

Proposed Solar PV Development

Preliminary Environmental Information Report

Chapter 3 Alternatives and Design Iteration

Byers Gill Solar

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3. Alternatives and design iteration

3.1. Introduction

3.1.1. This chapter of the PEIR provides a summary of alternative options that have been considered for Byers Gill Solar (the Proposed Development) to date, including in initial site selection and through the design development process to date. It summarises how an assessment of alternatives has been undertaken, identifies the factors which have been considered and what has informed the design of the Proposed Development.

3.2. Legislative and policy context

3.2.1. The consideration of alternatives has been undertaken within the context of legislative requirements and the national policy context for nationally significant energy projects.

3.2.2. Regulation 14(2)(d) of the EIA Regulations states that the ES must include: “a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment”.

3.2.3. Schedule 4(2) of the EIA Regulations further states that the following information must be included in the ES: “A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.”

3.2.4. The Overarching National Policy Statement (NPS) for Energy (EN-1) states at paragraph 4.4.1: “As in any planning case, the relevance or otherwise to the decision-making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS”. It confirms that there is no general requirement within the NPS to consider alternatives, or to establish that the Proposed Development represents the best option. NPS EN-1 does however identify in paragraph 4.4.2 the need to comply with any policy or legal requirement to consider alternatives, including those relating to the preparation of an ES or specific legislative requirements under the Habitats Directive.

3.2.5. This chapter has been prepared in compliance with the requirements of the EIA Regulations to provide a description of the reasonable alternatives studied by JBM Solar (the Applicant) to date. Any further alternatives studied by the Applicant in developing the design of the Proposed Development following statutory consultation and prior to DCO submission will be detailed in the ES. In complying with the EIA Regulations, this chapter is also in accordance with the relevant NPS.

3.3. Need for the scheme

- 3.3.1. The need for the Proposed Development is built upon its contribution to the delivery of national policy targets for decarbonisation, including meeting Net Zero targets, energy security and ensuring affordability of energy supply.
- 3.3.2. The National Policy Statements (NPS) were established against legal obligations made as part of the Climate Change Act 2008 [1], as amended by the 2050 Target Amendment Order 2019 [2], for the UK to meet Net Zero Greenhouse Gas (GHG) emissions by 2050. The NPS set out a case for the need and urgency of new energy infrastructure, to support government policy on sustainable development.
- 3.3.3. On 30 March 2023, a draft suite of revised energy NPS [3] were published for public consultation, which is ongoing at the time of preparation of this PEIR. The revised energy NPS reiterate the need for new energy infrastructure to support the country's national priorities regarding energy security, reducing costs, delivering on net zero and the creation of new green jobs and industries for the UK.
- 3.3.4. The Energy Security Strategy [4] produced by the UK Government in April 2022 announced the intent to increase solar capacity in the UK from 14GW to 70GW by 2035. The recent publication of the Powering Up Britain strategy [5] in March 2023 has reaffirmed the UK Government approach to solar development, announcing a commitment to quintuple solar power by 2035. In addition, the Energy White Paper: Powering our Net Zero Future [6] outlined the need to 'build back greener' following the impact of Coronavirus, addressing the inter-generational challenge of climate change. The White Paper identifies the UK Government's aim for a fully decarbonised, reliable and low-cost power system by 2050.
- 3.3.5. In addition to national policy targets, Darlington Borough Council and Durham County Council declared a climate emergency in 2019, whilst Stockton-on-Tees Borough Council has set out its aims to be net zero for greenhouse gas emissions by 2032 in its Environmental Sustainability and Carbon Reduction Strategy 2022-2032.
- 3.3.6. The Proposed Development would have the capacity to generate over 50MW of electricity and would provide enough low-carbon energy to meet the equivalent annual needs of over 70,000 homes. It would therefore make a meaningful contribution to local and national climate commitments, responding to an established need for increased solar capacity and a decarbonised energy system.

