbine. In practice, however, turbine towers on UK wind farms tend to be spaced between three and five rotor diameters apart, consistent with the findings of the academic study (Ref 82).

6.7.11 By assuming an annual load factor of 35% for onshore wind it is possible to calculate that onshore wind may generate 61 (18–144) GWh/Yr/km2, a factor of thirty more useful low carbon energy than from biofuels.

6.7.12 NPS EN-3 states that UK solar typically uses between 0.8 (High density) and 1.6Ha (Low density) of land per MW of installed capacity [(Ref 2), Para 2.10.17] (equivalent to 2 to 4 acres, or 62.5–125 MW/km2). The illustrative design for the Scheme lies within that range.

6.7.13 By assuming a conservative annual load factor of 10% for solar (Author Analysis, see also **Table 4**], solar may generate 54–108 GWh/Yr/km2. At the midpoint of EN-3's typical capacity range, large-scale solar may generate 72 GWh/Yr/km2 which is higher than the average reported in the academic study (Ref 82).

6.7.14 Biogas will generate just a small percentage of the levels of the two renewable technologies from the same area of land, while for efficient designs, the expected annual generation output per hectare of land for solar and onshore wind will be of a similar magnitude.

6.7.15 This analysis demonstrates that large-scale ground-mount solar schemes, including those that are developed with a configuration which maximises annual output, are likely to produce a greater quantity of low carbon electricity per acre than the output from a crop-to-biogas application.

6.7.16 When compared to onshore wind, the energy production from land under solar is of a similar order of magnitude while the environmental effects of solar schemes may be felt over a significantly smaller geography.

6.8 Solar cell efficiency

6.8.1 It is important to differentiate between the efficiency of solar technology (which is a measure of how much of the energy contained in the sunlight incident on the panel is converted into electrical energy) and the load factor, as described in **Section 6.4**. Both influence the output of a scheme.

6.8.2 The load factor of a scheme is influenced by the proposed location, the installed capacity of panels and their orientation and layout. The efficiency of a scheme is influenced by panel selection, the physical properties of those panels, the properties of other electrical components which make up a scheme, and the electrical design of that scheme. In summary, the efficiency of a scheme is intrinsic to its design, whereas the load factor is dependent on location, incident sunlight, and panel orientation as well as the efficiency of the scheme.

6.8.3 Solar panels and electrical infrastructure have become larger and more efficient, as shown in **Figure 19**, meaning that more electricity can now be generated from the same area of panel, and the same area of land than was previously possible. As a consequence, solar is now, and is expected to remain, a leading low-cost generation technology.

6.8.4 Whilst they do not represent an independently sourced update to **Figure 19**, panel supplier product specification sheets can be used to assess the efficiency of currently available solar panels.

6.8.5 **Figure 19** shows that the efficiency of solar cell technology has increased over the last 40 years and that Crystalline-Si, Multi-Function, and Thin-Film technology cell efficiencies have increased broadly linearly.

6.8.6 A review by the author of 500W and larger solar panels commonly available on the open market in September 2024 found that they were advertised as being between 21% and 23% efficient and converted incident irradiation at a rate of 210 – 220W/m2 (Author Analysis).

6.8.7 For context only, over the period 2019 to 2022, coal generation in the UK achieved an average efficiency of 35.1% and the UK's CCGT achieved 48.6%. Both technologies emit CO_2 as a by-product of electricity generation (Ref 84, Author Analysis).

6.8.8 The same data reports nuclear efficiency of 39.9%; Hinkley Point C is expected to achieve 36-37%. Smaller gas-fired reciprocating engines achieve similar levels, but they too emit greenhouse gasses when they generate electricity. Wind turbines are 20-40% efficient at converting wind energy into electricity (Author Analysis).

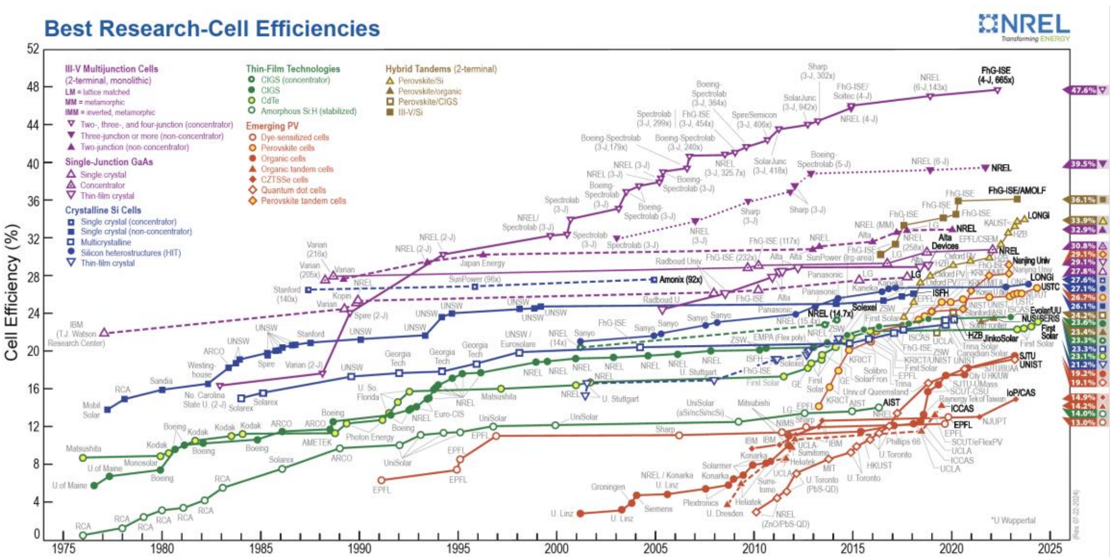

Figure 19: Evolution in solar cell efficiency 1975 - 2024

(Ref 83)

6.8.9 The efficiency of solar generation is towards the lower end of the scale of efficiencies for technologies commonly used to generate electricity in the UK, but solar cell efficiency continues to improve.

6.8.10 It is important to recognise however that sunlight, the input energy source for solar generation, is abundant, predictable, renewable, low carbon, and free.

Wind is similar but can be more difficult to predict. Solar generation produces no marginal carbon emissions and no long-term radioactive waste. Therefore, the lower efficiency exhibited by solar technology versus other generation sources should not be considered as a material objection to its future use. Solar generation also benefits from free input fuel (sunlight), very few moving parts, low height in comparison to other technologies, and zero-carbon operation.

6.8.11 Solar panel output increases as a product of panel size (area) and panel efficiency. Panel size has been and remains the key driver of panel power in newly released products, although efficiency increases have been achieved as a result of ongoing research and development.

6.8.12 Any increase in panel output due to increasing the size of each panel will not materially affect their coverage across a proposed parcel of land because the total area of panels which can be placed in the parcel will be broadly the same.

6.8.13 It is difficult to predict what the future capacity of a PV module will be, but manufacturers are constantly improving the technology. For example, one panel which became available in Q4 2020 was advertised at 21.3% efficiency, while a panel from a different manufacturer, which became available in Q1 2023, was advertised at 23% efficiency (Author Analysis).

6.8.14 It seems reasonable therefore to anticipate that panel efficiency will continue to increase at best linearly over the 2020s.

6.8.15 By installing more efficient panels, a facility may install fewer panels but the total coverage across a site is not expected to change significantly, and it is not a given that the installation of higher efficiency panels will result in reduced land take. Opportunities to enhance the overall efficiency of the scheme may materialise at the detailed design stage, for example by procuring more advanced (efficient) panels and spacing them out more (increasing the pitch) within land parcels to reduce shadowing effects or removing inefficient corners of fields that reduce infrastructure requirements.

6.8.16 Proposed designs can only incorporate products which are already available in the market. Similarly, detailed designs, which will be carried out post-consent for a scheme, will only incorporate those panels which are available at the time.

6.8.17 At the detailed design stage, opportunities will be investigated to increase the lifetime generation output of the scheme and the benefits arising from its development, within the envelope of development secured at consent.

6.9 Co-location

6.9.1 NPS EN-3 states that:

"Government is supportive of solar that is co-located with other functions (for example, agriculture, onshore wind generation, or storage) to maximise the efficiency of land use" [(Ref 2), Para 2.10.10].

6.9.2 **Section 6.9** describes the role of BESS within a net zero energy system. BESS provide services which support the operation of renewable energy generation schemes and the efficient and secure operation of the UK's electricity system provided that they are able to both import energy from and export energy to the electricity system.

6.9.3 BESS may be proposed as part of solar projects as a resource to hold energy generated by the solar farm during times of low demand and release it through the scheme's grid connection at times of high demand. If a scheme is to connect to the electricity system at a location where the scheme is also able to import electricity from the grid, a co-located BESS could allow energy to be imported from the grid at times of low demand and exported back to the grid at times of high demand.

6.9.4 At some locations, the former can be achieved without upgrades being required to existing grid connection substations, but at other locations, significant upgrades to transmission system infrastructure may be required to allow BESS to contribute fully to the electricity system.

6.9.5 Such upgrades may be time consuming and/or expensive. Waiting for grid upgrades to deliver before developing a scheme may delay the scheme's commissioning date, thus delaying the delivery of much needed renewable energy as a critical and urgent contribution to meeting net zero. Delays and increased costs may also increase the commercial risk associated with the scheme above the level at which investment may be secured, risking the deliverability of the scheme as a whole.

6.9.6 Developers may propose to install storage at sites which do not have a grid import connection, however current commercial, technical, and system operation considerations would suggest that storage is more beneficial to the electricity system, and more likely therefore to be developed, if it is able to both import energy from and export energy to the NETS, as well as store energy generated from the co-located solar panels.

6.9.7 The following Figures illustrate how co-located solar and BESS may work together under a number of different well-defined and distinct market scenarios. The reality of electricity market operation is that BESS and solar operations are unlikely to be so clearly defined and actual operations may vary significantly on a day-to-day basis.

6.9.8 For simplicity, **Figure 20** to **Figure 24** illustrate a 500MW solar array co-located with a 500MW, 1 hour (therefore 500MWh energy storage capacity) BESS, but the illustrations are applicable to larger arrays and co-located schemes with different energy storage capacity.

6.9.9 In each of **Figure 20** to **Figure 24**, the yellow bell-shape areas in sub-figures (a, left) and (b, middle) represent solar generation which is transmitted to the grid through the day. The green areas represent energy imports to the BESS, and the red areas represent energy exports from the BESS through the day. In sub-figures (c, right) the blue area represents the energy stored in the BESS through the day.

6.9.10 The import of energy from the co-located solar facility is illustrated by a green area overlapping a yellow area. The import of energy from the electricity network is illustrated by a green area which does not overlap a yellow area.

6.9.11 For example, in **Figure 20** to **Figure 24** following, the BESS is shown moving from 0% to 100% State of Charge and back again on each operation. In reality this may not be the case, and the BESS may instead undertake many more partial, rather than full, import/export operations.

6.9.12 Local solar generation is usually highest in the middle of the day, and national demand is currently often highest in the evening (around approximately 17:00 in Winter and 19:00 in Summer).

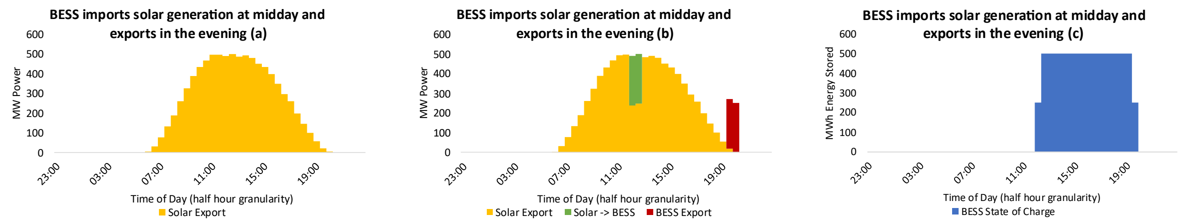

Figure 20: BESS stores midday solar generation for evening export

(Author Analysis)

6.9.13 **Figure 20**(a) represents solar generation at the facility over the course of one sunny day. If the asset operator's forward view was that energy may be in surplus in the middle of the day but would be needed in the evening, the operator could schedule the BESS to import from the solar generation during the middle of the day (**Figure 20**(b), green area) and to export that energy later when it was needed more (**Figure 20**(b), red area). **Figure 20**(c) shows the State of Charge of the BESS on that day.

6.9.14 The BESS may be configured to import and export at a lower rate than its maximum power output, this will allow it to import over a longer period and export as shown in **Figure 21**. Critically, the amount of energy the BESS can store is the same as in **Figure 20**. Operators would determine their rate of import and export according to market needs.

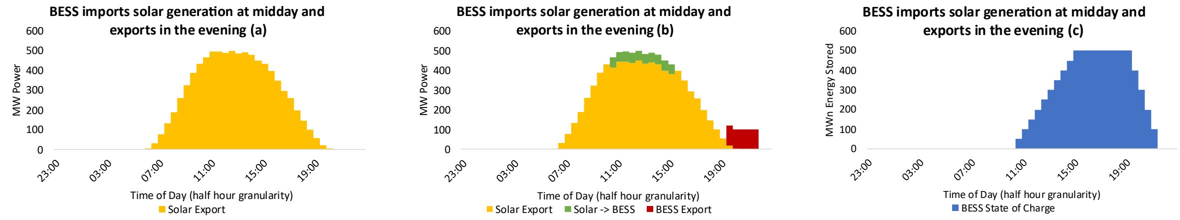

Figure 21: BESS stores midday solar generation for evening export – lower rates

(Author Analysis)

6.9.15 National UK electricity demand varies through the day, and can also be different from day to day, for example weekdays versus weekends, or Summer versus Winter days. Additionally, solar is not the only variable renewable generation on the UK electricity system.

6.9.16 This means that at times when the BESS is not supporting the operation of the principal solar site, it may be useful for the BESS to support the national supply and demand balance by importing directly from the grid rather than from the co-located solar, as was shown in **Figure 20** and **Figure 21**. A good example of when the BESS might import from the grid in response to national supply / demand balance, might be when wind generation is high.

