OAKLANDS FARM SOLAR PARK

Applicant: Oaklands Farm Solar Ltd

Environmental Statement
Chapter 3 – Site Selection and Design Strategy
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Oaklands Farm Solar Park - Environmental Statement Volume 1

Chapter 3: Site Selection and Design Strategy

Final report
Prepared by LUC
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Chapter 3
Site Selection and Design

Introduction

1.1 This chapter of the Environmental Statement (ES) provides details of the approach that has been taken to the site selection and design of the Proposed Development. It provides an overview of the need for the Proposed Development which has informed the approach to site selection and design. It outlines the site selection process that was undertaken by the Applicant and the alternatives which were considered when designing the Proposed Development. The chapter also details how and why the Proposed Development layout and associated infrastructure have been modified during the iterative Environmental Impact Assessment (EIA) process to explain the evolution of the design.

1.2 This information meets the requirements of Regulation 14(2)(d) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 'EIA Regulations' which states that an 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".* It accords with the approach set out in paragraph 4.4.3 of NPS EN-1 (4.3.22 of Draft NPS EN-1 to be designated).

1.3 The chapter is supported by the following figures:

- **Figure 1.3: Areas of the Site**
- **Figure 1.4a and 1.4b: Field Numbers**
- **Figure 1.5: Environmental Constraints**
- **Figure 3.1: Areas of the Site - Preliminary Environmental Information Report (PEIR)**
- **Figure 3.2a and b: Original Layout February 2021**

- **Figure 3.3a and b: Scoping Layout August 2021**
- **Figure 3.4a and b: PEIR Layout April 2022**
- **Figure 3.5: Updated Site Layout March 2023 (Additional Consultation)**
- **Figure 4.1a and b: Illustrative Concept Design**

1.4 Reference is also made to the following Appendices:

- **Appendix 1.3: Work Plans**
- **Appendix 3.1a: Agricultural Land and Sequential Study**
- **Appendix 3.1b: Agricultural Land and Sequential Study Addendum**

Need for the Proposed Development

1.5 The UK was the first country in the world to set legally binding carbon budgets to cut emissions by at least 80% by 2050, through the Climate Change Act 2008[1]. The UK Low Carbon Transition Plan (2009)[2] states that this is to be achieved *"through investment in energy efficiency and clean energy technologies such as renewables, nuclear and carbon capture and storage"*.

1.6 In response to the Intergovernmental Panel on Climate Change's (IPCC) 'Special Report on the impacts of global warming of 1.5°C above pre-industrial levels'[3], the Government's independent expert Climate Change Committee (CCC) published 'Net-Zero: The UK's contribution to stopping global warming' in May 2019. This report recommended that the UK Government extend the ambition of the Climate Change Act 2008 and that *"The UK should set and vigorously pursue an ambitious target to reduce greenhouse gas emissions (GHGs) to 'Net-*

[1] Her Majesty's Stationary Office (HMSO) (2008) Climate Change Act [online] Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents

[2] HMSO (2009) The UK Low Carbon Transition Plan; Five Point Plan [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228752/9780108508394.pdf

[3] Intergovernmental Panel on Climate Change (October 2018) 'Special Report on the impacts of global warming of 1.5°C above pre-industrial levels' [online] Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf

Zero' by 2050, ending the UK's contribution to global warming within 30 years." In June 2019, the UK Government announced the laying of a statutory instrument in Parliament, which amends the Climate Change Act 2008, in order to implement the CCC recommendation into law, and the UK became the first major economy to pass laws to end its contribution to global warming by 2050. In April 2021, the UK government announced a further target to reduce emissions by 78% compared to 1990 levels by 2035, which would bring the UK more than three-quarters of the way to net zero by 2050[4] .

1.7 The decarbonisation of the transport, heat and industrial sectors will cause a significant increase in electricity demand from low-carbon sources. Therefore, the capacity of electricity generation in the UK must grow to meet that demand. This shows a clear need for significant growth in technologies such as large scale energy storage which facilitate low carbon energy generation, as well as well-proven renewable energy generation technologies such as wind and solar.

1.8 To ensure the UK's energy supply is resilient, a mix of renewable generation infrastructure is necessary and solar is a key part of this mix.

1.9 In April 2022, the UK Government published a policy paper entitled 'British Energy Security'[5] which supports the co-location of solar with energy storage and agriculture. It set targets of up to 70GW of solar to be deployed by 2035 and states the contribution to the UK Net Zero aims will most likely be composed of wind and solar generation. In May 2023 the UK Solar Taskforce was established, with a membership drawn from government, the energy industry and finance sector, to drive forward the actions needed by government and industry to meet the solar deployment ambition of 70GW by 2035[6]. This represents a fivefold increase in the current installed capacity in less than 12 years.

[4] UK Government Press Release (2021) UK enshrines new target in law to slash emissions by 78% by 2035. Available at https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035 [Accessed 04/01/24]

[5] UK Government (2022) Policy Paper: British Energy Security Strategy [online] Available at: https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

[6] UK Government (no date) Solar Taskforce[online] Available at: https://www.gov.uk/government/groups/solar-taskforce

1.10 The need and support for solar generation with on-site energy storage is therefore clearly established in UK Government policy and reflected in the NPSs.

1.11 The Proposed Development will make a significant contribution towards the UK's national energy policy aims of decarbonisation and reducing carbon emission reductions, energy security, and affordability by:

- Providing a large scale, low carbon, renewable energy generating asset to contribute towards achieving Net Zero by 2050.
- Providing a secure supply of energy – a large scale scheme with direct connection to the National Grid transmission network, with the integration of Battery Energy Storage Systems (BESS).
- Providing affordable, large scale, generation with value for money for end-use consumers.

1.12 Further information is included within the Statement of Reasons (EN010122/APP/4.1) and Planning Statement (EN010122/APP/7.1) submitted with the DCO application.

