Light Valley Solar

Statement of Need

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Light Valley
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Light Valley Solar

DCO Submission

Statement of Need

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1 Executive Summary

1.1.1 Light Valley Solar Limited (the Applicant) is seeking a Development Consent Order (DCO) for the construction, operation and maintenance and decommissioning of Light Valley Solar (hereafter referred to as the Proposed Development). The Proposed Development comprises a solar photovoltaic (PV) electricity generating station with a total capacity exceeding 100 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 Proposed Development proposes to connect to the National Electricity Transmission System (NETS) at the existing Monk Fryston 275kV substation.

1.1.2 This Statement of Need describes how and why the Proposed Development addresses all relevant aspects of government policy which supports the rapid deployment of low carbon electricity generation at scale.

1.1.3 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**)) in deciding the application for development consent for the Proposed Development under the Planning Act 2008 (**Ref 3**) in accordance with those NPSs.

1.1.4 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 Proposed Development.

1.1.5 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 establishes that there is 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.

1.1.6 NPS EN-1 also confirms 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.

1.1.7 The Proposed Development, which consists of a large-scale solar farm with associated energy storage, is therefore aligned with the government's aims.

1.1.8 NPS EN-3 explains 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.

1.1.9 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.

1.1.10 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.

1.1.11 The government's Clean Power 2030 Action Plan, published in December 2024, reinforces the urgent need for new low carbon generation schemes to come forwards to decarbonise Great Britain's electricity system, to pave the way towards wider economy decarbonisation by 2050, as the country pursues the electrification of heat in buildings, transport, and industry.

1.1.12 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. Government's aim to deliver a clean power system by 2030 to prepare 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 a clean power system is not achieved by 2030.

1.1.13 The capacity ranges set out by government in its Clean Power 2030 Action Plan provide a foundation to prioritise the most critical infrastructure needed to deliver a clean power system. 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. As set out in the Government's response to consultation on the new NPSs, these ranges are not a target nor a cap for pipeline developments.

1.1.14 The energy NPSs designated in January 2026 incorporate the material policy changes brought forward in the Clean Power 2030 Action Plan into the planning system.

1.1.15 Progress has been made in recent years in the development of different low carbon electricity generation technologies. However, many of these have uncertain delivery timescales and the timings of any contribution to a net zero energy system are uncertain. Therefore, schemes of technologies which are proven in delivery and operation to deliver carbon emissions reductions comfortably within in the next decade are essential to keep the UK on its legally binding carbon reduction path. Large-scale solar is a proven technology, capable of delivery at scale against the timeframes required to deliver net zero.

1.1.16 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 to deliver and sustain a clean power system to achieve necessary wider societal carbon savings as electricity demand grows.

1.1.17 This Statement of Need provides evidence on the substantial benefits brought forward by large-scale ground mounted solar electricity generation generally, and the Proposed Development specifically, towards meeting the UK's critical strategic needs and concludes that the decarbonisation, security of supply, and affordability benefits delivered by the Proposed Development to the national urgent need for low carbon generation should be accorded substantial weight when assessing the planning balance.

1.1.18 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.

1.1.19 Solar facilities are already among the cheapest form of electricity generation in the UK and government forecasts indicate that costs will continue to reduce in the future. 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. Co-located storage facilities will support the Solar PV Arrays to deliver decarbonisation, security of supply and affordability benefits.

1.1.20 The Proposed Development has an agreement to connect 500MW of capacity to an existing part of the National Electricity Transmission System (NETS) at the existing and available Monk Fryston 275kV substation.

1.1.21 As part of the Connections Reform process, the Proposed Development received confirmation from NESO that the solar component would receive a Gate 2 final customer offer for a Phase 1 (up to and including 2030) connection. The BESS component is to receive a Gate 1 offer, the indicative connection date of which has not yet been confirmed. The proposed connection point is appropriate for the Proposed Development, and the Proposed Development will not cause grid constraints or experience excessive curtailment in this area of the NETS as a result of its connection point.

1.1.22 In summary, an unprecedented capacity of low carbon solar generation is urgently needed in the UK Flexible capacity is also needed in unprecedented capacities. The Proposed Development will, if consented, contribute to the achievement of government objectives to deliver sustainable development that enables decarbonisation. By doing so, the Proposed Development 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.

2 Overview

2.1 Document purpose

2.1.1 Light Valley Solar Limited (the Applicant) is seeking a Development Consent Order (DCO) for the construction, operation and maintenance and decommissioning of Light Valley Solar (hereafter referred to as the Proposed Development). The Proposed Development comprises a solar photovoltaic (PV) electricity generating station with a total capacity exceeding 100MW 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 Proposed Development proposes to connect to the National Electricity Transmission System (NETS) at the existing Monk Fryston 275kV substation.

2.1.2 This Statement of Need describes how and why the Proposed Development addresses all relevant aspects of government policy, in particular the Overarching National Policy Statement for Energy EN-1 (NPS EN-1) (**Ref 1**) and the National Policy Statement for Renewable Energy Infrastructure EN-3 (NPS EN-3) (Ref **2**), which support the rapid deployment of low carbon electricity generation at scale. These Statements were published in November 2025 and designated on 6 January 2026. The decision to consent the Proposed Development 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.

2.1.3 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, means that it is likely the need case will outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy, in all but the most exceptional circumstances. Government strongly supports the delivery of CNP infrastructure and it should be progressed as quickly as possible."*

2.1.4 This Statement of Need demonstrates the important contribution the Proposed Development 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.

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

2.1.6 The government's Clean Power 2030 Action Plan (**Ref 4**) 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. The delivery of large capacities of low carbon generation, including large-scale solar generation, is a critical part of the government's plans.

2.1.7 Delivering a clean power system is an important step towards delivering the UK's legally binding target of national net zero carbon emissions by 2050. **Chapter 1** 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.

2.1.8 The government's Clean Power 2030 Action Plan (**Ref 4**) describes government's aim to deliver a clean power system from as early as 2030. It also 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 a clean power system is not achieved before 2030.

2.1.9 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 Proposed Development. The Proposed Development 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.

2.2 Document overview

2.2.1 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.

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

2.2.3 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 Proposed Development. National and local planning policies are considered further in the Planning Statement [EN0110012/APP/LVS/05.02] itemised evidence for how the policy requirements established within NPS EN-1, EN-3 and EN-5, and other important national and local policy documents, are set out in the Policy

Compliance Document [EN0110012/APP/LVS/05.12] which sets out how the Proposed Development meets the various policy requirements in the NPSs.

2.2.4 **Chapter 1** 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 and enduring decarbonisation of the GB electricity system as described in the Clean Power 2030 Action Plan (**Ref 4**).

2.2.5 **Chapter 1** of this Statement of Need summarises those National Policy Statements (NPSs) which 'have effect' in relation to the Proposed Development. The decision to consent the Proposed Development must be taken having regard to 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.

2.2.6 **Chapter 1** 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.

2.2.7 **Chapter 1** 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.

2.2.8 **Chapter 7** 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.

2.2.9 **Chapter 8** sets out the benefits of the location of the Proposed Development in relation to decarbonisation, security of supply, and delivering to the identified urgent 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 **Environmental Statement Volume 1 Chapter 3 Alternatives and Design Iteration [EN0110012/APP/LVS/06.01.03]** and the **Environmental Statement Volume 3: Site Selection Report [EN0110012/APP/LVS/06.03.03.01]** which provides an explanation of the site selection process undertaken for the Proposed Development.

2.2.10 **Chapter 1** provides evidence that solar generation contributes to security of supply as part of a national multi-technology generation portfolio. While **Chapter 1** provides evidence for the need for storage facilities to be developed as renewable generation capacity grows, **Chapter 1** describes how co-located storage supports the operation of solar schemes and enhances the benefits they can deliver.

2.2.11 **Chapter 10** 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.

2.2.12 **Chapter 1** 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 the Proposed Development will be an essential step towards meeting the governmental objectives of delivering sustainable development to enable decarbonisation. By doing so, the Proposed Development 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.

2.3 Description of the Proposed Development

2.3.1 A full description of the Proposed Development is included in the **Environmental Statement Volume 1 Chapter 2 The Proposed Development [EN0110012/APP/LVS/06.01.02]**. A non-technical summary of the Proposed Development and its environmental impacts is provided in the **Environmental Statement Non-Technical Summary [EN0110012/APP/LVS/06.04.01]**.

3 Legal and policy background supporting the need for urgent decarbonisation

3.1 Chapter summary

3.1.1 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.

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

3.1.3 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.

3.1.4 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.

3.1.5 The need for and the scale of future actions to reduce carbon emissions actions is increasing. The only way that need and scale will decrease in the future, while still limiting global temperature increases, is by delivering very many actions like the Proposed Development without undue delay.

3.2 Global decarbonisation

3.2.1 The Paris Agreement (**Ref 5)** 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.

3.2.2 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.”*

3.2.3 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 6**) 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.

3.2.4 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.

3.2.5 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 7**). 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.

3.2.6 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, global GHG emissions will continue to increase to 2050, despite the effects of policies which have already been implemented.

3.2.7 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.

3.2.8 The purple band shows the decarbonisation path achieved if NDCs to 2030 are met, 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.

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

3.2.10 The cumulative warming effect of carbon means that not delivering against plans set out for the 2020s will require a greater scale and urgency for the delivery of future actions 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.

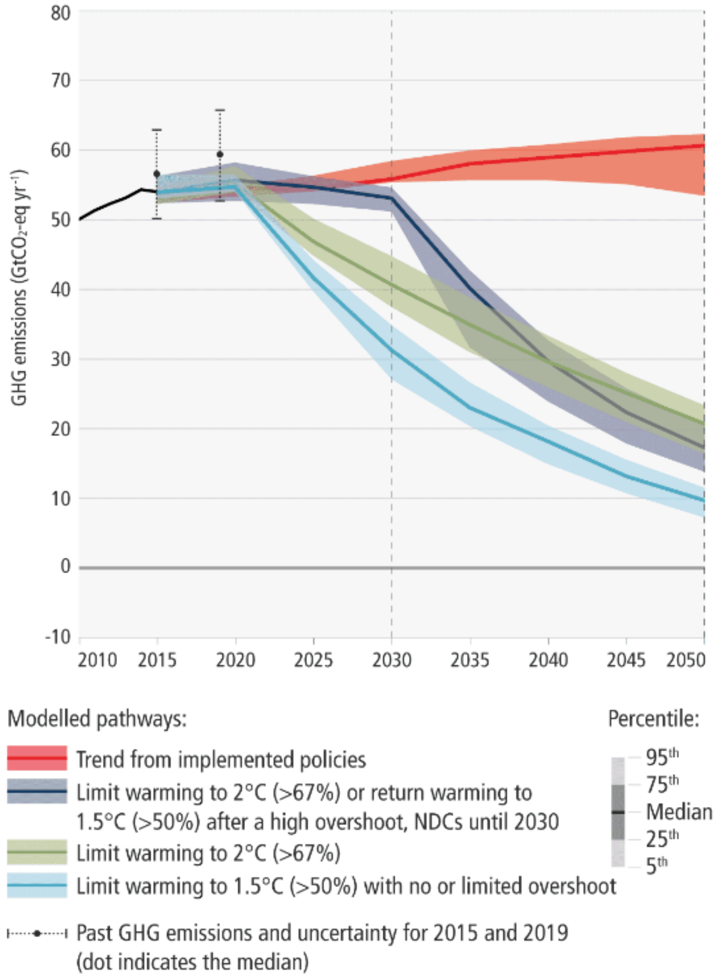

Figure 1: Representation of global GHG emissions of modelled pathways
(**Ref 7, Figure SPM.4**)

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

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

- Global climate change commitments made to date are not sufficient to meet nor sustain a (likely) successful pathway to 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.

3.2.13 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.

3.2.14 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.

3.2.15 WMO 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.

3.2.16 In May 2025 the WMO published their Global Annual to Decadal Climate Update (2025-2029) (**Ref 8**). Although the WMO report that long-term warming (averaged over decades) currently remains below 1.5°C, they estimate the chance that at least one of next five years be more than 1.5°C above the 1850-1900 average is over 85%, and the chance that the 5-year average warming for 2025-2029 will be more than 1.5 °C is 70%, up from 47% for the period 2024-2028 estimated by the WMO the previous year (**Ref 9**).

3.2.17 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 (**Ref 10**).

3.2.18 The same is true for the UK, 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 11**).

3.2.19 During COP29, which closed in November 2024, all countries were reminded that in 2025 stronger national climate plans (measured through NDCs) became due. 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**).

3.2.20 Ahead of the commencement of COP30 in November 2025, the UNFCC reported that, based on NDCs received at the time, estimated total global greenhouse gas (GHG) emissions for 2035 are projected to be around 12 per cent below 2019 levels (**Ref 13**). This falls short of the pathway to limit temperature increase to 2°C above pre-industrial levels with a probability of at least 67%, as shown by the purple band in **Figure 1**. Sufficient progress on fighting climate change has not yet been made and more needs to be done in both mitigation and adaption. Indeed, the closing statement, by the Secretary-General of the UN on the agreement reached at COP30 states that *"The gap between where we are and what science demands remains dangerously wide"* and that:

"The reality of overshoot is a stark warning: we are approaching dangerous and irreversible tipping points. Staying below 1.5 degrees by the end of the century must remain humanity's red line. That requires deep, rapid emission cuts – with clear and credible plans to transition away from fossil fuels and towards clean energy" (**Ref 14**)

3.3 Decarbonisation in the UK

3.3.1 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 15**).

3.3.2 Decarbonisation is therefore a UK legal requirement.

3.3.3 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 (**Ref 16**).

3.3.4 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 necessitate a significant investment in new energy infrastructure, both large nationally significant developments and smaller-scale developments determined at a local level (**Ref 1, Paras 2.3.3 & 2.3.4**).

3.3.5 The Climate Change Committee (CCC), a national independent advisory committee, made clear in its Progress Report to Parliament in 2025 (**Ref 17(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 17(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 17(2025), p15**).

3.3.6 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 17(2024),**

p18). In 2024 emissions were 50.4% below 1990 levels according to provisional estimates (**Ref 17(2025), p24**).

3.3.7 In February 2025 the CCC published their proposal for a Seventh Carbon Budget (CB7) covering 2038 to 2042. The CCC's proposal, which has not yet been endorsed by Parliament, is for UK emissions to fall to 87% below 1990 levels (**Ref 18, p60**).

3.3.8 **Figure 2** shows historical emissions and performance against historical Carbon Budgets. The 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). The Applicant notes that the Government's Carbon Budget and Growth Delivery Plan (CBGDP), published in October 2025 to inform Parliament and the public about the Government's proposals and policies to enable carbon budgets to be met, includes a significant number of measures and interventions to deliver greater carbon reductions than those set out in the legislated Carbon Budgets CB4 and CB5 while meeting CB6 (**Ref 19(2), Table 1**)

3.3.9 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 17(2025), p76**). If consented, the Proposed Development will contribute to meeting the urgent need for new low carbon generation to be brought online to contribute towards meeting government's 2050 target.

3.3.10 The CCC concluded that the main carbon emission reductions in 2024 versus previous levels were from the electricity supply and industry sectors. Surface transport sector emissions also reduced in 2024 from previous levels, 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 17(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 of carbon emission reduction over the previous eight years was only 13.4 MtCO2e per year.

3.3.11 The CCC conclude that *"This will increasingly require focus on transport, buildings, agriculture, and aviation"* (**Ref 17(2025), p22**). **Chapter 1** 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.

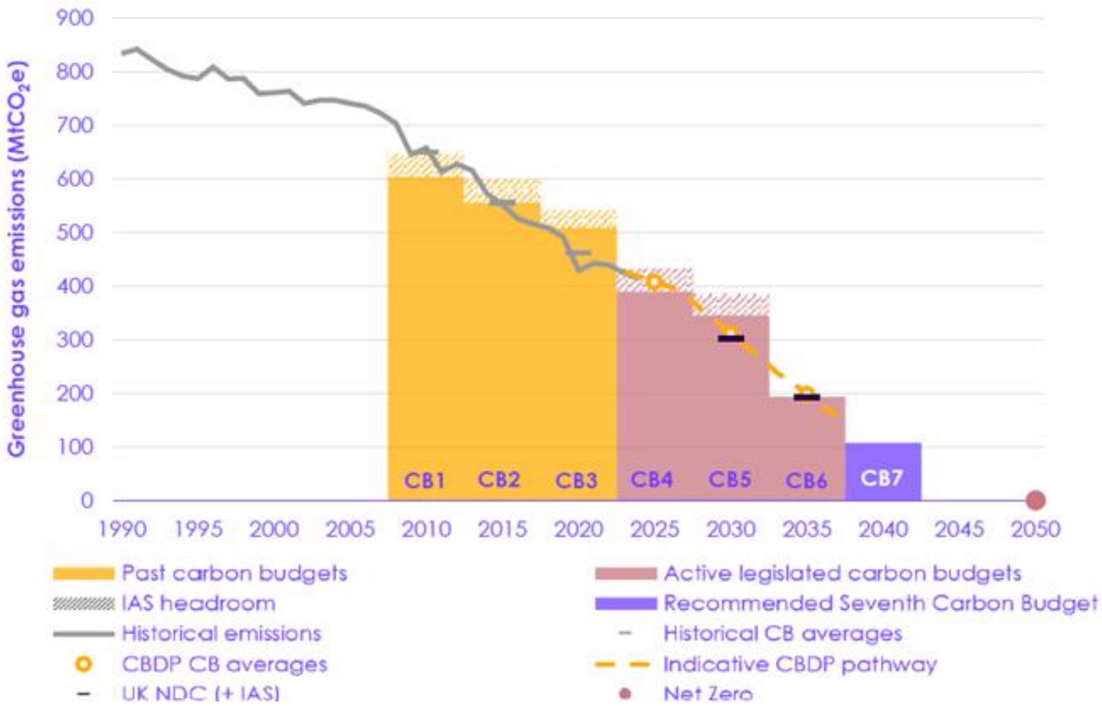

Figure 2: UK historical emissions, the Balanced Pathway and the UK's Carbon Budgets

(**Ref 17(2025), Figure 1.1**)

3.3.12 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.

3.4 The UK's strategic plan for decarbonisation

3.4.1 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**).

3.4.2 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.

3.4.3 **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.

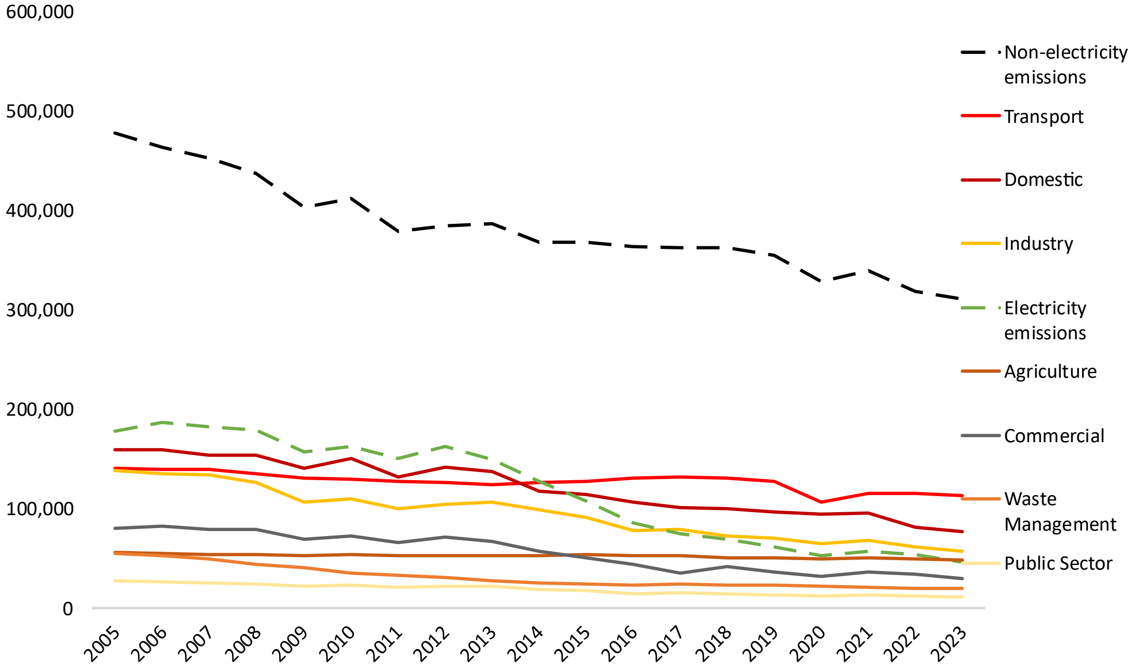

Figure 3: National (UK) GHG emissions 2005 – 2023

(LULUCF net benefits small and not shown) (**Ref 20(4)**)

3.4.4 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.

3.4.5 **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.

3.4.6 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.

3.5 Climate Change Committee: Progress Report to Parliament, 2025

3.5.1 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 17(2025), p10**).

3.5.2 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 17(2025), p10**).

3.5.3 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 17(2025), Figure 4**).

3.5.4 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.

3.5.5 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.

3.5.6 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.

3.5.7 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 17(2025), p14)**.

3.6 The government's energy strategy

3.6.1 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.

3.6.2 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 81% reduction as was recommended is consistent with the ambition legislated for in the Sixth Carbon Budget, but has been updated to include International Aviation and Shipping emissions and for a change in accounting methodology (**Ref 21**).

3.6.3 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.

3.6.4 In December 2024, the Prime Minister reconfirmed the government's mission to make Britain a clean energy superpower. The government took onboard NESO's advice to achieve *"at least 95% clean power by 2030, while accelerating the UK to net zero"* (**Ref 22, p6**) thereby staying on track to *"secure our energy supply with home-grown, clean power"* (**Ref 22, p40**), and in December 2024, government published the Clean Power 2030 Action Plan (**Ref 4)**.

3.6.5 Achieving the Clean Power target (see **Section 3.8**) would be a seminal 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 3.8** of this Statement for further information.

3.6.6 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 23, p5**).

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

3.6.8 That said, the urgency of the need to implement measures which deliver decarbonisation is now greater because of the reasons described in **Section 3.2** 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.

3.6.9 The government has explained that achieving a clean power system is of critical importance and the Action Plan delivers a mechanism to prioritise near-term actions in support of achieving that aim by 2030. 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 a clean power system is not achieved by 2030, as is also enabled by flexibility included in the government's Action Plan.

3.6.10 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. The need to deliver these benefits has increased under this government versus previous governments *"… because 6 years is a short time in building energy infrastructure."* (**Ref 4, Page 18**).

3.7 Connections Action Plan

3.7.1 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, the Connections Action Plan, published jointly by DESNZ and Ofgem in November 2023, recognised that:

> *"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 …"* (**Ref 24, p7**).

3.7.2 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 24, pp26 & 27**) and that ensuring that existing and future capacity is allocated efficiently will allow timely connection offers, aligned with net zero objectives.

3.7.3 The Connections Action Plan also describes two approaches to increasing network capacity. 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 24, pp40 & 41**).

3.7.4 The Connections Action Plan defines capacity allocation 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 24, p44**).

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

- 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 can make use of capacity sooner.

3.7.6 Projects which propose to develop technologies 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.

3.7.7 The Proposed Development consists of solar farm and associated infrastructure including battery energy storage with a total capacity exceeding 100MW connecting to an existing section of the NETS at an existing substation at Monk Fryston. Through the design of the Proposed Development, the Applicant seeks to maximise use of the connection capacity which is to be made available to it.

3.7.8 NESO concluded a key step of the connections reform process in December 2025 by 'reordering' the connection queue. Further detail on the reordered connection queue can be found in **Section 6.3** of this Statement.

3.7.9 Reordering the queue resulted in the issuance of prioritised connection offers ('Gate 2' offers) to projects which demonstrated that they were both 'ready' and 'strategically aligned' with Government's objectives to deliver before 2035. A Gate 2 offer is a firm offer for the connection of a specified MW capacity at a specified location by a specified date.

3.7.10 Projects which remain in the queue but did not receive a Gate 2 offer received a Gate 1 offer for connection for a specified MW capacity at an indicative location by an indicative date. Subsequent steps in the Connections Reform process will assess whether any Gate 1 offers may, or must, be converted to Gate 2 offers to meet the Clean Power target.

3.7.11 Project readiness relates to the securing of land rights and progress with planning activities. Strategic alignment relates to how the project 'fits in' with other ready projects in relation to the regional capacity ranges established in the Clean Power 2030 Action Plan, as described at **Section 3.8** of this Statement.

3.7.12 NESO's Connections Reform timeline (**Ref 25**) shows that all schemes which participated in the connection queue reordering received notification by early 2026 of the revised gate and phase of their application, being:

- Gate 1, or
- Gate 2 Phase 1 (in 2030 or earlier), or
- Gate 2 Phase 2 (between 2031 and 2035 inclusive).

3.7.13 However, NESO's Connections Reform timeline (**Ref 25**) shows that customers are expected to be notified by the end of Q3 2026 of the details of their revised offers. Once all revised connection offers have been accepted or declined by prioritised projects (later in 2026 or early 2027), this first step of the connection reform process will result in a thinned down connection queue which will form the basis of electricity network development and low carbon generation growth in Great Britain between now and 2035.

3.7.14 The connection for the solar component of the Proposed Development has secured a Gate 2 Phase 1 prioritisation (i.e. in 2030 or earlier). The BESS component of the Proposed Development holds a Gate 1 connection offer, the indicative connection date of which has not yet been confirmed.

3.7.15 The Proposed Development is aligned with the direction of travel of relevant policy and action plans in support of achieving the government's ambition to deliver a clean power system.

3.7.16 Advice on achieving clean power for Great Britain by 2030

3.7.17 In November 2024, following a request from government, NESO provided their input into the development of the government's plan to deliver a clean power system from 2030 by publishing the Clean Power 2030 report (**Ref 26**).

3.7.18 NESO's advice not only addresses the importance of enabling the delivery of a clean power system by 2030 but also of 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".*

3.7.19 NESO advise that clean power is needed by 2030*, "through 2030 … and beyond"* (**Ref 26, p6**) 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 26, p67**). The electrification of final energy demand from home-grown renewables will reduce the overall reliance on imported energy in the British energy system and increase protection for GB consumers from volatile international energy markets. (**Ref 26, p80**).

3.7.20 NESO also state that: *"With a short and shrinking window of time, pace must be the primary goal"* (**Ref 26, 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 26, p68**).

3.7.21 NESO's pathways *"see a doubling of onshore wind capacity … and a trebling of solar … by 2030"* (**Ref 26, p16**). Further*, "Flexibility is vital in a system with more variable renewables"* (**Ref 26, p7**). To achieve a clean power system 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 26, p9**).

3.7.22 **Section 5.3** of this Statement provides evidence that even if a clean power is achieved by 2030, even greater additional capacities of low carbon generation must be delivered in the 2030s to meet electricity demand growth. However, given the potential risks, it is also necessary to consider the implications for power system development into and through the 2030s if a clean power system is not achieved by 2030.

3.7.23 It is therefore necessary for projects which aim to deliver in both the 2020s and the 2030s to continue to progress to their project timeframes. Doing so will ensure that sufficient new 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.

3.7.24 NESO state that *"The risk of over-building is low, given the need to meet growing electricity demand through the 2030s"* (**Ref 26, p6**) and therefore, 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 26, p7**). 'Aiming high' on the deployment of critical technologies in any pathway to achieving a clean power system will reduce the risk of under delivery as a whole and also to reduce reliance on any single project (**Ref 26, p49**).

3.8 Clean Power 2030 Action Plan

3.8.1 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)**.

3.8.2 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**).

3.8.3 Critically, the Clean Power 2030 Action Plan confirms that the need for new low carbon generation will not stop at 2030. **Section 5.4** and **Section 5.5** of this Statement describe how electrification of non-traditional sectors will deliver carbon emission reductions, subject to a sufficient supply of low carbon electricity being secured to enable such electrification.

3.8.4 Therefore, the continued development of low carbon generation schemes which plan to deliver in the 2020s (such as the Proposed Development) and also those schemes planning to deliver in the 2030s is necessary to meet future electricity demand growth and achieve essential wider societal carbon savings.

3.8.5 Continuing to develop schemes which plan to be operationalto support the achievement of the Government's 2030 Clean Power target will reduce the risk of there being a shortfall in that target. However, schemes which deliver after 2030 will provide energy to support future electricity demand growth as well as help to make up for any shortfall in achieving the Government's targets.

3.8.6 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**).

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

- Clean sources will 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 will produce at least 95% of Great Britain's generation (in 2023, clean sourced produced 60% of GB generation, (**Ref 4, p26**)).

3.8.8 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**).

3.8.9 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 instigated a process to reduce and reform the grid connections process to *"prioritise projects needed for 2030, while maintain*[ing] *a robust pipeline* [of projects] *beyond 2030"* (**Ref 4, p11**).

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

3.8.11 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;
- Can demonstrate that they have the means to deliver; and
- Establish a pipeline of projects which will connect after 2030.

3.8.12 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 the solar PV pipeline of rooftop solar projects (**Ref 4, Connections Reform Annex, Table 1, Footnote 10**).

3.8.13 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**).

3.8.14 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.

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 (GW) (*)	DESNZ 2030 'Clean Power Capacity Range' (GW)	2035 FES-derived Capacity Range (GW) (**)
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 GB at the point of publication of the Clean Power 2030 Action Plan

(**) **Section 5.2** of this Statement provides a description of NESO's Future Energy Scenarios (FES)

3.8.15 Indeed, as stated in the Planning for New Energy Infrastructure Consultation Response (the consultation on the new NPSs), the Government states that:

> *"Clean Power 2030 is a milestone that reflects the scale of ambition required to meet our Net Zero 2050 target; it is not a fixed ceiling on technology deployment or project approvals"* (**Ref 27, p8**)

3.8.16 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 6.3** provides more information on pipeline attrition in the UK.