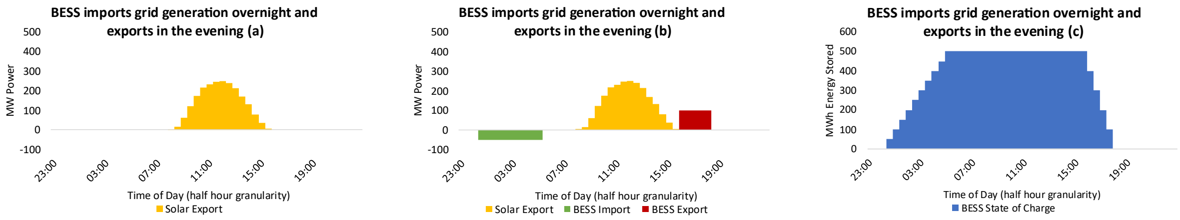

Figure 22: BESS stores overnight grid generation for evening export

(Author Analysis)

6.9.17 **Figure 22** shows how the BESS may import overnight, store its charge through the day, and export in the evening peak. **Figure 22** uses a solar output profile which may be more typical of a Winter's day, but the type of operation shown is not foreseen to be restricted only to the Winter.

6.9.18 On some days, operators may foresee the market need for the BESS to operate more than one import/export cycle over a 24-hour period, and **Figure 23** shows how this might work. In practice, the BESS operational parameters will limit how the BESS is able to respond to market need.

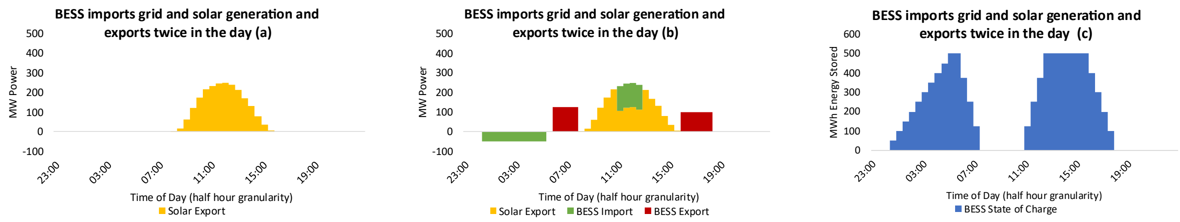

Figure 23: BESS stores solar and grid generation for export when needed

(Author Analysis)

6.9.19 Ancillary (Balancing) Services are contracted at relatively short notice (e.g. contracted 'today' for delivery 'tomorrow') and service time windows tend to be contracted in 4-hour windows, commencing 23:00, 03:00, 07:00, 11:00, 15:00, and 19:00 daily.

6.9.20 Ancillary (Balancing) Services help to keep the UK electricity system operating safely and securely. Some Ancillary (Balancing) Service contracts require BESS to provide upward regulation (export of energy to the UK's electricity network) and others require downward regulation (import of energy from the UK's electricity network). Some require both and providing both from the same facility is often a more economic option for both operators and NESO. To provide services, BESS would need to ensure that their State of Charge before they start a service window is appropriate for the service they are contracted to provide. This means that a BESS may therefore need to import or export to achieve an appropriate State of Charge immediately prior to a contracted period for Ancillary (Balancing) Service provision.

6.9.21 The UK's electricity system operates at a nominal frequency of 50Hz, and NESO procure services over very short timescales (sub-second response services) out to minutes or hours for reserve services to keep frequency always at or close to 50Hz.

6.9.22 BESS operation under reserve service contracts will be similar to the BESS operation shown in **Figure 20** to **Figure 23** above, i.e. consistent importing or exporting over periods of minutes or hours at pre-agreed levels. BESS operation under response service contracts will however be different.

6.9.23 Response contracts require the immediate import or export of energy to the grid based on whether the instantaneous frequency of the grid is higher or lower than the statutory 50Hz. Importing energy into the BESS has the effect of reducing grid frequency (so import actions are instructed when frequency is high). Exporting energy from the BESS has the effect of increasing grid frequency (so export actions are instructed when frequency is low).

6.9.24 Under normal operating conditions, the frequency of the grid varies by small amounts from the statutory 50Hz level. Short duration injections (or exports) of energy to the grid nudge frequency back to the statutory level. **Figure 24** shows how grid frequency changed second-by-second over a 30-minute period of operation in July 2023, and how a BESS operating under a Frequency Response contract may respond to those normal changes in grid frequency.

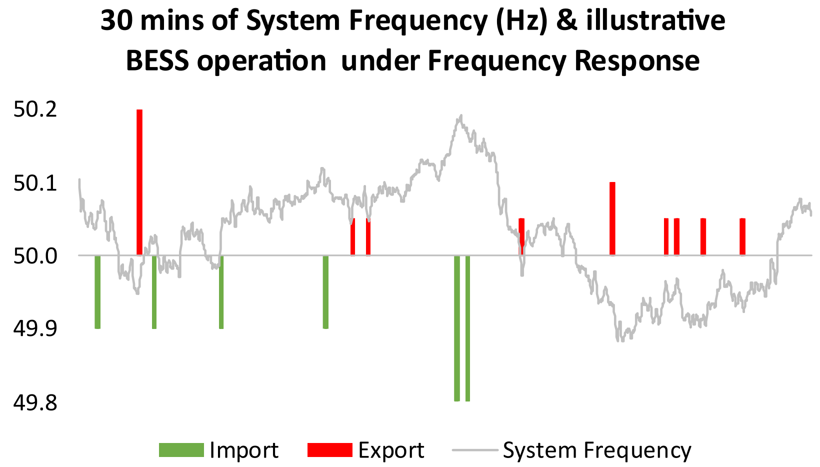

Figure 24: Illustrative BESS operation under Frequency Response type operation

(Author Analysis)

6.9.25 **Figure 24** seeks to illustrate that if frequency is moving away from the nominal 50Hz line, BESS will respond to bring frequency back towards 50Hz. The size of the green (import) and red (export) columns is intended to signify the magnitude of the BESS response, which would be driven by a combination of the rate of change of frequency (quicker changes require a larger response) and the magnitude of the variation of grid frequency from its nominal 50Hz at the time of the instruction.

6.9.26 In reality, BESS imports/exports may be much more frequent than those illustrated in **Figure 24**. In normal operational conditions, under Frequency Response, a BESS may import roughly the same amount of energy as it exports, leaving its State of Charge broadly unchanged over the contracted period. However, it is important that the contracted State of Charge is known before the contracted period starts such that in fault conditions, the BESS can be relied upon to deliver the extent of the services it has contracted with NESO.

6.9.27 Co-located BESS with both an import and export capability will allow the BESS to charge from the co-located solar and from the grid whenever UK system supply was greater than UK system demand. This type of operation provides much needed flexibility to the UK power system and therefore will provide benefits to the UK system and decarbonisation generally.

6.9.28 Being able to regulate power flows both to and from the grid would allow the BESS to provide many kinds of system-wide ancillary services which will support a further reduction in the UK's reliance on fossil fuels. **Table 2**: provides more information.

6.10 Conclusions on technical considerations

6.10.1 Large-scale solar is a highly beneficial technology within the UK's electricity system.

6.10.2 Solar developments require locations to possess three fundamental attributes of sufficient available land, a point of connection to the electricity system, and sufficient solar irradiation levels.

6.10.3 Large-scale schemes which connect to the NETS allow for a "more efficient bulk transfer of power" for national consumption [(Ref 1), Para 3.3.12] than smaller schemes which connect to distribution systems.

6.10.4 Connections to both transmission and distribution systems in the UK are in short supply. The use of existing and available connections is therefore necessary to support the delivery of low carbon generation in the next decade to meet the previous government's aims for a zero-carbon electricity system by 2035, and the government's aim to deliver 'Clean Power by 2030'.

6.10.5 The Scheme is to connect to the existing Melksham 400kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Scheme will generate to consumers nationally as well as into local distribution networks.

6.10.6 Other solar schemes must be developed across the country if the UK is to meet its Clean Power aims. It is foreseen that some new solar schemes will require the development of new substations. Schemes connecting to new substations may take longer to connect than those connecting to existing substations because new substations would need to be designed consented and constructed. Therefore, the prioritisation of existing and available substations goes towards meeting the urgent need to decarbonise the electricity system.

6.10.7 Solar schemes represent an efficient use of land for energy generation purposes.

6.10.8 The efficiency of solar generation is towards the lower end of the scale of efficiencies for technologies commonly used to generate electricity in the UK, but solar cell efficiency continues to improve. Sunlight, the input energy source is abundant, predictable, renewable, low carbon, and free. Solar's lower efficiency than other generation sources should not therefore be considered as detrimental to its future use.

6.10.9 Panel layout optimisation can increase the likely annual generation of schemes through their grid connection points. This goes towards best meeting the urgent need for solar generation within the context of a constrained grid connection queue.

6.10.10 Any optimisation of layout at a detailed design stage would be unlikely to identify any areas of land which would be useful to keep out of the scheme for alternate use, e.g. arable farming. This is because any such areas identified would be likely to be around the edges of field margins and disconnected from any other areas similarly identified and therefore would have little or no agricultural purpose.

6.10.11 The connection of very many small-scale (including rooftop) systems to the aggregate capacity targeted by government under its mission to deliver 'Clean Power by 2030' will not, in isolation, meet the urgent need for solar. The installation cost of small-scale schemes, which would be met by individual households, is much higher than the cost of large-scale schemes on a per unit basis.

6.10.12 The inclusion of a BESS as associated development to the main solar scheme will support the operation of the main solar scheme and will be able to store energy generated by the main solar scheme and export it to the NETS when it is needed.

6.10.13 The Scheme has been designed to optimise use of the available land area, grid connection capacity, and preferred SAT panel orientation while retaining the flexibility to install FSF panels at the detailed design stage. The AC-coupled BESS also included as associated development to the Scheme will support the operation of the main solar scheme and will be able to store any abundant generation and export it when it is needed. The Scheme seeks to optimise the annual average generation over its operational life at its specified location through the selection of technologies which will make efficient use of the natural and grid resources available to the Scheme.

7 Suitability of the proposed location for large-scale solar

7.1 Chapter summary

7.1.1 This chapter provides an overview of the evidence provided to support the suitability of the proposed location of the Scheme for large-scale solar plus storage.

7.2 Local demand / decarbonisation requirements

7.2.1 The Scheme is to connect to the existing Melksham 400kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Scheme will generate to local and national consumers, and this is a key benefit of the Scheme. The Connection Offer provides for the export of up to 500MW of power, connecting in July 2029.

7.2.2 Melksham is located close to an existing part of the NETS between Seabank and south Wales to the west and Bramley and Greater London to the east. The overhead line to which Melksham connects also sits on a north-south section of the NETS linking Birmingham (via Minety) to the south-west via Hinkley Point. The Scheme is located near to the Melksham substation in Wiltshire.

7.2.3 Melksham is located in the ‘South Wales and the Severn’ transmission network region, and Wiltshire is covered by Scottish & Southern Electricity Networks (SSEN) Southern distribution network.

7.2.4 The Clean Power 2030 Action Plan establishes a regional capacity breakdown for the ‘South Wales and the Severn’ region of 1.1GW for transmission connected solar in 2030 rising to 8.3GW (across both transmission and distribution networks) in 2035 [(Ref 4), Connections Reform Annex, Table 2]. The TEC Register lists no solar capacity proposing to connect to the NETS in the ‘South Wales and the Severn’ region which is currently consented. The REPD lists approximately 3.3GW of consented solar projects across the ‘South Wales and the Severn’ region, of which 1.5GW is operational, and a further 1.7GW arises from schemes of all scales which have been submitted for application but have not yet been determined.

7.2.5 The government’s local authority renewable generation data lists c.2.8GW of operational solar capacity in the ‘South Wales and the Severn’ region at the end of 2023. The current pipeline of projects as listed on planning registers amounts to 3.5GW (1.8GW consented but not yet operational and 1.7GW not yet determined).

7.2.6 Therefore, even if all currently identified pipeline capacity makes it through to operation, there will still be a shortfall in the capacity of solar schemes coming forward the ‘South Wales and the Severn’ region relative to government’s 2035 capacity range.

7.2.7 Subject to NESO's ongoing Connections Reform, the TEC Register lists ten schemes, including the Scheme, comprising 2.6GW of capacity with agreement to connect at Melksham. These schemes are listed in **Table 3** of this Statement. The Scheme comprises 90% of the future pipeline capacity of solar schemes able to connect at Melksham prior to 2035.

7.2.8 Bringing forward a sufficient capacity of schemes at all suitable grid substations in the 'South Wales and the Severn' region as well as nationally will be important to support the UK to achieve its Clean Power aims, especially given historical levels of project attrition. **Section 5.3** provides more information on pipeline attrition in the UK.

Table 3: NESO TEC Register entries for connection at Melksham

(Ref 49)

Technology	Capacity (MW)	Effective from date
Solar + BESS	57	Oct-25
Thermal	49	Nov-25
The Scheme	500	Jul-29
Storage	1030	Sep-37 to Nov-37
Solar + Storage	930	Jun-37 to Oct-37

7.2.9 Grid substations and Grid Supply Points (GSPs) are where the generators connect to the NETS and/or the NETS connects to local distribution networks. At these points, voltage is reduced from the NETS high-voltage cables to lower voltages for more local transmission via Bulk and Primary substations, then on to consumers.

7.2.10 Bulk and Primary substations ensure that although the energy generated at the Scheme may be transmitted to consumers nationally without constraint, there is a network pathway from the Scheme to local consumers. However, these distribution network substations and the cables between them, are not of a sufficient capacity to facilitate connection of the Scheme. Consumers and smaller generators may however be accommodated.

7.2.11 By proposing to connect to the NETS, the Scheme is not impacting distribution network connections in relation to either the capacity of new consumption or generation connections which can be made to the distribution network, nor the timescales required for those connections.

7.2.12 The energy generated at the Scheme will not necessarily or solely service either local or national consumption, but connecting the Scheme at Melksham will enable the unconstrained flow of energy to either local or national consumers, whenever it is needed.