Site Selection

Policy Context and Guidance

1.13 Draft NPS EN-3 for designation[7,8] includes factors influencing site selection by developers for renewable energy infrastructure, including solar farms, such as irradiance and site topography, proximity to dwellings, site capacity, grid connection, agricultural land classification and land type, and accessibility (Section 2.10). Draft NPS EN-3 notes at paragraph 2.3.5 that *"It is for applicants to decide what applications to bring forward and the government does not seek to direct applicants to particular sites for renewable energy infrastructure..."* (except in relation to offshore wind).

[7] The current NPS EN-3 doesn't include a section on solar energy

[8] Department for Energy Security and Net Zero (2023) Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)

Key Considerations for Solar Development

1.14 The Applicant evaluates new solar opportunities based on a number of key considerations, with feasible sites meeting the following criteria:

- Close to a substation offering sufficient capacity to enable export of power to the national grid; grid connection capacity is the key constraint for large scale solar development. This is supported within draft NPS EN-3 for designation which states in paragraph 2.10.60 that *"applicants will consider several factors when considering the design and layout of sites, including, proximity to available grid capacity to accommodate the scale of generation, orientation, topography, previous land- use and ability to mitigate environmental impacts and flood risk".*
- Acceptable irradiance levels.
- Suitable topography/slope.
- Good access from the public road network.
- Acceptable flood risk.
- No overriding environmental constraints (habitats, species, land designations and protected areas, agricultural land classification).
- Minimal interaction with local population.
- Acceptable physical constraints (utilities and other infrastructure).
- Acceptable planning constraints (local and national policies).
- Suitable land availability – area and location.

Identifying the Site

UK Wide Site Search

1.15 In 2019 the Applicant's parent company, BayWa r.e. UK Limited (BayWa) recognised that in order to meet the Government's stated Net Zero targets[9] a number of large scale (utility

[9] Legislation.gov.uk (no date) Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111187654 [accessed 09/11/23]

scale[10]) solar farms would need to be developed in the UK. To deliver these projects most efficiently they need to be located close to suitable grid connection points within the UK's electricity networks, while also meeting a suite of critical development parameters (see list of key considerations above). BayWa therefore carried out an assessment of grid capacity across the UK distribution and transmission networks to identify prospective substations with available capacity.

1.16 In parallel, BayWa engaged its sister company Cefetra, a major grains and animal feed trader, to contact their network of landowners and farmers, including those near to prospective substations, to identify whether any would be interested in diversifying and supporting their agricultural businesses with solar PV development.

1.17 A further site search of non-Cefetra land, including working with other parties, identified a number of other opportunities which have been pursued by BayWa resulting in several successful utility-scale solar developments of less than 50MW. Through this process BayWa has successfully received planning consent for Perrinpit[11], Rag Lane[12], Clump Farm[13] and Hill Farm[14] Solar Farms resulting in a current pipeline capacity of 150MW solar being developed through the Town and Country Planning Act regime. Further sites, not yet in the public domain, are also in various stages of early development.

Identification of the Site at Oaklands Farm

1.18 From their assessment of the grid capacity along the English and Welsh distribution and national grid networks, BayWa identified National Grid's substation at the former Drakelow Power Station as being of suitable scale and having available capacity.

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[10] Large solar farms connected directly to the energy network (grid).

[11] BayWa r.e.(no date) Perrinpit Road Solar Farm Project Information Page [online]. Available at: https://www.baywa-re.co.uk/en/solar/perrinpit-road-solar-farm

[12] BayWa r.e (no date) Rag Lane Solar Farm Project Information Page [online]. Available at: https://www.baywa-re.co.uk/en/solar/rag-lane-solar-farm

[13] BayWa r.e.(no date) Clump Solar Farm Project Information Page [online]. Available at: https://www.baywa-re.co.uk/en/solar/clump-solar-farm

[14] BayWa r.e (no date) Hill Solar Farm Information Page [online]. Available at: https://www.baywa-re.co.uk/en/solar/hill-solar-farm [accessed 09/11/23]

1.19 Cefetra were notified of this area of interest and through their landowner network the Oaklands Farm landowner, having expressed an interest in solar PV development and being located close to the Drakelow Substation, was identified as an early prospect.

1.20 The early phase assessment of the Oaklands Farm site included a preliminary feasibility assessment (see Feasibility Assessment below) of environmental and planning constraints and potential solar PV capacity. This initial assessment identified the land as being suitable for a utility scale solar PV farm, and it was noted that the Site was a solid block of fields which would offer optimal conditions to minimise infrastructure and facilitate the operation of a solar farm. As part of early feasibility work undertaken for the Oaklands Farm site BayWa undertook a Sequential Study to identify whether other more suitable sites were available for the development of a similar utility scale solar project (see Consideration of Alternatives below). This study, together with the feasibility assessment, and the landowner's willingness to enter negotiations, identified the land as being suitable for a utility scale solar PV farm.

1.21 Once Oaklands Farm was identified as a potentially suitable site, BayWa carried out preliminary grid assessments to confirm that suitable grid capacity was available at Drakelow Substation to develop a utility-scale solar farm in this area (see **Figure 1.3: Areas of the Site**).

1.22 Having established the likely availability of capacity on the grid network and following initial consultation with National Grid, an application to secure a formal grid connection offer was submitted to National Grid and subsequently secured.

1.23 Initially, for the grid connection route to the National Grid Drakelow Substation, BayWa assumed this would comprise underground cabling laid in the road/verge of Coton Road and running north from Oaklands Farm through Walton-on-Trent and along Walton Road to Drakelow Substation. However, during discussions with the landowner and assessment of possible grid connection routes, it was clear that land to the north of Oaklands Farm lying adjacent to Drakelow Substation offered the shortest, most direct grid connection route as well as a possible additional area for solar development. Following further feasibility assessment and positive discussions with the landowner the Park Farm area was added to the development in early 2021 (see **Figure 3.1: Areas of the Site (PEIR)**). National Grid confirmed that additional viable capacity was available and therefore the electrical capacity of the Proposed Development was increased to accommodate the Park Farm solar capacity.