3.8.17 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 6.3**). 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.

3.8.18 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**).

3.8.19 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 planning applications will need to continue to be made to maintain a clean power system into and beyond the 2030s.

3.8.20 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.

- The SSEP will be updated every three years. Its first iteration will focus on electricity generation and storage, including hydrogen assets. The SSEP will establish a single generation and demand pathway to 2050, which will directly feed into the CSNP.
- The CSNP will take long-term whole-system approach to planning energy networks across Great Britain to help meet the government's net zero ambitions, including potential future needs for and reinforcements to the NETS, both onshore and offshore.
- The RESPs will provide a strategic view of the future of the energy system for regions, and set the direction for proactive investment in the distribution networks (**Ref 28**).

3.8.21 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 29**). 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.

3.9 Solar Roadmap – United Kingdom powered by solar

3.9.1 In June 2025, the government published its Solar Roadmap (**Ref 30**). 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.

3.9.2 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 30, p3**).

3.9.3 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.

3.9.4 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.

3.9.5 The roadmap includes an illustrative future capacity breakdown by size. This projection (**Ref 30, 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 is presented as additional to and not instead of the government's projections for large-scale capacity installations.

> *"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 30, p20**).

3.9.6 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 2024) before 2030. This would also necessitate a doubling of installation rates of domestic and smaller scale commercial solar capacity versus recent year averages. Any shortfall in the deployment of these schemes must be made up for my other technologies, including from large scale schemes, if the UK Solar Roadmap Current Policy Scenario for solar capacity is to be achieved.

3.9.7 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.

3.10 Energy Act 2023

3.10.1 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.

3.10.2 The government press release at the time of Royal Assent (**Ref 31**) describes that 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.

3.10.3 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.

3.10.4 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.

3.10.5 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.

3.10.6 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.

3.10.7 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 1** of this Statement.

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

3.11 Conclusions on decarbonisation policy context

3.11.1 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.

3.11.2 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.

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

3.11.4 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 less likely to be achieved.

3.11.5 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 the Clean Power 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, 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**).

3.11.6 The Government is therefore not targeting specific capacities of specific technologies by specific future years. Rather, the Government recognises that latitude is required to facilitate the development of sufficient future generation capacity to meet its Clean Power target.

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

3.11.8 This is because climate change will not 'stop' at 2030, or as soon as the electricity system is 'clean'. As electricity demand continues to grow to decarbonise traditionally non-electrical sectors, achieving the characteristics of a clean power system in one year, will not secure that the characteristics of a clean power system will be maintained in any subsequent year, without the deployment of new clean sources of electricity.

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

3.11.10 The government's Clean Power framework has established a capacity range of 45-69GW for the prioritisation of large-scale solar scheme connections by 2035. To deliver this unprecedented increase in solar generation capacity, the equivalent of approximately one project the size of the Proposed Development would need to be switched on every other month from January 2026 to December 2035.

3.11.11 More solar schemes would be needed to achieve a clean power system if the ambitious capacity ranges for onshore and offshore wind by 2030 (see **Table 1**) are not met.

3.11.12 Projects such as the Proposed Development which have received notification from NESO that they have been awarded a Gate 2 connection offer are valuable to the government's ambition to deliver a clean power system from 2030. It is also important to continue to bring forward such schemes to meet future growth in electricity demand and also in the event that a clean power system is not achieved by 2030.

3.11.13 The connection for the solar component of the Proposed Development has secured a Gate 2 Phase 1 prioritisation (i.e. up to and including 2030). The BESS component of the Proposed Development holds a Gate 1 connection offer, the indicative connection date of which has not yet been confirmed.

3.11.14 The Proposed Development 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.

4 National Policy Statements

4.1 Overview for Nationally Significant Infrastructure Projects

4.1.1 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.

4.1.2 The Energy NPSs were established against obligations made as part of the Climate Change Act 2008 (CCA2008) and were first designated in June 2011 and were substantially updated in late 2023. Following the 2030 Clean Power Action Plan a further period of revision and consultation was undertaken in 2025, with a revised suite of NPSs published in December 2025 and designated on 6 January 2026.

4.1.3 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 32**), 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), and decisions made by the Secretary of State, on applications for energy developments that fall within the scope of the NPSs (**Ref 1, Paras 1.1.1 & 1.1.2**).

4.1.4 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 3.2.8 to 3.2.10**).

4.1.5 The NPSs include the 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 4.2.16 to 4.2.17**).

4.1.6 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 4.2.19**).

4.1.7 NPS EN-3 covers those technologies which, at the time of publication, fall within the ambit of the Planning Act 2008, including solar generation.

4.1.8 By virtue of the Proposed Development being a NSIP as it is over 100MW, the NPSs 'have effect' in relation to the Proposed Development and the application must be decided in accordance with them.

4.1.9 This Statement of Need for the Proposed Development 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 demonstrate why the Proposed Development is urgently needed at the scale proposed, why the proposed location is appropriate for such a development, and how the Proposed Development also addresses all relevant aspects of established and emerging government energy and climate change policy and commitments.

4.1.10 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 Proposed Development 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 to the Proposed Development.

4.1.11 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 Proposed Development. 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**).

4.1.12 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**).

4.1.13 Policies within NPSs EN-1, EN-3, and EN-5 that are relevant to the establishment of the need for the Proposed Development and those in accordance with which this Application must be decided are set out in this Chapter. The wider policies within the NPSs of applicability to the Proposed Development are considered in the **Planning Statement [EN0110012/APP/LVS/05.02]** and the **Policy Compliance Document [EN0110012/APP/LVS/05.12]**.

4.1.14 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 Proposed Development is demonstrated by the urgent need for new energy infrastructure as set out in NPS EN-1 (**Ref 1, Para 3.3.63**).

4.1.15 The consent of multiple large-scale ground mounted solar is supported by national policy because of the benefits it can bring towards delivering a secure and low carbon energy future.

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

4.2 Overarching National Policy Statement EN-1 (2025)

4.2.1 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:

> *"Reducing emissions in large parts of transport, heating and industry could lead to more than half of total energy demand being met by clean electricity in 2050, up from 17 per cent in 2019, representing a doubling in demand for electricity"* (**Ref 1, Para 2.3.7**).

4.2.2 The Government's national policy direction is to develop an integrated energy system which relies on low carbon electricity generation for a significant proportion of its supply. 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**).

4.2.3 The stated policy objectives for the energy system and for pursuing a clean power 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**).

4.2.4 Meeting this objective will require a significant investment in new energy infrastructure, both large nationally significant developments and smaller-scale developments determined at a local level (**Ref 1, Para 2.3.4**).

4.2.5 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 2.4.1**).

4.2.6 The Clean Power 2030 Action Plan (Ref 4) sets out the need to maintain high levels of resilience and security (including from weather events and cyber threats) as new energy infrastructure is rapidly deployed (**Ref 1, Para 2.4.6**).

4.2.7 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**).

4.2.8 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**).

4.2.9 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 NPS EN-1 states that the capacity ranges *"reflects 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 1, Para. 3.3.22**). 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.

4.2.10 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, *"a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar"* (**Ref 1, Para 3.3.23**).

4.2.11 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.

4.2.12 The government's UK Solar Roadmap (**Ref 30**) 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 30, p15**).

4.2.13 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**).

4.2.14 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 (**Ref 1, Para 3.3.57 – 3.3.61**).

4.2.15 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 while retaining optionality in the event that the deployment of some technologies is more successful than others, or that future needs change. Such optionality is included in NPS EN-1 (**Ref 1, Para 3.3.22**), reflecting the fact that progress (or otherwise) in delivering projects across all technologies will help to refine future capacity needs.

4.2.16 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 important still.

4.2.17 NPS EN-1 explains that renewable technologies will provide the vast majority of generation to the UK's clean power system and 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 1, Para 2.3.6**), especially as demand for electricity *"could more than double by 2050"* to reach net zero (**Ref 1, Para 3.3.3**).

4.2.18 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 1, Para 3.2.4**). Indeed, NPS EN-1 also clarifies that the Capacity Ranges included in the Clean Power 2030 Action Plan 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 (**Ref 1, Para 3.2.6**).

4.2.19 NPS EN-1 establishes that substantial weight should be given to the need for new renewable electricity generation projects 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 3.2.9 & 3.2.10**).

4.2.20 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**).

4.2.21 NPS EN-1 concludes 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 4.2.16). Low carbon electricity generation infrastructure is described as *"all onshore and offshore generation that does not involve fossil fuel combustion"* (**Ref 1, Para 4.2.17**) and as such large-scale solar generation is classified as CNP infrastructure under NPS EN-1.

4.2.22 NPS EN-1 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**).

4.2.23 The Proposed Development meets the definition of CNP Infrastructure because it is for the development of solar generation capacity. As CNP infrastructure, the urgent need for the Proposed Development 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**).

4.2.24 NPS EN-1 notes the crucial national benefits of increased system robustness through new electricity network infrastructure projects (**Ref 1, Para 3.3.69**).

4.2.25 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.

4.2.26 NPS EN-1 also sets out the Government's policy position on alternative proposals. In summary, the Secretary of State should *be "guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development."* (**Ref 1, Para 4.3.23**) Further, applications should not be refused *"simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site"* (**Ref 1, Para 4.3.24**) because it is possible that all suitable alternatives should also be needed.

4.2.27 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**).

4.2.28 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 7.9** 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.

4.2.29 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.

4.2.30 'Low carbon hydrogen' is also signalled as *"essential to achieve the government's Clean Energy Superpower and Growth Missions and will be a crucial part of our future energy system"* (**Ref 1, Paras 3.3.49**). Low carbon hydrogen will be produced from the electrolysis of water, using low carbon electricity. The electricity generated by the Proposed Development and others like it could support low carbon hydrogen technologies to come forwards to play an increasingly significant role in the national energy system. **Section 6.8** of this Statement provides further detail on the role of hydrogen.

4.3 National Policy Statement for Renewable Energy Infrastructure EN-3 (2025)

4.3.1 NPS EN-3 (**Ref 2**) covers nationally significant renewable energy infrastructure which includes solar photovoltaic (PV) at more than 100MW in England and more than 350MW in Wales (**Ref 2, Para 1.6.1**) and renewable projects brought into the 2008 Act regime via section 35.

4.3.2 NPS EN-3 states that *"The UK has huge potential for solar power: it is cost-effective, versatile and effective technology."* Further, *"Solar energy is at the heart of our Clean Power 2030 Mission"* (**Ref 2, Para 2.10.1 & 2.10.9**).

4.3.3 NPS EN-3 goes on to reiterate that the *"Clean Power 2030 Action Plan sets out a deployment range for solar PV of between 45 – 47GW by 2030 with scope to exceed the clean power capacity range, subject to system need, noting the potential of rooftop solar to boost deployment"* (**Ref 2, Para 2.10.3**).

4.3.4 Since *"Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation"* (**Ref 2, Para 2.10.5**), 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 2.10.6**).

4.3.5 NPS EN-3 also states that:

> *"Where sited on agricultural land, consideration may be given as to whether the proposal allows for continued agricultural use and/or can be co-located with other functions (for example, onshore wind generation, storage, hydrogen electrolysers) to maximise the efficiency of land use"* (**Ref 2, Para 2.10.24**).

4.3.6 NPS EN-3 also establishes that energy storage, if proposed as part of a solar farm proposal, may, on a case-by-case basis, be treated as associated development to that proposal (**Ref 2, Para 2.10.8**).

4.3.7 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 2.10.16 & 2.10.17**).

4.3.8 NPS EN-3 also lists irradiance and site topography as key inputs to site selection (**Ref 2, Paras 2.10.11 & 2.10.12**).

4.3.9 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 Proposed Development:

> *"Along with associated infrastructure, a solar farm currently requires between 1.6 and 2.25 hectares (4 – 5.6 acres) for each MW of output. 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 2.10.9**).

4.3.10 The degradation of solar efficiency over time is addressed in NPS EN-3 (**Ref 2, Paras 2.10.47 & 2.10.59**), 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.

4.3.11 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 2.10.57**). 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 Proposed Development.

4.4 National Policy Statement for Electricity Networks Infrastructure EN-5 (2025)

4.4.1 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 32, Para 1.6.2**) (such as the Cable Route Corridor for the Proposed Development).

4.4.2 NPS EN-5 explains that *"significant amounts of new electricity networks infrastructure is required"* (**Ref 32, Para 2.2.3**).

4.4.3 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 NESO"* (**Ref 32, Para 2.2.2**). However, it is noted that applicants retain control in managing the identification of routing and site selection between the identified initiating and terminating points of such new infrastructure (**Ref 32, Para. 2.2.5**). It is therefore anticipated that, where possible, applicants may choose to minimise the effects of routing grid connection infrastructure for their schemes.

4.4.4 The ability to lawfully install, inspect, maintain, repair, adjust, alter, replace or remove an electricity line its related equipment and/or its associated mitigation or enhancement schemes is necessary, and therefore the rights an Applicant has over the land on which grid infrastructure is placed, is of critical importance (**Ref 32, Para. 2.6.1**).

4.4.5 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 32, Paras 2.8.4**).

4.4.6 The Proposed Development is to connect to the existing Monk Fryston 275kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Proposed Development will generate to local and national consumers. This is a key benefit of the Proposed Development.

4.5 Conclusions on national policy

4.5.1 As set out in Paragraph 4.1.10 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 Proposed Development), the Secretary of State must have regard to it as a relevant NPS, and must decide the application in accordance with that NPS.

4.5.2 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 2, Para 2.10.2**) because of its huge potential in the UK.

4.5.3 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 defined as CNP infrastructure;
- Large-scale solar is technically and economically feasible;
- Large-scale solar can and will bring benefits for the UK; and
- Flexible assets are also needed.

4.5.4 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.

4.5.5 NPS EN-3 provides policy support for developments such as the Proposed Development, 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.

4.5.6 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.

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

4.5.8 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.

4.5.9 The energy NPSs support the achievement of government's Clean Power target, as described in **Section 3.8** of this Statement. The NPSs clarify that the Capacity Ranges included in the Clean Power 2030 Action Plan are not intended to propose limits on any new infrastructure that can be consented or limit the support that the NPSs give to new low carbon electricity generation infrastructure.

5 Electricity demand will increase on the path to net zero

5.1 Chapter summary

5.1.1 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**).

5.1.2 Energy final consumption in the UK in 2023 was 1,542TWh, with 17.6% (272TWh) in the form of electricity (**Ref 33, 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.

5.1.3 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 but uses the organisation's new name throughout.

5.2 Introducing the FES

5.2.1 The FES documents (**Ref 34**) are NESO's annual publications which explore strategic, credible choices to propel GB on the route to decarbonisation.

5.2.2 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.

5.2.3 Under NESO's strategic planning processes (see **Paragraph 3.8.20** of this Statement), the FES will be renamed the Future Energy Pathways and will contain NESO's view of potential pathways for future changes in the demand and supply of energy, separate to the SSEP (**Ref 28**).

5.2.4 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 34(2025), p5**).

5.2.5 The FES 2025 presents one counterfactual pathway that does not meet net zero in 2050 alongside three pathways that do.

5.2.6 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.

5.2.7 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 to meet net zero, and until widespread electrification is achieved, the need for wider electrification will increase year-on-year.

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

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

5.2.10 The second wave, is preparing for expanded energy infrastructure beyond 2030, including both networks and generation assets (such as the Proposed Development), to deliver energy security, resilience and carbon reductions, to unlock the opportunities of a clean energy system for the future (**Ref 34(2025), pp7-11**).

5.2.11 The FES 2023 Energy Background Document (**Ref 35**) 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 35, p15**).

5.2.12 While FES 2025 states that *"Pathways* [to Net Zero] *are narrowing but optionality and uncertainty on the route to net zero remain"* (**Ref 34(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 34(2025), p47**).

5.2.13 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.

5.2.14 For example, the Proposed Development would connect directly to Britain's electricity transmission system, meaning that the energy generated by the Proposed Development 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 35, p18**).

5.2.15 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.

5.2.16 In FES 2024, NESO stated that *"a high usage of renewables is enabling the carbon intensity of electricity generation to continue to fall,"* (**Ref 34(2024), p15**).

5.2.17 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 34(2025), p29**).

5.2.18 In FES 2025, NESO state that solar generation is a cost competitive 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 by 2035 (**Ref 34(2025), pp77 & 133-134**).

5.2.19 **Chapter 10** of this Statement provides additional evidence that, based on current economics, solar generation is likely to be one of the lowest cost 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.

5.2.20 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 34(2025), p11**).

5.3 Trends in UK electricity demand

5.3.1 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 36, p28 & Ref 37, p48**); and
- The COVID-19 pandemic (2020-2021) and cost of living crisis (from 2022).

5.3.2 The current 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.

5.3.3 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.

5.3.4 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. the electricity required to produce hydrogen off-grid would be in addition to the views included below.

5.3.5 Forecasts of electricity system demand in 2050 include:

- NPS EN-1 states that current levels of demand are expected to double (**Ref 1, 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**);
- The CCC's seventh carbon budget (although not yet endorsed by Parliament) states that, by 2050, annual electricity demand could be more than double 2023 levels (**Ref 18, p205**). The CCC's sixth carbon budget (which has been endorsed by Parliament) presented a range from 550 to 680TWh (**Ref 38, Table 3.4.a**)

- NESO presents a range from 559TWh for their counterfactual pathway to between 705 and 797TWh for their three net zero pathways (**Ref 34(2025), Table 2**); and
- The Connections Action Plan projects electricity demand of between 570 to 770 TWh by 2050 depending on how net zero is met (**Ref 24, pp68 – 70**).

5.3.6 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 borne out historically by industry data, in the future, demand on Winter days could be double that of milder days. Therefore, timing demand to periods of high 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**).

5.3.7 **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.

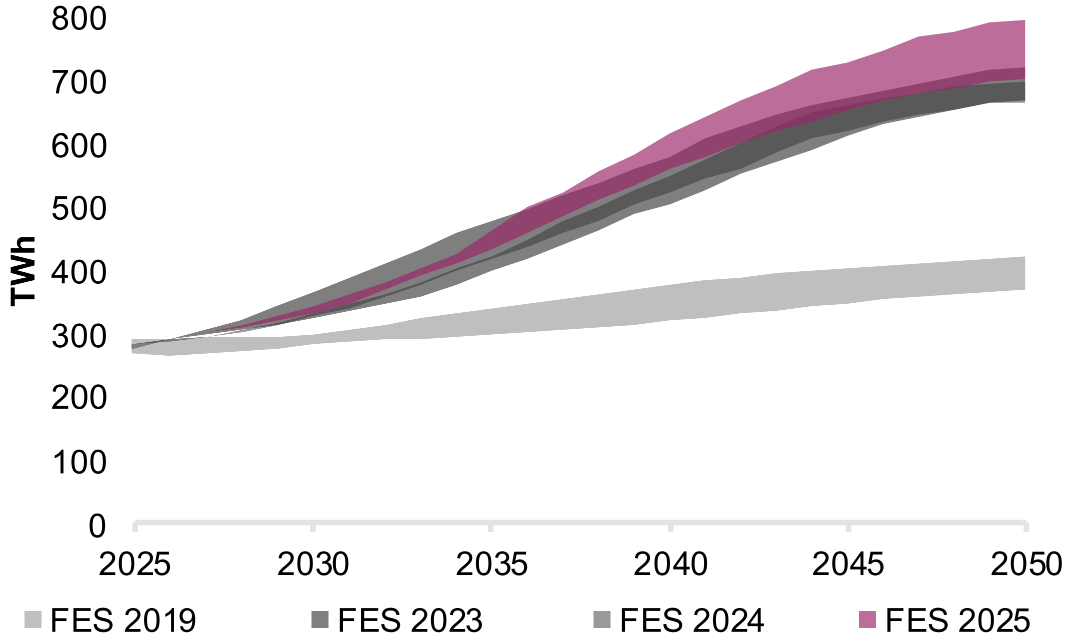

Figure 4: Evolution of GB electricity demand projections
(**Ref 34(2019, 2023, 2024 & 2025), Table ED1**)

5.3.8 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.

5.3.9 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 39**).

5.3.10 As the Government's Carbon Budget and Growth Delivery Plan explains:

> *"Around 30% of inflation in 2022 … came from energy bills rising … The main driver of high energy bills remains international gas prices … reducing our exposure to volatile international gas prices is the only way to reliably bring down bills and protect the UK from global energy shocks"* (**Ref 19(1)**).

5.3.11 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 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.

5.3.12 The range of demand provided by recent sources shows a shallow increase in future GB electricity demand over the coming five years as the aforementioned policies start to take hold. The demand projections 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 projected 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.

5.3.13 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.

5.3.14 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, as shown in all recent FES net zero consistent pathways.

5.3.15 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.

5.3.16 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 6.8** 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 a clean power system by 2030.

5.3.17 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.

5.3.18 The capacity of new low carbon schemes which will need to come online prior to 2030 to achieve a clean power system 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.

5.3.19 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.

5.4 Transport policies underpin a growth in future electricity demand

5.4.1 Surface transport is currently the largest source of UK GHG emissions. Surface transport accounted for just under one quarter of the UK's 2024 emissions (**Ref 17(2025), Figure 1.3, Charts and Data**). Continuing the shift to low emission vehicles will give a significant boost to UK decarbonisation.

5.4.2 For example, an analysis of Vehicle Certification Agency data (**Ref 40**) shows that the tailpipe emissions of an internal combustion vehicle average 15.7KgCO2(e)/100km with a range (1 standard deviation, s.d.) of 11.8 to 23KgCO2(e)/100km. The data also suggests that the average power consumption of an electric vehicle is 17.2kWh/100km with a range (1 s.d.) of 15.3 to 19.7kWh/100km.

5.4.3 Low carbon electricity used to take a petrol or diesel car off the road would reduce tailpipe emissions by between 600 and 1510gCO2(e)/kWh. This is approximately two to four times the emissions saving associated with displacing a Combined Cycle Gas Turbine (CCGT) from the GB electricity system.

5.4.4 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. The mandate required that at least 28% of all cars and 16% of all vans sold in Britain in 2025 were fully electric. The mandate requires that 80% of cars and 70% of vans by 2030 are fully electric, and 100% of each by 2035 (**Ref 41**).

5.4.5 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 39**).

5.4.6 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).

5.4.7 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 and year-end BEV registrations were up 23.9% year-on-year, achieving a market share of 23.4% (**Ref 42**).

5.4.8 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.

5.4.9 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.

5.4.10 The net zero FES pathways include an increase in annual electricity demand of approximately 25TWh in 2030 and 111 to 126TWh by 2050 (**Ref 34(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.

5.4.11 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 87,168 on 1 December 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 39**).

5.4.12 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. There is strong political support for the rapid development and rollout of EVs, including 'gigafactories' for the mass production of batteries and EV supply chains, with which will come significant additional electricity demand. Indeed, as the SMMT data shows, the rollout of EVs has already begun.

5.4.13 NESO's FES states that *"Vans and heavy goods vehicles (HGV) are starting to decarbonise, gradually following the car market. The ZEV mandate for vans has created policy certainty for industry and is demonstrated by the fact that 52% of all new van models were battery EVs at the start of 2025"* (**Ref 34, p96**). The application of hydrogen as a fuel for flight rail and shipping, and in industrial energy-intensive processes, is also progressing.

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

5.5.1 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 34(2025), Tables F.07**).

5.5.2 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.

5.5.3 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 (ToUTs) and demand flexibility schemes may allow consumers to support the flexibility needs of a low carbon electricity system.

5.5.4 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 17(2025), Figure 2.2**).

5.5.5 Ofgem report that annual gas consumption in domestic properties in the UK is from 7,500 to 17,000 kWh per year (**Ref 45**). Natural gas has a carbon content of 183gCO2e/kWh (**Ref 46**), implying that the use of natural gas in households emits between 1.4 and 3.1 tonnes CO2e each year.

5.5.6 Electrical water heaters, space heaters, boilers and ovens are highly efficient. Therefore, each MWh of low carbon electricity used to take a home off the gas network would reduce emissions by at least 183Kg, without accounting for any efficiency improvements associated with moving from gas to electricity. This is approximately one half of the emissions saving associated with renewable generation displacing a CCGT from the GB electricity system.

5.5.7 However, while many modern gas appliances are also highly efficient, older appliances can be significantly less efficient, implying that the replacement of old gas appliances with new electrical appliances would deliver higher carbon savings than stated above.

5.5.8 Due to the phasing out of all new installations of certain gas boilers from 2035, NESO's FES pathways include only low-carbon heating solutions from 2035 *"to meet carbon budgets and to prevent replacement of systems before end of life. Heat pumps, whether residential or district heating, are the solution for most buildings by 2050 across the pathways"* (**Ref 34(2025), p38**). The annual heat pump installation rates averaged across NESO's net zero consistent pathways increases from 80,000 in 2025 to 780,000 in 2030 and over 1,000,000 each year from 2032 to 2043.

5.5.9 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.

5.5.10 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 34(2025), Table F.07**).

5.6 Peak electricity demand is also expected to grow

5.6.1 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.

5.6.2 **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 34(2025), Figure F.54**).

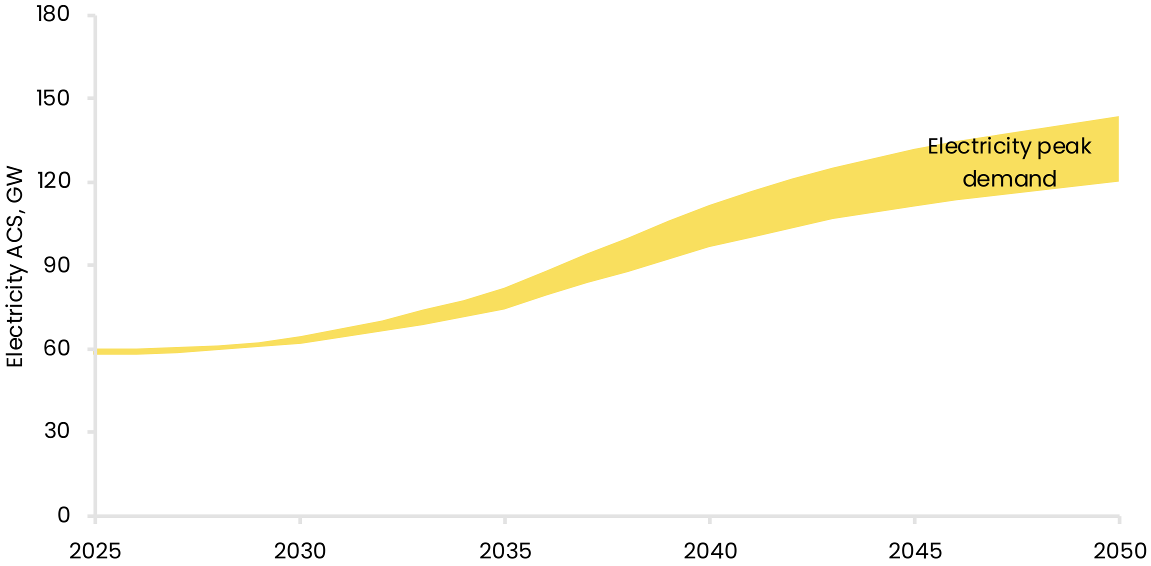

Figure 5: Electricity average cold spell peak demand
(GW, including losses) (**Ref 34(2025), Figure F.54**)

5.6.3 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.

5.6.4 Historically, electricity peak demand has tended to occur on Winter weekday evenings, when industrial and commercial demand overlaps with residential demand. However, NESO stated that *"as the share of renewable electricity supply increases, electricity peaks could occur at other times"* (**Ref 34(2024), p101**), an important point relating to security of supply, which is discussed in **Chapter 1** of this Statement.

5.6.5 Flexible assets such as BESS will help to meet periods when the gap between demand and renewable generation is highest.

5.6.6 ToUTs in domestic and commercial markets will move the shape of GB electricity demand from hour-to-hour from being a driver of market price, to becoming a function of market price, which in turn will be driven by weather conditions.

5.6.7 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.

5.6.8 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.

5.7 Conclusions on future electricity demand

5.7.1 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.

5.7.2 This substitution will increase GB electricity demand through the decades ahead, supporting the urgent and enduring need for new low carbon generation facilities.

5.7.3 Peak electricity demand is uncertain but is likely to grow, and electricity demand must be met through the wide range of weather conditions experienced in Great Britain. Peak electricity demand periods 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.

5.7.4 The inclusion of a flexible storage asset as associated development to the main solar array would provide the opportunity for the Proposed Development to contribute to meeting peak demand whenever it occurs, not only when the asset is generating at its peak.

5.7.5 Electricity consumption met from carbon-emitting sources remains significant and the capacity of new low carbon schemes which will need to come online prior to

2030 to meet anticipated 2030 demand and achieve a clean power system by 2030 is unprecedented. However, demand growth through the 2030s and 2040s is expected to be even larger. This presents the need for an even greater capacity of new low carbon schemes to come online in the 2030s to keep power clean through to 2040 as other sectors also decarbonise.

5.7.6 **Chapter 10** 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.

5.7.7 Increasing supplies from lower cost and lower carbon energy sources will help to incentivise other sectors to move away from fossil fuels to electricity through cost efficiencies, by providing a shield for GB consumers from volatile international energy prices, and increasing GB security of supply.

5.7.8 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.

5.7.9 The Proposed Development would contribute to meeting GB's future electricity demand by providing to its 500MW grid connection offer of clean power and a significant quantity of low carbon generation annually. The Proposed Development would be a critical enabler of the UK's decarbonisation and energy security aims.