7.2.13 **Figure 25** shows annual energy demand from 2005 to 2022 across an area which closely approximates SSEN's Southern distribution region. This has been developed by summing the government's energy consumption data for local authorities within the distribution region [(Ref 16)(1)] but is not a precise evaluation. This data shows that the urgent and unprecedented need for new low carbon generation infrastructure nationally also applies to a more local geography.

7.2.14 In 2023 (the most recent year for which data is available) 28.2TWh of electricity was consumed in the region, equivalent to around 11% of national electricity consumption. Transport needs in the region consumed 49.6TWh, and a further 64.9TWh (non-electricity demand) was sourced from other fuels such as coal, gas, oils, and biomass.

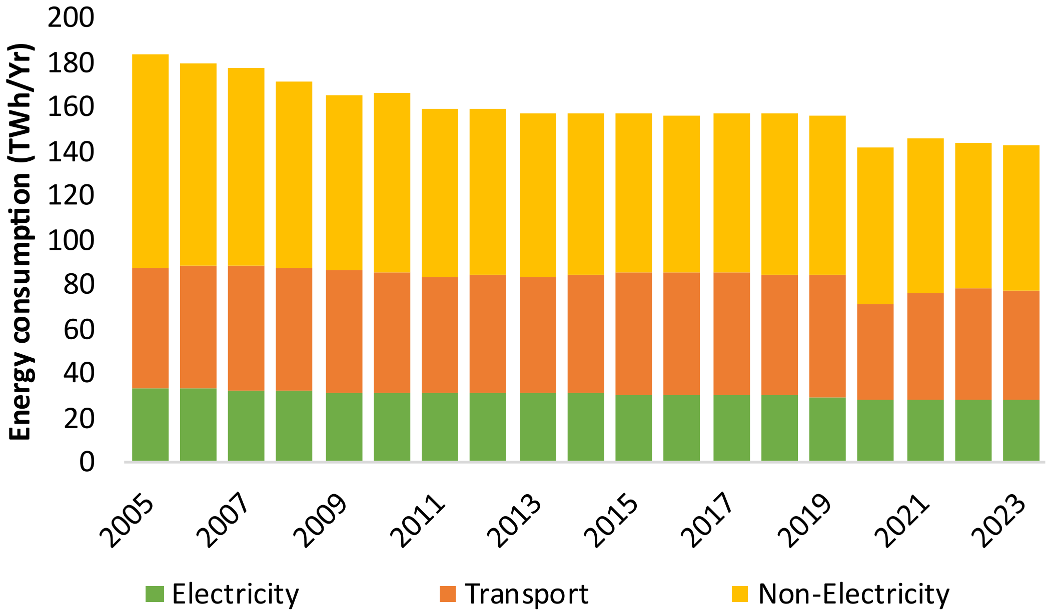

Figure 25: Historic annual energy consumption in SSEN's Southern region

(2005 – 2023, TWh/Yr) [(Ref 16)(1), Author Analysis]

7.2.15 Total energy consumption in the region reduced by 22.6% over the period 2005 to 2023. Electricity consumption decreased by 14.9% and non-electricity consumption including transport decreased by 24.3%. Transport consumption decreased by 9.9%.

7.2.16 The data shows that non-electricity consumption (including transport) in the region is approximately four times greater than electricity consumption. A significant increase in electricity as a share of total energy consumption will be required in the future to meet net zero locally. These trends are broadly consistent with the national trend as described in **Chapter 4** of this Statement.

7.3 Local supply

7.3.1 As part of its 2022 FES, NGESO published a map of regional generation carbon intensity on two types of day (a higher wind day and a lower wind day) [(Ref 36)(2022), p32]. This map is reproduced in **Figure 26**.

7.3.2 The average national carbon intensity of generation in 2024 was reported as 154 g/kWh [(Ref 35), Table 5.14], i.e. at the 'high' end of the 'low' range shown in **Figure 26**.

7.3.3 The map on the left of **Figure 26** shows the carbon intensity of generation by region during a higher wind day, and the map on the right shows the same but for a lower wind day. The values indicate the installed wind capacity in each region at the time of publishing the map, therefore current capacities may be higher, particularly in Scotland and off the east coast of England.

7.3.4 The region with red-edged legend is SSEN's Southern region and the approximate location of the Scheme is shown by a dark blue point on each map.

7.3.5 As expected, during windy days, the carbon intensity of generation is on average lower than the annual average figure. On days with lower wind, carbon emissions from electricity supply in Scotland and the north of England remain below the annual average, but from Yorkshire and North Wales and further south, the carbon intensity of generation is at best moderate, and may approach double the annual average figure.

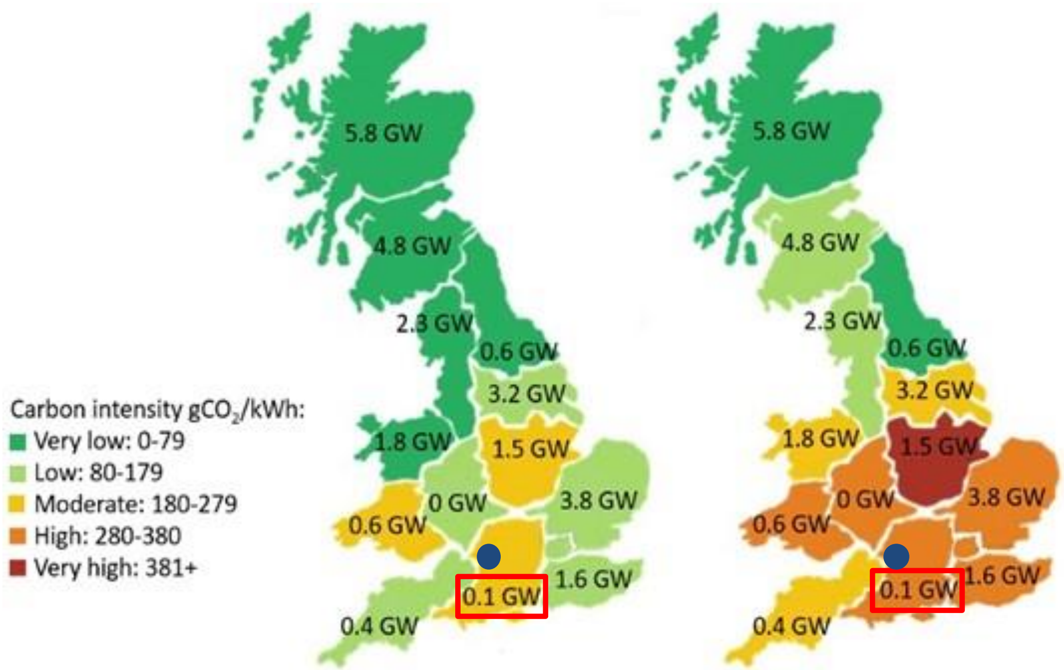

Figure 26: NGESO Regional generation carbon intensity analysis

(Left: a higher wind day, Right: a lower wind day. Numbers = installed wind capacity in 2022) [(Ref 36)(2022)]

7.3.6 Measures must be implemented to reduce the carbon intensity of generation outside of Scotland and the north of England during low-wind days. Solar generation is well suited to support a such a reduction.

7.3.7 Further, **Figure 26** suggests that there is carbon emitting plant located in the south of the country which currently generates when wind output is low. This can be inferred because at times of low wind, the carbon intensity of generation in the south of the country is high. During periods of low wind, NGESO's analysis shows that generation in SSEN's Southern region has a high carbon intensity of generation. The Scheme will, if consented, reduce the local carbon intensity of generation in both 'low' and 'normal' wind conditions. The inclusion of BESS as part of the Scheme means that it will be able to store low carbon energy when generation is in abundance and release it when demand for energy is higher.

7.3.8 As **Section 5.2** describes, solar and other renewable generation displaces carbon emitting generation from the grid and therefore has a decarbonising effect on the electricity system. The placement of any solar farms in these areas means that when the sun is shining their generation will be flowing through parts of the transmission system where otherwise the energy generated by carbon emitting plant would flow. It is unlikely therefore that the installation of solar schemes would cause any significant network constraints by connecting in these areas. Further information on the benefits of a multi-technology energy system can be found in **Chapter 8**.

7.3.9 **Figure 16** shows that the Scheme is located in an area with solar irradiation levels above average for the UK, and initial studies suggest that an average annual load factor before degradation at the Site is sufficiently high to support the development of a large-scale ground mounted solar facility at the proposed location. The region is well positioned to use its natural resources and existing infrastructure to support the UK's energy needs through the development of the proposed large-scale solar scheme to generate clean electricity to power homes, cars, offices, shops, and factories, both locally and nationally.

7.4 Grid suitability

7.4.1 Annually, NESO perform an analysis of the NETS from a security and quality of supply (SQSS) and power flow capability perspective. Their analysis is published as part of their Electricity Ten Year Statements (ETYS) (Ref 85). Options to improve power flow capability can be found in their Network Options Assessment (NOA) (Ref 71).

7.4.2 NESO subdivides its network into operational areas by means of system boundaries. These boundaries are not hard, nor physical, but differentiate areas within which NESO characterise power flows.

7.4.3 The ETYS looks at whether the current network allows GB national demand to be met through two lenses.

7.4.4 The first is the Security Criteria. This validates that the capability of each boundary is sufficient to allow the expected maximum flow across that boundary required to ensure security of supplies across the network. In other words, the maximum boundary transfer capability must be greater than that required to maintain, under reasonable 'worst case' conditions, security of supply at all locations on one side of the boundary with supplies from the other side.

"The boundary transfer requirements needed to satisfy demand without relying on intermittent generators or imports from interconnectors" (Ref 85).

7.4.5 The second is the Economy Criteria. This validates that the capability of each boundary is sufficient to allow the expected flow of power across the network such that a national merit order of operation is maintained. In other words, the Economy Criteria balances the need for cheap power to flow unconstrained across the network (therefore lowering prices and costs for consumers), against the enabling cost of upgrading the network:

"The boundary transfer requirements when demand is met with high output from intermittent and low carbon generators and imports from interconnectors. This ensures capacity is adequate to transmit power from highly variable generation without any network constraint" (Ref 85).

7.4.6 The NOA then identifies, assesses, and recommends (where appropriate) specific upgrade projects which meet the future needs as anticipated in the ETYS.

7.4.7 The Scheme proposes to connect to a major existing 400kV transmission circuit which provides connections to Birmingham and the north and to demand centres in south Wales and London and the south-east.

7.4.8 The main north-south and west-east transmission circuits running through Melksham are double transmission lines, providing defence in depth. In the event that one line of a double circuit section of the NETS faults, power is still able to flow on the other line. Double circuits also deliver high power flow capability [(Ref 85), Appendix A]. This is true for the transmission circuits around Melksham, delivering high network resilience and reliability to this part of the NETS.

7.4.9 The Scheme's proposed point of connection is located well away from areas of the network which may be constrained during high levels of wind generation. Connecting a large-scale renewable generator in this location is not likely to cause any significant network constraints under either the economy or security criteria.

7.4.10 The flow of energy from the Scheme is therefore unlikely to cause constraints on the NETS during normal conditions. The Scheme will be able to displace more expensive and carbon intensive power generated in southern England.

The displacement of carbon intensive power generation will be to the benefit of electricity system decarbonisation and consumer cost nationally.

7.4.11 Additionally, the inclusion of BESS as part of the Scheme will provide NESO with a cost-effective tool to help manage power flows on the NETS in the vicinity of the Scheme over its operational life. For example, extreme weather conditions such as concurrent high wind and high solar irradiation, or unplanned power station failures may require NESO to balance supply with demand either locally near Melksham or nationally. Minimising these in a cost-effective way would be to the commercial benefit of consumers.

7.5 Connection points / history

7.5.1 **Figure 27** shows a map of the NETS, with a 50km radius drawn in red and centred at Melksham. There are very few existing substations near Melksham. Other transmission lines running north-south and west-east all lie parallel to and approximately 40km away from the lines running through Melksham. Minety is an existing substation on Melksham's north-south connection, located approximately 20k to the north. Iron Acton and Seabank are located approximately 25km to the west and Sandford is approximately 40km to the south-west.

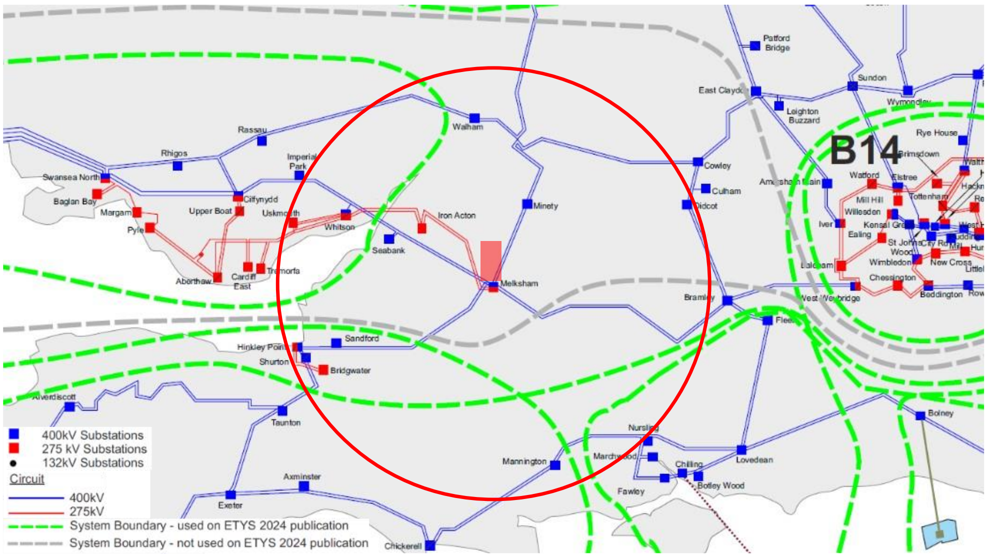

Figure 27: Transmission system within 50km of Melksham

[(Ref 85), Appendix A]

7.5.2 Subject to ongoing connection reforms, the TEC Register lists five solar or solar plus storage schemes totalling 220MW with agreements to connect to Iron Acton, Minety, Melksham or Sandford before 2028. Five other schemes, including the Scheme, have connection agreements to Melksham (see **Table 3** for connection dates) and Sandford, to connect in 2037.