Feasibility Assessment

1.24 In 2019 to 2020 BayWa undertook a site feasibility exercise with relevant studies to assess the feasibility of the Site for solar development. This considered irradiance levels, topography and any environmental constraints associated with Oaklands Farm and subsequently Park Farm (see **Figure 1.5: Environmental Constraints**).

1.25 A site walkover confirmed that the topography of the Site was acceptable and irradiance levels were confirmed, through commercially available meteorological data.

1.26 Given the available grid capacity, topography and slope of the Site and acceptable irradiance levels, the Applicant considered that a utility scale, ground-mounted, solar project could be viable in this area. The feasibility study did not identify any statutory designations which would impact the Site's development or physical constraints such as utilities, watercourses, road and rail infrastructure which would impose significant limitations.

1.27 Suitable access points onto the Site were confirmed through discussions with the landowner, identification of existing points and assessment of the local road network. The access points from the public road network were identified as capable of providing suitable construction, operational and decommissioning access.

1.28 An initial assessment of flood risk was undertaken and was considered generally low, with one, minor watercourse running along the north east boundary of Oaklands Farm and then north towards Park Farm. Alongside the watercourse a narrow strip of land is designated as lying within flood zones 2 and 3.

1.29 When considering the feasibility of a potential solar PV and BESS site, national and international nature conservation designations such as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar wetland sites and nature reserves are generally avoided. Areas adjacent to such designations may have potential for development depending on the nature of the designation and of the land considered for development. The River Mease SAC and SSSI was recorded 4.4km to the south of the Site. No further statutory designated sites were recorded within 5km of the Site[15]. A total

[15] The initial feasibility stage checked for the presence of statutory designated sites within 5km; this is the standard distance used for preliminary ecological appraisals. A 15km buffer was used as part of the Habitats Regulations Assessment, see **Appendix 6.1: Report to Inform HRA** to identify European sites..

of 14 Local Wildlife Sites (LWS), four potential LWS and one nature reserve were recorded within 2km of the Site, with the nearest sites recorded to the south-east at Rosliston Forestry Centre – Hedgerow LWS (outside of the Site boundary) and to the north at Grove Wood LWS (partly within the Site boundary). It was concluded that there are no ecological designations within the Site that could pose a constraint to development.

1.30 The presence of settlements and individual properties surrounding the Site was considered. It was noted the landscape includes existing electricity network infrastructure, primarily a number of large overhead lines (OHLs) running north-south through the Site and connecting in to the former Drakelow coal fired power station at the National Grid Drakelow Substation.

1.31 A more detailed feasibility study was undertaken to consider landscape, visual and historic environment matters, informed by mapped Zones of Theoretical Visibility for panels and a substation. This identified the Site as lying within a less sensitive landscape area, within no designated landscapes but within the National Forest, and concluded that visibility was largely contained within 2km of the Site, with further consideration required of views from the closest properties. There was no desk based evidence of archaeological constraints, and no designated heritage assets were identified which would experience harm as a result of the Proposed Development.

1.32 Overall, the feasibility assessment concluded the Site was suitable for solar and BESS development. No 'showstoppers' were identified to suggest the Site should not be taken forward for more detailed consideration. All potential environmental impacts would be subject to further, more detailed, assessment through the EIA.

Inclusion of Battery Energy Storage System

1.33 During the early feasibility and design work the Applicant explored opportunities to maximise the site capacity and performance and investigated the potential of including an associated large scale battery energy storage system (BESS). The BESS is designed to store and discharge electricity from the solar panels and to also optimise the operation of the solar farm and provide ancillary services to assist with management and operation of the electricity network. National Grid considers BESS an essential technology that will play an increasingly

pivotal role in its efficient management of supply and demand[16]. It will do this by storing electricity generated from the PV Panels in the batteries in order to dispatch to the electricity grid when it is most required. The BESS can also import electricity from the National Grid to provide ancillary energy time-shifting services to help National Grid Electricity Transmission plc (NGET) manage the increasing penetration of (variable) renewable generation on the transmission network, an increasing requirement as the electricity network moves towards Net Zero.

1.34 Consultation with National Grid confirmed viable import capacity was available and viable, and the Applicant subsequently applied for and secured import capacity to enable the BESS to be charged by electricity from the National Grid, as well as from the solar PV output.

Consideration of Alternatives

1.35 The Applicant considered a number of alternatives, which are discussed below:

- Other sites within 10km of Drakelow Power Station.
- Alternative Layout: Inclusion of solar panels on land at Park Farm (**Figure 3.3a and b Scoping Layout August 2021** and **Figure 3.4a and b PEIR Layout April 2022**).
- Alternative locations within the Site for Proposed Development's Substation and BESS; and alternative construction routes (see Design Evolution, below).

Other sites within 10km of Drakelow Power Station

1.36 Having identified the opportunity at Oaklands Farm, the Applicant carried out a Sequential Study in order to ascertain whether there were other sites available that might be more suitable for a utility scale, ground-mounted solar farm development to connect to the National Grid Drakelow Substation (see **Appendix 3.1a: Agricultural Land and Sequential Study**). This is summarised below.

1.37 The Sequential Study sought to determine whether there were any sequentially preferable sites on lower quality agricultural land and previously developed land, within a 10km radius of the proposed grid connection point for the Proposed Development. While the Applicant

[16] National Grid (no date) What is battery storage? Available at: https://www.nationalgrid.com/stories/energy-explained/what-is-battery-storage

identified that a grid connection of more than 4km would be uneconomical, a search radius of 10km was selected as being sufficient to ensure a range of potential options could be considered.

