

Gate Burton Energy Park EN010131

Outline Design Principles
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Prepared for:

Gate Burton Energy Park Limited

Prepared by:

AECOM Limited

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1. Introduction and Summary

- 1.1.1 This Outline Design Principles document ('ODP') has been prepared to accompany the Development Consent Order (DCO) Application for Gate Burton Energy Park ('the Scheme'). It provides the guiding principles for the detailed design of the Scheme and is secured by a requirement in the draft DCO. When the detailed design for the Scheme is submitted for approval to the relevant planning authorities, those details must be in accordance with the design principles set out in this ODP.
- 1.1.2 Securing the detailed design post consent, is necessary to achieve technological and design flexibility for the Scheme because solar photovoltaic (PV) and battery energy storage system (BESS) technology is rapidly evolving. Gate Burton Energy Park seeks to allow provision in the DCO for the technological innovation and improvements that may be realised at the time of procurement and construction, in order to ensure that it can construct the Scheme taking advantage of innovation, safety improvements and cost-efficiencies.
- 1.1.3 That necessary flexibility has been facilitated by the adoption of the 'Rochdale Envelope' approach in the Environmental Statement (ES). The Rochdale Envelope approach ensures the maximum parameters and realistic worst case have been assessed, and that envelope is defined by the design principles set out in this document. Therefore, by requiring that the detailed design of the Scheme must be in accordance with the design principles, there can be confidence that the environmental effects would be the same as or no worse than those assessed and reported in the ES.

1.2 Design Principles

- 1.2.1 The Scheme is described in Schedule 1 to the draft DCO **[EN010131/APP/6.1]** where the different components of the Scheme are divided into works packages which correspond with the work number areas shown on the **Works Plans [EN010131/APP/5.2]** which will be subject to differing levels of development and/or management. The Works include a generating station with a generating capacity of over 50 MW which is the "*Nationally Significant Infrastructure Project*" (NSIP). For the purposes of the EIA, the Scheme is described in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**.
- 1.2.2 Parts of Work Nos. 4, 5 and 6 address temporary construction areas. The parameters for these temporary laydown areas are addressed in the **Works Plans [EN010131/APP/5.2]** and in the **Framework Construction Environmental Management Plan [EN010131/APP/7.3]** and therefore the temporary construction elements of Work No. 5 and Work No. 6 are not included in Table 1 of this document.

- 1.2.3 Work No. 8 relates to access and the parameters for access works are addressed in the Framework Construction Traffic Management Plan (CTMP) (**ES Volume 3: Appendix 13-E [EN010131/APP/3.3]**) with the parameters for their ongoing use during operation addressed in the **Framework Operational Environmental Management Plan (OEMP) [EN010131/APP/7.4]** and therefore Work No. 8 is not included in Table 1 of this document.
- 1.2.4 The design principles which apply to the Scheme within these areas are set out in Table 1. Further associated development in connection with the above works (as listed in the final paragraph of Schedule 1 to the draft DCO) may be necessary across the Order limits and will be subject to the design principles where they apply.
- 1.2.5 Construction activities are subject to the controls included in:
- Construction Environmental Management Plan which will be substantially in accordance with the **Framework CEMP [EN010131/APP/7.3]**;
 - Construction Traffic Management Plan which will be substantially in accordance with the **Framework CTMP (ES Volume 3: Appendix 13-E [EN010131/APP/3.3])**;
 - Public Rights of Way (PRoW) Management Plan which will be substantially in accordance with the **Framework PRoW Management Plan [EN010131/APP/7.8]**;
 - Battery Safety Management Plan which will be substantially in accordance with the **Outline Battery Safety Management Plan [EN010131/APP/7.1]**; and
 - Soils Resource Management Plan which will be substantially in accordance with the Outline Soils Resource Management Plan appended to the **Framework CEMP [EN010131/APP/7.3]**
- 1.2.6 These Plans are secured by requirements in the draft DCO.
- 1.2.7 The operation of the Scheme is subject to the controls included in:
- Operational Environmental Management Plan, which will be substantially in accordance with the **Framework OEMP [EN010131/APP/7.4]**;
 - Battery Safety Management Plan which will be substantially in accordance with the **Outline Battery Safety Management Plan [EN010131/APP/7.1]**;
 - Soils Resource Management Plan which will be substantially in accordance with the Outline Soils Resource Management Plan appended to the **Framework CEMP [EN010131/APP/7.3]**;
 - Landscape and Ecological Management Plan (LEMP) which will be substantially in accordance with the **Outline LEMP [EN010131/APP/7.10]**;
 - Drainage Strategy which comprises the SuDS Strategy which will be substantially in accordance with the outline drainage strategy (**ES Volume 3, Appendix 9-C [EN010131/APP/3.3]**);
 - **Works Plans [EN010131/APP/5.2]**; and
 - **Streets, Rights of Way and Access Plans [EN010131/APP/5.3]**.
- 1.2.8 The controls in these documents are not duplicated here.