7.5.3 **Figure 17** confirms that no new schemes (i.e. schemes which are not already listed on the TEC Register) are able to connect to any of those substations within 50km of Melksham before 2033.

7.5.4 Given that **Figure 16** shows that solar irradiation near Melksham is above the UK average, and given that the opportunities to bring large-scale solar schemes located in this area to grid are limited, it is clear that the development of this Scheme, which makes use of existing and available infrastructure to bring large-scale solar generation capacity to the grid, is needed to deliver to the urgent need for significant new renewable generation capacities to connect in the next decade to support the drive towards net zero.

7.5.5 Using this available and currently underutilised generation connection and the capacity within the transmission lines to which it connects is critical to support the urgent deployment of low carbon generation assets required to decarbonise the UK's electricity system.

7.5.6 The Scheme will be an important part of the future generation mix connecting in southern England, especially if any of the other schemes proposing to connect nationally and at similar timeframes are either delayed or cancelled. Existing and new grid connections to existing grid infrastructure must be used to the greatest possible extent, to connect new low carbon generation in timescales which meet the government's plans to reduce national carbon emissions.

7.5.7 If existing underutilised grid infrastructure is not used to connect low carbon generation to consumers at the earliest available opportunity, the deployment of low carbon generation will be significantly slower and potentially a lower overall level of installed capacity would be achieved than would otherwise be the case.

7.5.8 The Applicant's **ES Volume 3, Appendix 4-1 Site Selection Assessment Report [EN010168/APP/6.3]** provides additional information on the Applicant's site selection process.

7.6 Conclusions on locational suitability

7.6.1 **Figure 16** and **Figure 27** show that the location of the Scheme is well suited to support the UK's energy needs through the development of the proposed large-scale solar and storage scheme to generate, store, and release clean electricity to power homes, vehicles, offices, shops, and factories, both locally and nationally.

7.6.2 This Statement of Need demonstrates that the proposed connection point is suitable, and the Scheme will not cause any grid constraints or curtailment in the area, as a result of connecting at this location.

7.6.3 The Scheme has a Grid Connection Agreement with NESO. Subject to obtaining the necessary consents, the Applicant aims to construct the Scheme ready for connection to the NETS in line with the timeframes set out in the

Scheme's **Grid Connection Statement [EN010168/APP/7.5]** and the proposed construction plan set out in the **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**.

7.6.4 Therefore, if consented, the Scheme would contribute to continuing the UK's decarbonisation and security of supply efforts to meet anticipated increases in electricity demand from non-traditional sectors in the 2030s.

7.6.5 If the DCO is not granted, then a critical opportunity will be missed to deliver a significant capacity of low carbon solar generation capacity onto the NETS in the timeframes indicated. This would increase the risk of non-delivery of the UK's legal obligations because:

- The benefits which would have been brought forward by the Scheme would need to be delivered by as yet undefined, unconsented schemes;
- The criticality and scale of schemes required to deliver in later timeframes to make up for those benefits would both increase; and
- The pace and cost of delivery of such schemes would also likely be higher than in the case that the Scheme was consented.

7.6.6 NPS EN-1 is clear on the point of need:

"The Secretary of State should assess all applications for development consent for the types of infrastructure covered by this NPS on the basis that the government has demonstrated that there is a need for those types of infrastructure which is urgent" [(Ref 1), Para 3.2.6].

7.6.7 NPS EN-1 further states that "the Secretary of State has determined that substantial weight should be given to this need when considering applications for development consent under the Planning Act 2008" [(Ref 1), Para 3.2.7] and that the "Secretary of State is not required to consider the specific contribution of any individual project to satisfying the need established within the NPS" [(Ref 1), Para 3.2.8].

7.6.8 The need for the Scheme is urgent and substantial weight should be given to that need. The proposed location is an appropriate location for large-scale solar because of the existence of a grid connection with the capacity available to connect the Scheme in the timeframes indicated, with sufficient solar irradiation, and suitable secured land for the solar and BESS.

7.6.9 Further, the development of a large-scale solar development connecting at Melksham provides the potential to help decarbonise local electricity demand to the benefit of consumers both locally and nationally.

7.6.10 The Applicant's grid connection at Melksham is suitable and available for the Scheme to commission in a timeframe which will enable it to contribute to the UK achieving its sixth Carbon Budget. Connection to the transmission system is of significant importance, enabling an unencumbered and efficient transfer of bulk power across the country, in order to provide electricity wherever it is needed.

7.6.11 The land included in the Scheme's proposals will support an optimisation of the available grid connection secured at Melksham from the proposed layout and BESS configuration, while being sympathetic to planning issues and respecting identified constraints.

7.6.12 Lastly, the electricity network local to the Scheme has sufficient capacity to accommodate the anticipated generation from the Scheme without constraint. By connecting the Scheme to a part of the NETS which is geographically distant from areas of current constraint, the anticipated generation is not expected to exacerbate any existing network constraints. The Scheme will also not impact the local distribution networks by either causing any connection delays for smaller schemes or consumer loads, or complexity in operation of both generation and demand on the local circuits.

8 The contribution of large scale solar to system security

8.1 Chapter summary

8.1.1 This chapter provides an overview of the system security benefits of large-scale solar in the UK.

8.1.2 Decarbonisation is just one of the three pillars of GB energy policy. Low carbon generation of all forms, solar, wind, and nuclear included, brings with it new challenges. Current and future energy policy and related actions must ensure that security of supply is maintained, and that electricity is affordable for all. This chapter demonstrates how solar has contributed, and will continue to contribute, to security of supply in Great Britain. As set out in NPS EN-1:

"[The government] need[s] to ensure that there is sufficient electricity to always meet demand; with a margin to accommodate unexpectedly high demand and to mitigate risks such as unexpected plant closures and extreme weather events" [(Ref 1), Para 3.3.1].

"The larger the margin, the more resilient the system will be in dealing with unexpected events, and consequently the lower the risk of a supply interruption" [(Ref 1), Para 3.3.2].

"We need a diverse mix of electricity infrastructure to come forward, so that we can deliver a secure, reliable, affordable and net zero consistent system during the transition to 2050 for a wide range of demand, decarbonisation, and technology sources" [(Ref 1), Para 3.3.19].

"A secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar" [(Ref 1), Para 3.3.20].

8.1.3 'Security of supply' means, essentially, keeping the lights on in people's homes and businesses, and has two main components:

- Ensuring that there is enough electricity generation capacity available and operational to meet demand (adequacy); and
- Ensuring that the quality of electricity supplied to customers falls within a narrow 'quality' band during all reasonably foreseeable operational circumstances and is resilient during rare excursions from this band.

8.1.4 This definition of adequacy includes not only the capacity of generation assets but also the availability of source fuel to those assets so that they are able to generate electricity.

8.2 Power system stability

8.2.1 Power systems connect supply (sources of power, largely generators) to assets which demand power (industrial, commercial, or domestic customers). Power systems are complex; yet they must be designed and operated safely, securely, and economically.

8.2.2 Governments define policies to ensure that adequacy requirements are met, i.e. that there is sufficient generating capacity (i.e. the maximum achievable level of power generation which may be connected to the NETS) available to meet maximum expected demand, with secure and economic supply chains for the fuel they use to generate electricity.

8.2.3 Key power quality characteristics (including frequency, voltage, and power shape) must also be controlled for the electricity system to operate without fault. NGESO defines this topic area as system operability, specifically: “the ability to maintain system stability and all of the asset ratings and operational parameters within pre-defined limits safely, economically and sustainably” [(Ref 86), p5].

8.2.4 Keeping an electricity system from entering fault conditions during operation or returning an electricity system to normal operational conditions post-fault is also important. All large-scale generators must be capable of maintaining their own synchronicity with the system to a high level of reliability.

8.2.5 NESO also ensures that power demand, or load, and power supply, always remain balanced. Balancing requires the right generating assets to be connected and disconnected to/from the right power levels, and at the right time. This can sometimes be at short notice, in response to emergent (fault) conditions. NESO calls those services which support NETS stability and operability are called Ancillary Services and examples have been listed previously in **Figure 13** and **Table 2**.

8.2.6 The NIC addressed the topic of system stability by stating that it is "Important that generators are responsible for costs and benefits they impose on the system, such as those related to where they situate" [(Ref 87), p40].

8.2.7 It is well understood that the activities associated with integrating renewables into the GB electricity system will increase as the capacity of renewables grows. Energy balance must be managed at all times; and as renewable capacity increases, a greater volume and range of Ancillary Services may be required to maintain or regain supply / demand balance and retain system control, particularly when demand is either very high or very low. Balancing actions may also increase.

8.2.8 Technological advances, in particular in the introduction of power electronics into generating assets, is increasing the ancillary services and system stability services available from users of the electricity system, for example, by improving an asset's response speed and capability to system faults, and their ability to withstand periods of system instability without disconnecting.

8.2.9 The installation of power electronics at low carbon generation assets is an exciting development which will enable them to provide important system stability services as part of their normal daily operational routine. By reprogramming the digital power inverters attached to solar panels, services required by the ESO can be delivered from solar generation facilities. Some solar farms already operating have incorporated state-of-the-art power electronics into their designs and are providing important stability services to NESO.

8.3 Power system adequacy

8.3.1 Solar plays an important role in diversifying renewable generation sources to maintain adequacy and minimise curtailment.

8.3.2 The uncontrollable nature of the weather raises a potential challenge to the ability of solar generation to play a significant role in electricity supply. However, the variability of solar generation can be mitigated by:

- Developing larger generation capacities (to maximise output during periods of low irradiation, for example through overplanting);
- Connecting assets to different parts of the NETS; and
- Developing projects with generation profiles which are complementary to solar (for example wind: see **Section 8.5**).

8.3.3 'Integration technologies' may also be used to respond to the intermittency of renewable generation, including electricity storage, interconnection, hydrogen, and demand side response [(Ref 1), Para 3.3.6]. 'Integration technologies' will help balance supply and demand, improving the efficiency of the electricity system as a whole and potentially reducing the installed generation capacity required to meet peak demand.

8.3.4 NESO states that security of supply "refers to meeting all electricity demand at any given time" and that "Traditionally, risks to meeting electricity security of supply, have been at times of high demand." However, "as we move to higher volumes of weather-dependent renewable energy, we will also face additional challenges around both the oversupply and undersupply of renewable generation" [(Ref 36)(2024), p99].

8.3.5 The Capacity Market, which is one of the UK's primary measures for delivering security of supply, applies a de-rating factor to contracts on a technology-by-technology basis. All technologies attract a de-rating factor, and all de-rating factors are lower than 1. This highlights that no single technology can be relied upon to deliver security of supply at all times (otherwise it would have a de-rating factor of 1).

8.3.6 Critically, the de-rating factor for solar in the Capacity Market has nearly tripled for projects contracting capacity over the period 2021/22 to 2027/28 (Ref 88) from 2.34% to 6.25%, demonstrating how quickly the market is moving away from traditional norms of supply risk at Winter evening peak times only, and how important a multi-technology mix is to the achievement of security of supply for consumers at all times of the day and year.

8.3.7 The Clean Power 2030 Action Plan describes that meeting a possible doubling of electricity demand by 2050 "will require strong growth in power generation from a diverse range of clean sources on a sustained basis through the 2030s and 2040s" [(Ref 4), p39].

8.3.8 A significant increase in UK electricity generation capacity is required to meet growing demand and deliver security of supply under different weather conditions. Because the weather is uncontrollable, more capacity is needed to ensure that demand can be met even when renewable output is low. The implication is that when renewable output is high, there is a risk of oversupply. The laws of supply and demand in liquid markets such as electricity, imply that at times of oversupply, the price of the traded commodity i.e. electricity, will decrease.

8.3.9 NESO states that "There is day-to-day uncertainty due to weather but in general, solar generation is quite predictable over the course of a year and the position of the sun and its expected radiation levels over the year are well known. This means it can be a great asset for meeting annual demand levels, especially [and therefore by extension, not exclusively] when coupled with suitable storage" [(Ref 36)(2023), p132]. **Figure 11** of this Statement provides further information on the growth of storage facilities in GB.

8.3.10 Solar generation, and its potential abundance at foreseeable times of the day and year, will provide regular market signals which support the growth in demand-side flexibility (shifting demand to times of abundant renewable generation) and storage. As well as providing essential support to the security of supply during daylight hours, growth in solar generation will also encourage a shift in demand away from times of traditional peak needs, and/or store abundant energy which can then be dispatched when it is needed.

8.3.11 The inclusion of a storage facility as associated development to the main solar scheme allows the scheme to support the transition to net zero by providing flexibility to a fully low carbon electricity system.

8.4 Curtailment

8.4.1 NESO's Future Energy Scenarios also describes and evaluates the potential for curtailment to occur in the UK's future electricity system.

8.4.2 It is important therefore to explain why curtailment currently occurs in the UK electricity system, and the level of the prices currently paid to generators for some curtailment actions.

8.4.3 Currently, the majority of curtailment in the UK occurs on the large-scale wind fleet and mainly due to transmission constraints. Transmission constraints occur when the electricity network linking the point of generation to the major points of consumption, does not have the capacity to transmit all of the generation at certain times, but in particular when generation output is high.

8.4.4 In 2024, NESO metered 65.7TWh of wind generation. Transmission constraints amounted to 8.1TWh (c.12% of net generation) and constraints due simply to there being 'too much wind energy on the system' totalled c.0.2TWh, or less than 0.5% of net generation.

8.4.5 Curtailment in the UK is therefore currently more to do with where electricity is generated, than how much electricity is generated, and future curtailment in the UK is anticipated to be associated with the nature and capacity of flexible assets deployed on the NETS [(Ref 36)(2025), Table ES1].

8.4.6 Curtailment for network constraints currently results in a compensation to the asset operator for the electricity which would have been generated and sold but for the fact that that energy was not accepted onto the transmission system.

8.4.7 An asset located on a transmission network which is well connected to demand centres, is unlikely to be curtailed for the same reasons as the majority of current curtailment in the UK. However, the possibility of curtailment for non-locational reasons remains.