1.38 The sequential assessment employed GIS mapping tools to identify development constraints or exclusion zones including flood zones, woodland, developed land and any sites designated for landscape, biodiversity or heritage reasons. Physical constraints for grid connection such as major road crossings, railways and watercourses were also identified, which precluded land available to the west of Burton upon Trent. Two sifting exercises were then conducted comparing the remaining areas against the proposed Oaklands Farm area size (c.172ha). The first sift applied a 90% size threshold (154.8ha) to identify similar sized sites. Five sites that achieved this size threshold were taken forward for further consideration (**Appendix 3.1a: Agricultural Land and Sequential Study**, Figure 1: Proposed Alternative Sites).

1.39 The second sifting exercise looked for areas of search (AOS) which could potentially accommodate smaller solar developments, defined for the purpose of the study as areas which were at least 30% of the area of the proposed Oaklands Farm area (51.6ha). These were taken forward for further consideration. The areas were visually assessed using aerial imagery and GIS software, and those areas that were limited by numerous constraints, and therefore not suitable, were not considered further.

1.40 The second phase of the assessment focused on identifying whether any alternative areas were likely to be located on lower quality agricultural land, or previously developed (brownfield) land. It also checked for further constraints and potential grid connection routes using the existing road network.

1.41 The targeted desk based agricultural land quality analysis of the remaining areas took into account:

- Soils and other climatic data sets.

- The provisional Agricultural Land Classification (ALC) maps from the 1970s, and the predictive Best and Most Versatile[17] (BMV) ALC maps (2017) (**Appendix 3.1a Agricultural Land and Sequential Study**, Figure 1: Areas of Search and Best and Most Versatile Land)
- A review of planning application registers, and any available ALC data within the study area that is not shown on the DEFRA (MAGICMaps) website.
- A review of aerial photography and Streetview images to assess land use and farming practices.

1.42 The agricultural land classification of sites identified within the 10km study area is generally good, with two of the five sites identified in the initial sift consisting of 100% BMV agricultural land, and two having 70-75%. For comparison, approximately 67% of the land at the Oaklands Farm area is considered to be BMV agricultural land (44% Grade 3a, 23% Grade 2)[18]. Only one of the five identified larger sites had a lower proportion of BMV agricultural land than the Oaklands Farm area, however it lies 7.8km from the Drakelow Substation and adjacent to a village, and is therefore less suitable for development. Areas of Search 09 and 10 were also expected to be of lower agricultural quality, but lie around 14-15km away from the Drakelow Substation (by road) and therefore not considered further.

1.43 The review also considered:

- A high-level criteria-based landscape and visual appraisal to assess whether the alternative areas identified by the GIS study would be within a more or less sensitive landscape character area.
- Presence of existing land uses such as recreation and sport, education, military etc.
- Allocations by the local planning authority and planning permissions for residential, commercial or infrastructure.
- Local designations in the Local Plan.

1.44 The review concluded that none of the areas identified would be less sensitive or otherwise more suitable than the Oaklands Farm area as shown in **Table 3.1**.

[17] Land of Grades 1, 2 and 3a of the Agricultural Land Classification is defined as 'Best and Most Versatile' in the National Planning Policy Framework (NPPF, MHCLG, December 2023).

[18] Table 2.2, Appendix 3.1a

Table 3.1: Summary of the findings of the Agricultural Land and Sequential Study

Site	Size (ha)	BMV %	Grid connection distance by road (km)	Landscape / planning policy	Reasons not more suitable
Oaklands	172	67	4.5	'Least sensitive'; views generally contained within 2km.	-
1	183	75	14.7	'Moderate sensitivity'; Low lying, lack of woodland to screen.	Distance / landscape / BMV
2	312	100	11.6	-	BMV
3	245	70	11.1	'Moderate / least sensitive'; Potential for extensive views; adjacent to settlement.	Distance / landscape / views
4	156	100	8.3	-	BMV
5	202	50	7.8	'Least sensitive'; Higher ground with woodland; adjacent to settlement.	Distance / views
AOS9/ AOS10	462	30	13.8	AOS09: includes woodland; AOS10 more sensitive / visible.	Distance / landscape

1.45 Following the main study, an additional assessment was undertaken, following revised advice from the developer's solar design team to remove the aspect constraint previously applied to land facing north west to north east (as this aspect is suitable for solar panel operation). This identified some other potential sites with lower quality agricultural land, but

these were located around the north west edge of the 10km search area, beyond Burton upon Trent, and therefore not feasible for connection to the grid at Drakelow. This additional assessment was reported as an Addendum to the Agricultural Land and Sequential Study, and is included in **Appendix 3.1b: Agricultural Land and Sequential Study Addendum**.

1.46 The review of previously developed land comprised a search of the Brownfield Land Registers for South Derbyshire District, East Staffordshire Borough, Litchfield District and North West Leicestershire District, with the search focusing on sites of at least 50ha in size. There were no sites of 50ha and above in the registers for South Derbyshire, East Staffordshire or North West Leicestershire. While there was a larger site in Litchfield, it was located outside the 10km study area. Two smaller sites (which when combined would be just below 50ha) were also identified in Litchfield just beyond the study area, and subject to live planning applications for residential use or under construction. In addition, the planning context of the Drakelow Power Station area was also reviewed, and a number of planning permissions, allocations and live applications were identified for energy, employment, housing and transport uses. The identified sites were discounted due to their distance from the connection point and / or planning status. In conclusion, the review did not identify any previously developed (brownfield) sites over 50ha suitable for solar within 10km of the connection point.

1.47 No potential sites were identified which are closer to the grid connection than Oaklands Farm, apart from the Park Farm area.

1.48 Considering the criteria identified above, the Oaklands Farm area (and the later addition of the Park Farm area[19]) was concluded to be a suitable and available site.

Alternative Layout: Inclusion of solar panels on land at Park Farm

1.49 During early discussions with the landowner and assessment of possible grid connection routes, it was determined that land to the north of Oaklands Farm lying adjacent to the Drakelow Substation could be suitable for hosting the grid connection cable and possibly additional solar panels. Following positive discussions with the landowner, feasibility assessment and consultation with National Grid, land at Park Farm was included within the development in early

[19] Park Farm is now only being used for construction access and grid connection.