6 Delivering net zero through clean electricity supplies

6.1 Chapter summary

6.1.1 This chapter reviews selected current policy support and development / delivery in technologies which are being tasked to support the journey to a clean power system and net zero.

6.2 Current and future generation mix

6.2.1 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 (**Ref 4, p25**).

6.2.2 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. Significant carbon emissions reductions across all sectors is essential for the UK to meet net zero (**Ref 17(2024), p8**).

6.2.3 The government's Carbon Budget and Growth Delivery Plan (**Ref 19(2), Table 8**) clarifies that to deliver the government's Carbon Budgets, 63% of total projected electricity generation required in 2035 is required to come from low carbon sources in 2030, rising to 98% in 2035. This underscores the importance of delivering the Clean Power target and sustaining a clean power system beyond 2030 to ensure that carbon emissions from all sectors continue to reduce.

6.2.4 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.

6.2.5 **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.

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

6.2.7 **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.

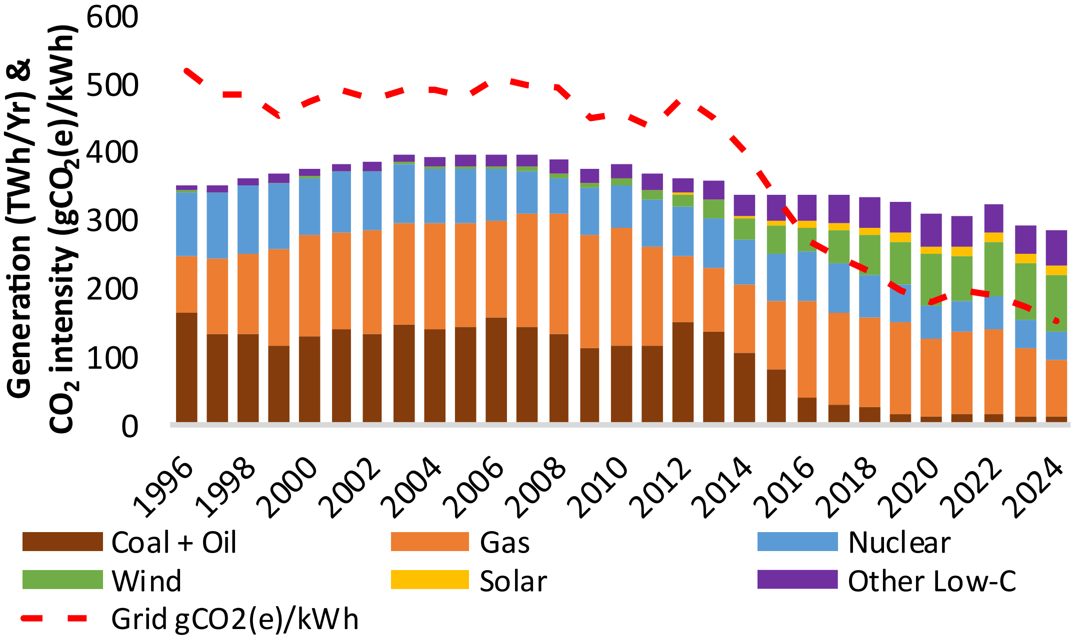

Figure 6: Historical annual electricity generation and carbon intensity

(Generation: TWh/Yr. Carbon intensity: gCO2(e)/kWh) (**Ref 33, Tables 5.6 & 5.14**)

6.2.8 Nuclear generated over one quarter of the UK's electricity needs in 1996 but in more recent years, output has significantly reduced as older plants have closed. Nuclear contributed just 14% of the UK's electricity needs in 2023 and 2024. 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. 2025 year-end information will be available on a consistent basis in mid-2026, however the data shows that nuclear output reduced by approximately 10% from 2024 to 2025 and CCGT output increased to compensate

6.2.9 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 33, Tables 5.14**).

6.2.10 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 10.2** of this Statement explains how GB electricity market arrangements support this essential shift.

6.2.11 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.

6.2.12 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 to 2050 in all three pathways.

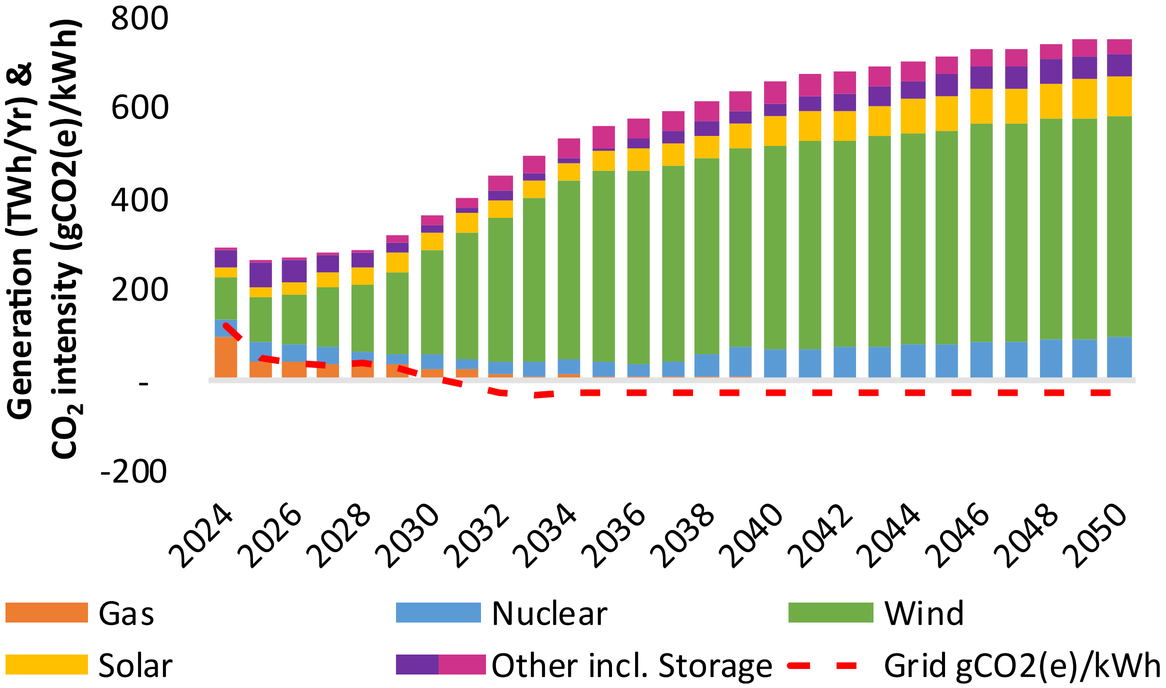

Figure 7: Projected annual electricity generation and carbon intensity

(Generation: TWh/Yr. Carbon intensity: gCO2(e)/kWh) (**Ref 34(2025), Tables F.13 & ES1 – 'Holistic Transition'**)

6.2.13 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 by 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 NESO's current net zero pathways.

6.2.14 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).

6.2.15 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.

6.2.16 However, as the Clean Power 2030 Action Plan states, *"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."* (**Ref 4, p23**).

6.2.17 Further, the Clean Power 2030 Action Plan 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 3.8.7** 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.

6.2.18 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**.

6.2.19 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.

6.2.20 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).

6.2.21 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**). This target is also included in NPS EN-1 (**Ref 1, Para. 3.3.19**).

6.2.22 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.

6.2.23 **Section 5.3** 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.

6.2.24 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.

6.2.25 **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.

6.2.26 **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 established by the government in its Clean Power 2030 Action Plan (**Ref 4, Table 1**).

6.2.27 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 37, p19**).

6.2.28 Approximately ten percent of NESO'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 6.11** of this Statement.

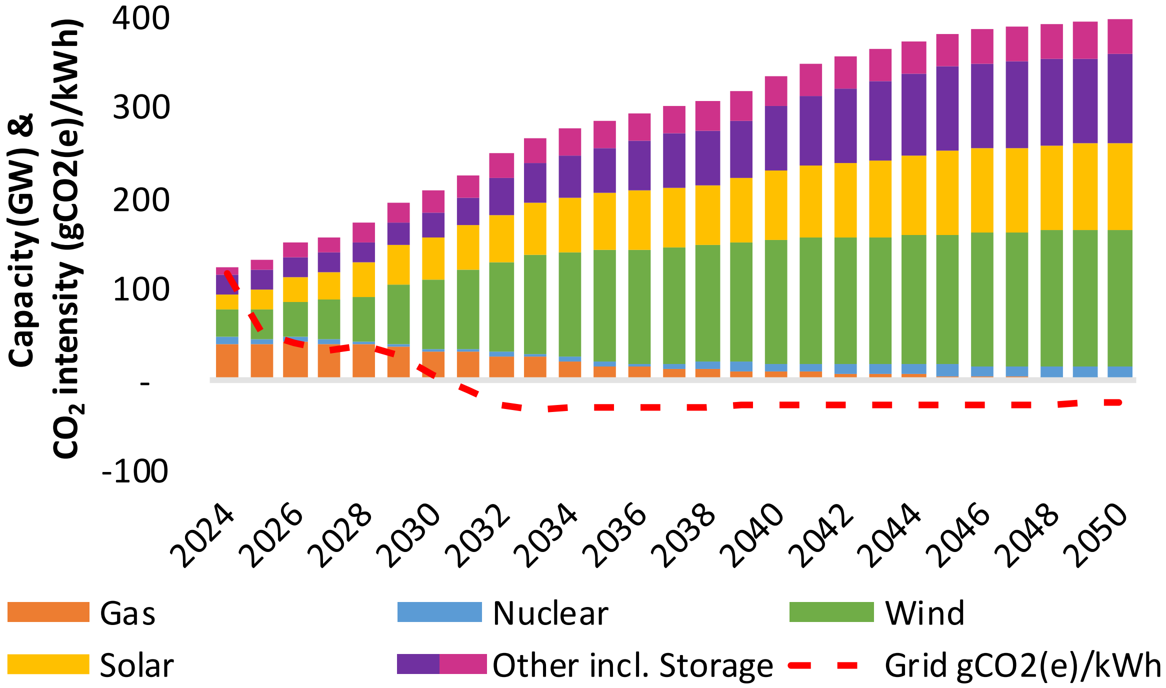

Figure 8: Projected electricity generation capacity and carbon intensity

(Capacity: GW. Carbon intensity: gCO2(e)/kWh) (**Ref 34(2025), Tables F.13 & ES1 – 'Holistic Transition'**)

6.2.29 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.

6.2.30 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, NESO'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**).

6.2.31 Any program to expand capacity at the scale identified across many technologies, does not come without risk. It is very possible, if not probable, that the capacity delivered of one or more technologies will not meet the capacity ranges established in the Clean Power 2030 Action Plan and included at **Table 1** of this Statement. In this case, technologies which are successfully being deployed will need to accelerate their deployment further, to meet the Clean Power target.

6.2.32 Challenges to deployment may include international competition in supply chains, technology, and labour markets.

6.2.33 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**).

6.2.34 FES 2023 also reiterated that *"sufficient electricity connection capacity is vital"* to support the delivery of increased generation capacity (**Ref 34(2023), p132**). 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**).

6.2.35 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 17(2025), Box 3.5**).

6.2.36 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 8** provides more information on this point.

6.3 Development pipelines

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

6.3.2 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 maintained in NESO's Transmission Entry Capacity (TEC) Register (**Ref 48**);
- Step two relates to applying for and obtaining planning consent. The government's Renewable Energy Planning Database (REPD) (**Ref 49**) provides insight into determined and yet to be determined renewable energy projects at all scales nationally; and

- Step three relates to securing funding for the project. 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 funding requirements prior to construction and operation of the project.

6.3.3 Reforms to the grid connection process have been implemented to address the bottleneck that Ofgem, NESO and the government have identified in the near-term delivery of schemes due to a significant capacity of schemes completing Step one of the process.

Connections Reform results

6.3.4 Further information on the Connections Action Plan and the Connections Reform process can be found in **Section 3.7** of this Statement.

6.3.5 Connections Reform aims to reduce the queue of schemes waiting to connect to the electricity system, resulting in a pipeline of schemes with Gate 2 connection dates prior to 2035 which have demonstrated their readiness to proceed, and which are strategically aligned.

6.3.6 Schemes which did not receive a Gate 2 connection offer in the 2025 prioritisation round will receive notification of their Gate 1 offer. Such schemes will be reconsidered for Gate 2 connection offers in subsequent NESO queue prioritisation rounds. Such schemes will be needed to meet the continuing need for new low carbon generation schemes to come forwards to sustain a clean power system and / or to make up for any schemes which were prioritised in the 2025 prioritisation round but do not make it through to fruition.

6.3.7 **Table 2** contains the high-level results of NESO's first queue prioritisation process for major technologies including solar and storage. The TEC Register will be updated as schemes sign new connection offers made as part of the connection reforms process.

Table 2: Great Britain's new connections delivery pipeline (GW)

(**Ref 50**, approximate capacities)

Technology	Already Built (2025)	Prioritised for			Capacity Range (2035)
		Phase 1 (to 2030)	Phase 2 (2031 – 2035)	Total	
Offshore wind	17.5	32.5	38	88	88
Onshore wind	14	13.5	5	32.5	37
Solar	10	30	28	68	69
Nuclear	1.2	3.7	3.5	8.4	5
Batteries	7.5	34	49	90.5	29

6.3.8 Through the Clean Power 2030 Action Plan, the government has set 'capacity ranges' to assess the 'strategic alignment' of projects with the capability to deliver 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**). Therefore, future revisions to the Government's capacity ranges are anticipated and will be subject to the success or otherwise of the delivery of projects at the front end of the queue.

6.3.9 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. It is also confirmed that NPS EN-1 *"imposes no limit on the number of CNP infrastructure projects that may be consented"* (**Ref 1, Para 4.2.34**).

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

6.3.11 Further, NESO's new connections process prioritises schemes which are 'ready' for connection, implying that some schemes will be seeking planning consent (only one measure of 'readiness', with the other being that the land required for the scheme is under option) prior to their having secured a Gate 1 or Gate 2 grid connection offer.

6.3.12 Net zero 2050 will require a very large capacity of low carbon generation to be delivered. The capacity ranges set out in the Clean Power 2030 Action Plan are a stepping stone to the required 2050 capacities. The Action Plan is 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 enduring.

6.3.13 The connections queue has been reordered and prioritised using those capacity ranges as a guide. Government has retained optionality in setting the Clean Power capacity ranges and the success or otherwise of prioritised projects to enter commercial operation will inform subsequent revisions of those ranges, and therefore future queue prioritisation events.

Commercial support for low carbon electricity generation

6.3.14 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.

6.3.15 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.

6.3.16 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**).

6.3.17 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.

6.3.18 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 54, pp16 & 20**).

6.3.19 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 55**):

- 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).

6.3.20 The results of CfD AR7 (offshore wind) were published in January 2026. The results of CfD AR7a for non-offshore wind technologies, including solar, is expected to be published in February 2026 following an auction process in late January. The Government has allocated a budget of £1.2m for Pot 1 technologies (consisting of Energy from Waste with CHP, Landfill Gas, Hydro (>5MW and 5MW), Remote Island Wind (>5MW), Sewage Gas and Solar PV (>5MW)) for delivery between 2027 and 2031. (**Ref 56**).

Project development pipeline attrition

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

6.3.22 For example, in February 2023 NESO shared their analysis that *"only 30-40% of projects in the [connections] queue make it to fruition"* (**Ref 57**). This Statement describes reforms being taken under the Connections Action Plan to deter speculative connection applications and remove stalled schemes from the connections queue.

6.3.23 Because projects which have been prioritised as part of the Connection Reform process have been assessed as more 'ready' than others, the Connection Reform process should (but is not guaranteed to) result in a connections queue which will experience a lower attrition rate than NESO's historical assessment (60-70%).

6.3.24 Of the 191.5GW of projects of renewable generation technologies (incl. geothermal, hot dry rocks, tidal, wave, hydro solar and wind) listed on the REPD (**Ref 49**), 66GW are consented but not yet operational; 40.6GW are listed as operational; and 28.5GW will not move forwards due to having been refused planning consent, being abandoned (by the developer), or planning permission having expired (i.e. a 21% MW attrition rate at the planning stage.

6.3.25 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. 108 schemes with CfDs have had their CfD terminated or have registered a reduction to the capacity of the CfD Unit, representing a 20% MW attrition rate from the revenue scheme (although in some cases the reduced capacity may come forward under other commercial arrangements):

- Offshore wind: four schemes (3,808MW) terminated, 1,512MW reduction on 25 schemes still going forwards, 32 schemes unchanged from contract award;
- Onshore wind, including Remote Island Wind: ten schemes (942MW) terminated, 102MW reduction on 16 schemes still going forwards, 56 schemes unchanged from contract award;
- Biomass / Waste / CHP / Advanced Conversion schemes: thirteen schemes (292MW) terminated, 25MW reduction on two schemes still going forwards, with three schemes unchanged from contract award; and
- Solar PV: fourteen schemes (429MW) terminated, 140MW reduction across 28 schemes still going forwards, 170 schemes unchanged from contract award.

6.3.26 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.

6.3.27 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. It is of related importance that NPS EN-1 sets out that the Secretary of State's consideration of alternative proposals to a development should be guided by *"whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development"* (**Ref 1, Para 4.3.23**).

6.3.28 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 3.2.6**). In assessing an application, the Secretary of State therefore *"should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals"* (**Ref 1, Para 4.3.24**).

6.3.29 This data and corresponding analysis suggest that it is not prudent to assume the full delivery of pipeline projects listed on various registers. It is likely that a significant proportion of that capacity will not make it through to operation. However, the government seeks a large capacity of operational projects, therefore the risk of attrition needs to be considered in the formulation of those development pipelines.

6.4 Offshore wind

6.4.1 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**).

6.4.2 NESO's FES pathways highlight 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. Government's Clean Power capacity range for offshore wind is 43-50GW by 2030 and 72-89GW by 2035.

6.4.3 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.

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

6.4.5 **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.

6.4.6 **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.

6.4.7 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.

6.4.8 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**).

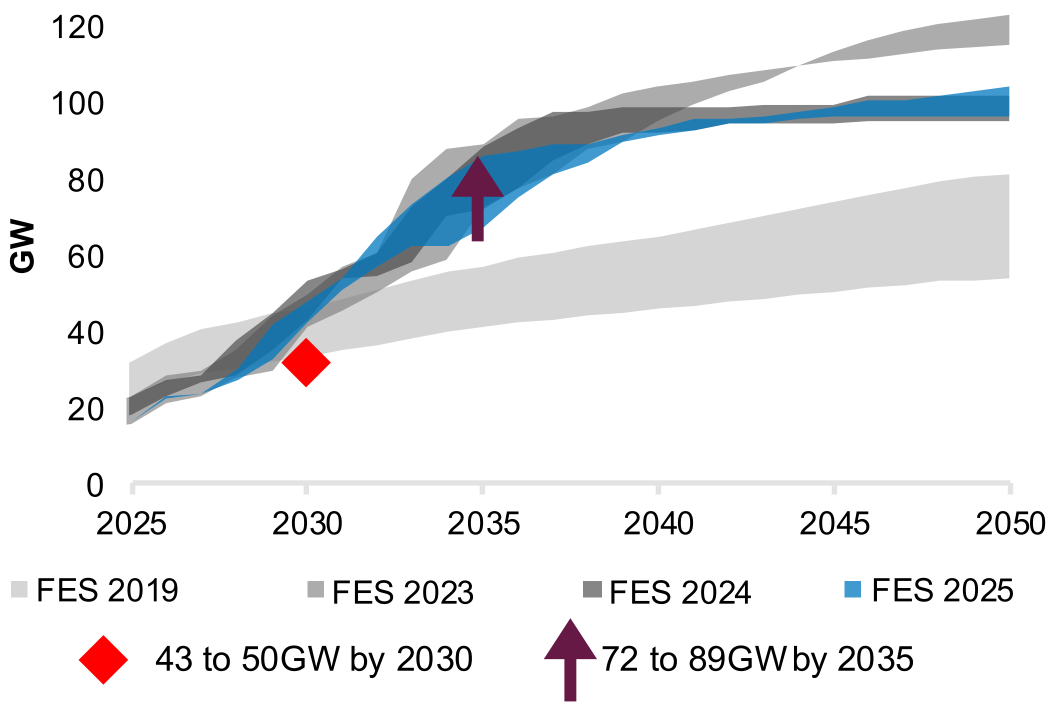

Figure 9: Current and potential future connected capacity of offshore wind technology

(**Ref 34(2019, 2023, 2024 & 2025), Table ES1**)

6.4.9 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.

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

6.4.11 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.

6.4.12 **Table 2** shows that the capacity of offshore wind schemes prioritised by NESO for Gate 2 connection offers in 2030 or earlier is 32.5GW, and from 2031 to 2035 is 38GW. This is broadly in line with both the most ambitious FES pathways and the government's current 2030 and 2035 capacity ranges but leaves no space to account for project attrition or development delays. The current pipeline therefore cannot be guaranteed to deliver sufficient capacity to meet the government's ambition.

6.4.13 Any attrition in the offshore wind pipeline will increase the need for additional new capacity of other technologies to come forwards to deliver a clean power system to keep the UK on track to achieving net zero 2050.

6.4.14 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 43-50GW of offshore wind to the UK electricity network by 2030. The risks associated with the delivery of these pipelines should not be understated.

6.4.15 Network development may have a significant impact on the delivery of offshore wind. This is because NESO's approach to offshore transmission development is to develop a network of connections with transmission assets being shared by multiple schemes, whereas previously offshore transmission assets have been developed for individual schemes (**Ref 24, p62**). The impact of a delay on the delivery of an offshore transmission development may therefore be felt across more than one scheme.

6.4.16 Data from the REPD (**Ref 49**) 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. Therefore, projects which aim to connect prior to 2030 are likely already to have secured planning consent.

6.4.17 Further, all consented offshore wind capacity which is still going ahead must deliver near to the highest historically achieved rates through the next decade to keep on track with NESO's FES pathways (**Figure 9**). However, not all capacity is currently commercially contracted.

6.4.18 On receipt of planning consent, offshore wind developers are currently eligible to compete with other projects for CfDs, CfD participation rules have changed to allow fixed bottom offshore wind facilities which have been in the planning system for at least 12 months to participate in CfD Allocation Round 7 (**Ref 4, p57**).

6.4.19 Net of CfD terminations and capacity reductions, a remaining 12.2GW of offshore wind scheme capacity has secured but not yet commenced CfDs awarded up to and including CfD Allocation Round 6 (2024). While some projects are in their construction phases, many have yet to start build.

6.4.20 Securing funding 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**).

6.4.21 The UK's current offshore wind pipeline shows great potential to deliver significant decarbonisation and energy security benefits. However, the delivery of the pipeline to the levels established in the Clean Power 2030 capacity ranges should not be taken for granted.

6.4.22 The results of CfD Allocation Round AR7 were published in early 2026, The results include 8.4GW of contracted capacity, however only 3.2GW will be generating by the end of 2030. AR8 is planned to follow in 2026 and based on project development rates and contract award windows, is likely to represent the last opportunity to contract new UK offshore wind capacity which has a chance of delivering before 2030.

6.4.23 It is therefore not a given that the government's ambition for 43-50GW of offshore wind by 2030 will be met, or even that NESO's prioritised pipeline for the technology class will be achieved by 2030 or by 2035.

6.4.24 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. Government will encourage any shortfalls to be made up through the optionality it retained while establishing the parameters of its prioritisation framework.

6.5 Onshore wind

6.5.1 FES 2025 reports that 14.6GW of GB onshore wind capacity was operational in Great Britain in 2024 (**Ref 34(2025), Table ES1**).

6.5.2 In 2015 an effective moratorium was placed on onshore wind development in England. According to the REPD, operational onshore wind capacity in England has increased by just 0.7GW since the end of 2015.

6.5.3 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 34(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**).

6.5.4 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. Onshore wind technology was also re-introduced to the definition of nationally significant energy generating stations under the Planning Act 2008, effective from when the Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025 took effect on 31 December 2025, with policy supporting that change included in the most recently designated National Policy Statements.

6.5.5 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.

6.5.6 NESO's TEC Register (**Ref 48**) shows that no new onshore wind schemes in England and Wales have agreements to connect to the Transmission system before October 2026 and in England before 2028. Only 4.8GW hold agreements to connect in England before 2030. Some smaller schemes have been accepted to connect to the English and Welsh electricity distribution networks, however, the REPD shows that just 54 applications for a total of 700MW of onshore wind have been made but are not yet determined in England and Wales. 60 schemes for a total of 810MW 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.

6.5.7 Yet, **Table 2** shows that the capacity of onshore wind schemes prioritised by NESO for Gate 2 connection offers in 2030 or earlier is 13.5GW, and from 2031 to 2035 is just 5GW. This falls short of the government's 2035 capacity ranges even prior to any project attrition or development delays. The current pipeline cannot therefore be guaranteed to deliver sufficient capacity to meet the government's ambition

6.5.8 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.

6.5.9 It is therefore not a given that the changes to the NPPF, NPSs and Planning Act 2008 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.

6.5.10 Although onshore wind retains support in Wales, the UK will therefore also need to look to Scotland to support an increase in onshore wind capacity through the next circa five years.

6.5.11 The REPD pipeline for Scotland shows 7.6GW of consented schemes which are not yet operational (just 2GW of these are listed as under construction) as well as 10.5GW of applications in Scotland which have not yet been determined.

6.5.12 The REPD also shows that of the total capacity of Scottish onshore wind schemes listed in the REPD as having been determined, only 50.4% have been consented (17GW consented of 34GW determined). The pipeline of Scottish onshore wind schemes alone is of a sufficient scale to deliver near to the lower of government's capacity range for onshore wind in 2030, only if consent rates continue as they have done historically, and no developer-led project attrition occurs.

6.5.13 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.

6.5.14 The UK's CfD Allocation Round 6, results of which were published in September 2024, allocated contracts to 910MW of Scottish onshore wind, predominantly delivering in 2027/28.

6.5.15 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.

6.6 Nuclear

6.6.1 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 2028 +/- one year, and a further two stations (also 2.4GW total capacity) are due to close in 2030 +/- two years (**Ref 58**).

Existing nuclear stations

6.6.2 The government made a manifesto commitment to extending the lifetime of existing plants, but operational lifetime is limited at four of these stations by irreversible engineering processes deep inside the reactor cores and any extension is not a guarantee of operation up to that date.

6.6.3 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 and reliably until their next programmed inspections and towards their current programmed closure dates.

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

6.6.5 Nuclear power is a low carbon power source, therefore the 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. Any shortfall will result in a net increase in grid carbon intensity over the next five years and will work against the Government's ambition to deliver its

Clean Power target. 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**).

In-flight new large-scale nuclear projects

6.6.6 New nuclear has been a part of every government's energy strategy since the mid-2000s. 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.

6.6.7 For example, Hinkley Point C development started in earnest in the late 2000s, and civil site construction commenced in 2016. Hinkley Point C is currently still under construction.

6.6.8 It was announced in January 2024 that the plan to start commercial operations had been delayed to between 2029 and 2031 (**Ref 59**), due to construction delays. The government's Clean Power 2030 Action Plan advises that the first unit at Hinkley Point C 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**).

6.6.9 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 60**).

6.6.10 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.

6.6.11 However, 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 EN-7 which came into force on 18 December 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.

Small modular reactors

6.6.12 The Energy Act 2013 also created a body corporate, the Office for Nuclear Regulation (ONR), to regulate all nuclear licensed sites in Great Britain. To address complexities, conservatism and delays in nuclear regulatory decision making, and speed the development of new nuclear power generation facilities, the Government's Nuclear Regulatory Review 2025 provides recommendations for a *"coherent blueprint for a 'radical reset' of the UK's nuclear regulatory system … to create a regulatory environment that enables the UK to capitalise fully on the strategic benefits of nuclear technology for the nation"* (**Ref 61**).

6.6.13 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 62**).

6.6.14 Three SMR designs are now being assessed under GDA by the ONR, a process which has previously taken three or more years. 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.

6.6.15 However, SMRs may require approved manufacturing facilities to be constructed before the first unit can be manufactured.

6.6.16 Although SMRs may bring decarbonisation and energy security benefits to the UK, the UK's first Rolls Royce SMR units, earmarked for deployment on Anglesea (**Ref 63**), are very unlikely to be operational in the UK within this decade. GBN's SMR selection process considered companies which *"offer*[ed] *the greatest confidence in being able to make a final investment decision in 2029"* and were considered *"most able to deliver cutting-edge technology by* [the] *mid-2030s"* (**Ref 64**).

6.6.17 In September 2025, the government announced the Atlantic Partnership for Advanced Nuclear Energy. This new deal with the US clears the way for a major expansion of new nuclear projects in the UK and will make it quicker for companies to build new nuclear power stations (**Ref 65**). This deal is designed to streamline bringing nuclear to construction stage, however the fundamental steps in the development process are significant and should not be underestimated.

6.6.18 Commencing construction of any reactor, whether large- or small-scale, means that it will have passed through GDA, selected a suitable site, secured grid connection and secured a Development Consent Order. Offsite manufacturing facilities may also require nuclear-level consenting and approval prior to construction commencing. 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.

6.6.19 Revenue mechanisms will also need to be developed, funding secured, and then the process of construction and installation completed, before facilities can be commissioned.

6.6.20 Large-scale 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.

6.6.21 Although SMRs are considered to be quicker and cheaper to deploy than larger scale reactors, they are currently untested in construction, commercial deployment or operation. 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.

Nuclear pathways

6.6.22 In the FES 2025 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.

6.6.23 **Figure 10** shows the average and the range of the annual nuclear capacity projections for NESO's Net Zero compatible FES projections.