3.4. Stakeholder engagement

- 3.4.1. The design iteration of the Proposed Development has been informed in part by engagement undertaken with relevant statutory consultees, affected landowners and local stakeholders, as summarised in Chapter 4 of the PEIR. This has included a series of collaborative design workshops, focused technical meetings with statutory bodies, meetings with landowners and local people in response to requests.

3.4.2. Feedback on the design of the Proposed Development will be sought through statutory consultation and other engagement activities; this will inform further development of the design prior to submission of the DCO application. A Consultation Report submitted with the DCO application will detail the statutory consultation undertaken (as well as other engagement activities), including a summary of feedback received and how that feedback has been taken into account in developing the design and assessment of the Proposed Development.

3.5. Approach to alternatives

Scope of assessment

3.5.1. This chapter seeks to describe the alternatives studied to date in developing the siting and design of the Proposed Development, taking into account the requirements of the EIA Regulations and the policy position of the NPS. This chapter first provides a detailed account of how the Applicant initially selected the site for the Proposed Development, taking into consideration the specific characteristics of solar farm development and the potential effects on the environment. It then provides an account of the various alternatives considered in the design iteration of the Proposed Development to date, which includes:

- Site layout.
- Cable routes.
- Solar technologies.
- Substation.
- Energy storage facilities and other supporting infrastructure.

3.5.2. An important factor when considering alternatives for the Proposed Development is the land acquisition strategy proposed by the applicant which seeks to deliver the Proposed Development through voluntary agreement. The scope of reasonable alternatives assessed by the Applicant is therefore limited to those which could be deliverable without the need for compulsory acquisition.

3.5.3. A 'no development' alternative would not provide the additional electricity generation that would be delivered by the Proposed Development and has therefore not been considered further and will not be assessed in the ES.

3.6. Site selection

3.6.1. The location of the Proposed Development was selected through a staged process to ensure that a site could be identified which would be suitable for solar energy generation and feasible to deliver, whilst avoiding and minimising the potential for harm to the environment and communities.

3.6.2. The key stages for site selection were:

1. Identifying the area of search.
2. Consideration of environmental and planning constraints.
3. Land assembly.
4. Initial identification of panel areas.

3.6.3. The activities undertaken at each stage are summarised in turn below.

Stage 1: Identifying the area of search

3.6.4. In order to focus the site selection process, an initial area of search had to be defined. JBM Solar identified optimal locations for solar farms of a nationally significant scale based on two key factors: the irradiance and yield; and the availability of grid connection capacity.

Irradiance and yield

3.6.5. Solar irradiance refers to the amount of energy from the sun that reaches the surface of the earth and is measured by the amount of sunlight received per square metre per second (Wh/m²). The amount of solar irradiance impacts on the potential yield of a solar farm, affecting the amount of sunlight falling on the PV modules to be converted to energy. The irradiance and subsequent yield of an area is influenced by factors such as its location, climate/weather patterns, altitude and topography. Whilst there are clearly significant differences in such factors globally, there are also national variations leading to some areas of the UK being more suited to solar energy than others.

3.6.6. The north-east region has suitable levels of irradiance to gain a viable yield from current solar panel technology. This is applicable to fixed south facing panels or tracking panels. For this reason, the north-east region was identified as a potential location for solar development by JBM Solar.

Grid connection capacity

3.6.7. In order for the Proposed Development to be feasible, it requires a connection to the national grid through which the energy it generates would be delivered and would contribute to the national energy supply. Engagement with the relevant Distribution Network Operator (DNO) Northern Power Grid (NPG) identified that connection capacity was available from the Norton Substation, located to the north-west of Stockton-on-Tees. A connection agreement has been secured with NPG for the generation of 180 MW of electricity.

3.6.8. The grid connection capacity has informed both the site location and the overall size of the Proposed Development, as it has been sized for the availability of this connection capacity. In doing so, it seeks to ensure that the delivery of solar energy can be provided to the national grid when the construction of the solar farm is complete.