2021 and Park Farm was identified within the Scoping layout (see **Figure 3.1: Areas of the Site (PEIR)**).

1.50 Consultation with National Grid confirmed that additional capacity was available at Drakelow Substation and the associated connection costs, were commercially viable. As a result, the Applicant applied to increase the export capacity of the Proposed Development, to accommodate the additional Park Farm solar capacity.

1.51 The Scoping layout was therefore expanded to incorporate solar PV capacity on the Park Farm area, and over the course of 2021 and into 2022, the layout design of additional solar capacity and the BESS was refined and presented as part of statutory consultation in Spring 2022 and assessed within the accompanying PEIR.

1.52 Following statutory consultation the landowners of Park Farm reviewed their long term farm plans and opted to continue their current land practices. As a result, the Park Farm area was no longer available to the Applicant for solar panels. However, the proposed construction access and grid connection cabling could be accommodated within the Park Farm area, and are included in the Proposed Development.

Design Evolution

Design Considerations

1.53 The overarching approach used to design the Proposed Development has been to minimise environmental impacts while using land efficiently to maximise renewable energy outputs. These key design principles have been kept in mind throughout the design process.

1.54 A number of design considerations fed into the layout and design of the Proposed Development, many of which are linked to the key considerations which informed site selection (see paragraph **3.14** above). Throughout the EIA process, there has been feedback into the design, which has been influenced by the site characteristics and the detailed assessment of environmental effects alongside technical considerations for the type of equipment to be installed during construction. More details are provided below. The design process culminated in the Proposed Development, which can be found in **Chapter 4: Project Description**.

1.55 The technical requirements of the following five main infrastructure components have driven the detailed layout and design of the Proposed Development:

- Layout of solar panel arrays.
- Location of the Proposed Development's Substation.
- Location of BESS.
- Site access points.
- Grid connection route.

1.56 Other key drivers within the design process were avoidance of flood risk zones, reducing residential visual and noise impacts and minimising other environmental and ecology impacts.

1.57 Computer modelling was used as a tool to aid design, in particular, Zone of Theoretical Visibility (ZTV) models were generated and used as a proxy for potential visual effects and wireframes were generated to illustrate views from key locations around the Site.

1.58 More detailed information from utility asset owners was obtained through discussion and the design was refined based on more accurate buffers from utility assets.

1.59 Design workshops have been used to identify necessary changes to the design, and to communicate these to the wider project team.

1.60 The **design considerations** that have influenced the layout are set out below.

- The **Landscape and Visual** design strategy was to:
  - integrate the Proposed Development into the landscape and preserve the key qualities of landscape character.
  - preserve field patterns within the Site by setting PV panels back from the edges of fields.
  - avoid losses of valued woodland and tree cover as much as possible.
  - avoid or minimise adverse effects on views from settlements (in particular Rosliston) and nearby residential properties.
  - maintain the recreational value of the Site by minimising visual intrusion along the Cross Britain Way / National Forest Way long distance footpath.
  - mitigate adverse effects with new planting that is in character with the landscape of the Site and its surroundings, and is in accordance with the aims of The National Forest.
- Solar panels and other site infrastructure were sized with a maximum height to account for technology changes between planning and delivery, and all visual assessments utilised these "future-proof" designs. Design and assessment work included mapping to identify where the Proposed Development would be visible from. Consideration was given to the proximity of the BESS and the Proposed Development's Substation from residential

properties using existing natural screening, as well as whether new 132kV grid connection cabling to the Drakelow Substation should be underground or overhead. Areas to plant new screening to mitigate visual impacts were also identified. Following feedback from residents during the statutory consultation the Proposed Development's Substation was moved to the centre of the Site to reduce visual (and noise) impacts from nearby residential receptors.

- **Noise**: Location and mitigation options for the BESS and the Proposed Development's Substation were considered, including acoustic barriers, and noise-attenuating equipment. Following initial noise modelling (and for landscape and visual reasons), the location of the BESS was moved to a more suitable location in the centre of the southern part of the Site further from residential properties. Noise modelling was also used to influence the location of Site infrastructure, with a stand-off distance of at least 100m proposed between solar plant and residential properties. In addition, the location of string inverters and internal access tracks was designed to ensure they are screened as much as possible from sensitive receptors by intervening solar panels. Through Noise Impact Assessment, it was concluded that mitigation measures such as acoustic barriers and noise-attenuating equipment were not necessary to maintain acceptable noise levels through operation of the Proposed Development.
- **Ecology**: A decision was made early in the design process that the Proposed Development would be designed to retain all trees with high/moderate bat roost potential, with design modifications made at the entrance to Drakelow Substation to avoid the loss of high and moderate bat roost suitability trees. The decision was made at pre-scoping stage to commit to avoiding removal of high/medium value trees and to maintain existing hedgerow not deemed as "species poor and defunct" with a 5m buffer from the Proposed Development infrastructure. A 30m buffer has been applied around badger setts and no construction works will be undertaken within this buffer during the breeding season between November and June inclusive. Any works undertaken within 30m of a badger sett will be completed under a Natural England badger disturbance licence as necessary.
- **Utilities**: Buffers from Proposed Development installations were agreed in consultation with transmission and distribution network operators and applied from NGET's existing overhead electricity transmission lines and NGED's existing underground and overhead electricity distribution lines. Other utilities such as gas, telecoms, sewage and water pipes were

identified through utility and title searches, and through discussions with utility asset owners, the design progressed to ensure integrity of utility assets, using detailed GIS and engineering design data to flag asset locations and provide accurate setbacks where required.