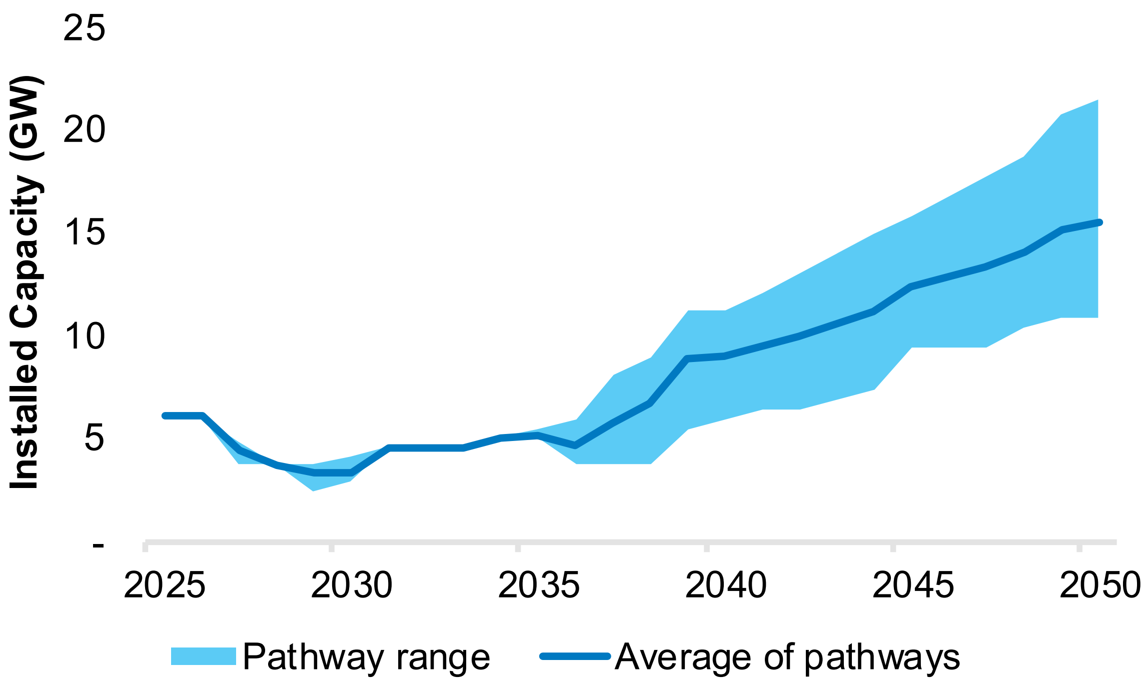

Figure 10: FES nuclear capacity pathways 2025-2050
(GW) (**Ref 34(2025), Table ES.21**)

6.6.24 This analysis suggests that 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 both to make up for closing reactors, and to meet an anticipated increase in electricity demand.

Nuclear fusion

6.6.25 In October 2023, the then government also published 'Towards Fusion Energy 2023', the next stage of the UK's nuclear fusion energy strategy (**Ref 66**).

6.6.26 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.

6.6.27 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 66, p20**).

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

6.6.29 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.

6.7 Unabated fossil fuels and abatement technologies

6.7.1 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 34(2025), Table ES1**).

6.7.2 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.

6.7.3 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, 25% from CCGT and 15% from other fuels including unabated biomass and energy from waste) (**Ref 4, pp25 & 26**).

6.7.4 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) or the similar Carbon Capture and Storage (CCS).

6.7.5 Decarbonisation of the fuel used to generate electricity in the CCGT fleet could be achieved by burning low carbon hydrogen. **Section 6.8** of this Statement provides further detail on the role of solar and other renewable electricity generation in the production of low carbon hydrogen.

6.7.6 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.

6.7.7 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.

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

6.7.9 As a first-of-a-kind low carbon dispatchable technology, by capturing emissions from existing fossil fuel generators, 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**). Although *"the technology has not been delivered at scale and significant risks remain"* (**Ref 67, p53**), 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.

6.7.10 CCUS deployment is currently progressing with projects now identified and under development within clusters. Projects have been selected to proceed to negotiations for government support and Development Consent Orders have been granted for some but not yet all of the CCUS related projects aiming for operation in the late 2020s.

6.7.11 Progress has been made on project definition, design, consenting and commitment since EA 2023 provided a licensing framework for CO2 transport and storage.

6.7.12 The Cluster approach provides the possibility of directly capturing and storing emissions from CCGT and Biomass electricity generation facilities close to where the clusters are located. When delivered, the cluster approach will provide abatement for a significant proportion of the UK's operational CCGT fleet as well as the opportunity to decarbonise heavy industry in the areas local to the proposed pipelines. However, an extension of the UK's CCUS or hydrogen pipelines will be required to capture carbon emitted from the many CCGT and industrial facilities which are not near to an existing or proposed cluster.

6.7.13 The government have set out the important role which CCUS is required to play in the CBGDP (**Ref 19(2), Table 4**). However, 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 17(2025), p106**).

6.7.14 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.

6.7.15 Therefore, other low carbon supplies may be required to make up for facilities which, by 2030, have not yet been abated in order to secure the government's aim to deliver a clean power system by 2030, and keep power clean through to 2050 and beyond. The ongoing development of onshore renewables, including solar, is therefore even more important to compensate for any delays or shortfalls in CCUS deployment.

6.8 Hydrogen

6.8.1 The 2021 UK Hydrogen Strategy explains that hydrogen has *"the potential to overcome some of the trickiest decarbonisation challenges facing our economy"* (**Ref 68, p2**), especially in enabling the decarbonisation of industry and land transport, and as a potential substitute for current carbon-intensive marine and aviation fuels.

6.8.2 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 6.7**) are hoped to become operational in the second half of the 2020s.

6.8.3 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.

6.8.4 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.

6.8.5 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 34(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 23, pp6 & 36**).

6.8.6 Hydrogen continues to be an interesting and potentially 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.

6.8.7 The government has pursued electrolytic hydrogen production through the establishment of Hydrogen Allocation Rounds (HARs). The delivery of electrolytic hydrogen capacity requires significant supplies of low carbon electricity from the UK's electricity network. The Proposed Development (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 Proposed Development, the UK's electrolytic hydrogen ambitions are unlikely to be met.

6.8.8 Progressing electrolytic hydrogen de-risks growth in this valuable energy technology from already announced and potential future delays in the delivery of CCUS infrastructure. 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.

6.8.9 It is therefore clear that large capacities of low carbon electricity generation will be needed to produce hydrogen to support its future use as a way of reducing carbon emissions. However, hydrogen clearly cannot be regarded as a substitute for low carbon electricity generation.

6.9 Biomass

6.9.1 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 34(2025) Table ES1**).

6.9.2 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 69, p6**).

6.9.3 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.

6.9.4 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 69, p4**).

6.9.5 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.

6.9.6 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.

6.9.7 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 34(2025), Table ES1**). In January 2024, the then Secretary of State approved the DCO to convert two existing biomass units at Drax Power Station to BECCS. A Low Carbon Dispatchable CfD Agreement Relating to Drax Power Station was signed in November 2025 which may take effect from 1st April 2027.

6.9.8 However, BECCS will be dependent upon the delivery of CCS infrastructure to capture carbon emissions, and any shortfall in the delivery of BECCS schemes (including at Drax) against the FES pathway projections will need to be made up for instead by other low carbon technologies.

6.10 Solar

6.10.1 The government's solar photovoltaics deployment information resource (**Ref 70**) records installed and operational solar capacity in Great Britain and the UK. The government's data shows that at the end of October 2025, Great Britain had 20.3GW of operational capacity. A further 0.4GW was located in Northern Ireland.

6.10.2 UK Solar has generated over 10TWh annually since 2016, rising to over 14TWh in both 2023 and 2024 (**Ref 33, 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 1** of this Statement.

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

6.10.4 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.

6.10.5 **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.

6.10.6 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 November 2025 additions have been pro-rated to an indicative year-end 2025 position.

6.10.7 Annual installations peaked at 4.2GW in 2015. Annual installations averaged 1.1GW over the period 2010 to 2024 and 1.4GW from 2021 to 2025 inclusive.

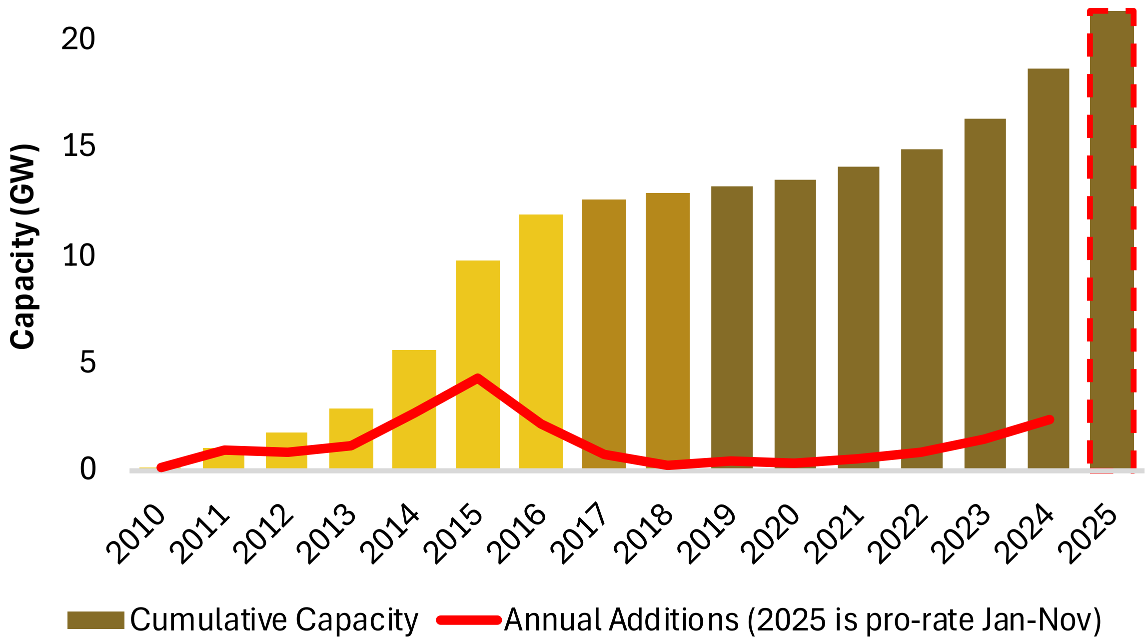

Figure 11: Cumulative and annual installed solar capacity in the UK
(GW, 2010 – pro-rate November 2025) (**Ref 70**)

6.10.8 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.

6.10.9 In its Clean Power 2030 Action Plan, the government established 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**).

6.10.10 Importantly, to achieve the bottom of the 2030 capacity range by 2030, solar capacity (excluding rooftop capacity, see commentary to **Table 1** of this Statement) will have to increase by circa 6GW each year from 2026 to 2029 inclusive, i.e. new installations in each year will have to be one-and-a-half times higher than the UK's previous single highest achieved annual installations. To achieve even the bottom of the 2035 capacity range by 2035, annual solar capacity additions will need to average circa. 2.7GW each year from 2026 to 2034 inclusive. Both pathways require a significant and sustained increase in annual deployment than that achieved in seen in the UK in the last decade.

6.10.11 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 34(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**.

6.10.12 **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.

6.10.13 **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.

6.10.14 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.

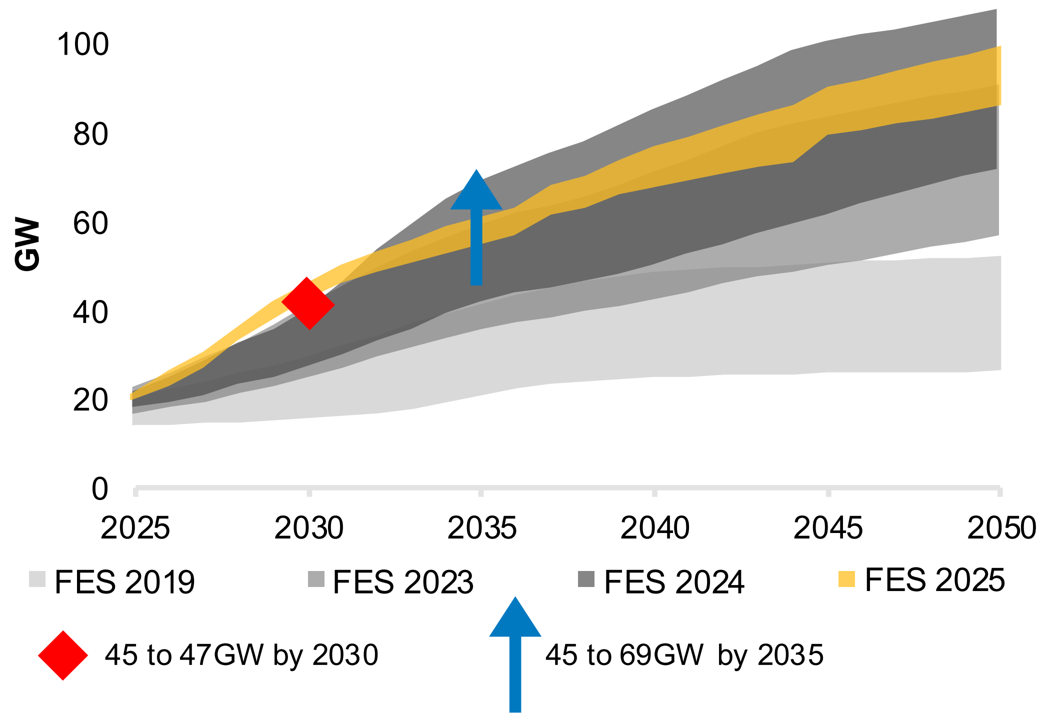

Figure 12: Evolution of future solar capacity forecasts in the UK
(GW) (**Ref 34(2019, 2023, 2024 & 2025), Table ES1**)

6.10.15 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**).

6.10.16 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 and average over 5GW new capacity each year.

6.10.17 To achieve the 2030 capacity range, an even more ambitious deployment rate is needed over the four years 2026-2029, and critically one which has never previously been achieved in the UK.

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

6.10.19 Solar schemes must come forward for delivery in the 2020s as well as 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.

6.10.20 **Table 2** shows that the capacity of solar schemes prioritised by NESO for Gate 2 connection offers in 2030 or earlier is 30GW, and from 2031 to 2035 is 28GW. This meets the government's 2035 capacity ranges but does not account for project attrition or development delays. The current pipeline cannot therefore be guaranteed to deliver sufficient capacity to meet the government's ambition, and projects currently with Gate 1 offers may prioritised in future connections queue review cycles.

6.10.21 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 Proposed Development) continually feeds the connections and contracting process through the intervening years, and competition within the pipeline of projects will improve outcomes for consumers through the delivery of higher quality or lower cost projects.

6.10.22 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

6.10.23 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 10**) as well as meet the already urgent need for schemes to come forwards to support decarbonisation and energy security aims.

6.10.24 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.

6.10.25 In this context, the urgent development of large capacities of a technology which is 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**).

6.10.26 The solar sector is already proven in delivery and in operation. The technology benefits from a short development duration (relative to other technologies) and is therefore well placed to deliver to the urgent need for low carbon generation.

6.10.27 Data from the REPD (**Ref 49**) quantifies the average duration from planning submission to operation of a solar farm in the UK as 1.4 years, calculated over an average of circa 1,000 projects).

6.10.28 Larger projects may take longer to consent and construct. 22 solar projects with capacity over 40MW are listed as operational in the REPD. These projects took on average 2.5 years from planning submission to operation.

6.10.29 The data also evaluates the average solar park construction period at 3-6 months with larger sites circa. 1 year.

6.10.30 This data is in stark contrast to historical development timescales in the UK for onshore wind (see **Section 6.5**), offshore wind (see **Section 6.4**) and nuclear power (see **Section 6.6**).

6.10.31 NESO's Connections Reform process (**Ref 50**) confirms that circa. 30GW of solar schemes have been prioritised for connection prior to 2030, and a further circa 28GW of solar schemes have been prioritised for connection prior to 2035. Between 26.4GW and 28.4GW of new solar capacity would meet government's current 2030 capacity range, broadly aligned with the capacity of solar projects prioritised for 2030. However, **Section 6.3** of this Statement provides evidence that development pipelines must be assessed with caution for all technologies.

6.10.32 The size of the solar pipeline is encouraging, but the potential for scheme attrition poses a real risk to the delivery of future capacity. The future need for solar capacity is not already met by prioritised schemes.

6.10.33 If a significant capacity of solar generation is not ready to feed the prioritised connections queue 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.

6.10.34 With that context in mind, bringing the Proposed Development forwards will be a critical step in the development and delivery of large-scale solar capacity in the UK.

6.11 Flexibility

6.11.1 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**).

6.11.2 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 use more) and release energy to (or save) the energy system in response to market drivers, as will subsequently be explained.

6.11.3 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.

6.11.4 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.

6.11.5 **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.

6.11.6 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.

6.11.7 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.

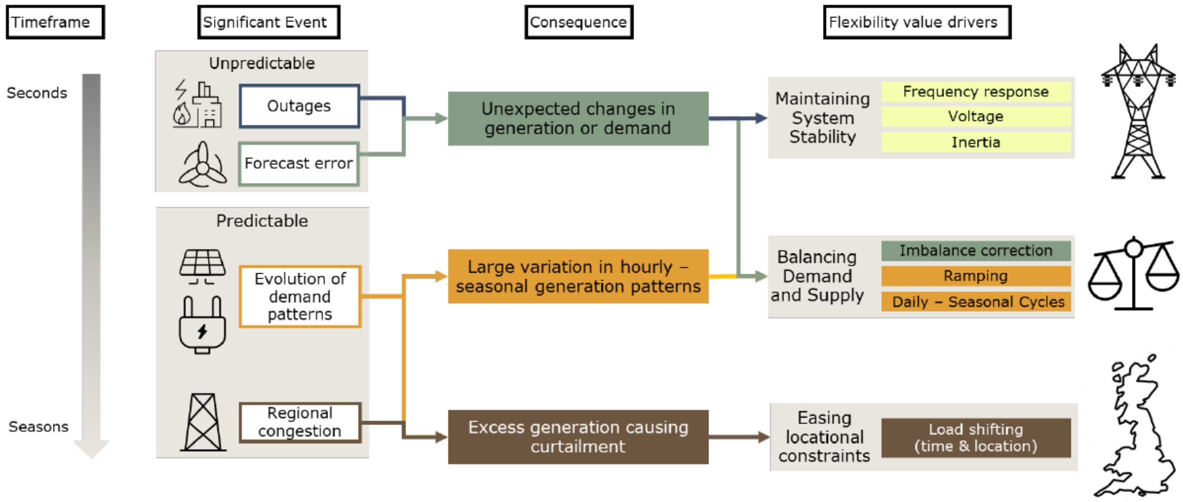

Figure 13: Drivers of flexibility requirements

(**Ref 71**)

6.11.8 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**).

6.11.9 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

6.11.10 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 longer duration balancing needs; and
- Long Duration Storage (LDS) with durations of over 12 hours, are more suited to meeting multi-day and seasonal balancing needs.

6.11.11 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).

6.11.12 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.

6.11.13 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.

6.11.14 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.

6.11.15 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.

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

6.11.17 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 Proposed Development, are designed to address.

6.11.18 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.

6.11.19 NPS EN-3 also describes the government's support for solar which is co-located with storage (**Ref 2, Para 2.10.24**).

6.11.20 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.

6.11.21 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.

6.11.22 BESS are typically shorter duration electricity storage systems but are capable of operating over longer durations if needed. BESS are well suited to increasing the effectiveness of solar schemes in different weather scenarios.

Quantifying future flexibility needs

6.11.23 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 34(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.

6.11.24 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**).

6.11.25 **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.

6.11.26 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.

6.11.27 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.

6.11.28 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.

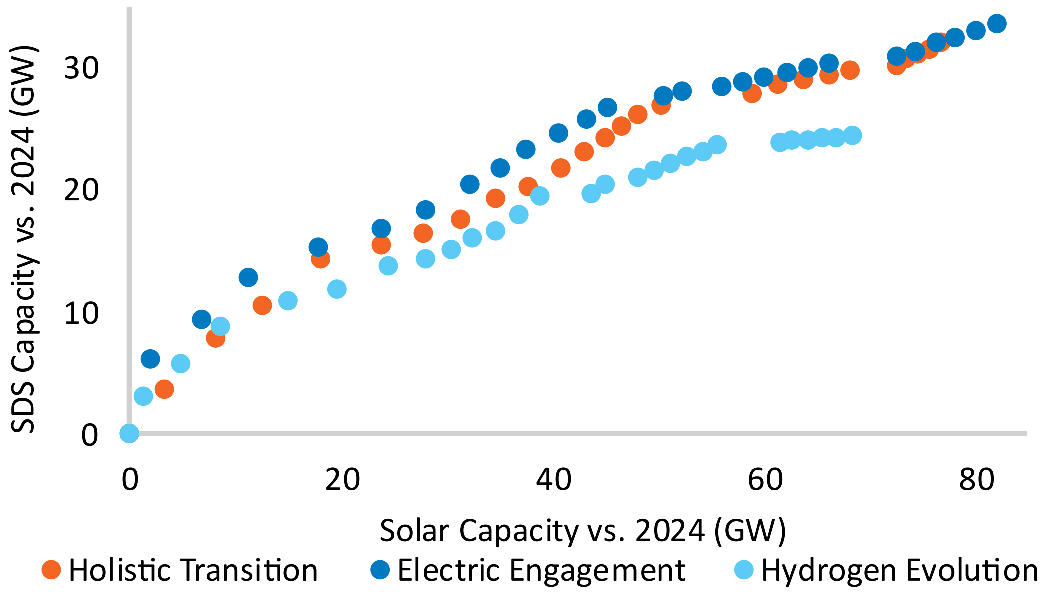

Figure 14: Growth in Short Duration Storage capacity vs. solar capacity
(GW, 2024 – 2050) (**Ref 34(2025), Table ES1**)

BESS provide flexibility

6.11.29 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 grid balancing services.

6.11.30 BESS and renewable generators may be co-located with each other or developed as standalone projects. Co-location is discussed in **Section 7.9** of this Statement.

6.11.31 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.

6.11.32 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. However, the implementation of smart meters, ToUTs, electric heating and transport needs in domestic and commercial properties will move the shape of GB electricity demand from hour-to-hour from being a driver of market price, to becoming a function of market price, which in turn will be driven by weather conditions.

6.11.33 NESO calls grid balancing services which support NETS stability and operability Ancillary Services. Grid balancing services are procured by NESO and under these contracts, operators respond to NESO's requests to import or export power. Grid balancing services are important because they help match supply and demand of electricity at all times, and help NESO keep the electricity system within its statutory control parameters. The need for grid balancing services is projected to increase as the capacity of intermittent renewable generation on the UK's electricity system increases.

6.11.34 **Section 7.9** describes the potential contributions made by a storage asset as part of the Proposed Development to the GB electricity market. This includes the role of a co-located storage asset in supporting the operation of the solar array by directing energy from times when generation is abundant to times when it is needed, including at times when national electricity demand is higher than national renewable generation. All storage assets would also be able to provide grid balancing services which support the operation of a decarbonised GB electricity system and so help to mitigate the impact arising from an increasing portion of the UK's electricity being supplied from intermittent renewable sources. Co-located storage assets are able to provide these services to support the operation of the solar asset as well as the operation of the electricity system. Further explanation of the associated nature of the storage development is included in **Section 7.11**.

6.11.35 **Table 3** 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).

6.11.36 The fourth column describes whether the service is a grid balancing service, procured by NESO for the proper functioning of the electricity system. 'Other' services help to '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 72, p6**).

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

6.11.38 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 [grid balancing] 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 3: Storage asset operation in the GB electricity market

Service	Explanation	Applicability	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 NESO 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		Grid balancing	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	Grid balancing	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	Grid balancing	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	Grid balancing	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	Grid balancing	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	

6.11.39 Under a contract to provide grid balancing services, 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.

6.11.40 BESS are able to provide both upward and downward regulation by ensuring that they are entering their contracted period with a circa 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%).

6.11.41 **Table 3** 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.

6.11.42 Not all grid connections have available import capacity, so it follows that where both export and import capacity is available at a particular grid connection point and a BESS is proposed, that proposal 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 NESO.

6.11.43 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 by market participants ahead of time based on operational forecasts of supply and demand 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 7.9** of this Statement. Any other operation at delivery will be under the arrangements of an Ancillary contract for grid balancing services.

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BESS operational parameters

6.11.45 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.

6.11.46 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.

6.11.47 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.

6.11.48 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.

6.11.49 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.

6.11.50 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.

6.11.51 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).

6.11.52 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.

6.11.53 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%).

6.11.54 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).

6.11.55 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%.

6.11.56 **Section 7.9** 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.

6.11.57 **Section 10.2** 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.

6.11.58 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.

6.11.59 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.

6.11.60 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.

6.11.61 Evidence on possible modes of operation of a co-located solar and BESS scheme are included at **Section 7.9**.

6.12 Conclusions on clean electricity supplies

6.12.1 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.

6.12.2 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.

6.12.3 The results of NESO's Connections Reform process were published in December 2025 and are included in **Table 2** of this Statement. The Applicant has been notified that the solar component of the Proposed Development has been prioritised as a Gate 2 Phase 1 scheme with connection in 2030 or earlier. The

BESS component of the Proposed Development holds a Gate 1 connection offer, the indicative connection date of which has not yet been confirmed.

6.12.4 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.

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

6.12.6 The evidence shows that there are many significant uncertainties associated with the development of many low carbon technologies, including CCUS, hydrogen and nuclear power, particularly in relation to the timeframes in which material contributions to decarbonisation and security of supply must be made. Put plainly, these technologies cannot yet be relied upon to contribute to the delivery of net zero in the coming years simply are not likely to be ready to contribute in a meaningful way to decarbonisation before the 2030s. Achieving meaningful progress in decarbonisation during the 2020s, and establishing a robust pipeline of projects which will deliver in the early 2030s is of critical importance in the fight against climate change. The results of NESO's Connections Reform process confirm that the Proposed Development holds an important position in that pipeline.

6.12.7 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.

6.12.8 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 frameworks have the potential to complement the UK's growing renewable generation capacity to deliver decarbonisation and security of supply benefits both before 2030 and into the next decade.

6.12.9 However, although an actual, potential, or aspirational pipeline for longer term low carbon generation schemes presents additional opportunity for future decarbonisation, the risk associated with the delivery of that pipeline should not be understated.

6.12.10 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.

6.12.11 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 unproven technologies which ultimately may not deliver.

6.12.12 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**).

6.12.13 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.

6.12.14 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 particularly when demand is higher than renewable generation. Energy storage capacity is also needed to increase to support renewable electricity generation capacity growth. The Proposed Development seeks to bring forwards co-located storage facilities as associated development to the main (renewable generation) development.

6.12.15 The Proposed Development 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 Proposed Development, 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.

6.12.16 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.

6.12.17 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.

6.12.18 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 be used as an argument against the consent and development of the Proposed Development, a principle established in NPS EN-1 (**Ref 1, Paras 4.3.23 – 4.3.24**).

6.12.19 The Proposed Development is a viable proposal to use proven technology with short development timescales, thereby delivering dependable decarbonisation benefits. During operation, the Proposed Development will deliver significant carbon reduction benefits through the deployment of a proven, low-cost technology through an appropriate grid connection. As such, the Proposed Development possesses exactly those attributes identified as being required to deliver material carbon reductions in the UK electricity sector.

7 Technical considerations for UK solar schemes

7.1 Chapter summary

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

7.2 Large-scale and small-scale generators

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

7.2.2 Electricity transmission networks such as the network to which the Proposed Development 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.

7.2.3 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 24, p79**). It is therefore not the case that the connection of renewable generation to the distribution networks is by default either quicker, cheaper or easier than a connection to the transmission network.

7.2.4 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.

7.2.5 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 34(2025), Table F.12**).

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

7.2.7 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 73**).

7.2.8 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**).

7.2.9 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 34(2025), Table F.12**).

7.2.10 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%.

7.2.11 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.

7.2.12 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**).

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

7.2.14 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.

7.2.15 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.

7.2.16 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**).

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

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

7.2.19 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.

7.2.20 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 74, p182**), and keep power flowing to consumers with the high levels of reliability consumers have come to expect and require.

7.2.21 The Applicant has accepted a Connection Offer from NESO to connect the Proposed Development to the NETS at the existing substation at Monk Fryston. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Proposed Development will generate to both local consumers and across the country where it is required. This is a key benefit of the Proposed Development. The solar component of the Proposed Development has been notified of its status as a prioritised Gate 2 scheme with connection in 2030 or earlier. The BESS component of the Proposed Development holds a Gate 1 connection offer, the indicative connection date of which has not yet been confirmed.

7.3 Large-scale, brownfield and rooftop solar

7.3.1 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.

7.3.2 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 34(2025), Table F.12**), may also be unable to distribute the energy generated from new generators, even if connection points are found close to potential sites.

7.3.3 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. Some of these issues in the context of the Proposed Development are discussed in the **Environmental Statement Volume 3 Site Selection Report [EN0110012/APP/LVS/06.03.03.01]**.

7.3.4 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.

7.3.5 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 likely to be less suitable for rooftop solar panels.

7.3.6 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.

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

7.3.8 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.

7.3.9 **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 75**), 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 76(2023)**) and the government's own analysis of the costs of small scale solar installations (**Ref 77**). Capital cost includes development, construction, and infrastructure costs where appropriate.

7.3.10 **Section 10.3** 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, as **Figure 15** shows.

