CLEVE HILL SOLAR PARK

UPDATES TO APPLICATION DOCUMENTS
OUTLINE DESIGN PRINCIPLES

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CLEVE HILL SOLAR PARK – OUTLINE DESIGN PRINCIPLES REVISION F

CLEVE HILL SOLAR PARK LTD

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1 INTRODUCTION AND SUMMARY

1. Cleve Hill Solar Park Limited ('CHSPL') is seeking to develop a solar photovoltaic array electricity generating facility and electrical storage facility at Cleve Hill, 2 km north east of Faversham and 5 km west of Whitstable on the north Kent coast, referred to as the Cleve Hill Solar Park.

2. This Outline Design Principles document ('ODP') has been prepared to accompany the Development Consent Order (DCO) application for Cleve Hill Solar Park ('the Development'). It is expected to be the subject of a Requirement of the DCO in order to prescribe the guiding principles to inform the detailed design of the Development. Assuming the DCO is granted and applications are made to the relevant local planning authority ('LPA') for approval of detailed design via discharge of a DCO Requirement, the LPA will assess those details having regard to the principles set out in this ODP and the Environmental Statement (ES) for the Development as certified by the Secretary of State.

3. It is necessary to achieve flexibility in the DCO because solar photovoltaic (PV) and battery energy storage technology is rapidly evolving and costs are reducing. CHSPL needs to make provision in the DCO for technological innovation and improvement realised at the time of procurement and construction to ensure that it can construct the Development in the most innovative and cost-effective manner. That would ultimately mean reduced cost for the consumers of the energy produced and greater power production, thus contributing to decarbonisation.

4. That flexibility has been facilitated by the adoption of the 'Rochdale Envelope' approach in the ES. This ODP defines the key design principles which reflect the worst-case scenario adopted in the environmental impact assessment that has been undertaken for the Development. Provided that the detailed design of the Development is in accordance with the key principles set out in this ODP, the conclusions of the ES will be upheld, whilst also providing for flexibility.

5. The draft DCO submitted with the application includes the following Requirement:

Detailed design approval

2.—(1) No phase of the authorised development may commence until details of—

(a) the layout;

(b) scale;

(c) proposed finished ground levels;

(d) external appearance;

(e) hard surfacing materials;

(f) vehicular and pedestrian access, parking and circulation areas;

(g) refuse or other storage units, signs and lighting;

(h) drainage, water, power and communications cables and pipelines;

(i) programme for landscaping works; and

fencing

relating to that phase have been submitted to and approved in writing by the relevant planning authority.

(2) The details submitted must accord with—

(a) the Location, Order limits and Grid coordinates plan;

(b) the works plan; and

(c) the Outline Development Principles, or such variation thereof as may be approved by the relevant planning authority pursuant to Requirement 19.

(3) The authorised development must be carried out in accordance with the approved details.

6. Safety management aspects of the Development are addressed by Requirement 3 of the DCO. Safety management information that would be specified in the detailed design would include, but not be limited to, the following, for both the construction and operation phases:

- Identification of specific hazards (e.g., chemicals use/storage, transportation of substances);
- Control measures relating to those hazards (management systems, monitoring, etc.);
- Potential risks (types of potential incidents, etc.);
- Consequence assessment;
- Incident response protocols; and
- Recording and reporting requirements.

7. These aspects would be addressed by the Battery Safety Management Plan required to address DCO Requirement 3.

1.1 Candidate Design

8. In order to allow direct comparison between the detailed design submitted in respect of Requirement 2, and the candidate design used in the ES, the candidate design from ES Chapter 5 - Development Description has been included as Appendix B. Any exceedance of those parameters must be justified in respect of the ES assessments undertaken to satisfy Requirement 2, or Requirement 19.

9. This will serve to demonstrate that the 'as built' development does not exceed the maximum adverse effect identified and assessed in the ES.

1.2 Design Principles

10. The Development is described in Chapter 5: Development Description of the ES (Document Reference: 6.1.5). It is classified as an NSIP because it comprises two generating stations each with generating capacity of over 50 MW. It may include one or more generating stations (a solar photovoltaic array and an energy storage facility) and will take place within the areas shown on the Works Plans (Document Reference: 2.2, appended here (Appendix C) for ease of reference) which will be subject to differing levels of development and/or management:

- Solar PV arrays;
- Electrical compound, comprising;
  - Energy storage facility or an extension to the solar PV arrays; and
  - Development substation;
- Electrical connection to the National Grid;
- Site access;
- Habitat management areas; and
- Flood defences.