3.6.9. Having established the agreed grid connection for the Proposed Development, an area of search of 6km was applied around the Norton substation in order to identify potential sites for the solar farm. This area of search was defined by the extent to which a solar farm of the proposed scale could be viable, taking into account the distance from the grid connection and cost of underground cable. This 'area of search' enabled the site selection process to progress onto Stage 2.

Stage 2: Consideration of environmental and planning constraints

3.6.10. A constraints mapping exercise was undertaken in order to assess potential locations for siting the Proposed Development within the area of search. This was undertaken using Geographic Information Systems (GIS) software and the analysis reviewed the following constraints within the area of search:

- Brownfield land register
- Agricultural Land Classification
- Ecological designations
 - Biosphere Reserves
 - Environmentally Sensitive Areas (ESAs)
 - Local Nature Reserves (LNRs)
 - Nature Improvement Areas (NIAs)
 - Proposed Ramsar sites
 - Ramsar sites
 - Royal Society for Protection of Birds (RSPB) reserves
 - Sites of Special Scientific Interest (SSSI)
 - Special Areas of Conservation (SAC)
 - Special Protection Area (SPA)
 - National and Community Forest
- Flood Zones
- Cultural Heritage
 - Battlefields
 - Conservation areas
 - Country Parks
 - Heritage at Risk
 - Listed Buildings
 - Parks and Gardens
 - Roman Roads and Antiquity Lines

- Scheduled Monuments
- World Heritage Sites
- Landscape designations
 - Greenbelt
 - Area of Outstanding Natural Beauty (AONB)
 - Countryside and Rights of Way Act 2000 Designations
 - National Parks
- Public Rights of Way (PRoW)

3.6.11. A map of environmental constraints is provided in Figure 2.9 of the PEIR.

3.6.12. In considering the mapped constraints, the Applicant made a high level judgement on the potential environmental effects of the Proposed Development, taking into account the Applicant's previous experience and values as a responsible developer.

Stage 3: Land assembly

3.6.13. Alongside analysis of environmental and planning constraints, the Applicant began engagement with landowners in the area of search to receive expressions of interest in solar development. From the outset, the Applicant has sought to deliver the Proposed Development via landowner agreement rather than requiring compulsory acquisition. JBM Solar approached landowners with a sufficient area of land for panel areas, mitigation and enhancement to enter into an option agreement. This was successfully achieved, enabling the potential panel areas of the Proposed Development to be defined under Stage 4 of the site selection process.

Stage 4: Initial identification of panel areas

3.6.14. Stage 2 and Stage 3 of the site selection process established that within the area of search, there was sufficient available land, secured via agreement, located outside of major environmental and planning constraints. This was considered to fulfil the requirement to deliver a viable solar farm and the process progressed to developing an initial layout design for the Proposed Development.

3.6.15. Initially, all land subject agreement was proposed for use as a PV panel area. This initial design confirmed that there was the required land to meet the capacity of the available grid connection.

3.6.16. Having established this, an exercise was undertaken to refine the location of the panel areas. This design iteration sought to introduce setbacks from communities and landowner properties, as well as adjust panel configuration to account for local topography and utility searches. Setbacks introduced at this stage included those to reduce the proximity of panels to Great Stainton village, Bishopton village, properties

at Downland Farm, Coatham Mundeville Conservation area and Brafferton. This resulted in a second iteration of the design.

- 3.6.17. Having established this layout, the potential location of substations was considered and an initial option selected, as detailed further in section 3.8. Following the substation selection process, options for cable routes were considered. Easements for the 33kv and 132kv cable routes were sought and are being negotiated with relevant landowners and Highway Authorities. Further information on the consideration of cable route options is provided in section 3.9.
- 3.6.18. Having concluded Stage 4 of the site selection process, the Applicant had identified a red line boundary and a site layout comprising of panel areas and potential cable route options, taking account of high-level environmental constraints, and detailed consideration of the impacts of elements of the scheme on specific receptors in the local environment. This design was the basis for undertaking further environmental and technical assessment ahead of undertaking an EIA Scoping Report.