8.4.8 In such circumstances, curtailment would occur because more energy was being generated than that which could be consumed or stored at that time. **Figure 30** of this Statement shows that an excess of supply reduces market price, incentivising price-sensitive demand to increase, or in extremis, incentivising supply to shut down so as to avoid having to pay (rather than be paid) to generate. Critically, neither of these outcomes results in a compensation payment from consumers to the asset operator for the electricity they have not generated.

8.4.9 **Chapter 7** of this Statement describes that the Scheme proposes to connect to a well-connected section of the NETS which has available transmission capacity and is geographically distant from areas of the network which currently are constrained. As such, transmission constraints are less likely to cause curtailment at the Scheme during its operational life than may be experienced at other locations. Further, the Scheme is unlikely to receive consumer-funded compensatory curtailment payments.

8.4.10 With energy storage proposed as associated development to the main solar scheme, the Scheme will be able to provide its own operational flexibility to the electricity system without fully relying on flexibility provision from other electricity system users. Such flexibility could include storing solar energy in the co-located batteries during periods of abundant solar supply, until it is needed. This would reduce any impact of curtailment on the output of the scheme.

8.4.11 More generally, a growth in the capacity of flexible assets (including demand-side response, storage, interconnection, and hydrogen) will help to minimise the curtailment of assets in the future UK electricity system arising from the build out of large capacities of renewable generation. But because renewable electricity is variable, the UK may not be able to meet demand at times of low renewable output without the build out of large capacities of renewable generation.

8.4.12 Having insufficient operational renewable generation capacity in the UK may cause one or more of the following to occur:

- Power cuts (contrary to the government's aim to ensure security of supply);
- Price spikes (contrary to the government's aim to shield consumers from volatile energy markets); and
- Higher output from-fossil fuel assets (contrary to the government's aim to decarbonise the electricity system).

8.4.13 The alternative approach, which is the government's approach, is the build-out of large capacities of renewable generation. This approach meets the government's aims and provides opportunities for market approaches to manage curtailment through flexibility, by:

- Using curtailed energy to support security of supply when demand is high;
- Keeping consumer costs down by capturing and storing energy when it is abundant (therefore cheap) and releasing it when it is needed; and
- Displacing stand-by fossil assets by using stored energy as a low carbon "peaking" energy resource, further supporting the government's ambition to deliver 'Clean Power by 2030'.

8.4.14 A flexibility measure which has already gained traction in the UK, and which has been enabled by the introduction of smart meters into domestic homes, is the introduction of 'time of use tariffs' (ToUTs). ToUTs apply different prices to consumption metered at different times of the day or year. ToUTs provide customers with the opportunity to schedule their electricity consumption towards times of low prices and away from times of high prices. Consumers benefit from providing flexibility through lower utility bills.

8.4.15 In summary, future curtailment, if/when it occurs, could be interpreted as a 'good' problem for the UK power sector to have when compared to the alternate of under-delivering on the UK's current decarbonisation and energy security aims. This is because if curtailment occurs, it would be because large capacities of renewable generation have already been built out to deliver low carbon supplies to meet demand, deliver security of supply, meet carbon reduction targets, and reduce wholesale costs of energy.

8.4.16 Further, the market signals associated with curtailment will drive the development of consumer and/or supply side flexibility to make efficient use of abundant resources and drive further security of supply, decarbonisation, and affordability benefits for consumers across the whole energy system.

8.4.17 The Applicant notes that a key benefit of the Scheme being connected to the NETS is that when operational, it will need to adhere to the Grid Code. This means that the operational asset will need to inform NESO of its expected generation output ahead of time, and at all times be ready to respond to instructions from NESO to adjust its output in the Balancing Mechanism. These arrangements provide NESO with control and response options to help NESO balance supply with demand.

8.4.18 These arrangements do not cover smaller embedded generators, including rooftop schemes, which are significantly less visible, less controllable, and therefore potentially harder to manage within the UK's electricity market.

8.5 The system adequacy of solar generation

8.5.1 System adequacy is primarily managed through the GB Capacity Market. On an asset-by-asset basis, intermittent generation capacity, such as wind or solar, is variable. However, the output from portfolios of intermittent capacity, especially those that consist of different technologies, can be relied upon more fully and are easier to forecast more accurately. This supports the efficient provision of system adequacy and security of supply.

8.5.2 Further, large capacities of renewable generation will, in combination, be capable of meeting GB's seasonal electricity demand. This section provides analysis to support both points.

Portfolio effects of renewable generation

8.5.3 The following analysis demonstrates this by showing that the average aggregate monthly output per unit installed capacity of a multi-technology portfolio of wind and solar assets is less variable than the average monthly output per unit installed capacity of each of the single technology portions of that portfolio.

8.5.4 **Figure 28** displays the resulting output per unit of installed capacity at a monthly level for GB wind (green columns) and solar generation (yellow columns). It shows the seasonality of wind load in GB: low in the Summer months but higher in the Autumn through Spring. It also shows the seasonality of solar generation in GB: high in the Spring and Summer months and lower in

Autumn and Winter. The output associated with an illustrative combined portfolio is shown by the red line.

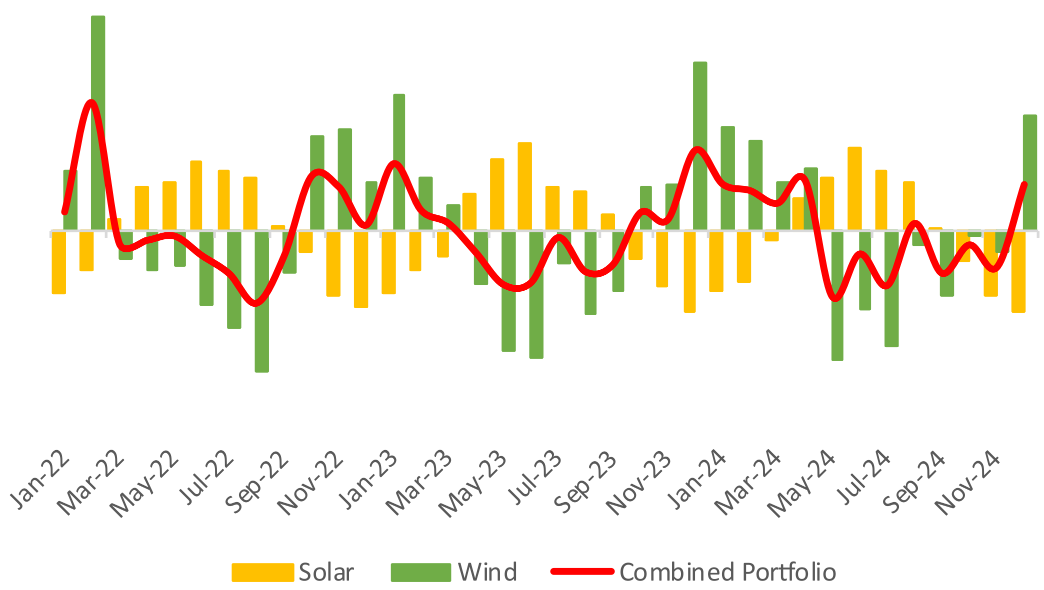

Figure 28: Generation dependability of a portfolio of solar and wind in GB

[(Ref 89), (Ref 36)(2024), Author Analysis]

8.5.5 The red line in **Figure 28** is the weighted average load factor for the combined national portfolio of wind and solar i.e. (wind generation + solar generation) / (wind capacity + solar capacity). The red line always lies between the extent of the green and yellow columns and is flatter across the timeframe analysed than either of the columns, showing a lower variation from month-to-month through the year.

8.5.6 The data for **Figure 28** is sourced from NESO's Demand Data and Actual Metered Generation data. These are operational data files, available to download from NESO's data portal, and are updated on a regular basis. These files are large and as such have not been submitted as a reference to this document, but extracts can be provided to the Examining Authority if required.

8.5.7 The Demand Data files include NESO's estimated output, and capacity, for unmetered wind and unmetered solar generation.

8.5.8 The Actual Generation file includes metered wind generation (but not installed capacity). The workbooks accompanying the annual FES publications include historic installed wind capacity by type (onshore and offshore), connection type (distribution and transmission) and year (Ref 36).

8.5.9 Data from 1 January 2022 to 31 December 2024 has been used to derive a series of historical metered wind capacity for onshore and offshore wind.

8.5.10 Using three recent years of data provides a credible representation of national generation and capacity including all micro wind, onshore wind and offshore wind as well as rooftop, commercial, and larger scale ground mounted solar to a total combined portfolio of approximately 31GW of wind and 19GW of solar (estimated at year end 2024). The solar and wind generation facilities included in this portfolio are located throughout the UK.

8.5.11 Taking a multi-technology approach to electricity supply can reduce the effects of weather variability on output. By combining two generation portfolios which are largely independent of each other (meaning, the level of solar generation in the UK at any time is not mathematically dependent on the level of wind generation in the UK at that time, and vice-versa), the variation of the combined portfolio of (solar + wind), when averaged over a period of time, is lower than the variation of each of the portfolios separately.

8.5.12 Clearly, the identification of a general trend does not imply conformance to that trend on all days and at all times. Future 'actuals' will be dependent on prevailing weather conditions as well as levels of installed wind and solar generation capacity at delivery.

8.5.13 Running the analysis over different time periods by using a different range of historical data derives similar results. The level of certainty which may be ascribed to the general conclusions of the analysis is therefore high, based on historical information. Insofar as solar and wind capacity both increase in the future, in broadly similar proportion to each other as has been experienced historically, then it is reasonable to assume that the conclusions reached will remain valid in the future.

8.5.14 Forecastable and stable generation output per unit of installed capacity is important because it relates to the reliability of, and therefore NESO's ability to depend on, forward forecasts of generation outturn. At the macro level, a greater reliability of generation outturn allows for a more efficient and targeted asset development program to be developed; and a lower requirement for (currently fossil fuelled) backup plant, without creating an excess of generation capacity.

8.5.15 A growing portfolio of solar generation would therefore complement the existing and growing GB wind portfolio to deliver a combination of low carbon generation with improved reliability and predictability than associated with the separate technologies.

Renewable generation can meet GB's seasonal electricity demand

8.5.16 A second analytical model has been developed to illustrate the collective capability of solar and wind generation in meeting seasonal demand for electricity in GB.

8.5.17 The model evaluates the contribution made by different generation classes to overall national demand throughout a year on a month average basis, but does not take into account the requirement to balance supply and demand on a shorter-term basis.

8.5.18 The data sets model underlying demand, heat demand, transport demand, and different sources of low carbon supply including solar generation and wind generation, and how each of these change through the year.

8.5.19 The analysis is based on the average within-year shape of demand from 2015 to 2019.

8.5.20 Each data set therefore comprises a month-to-month shape and a future level. The methodology used to derive the shape for each series is as follows:

- 2015 – 2019 national demand data is used to derive a month-average demand expressed as a ratio of annual average demand. The data therefore avoids any one-off within-year impacts associated with outlier weather patterns (because the base data covers multiple years) or due to the COVID-19 pandemic and subsequent cost of living crisis (because data including and after 2020 has not been used);
- The heating demand shape has been derived from the industry rule of thumb that in the UK, gas demand in the Winter is up to five times higher than in the Summer, and therefore electricity demand for heating (when it displaces gas heating) may follow a similar shape;
- The transport demand shape has been estimated as flat through the year; and
- Demand for electrolysis of water to produce hydrogen has been included in monthly demand estimates for completeness but at only small capacities in the 2030 timeframe, in line with NESO's projections.

8.5.21 Total demand is the sum of underlying demand, heat demand, transport demand, and electrolysis demand.

8.5.22 Supply has been modelled with only zero-carbon technology types, to capacities which are consistent with the government's Clean Power 2030 capacity ranges (see **Table 1** and **Paragraph 2.9.12**). The results are shown in **Figure 29**. The technology types are: zero carbon baseload (grey), onshore wind (green), offshore wind (blue), and solar (yellow).

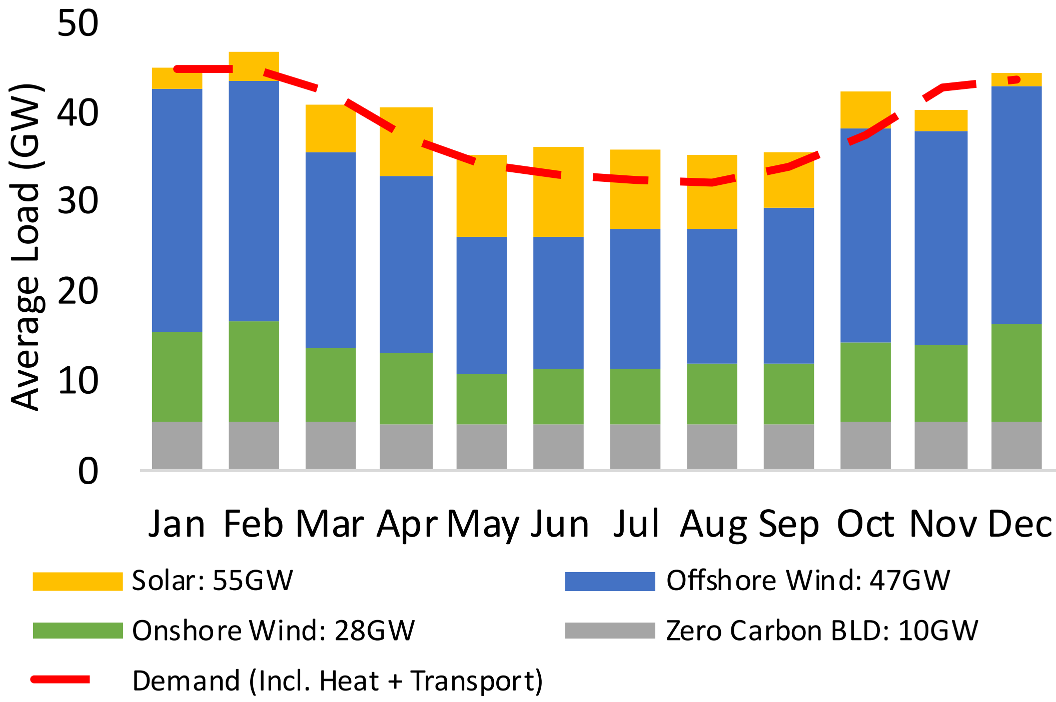

Figure 29: Government's 2030 Capacity Ranges meet anticipated seasonal demand

[(Ref 36)(2025), Tables ES1 & ED1, (Ref 4), Connections Reform Annex, Table 1, Author Analysis]

8.5.23 The methodology used to derive the shape for each series is set out below.

- Zero carbon baseload generation represents nuclear energy from the remaining existing UK nuclear fleet (Hinkley Point C is not assumed to have been commissioned by 2030 in the EE pathway), alongside existing biomass, energy from waste and hydro generation. All assets are assumed to have an Unplanned Capability Loss Factor (breakdown rate) of 10% and planned outages are assumed to take place on the nuclear plant in Summers rather than Winters, leading to a Summer baseload low carbon technology monthly availability of 50.6% and a Winter month availability rate of 54.1%;

- The average monthly load factor for onshore and offshore wind and solar generation has been derived from NESO market data for the entire UK operational wind and solar portfolio for the period 2022 to 2024. The data sources are the same as those used to derive **Figure 28**. Historically, both onshore and offshore wind generation in Winter months (October through March) has been just below twice the level seen in the low months of the year (June and July), which is almost the inverse solar generation levels; and

- The data derives a within-year shape (at monthly granularity) which is consistent with NESO Operational Data for the entire UK operational solar estate over the period 2022 – 2024.