- **Hydrology**: The Environment Agency (EA) requested a minimum 8m easement between the top of any watercourse bank and any infrastructure. Mapping of flood zones for fluvial and surface water flooding identified areas where site infrastructure was to be excluded. This led to the relocation of the Proposed Development's Substation and BESS out of an area where surface water ponds on site.
- **Traffic**: Consideration of transport routes to provide suitable road surfaces, dimensions, weight restrictions and cornering to accept construction vehicles and abnormal loads (up to two x 132kV 90MVA transformer units) was undertaken. Identification of limitations such as narrow bailey bridge in Walton-on-Trent, residential populations and existing vegetation or other sensitive ecology was carried out to arrive at suitable access points for the Site. As the design has progressed the following changes to the road network and Site have influenced the proposed routes to Site:
  - Weight limit on Chetwynd Bridge (18 Tonnes, later reduced to 7.5 Tonnes).
  - Walton bypass delivery delay.
  - Assessment of visibility and swept-path analysis, and use of one-way HGV routing for construction utilising "in-only, left-turn only" ingress and "out-only, right-turn only" egress points off Walton Road into/out of Park Farm to avoid stacking of vehicles entering/exiting the Site and to ensure visibility is safe while limiting the loss of trees and hedgerow. LGVs and small construction vehicles, personnel and operational cars and vans will utilise "in-only" access points and a single exit point at the main junction on Coton Road to ensure safe visibility is in place for all these vehicle movements while limiting the loss of hedgerow.
  - Using existing farm access for operation and maintenance access points to provide flexibility in access and to provide quick ingress/egress to all parts of the Site south of Rosliston Road in the event of an emergency (a new gated emergency access point will be available throughout operations on the south side of Rosliston Road to respond quickly to safety incidents in the Oaklands Farm area).

How the Design Has Evolved

1.61 The key design changes are presented in the following figures:

- **Figure 3.2a** and **b: Original Layout February 2021 –** Pre-scoping layout from early in the site design process in February 2021**.**
- **Figure 3.3a** and **b: Scoping Layout August 2021 –** Scoping layout that was submitted with the Scoping Report in August 2021. This shows development of the design in terms of avoiding flood risk areas and applying necessary buffers around residential properties**.**
- **Figure 3.4a** and **b: PEIR Layout April 2022 –** layout that was assessed in the PEIR in April 2022**.**
- **Figure 3.5: Updated Site Layout March 2023 (Additional Consultation)**
- **Figure 4.1a** and **b: Illustrative Concept Design** and **Appendix 1.3: Work Plans**– the current layout assessed in the ES.

Solar Panel Layout

1.62 As shown in **Figure 3.2a and b – Original February 2021**, the initial approach to panel siting was to maximise the number of panels on Site (both Oaklands and Park Farm areas) taking into account the following initial and high level constraints:

- Siting of panels on slopes up to 15 degrees gradient, preferably in a south-facing orientation.
- Provision of 2.5m spacing between panel rows to optimise available space while allowing maintenance access between rows.
- Maintaining 5m buffer from hedgerows to allow for landscaping and maintenance access to perimeter solar infrastructure, providing more “undeveloped” land within the Site boundary that is suitable for landscape and ecology enhancement, and Biodiversity Net Gain (BNG).
- Avoiding existing overhead lines with suitable buffers.
- Designing around ecologically valuable trees, hedgerows, copses, water bodies and watercourses, to maintain high value ecological features.

1.63 Taking this pre-scoping layout as a starting point, the EIA and design team worked to obtain more detailed information on environmental impacts through surveys and assessments, to identify options for design refinements where necessary.

1.64 Following the statutory consultation in Spring 2022, and in light of changes to the Park Farm landowner's long term farm plans, all solar panels were removed from the Park Farm area. Solar panels were also removed in the area immediately north of Oakland farmhouse in order to provide an area for cattle grazing to allow the landowner the opportunity to continue his cattle farming practice.

Proposed Development's Substation

1.65 The design requirements for the Proposed Development's Substation were: a sufficient area of flat ground outside the floodplain, proximity to Drakelow Substation, area clear of trees and hedgerows, suitable access, no other environmental constraints present, and limited visibility.

1.66 Early designs had located the Proposed Development's substation on the Park Farm area so it would be closer to the Drakelow Substation, but it was determined through technical assessment that this would require more cabling and the installation of two substations to support the Proposed Development. This would have incurred greater visual, noise and environmental impacts due to more electrical infrastructure and would have increased the grid connection cost. Therefore, the Oaklands Farm area was chosen to host the Proposed Development's Substation for the PEIR Layout, and to minimise cabling installations it was placed in the northern part of the Oaklands Farm area to be closest to the Drakelow Substation (see **Figure 3.4a and b PEIR Layout April 2022**). The location was identified following a site visit and survey which identified a sufficient flat, unobstructed area available, which could be screened from nearby houses by existing trees and vegetation.

1.67 However, a subsequent noise assessment identified that the nearest residential receptors would experience unacceptable noise impacts if the Proposed Development's Substation and BESS were both to be located in this area. Following further assessment undertaken to inform the PEIR, it was determined that the BESS would generate the greatest noise output, and that separating the BESS and the Proposed Development's Substation was a viable method for reducing noise impacts to acceptable levels at the nearest receptors. The BESS was therefore relocated to the centre of the Oaklands Farm area (see below).

1.68 Following stakeholder consultation on the PEIR, to address consultation responses received from local residents, the Applicant agreed to relocate the Proposed Development's Substation further away from local houses to the middle of the Site, adjacent to the BESS. The ES confirms there are no significant noise impacts resulting from locating both facilities together in this location (see **Chapter 11: Noise**).

1.69 The BESS and Proposed Development's Substation are both generally located on 'good' quality[20] agricultural land (Grade 3a), with the very southern part of the substation compound located on 'moderate' quality agricultural land (Grade 3b). While higher quality Grade 2 agricultural land has been avoided, it has not been possible to site this infrastructure completely within 'moderate' quality agricultural land (Grade 3b) due to the need to minimise visual and noise effects on neighbouring residential properties, as described above. In addition, this location is close to existing farm tracks minimising the length of new tracks required, and makes use of the existing field pattern and hedgerows for screening.