3.7. Alternative site layouts

Amendments prior to EIA Scoping report

- 3.7.1. Environmental surveys and assessment commenced in early 2022. However, ongoing negotiations regarding voluntary land agreements resulted in some areas of land being removed from the scheme and new areas being added in. The key changes comprised:
- removal of large panel area to the south of the site,
 - the addition of land to the north-west of the site (Panel Area A)
 - the addition of land to Panel Area B
 - the addition and removal of small areas of land in Panel Area C
- 3.7.2. These changes resulted in a new design iteration which became the basis for the Scoping Report and initial environmental assessment. Figure 1.2 and Figure 2.2 of the EIA Scoping Report (PEIR Appendix 4.1) depict this design.

Design iteration EIA Scoping to PEIR

- 3.7.3. Following the submission of the Scoping Report in October 2022, the Applicant undertook targeted engagement through a collaborative design process in early November 2022. Feedback from this engagement was then taken into account through a design iteration process ahead of undertaking further environmental assessment and preparation of the PEIR.
- 3.7.4. Two specialist design workshops were undertaken to identify and review potential changes to the design of the Proposed Development that could be implemented to reduce or avoid effects on the environment and the community. Opportunities to

provide enhancement or community benefits were also identified. These potential design changes were informed by the results of environmental surveys and ongoing environmental assessment, as well as the suggestions and feedback from the engagement activities (both through the co-design sessions and direct engagement with statutory consultees). The design workshops reviewed potential changes to the design from a multi-disciplinary perspective, in which views were sought on each change to ensure it would not result in unintended harmful effects to other aspects of the environment and that it would be feasible in terms of deliverability (cost and likely landowner agreement).

3.7.5. As a result of this design iteration process, a revised layout and an initial landscape and environmental masterplan of the Proposed Development was produced. This design has formed the basis of this PEIR and is the basis of statutory pre-application consultation. It can be viewed in Figures 2.1 – 2.13 of the PEIR.

3.7.6. Whilst not exhaustive, a list of the key changes made to the layout is provided below:

- Buffers applied to key environmental receptors as identified through surveys and environmental assessment:
 - 30m buffer to badger setts.
 - 5m buffer to trees with potential for bats.
 - 15m buffer applied to ancient and veteran trees, as well as root protection area for all other trees.
 - 8m buffer applied to watercourses and flood zone.
 - Increased set-back around Little Stainton Beck.
- Removal of panels in response to initial landscape and visual assessment to reduce impacts on identified receptors. These reductions were implemented in Panel Area A, Panel Area C, Panel Area E and Panel Area F.
- Re-routing of PRowS across the site to mitigate potential visual impacts or to provide improvement to existing routes and user experience.
- Infilling of panel areas where appropriate (i.e. in locations where PRowS relocated)

3.7.7. Additionally, a minor amendment to the red line boundary was made at this stage to bring the Norton Substation into the Proposed Development boundary.

3.7.8. These changes were made in response to further technical assessment, stakeholder feedback and ongoing engagement, as outlined above. The design will continue to be refined prior to submitting the DCO application in order to take into account feedback from statutory consultation and further environmental and technical assessment. The future design iteration of the Proposed Development will be recorded and reported upon in DCO application, primarily within Chapter 3 of the ES and the Consultation Report. Additionally, a Design and Access Statement or similar document(s) will be

produced with the DCO application which will define the project design principles to be secured and implemented through the DCO.