8.5.24 **Table 4** shows the load factors assumed in the analysis alongside NESO assumptions [(Ref 36)(2025), Data worksheet ES1] and other relevant sources [(Ref 16)(3)(2023), (Ref 75)(2023)].

Table 4: Comparison of assumed load factors with independent data sources

[(Ref 36)(2025), Table ES1, (Ref 16)(3)(2023), (Ref 75)(2023)]

Load Factor (%)	Model Assumption	FES Average	DESNZ Regional Data	DESNZ Cost Assumption
Offshore wind	45%	45%	37%	65%
Onshore wind	29%	29%	27%	41%
Solar	10.5%	12%	10%	11%

8.5.25 New offshore wind farms have significantly higher load factors than early wind farms, and the technology is projected to see significant growth from today through to 2030 and beyond. This is predominantly due to:

- Developments being located in areas with higher average wind resource, and larger more efficient turbines now being available on the market. The model assumption (derived from author analysis) matches the FES 2024 assumption; and
- New onshore wind farms are likely to be more constrained in location and turbine size than new offshore wind farms and growth in load factor is less certain. The model assumption therefore adopts a lower load factor, also derived by the author, for onshore wind than for offshore wind which also matches the FES 2024 assumptions.

8.5.26 The FES [(Ref 36)(2025), Table ED1] provides projections for the average levels of demand associated with underlying electricity use, heat, transport, and electrolysis capacities of each technology which may be in operation in 2030.

8.5.27 The analysis assumes annual average load levels for underlying demand of 31.7GW, for heat demand of 2.9GW, for transport demand of 3.1GW, and for Electrolysis of 1.9GW.

8.5.28 The model is an illustration based on projections of capacity roll out, electrification of demand, and efficiency / load factor. **Figure 29** shows the output of just one projection of a multitude of possible projections. Other outcomes are therefore possible, including those associated with rapid expansions of other zero-carbon generation technologies, should they materialise.

8.5.29 The model assumes future levels of supply capacity which are consistent with the government's Clean Power 2030 capacity ranges and are listed in **Table 5**, alongside the projections of capacity in FES 2024 (average; minimum and maximum installed capacity in 2030 for each technology in the three net zero compliant scenarios).

Table 5: Comparison of installed capacity assumptions vs. FES 2025

[(Ref 36)(2025), Table ES1, Author Analysis]

Technology Assumed Capacity (GW)	Model Assumption	FES 2025 Average	FES 2025 Min	FES 2025 Max
Offshore wind	46.5	46	42	48
Onshore wind	28	29	27	30
Solar	55	46	43	47
Zero carbon baseload	10	8	7	8

8.5.30 However, considering the contribution only of proven low carbon generation technologies to meeting future demand is a prudent approach because:

- **Section 2.3** of this report describes the urgency for action to reduce carbon emissions from the UK's electricity system in the critical 2020s, and **Section 6.6**, **Section 5.7** and **Section 5.8** of this report describe that there are as yet no fully funded and consented nuclear, CCUS or hydrogen projects set to deliver in the 2020s beyond the projections already included in the analysis; and
- **Section 3.2** articulates the prudent view that infrastructure development should be planned on a conservative basis, without over-relying on yet-to-be-proven technologies, technologies with long development lead-times, or technologies which have historically experienced funding difficulties.

8.5.31 **Figure 29** should not be inferred to advocate either for a specific renewables mix, nor for a system without adequate backup or flexible generation, both of which may be required to support decarbonisation of the NETS by managing day-to-day swings in both demand and supply.

8.5.32 The government's mission is to deliver its Clean Power target by rapidly expanding the capacity of renewable generation installed in the UK. **Chapter 5** of this Statement describes that although the current pipelines for low carbon generation are large, it cannot be relied upon that the delivery of those pipelines will be achieved.

8.5.33 However, **Figure 29** shows that a portfolio of low carbon generation which includes solar, onshore and offshore wind, and a low carbon base, if delivered, is capable of closely matching a future projection of national electricity demand on a month-average level.

8.5.34 **Figure 29** uses average load factor data and therefore, for renewable technologies, generation in some months may be higher than the data presented, and in other months generation may be lower.

8.5.35 **Figure 29** shows that if the government's capacity ranges are delivered across offshore wind, onshore wind, and low carbon baseload technologies, it would be likely that sufficient energy would be generated to meet estimated demand in most Winter (October to March) months. The tops of the blue stacked columns (total generation) are near to the red line (total demand) in October, December, January, and February and are within reach of the red line in November.

8.5.36 However, because of the seasonality of wind generation in UK territory, the projected capacities of low carbon generation would likely be insufficient to meet Summer (April to September) demand. The top of the blue stacked column is below the red line in the majority of these months. The same is true for March.

8.5.37 Approximately 46GW of large-scale solar (an increase of 29GW on mid-2024 levels, consistent with the government's analysis) alongside an additional 9GW of distributed solar would provide additional low carbon energy to help meet the UK's electricity needs throughout the year, and specifically in the Summer months when wind energy yields are lower.

8.5.38 However, demand must be met under a wide range of supply scenarios, including when renewable supplies are low. This analysis should not therefore draw the reader to the conclusion that the government has does not seek more renewable generation capacity beyond 2030.

8.5.39 To meet 2030 Summer levels with a similar level of reliability as shown in this pathway without solar generation, a further c.15GW of offshore wind generation (i.e. a total installed capacity of ~62GW), or an additional c.11GW of low carbon baseload generation (three new Hinkley Point C equivalent power plants), would be required to be built in the next 10 years.

8.5.40 However, by building out either additional low carbon baseload or offshore wind generation capacity of the levels indicated to meet Summer demand levels without solar, there would be significant over-generation of power in the Winter periods of between 8% and 14%. Over-generation may be curtailed (either at a cost to the consumer or by reducing available revenues to asset operators) or stored. If revenues are reduced for asset operators, in some cases assets may not be commercially attractive and therefore may not get built out.

8.5.41 The model supports the conclusion that the deployment of large-scale solar alongside offshore wind, onshore wind, and low carbon baseload assets provides the opportunity for a lower capital, lower curtailment (therefore lower cost) energy system through diversity of asset type than that provided by scenarios which do not include solar generation.

8.5.42 A high degree of certainty may be attached to this conclusion because of the horizon of data used to inform variable inputs to the model, and consistency of these and other assumptions with those made in NESO's FES 2024 pathways.

8.5.43 As the technical and economic viability of inter-seasonal storage advances, more options will become available for optimising GB's generation mix in relation to balancing capital deployment, development risk, the availability of suitable locations, and ongoing system operations (e.g. curtailment). However, based on current assessments, it is clear that the deployment of large-scale solar alongside that of offshore wind, onshore wind, and low carbon baseload assets, provides the opportunity for a lower capital, lower curtailment (therefore lower cost) energy system through diversity of asset type than that provided by scenarios which do not include solar generation.

8.6 Conclusions on security of supply

8.6.1 The need for CNP Infrastructure is established by the NPSs. The Clean Power 2030 Action Plan provides additional focus on both the scale and the urgency to deliver new low carbon generation capacity. This Statement of Need sets out how this Scheme, alongside other low-carbon schemes, are a key part of achieving the UK's decarbonisation policy objectives.

8.6.2 Although individual renewable assets are variable generators, aggregated generation output from portfolios which consist of different renewable technologies is more stable. The generation profiles of diverse ranges of low carbon generators combine to meet seasonal average demand levels without requiring significant and unproductive capital investment, seasonal excess generation, or inefficient network / system operating costs.

8.6.3 Many integration measures are already available, or are already in development, which, over short periods, help balance electricity generation from variable generators to meet demand, and to ensure that the best use is made of low carbon electricity when it is being generated in oversupply. Such examples include BESS, pumped hydro, or interconnectors (see **Section 5.11**).

8.6.4 The contribution made by flexible assets to the short-term balancing of supply and demand are described in **Section 5.11** and **Section 6.9**. However, until inter-seasonal storage is brought forwards at scale and at grid parity costs, the most efficient measures for seasonal balancing of renewable generation include increasing the capacity and geographic diversity of renewable generators, including portfolios of assets with complementary seasonal generation profiles, and managing shorter term intermittency through storage or other measures.

8.6.5 Solar is an asset class which is needed to support a high level of generation adequacy and generation dependability within the GB electricity system.

8.6.6 The Scheme, if consented as a leading large-scale solar scheme in GB, represents c. 2% of the new large-scale solar generation capacity required to achieve the bottom of the 2035 FES-derived Capacity Range (Ref 4), Table 1 & Connections Reform Annex, Table 1]. Therefore, the Scheme and many others like it are essential to move the UK towards the future of efficient decarbonisation through the deployment of large-scale, technologically and geographically diverse low carbon generation assets.

8.6.7 Global expertise in the operation of electricity systems with high proportions of RES is growing. Technologies which help the integration of renewable assets to the grid are already in operation in the UK. However, solar assets are increasingly able to provide important system services themselves, and flexible integration assets are being deployed on a stand-alone and co-located basis to do the same, as well as to manage short-term supply / demand volatility.

8.6.8 Growth in solar capacity, alongside other renewable technologies, is expected to improve the dependability of those assets as a combined portfolio, and this is expected to reduce further any integration costs associated with such growth.

8.6.9 Further, growing capacities of British-based renewable energy sources, including large-scale solar, improves energy security by reducing Britain's vulnerability to volatile global fossil fuel markets.

8.6.10 The Scheme, if consented, would contribute to an adequate and dependable GB generation mix, through enabling the generation of more low carbon power from indigenous and renewable resources. Therefore, the Scheme will make a significant contribution to GB's energy security needs, and the decarbonisation needs of the UK.

9 The contribution of large scale solar to the affordability of electricity

9.1 Chapter summary

9.1.1 This chapter provides an overview of the affordability benefits of large-scale solar in the UK which arise from reducing deployment costs and low marginal costs of generation:

"Analysis [commissioned by the NIC] suggests that there is no material cost impact, either over the short or long term, of deploying renewables faster. Renewables are now the cheapest form of electricity generation due to dramatic cost reductions in recent years. Cost reductions have been greater than was predicted in 2018 when the Commission made its recommendation on what level of renewable generation the government should be targeting" [(Ref 70), p9].

9.2 Pricing in the GB electricity market

9.2.1 In the GB power market, generators schedule themselves to generate in response to whether a market price signal for a specific period is above or below their marginal cost of generation. Marginal cost of generation is defined as the cost of generating an additional 1MWh, usually including variable fuel, carbon emissions, and transmission costs.

9.2.2 Each day is subdivided into 48 half-hour Settlement Periods (SPs) and power is traded ahead of delivery for these periods, or continuous groups thereof, from just 90 minutes ahead, up to months or even seasons ahead.

9.2.3 Solar generation has very low or zero marginal costs and therefore solar assets generate as much power as they are able to, when they are available (i.e. whenever there is light) and whenever power prices are positive. Because of the variable, but forecastable nature of solar irradiation, they also tend to trade on near-term power markets, therefore much of the impact of sunny (or overcast) weather on power price is felt in the few days close to delivery.

9.2.4 Thermal plants have higher marginal costs, relating to the cost of the fuel they are converting into that additional MWh, and any emissions costs associated with the use of that fuel. Thermal and hydro plants will therefore only generate when the market is providing a higher price signal, i.e. when demand is expected to be higher than the supply of low-marginal cost supplies at the time of dispatch. Thermal and hydro plants may also trade power, fuel, and carbon emissions costs into the future to fix their income.

9.2.5 Increases in the cost of source fuels and emissions increase the cost of generation from these assets. Therefore, when they are required to generate electricity, they will do so at a cost which increases the price of electricity for all market consumers for that period.

9.2.6 All generators produce active power (MWs), and at all times, the total national active power generated must meet the total national system load. If solar farms are generating electricity during a settlement period, then less electricity is required from plants with more expensive marginal costs, therefore the price of electricity for that settlement period reduces.

9.2.7 Emissions pricing ensures that carbon-emitting generation is more expensive to dispatch than zero-carbon generation. Therefore, by undercutting carbon emitting assets on marginal cost, zero-carbon assets will displace carbon intensive assets, providing both a carbon emission saving and a cost benefit to consumers.

9.2.8 This market mechanism is illustrated in **Figure 30**. The blue line, increasing from left to right along the x-axis, represents the marginal cost of generation in GB at each level of demand. As demand increases, more expensive supply must be scheduled into the market to meet that demand.

9.2.9 The three red vertical lines represent different levels of demand. At a mid-level of demand, the solid vertical red line crosses the blue line (in this illustration: at about £45/MWh) and is the price of electricity for that period.