Table 1 Design Principles

Element of Scheme	Parameter Type	Design Principle
Work No. 1		
<i>Solar PV Array</i>	Location	The Solar PV Array Works Areas will be located as shown as Work No. 1 on the Works Plans [EN010131/APP/5.2] .
	Scale	The maximum total land area occupied by the Solar PV Array Works Areas will be up to 474 ha.
<i>Solar PV Panels and PV Mounting Structure</i>	Location	All PV Panels will be located within the Solar PV Array Works Areas marked as Work No. 1 on the Works Plans [EN010131/APP/5.2] .
	Scale	The maximum height of highest part of the PV Panels will be 3.5m above ground level (AGL) (existing levels).
	Scale	The minimum height of the lowest part of the PV Panel will be 0.8m AGL except in zones of higher flood risk where they will be 1.1m AGL.
	Scale	The minimum spacing gap between consecutive rows of PV Tables will be 2m.
	Scale	The indicative footprint of each PV Table is approximately 80m x 9m.
	Design	The PV Tables will slope towards the south.
	Design	The PV Panels will be dark blue, grey or black in colour.
	Design	The PV Mounting Structures will be bare metal in appearance.
Design	The PV panels will have an anti-reflective coating (ARC).	
Design	The maximum depth of PV Mounting Structure piles will be 2m below ground.	
Design	Up to 5% of PV Mounting Structure legs could be supported on concrete footings (rather than piles being driven into the ground).	

Element of Scheme	Parameter Type	Design Principle
	Design	The PV panels will positioned at a fixed angle between 5 to 45 degrees from horizontal.
	Design	5.3m minimum clearance shall be maintained in still and conductor swing from the National Grid OHL to the highest point of the PV Tables.
	Design	Access will be maintained to all OHL towers currently passing through the Order limits.
<i>Balance of Solar System (BoSS)</i>	Location	All BoSS plant will be located within the areas marked as Work No. 1 on the Works Plans [EN010131/APP/5.2] .
	Scale	There will be up to 143 BoSS locations.
	Scale	Approximately 1,430 string inverters are to be used, subject to detailed design. These will be distributed throughout Work No. 1. Centralised inverters would be located at the up to 143 BoSS locations.
	Scale	When the Power Conversion Unit (PCU) is enclosed in a single container, the maximum dimensions will be a maximum of 40 square metres (footprint), up to 8m in length, up to 5m in width and up to 3.5m in height.
	Scale	To avoid adverse noise effects on residential properties in close proximity to the Scheme, string inverters and Power Conversion Units would not be located within the 'PCU Exclusion Zones' as shown within ES Volume 2: Figure 11-1 [EN010131/APP/3.2] .
	Scale	If fewer BoSS locations are required, or the infrastructure requirement is reduced BoSS can be substituted for PV panels according to the parameters set out above.
	Scale	BoSS plant will not exceed 3.5m in height AGL (existing levels).
	Design	Externally finished in a colour in keeping with the prevailing surrounding environment, often with a green painted finish.
<i>Electrical cables (Work No. 5)</i>	Scale	The maximum dimensions for cable trenches are 0.8-1.2m depth and up to 1.2m wide.
	Design	Electrical cables within the Solar PV Array Works Areas will be secured to the PV Mounting Structures, the BoSS, or will be underground. No new overhead lines will be constructed.
	Design	The Solar PV Arrays will be connected by a buried cable laid at one end of a row of PV Panels. These cables will feed into larger cables (either through a junction box, string inverter, or combination of the two) and in turn will connect to a central inverter of transformer.