3.8. Substation siting alternatives

- 3.8.1. An on-site substation is required for the Proposed Development to connect the panel areas to the distribution and transmission networks. It also contains other electrical equipment such as transformers, switchgear and metering equipment.
- 3.8.2. Options for the location of the substation were assessed following the second design iteration, determining the initial panel area layout. Four options for locating the substation were initially identified and a comparative exercise undertaken considering landowner consent, technical feasibility / cost, and environmental constraints. These options were:
- Option 1: to the west of Panel Area D.
 - Option 2: to the north of Panel Area C.
 - Option 3: to the east of Panel Area D.
 - Option 4: the south-west of Panel Area E.
- 3.8.3. Option 2 was considered the most favourable given its lesser impact on heritage assets and lesser proximity to settlements, as well as the existing screening opportunities. These planning and environmental factors were considered to outweigh the comparative drawbacks relating to the cost (most expensive) and technical elements of the location (furthest from Norton substation) as well as any environmental impacts associated with an increased length of cable.

3.9. Cable route alternatives

- 3.9.1. There are two types of cable required for the Proposed Development: 33kV cables which connect the Panel Areas to the site substation, and 132kV cables which connect the on-site substation to the National Grid Norton substation.
- 3.9.2. There are three main options for the routing of cables in solar farm development:
1. All cables installed along existing road routes.
 2. All cables installed on greenfield land.
 3. A hybrid approach with cables utilising both greenfield land and existing road routes.
- 3.9.3. As a starting principle for determining cable routes, the Applicant's first preference is to avoid impacts to local communities that may be derived from utilising routes along existing roads, such as disruption to local access during the works. Avoiding routes along existing roads also has engineering and cost benefits. It is considered that the potential for environmental impacts from using off-road routes is low considering the limited area of land required and the short-term nature of construction, with any

agricultural land affected able to be returned to agriculture post-construction. Therefore, the Applicant engaged with local landowners to identify potential easements on greenfield land for cable routes.

- 3.9.4. Through this process, a network of 33kV and 132kV cable routes have been identified utilising both on-road and off-road options. Where off-road options have been identified, assessment is ongoing to understand the likely effects of them on the environment and any mitigation possible to reduce these effects. The key driver in deciding whether the cable routes are to be on-road will be land agreements and it is recognised that avoiding the road is likely to have better outcomes for some environmental topics. It is therefore the Applicant's preference to avoid the on-road where feasible.
- 3.9.5. The cable routes presented at this stage of design development represent a worst-case scenario of shortlisted options and will be refined to present a single 33kV network and a single 132kV cable route at DCO submission.

3.10. Consideration of energy storage facilities and other supporting infrastructure

- 3.10.1. The Proposed Development would include a Battery Energy Storage System (BESS) to store surplus energy on site, as described in Chapter 2 of the PEIR. Other supporting infrastructure is also required such as fencing and gates; CCTV; lighting; access tracks; drainage; and, storage containers. The location of this infrastructure takes into account the following principles:
- Any supporting infrastructure with the potential to generate noise (such as BESS) are placed at least 300m from residential properties where possible.
 - Lighting is not used at night.
 - CCTV does not allow for views outside of panel areas.
 - Access tracks are likely to be crushed gravel.
 - Container structures for supporting infrastructure would be grey in colour.
- 3.10.2. Further information on the siting of supporting infrastructure and the design principles underpinning their appearance and location will be provided in the DCO application.

3.11. Alternative solar technologies

- 3.11.1. As noted in Chapter 2 of the PEIR, to date the Applicant has kept different solar technologies under review and consideration for the Proposed Development. In doing so, a worst-case scenario has formed the basis of the assessment. The primary options available are a fixed panel or a tracking panel system. The Applicant intends to further assess these options to finalise the design ahead of DCO submission.

3.12. Summary

- 3.12.1. In accordance with the EIA Regulations, this chapter has set out reasonable alternatives studied by the Applicant in both the site selection undertaken at the outset of the project and in the ongoing design iteration process. It has set out the main reasons for selecting the chosen option and how the effects of the development on the environment have been taken into account. Where options are still under consideration, it has been identified how and when the options will undergo further assessment to lead to selection of a single option. The ES will report on any design iteration that takes place between publication of this PEIR and the submission of the DCO Application.

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