11. The design principles which apply to the Development within these areas are set out in Table 5.1. Associated Development which may be necessary across the Development site and to which design principles apply are also included.

12. Table 5.2 sets out design principles which apply in respect of the construction phase. Construction activities are also subject other controls such as those included in:

    - Outline Construction Environmental Management Plan (Document Reference: 6.4.5.4); and
    - Outline Construction Traffic Management Plan (Document Reference: 6.4.14.1).

13. The controls in these other documents are not repeated here as they will be the subject of other Requirements of the DCO.

Table 1 Design principles

Element of Development	Parameter Type	Design Principle
Work No.1— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts comprising— (a) solar modules; (b) inverters; (c) transformers; and (d) a network of cable circuits.		
Solar PV Array Fields	Location	The solar PV array fields will be located as shown as Work No. 1 on the Works Plan (Appendix C and Document Reference: 2.2).
	Scale	The maximum area of the solar PV array fields will be as set out in Appendix A to this ODP document.
Solar PV Modules and Mounting Structures	Location	All solar photovoltaic modules will be located within the 'fields' marked as Work No. 1 on the Works Plan (Appendix C and Document Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Scale	The total area of solar PV modules in each field will not exceed the solar PV module areas set out in Appendix A and a total area of 176.3399 ha.
	Scale	The maximum height of highest part of the solar PV modules will be 3.9 m above ground level (AGL).
	Scale	The minimum height of the lowest part of the solar PV modules will be 1.2 m AGL.
	Design	The solar PV modules will slope towards the east and west.
	Design	The minimum east-west separation between the external parameters of array tables will be 2.5 m.
	Design	The minimum separation at the central ridge of the array tables will be 300 mm.
	Design	The arrangement of solar PV modules within an array table will be the same across all solar PV array fields.
	Design	The solar PV modules will be dark blue, grey or black in colour.
	Design	The mounting structures will be bare metal in appearance.
	Design	The maximum depth of piles will be 2 m below ground level.
	Design	The solar PV modules will be positioned at an angle of 8 degrees from horizontal.
	Design	A maximum of 50 pyranometers will be located across all the solar PV array fields (including any extension in Work No. 2 & 3), not less than 100 m from the Saxon Shore Way.
	Design	Crystalline silicone solar PV modules will be used.
	Design	Physically damaged solar panels will be removed within one week of the damage being detected.
Inverters	Location	All inverters will be located within the areas marked as Work No. 1 on the Works Plan (Appendix C and Document

Element of Development	Parameter Type	Design Principle
		Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Design	String inverters will be used which will be mounted beneath the solar PV modules on the solar PV module mounting structures.
Transformers	Location	All transformers will be located within the areas marked as Work No. 1 on the Works Plan (Document Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Scale	The transformers will not exceed 3 m in height AGL (except during a flood event for floating transformers).
	Design	The transformers will be resistant to flooding to a depth at least equivalent to the field flood level (+ 300 mm) above ground level as set out for each field in Appendix A.
Electrical Cabling	Design	All cable circuits within the solar PV array fields will be secured to the solar PV module mounting structures or will be underground. No new overhead lines will be constructed.
Work No.2— works comprising either: (a) an energy storage facility with a gross storage capacity of over 50 megawatts comprising— (i) energy storage; (ii) transformers; (iii) switch gear and ancillary equipment; (iv) a network of cable circuits; (v) cables connecting to Work Nos. 1 and 3; and (vi) a flood protection bund; or (b) an extension of the ground mounted solar photovoltaic generating station in Work No.1 and comprising— (i) solar modules; (ii) inverters; (iii) transformers; (iv) electrical underground cables connecting to Work Nos. 1 and 3; (v) a network of cable circuits; and (vi) a flood protection bund.		
Flood Protection Bund	Location	The flood protection bund will be located within the area marked as the electrical compound in Work No. 2 & 3 on the Works Plan (Document Reference: 2.2).
	Scale	The crest of the flood protection bund will be located at a height above ordnance datum (AOD) of not less than 5.316 m to protect against the modelled 1 in 1,000 year flood event including a simulated breach of the existing coastal flood defences (the flood modelling is provided in ES Technical Appendix A10.1 (Document Reference 6.4.10.1) and summarised in ES Chapter 10: Hydrology, Hydrogeology, Flood Risk and Ground Conditions) (Document Reference 6.1.10).
	Scale	The crest of the flood protection bund will be located at a height above ordnance datum (AOD) of not more than the highest point of the existing coastal sea defences.
	Scale	The total area of the electrical compound including the flood protection bund, Development substation and energy storage facility will not exceed 10 ha.