BESS

1.70 The design requirements for the BESS were: a sufficient area of flat ground outside the floodplain, proximity to Drakelow substation, no trees and hedgerows, suitable access, no other environmental constraints present, and limited visibility.

1.71 Locating the BESS facility on the Park Farm area closer to Drakelow was initially considered to minimise the distance from Drakelow Substation, but this would require two separate substations, additional electrical infrastructure and would increase project delivery costs. For scoping, the BESS was located adjacent to the Proposed Development's Substation to minimise cabling and to consolidate the footprint of this infrastructure as much as possible.

1.72 Following the outcome of noise assessments to inform the PEIR, the BESS was moved to address unacceptable noise impacts on the nearest receptors. A number of potential locations within the Oaklands Farm area were considered, with a requirement to keep the BESS as close to the Proposed Development's Substation as possible with consideration of topography, flood risk and visual and noise receptors. The chosen location, approximately 400m to the south-west of the location at scoping and unchanged since the PEIR, is shown in

[20] Grade classifications from Agricultural Land Classification of England and Wales. Guidance and criteria for grading the quality of agricultural land. MAFF. 1988.

Appendix 1.3: Work Plans and **Figure 4.1a** and **b: Illustrative Concept Design**. It has suitable access from the planned construction access track for delivery of the large BESS units, is suitably flat and is sufficiently far away from residential receptors to reduce noise impacts to acceptable levels.

1.73 The BESS and Proposed Development's Substation are both generally located on 'good' quality[21] agricultural land (Grade 3a), with the very southern part of the substation compound located on 'moderate' quality agricultural land (Grade 3b). While higher quality Grade 2 agricultural land has been avoided, it has not been possible to site this infrastructure completely within 'moderate' quality agricultural land (Grade 3b) due to the need to minimise visual and noise effects on neighbouring residential properties, as described above. In addition, this location is close to existing farm tracks minimising the length of new tracks required, and makes use of the existing field pattern and hedgerows for screening.

Site Access

1.74 Construction access for the Proposed Development is required for heavy goods vehicles (HGVs), light goods vehicles (LGVs), and a small number of larger abnormal loads. Operational and maintenance access is required for LGVs and HGVs. Through an assessment of the road network and physical constraints such as road layout and geometry the design team identified that each of the Oaklands and Park Farm areas had viable access points from suitable roads on the public highway network, with the ability to use and upgrade existing farm access tracks to avoid impacts to hedgerows and trees. Site access points have been identified away from residential receptors as far as possible, reducing the perceived noise from traffic associated with the Site and avoiding traffic through the nearest villages of Rosliston and Walton-on-Trent.

1.75 In the PEIR, access to the Park Farm area was proposed via the A38 and Walton Road, with a new permanent access to be installed off Burton Road into Park Farm. As solar panels are no longer proposed on the Park Farm area, this access is no longer required. Access to the Oaklands Farm area was proposed from the south, from the A38 and A513 using Chetwynd Bridge.

[21] Grade classifications from Agricultural Land Classification of England and Wales. Guidance and criteria for grading the quality of agricultural land. MAFF. 1988.

1.76 Due to various changes to the road network which emerged throughout the design process (such as the weight limit reduction on Chetwynd Bridge), construction and decommissioning transport routes presented within the PEIR have been revised. Staffordshire County Council imposed a weight limit of 7.5T on Chetwynd Bridge (A513) in late 2022, precluding HGVs from using the bridge to access the Oaklands Farm area from the south.

1.77 The Applicant therefore consulted on alternative routes as part of additional consultation in Spring 2023. This included:

- The preferred access route via the A38 to the Walton-on-Trent by-pass, travelling east along Walton Road to Park Farm and avoiding Chetwynd Bridge.
- A back-up access route for HGV traffic from the A38 via the A5189 through Stapenhill and Rosliston Road and Walton Road to Park Farm, avoiding Chetwynd Bridge.
- Back-up access routes for light goods and small vehicles utilising the A513 and an unnamed road through Catton as well as the HGV route above via Burton Road and Walton Road.

1.78 The preferred construction route for the Proposed Development (referred to as Scenario 1 in **Chapter 10: Transport and Access** and shown on **Figure 10.2**) is for all HGVs and cars to travel via the A38 to the Walton-on-Trent by-pass, travelling east along Walton Road to Park Farm. Construction traffic will use the existing main access to Park Farm from Walton Road to join a new temporary access track to be installed across the Park Farm area, before crossing Rosliston Road and into the Oaklands Farm area.

1.79 Through consultation with Derbyshire County Council the Applicant is aware that delivery of the by-pass has been delayed and may not be available for construction of the Proposed Development. In the event the Walton by-pass is not available, the likely alternative route for HGVs (referred to as Scenario 2a in **Chapter 10: Transport and Access** and shown on **Figure 10.3**) will be for all HGVs to travel from the A38 through Stapenhill to Walton Road, travelling west to Park Farm. This route will be supported by a back-up alternative route (referred to as Scenario 2c in **Chapter 10: Transport and Access** and shown on **Figure 10.4**) through Coton-in-the-Elms if necessary, which will also be used for abnormal loads. LGVs will utilise several available routes, including the Chetwynd Bridge via Catton, to disperse construction traffic across the road network.

Access for Recreation

1.80 Following statutory consultation on the PEIR, a permissive path (footpath) has been included in the design to create a new link to the Cross Britain Way from the Public Right of Way at Catton Lane/Lads Grave in the south east of the solar farm. This route would open up the Site for recreational use by pedestrians.

Grid Connection Route

1.81 Grid routing options between the Site and Drakelow Substation were considered with reference to visual and noise impacts, environmental constraints such as waterbodies, existing trees and physical infrastructure that limited the placement of grid infrastructure. The area to the south of Drakelow Substation is populated with a number of 400kV and 275kV overhead transmission lines and towers, two of which run north south over the eastern and western flanks of the Oaklands and Park Farm areas and connect into Drakelow Substation to the north. Overhead distribution cabling also converges into the distribution network operator's section of Drakelow Substation. The landscape in this localised area is characterised by overhead power lines.