9.2.10 If demand reduces (e.g. to the left-hand dashed vertical red line), a lower capacity of assets is required to run to meet demand. Therefore, the marginal cost of the most expensive asset required to run to meet demand will be lower than it would otherwise have been, and the price of electricity for that period would also reduce.

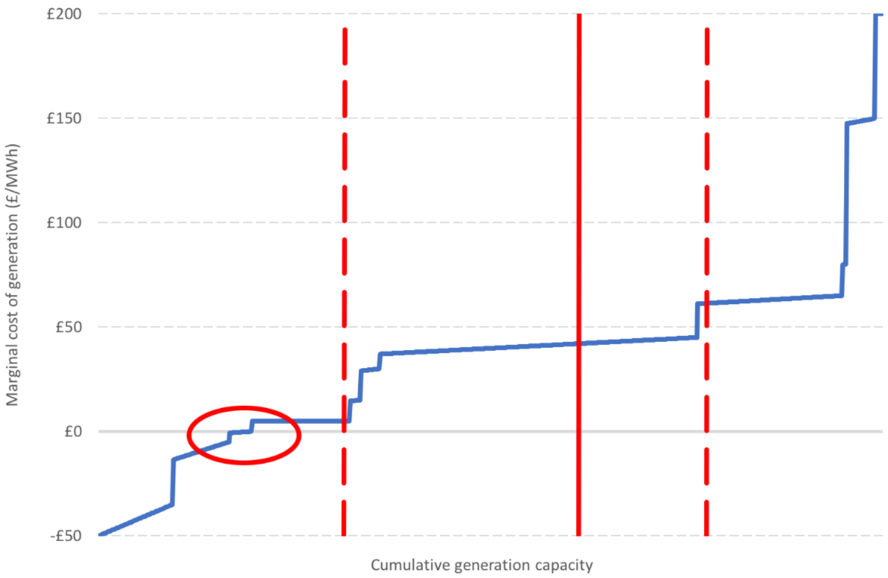

Figure 30: Representative marginal cost stack for the GB electricity system

(Author Analysis)

9.2.11 Conversely, if demand increases (e.g. to the right-hand dashed vertical red line) assets with higher marginal costs of production are required to run, and they set a higher price of power.

9.2.12 The blue line in **Figure 30** will be different for each half hour settlement period because generators may become available or unavailable through the day due to outages or breakdowns. The level of renewable generation will also change through the day. More renewable generation will stretch the blue line within the red ellipse (around a zero marginal cost of power), lowering the price of electricity for that period (the point of intersection between a vertical red line point with any fixed red line), and as a result, the blue line slides to the right for all higher levels of demand.

9.2.13 The marginal cost of production to meet demand over these periods will therefore be lower, and as a result, the traded price of power will be lower.

9.2.14 By running this type of analysis over every settlement period over the future trading horizon, it is possible to derive a view of the price of power for the next week, month, quarter, or season.

9.2.15 The conclusion remains the same: namely that increasing the capacity of renewable assets in GB reduces the traded price of power.

9.2.16 The GB power pricing mechanism also provides the explanation as to why the British Energy Security Strategy increases the UK's ambition for renewable generation to reduce our dependency on volatile international energy markets.

9.3 Levelised cost of solar generation

"The International Renewable Energy Agency (IRENA) found that between 2010 and 2019, the cost of solar PV globally dropped by 82%... In 2019 alone, the cost of electricity from solar fell by 13% to just over five pence per kilowatt-hour. This means that by… [2020] globally, there will be up to 1,200GW of existing coal capacity that will cost more to operate than it would to install new solar PV capacity." (Ref 90).

9.3.1 The market mechanisms described in **Section 9.2** only reduce the price of power if solar projects come to market, or if developers believe they are able to make reasonable returns on their investments. The cost of solar generation is an important enabler of its development. Solar panels and electrical infrastructure have become larger and more efficient, as described in **Section 6.8**, meaning that more electricity can be generated from the same area of land as was previously possible. As a consequence, solar is now a leading low-cost generation technology (see **Figure 31**).

9.3.2 Levelised Cost of Energy (LCOE) is an important metric allowing all forms of generation to be compared with each other on a consistent basis. LCOE is calculated using a discounting methodology and is a measure of the lifetime unit cost of generation from an asset, including capital and operating costs. In-life capital and operating expenses, for example the re-powering of sites to manage anticipated degradation, are also anticipated.

9.3.3 **Figure 31** shows the results of an analysis of the government's Electricity Generation Costs report [(Ref 75)(2023)], with the range of values representative of different complexities of technical solution.

9.3.4 **Figure 31** shows a 'triple' of columns for each of five generation technologies. Each column within each triple shows the technology's anticipated LCOE for assets commissioning in 2025 (left hand column), 2030 (middle column), and 2035 (right hand column).

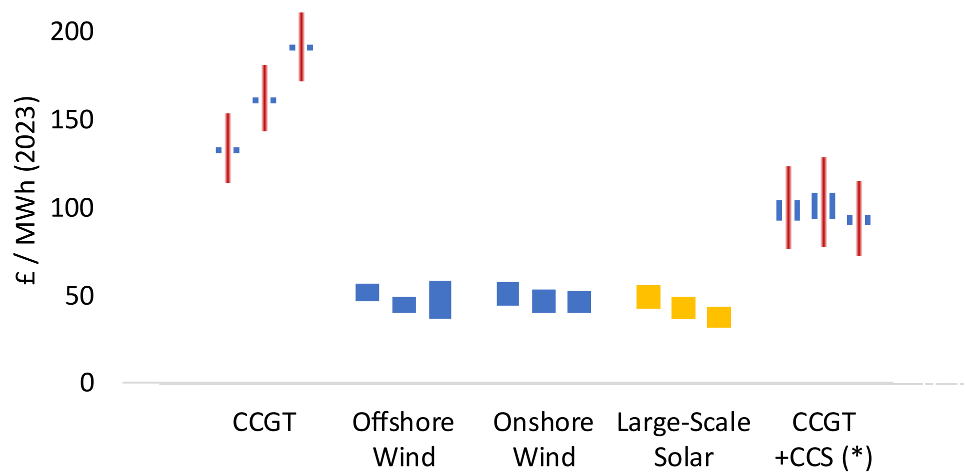

Figure 31: Levelised cost of energy comparison

(Ref 75)

9.3.5 Governmental modelling anticipates different projected operational lifetime, load factors (a measure of the output of the plant per year versus its theoretical maximum if availability is unconstrained), capital and operational costs, and development duration to derive a range of cost projections. The blue bars show that range while the red columns represent the LCOE range under different projections for input fuel costs for those technologies which require a non-zero cost input fuel.

9.3.6 The levelised cost ranges of large-scale solar (the governmental analysis assumes a capacity of 16MW) are highlighted in yellow. **Figure 31** shows that renewable generation technologies hold a significant levelised cost benefit when compared to technologies which are reliant on fossil fuels (CCGT and CCGT + CCS), even when fuel input costs are included at a low level.

9.3.7 The government did not refresh its cost estimates for CCGT + CCS. The data shown is government's 2020 estimate, adjusted for inflation and signposted with an asterisk on the chart.

9.3.8 The analysis illustrates that the LCOE of solar delivered in 2025 is lower than the LCOE of offshore wind delivered in a similar timeframe, and is comparable to the LCOE of onshore wind. However, predictions are that solar generation delivered in future years is likely to be cheaper than both onshore and offshore wind on an LCOE basis.

9.3.9 A project with a lower LCOE would allow consumers to benefit through market mechanisms. For example, a project with a lower LCOE would be able to bid into a future CfD Allocation Round at a lower strike price than a project with a higher LCOE. If such a project secured an agreement, consumers would also benefit versus the case that it did not.

9.3.10 The government's Cost of Electricity Generation report series (Ref 75) also shows that solar LCOE has reduced significantly in the last decade. Solar, already being highly competitive against current conventional and renewable generation costs, is predicted to retain a cost advantage for the decades ahead.

9.3.11 Solar costs have been driven down through the realisation of efficiencies in capital infrastructure, development and integration costs, and lifetime Operating and Maintenance costs. This includes working to reduce the effects of degradation of solar panels and inverters. Improvements in lifetime cost are likely to continue to be delivered.

9.3.12 Technological advances have also increased the efficiency of solar panels (see **Section 6.8** of this Statement) and extended their useable lifetimes. At the same time, economies of scale through the global supply chain have reduced the cost of panels. Development costs have also reduced as efficiencies in the build process have been captured through prior experience.

9.3.13 **Figure 32** shows the results of previous and current governmental analysis. The mid grey lines show the 2016 projections of the LCOE of solar commissioning in 2020, 2025, and 2030. The solid line shows the central case projection, and the dotted line shows the low case projection.

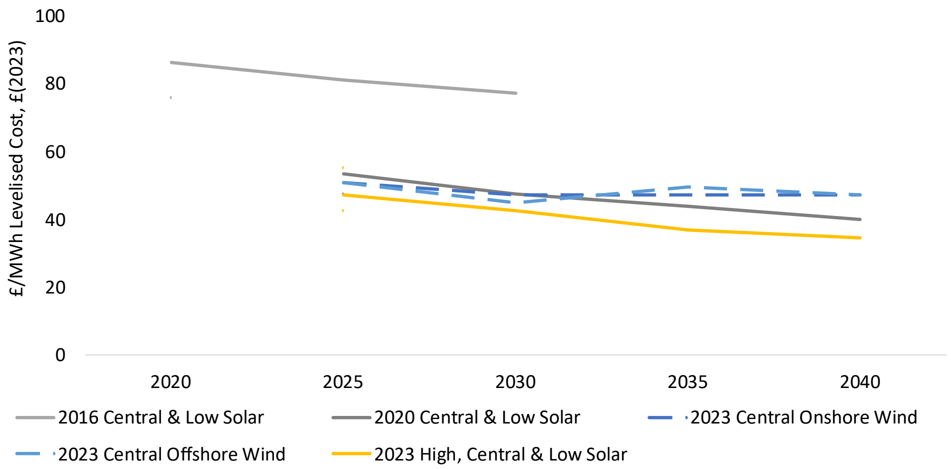

Figure 32: An evolution of levelised cost forecasts

[(Ref 75), Author Analysis]

9.3.14 The 2013 projections (not shown in **Figure 32**) were approximately 70% higher on a consistent 2023 real price basis. Just four years later, the government's 2020 solar LCOE projection (shown in dark grey) was over 30% lower for sites commissioning in 2025 and 2030.

9.3.15 Their projections made in 2023 are shown by the yellow solid line (central cost) and are bounded by the high and low cases shown by the dotted lines. The 2023 solar LCOE estimate is a further 10% lower than the 2020 estimate on a consistent 2023 real price basis.

9.3.16 Industry-sourced data and opinion concurs with the direction of this analysis. For example, a CCC illustration of data from IRENA analysis (2020) shows similar cost reductions in renewable generation technologies, and the competitiveness of those technologies against fossil fuel generation [(Ref 14)(2020), Figure 2.2].

9.3.17 **Figure 32** should not however be taken as a justification for delaying the development of renewable projects, in order to capture a lower future installed price. **Section 2.2** explains the rationale for urgent action to develop significant capacities of low carbon generation. Time is a precious commodity.

9.3.18 Further, it is the continuous development of projects which allows learnings to be implemented, technology to advance through practical application, and markets and supply chains to evolve and improve efficiency, to achieve the future cost reductions which have been forecast by previous governments and others.

9.3.19 Solar was included in the 2021/22 CfD Allocation Round (AR4) to help "deliver a diverse generation mix at low cost" and to realise "the rate and scale of new projects needed in the near-term to support decarbonisation of the power sector and meet the net zero commitment" while providing other benefits such as diversity of supply through different resource requirements and a geographical separation from other significant renewable energy sources [(Ref 91), pp16 & 20]. **Section 5.3** of this Statement explains that CfDs provide revenue certainty for developers by shielding them against volatile energy costs. This shield also benefits consumers during times of high energy prices.

9.3.20 Many solar projects were successful in CfD AR4, AR5, and AR6 (2024). Auction results indicate that solar is an important and cost-competitive technology within the evolving GB electricity system (Ref 92):

- In AR4, over 2.2GW of solar capacity across 66 projects (commencing in 2023/24 or 2024/25) secured CfDs at an initial strike price of £45.99 (2012 indexation, estimated to be equivalent to £64.18 in 2024 money);
- In AR5, over 1.9GW of solar capacity across 56 projects (commencing between 2025 and 2028) secured CfDs at an initial strike price of £47.00 (2012 indexation, estimated to be equivalent to £65.58 in 2024 money); and
- In AR6, nearly 3.3GW of solar capacity across 93 projects (commencing in 2026/27 or 2027/28) secured CfDs at an initial strike price of £50.07 (2012 indexation, estimated to be equivalent to £69.87 in 2024 money).

9.4 Whole system costs

9.4.1 The NIC's current view is that RES represent a most likely low-cost solution for GB electricity generation, over large-scale conventional investments:

"More renewables do lead to more money being spent to match supply and demand: a system with 90 per cent renewables is estimated to cost up to £4.5 billion more per year to balance. But cheaper capital costs are estimated to offset this within the costs for the overall system" [(Ref 87), p39].

9.4.2 Both **Figure 28** and **Figure 29** provide evidence that the deployment at scale of more than one renewable generation technology will help reduce the capacity of integration technologies needed to manage generation variability across many timeframes, including potentially the long-term storage of excess generation, although it is unlikely to fully remove the need.

9.4.3 An Imperial College expert economic analysis of whole system costs of renewables agrees; they show that the integration costs of RES fall on an absolute basis, as capacity increases from 10GW up to 50GW (Ref 93).

9.4.4 The NIC published the results of a whole system cost analysis in 2020. NIC's analysis complements that of the Imperial College team, suggesting that "there is no material cost impact, either over the short or long term, of deploying renewables faster. Renewables are now the cheapest form of electricity generation due to dramatic cost reductions in recent years." (Ref 70).