Element of Scheme	Parameter Type	Design Principle
Work No. 2		
<i>Battery Energy Storage System (BESS) Compound</i>	Location	The BESS Compound will be located within the areas marked as Work No. 2 on the Works Plans [EN010131/APP/5.2] .
	Scale	The BESS compound will include up to a maximum 156 battery storage containers, battery inverters, transformers, switchgear and access tracks.
	Scale	BESS to be installed in compound with a maximum footprint up to 200m x 180m.
<i>BESS Switchgear and Control Room</i>	Scale	Dimensions of BESS Switchgear and Control Room will be a maximum of 4.5m in height and 12.5m x 2.5m footprint.
<i>BESS Containers</i>	Scale	Dimensions of one BESS container will be a maximum of 4.5m in height with a 12.5m x 2.5m footprint.
	Design	The BESS will utilise a lithium ion energy storage system.
	Design	The enclosures and compounds forming part of the BESS will be white, grey or green in colour.
	Design	No component of the BESS, except the CCTV towers, will exceed 4.5m in height AGL (existing levels).
	Design	Foundations will be a concrete base or monolith plinth, with a maximum depth of 2m.
	Design	The BESS will incorporate fire detection and suppression measures including adequate provision for water storage to provide a minimum supply of 1,900 litres per minute for 2 hours.
	Design	Lighting at the BESS and on-site substation will be PIR operated (passive infra-red), calibrated to detect vehicles and personnel. Lighting at the BESS entrances and adjacent to the access track within the BESS will be operated by PIR calibrated to trigger on vehicle and personnel, with the option of manual control
	Design	Operational lighting will be directed within the Order limits i.e. not principally towards land outside the Order limits and will include features designed to reduce light spill beyond the areas required to be lit.

Element of Scheme	Parameter Type	Design Principle
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Work No. 3

<i>Onsite Substation</i>	Location	The onsite Substation will be located within the area marked as Work No 3 on the Works Plans [EN010131/APP/5.2] .
	Scale	The components of the onsite Substation will be a maximum of 13m in height AGL (existing levels).
	Scale	The substation would have up to four transformers and would have a maximum footprint will be up to 220m x 130m.
	Design	No lighting will be permanently illuminated.
	Design	Low frequency noise will be considered throughout the Front-End Engineering Design (FEED) for the substation and eliminated through design, or appropriately mitigated (isolation and attenuation measures) where appropriate.
	Design	Operational lighting will be directed within the Order limits i.e., not principally towards land outside the Order limits and will include features designed to reduce light spill beyond the areas required to be lit.

Work No. 4

<i>Grid Connection Corridor</i>	Location	The Grid Connection Corridor will comprise one 400kV cable circuit, approximately 7.5km in length.
	Scale	The Grid Connection Cables between the Onsite Substation (Work No. 3 on the Works Plans [EN010131/APP/5.2]) and Cottam Substation will be underground.
	Design	The 400kV cable trench for open trenching will be a maximum of 2.5m deep and 1.42m wide.
	Design	HDD will be used to install the 400kV cables beneath watercourses within the avoidance areas (as shown on ES Volume 3: Appendix 2-B (Figure 1) [EN010131/APP/3.3]), This will include the crossing of the WFD designated River Trent (approximate NGR SK 83100 80985), Marton Drain (approximate NGR SK 83693 81149) and Seymour Drain (approximate NGR SK 82087 80693). The HDD depth will be a maximum of 25m below the bottom of the river bed and a minimum of 2m below the bed in order to prevent risk of any scour exposing cable.

Element of Scheme	Parameter Type	Design Principle
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Work No. 5

<i>Electrical Cables</i>	Design	The maximum underground cable trench dimensions will be up to 1.2m wide and up to 1.6m below existing ground level or ditch bottom (except where other separation is required to avoid existing services, or where trenches converge at connections).
	Location	Underground cable circuits will avoid root protection areas of trees and hedgerows, except where hedgerow crossing is required.
<i>Fencing</i>	Location	Fencing and security measures will be located within the area shown as Work No. 5 on the Works Plans [EN010131/APP/5.2] .
	Scale	Fencing around the Solar PV Array Work Areas will not exceed 3m in height AGL (existing levels).
	Design	Fencing around the Solar PV Array Work Areas will be wooden post and metal stock fencing.
	Location	All fencing will be a minimum of 15m from all National Grid overhead line (OHL) tower bases.
	Design	Steel palisade security fencing with a maximum height of 2.5m AGL (existing levels) will be installed to prevent public access to the BESS Compound (Work No. 2), Onsite Substation (Work No. 3) and the office, warehouse and plant storage building (Work No. 7).
<i>Security Measures including CCTV and Lighting</i>	Scale	CCTV towers will not exceed 5m in height.
	Design	CCTV lighting will be infrared (not visible) during hours of darkness.
	Design	No lighting will be permanently operated. If required, any visible lighting will be operated by a manual switch or by a motion detection system. Infra-red lighting will be provided by the CCTV/security system to provide night vision functionality for CCTV. Lighting within the site will be manually operated and used only in fault or emergency situations.
	Design	Operational lighting will be 50W, installed to maximum height of 4m and directed downwards within the Order limits i.e., not principally towards land outside the Order limits and will include features designed to reduce spill beyond the areas required to be lit.