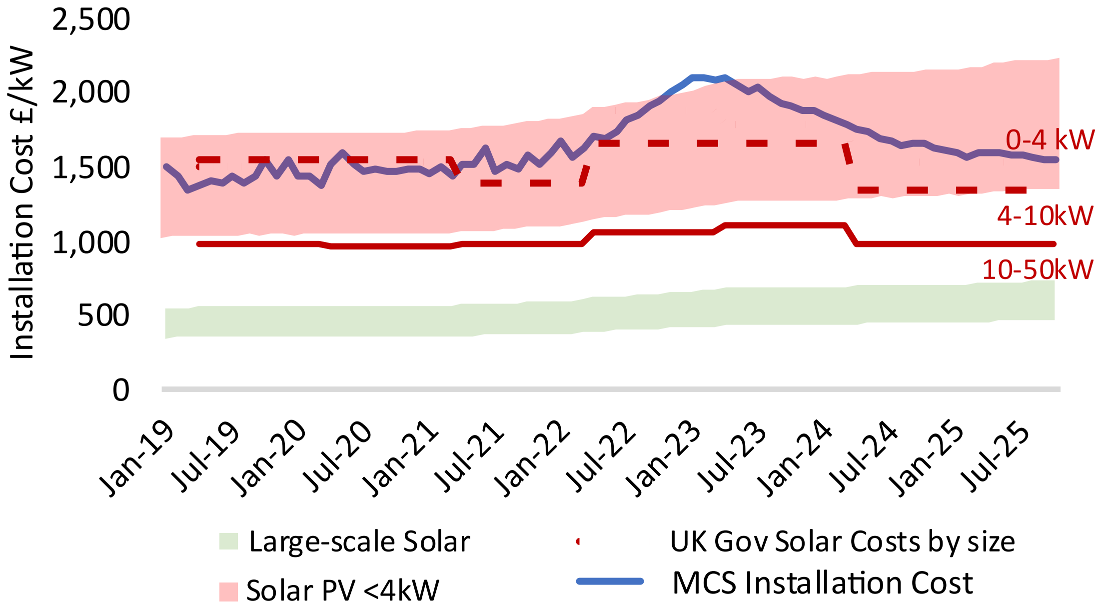


Figure 15: Reported and estimated small-scale and large-scale solar capital costs (£/kW) (**Ref 75, Ref 76, Ref 77**)

7.3.11 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.

7.3.12 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.

7.3.13 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.

7.3.14 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.

7.3.15 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.

7.3.16 Data from the government's MCS scheme shows that the rate of small-scale installations increased near the end of 2022 and continues to grow albeit modestly. The average installation rate from August 2023 to July 2025 inclusive was 83MW/month (0.9GW/year) from November 2022 to October 2023 inclusive, lower at 74MW/month (0.9GW/year) from November 2023 to October 2024 but higher at 93MW/month (1.1GW/year) from November 2024 to October 2025 inclusive. The average installation rate from January 2019 to October 2025 was just 50MW per month (0.6GW/year) (**Ref 75**).

7.3.17 Government's solar capacity range for 2035 is 45GW to 69GW (**Ref 4, Connections Reform Annex, Table 1**). Growth in rooftop and other solar microgeneration schemes will bring forward additional capacity not considered within the capacity range.

7.3.18 The government has clarified that its capacity ranges for solar do not seek to prioritise nor 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**).

7.3.19 At current installation rates, small-scale installations alone would deliver the bottom of the 2035 solar capacity range in approximately 22 years, a timeframe incompatible with the urgent need to achieve a clean power system.

7.3.20 Alternatively, to reach the bottom of the 2035 solar capacity range in 2035 from small-scale installations alone would require ten consecutive years, starting in January 2026, of over double the average annual installation rate achieved between November 2022 and October 2025. Under current economic and subsidy conditions, such a sustained increase seems unachievable.

7.3.21 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.

7.3.22 The data shows that reaching the government's solar capacity ranges through the deployment of only small-scale schemes is not a feasible pathway to a clean energy system. Therefore, large-scale solar schemes are required in order to achieve net zero and smaller scale solar, including rooftop solar, must be considered as additional to, as opposed to instead of, the need for large-scale solar.

7.4 Site selection for large scale solar

7.4.1 This section sets out, in general terms, the assessment process for sites for large-scale solar generation in the UK. The application of these principles to the site selection process undertaken for the Proposed Development is set out in the **Environmental Statement Volume 3 Site Selection Report [EN0110012/APP/LVS/06.03.03.01]**.

7.4.2 Suitable sites will be:

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

7.4.3 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 and objectives 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.

7.4.4 Solar schemes 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 that scheme's aims and objectives;
- 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.

7.4.5 Other attributes will also apply in the site selection process, for example those environmental attributes described in NPS EN-3 Paras 2.10.19 to 2.10.40 and the potential for environmental impacts as described in NPS EN-3 Paras 2.10.65 to 2.10.118. 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.

7.4.6 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 3.2.4**). 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.

7.4.7 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.

7.4.8 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.

7.4.9 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.

7.4.10 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.

7.4.11 **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.

7.4.12 The approximate location of the Proposed Development is shown in **Figure 16** by the green point.

7.4.13 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.

7.4.14 The average load factor of the UK's aggregated solar generation assets from 2016 to 2024 is 10.3%. This means that, on average UK solar has generated 902kWh/kW(p) (902 = 10.4% x 8,760 hours per year). The lowest annual achieved load factor was 9.0% (788kWh/kWp) in 2024, and the highest was 11.1% (972kWh/kWp) in 2018. On the scale in **Figure 16**, the UK's average load factor of 10.3% lies between the yellow to the right of 876kWh/Yr/kWp and the darker yellow to the left of 949kWh/Yr/kWp.

7.4.15 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 from Aberdeen to Manchester, or south of Manchester, could be expected to experience a higher load factor than the current UK average.

7.4.16 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.

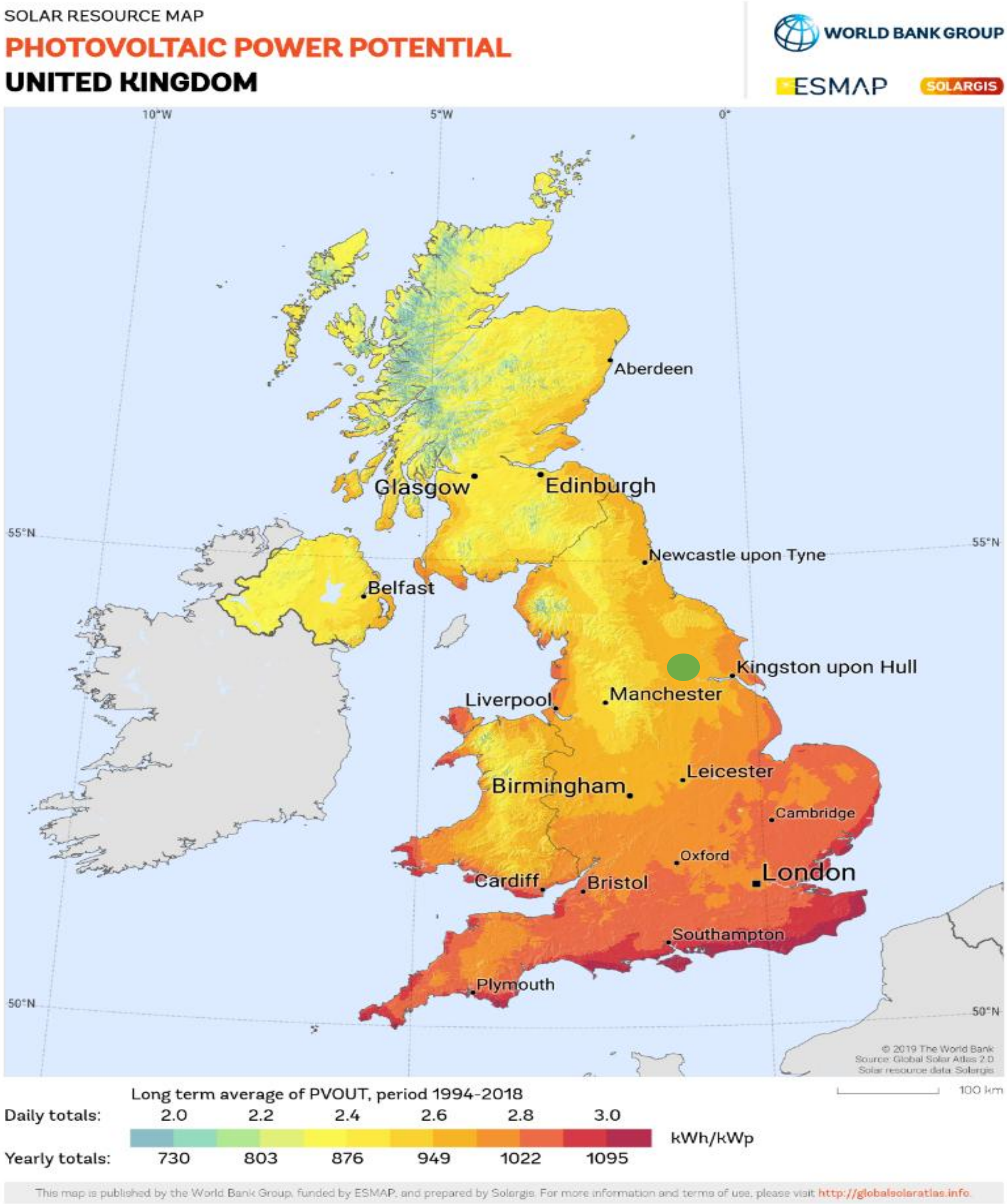


Figure 16: UK solar irradiation
(**Ref 78**)

7.4.17 **Figure 16** shows that the solar resource at the Proposed Development's location (marked by the green point) is higher than the UK average.

7.4.18 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.

7.4.19 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 2.10.14**).
>
> *"Larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure"* (**Ref 2, Para 2.10.15**).
>
> *"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 2.10.17**).

7.4.20 To enhance the overall benefit of a 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.

7.4.21 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 with available capacity. Such instances have already occurred for offshore wind.

7.4.22 **Figure 17** shows data from NGET's online ConnectNow Research Assistant (**Ref 79**). 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.

7.4.23 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.

7.4.24 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, currently remains a constraint to many schemes which are coming forwards.

7.4.25 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.

7.4.26 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.

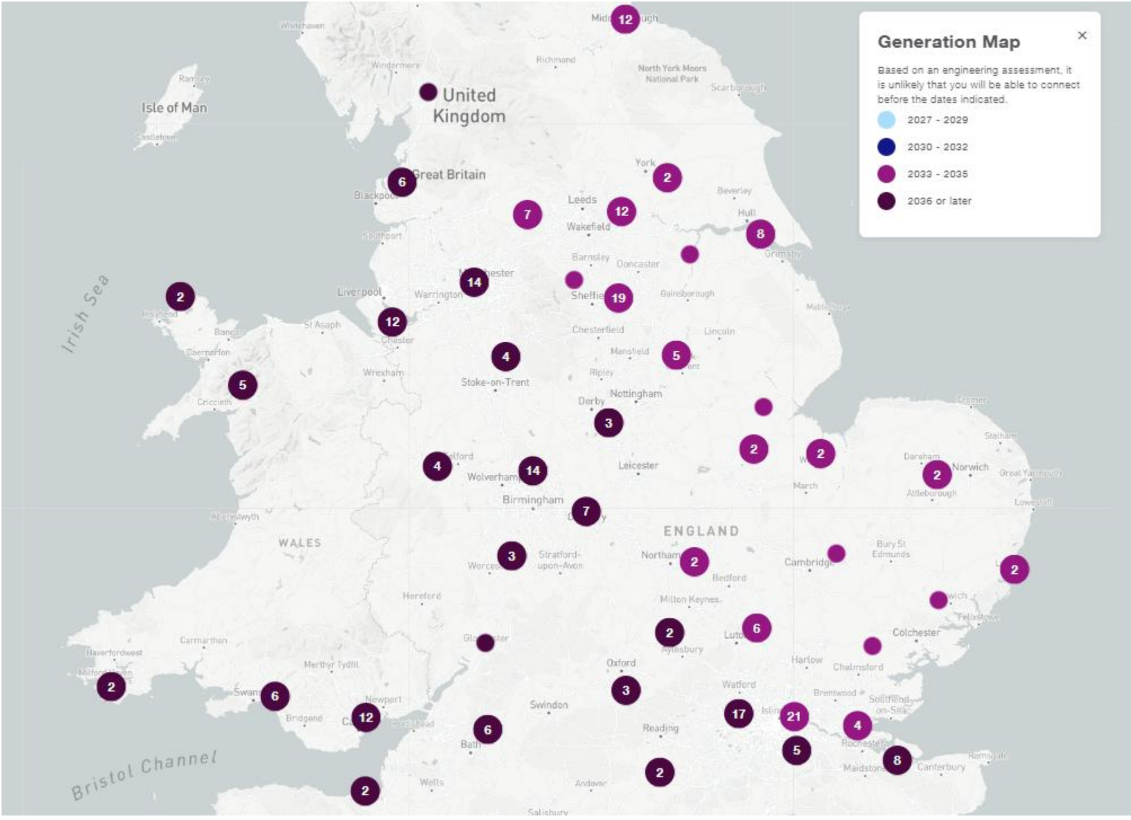


Figure 17: Transmission system connection points and potential connection dates
(**Ref 79**)

7.4.27 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 Proposed Development. The existing Monk Fryston 275kV substation had available grid connection capacity which the Proposed Development has contracted to use. Further, Monk Fryston substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Proposed Development will generate to consumers nationally as well as into local distribution networks.

7.4.28 Therefore, the Proposed Development will make efficient use of existing infrastructure and this a key benefit of the Proposed Development within the context of the significant national need for new electricity networks infrastructure. The Proposed Development is also located away from areas of the NETS which are currently experiencing flow constraints and generation curtailment, as described in **Section 9.4** of this Statement. This is a key benefit of the Proposed Development's proposed location.

7.4.29 Large scale solar schemes must connect to the grid via high voltage electrical cables. Locating solar schemes and their grid connection points close to each other 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.

7.4.30 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.

7.4.31 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).

7.4.32 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.

7.4.33 Further evidence supporting the suitability of the location of the Proposed Development is included in **Chapter 8** of this Statement and further information on site selection for the Proposed Development can be found in the **Environmental Statement Volume 1 Chapter 3 Alternatives and Design Iteration [EN0110012/APP/LVS/06.01.03]** and the **Environmental Statement Volume 3 Site Selection Report [EN0110012/APP/LVS/06.03.03.01]**.

7.5 Technology selection / orientation

7.5.1 NPS EN-3 provides guidance that, along with associated infrastructure, a solar farm typically requires between 4 and 5.6 acres for each MW of output (**Ref 2, Para 2.10.9**).

7.5.2 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.

7.5.3 Panels may be orientated vertically (portrait) or horizontally (landscape) and may be mounted with one or more above (or next to) the first.

7.5.4 Different configurations have different benefits and disbenefits, and some configurations may be better suited to some locations than others.

7.5.5 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.

7.5.6 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.

7.5.7 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.

7.5.8 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.

7.5.9 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.

7.5.10 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.

7.5.11 The Applicant's **Environmental Statement Volume 1 The Proposed Development [EN0110012/APP/LVS/06.01.02]** 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 Proposed Development through retaining the flexibility to install panels in a SAT orientation or FSF panels at the detailed design stage.

7.6 Overplanting

7.6.1 This section describes key aspects of overplanting. Although overplanting is not achievable on all schemes, the Proposed Development is coming forward with overplanting.

7.6.2 Overplanting has been proposed to increase utilisation of the available grid connection capacity versus the case that no overplanting was considered. The ratio of overplanting considered at this scheme lies within the ranges described in this section and the impacts of the Proposed Development have been assessed including the overplanted capacity.

What is overplanting?

7.6.3 An important consideration for developers is maximising the utilisation of the available grid connection capacity from the available land area through the life of a scheme. Schemes with greater lifetime outputs will deliver greater decarbonisation and security of supply benefits and should also be more affordable. Location-specific commercial and environmental constraints also need to be respected for schemes to be both consentable and financially rational.

7.6.4 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 2.10.47, Footnote 98**).

7.6.5 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 that scheme including any overplanting (**Ref 2, Para 2.10.47, Footnote 98**). However, overplanting is not a requirement of a scheme but is a common approach taken by developers to maximise the benefit a scheme can deliver from the available land and grid connection.

7.6.6 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, including as a result of degradation (see also Section 7.8 of this Statement).

7.6.7 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. Overplanting is commercially rational on all types of schemes subject to the availability and suitability of a sufficient area of land for overplanting.

7.6.8 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.

7.6.9 Subject to the availability of land and selection of co-located storage technology, if applicable, different schemes may take different overplanting strategies.

7.6.10 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.

7.6.11 There may also be rational reasons why a particular developer, at a particular location, does not pursue an overplanting strategy for their scheme.

The benefits of overplanting

7.6.12 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 7.9**) if it is not to be lost. This is sometimes called clipping.

7.6.13 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**.

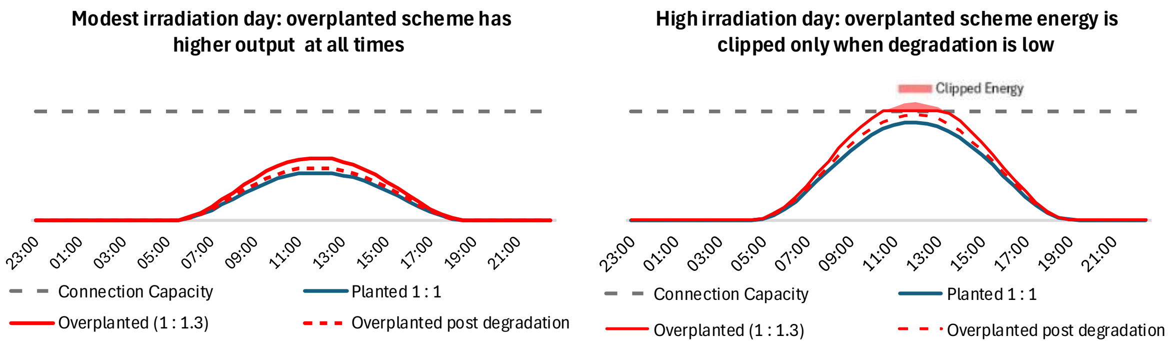


Figure 18: Clipped and optimised generation on overplanted vs. unitary solar schemes

7.6.14 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 that scheme (MW, in AC).

7.6.15 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).

7.6.16 On a modest irradiation day, more energy is exported from the overplanted scheme than the unitary scheme in every hour, and no energy is clipped.

7.6.17 However, on a high-irradiation day, more energy is exported each hour from the overplanted scheme only until the grid capacity limit is reached. Under these conditions, 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 that scheme to reduce back below the grid export limit. Later in the day, more energy is exported each hour from the overplanted scheme than the unitary scheme until the sun sets.

7.6.18 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 that scheme before degradation.

7.6.19 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.

7.6.20 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. If sufficient land is available to deliver an overplanted scheme, overplanting can increase the utilisation of available grid connection capacity. Noting that, nationally, grid connection capacity is currently constrained and is projected to remain constrained over the coming decade, this is a key benefit of an overplanted scheme.

7.6.21 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 a 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.

7.6.22 Overplanting supports developers to increase the volume of low carbon energy transmitted to the grid over the lifetime of a 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.

7.6.23 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.

Limits to the net benefits of overplanting

7.6.24 **Figure 19** and **Figure 20** show the results of an analysis of the average annual output of a solar scheme per MW installed (y-axis) as a function of the overplanting ratio (x-axis), for a Fixed South Facing (FSF – blue) scheme and a Single Axis Tracker (SAT – orange) layout.

7.6.25 These figures have been derived from inputs which are appropriate for UK-based solar schemes generally and therefore the conclusions following are also applicable across all schemes, excluding the impacts of location-specific parameters.

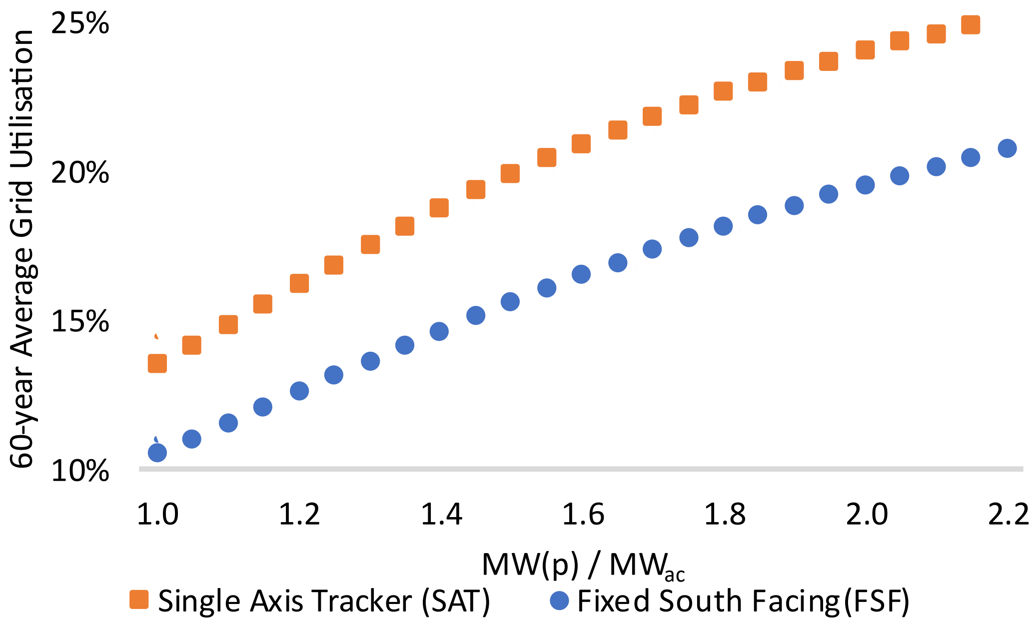


Figure 19: Grid utilisation increases as overplanting increases

7.6.26 At times of high irradiation and early in a scheme's operational life, as the overplanting ratio of a scheme increases, clipped generation also increases. Those losses may be compensated for by greater output in times of lower irradiation and more generally later in operational life, as illustrated previously. The level of overplanting determines the overall balance between clipped generation during times of high irradiation, and incremental generation at times of lower irradiation.

7.6.27 **Figure 19** illustrates the average annual output of an illustrative scheme through a Grid Utilisation metric (%) over the first 60 years of operation.

7.6.28 Grid Utilisation is calculated as the total MWh exported through the grid connection during the life of the project, divided by the maximum MWh export possible through the connection during the life of the project, i.e. [grid connection capacity (MW)] x [project life (years)] x 8760 (hours/year).

7.6.29 The points on **Figure 19** show the lifetime Grid Utilisation for schemes with an overplanting ratio of between 1.0 and 2.2, at regular increments under either an FSF (blue) or a SAT (orange) layout. Clearly an underplanted scheme (i.e. one in which the MW peak installed solar generation capacity is lower than the grid connection capacity), would deliver a lower 60-year average grid utilisation factor than that of a scheme which is planted at unity, or one which is overplanted. Because connection capacity is nationally constrained, it is of vital importance that schemes which come forwards make the most of that contracted capacity.

7.6.30 The orange and blue dotted lines are straight lines of best fit through each 'curve' of points. This is for visual aid only, as they help the reader to assess the gradient of the curves which passes through each point, and where that gradient changes.

7.6.31 As the overplanting ratio increases, so too does Grid Utilisation. However, beyond an overplanting ratio of approximately 1.6 (where the coloured points are furthest above the straight trend lines), the incremental benefit of overplanting on grid utilisation reduces (the points start to return back towards the straight line and ultimately fall below it).

7.6.32 Any scheme which has an installed capacity which is lower than its grid connection capacity would generate less energy than a scheme which is overplanted and would therefore deliver a lower quantum of overall benefit to energy security and decarbonisation than that delivered by an overplanted scheme. Scale is therefore important.

7.6.33 **Figure 20** following shows that the average annual output of a scheme over the first 60 years of its operation on a MW(p) basis (installed panel capacity) decreases only when the overplanting ratio increases above a certain level.

7.6.34 Beyond an overplanting ratio of c.1.3, the curves between the points start to turn downwards more steeply than they do for a lower overplanting ratio, implying that the incremental benefit of overplanting starts to reduce as overplanting ratio increases beyond c.1.3.

7.6.35 This analysis does not seek to establish 'hard and fast' rules around overplanting, but together **Figure 19** and **Figure 20** provide quantifiable evidence that an overplanting ratio of between 1.3 and 1.6 is rational for this scheme.

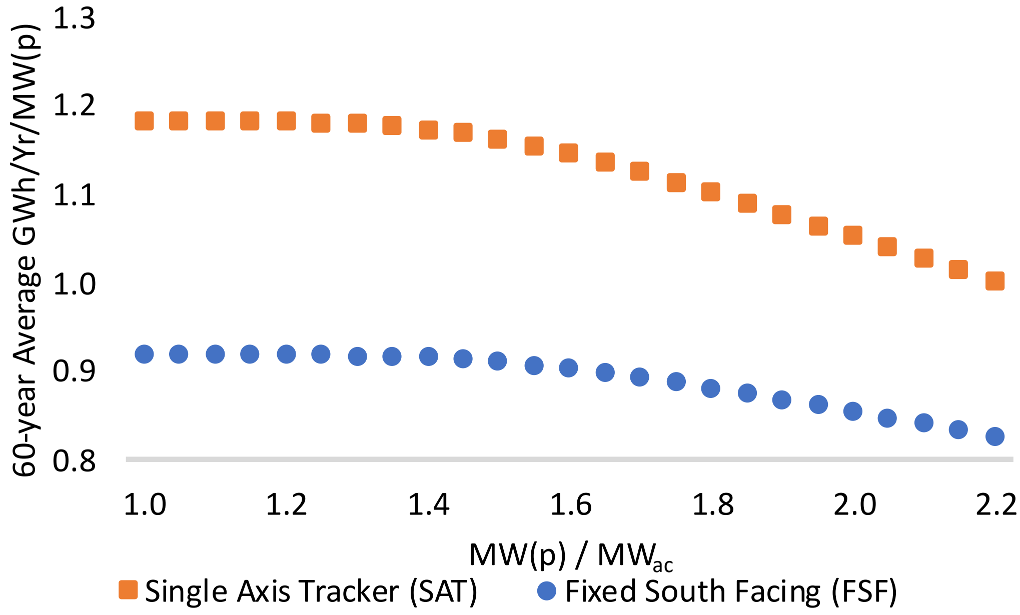


Figure 20: GWh/Yr/MW decreases as overplanting increases

Overplanting and co-located BESS

7.6.36 Generally, BESS facilities may be connected to generators through Alternating Current (AC) or Direct Current (DC) coupling. AC and DC coupled schemes provide different energy system benefits and different environmental effects.

7.6.37 At proposals for co-located solar and storage facilities, the power and energy capacity of any co-located BESS facility, alongside how they are coupled with the solar scheme, and environmental factors, may also be important in determining the level of overplanting which can be accommodated.

7.6.38 There is no ‘one size fits all’ approach to optimising co-located facilities, however the co-location of BESS at solar schemes provides an opportunity for clipped generation to be stored and released when generation levels are lower.

7.6.39 AC-coupled BESS facilities are grouped in one or a small number of locations on site which may be in close proximity to the substation or may have very low landscape and visual impacts. DC-coupled systems are placed in very many small groups, dispersed among the solar arrays.

7.6.40 Being located close to the grid substation means that line losses associated with power flows between the BESS and the grid may be lower for AC-coupled BESS, while line-losses between the panels and the BESS may be lower for DC-coupled BESS.

7.6.41 Maintenance access must be available to all BESS groups through the operational life of a scheme, and some locations may render this unachievable for operational or commercial reasons. Schemes may therefore be better suited to one technology over the other.

7.6.42 These considerations may be significant when assessed over the anticipated operational life of a scheme. AC-coupled systems are currently more established in the UK market. The Proposed Development includes AC-coupled BESS which is considered by the Applicant to be more suitable than DC-coupled BESS at this location, for practical and operational reasons, including the consideration of suitable parcels of land within the red line boundary upon which BESS can be accommodated.

7.6.43 Section 7.9 of this Statement provides further detail on the benefits arising from co-location of storage with solar schemes.

7.7 Land use associated with large-scale solar

7.7.1 NPS EN-3 indicates that along with associated infrastructure, a solar farm currently requires between 4 and 5.6 acres for each MW output (**Ref 2, Para 2.10.9**). Different configurations have different performance characteristics in terms of acres/MW(p). The illustrative design for the Proposed Development shows a layout which is more land efficient than that range, at under 3 acres per MW (excluding land for environmental mitigation). 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.

7.7.2 Lifetime average annual generation is another metric which can be maximised to provide the greatest lifetime decarbonisation and energy security benefit from a 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.

7.7.3 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.

7.7.4 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.

7.7.5 The inclusion of co-located storage as part of a scheme may also change that scheme's land efficiency.

7.7.6 Large-scale solar schemes are also efficient in comparison to other onshore technologies in terms of the energy they generate over their lifetime on a per unit area basis.

7.7.7 By way of example, an analysis of the source data (**Ref 80**) shows that a solar scheme with land use ratios similar to the Proposed Development would generate nearly 50 times the energy output per unit area of growing crops for energy. Solar generation also produces no marginal carbon emissions, whereas the generation of electricity by burning crop-based fuels releases carbon emissions.

7.7.8 Another pertinent example is a comparison with onshore wind. An analysis of the source data (**Ref 81**) and **Table 4** of this Statement shows that a solar scheme designed to maximise its output would also generate a similar amount of energy per acre of land as onshore wind on the same site.

7.8 Solar cell efficiency

7.8.1 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 7.4**. Both influence the output of a scheme.

7.8.2 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 a scheme.