9.4.5 With the development of new schemes, solar technology is proven to be commercially rational over a growing geography. Developing technology, construction risk mitigation, efficient grid connection and efficient financing have all applied downward pressure on solar project costs. As a consequence, utility-scale project costs projected to fall. The global solar market is growing, and the GB solar market is growing as well.

9.5 Conclusions on affordability

9.5.1 Large-scale solar power decarbonises the electricity system and lowers the market price of electricity by generating power so that expensive and more carbon intensive forms of generation do not need to generate as much.

9.5.2 In doing so, solar power delivers national decarbonisation benefits and supports consumer affordability aims, to the benefit of electricity consumers.

9.5.3 Growing capacities of British-based renewable energy sources, including large-scale solar, supports consumers by reducing the British energy system's exposure to gas price fluctuations arising from volatile global fossil fuel markets.

9.5.4 Due to technological advances, solar facilities are already among the cheapest form of electricity generation in the UK and government produced forecasts indicate that costs will continue to reduce in the future.

9.5.5 Scale remains important. Maximising the generating capacity of schemes improves their economic efficiency and so brings electricity generation to the market at a lower cost.

9.5.6 Larger solar schemes deliver more quickly and at a lower unit cost than multiple independent schemes which make up the same total capacity, bringing forward carbon reduction and energy security benefits as well as helping to keep consumer costs in check, in line with government policy, including that of the previous government).

9.5.7 The Scheme will be a substantial infrastructure asset, which if consented will deliver large amounts of cheap, secure, and low carbon electricity in support of government's energy policy aims to ensure that the national energy system always remains secure, reliable, affordable, and low carbon. Maximising the capacity of generation in the proposed location for the Scheme represents a significant and commercially rational step forward in achieving government's energy policy aims.

10 Overall conclusions

10.1.1 Decarbonisation is a legally-binding climate change target for the UK and is of global significance. It cannot be allowed to fail, and urgent actions are required in the UK and abroad, to keep decarbonisation on track to limit global warming.

10.1.2 The NPSs establish a critical national priority for the provision of nationally significant low carbon infrastructure, which includes large-scale solar farms, because a combination of many or all types of such infrastructure is urgently required for both energy security and Net Zero.

10.1.3 NPS EN-1 states that “For projects which qualify as CNP Infrastructure, it is likely that the need case will outweigh the residual effects in all but the most exceptional cases” [(Ref 1), Para 4.1.7]. The Scheme is CNP Infrastructure. Therefore, it follows that the urgent need for the Scheme to achieving the UK’s energy objectives, together with the national security, economic, commercial, and net zero benefits will outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy [(Ref 1), Para 3.3.63].

10.1.4 The government’s Clean Power 2030 Action Plan (Ref 4) reinforces the urgent need for low carbon generation schemes to come forwards to pave the way to decarbonising the wider economy by 2050 as the UK pursues the electrification of heat in buildings, transport, and industry. It also provides a framework for the prioritisation of offers for projects which align with NESO’s advice on deliverable connections, and which can demonstrate that they have the means to deliver to the timeframes involved.

10.1.5 The Scheme is required to ensure that the UK remains on track to meet its legally binding carbon emissions reduction targets, including the Sixth Carbon Budget, while enhancing national security of supply, and at a cost which, in relation to other electricity generation infrastructure developments, provides value for money for end-use consumers.

10.1.6 This Statement shows that large-scale solar generation is economically and technically viable in the UK, and that it is an economically and technically preferable source of low carbon energy for the GB electricity consumer.

10.1.7 The UK has substantial renewable energy resources, including wind and solar, and large areas of the country receive high levels of solar irradiation. These resources must be harnessed to decarbonise our economy and the utilisation of existing and available points of connection supports this endeavour.

10.1.8 The UK policy view is that a low-cost, net zero consistent system is likely to be composed predominantly of wind and solar [(Ref 1), Para 3.3.20]. Flexible assets are also needed to balance supply with demand. National policy is supportive of solar that is co-located with storage to maximise the efficiency of land use.

10.1.9 The Scheme will, if consented, bring forward large-scale ground-mount solar with co-located energy storage facilities. The Scheme therefore goes towards meeting the government's aims.

10.1.10 **Chapter 5** of this report describes the government's aims for many renewable technologies and describes the opportunities and risks associated with their delivery. If solar generation does not meet the decarbonisation and energy security contributions ascribed to it, the challenge faced by the UK in meeting its decarbonisation targets from other technologies will be significantly harder.

10.1.11 Conversely, the continued development of proven low carbon technologies like large-scale solar is important to protect against the possibility that technologies which are currently in 'prototype' stage do not deliver operational capacity at the pace or scale required.

10.1.12 Other conventional low carbon generation (e.g. nuclear or conventional generation with CCUS) and new low carbon dispatchable generation (e.g. hydrogen) will be important contributors to achieving the 2050 net zero obligation, but their contributions in the timeframe in which the Scheme will deliver are uncertain.

10.1.13 The Scheme would generate power ahead of other potential technologies (which may have longer construction timeframes or have potentially not yet been proven at scale) which will support decarbonisation only in future years and only if they are brought forwards.

10.1.14 The need for solar is especially important given the context of the CCC's identification of the need for urgent action to increase the pace of decarbonisation in the GB electricity sector, and the then government's adoption of their recommendations for the Sixth Carbon Budget (2033 – 2037).

10.1.15 The Scheme will, if consented, be capable of supporting the delivery of the Sixth Carbon Budget. Large-scale solar is needed alongside rooftop solar because without increasing capacities of solar generation at both scales, the UK will likely fall short of its solar capacity aims and therefore its climate change targets.

10.1.16 Large-scale solar delivery both before and beyond 2030 is important not only to reduce power-related carbon emissions, but also to provide a timely next step contribution to a future generation portfolio which will support the electrification and therefore decarbonisation of transport, heat, and industrial demand.

10.1.17 As part of a diverse generation mix, solar generation improves the stability of capacity utilisations which in turn improves generation dependability. When developed alongside other renewable technologies, large-scale solar will help smooth out seasonal variations in total GB renewable electricity generation, more closely matching anticipated seasonal average levels of demand.

10.1.18 As associated development to the solar PV arrays, co-located storage will help the Scheme operate flexibly as an essential part of a zero-carbon electricity and energy system.

10.1.19 The proposed location is an appropriate location for large-scale solar because a grid connection for the required capacity can be made available to connect the Scheme in the timeframes indicated, with sufficient solar irradiation, and suitable secured land for the solar and BESS. The Scheme would connect to an existing grid connection point on an existing part of the NETS, efficiently optimising the use of an already existing national infrastructure asset.

10.1.20 By being connected to the transmission system, large-scale solar generation can and will play an important role in the resilience of the GB electricity system from an adequacy and system operation perspective. This is because the transmission system is able efficiently to transfer bulk power from where it is generated in abundance to where it is needed. The proposed transmission system connection means that it will be required to play its part in helping NESO manage the national electricity system.

10.1.21 Large-scale solar generation also supports security of supply by helping reduce the national dependency on imported hydrocarbon source fuels. The Scheme will therefore also help reduce the UK's exposure to volatile international energy prices.

10.1.22 The low marginal cost and low marginal carbon emissions energy generated at the Scheme can be confidently forecast and priced into future contracts for power delivery by all market participants, thus allowing all consumers to benefit from the market price reducing effect of solar generation.

10.1.23 The cost of solar generation is already highly competitive against the cost of other forms of conventional and low carbon generation, both in GB and more widely.

10.1.24 Internationally, and importantly for GB in this regard, there is the ongoing trend of solar generation assets becoming larger and more affordable, each subsequent project providing a real-life demonstration that solar schemes of similar size and scale as the Scheme can and should be developed in GB. The development of such schemes will provide decarbonisation, energy security and commercial benefits to consumers.

10.1.25 If consented, the Scheme, along with other solar schemes, will make a critical contribution towards net zero. The government's Clean Power 2030 Action Plan (Ref 4) establishes its aim to achieve its Clean Power target. The Clean Power capacity ranges provide a foundation to prioritise the most critical infrastructure to meet Clean Power 2030 and include a range of 45 to 47GW for large-scale solar by 2030 and 45GW to 69GW by 2035.

10.1.26 The need for new clean power does not stop at 2030. The continued delivery of low carbon generation facilities beyond 2030 is necessary to meet future electricity demand growth and achieve essential wider societal carbon savings. It is also important to continue to bring forward schemes in the event that ‘Clean Power by 2030’ is not achieved. The Scheme could contribute nearly 2% of the capacity required to meet the government’s Clean Power Capacity Range for solar power by 2030.

10.1.27 The meaningful and timely contributions offered by the Scheme to UK decarbonisation and security of supply, while helping lower bills for consumers throughout its operational life, will be critical on the path to net zero beyond delivery of the government’s ‘Clean Power by 2030’ mission.

10.1.28 Without the Scheme, a significant and vital opportunity to develop a large-scale low carbon generation scheme will have been passed over, increasing materially the risk that future Carbon Budgets and the net zero 2050 target will not be achieved.

10.1.29 The Scheme is a leading GB large-scale solar plus storage scheme. If consented, it would be an essential component of the UK’s plan to deliver a future of efficient decarbonisation through the deployment of large-scale, technologically and geographically diverse low carbon generation schemes and would also deliver flexibility to the UK electricity market.

10.1.30 The Scheme is consistent with and addresses all important and relevant aspects of existing and emerging government policy.

11 Author's qualifications and experience

11.1.1 This Statement of Need has been authored by Si Gillett, Director at Humbeat Ltd.

11.1.2 Humbeat is an independent electricity consultancy, established in 2016, to support participants in the UK's transition to a low carbon electricity and energy system. The consultancy supports and advises private individuals and organisations with pre- and post-construction electricity developments by providing commercial and strategic advice in relation to those developments.

11.1.3 Humbeat specialises in assessing, describing, and quantifying the benefits specific technologies and individual developments bring to the overarching and urgent need for decarbonisation in the UK. Humbeat has been commissioned to provide electricity market expertise to over 12,000MW of development-phase renewable generation developments across the UK, including over 3,000MW of ground mount solar, ranging from 10MW sites to large-scale developments.

11.1.4 Mr Gillett authored Statements of Need for eight NSIP solar schemes which received Development Consent between 2020 and 2025, including Cleve Hill Solar Park (May 2020), Longfield Solar Farm (June 2023), Sunnica Energy Farm (July 2024), Mallard Pass Solar Project (July 2024), Gate Burton Energy Park (July 2024), Cottam Solar Project (September 2024), West Burton Solar Project (January 2025) and East Yorkshire Solar Farm (May 2025).

11.1.5 Mr Gillett also developed evidence to support IROPI (Imperative Reasons of Overriding Public Interest) justifications for Hornsea 3 and Hornsea 4 Offshore Wind Farms. DCOs were granted in December 2020 and July 2023 respectively.

11.1.6 Humbeat is currently supporting approximately ten other nationally significant electricity generation infrastructure developments by providing electricity market and low carbon transition expertise to their development teams, as well as multiple engagements on TCPA planning applications for solar and solar plus storage developments.

11.1.7 Mr Gillett has 20 years of experience in energy sectors including petroleum and natural gas liquids, and conventional, nuclear, and renewable electricity – on both the generation and sale side. A wide range of energy experience provides a robust basis for a balanced assessment and analysis of the UK energy sector as a whole. This is especially important as the journey to net zero involves more integrated and system-level thinking than has ever previously been required in the electricity sector.

11.1.8 Mr Gillett holds master's degrees in mathematics and nuclear regulation.

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13 Glossary

Abbreviation/Term	Definition
AR4/5/6	Allocation Round 4/5/6 of the Contracts for Difference scheme
BECCS	Bioenergy with Carbon Capture and Storage
BESS	Battery Energy Storage System
BEV	Battery Electric Vehicle
CBDP	Carbon Budget Delivery Plan
CCC	The Climate Change Committee
CCGT	Combined Cycle Gas Turbine
CCUS	Carbon Capture Use and Storage
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC)
CSNP	Centralised Strategic Network Plan
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DUKES	Government's Digest of UK Energy Statistics
ETYS	National Grid ESO's Electricity Ten Year Statement
EV	Electric Vehicle
E-W	East-West solar panel layout
FES	National Grid ESO's Future Energy Scenarios
FiT	Feed in Tariff
FSF	Fixed South Facing solar panel layout
GBN	Great British Nuclear
GDA	Generic Design Assessment
GHG	Greenhouse Gas
GSP	Grid Supply Point
GWh / GW	Gigawatt hour (energy) / gigawatt (power). 1GW = 1,000 MW
ha	Hectare
HAR	Government's Hydrogen Allocation Round
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
kWh / KW	Kilowatt hour (energy) / kilowatt (power). 1MW = 1,000 kW
LCOE	Levelised Cost of Energy
LULUCF	Land Use, Land-use Change and Forestry
MCS	Government's Microgeneration Certification Scheme
MtCO2 / MtCO2(e)	Million tonnes of carbon dioxide / Million tonnes of carbon dioxide equivalent

Abbreviation/Term	Definition
MWh / MW	Megawatt hour (energy) / megawatt (power)
NDC	Nationally Determined Contributions
NESO	National Energy System Operator (formerly NGESO)
NETS	National Electricity Transmission System
NGESO	National Grid Electricity System Operator (now NESO)
NGET	National Grid Electricity Transmission
NIC	National Infrastructure Commission
NOA	National Grid ESO's Network Options Assessment
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
ONR	Office for Nuclear Regulation
PV	Solar Photovoltaics
REPD	Government's Renewable Energy Planning Database
RESP	Regional Energy Strategic Plan(s)
RES	Renewable Energy Source
SAT	Single Axis Tracker solar panel layout
SMMT	Society of Motor Manufacturers and Traders
SMR	Small Modular (nuclear) Reactor
SoC	State of Charge (e.g. of a BESS)
SP	Settlement Period (of the GB electricity market)
SSEP	Strategic Spatial Energy Plan
TEC	Transmission Entry Capacity
TWh / TW	Terawatt hour (energy) / terawatt (power). 1TW = 1,000 GW
WMO	World Meteorological Organisation
ZEV (mandate)	Zero Emission Vehicle (mandate)