Element of Scheme	Parameter Type	Design Principle
	Design	Potentially visible operational lighting will not be located within 100m of residential properties.
	Design	CCTV poles, CCTV feed or weather stations will be a minimum of 30m from National Grid OHL towers to prevent potential Transient faults.
<i>Access Tracks</i>	Design	Internal access tracks will have a maximum width of 6m with the exception of the access track to the sub-station and BESS which will have a maximum width of 8m.
	Design	With the exception of the access track to the sub-station and BESS, internal access tracks (where new or upgraded) will be of permeable stone construction, with 1:2 gradient slopes on either side.
<i>Ditch Crossings</i>	Design	Ditch crossings to facilitate internal access track construction, fences and cable crossings of ditches will be upgraded (if they currently exist and require upgrading) or constructed.
	Design	The maximum extension of existing ditch crossing culverts is 2m. Where a new ditch crossing is required, both a new culvert and an open span bridge will be considered, with the type of crossing selected based on site-specific factors and in consultation with the relevant authority (generally the internal drainage board (IDB)/ lead local flood authority). Culverts/culvert extensions will be designed to maintain connectivity along watercourses for aquatic species and riparian mammals, where these are shown to be present. All culverts to convey watercourses will be set 150 mm below bed level to allow sedimentation and a naturalised bed to form, which will maintain longitudinal connectivity for aquatic fauna. Where new culverts are required, length-for-length watercourse enhancements are required in each case to mitigate the impacts, and to ensure compliance against WFD objectives.
<i>Existing and Ancient Woodland</i>	Design	A minimum buffer of 15m from the edge of all woodland (including ancient woodland) will be maintained and within which there will be no built development.
<i>Existing hedgerows with trees</i>	Design	A minimum buffer of 10m from the edge of all existing or proposed hedgerows with trees and 5m from all existing or proposed hedgerows (without trees) will be maintained and within which there will be no built development.
<i>Permissive Paths, Public Rights of Way, Cycle Routes</i>	Location	A minimum buffer of 5m from the existing public right of way will be maintained, within which there will be no built development.
<i>Diversion of existing overhead line</i>	Location	The existing 11kV overhead line will be diverted around the BESS and substation area. These works will be undertaken within Work No. 5.
<i>Signage</i>	Design	Signage will be located along PROWs and Clay Lane to inform members of the public of the BESS compound infrastructure. Signage will ensure members of the public can accurately report the nature of any fire to the emergency services.

Element of Scheme	Parameter Type	Design Principle
<i>Heritage Setting Buffer</i>	Design	No built infrastructure is to be located within the heritage setting buffer, as shown within ES Volume 2: Figure 2-4 [EN010131/APP/3.2] . Only landscaping and biodiversity enhancement is to be located within this area, as set out within the Outline LEMP [EN010131/APP/7.10]
Work No. 7		
<i>Permanent Office, Warehouse And Plant Storage Building</i>	Location	The permanent office, warehouse and plant storage building will be established within the area marked Work No. 7 on the Works Plans [EN010131/APP/5.2] .
	Scale	The permanent warehouse and plant storage building will be a maximum height of 7.2m (above ground level).
	Scale	The permanent warehouse and plant storage building will occupy a maximum footprint of 36m x 15m within Work No. 7.
	Design	External lighting will be provided by PIR (passive infra-red) operated lights calibrated to vehicles and personnel. These will be located at building entrances and to cover the parking and refuge areas. These will be PIR operated calibrated to vehicles and personnel.
Work No. 9		
<i>Habitat Management Area</i>	Location	Habitat management areas will be located as marked as Work No. 9 on the Works Plans [EN010131/APP/5.2] .