7.8.3 Degradation also affects solar panel efficiency. Degradation is caused by physical processes relating to weather effects including the effects of light on the panels over time.

7.8.4 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.

7.8.5 Solar panels and electrical infrastructure have become larger and more efficient, as shown in **Figure 21**, 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.

7.8.6 Whilst they do not represent an independently sourced update to **Figure 21**, panel supplier product specification sheets can be used to assess the efficiency of currently available solar panels.

7.8.7 **Figure 21** 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.

7.8.8 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.

7.8.9 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%. However, both technologies emit CO2 as a by-product of electricity generation (**Ref 33, Table 5.6**).

7.8.10 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 can be 20-40% efficient at converting wind energy into electricity, depending largely on the span of their turbine blades.

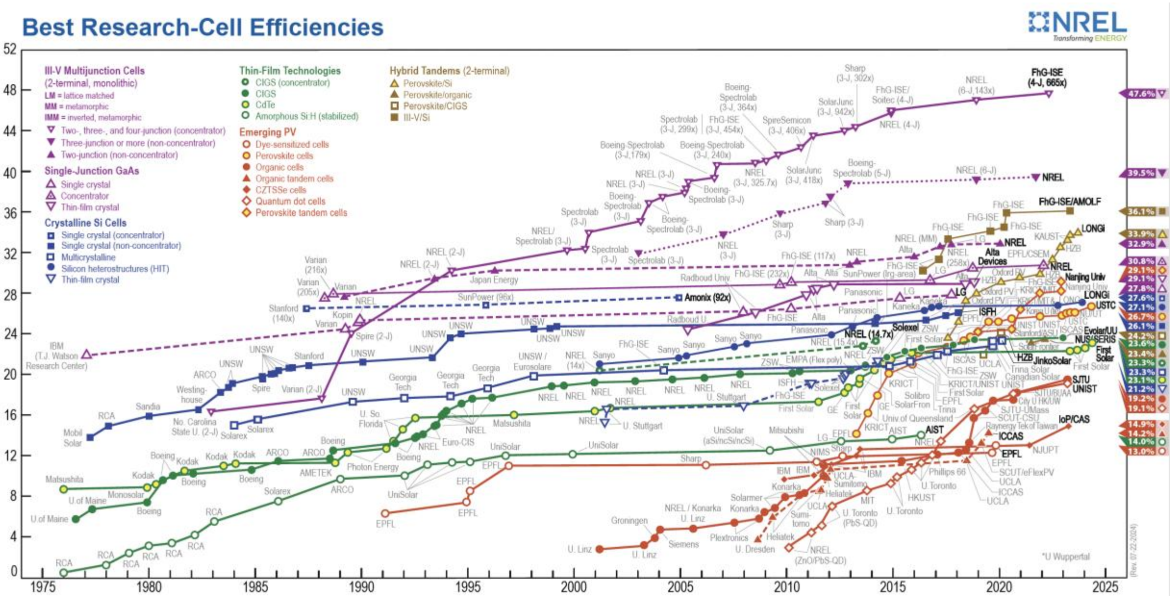


Figure 21: Evolution in solar cell efficiency 1975 - 2024

(**Ref 82**)

7.8.11 The efficiency of solar generation is currently towards the lower end of the scale of efficiencies for technologies commonly used to generate electricity in the UK, but solar cell efficiency is continuously improving.

7.8.12 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 very few moving parts, low emitted noise levels and a low height in comparison to other technologies.

7.8.13 Solar panel output (panel power) 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.

7.8.14 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.

7.8.15 It is difficult to predict what the future power rating 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.

7.8.16 It seems reasonable therefore to anticipate that panel efficiency will continue to increase in the future, and recent increases have been approximately linear.

7.8.17 By installing more efficient panels, a facility may need to install fewer panels to achieve a specified total asset capacity but the total coverage across a site would not be expected to change significantly. Opportunities to enhance the overall efficiency of a 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. Alternatively, a higher scheme capacity could be achieved by installing the same number of panels, each with a higher panel power.

7.8.18 It is therefore not a given that the installation of higher efficiency panels will result in reduced land take.

7.8.19 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.

7.8.20 At the detailed design stage, opportunities will be investigated to increase the lifetime generation output of a scheme and the benefits arising from its development, within the envelope of development secured at consent.

7.9 Co-location

7.9.1 NPS EN-3 states that:

> *"Where sited on agricultural land, consideration may be given as to whether the proposal allows for continued agricultural use and/or can be co-located with other functions (for example, onshore wind generation, storage, hydrogen electrolysers) to maximise the efficiency of land use"* (**Ref 2, Para 2.10.24**).

7.9.2 **Section 6.11** describes the services BESS can deliver within a net zero energy system. BESS provide services which support the operation of renewable energy generation schemes and, for schemes that are able to both import and export energy, also support the efficient and secure operation of the UK's electricity system through providing a wide range of grid balancing services.

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

7.9.4 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.

7.9.5 Standalone solar schemes, and other renewable generation technology schemes, generate, from a renewable source, zero-marginal carbon electricity. Therefore, alongside co-located schemes, standalone solar schemes also provide an essential contribution to reaching net zero. Standalone schemes are already prevalent and will likely continue to be prevalent in the UK's future electricity system.

7.9.6 Alternatively, BESS may be proposed as part of a solar development to support its operation by holding energy generated by the solar panels during times of low demand and releasing it to the grid at a time when it is needed. This benefit could be delivered without an import connection.

7.9.7 However, storage facilities which are able to both import energy from and export energy to the NETS would be able to provide a wider range of services to the electricity system. Such a scheme could allow energy to be imported into the BESS from the grid at times of low demand and exported back to the grid at times of high demand, as well as store energy generated from the co-located solar panels.

7.9.8 At some locations, co-located schemes can be connected without upgrades being required to existing grid connection substations. At other locations however, upgrades to transmission system infrastructure may be required to provide a BESS with an import connection.

7.9.9 Such upgrades may be time consuming and/or expensive. Waiting for grid upgrades to deliver before developing a scheme may delay a scheme's commissioning date, thus unwittingly 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 a scheme, risking the deliverability of that scheme as a whole.

Co-location and standalone schemes

7.9.10 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. 2.10.8**).

7.9.11 Solar facilities may be developed as standalone from a storage scheme. Storage facilities may also be developed as standalone from a renewable generation scheme.

7.9.12 It is important to recognise that standalone storage schemes are already commonplace in GB and there may be location-specific reasons why anew site coming forward also comes forward as a standalone scheme.

7.9.13 Standalone storage schemes are likely to continue to come forwards, delivering decarbonisation and energy security benefits as they do 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. However, as NPS EN-3 clarifies, co-location is an approach which may help to maximise the efficiency of a scheme’s land use (**Ref 2, Para. 2.10.24**).

7.9.14 **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.

7.9.15 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 that scheme’s grid connection infrastructure and available land.

7.9.16 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 control specific elements of a scheme, including parameters which will have the effect of capping the energy capacity of the proposed BESS.

7.9.17 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 associated storage facility, or generally prevent it from coming forwards. 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, including developments to a scheme’s grid connection agreement.

7.9.18 This will ensure that a scheme may be consented to be responsive to a changing grid connection environment, and constructed to meet incorporate future and as yet unknown innovation, safety improvements, and cost-efficiencies.

Co-located schemes in operation

7.9.19 A co-located BESS with import and export grid connection capacity 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 under a grid balancing contract instruction from NESO.

7.9.20 A co-located BESS with only export grid connection capacity would not have the capability to import from the grid and, as shown in **Table 3** would be able to provide a smaller range of grid balancing services to NESO than a scheme with both import and export capability.

7.9.21 A stand alone solar scheme would also be able to provide some of the grid balancing services shown in **Table 3**, but the range of services which it could provide would also be smaller. The following figures illustrate how co-located solar and BESS may work together under a selection 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 or hour-to-hour basis for both co-located and stand alone facilities.

7.9.22 For simplicity, **Figure 22** to **Figure 26** 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.

7.9.23 In each of **Figure 22** to **Figure 26**, 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.

7.9.24 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.

7.9.25 The figures show the BESS 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.

7.9.26 Local solar generation is usually highest in the middle of the day, and national demand is currently often higher in the evening (around approximately 17:00 in Winter and 19:00 in Summer). However, as **Section 9.3** of this Statement explains, NESO expect that this will not always be the case.

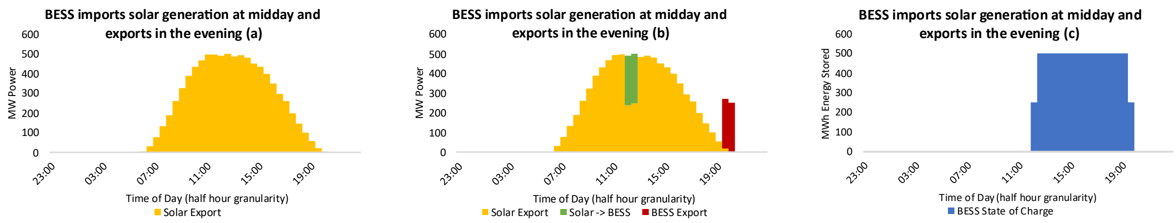


Figure 22: BESS stores midday solar generation for evening export

7.9.27 **Figure 22(a)** represents solar generation at the facility over the course of one sunny day. If the asset operator's forward view was that the energy system may be in surplus in the middle of the day but may be in deficit in the evening, the operator could schedule the BESS to import from the solar generation during the middle of the day (**Figure 22(b)**, green area) and to export that energy later when it was needed more (**Figure 22(b)**, red area). **Figure 22(c)** shows the State of Charge of the BESS on that day.

7.9.28 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 23**. Critically, the amount of energy the BESS can store is the same as in **Figure 22**. Operators would determine their rate of import and export according to market needs.

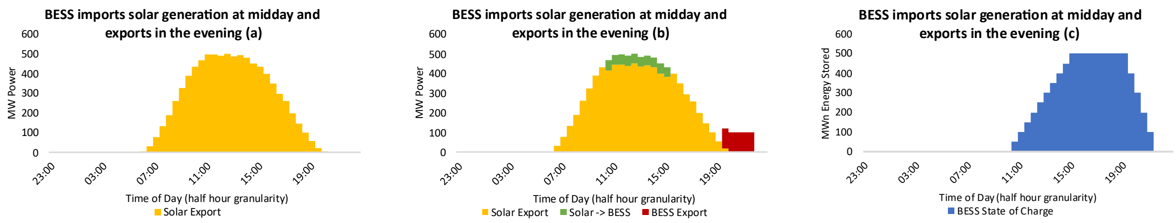


Figure 23: BESS stores midday solar generation for evening export – lower rates

7.9.29 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.

7.9.30 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 22** and **Figure 23**. 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.

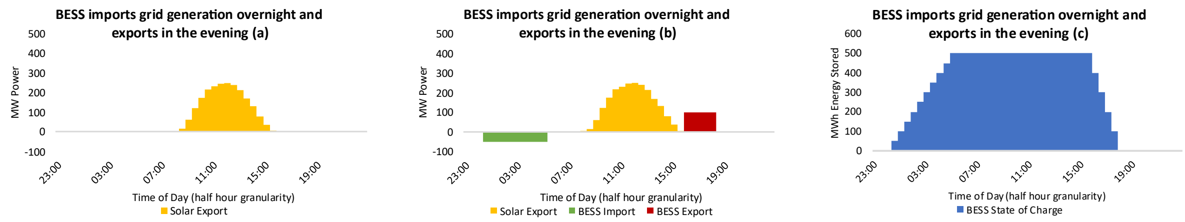


Figure 24: BESS stores overnight grid generation for evening export

7.9.31 **Figure 24** shows how the BESS may import overnight, store its charge through the day, and export in the evening peak. **Figure 24** 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.

7.9.32 On some days, operators may foresee a system need for the BESS to operate more than one import/export cycle over a 24-hour period, and **Figure 25** shows how this might work. In practice, the BESS operational parameters will limit how the BESS is able to respond to system need.

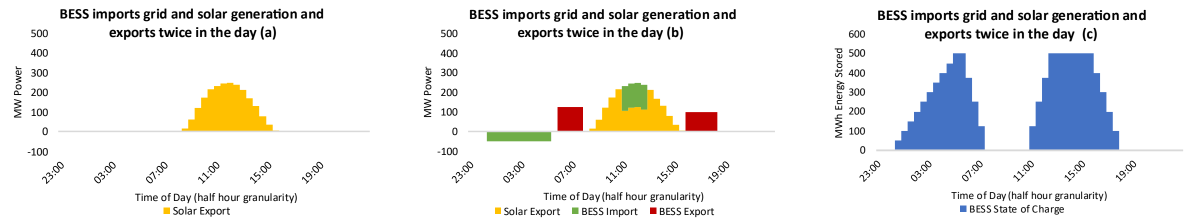


Figure 25: BESS stores solar and grid generation for export when needed

7.9.33 Grid balancing services are contracted ahead of time but are instructed at shorter 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.

7.9.34 Grid balancing services help to keep the UK electricity system operating safely and securely. Some grid 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 an efficient deployment of infrastructure and can therefore often be 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 need to import or export immediately prior to a contracted period for the provision of grid balancing services to achieve an appropriate State of Charge immediately prior to a contracted period for Ancillary (Balancing) Service provision.

7.9.35 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.

7.9.36 BESS operation under reserve service contracts will be similar to the BESS operation shown in **Figure 22** to **Figure 25**, 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.

7.9.37 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).

7.9.38 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 26** 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.

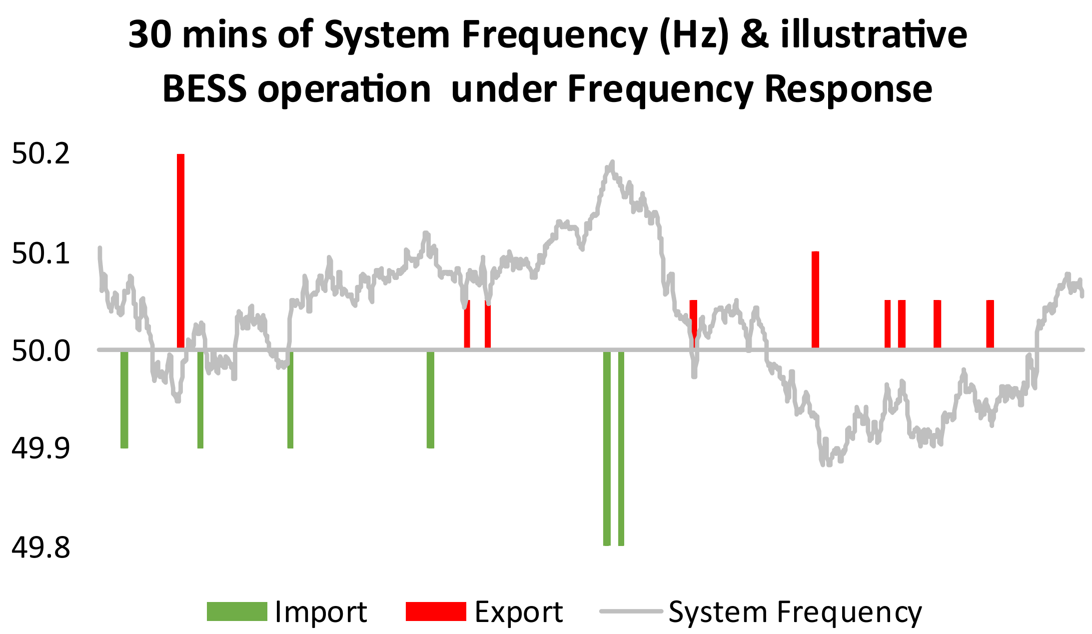


Figure 26: Illustrative BESS operation under Frequency Response type operation

7.9.39 **Figure 26** illustrates 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 signifies the magnitude of the BESS response required. This would be related to 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.

7.9.40 In reality, BESS imports/exports may be much more frequent than those illustrated in **Figure 26**. 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.

7.9.41 A 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.

7.9.42 Being able to regulate power flows both to and from the grid would allow the BESS to provide many kinds of system-wide grid balancing services which will support a further reduction in the UK's reliance on fossil fuels. **Table 3** provides more information.

7.10 BESS store predominantly low-cost, low-carbon energy

7.10.1 Over its operational lifetime, the energy stored in a BESS will have been generated by overwhelmingly low-cost, low-carbon sources, including from UK renewables.

7.10.2 Sources of renewable electricity are largely uncontrollable, meaning that they generate energy depending on the local natural conditions of wind or sunlight. These sources will generate as much electricity as they are able to under the local natural conditions at the time unless commercial drivers incentivise them to reduce output (e.g. prices are negative) or they are instructed to reduce output by NESO.

7.10.3 Conversely, increasing the output from a renewable generator on demand is possible only if the facility has been artificially constrained and that constraint is released, or if the facility is co-located with an asset which can store and dispatch power on demand, e.g. a BESS.

7.10.4 There are already periods when renewable electricity is generated in abundance in the UK, meaning that during those periods supply is greater than demand and the price of electricity is low. At other times, demand may be greater than supply, and the price of electricity is higher.

7.10.5 BESS respond to the resulting market price signal: buy low, sell high. BESS store energy when it is generated in abundance and release it to the grid when it is needed. **Section 10.2** of this Statement explains that in order to sell, however, a BESS will need to price its output at a lower level than alternative sources, such as dispatchable gas fired power stations, for example.

7.10.6 Each green dot in **Figure 27** shows the daily average market price for electricity in Great Britain plotted on the y-axis against the daily average output from renewable generation in the Great Britain for the same day on the x-axis. Data has been plotted for the period 1st January 2023 to 31st December 2024. The orange dashed line is a simple straight-line trend through the data points.

7.10.7 **Figure 27** shows that daily average prices tend to be higher when GB renewable generation is lower, and vice versa.

7.10.8 Renewable output is not the only driver of low and high prices. For example, the daily profile of demand also has an impact. The same correlation can be seen when the data is disaggregated into more granular half hour 'settlement periods' used in the GB electricity market.

7.10.9 However renewable output is a major driver which has grown in influence on electricity prices year-on-year and will continue to gain in influence as the electricity system decarbonises. The correlation is clear.

7.10.10 This market characteristic means that BESS will buy and store abundant renewable electricity (when price is lower) and export it when it is needed (when price is higher).

7.10.11 Further, BESS will not tend to store electricity which has a high carbon content such as that generated by GB's carbon-emitting thermal power stations. This is because the GB electricity market operates on a 'marginal cost' basis (also described in **Section 10.2** of this Statement) and carbon-emitting thermal power stations are generally the marginal plant. Therefore, market price will never be high enough for thermal power stations to generate more electricity than is needed at that time. Commercially rational power stations will instead shut down, removing the possibility of abundant electricity output sourced from the thermal asset.

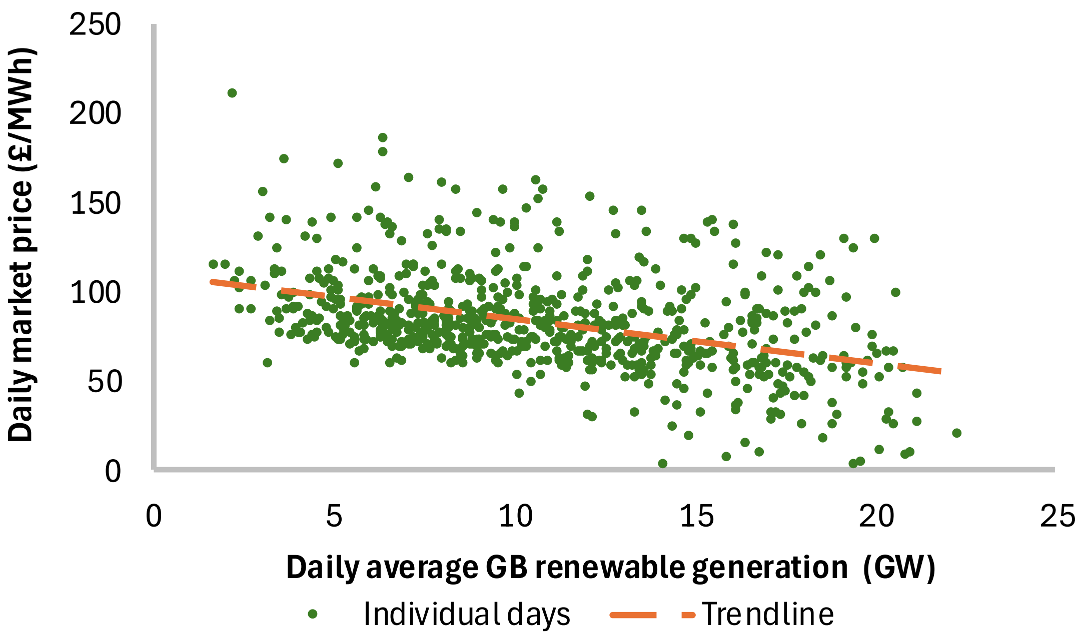


Figure 27: Higher generation from renewable assets correlates with lower market prices

(Market data for 2023 & 2024 sourced from NESO, Elexon & LCCC)

7.10.12 This analysis illustrates that BESS will store electrical energy either from the main solar scheme or from the grid when supplies are abundant and have a low carbon content, and export it back to the grid when it is needed. The stored energy may have been generated either from a co-located renewable scheme or from the grid.

7.10.13 The same logic demonstrates that when the Proposed Development exports its stored energy, it will displace more expensive carbon emitting generators from the grid, thereby reducing the need for carbon emitting generation to fire up to meet demand.

7.10.14 Because the Proposed Development will connect to the UK's electricity network which transmits and distributes energy from generators to consumers across the country, the carbon content of any energy imported to the BESS will be a product of the mix of generation nationally at the time it is imported.

7.10.15 Therefore, storing lower-carbon electrical energy in the BESS for dispatch when it is needed, reduces the national average carbon content of the UK's electricity system.

7.10.16 This is because the carbon content of the energy imported into the BESS will overwhelmingly be lower than the national average, and the carbon content of the energy on the national grid when the Proposed Development exports will overwhelmingly be higher than the national average.

7.10.17 Further, as the capacity and output of renewable generators in the UK increases, the national average carbon content of electricity at times of import will decrease, and so too will the average carbon content of the energy stored in the BESS.

7.11 BESS as associated development

7.11.1 Paragraph 5 of the Guidance on associated development applications for major infrastructure projects (**Ref 83**) describes four tests for associated development. The tests are:

- **Direct Relationship**: The definition of associated development requires a direct relationship between associated development and the principal development. Associated development should therefore either support the construction or operation of the principal development, or help address its impacts.
- **Subordinate**: Associated development should not be an aim in itself but should be subordinate to the principal development.
- **Not only additional revenue**: Development should not be treated as associated development if it is only necessary as a source of additional revenue for the applicant, in order to cross-subsidise the cost of the principal development. This does not mean that the applicant cannot cross-subsidise, but if part of a proposal is only necessary as a means of cross-subsidising the principal development then that part should not be treated as associated development.
- **Proportionate in nature and scale**: Associated development should be proportionate to the nature and scale of the principal development.

7.11.2 In the context of the Proposed Development, the following points are noted.

7.11.3 **Direct Relationship**: There is a direct relationship between the proposed BESS and the solar array. When energy is generated by the solar array but is not immediately needed, the BESS will store that energy and will export it to the grid when needs are greater. This supports the operation of the Proposed Development by increasing its effectiveness, reducing the potential for wasted energy, and maximising a key benefit of the Proposed Development, being the level of carbon free energy sent to the grid.

7.11.4 The BESS will also be capable of delivering support to the grid which will increasingly be needed to operate a low-carbon electricity system. This also supports the operation of the Proposed Development by increasing the security, reliability and flexibility of the system to which it connects and therefore is also demonstrative of a direct relationship between the BESS and the solar array.

7.11.5 **Subordinate**: The BESS is subordinate to the solar array in that the principle benefit of the Proposed Development, being the generation of carbon free energy, derives from the solar array. The Proposed Development aims to meet the need for new energy generation on the grid by developing the solar array with a co-located BESS. A standalone BESS development would provide benefits to the energy system but on its own would not generate low-carbon electricity. Therefore, the BESS is clearly functionally subordinate to the solar array.

7.11.6 Further, the BESS would operate in a subordinate fashion to the solar array, in that the output from the solar array would influence how the BESS could operate at that time. However, in practice, how the BESS would operate at any time would also depend on a large number of other factors including national demand, the weather, and the evolving composition of the future GB generation fleet.

7.11.7 To illustrate this point, if at a time when the grid needed energy, the sun was shining and the BESS had available charge, the solar array would generate and discharge to the grid. The BESS, however, would sit idle unless export capacity to the grid was available, or at a later time became available, for the BESS to export (i.e. when the generation from the solar array reduced to below the connection capacity level).

7.11.8 **Not only additional revenue**: Investing in unsubsidised solar is economically rational on a stand-alone basis and requires no cross-subsidisation financially to justify the cost of the principal development. For example, EN-3 states: *"Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation"* (**Ref 2, Para 2.10.5**). As such, the BESS is not only necessary as a source of additional revenue for the applicant, to cross-subsidise the cost of the principal development, because no cross-subsidisation is necessary for the solar array.

7.11.9 **Proportionate in nature and scale**: The BESS is proportionate to the Proposed Development in nature and scale. This is because:

- the power capacity of the BESS matches the grid export capacity available to it;
- based on the indicative layout of the solar array and the BESS design parameters, the energy generated by the solar array over the course of a day can regularly exceed the energy storage capacity of the BESS; and
- the footprint of the BESS is much smaller than the footprint of the solar array.

7.12 Conclusions on technical considerations

7.12.1 Large-scale solar is a highly beneficial technology within the UK's electricity system.

7.12.2 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.

7.12.3 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.

7.12.4 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 a clean power system on the way to net zero by 2050.

7.12.5 The Proposed Development is to connect to the existing Monk Fryston 275kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Proposed Development will generate to consumers nationally as well as into local distribution networks, as discussed in **Chapter 8** of this Statement.

7.12.6 Other solar schemes must also 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 while others may use existing and available substations.

7.12.7 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 because solar schemes also represent an efficient use of land for the purpose of generating electricity in comparison to other generation technologies which may be deployed at the same location.

7.12.8 Overplanting and panel layout optimisation can both 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. The Proposed Development's illustrative layout delivers a commercially rational overplanting ratio (i.e. is consistent with the ranges shown in **Section 7.6**) thereby enabling the grid connection to be maximised across the lifetime of the site. The illustrative design for the Proposed Development, which includes overplanting, shows a layout which is more land efficient than the ranges stated in NPS EN-3 (**Ref 2, Para 2.10.9**).

7.12.9 Any optimisation of layout at a detailed design stage would be unlikely to identify any areas of land of sufficient size or shape which would be useful to keep out of the Proposed Development 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.

7.12.10 The connection of very many small-scale (including rooftop) systems to the aggregate capacity targeted by government under its mission to deliver a clean power system 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.

7.12.11 A proportionate capacity of BESS is proposed as associated development to the Proposed Development. Operating a BESS as an associated part of the Proposed Development would support the operation of the main solar array through any periods with a risk of commercial curtailment. The BESS would be able to store energy generated by the main solar scheme and export it to the NETS when it is needed, including at times when national electricity demand is higher than national renewable generation. Storing lower-carbon electrical energy in the BESS for dispatch when it is needed, reduces the national average carbon content of the UK's electricity system.

7.12.12 The Proposed Development has been designed to optimise use of the available land area, grid connection capacity, and retains the flexibility to install SAT or FSF panels at the detailed design stage. The AC-coupled BESS also included as associated development to the Proposed Development would support the operation of the main solar scheme and would be able to store any abundant generation and export it when it is needed. The Proposed Development seeks to optimise the annual average generation over its operational life at its specified location through the flexibility to select technologies which will make efficient use of the natural and grid resources which are available to the Proposed Development.

8 Suitability of the proposed location for large-scale solar

8.1 Chapter summary

8.1.1 This chapter provides an overview of the evidence provided to support the suitability of the proposed location of the Proposed Development for large-scale solar plus storage.

8.2 Transmission network regional capacity assessment

8.2.1 The Proposed Development is to connect to the existing Monk Fryston 275kV substation. This substation is connected to an existing part of the NETS with sufficient capacity to transmit the energy the Proposed Development will generate to consumers nationally as well as into local distribution networks. This is a key benefit of the Proposed Development.

8.2.2 Monk Fryston is located close to an existing part of the NETS in the northern former coal belt. The overhead line to which Monk Fryston connects is on an east-west section of the NETS connecting Yorkshire with the west coast and south through the industrial heartlands around Manchester and Sheffield to the Midlands. The Proposed Development is located near to the Monk Fryston substation.

8.2.3 Monk Fryston is located in:

- the 'Yorkshire and the Humber' transmission network region;
- the Northern Powergrid (Yorkshire) distribution network; and
- the 'N. Wales, the Mersey & the Humber' region for the purposes of the regional capacity breakdown included in the Clean Power 2030 Action Plan.

8.2.4 NESO's Connections Reform process has re-ordered the connections queue and prioritised sufficient solar schemes to meet the Clean Power 2030 regional capacity ranges for 2035 for the 'N. Wales, the Mersey & the Humber' transmission network region.

8.2.5 The connection for the solar component of the Proposed Development has secured a Gate 2 Phase 1 prioritisation (i.e. in 2030 or earlier). The BESS element of the Proposed Development holds a Gate 1 connection offer with an as yet unconfirmed connection date.

8.2.6 The capacity of schemes in the planning pipeline in the region, is at a level which will, if delivered, provide significant support to the government's Clean Power target. This underpins the suitability of this transmission network region for the development of large-scale solar schemes.

8.2.7 However, although **Section 6.3** of this Statement demonstrates that it is not likely that all of this capacity will make it through to fruition, **Section 5.3** of this Statement demonstrates that anticipated electricity demand increases will require even more schemes to come forwards beyond 2035. It is therefore important that schemes continue to come forwards to meet the future need identified.