1.82 The Applicant initially considered an underground or overhead grid route utilising the public road network through Walton-on-Trent (see **Plate 1**). This option was discounted due to the length of cable route (4.5km), anticipated congestion from other existing utility assets, visual impact and installation disruption within Walton-on-Trent and the increased cost versus a shorter, more direct route over agricultural land.

1.83 Following discussions with the landowner of Park Farm a shorter, more direct 3km route north from Oaklands into Drakelow was identified and assessed from a technical, environmental and cost point of view. An entirely overhead connection along this route was initially considered preferable given the multiple crossing of watercourse that runs along the western side of the Park Farm area and past the northern part of the Oaklands Farm area. A possible route corridor was identified in the EIA Scoping Report (see paragraph 3.18 in **Appendix 2.1: Scoping Report** and **Figures 3.3a** and **3.3b** in ES **Volume 3**). Through further assessment of required safety setback distances, cost and operational implications of crossing the existing overhead lines, it was determined that a combination of overhead and underground sections would be preferable. This design involved an overhead connection from the Oaklands Farm area over the watercourse and into the south-western part of the Park Farm area through the wide corridor

between the existing overhead lines where it could be undergrounded for the remainder of the grid connection route to Drakelow. This configuration was presented for stakeholder comment in the PEIR as part of statutory consultation in Spring 2022.

1.84 The statutory consultation process invited interested parties and statutory consultees to input into the Applicant's grid routing design by indicating a preference for underground or overhead grid connection cabling. The results of statutory consultation indicated a strong preference for fully underground grid cabling to limit visual impact. After further assessment, the Applicant determined a fully underground grid connection from the Site to the point of connection within Drakelow Substation was appropriate.

1.85 Throughout the EIA and prior to submission of the ES, the Applicant has engaged with National Grid, landowners, relevant authorities, and utility asset owners to determine an optimal grid connection design and routing. The cable route has also been adjusted to retain trees and avoid impacts to hedgerows and other ecological receptors.

1.86 A full routing study was conducted by specialist grid advisors and National Grid to determine an agreed corridor for the proposed cable route. The fully underground cable route requires four watercourse crossings (see **Figure 4.12**) and two road crossings. Where the cable crosses Walton Road and Rosliston Road, it will be laid under the road either via open trenching or directional drilling (see **Figure 4.15a: 132 kV Cable Trench Sections** and **Figure 4.15b: 132kV Joint Bay Details**).

1.87 The cable route will also require multiple crossings of electrical, gas, water, and telecoms utilities (see **Figure 16.1: Existing Utilities and Infrastructure Identified during Consultation**).

1.88 For the final cable length, through land surrounding the National Grid Drakelow Substation compound to the point of connection within, detailed discussions with National Grid's engineering and land teams have been conducted in order to assess the optimal design to safely navigate the high number of converging overhead lines, underground electrical infrastructure and substantial tree coverage. The need for flexibility at Drakelow is therefore incorporated in the Proposed Development (see **Chapter 4**), and a reasonable worst case route has been identified for the purposes of EIA within the agreed corridor (see **Figure 4.5a and b: Illustrative Drakelow Access Design and detail**).

1.89 In addition, the presence of trees with high and moderate bat roost suitability have informed the design of the cable route and permanent access junction and track off Walton Road, which will provide operations and maintenance access to the cable throughout the operational life of the project.

Plate 1: Initial option for Grid Connection via Public Road Network

Site Boundary

1.90 The Site boundary has also evolved during the design process. The Scoping Report Site boundary is shown in **Figure 3.3a** and **b: Scoping Layout August 2021**. It was expanded for the PEIR to include additional land within the former Drakelow power station site to accommodate flexibility as the connection point and route into the National Grid Drakelow Substation was not known. In addition, two areas of woodland in the east and west of the Park Farm area were included for the PEIR to enable habitat enhancement to be implemented.

1.91 As part of design freeze for the ES and DCO application, the Site boundary has been reduced to reflect the removal of solar panels, access point, and woodland planting areas from the Park Farm area in the north, removal of solar panels adjacent to Oaklands Farm (see paragraph 3.64 above), confirmation of the cable route into Drakelow Substation and the revised construction traffic route through the Site (see paragraph 3.75 above).

Feedback from Consultation

1.92 The iterative design process has continued throughout the EIA process, with the design responding to consultee comments received during statutory consultation (see **Chapter 2: The Environmental Impact Assessment)**. Key design changes resulting from consultation feedback include:

- The substation has been moved to the middle of site, adjacent to the BESS to increase distance from residential properties following feedback from residents along Rosliston Road.
- A permissive path to create a new link to the Cross Britain Way from a Public Right of Way at Catton Lane/Lads Grave in the southeast of the Site has been included responding to comments from Derbyshire County Council's Rights of Way officer.
- Changes to the proposed construction access routes to Site and within the Site accommodate the weight limit on Chetwynd Bridge, including securing third party land to provide a new haul route off the public road network to prevent heavy construction vehicles from going through the villages of Walton-on-Trent and Rosliston, responding to comments from Staffordshire County Council.

Conclusion

1.93 This chapter has explained the identification of the Site, feasibility assessment and consideration of alternatives, and it is considered there is no more suitable site within the area of search for connection to the Drakelow Substation. The Site is suitable for a utility scale solar PV and BESS, as demonstrated through the feasibility assessments. The close proximity to Drakelow Substation and the undergrounding of the grid connection cable has reduced the visual impact, and the amount of infrastructure to a minimum. The design evolution has addressed the environmental effects identified through the EIA along with consultation feedback, and the Proposed Development has avoided and minimised effects wherever possible. Where there are any remaining potentially significant adverse effects that could result from the Proposed Development these have been address though the EIA process, reported in this ES and suitable mitigation put forward.