8.3 Electricity networks near to the Order Limits

8.3.1 NESO's ongoing Grid Connections Reform process will is delivering a prioritised queue for those of schemes which are more ready to come forward than others, and which are also strategically aligned.

8.3.2 Bringing forward a sufficient capacity of schemes at all suitable grid substations in the 'N. Wales, the Mersey & the Humber' 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 6.3** provides more information on pipeline attrition in the UK.

8.3.3 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.

8.3.4 Bulk and Primary substations ensure that although the energy generated at the Proposed Development may be transmitted to consumers nationally without constraint, there is a network pathway from the Proposed Development to local consumers. However, these distribution network substations and the cables between them, are not of a sufficient capacity to facilitate connection of the Proposed Development. Consumers and smaller generators may however be accommodated.

8.3.5 By proposing to connect to the NETS, the Proposed Development would not impact 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.

8.3.6 The energy generated at the Proposed Development will not necessarily or solely service either local or national consumption, but connecting the Proposed Development to the NETS will enable the unconstrained flow of energy to either local or national consumers, whenever it is needed.

8.3.7 **Figure 28** shows annual energy demand from 2005 to 2023 in the Yorkshire and the Humber region (**Ref 20(1)**). This data shows that the urgent and unprecedented need for new low carbon generation infrastructure nationally also applies to a more local geography.

8.3.8 In 2023 (the most recent year for which data is available) 20.5TWh of electricity was consumed in the region, equivalent to around 8.2% of Great Britain's end use electricity consumption. Transport needs in the region consumed 41TWh, and a further 92.4TWh (non-electricity demand) was sourced from other fuels such as coal, gas, oils, and biomass.

8.3.9 Total energy consumption in the region reduced by 26% over the period 2005 to 2023. Electricity consumption decreased by 23.4% and non-electricity consumption decreased by 26.5%, within which transport consumption decreased by just 4.4%.

8.3.10 The data shows that non-electricity consumption (including transport) in the region is approximately four times greater than electricity consumption. The electrification of non-electricity energy demand in Yorkshire and the Humber will be needed to meet net zero regionally, and this will increase the need for low carbon electricity generating facilities both regionally and nationally. These trends are broadly consistent with the national trend as described in **Chapter 1** of this Statement.

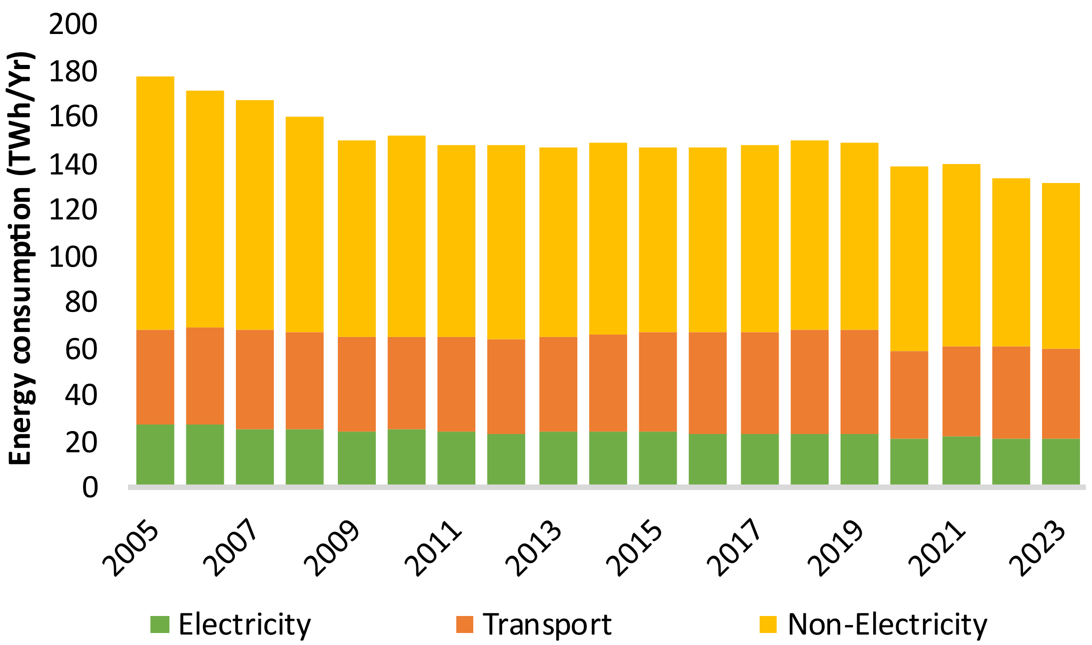


Figure 28: Historic annual energy consumption in Yorkshire and the Humber
(2005 – 2023, TWh/Yr) (**Ref 20(1)**)

8.4 Local supply

8.4.1 As part of its 2022 FES, NESO published a map of regional generation carbon intensity on two types of day (a higher wind day and a lower wind day) (**Ref 34(2022), p32**). This map is reproduced in **Figure 29**.

8.4.2 The average national carbon intensity of generation in 2024 was reported as 154 g/kWh (**Ref 33, Table 5.14**), i.e. at the 'high' end of the 'low' range shown in **Figure 29**.

8.4.3 The map on the left of **Figure 29** 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.

8.4.4 NPG's Yorkshire region is shown with a red-edged legend and the approximate location of the Proposed Development is shown by a small black point on each map.

8.4.5 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.

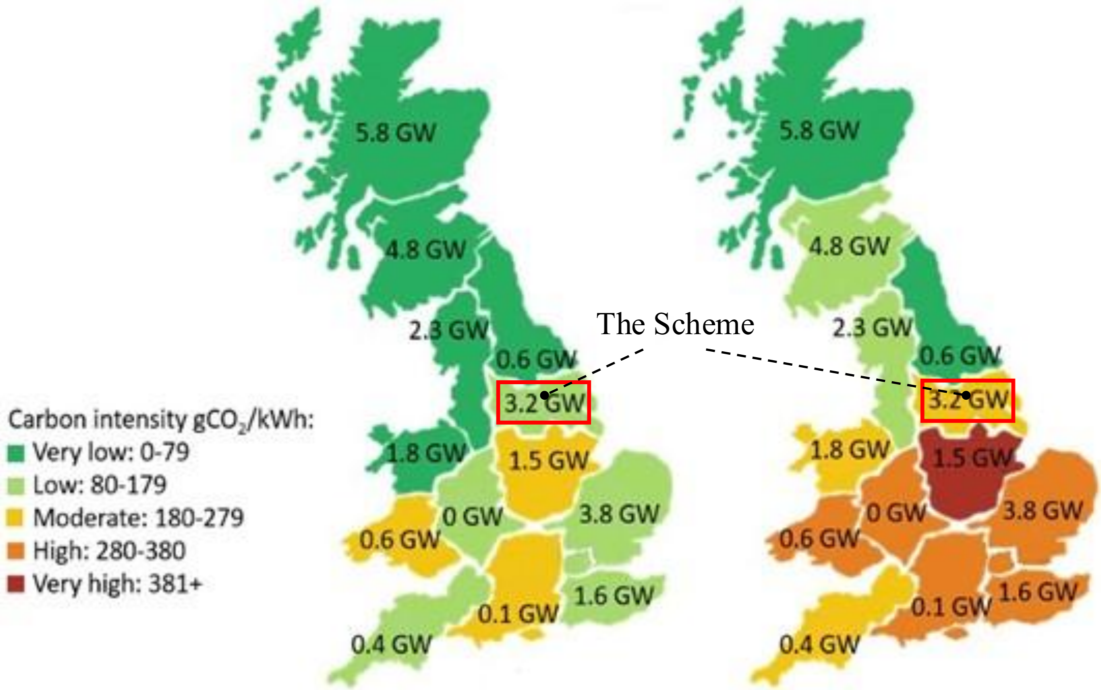


Figure 29: NESO Regional generation carbon intensity analysis

(Left: a higher wind day, Right: a lower wind day. Numbers = installed wind capacity in 2022) (**Ref 34(2022)**)

8.4.6 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.

8.4.7 Further, **Figure 29** 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, NESO's analysis shows that generation in NPG's Yorkshire region has a moderate carbon intensity of generation.

8.4.8 The Proposed Development 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 Proposed Development 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.

8.4.9 As **Section 6.2** describes, solar and other renewable generation displaces carbon emitting generation from the grid and therefore has a decarbonising effect on the electricity system. The connection of solar schemes to the NETS means that when the sun is shining, their generation will flow instead of energy generated by carbon emitting plant. It is unlikely therefore that the connection to the NETS of solar schemes in NPG's Yorkshire region would cause any significant network constraints. Further information on the benefits of a multi-technology energy system can be found in **Chapter 1** of this Statement.

8.4.10 **Figure 16** shows that the Proposed Development is located in an area with solar irradiation levels above average for the UK. 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.

8.5 Grid suitability

8.5.1 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 84**). Options to improve power flow capability can be found in their Network Options Assessment (NOA) (**Ref 73**).

8.5.2 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.

8.5.3 The ETYS looks at whether the current network allows GB national demand to be met through two lenses.

8.5.4 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 84**).

8.5.5 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 84**).

8.5.6 The NOA then identifies, assesses, and recommends (where appropriate) specific upgrade projects which meet the future needs as anticipated in the ETYS.

8.5.7 The Proposed Development proposes to connect to existing 275kV transmission circuits which are well connected to 400kV circuits through Yorkshire to the Midlands and beyond, to demand centres in London and the south-east.

8.5.8 The main transmission circuits connecting Monk Fryston to nearby demand centres and the south are double transmission lines, providing defence in depth. If 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 84, Appendix A**). This is also true for many of the transmission circuits in this area of the country, delivering high network resilience and reliability to this part of the NETS.

8.5.9 The Proposed Development'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 solar scheme in this location is not likely to cause any significant network constraints under either the economy or security criteria.

8.5.10 However, operating a BESS as an associated part of the Proposed Development would support the operation of the main solar array through any periods with a risk of constraint or commercial curtailment, and provide NESO with a cost-effective tool to help manage power flows on the NETS in the vicinity of the Proposed Development over its operational life and through one grid connection point. Such periods could include, for example, extreme weather conditions such as coincident high wind and high solar irradiation, or unplanned power station failures. Under these circumstances, NESO may need to balance supply with demand either locally near Monk Fryston or nationally. Minimising these in a cost-effective way through an associated BESS would be to the commercial benefit of consumers.

8.5.11 The flow of energy from the Proposed Development is therefore unlikely to cause constraints on the NETS during normal conditions. The Proposed Development will be able to displace more expensive power generated by carbon intensive facilities elsewhere in Great Britain. The displacement of carbon intensive power generation will be to the benefit of electricity system decarbonisation and consumer cost nationally.

8.6 Local connection points

8.6.1 **Figure 30** shows a map of the NETS, with a 50km radius drawn in solid red and 25km in dashed red, centred at Monk Fryston. Substations close to Monk Fryston are either connected to the 400kV system (blue lines) south of the Proposed Development, or the lower-capacity 275kV system (red lines) to the north and west of the Proposed Development.

8.6.2 National Grid's Yorkshire GREEN Project was granted Development Consent in March 2024. The project will allow cleaner energy to flow into homes and businesses that need it in Yorkshire and beyond. The project involves reinforcement upgrades local to the Proposed Development, primarily to the circuits to the north of Monk Fryston.

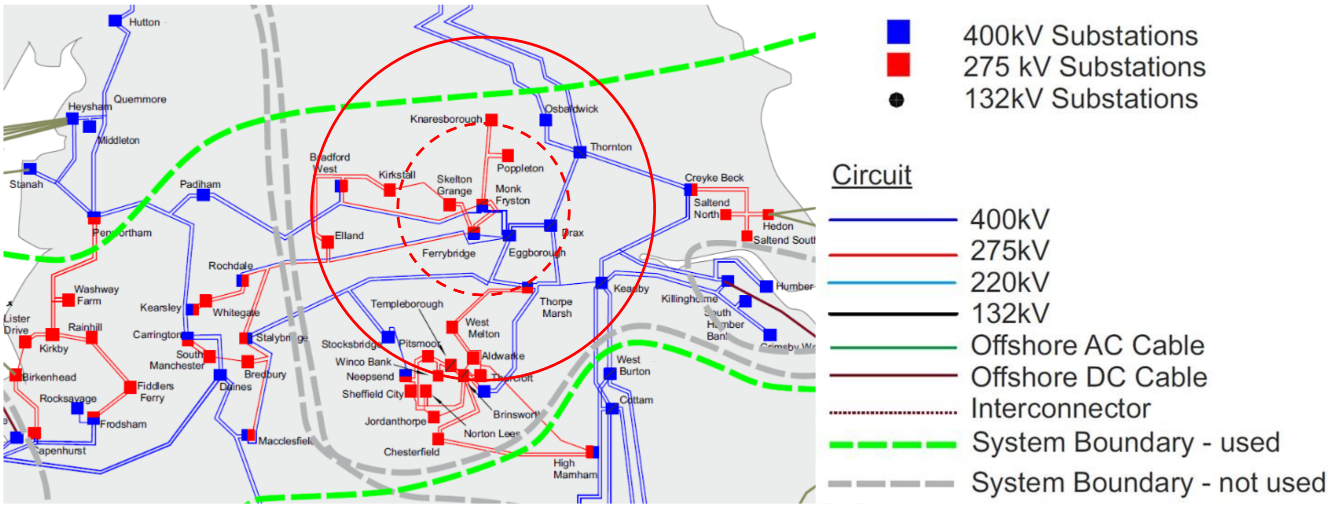


Figure 30: Transmission system within 25km and 50km of Monk Fryston
(**Ref 84, Appendix A**)

8.6.3 NESO's Connection Reform process has prioritised schemes for delivery in two phases, as described in **Table 2** of this Statement. NESO explain that sufficient projects have been prioritised in the relevant transmission network region for its regional capacity range to 2035 to be satisfied. NESO's TEC Register will be updated with prioritised projects as project owners are issued with and accept or reject grid connection offers.

8.6.4 **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 existing substations within 50km of Monk Fryston before 2033.

8.6.5 Given that **Figure 16** shows that solar irradiation near Monk Fryston 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 the Proposed Development, which makes use of existing and available infrastructure to bring large-scale solar generation capacity to the grid, is an essential part of delivering to the urgent need for significant new renewable generation capacities to connect in the next decade to support the drive towards net zero.

8.6.6 Using this available and currently underutilised part of the NETS is critical to support the urgent deployment of low carbon generation assets required to decarbonise the UK's electricity system.

8.6.7 Through the identification of nearby initiating (the Solar PV Array) and terminating (the National Grid Substation) points the Proposed Development has sought to minimise the effects of routing the necessary grid connection infrastructure in accordance with NPS EN-5 (**Ref 32, Para. 2.2.5**).

8.6.8 The Proposed Development will be an important part of the future generation mix connecting in Yorkshire, 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.

8.6.9 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.

8.6.10 The Applicant's **Environmental Statement Volume 3 Site Selection Report [EN0110012/APP/LVS/06.03.03.01]** provides additional information on the Applicant's site selection process.

8.7 Conclusions on locational suitability

8.7.1 **Figure 16** and **Figure 30** show that the location of the Proposed Development 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.

8.7.2 This Statement of Need demonstrates that the proposed connection point is appropriate, and the Proposed Development will be unlikely to cause any grid constraints or curtailment in the area, as a result of connecting at the proposed location.

8.7.3 The Proposed Development has a Grid Connection Agreement with NESO. The connection for the solar component of the Proposed Development has secured a Gate 2 Phase 1 prioritisation (i.e. in 2030 or earlier). The BESS component of the Proposed Development holds a Gate 1 connection offer, the indicative connection date of which has not yet been confirmed. Subject to obtaining the necessary consents, the Applicant aims to construct the Proposed Development ready for connection to the NETS in line with the timeframes set out in the Proposed Development's **Grid Connection Statement [EN0110012/APP/LVS/05.10]** and the proposed construction plan set out in **the Environmental Statement Volume 1 The Proposed Development [EN0110012/APP/LVS/06.01.02]**.

8.7.4 Therefore, if consented, the Proposed Development would contribute to continuing the UK's decarbonisation and security of supply efforts to meet anticipated increases in electricity demand from non-traditional sectors before 2030.

8.7.5 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 Proposed Development 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 need to be higher than in the case that the Proposed Development was consented.

8.7.6 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 3.2.8**).

8.7.7 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 3.2.9**) 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 3.2.10**).

8.7.8 The need for the Proposed Development 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 Proposed Development in the timeframes indicated, with sufficient solar irradiation, and a suitable area of secured land for the solar and BESS.

8.7.9 Further, a large-scale solar development connecting at Monk Fryston provides the potential to help decarbonise local electricity demand to the benefit of consumers both locally and nationally.

8.7.10 The Applicant's grid connection at Monk Fryston is appropriate and critically, is available for the Proposed Development to commission in a timeframe which will enable it to contribute to the UK achieving its sixth Carbon Budget and beyond. 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.

8.7.11 The land included in the Proposed Development's proposals will support an optimisation of the available grid connection secured at Monk Fryston from the proposed layout and BESS configuration, while being sympathetic to planning issues and respecting identified constraints.

8.7.12 Lastly, the local area of the electricity network to which the Proposed Development proposes to connect has sufficient capacity to accommodate the anticipated generation from the Proposed Development without constraint. By connecting the Proposed Development 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 Proposed Development 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.

9 The contribution of large scale solar to system security

9.1 Chapter summary

9.1.1 This chapter provides an overview of the system security benefits of large-scale solar in the UK.

9.1.2 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 2030 and 2050 for a wide range of demand, decarbonisation, and technology sources"* (**Ref 1, Para 3.3.21**).

> *"A secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar"* (**Ref 1, Para 3.3.23**).

9.1.3 'Security of supply' means, essentially, keeping the lights on in people's homes and businesses. It 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.

9.1.4 In relation to security of supply, the term 'adequacy' includes not only the available capacity of generation assets to meet electricity demand, but also the availability of source fuel to those assets so that they are able to generate.

9.2 Power system stability

9.2.1 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.

9.2.2 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.

9.2.3 Key power quality characteristics (including frequency, voltage, and power shape) must also be controlled for the electricity system to operate without fault. NESO 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 85, p5**).

9.2.4 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.

9.2.5 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 instructs assets to deliver grid balancing services. Examples have been listed in **Figure 13** and **Table 3** of this Statement.

9.2.6 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 86, p40**).

9.2.7 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 grid balancing 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 (matching supply to demand at all times) may also increase.

9.2.8 Technological advances, in particular in the introduction of power electronics into generating assets, is increasing the grid balancing 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.

9.2.9 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 operational solar farms have already incorporated state-of-the-art power electronics into their designs and are providing important stability services to NESO.

9.2.10 By co-locating BESS with solar facilities, as is proposed at the Proposed Development, a wide range of grid balancing services and energy balancing capabilities can be delivered through a single grid connection.

9.3 Power system adequacy

9.3.1 Solar plays an important role in diversifying renewable generation sources to maintain adequacy and minimise curtailment.

9.3.2 The uncontrollable nature of the weather requires mitigations to be put in place to ensure that electricity supplies remain secure and reliable. 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 9.5**).

9.3.3 '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' 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 demand when it is at its peak or when additional supplies are most needed.

9.3.4 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 34(2024), p99**).

9.3.5 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 specific basis. No single technology can be relied upon to deliver security of supply at all times.

9.3.6 Critically, the de-rating factor for solar in the Capacity Market has nearly tripled for projects contracting capacity over the period 2021/22 to 2029/30 (**Ref 87**) from 2.34% to 5.96%, 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.

9.3.7 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**).

9.3.8 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.

9.3.9 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 34(2023), p132**). **Figure 14** of this Statement provides further information on the growth of storage facilities in GB.

9.3.10 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.

9.3.11 The inclusion of a storage facility as associated development to the main solar scheme provides additional support to the operation of the main solar scheme in a heavy-renewable electricity system. Further, a co-located storage facility allows the Proposed Development to support the transition to net zero by providing flexibility as part of a clean power system through one grid connection point.

9.4 Curtailment

9.4.1 NESO's Future Energy Scenarios also describes and evaluates the potential for curtailment to occur in the UK's future electricity system.

9.4.2 It is important therefore to explain why curtailment currently occurs in the UK electricity system, and the level of the pricing currently paid to generators for some curtailment actions.

9.4.3 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.

9.4.4 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.

9.4.5 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 34(2025), Table ES1**).

9.4.6 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.

9.4.7 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.

9.4.8 In such circumstances, curtailment would occur because more energy was being generated than that which could be consumed or stored at that time. **Figure 33** 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.

9.4.9 **Chapter 8** of this Statement describes that the Proposed Development 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 Proposed Development during its operational life than may be experienced at other locations. Further, the Proposed Development is unlikely to receive consumer-funded compensatory curtailment payments.

9.4.10 The BESS proposed as associated development to the main solar scheme would enable the Proposed Development 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 support the operation of the main solar array, for example by reducing the impact of curtailment on its output.

9.4.11 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. However, because the generation of renewable electricity is influenced by nature rather than schedule, large capacities of renewable generation in the UK will be required to ensure that demand can be reliably met even at times of low renewable output.

9.4.12 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).

9.4.13 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:

- Storing otherwise 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 flexible energy resource, further supporting the government's ambition to deliver a clean power system from as early as 2030 and to keep the power system clean thereafter.

9.4.14 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 therefore benefit from providing flexibility through lower utility bills and reducing the amount of other flexibility required on the electricity system. ToUTs and intelligent load scheduling are anticipated to grow through the decades ahead.

9.4.15 In summary, experiencing future curtailment is preferential to the alternative 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. However, clearly 'too much' curtailment would indicate that the energy system is not operating as efficiently as it should, and therefore imply that costs are higher than they otherwise could have been.

9.4.16 However, 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. The co-located BESS which is proposed as associated development to the main solar scheme is one such measure intended to support the operation of the Proposed Development through its operational life.

9.4.17 The Applicant notes that a key benefit of the Proposed Development being connected to the NETS is that when operational, it must adhere to the Grid Code. Therefore, 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 (if required) to adjust its output in the Balancing Mechanism. These arrangements are mandatory for large generators and provide NESO with control and response options to help balance supply with demand at all times.

9.4.18 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 system.

9.5 The system adequacy of solar generation

9.5.1 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.

9.5.2 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.

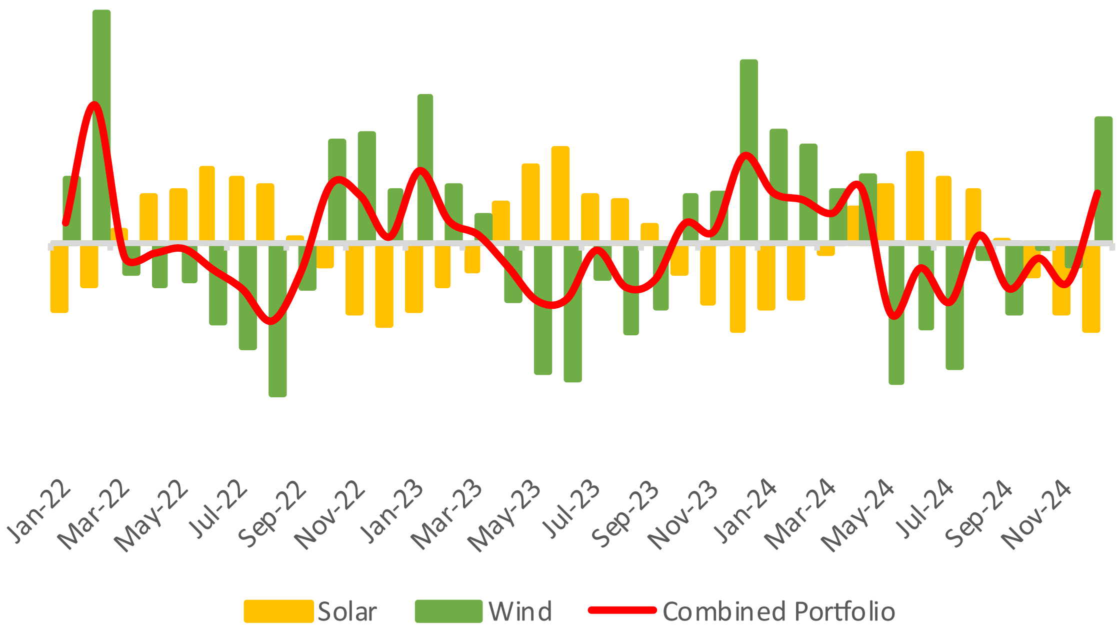
Portfolio effects of renewable generation

9.5.3 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.

9.5.4 **Figure 31** 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 31: Generation dependability of a portfolio of solar and wind in GB



(**Ref 88, Ref 34(2024)**)

9.5.5 The red line in **Figure 31** 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.

9.5.6 The data for **Figure 31** 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.

9.5.7 The Demand Data files include NESO's estimated output, and capacity, for unmetered wind and unmetered solar generation.

9.5.8 The Actual Metered 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 34**).

9.5.9 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.

9.5.10 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.

9.5.11 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.

9.5.12 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.

9.5.13 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.

9.5.14 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.

9.5.15 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

9.5.16 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.

9.5.17 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.

9.5.18 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.

9.5.19 The analysis is based on the average within-year shape of demand from 2015 to 2019.

9.5.20 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 the 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.

9.5.21 Total demand is the sum of underlying demand, heat demand, transport demand, and electrolysis demand.

9.5.22 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 3.8.12**). The results are shown in **Figure 32**. The technology types are: zero carbon baseload (grey), onshore wind (green), offshore wind (blue), and solar (yellow).

9.5.23 The methodology used to derive the shape for each series is as follows:

- Zero carbon baseload generation represents nuclear energy from the remaining existing UK nuclear fleet (3GW; Hinkley Point C is not assumed to have commissioned by 2030 in this pathway), alongside existing biomass (3GW), energy from waste (2GW) and hydro generation (2GW). 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 31**. 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 each major renewable generation technology in Great Britain over the period 2022 – 2024.

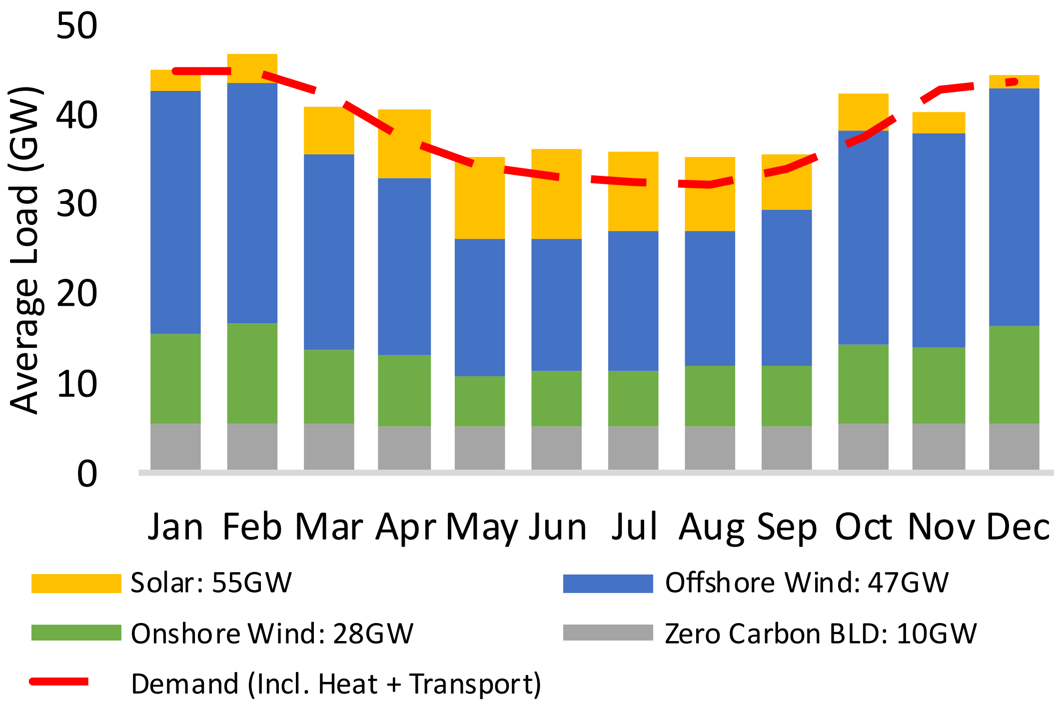


Figure 32: Government's 2030 Capacity Ranges meet anticipated seasonal demand
(**Ref 34(2025), Tables ES1 & ED1, Ref 4, Connections Reform Annex, Table 1**)

9.5.24 **Table 4** shows the load factors assumed in the analysis alongside NESO assumptions (**Ref 34(2025), Data worksheet ES1**) and other relevant sources (**Ref 20(3)(2023), Ref 76(2023)**).

Table 4: Comparison of assumed load factors with independent data sources
(**Ref 34(2025), Table ES1, Ref 20(3)(2023), Ref 76(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%

9.5.25 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 2025 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 2025 assumptions.

9.5.26 The FES (**Ref 34(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.

9.5.27 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.

9.5.28 The model is an illustration based on projections of capacity roll out, electrification of demand, and efficiency / load factor. **Figure 32** 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.

9.5.29 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 34(2025), Table ES1**)

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

9.5.30 However, considering the contribution only of proven low carbon generation technologies to meeting future demand is a prudent approach because:

- **Section 3.3** 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 6.7** and **Section 6.8** 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 4.2** articulates 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.

9.5.31 **Figure 32** should not be inferred to advocate either for a specific mix of renewables, 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.

9.5.32 The government's mission is to deliver its Clean Power target by rapidly expanding the capacity of renewable generation installed in the UK. **Chapter 1** 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.

9.5.33 However, **Figure 32** 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.

9.5.34 This analysis 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. However, **Figure 32** 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.

9.5.35 Additionally, because of the seasonality of wind generation in Great Britain, 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, the only winter month when wind generation falls short of demand.

9.5.36 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 March and in the Summer months when wind energy yields are lower.

9.5.37 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 does not seek more renewable generation capacity beyond 2030.

9.5.38 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.

9.5.39 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.

9.5.40 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.

9.5.41 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 2025 pathways.

9.5.42 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.

9.6 Conclusions on security of supply

9.6.1 The need for CNP Infrastructure is established by the NPSs. The Clean Power 2030 Action Plan provides additional focus on the scale and the urgency to deliver new low carbon generation capacity. This Statement of Need sets out how the Proposed Development, alongside other low-carbon schemes, are a key part of achieving the UK's decarbonisation policy objectives.

9.6.2 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.

9.6.3 Many integration measures are already available, or are already in development, which, over short-term 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 6.11**).

9.6.4 The contribution made by flexible assets to the short-term balancing of supply and demand are described in **Section 6.11** and **Section 7.9**. 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, developing a national portfolio of assets with complementary seasonal generation profiles, and managing shorter term intermittency through storage or other measures.

9.6.5 Solar is an asset class which is needed to support a high level of generation adequacy and generation dependability within the GB electricity system.

9.6.6 The Proposed Development, 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 Proposed Development 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.

9.6.7 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.

9.6.8 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.

9.6.9 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.

9.6.10 The Proposed Development, if consented, would contribute to an adequate and dependable GB generation mix, by generating low carbon power from an indigenous and renewable resource. Therefore, the Proposed Development will make a significant contribution to GB's energy security needs, and the decarbonisation needs of the UK.

10 The contribution of large scale solar to the affordability of electricity

10.1 Chapter summary

10.1.1 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 72, p9**).

10.2 Pricing in the GB electricity market

10.2.1 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.

10.2.2 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.

10.2.3 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.

10.2.4 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.

10.2.5 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.

10.2.6 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.

10.2.7 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.

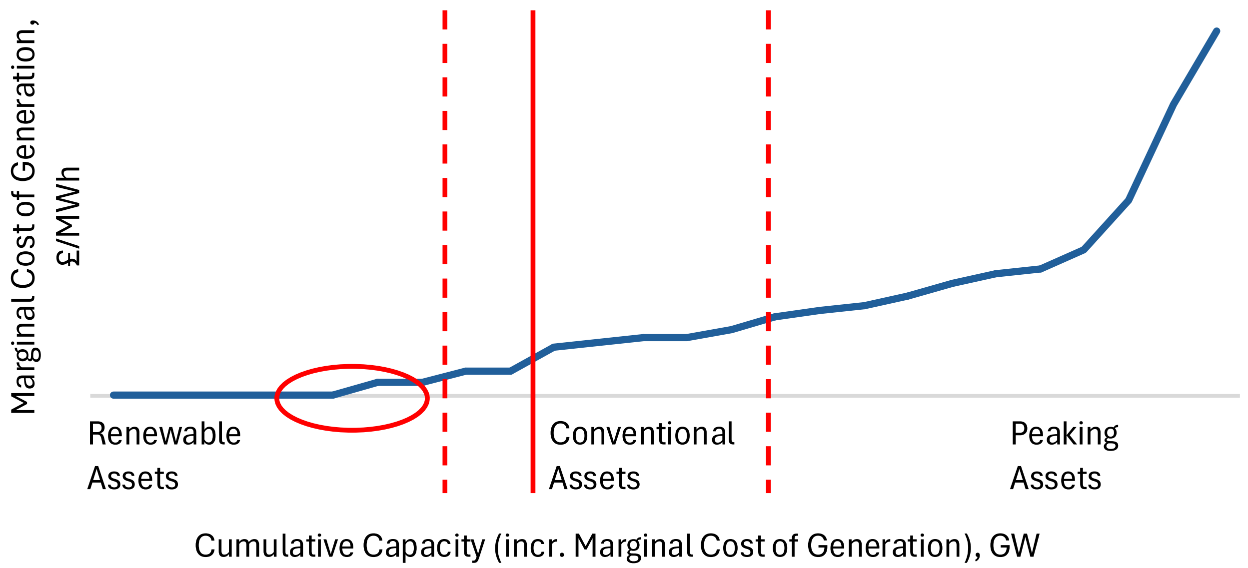


Figure 33: Representative marginal cost stack for the GB electricity system

10.2.8 This market mechanism is illustrated in **Figure 33**. 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.

10.2.9 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.

10.2.10 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.

10.2.11 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.

10.2.12 The blue line in **Figure 33** 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.

10.2.13 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.

10.2.14 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.

10.2.15 The conclusion remains the same: namely that increasing the capacity of renewable assets in GB reduces the traded price of power.

10.2.16 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.

10.3 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 89**).

10.3.1 The market mechanisms described in **Section 10.2** 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 7.8**, meaning that more electricity can be generated from the same area of land as was previously possible. Consequently, solar is now a leading low-cost generation technology (see **Figure 34**).

10.3.2 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.

10.3.3 **Figure 34** shows the results of an analysis of the government's Electricity Generation Costs report (**Ref 76(2023)**), with the range of values representative of different complexities of technical solution.

10.3.4 **Figure 34** 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).

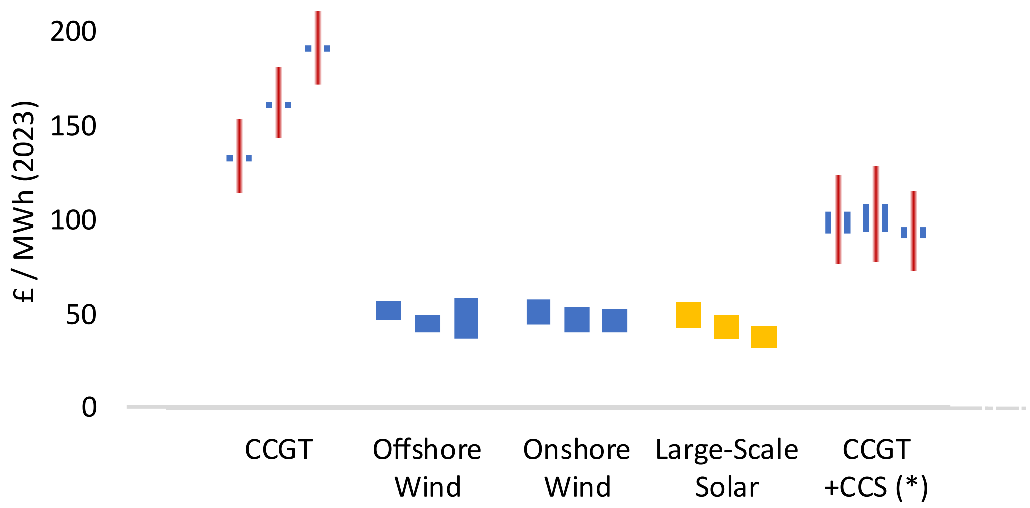


Figure 34: Levelised cost of energy comparison

(**Ref 76**) (*) see **Paragraph 10.3.7** of this Statement.

10.3.5 Government's 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.

10.3.6 The levelised cost ranges of large-scale solar (the governmental analysis assumes a capacity of 16MW) are highlighted in yellow. **Figure 34** 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.

10.3.7 The government did not refresh its cost estimates for CCGT + CCS in its most recent costs report. The data shown is therefore government's 2020 estimate, adjusted for inflation and signposted with an asterisk on the chart.

10.3.8 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.

10.3.9 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.

10.3.10 The government's Cost of Electricity Generation report series (**Ref 76**) 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.

10.3.11 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 operating costs are likely to continue to be delivered through technological advancements and operating experience.

10.3.12 Technological advances have also increased the efficiency of solar panels (see **Section 7.8** 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.

10.3.13 **Figure 35** 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.

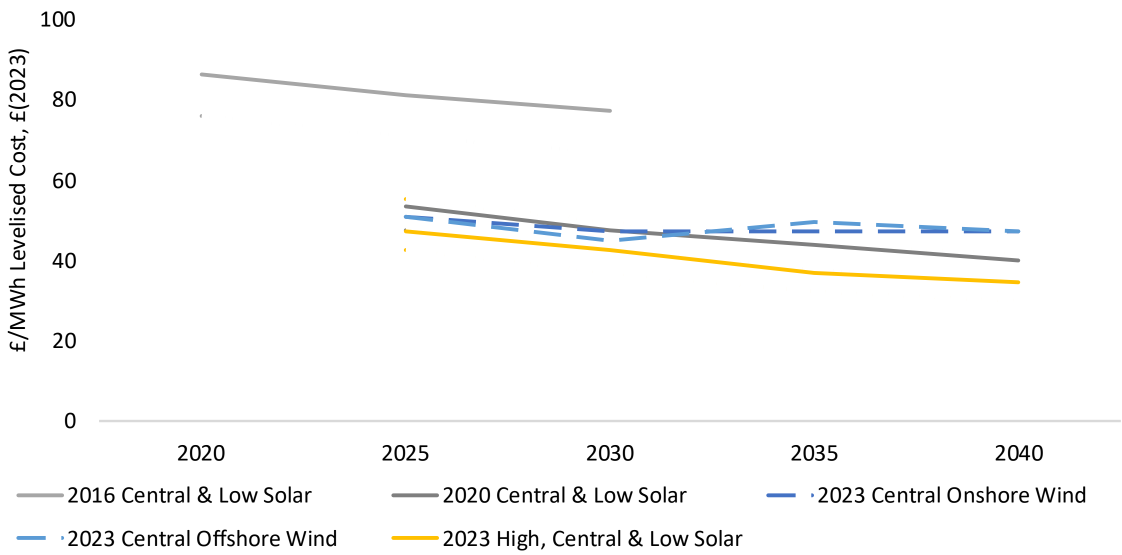


Figure 35: An evolution of levelised cost forecasts
(**Ref 76**)

10.3.14 The 2013 projections (not shown in **Figure 35**) 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.

10.3.15 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.

10.3.16 Industry-sourced data and opinion agrees 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 17(2020), Figure 2.2**).

10.3.17 **Figure 35** 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 3.2** explains the rationale for urgent action to develop significant capacities of low carbon generation. Time is a precious commodity.

10.3.18 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.

10.3.19 CfD Administrative Strike Prices (ASPs) set a cap on clearing prices at the maximum support, on a £/MWh basis, that the government is willing to offer developers for each technology in a given delivery year. Government's ASPs for CfD AR7 are consistent with their view that the costs of developing solar power will be lower in the future than they have been in the past. While the ASP for large-scale Solar PV was set at £61/MWh (2012 prices) in CfD AR6, the budget notice for CfD AR7 confirms that the ASP has been set at a lower level of £75/MWh (2024 prices, equivalent to £54/MWh in 2012 prices) (**Ref 90**).

10.4 Whole system costs

10.4.1 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 86, p39**).

10.4.2 Both **Figure 31** and **Figure 32** 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.

10.4.3 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 91**).

10.4.4 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 72**).

10.4.5 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. Therefore, utility-scale project costs are projected to reduce. The global solar market is growing, and the GB solar market is also growing.

10.5 Conclusions on affordability

10.5.1 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.

10.5.2 In doing so, solar power delivers national decarbonisation benefits and supports consumer affordability aims, to the benefit of electricity consumers.

10.5.3 Growing Great Britain's capacities of renewable energy sources, including large-scale solar, supports consumers by reducing the GB energy system's exposure to gas price fluctuations arising from volatile global fossil fuel markets.

10.5.4 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.

10.5.5 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.

10.5.6 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).

10.5.7 The Proposed Development will be a substantial infrastructure asset, which if consented will deliver large amounts of low cost, 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 Proposed Development represents a significant and commercially rational step forward in achieving government's energy policy aims.

11 Overall conclusions

11.1.1 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.

11.1.2 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.

11.1.3 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. Co-locating solar with storage assets can increase the efficiency of land use, and the utilisation of available grid connection capacity.

11.1.4 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.

11.1.5 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 Proposed Development is CNP Infrastructure. Therefore, it follows that the urgent need for the Proposed Development 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**).

11.1.6 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 government's adoption of their recommendations for the Sixth Carbon Budget (2033 – 2037).

11.1.7 The government's Clean Power 2030 Action Plan (**Ref 4**) reinforces the urgent need for low carbon generation schemes to come forwards to achieve its Clean Power target and pave the way to decarbonising the wider economy by 2050 as the UK pursues the electrification of heat in buildings, transport, and industry.

11.1.8 It also provides a framework 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. 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, will be prioritised. The connection for the solar component of the Proposed Development has secured a Gate 2 Phase 1 prioritisation (i.e. in 2030 or earlier). The BESS component of the Proposed Development holds a Gate 1 connection offer with an as yet unconfirmed connection date.

11.1.9 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 a clean power system is not achieved by 2030. The Proposed Development could contribute nearly 2% of the capacity required to meet the government's Clean Power Capacity Range for solar power by 2030.

11.1.10 **Chapter 1** of this Statement 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.

11.1.11 Other conventional low carbon generation (e.g. nuclear or conventional generation with CCUS) and new low carbon dispatchable generation (e.g. hydrogen) have the potential to be important contributors to achieving the 2050 net zero obligation, but their contributions in the timeframe in which the Proposed Development will deliver are uncertain.

11.1.12 Conversely, the continued development of renewable technologies like large-scale solar and battery storage is important to protect against the possibility that technologies which are not yet proven in delivery or operation at grid scale do not deliver operational capacity at the pace or scale required. Large-scale solar is a proven technology, capable of delivery at scale against the timeframes required to deliver net zero.

11.1.13 This Statement shows that large-scale solar generation is economically and technically viable in the UK, and that it is an economically and technically appropriate source of low carbon energy for the GB electricity consumer. 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. 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 the Proposed Development will be required to play its part in helping NESO manage the national electricity system.

11.1.14 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. Government expects large-scale solar costs to continue to reduce in the future. The development of such schemes will therefore provide decarbonisation, energy security and commercial benefits to consumers.

11.1.15 Large-scale solar generation also supports security of supply by helping reduce the national dependency on imported hydrocarbon source fuels, thereby providing a shield for consumers from the effects of volatile international energy markets.

11.1.16 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.

11.1.17 The Proposed Development will, if consented, bring forward large-scale ground-mount solar with co-located energy storage facilities and will make a critical contribution towards net zero. The Proposed Development therefore goes towards meeting the government's aims.

11.1.18 The Proposed Development is required to ensure that the UK remains on track to support government's clean power ambitions on the way to meeting its legally binding carbon emissions reduction targets, including the Sixth Carbon Budget and beyond. The government's Carbon Budget and Growth Delivery Plan (**Ref 19(1)**) describes that large-scale solar enhances national security of supply and tackles the influence of volatile international energy prices on inflation and consumer pockets. Large-scale solar is also expected to deliver at a cost which, in relation to other electricity generation infrastructure developments, provides value for money for end-use consumers, as shown in **Figure 15** and **Figure 34** of this Statement..

11.1.19 The Proposed Development could generate power ahead of any schemes which have longer construction timeframes or are of technologies which have not yet been proven at scale and could therefore support decarbonisation only in future years and only if they are brought forwards.

11.1.20 As associated development to the solar PV arrays, co-located storage will help the Proposed Development operate flexibly as an essential part of a low carbon energy system.

11.1.21 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 Proposed Development in the timeframes indicated, with sufficient solar irradiation, and suitable secured land for the solar and BESS. The Proposed Development 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.

11.1.22 The low marginal cost and low marginal carbon emissions energy generated at the Proposed Development 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.

11.1.23 The meaningful and timely contributions offered by the Proposed Development 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 mission to deliver a clean power system from as early as 2030.

11.1.24 Without the Proposed Development, 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.

11.1.25 The Proposed Development 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.

11.1.26 The Proposed Development is consistent with and addresses all important and relevant aspects of existing and emerging government policy.

12 Author's qualifications and experience

12.1.1 This Statement of Need has been authored by Si Gillett, Director at Humbeat Ltd.

12.1.2 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.

12.1.3 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.

12.1.4 Mr Gillett has authored Statements of Need for multiple NSIP solar schemes which received Development Consent between 2020 and 2025.

12.1.5 Mr Gillett has also developed evidence to support IROPI (Imperative Reasons of Overriding Public Interest) justifications for offshore wind farms for which DCOs have been granted.

12.1.6 Humbeat is currently supporting approximately multiple 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.

12.1.7 Mr Gillett has over 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.

12.1.8 Mr Gillett holds master's degrees in mathematics and nuclear regulation.

References

Ref 1 UK Gov, Overarching National Policy Statement for Energy (EN-1), December 2025

Ref 2 UK Gov, National Policy Statement for Renewable Energy Infrastructure (EN-3), December 2025

Ref 3 UK Gov, Planning Act 2008 (2008). Available at: https://www.legislation.gov.uk/ukpga/2008/29/contents

Ref 4 UK Gov, Clean Power 2030 Action Plan: A new era of clean electricity, available online: https://www.gov.uk/government/publications/clean-power-2030-action-plan

Ref 5 UNFCCC, What is the Paris Agreement, available online: [redacted]

Ref 6 IPCC, Special Report, Global Warming of 1.5C, available online: [redacted]

Ref 7 IPCC, Sixth Assessment Report, April 2022

Ref 8 World Meteorological Organisation, Global Annual to Decadal Climate Update (2025-2029), 2025, available online: [redacted]

Ref 9 World Meteorological Organisation, news report accompanying the Global Annual to Decadal Climate Update (2024-2028), 2024, available online: [redacted]

Ref 10 UNFCC, COP28 Outcomes, 2023, available online: [redacted]

Ref 11 UK Gov, Energy Secretary convenes COP leaders past, present and future to offer UK support and leadership in responding to the climate crisis, 2024, available online: https://www.gov.uk/government/news/energy-secretary-convenes-cop-leaders-past-present-and-future-to-offer-uk-support-and-leadership-in-responding-to-the-climate-crisis

Ref 12 UNFCC, COP29 UN Climate Conference Agrees to Triple Finance to Developing Countries, Protecting Lives and Livelihoods, available online: [redacted]

Ref 13 UNFCC, Message to parties and observers, Nationally Determined Contributions Synthesis Report – Update, November 2025, available online: [redacted]

Ref 14 UN Secretary General, Statement on the agreement at COP30, November 2025, available online: [redacted]

Ref 15 Climate Change Act 2008 (2050 Target Amendment) Order 2019

Ref 16 UK Government's press release of acceleration of carbon reduction to 2035, 2021, available online: https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

Ref 17 Climate Change Committee, Annual Progress Reports to Parliament (2019 – 2025)

Ref 18 Climate Change Committee, The Seventh Carbon Budget. Available online: [redacted]

Ref 19 UK Gov, Carbon Budget and Growth Delivery Plan, October 2025, available online: https://www.gov.uk/government/publications/carbon-budget-and-growth-delivery-plan

(1) Unlocking the benefits of the clean energy economy

(2) Charts and Tables

Ref 20 UK Gov, Government energy use statistics at regional and local authority level, available online:

(1)https://www.gov.uk/government/statistics/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2023

(2)https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics (2005 to 2023)

(3)https://www.gov.uk/government/statistics/regional-renewable-statistics (2014 to 2024)

(4)https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics-2005-to-2022

Ref 21 Climate Change Committee, CCC advises 81% reduction in emissions by 2035, available online: [redacted]

Ref 22 UK Gov, Plan for change, Milestones for a mission-led government, available online: https://assets.publishing.service.gov.uk/media/6751af4719e0c816d18d1df3/Plan_for_Change.pdf

Ref 23 Energy Systems Catapult, Innovating to Net Zero, 2020

Ref 24 The Department for Energy Security and Net Zero and Ofgem, Connections Action Plan, November 2023

Ref 25 NESO, Connections Reform timeline, available online: [redacted]

Ref 26 NESO, Clean Power 2030, Advice on achieving clean power for Great Britain by 2030, available online: [redacted]

Ref 27 UK Gov, Consultation Response, Planning for New Energy Infrastructure, November 2025, available online: https://assets.publishing.service.gov.uk/media/69121170bda892e068aa6454/nps-revisions-2025-consultation-government-response.pdf

Ref 28 Ofgem, Guidance: Centralised Strategic Network Plan, November 2025, available online: https://www.ofgem.gov.uk/guidance/centralised-strategic-network-plan

Ref 29 Ofgem, Decision on the Regional Energy Strategic Plan Policy Framework, available online: https://www.ofgem.gov.uk/sites/default/files/2025-04/RESP-policy-framework-decision.pdf

Ref 30 UK Gov, Solar Roadmap, United Kingdom powered by solar, 2025, available online at: https://www.gov.uk/government/publications/solar-roadmap

Ref 31 UK Gov, New laws passed to bolster energy security and deliver net zero, October 2023, available online: https://www.gov.uk/government/news/new-laws-passed-to-bolster-energy-security-and-deliver-net-zero

Ref 32 UK Gov, National Policy Statement for Electricity Networks (EN-5), December 2025

Ref 33 UK Gov, Digest of UK Energy Statistics (DUKES): energy, available online: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2025

Ref 34 National Energy System Operator, Annual Future Energy Scenarios (2012 - 2025) available online: [redacted]

Ref 35 National Grid Electricity System Operator, Energy Background Document, 2024

Ref 36 UK Gov, UK Energy in Brief, 2021, available online: https://assets.publishing.service.gov.uk/media/618a87f8d3bf7f55f9479789/UK_Energy_in_Brief_2021.pdf

Ref 37 National Infrastructure Commission, Net Zero: Opportunities for the power sector, 2020

Ref 38 Climate Change Committee, The Sixth Carbon Budget: The UK's path to Net Zero, 2020

Ref 39 UK Gov, Consultation outcome: Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition: summary of responses and joint government response, available online: https://www.gov.uk/government/consultations/phasing-out-sales-of-new-petrol-and-diesel-cars-from-2030-and-supporting-the-zev-transition

Ref 40 Vehicle Certification Agency, Car fuel and emissions data (2024), available online: [redacted]

Ref 41 UK Gov, The Vehicle Emissions Trading Schemes Order 2023

Ref 42 Society of Motor Manufacturers and Traders, Vehicle Data / Car Registrations, (December 2025 publication referenced) available online: [redacted]

Ref 43 UK Gov, Taking charge: the Electric Vehicle Infrastructure Strategy, 2022

Ref 44 UK Gov, Electric vehicle charging devices by local authority (December 2025 publication referenced), available online: https://www.gov.uk/government/statistics/developing-faster-indicators-of-transport-activity

Ref 45 Ofgem, Average gas and electricity usage (2025), available online: https://www.ofgem.gov.uk/information-consumers/energy-advice-households/average-gas-and-electricity-use-explained

Ref 46 UK Gov, Greenhouse gas reporting: conversion factors 2025, available online: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025

Ref 47 NESO, Connections Reform timeline, available online: [redacted]

Ref 48 NESO, TEC Register (2 December 2025 publication referenced) available online: [redacted]

Ref 49 UK Gov, planning databases are available online:

(1) Renewable Energy Planning Database (October 2025 publication referenced) available online: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract

(2) Planning Inspectorate, Projects List (December 2025 extract) available online: https://national-infrastructure-consenting.planninginspectorate.gov.uk/project-search

Ref 50 NESO, Connections Reform results, available online: [redacted]

Ref 51 Helm, D. Cost of energy review. BEIS, 2017

Ref 52 Low Carbon Contracts Company, CfD Register (26 November 2025 publication reference) available online: [redacted]

Ref 53 EMR Delivery Body, Capacity Market Registers, (December 2025 publication referenced) available online: [redacted]

Ref 54 UK Gov, Contracts for Difference for Low Carbon Electricity Generation - Consultation on proposed amendments to the scheme, 2020

Ref 55 UK Gov, CfD Allocation Round (AR) results are available online:

(1)AR4 https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-4-results

(2)AR5 https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-5-results

(3)AR6 https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-6-results

(4)AR7 https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-7-results

Ref 56 DESNZ, CfD Allocation Round 7a (AR7a): Contract Budget notice, January 2026 available online: https://assets.publishing.service.gov.uk/media/6936af01a6fc97b81e57434b/cfd-ar7-second-contract-budget-notice.pdf

Ref 57 National Grid ESO, ESO leads the way with major initiative to accelerate connections to the electricity transmission grid, February 2023, available online: [redacted]

Ref 58 EDF Energy, Two UK nuclear plants to generate for longer supporting energy security, September 2025, available online: [redacted]

Ref 59 The Guardian, Hinkley Point C could be delayed to 2031 and cost up to £35bn, says EDF, January 2024, available online: [redacted]

Ref 60 UK Gov, Sizewell C gets green light with final investment decision, July 2025, available online: https://www.gov.uk/government/news/sizewell-c-gets-green-light-with-final-investment-

Ref 61 UK Gov, Nuclear Regulatory Review 2025: summary, available online: https://www.gov.uk/government/publications/nuclear-regulatory-taskforce/nuclear-regulatory-review-2025-summary

Ref 62 UK Gov, Great British Nuclear: About us, available online: https://www.gov.uk/government/organisations/great-british-nuclear/about

Ref 63 UK Gov, North Wales to pioneer UK’s first small modular reactors, available online: https://www.gov.uk/government/news/north-wales-to-pioneer-uks-first-small-modular-reactors

Ref 64 UK Gov, Six companies through to next stage of nuclear technology competition, October 2023, available online: https://www.gov.uk/government/news/six-companies-through-to-next-stage-of-nuclear-technology-competition

Ref 65 UK Gov, Golden age of nuclear delivers UK-US deal on energy security, September 2025, available online at https://www.gov.uk/government/news/golden-age-of-nuclear-delivers-uk-us-deal-on-energy-security

Ref 66 UK Gov, Towards Fusion Energy Strategy 2023 (update), 2023

Ref 67 National Infrastructure Commission, National Infrastructure Strategy, Fairer, Faster, Greener, 2020

Ref 68 UK Gov, UK Hydrogen Strategy, 2021

Ref 69 UK Gov, Biomass Strategy, 2023

Ref 70 UK Gov, Solar photovoltaics deployment (November 2025 publication referenced) available online https://www.gov.uk/government/statistics/solar-photovoltaics-deployment

Ref 71 UK Gov, Benefits of Long Duration Electricity Storage, BEIS Research Paper Number 2022/019, 2022

Ref 72 National Infrastructure Commission, Renewables, recovery, and reaching Net Zero, 2020

Ref 73 National Grid ESO, Network Options Assessment, 2022

Ref 74 Climate Change Committee, Net Zero – The UK's contribution to stopping global warming, 2019

Ref 75 Microgeneration Certification Scheme Data dashboard (December 2025 publication referenced), available online [redacted]

Ref 76 UK Gov, Electricity generation costs, issued on three-year cycle, in 2013, 2016, 2020 and 2023

Ref 77 UK Gov, Solar photovoltaic (PV) cost data (May 2025 publication referenced) available online: https://www.gov.uk/government/statistics/solar-pv-cost-data

Ref 78 The World Bank: Global Solar Atlas 2.0, Solar resource data: Solargis

Ref 79 National Grid Electricity Transmission Research Tool (March 2025 publication referenced) available online: [redacted]

Ref 80 Guardian, There are solutions to the food crisis. But ploughing up Britain isn't one of them, 2021.

Ref 81 Enevoldsen, P. and Jacobson, M.Z., Data investigation of installed and output power densities of onshore and offshore wind turbines worldwide, Energy for Sustainable Development, Elsevier, 2020. Available online: [redacted]

Ref 82 National Renewable Energy Laboratory, Best Research-Cell Efficiency Chart, available online: [redacted]

Ref 83 Department for Communities and Local Government (2013) Planning Act 2008, Guidance on associated development applications for major infrastructure projects, available online: https://assets.publishing.service.gov.uk/media/5a7b5f04ed915d3ed9063f36/Planning_Act_2008_-_Guidance_on_associated_development_applications_for_major_infrastructure_projects.pdf

Ref 84 National Grid Electricity System Operator, Electricity Ten Year Statement, 2022

Ref 85 National Grid Electricity System Operator, System Operability Framework, 2014

Ref 86 National Infrastructure Commission, National Infrastructure Assessment Chapter 2: Low Cost, Low Carbon, 2018

Ref 87 EMR Delivery Body, Capacity Market Auction Guidelines (2025 publication referenced), available online:
[redacted]

Ref 88 National Grid ESO Data Portal, available online:
[redacted]

Ref 89 Solar Power Portal, Solar PV costs fall 82% over the last decade, says IRENA, 2020, available online:
[redacted]

Ref 90 DESNZ, The Contracts for Difference (Allocation) Regulations 2014 Pot and Price Notice, July 2025, available online: https://assets.publishing.service.gov.uk/media/6881ea7c901d5f8d4712057e/cfd-ar7-pot-and-price-notice.pdf

Ref 91 Strbac, G., Aunedi, M. Whole-system cost of variable renewables in future GB electricity system, 2016

13 Glossary

Abbreviation/Term	Definition
AR4/5/6/7	Allocation Round 4/5/6/7 of the Contracts for Difference scheme
ASP	Administrative Strike Prices for the Contracts for Difference scheme
BECCS	Bioenergy with Carbon Capture and Storage
BESS	Battery Energy Storage System
BEV	Battery Electric Vehicle
CB(G)DP	Carbon Budget (and Growth) 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

Abbreviation/Term	Definition
MtCO2 / MtCO2(e)	Million tonnes of carbon dioxide / Million tonnes of carbon dioxide equivalent
MWh / MW	Megawatt hour (energy) / megawatt (power)
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)

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