Element of Development	Parameter Type	Design Principle
	Design	The flood protection bund will entirely enclose the energy storage facility and the Development substation.
	Design	As much site won material from within the electrical compound area will be used to construct the bund as is reasonably practicable.
Access	Location	An internal access road will link the main site access road in Work No. 6 to the components within Work No. 2 & 3.
	Design	The access road will have a permeable surface within the electrical compound.
Energy Storage Facility	Location	The energy storage facility will be located within the area marked as Work No. 2 & 3 on the Works Plan (Appendix C and Document Reference: 2.2).
	Scale	The components of the energy storage facility will not be higher than the top of the flood protection bund.
	Design	The energy storage units will be similar in structure and finish to shipping containers, and may be of a range of finished colour, with visibility screened by the flood protection bund and planting on that bund.
	Design	The energy storage facility will incorporate fire detection and suppression measures.
Extension of Solar PV Arrays	Location	The potential extension to the solar PV arrays would be undertaken within the area marked as Work No. 2 & 3 on the Works Plan (Appendix C and Document Reference: 2.2).
	Scale	The maximum height of highest part of the solar PV modules will be 3.9 m AGL.
	Scale	The minimum height of the lowest part of the solar PV modules will be 1.2 m AGL.
	Design	The solar PV modules will slope towards the east and west.
	Design	The minimum separation between solar PV module array tables will be 2.5 m.
	Design	The minimum separation at the central ridge of the tables will be 300 mm.
	Design	The solar PV modules will be dark blue, grey or black in colour.
	Design	The solar PV module table arrangement will be the same arrangement as used in all other fields.
	Design	The mounting structures will be bare metal in appearance.
	Design	The maximum depth of piles will be 2 m below ground level.
	Design	The solar PV modules will be positioned at an angle of 8 degrees from horizontal.
	Design	Crystalline silicon solar PV modules will be used.
	Design	Physically damaged solar panels will be removed within one week of the damage being detected.

Element of Development	Parameter Type	Design Principle
and associated development within the meaning of section 115(2) of the 2008 Act comprising— **Work No.3**— a substation with works comprising— (i) a network of cable circuits; (ii) electrical underground cables connecting to Work Nos. 1 and 2 and the existing substation; (iii) construction compounds; and (iv) a flood protection bund.		
Development Substation	Location	The Development substation will be located within the area marked as Work No. 2 & 3 on the Works Plan (Appendix C and Document Reference: 2.2). The Development substation will be located in the southeast corner of the area marked as Work No. 2 & 3 on the Works Plan, in order to minimise the length of connecting cable required to the grid connection point at the existing Cleve Hill Substation.
	Scale	The components of the Development substation will be a maximum of 13.6 m in height AOD.
	Scale	The dimensions of any building (i.e., a structure with a roof and walls) forming part of the Development Substation will be limited to a maximum footprint of 1,600 m^2 (e.g., 40 m by 40 m) with a maximum height of 8.8 m AOD.
	Design	The colour of the Development substation components which extend above the flood protection bund will be in keeping with the existing Cleve Hill Substation and/or the local vernacular.
Work No.4 — works comprising— (a) a network of cable circuits; (b) construction compounds; (c) landscaping; (d) earthworks; (e) drainage; and (f) undergrounding of existing overhead line.		
Fencing and security measures including CCTV and lighting	Location	Fencing and security measures will be located within the area shown as Work No. 4 on the Works Plan (Appendix C and Document Reference: 2.2).
	Scale	Fencing and CCTV equipment will not exceed the maximum height AGL of the solar PV modules in the closest solar PV array field as set out in Appendix A.
	Design	Fencing will be installed to prevent public access to the solar PV arrays and the electrical compound.
	Design	Fencing (excluding security fencing within the electrical compound (work no. 2 and 3) and temporary stock proof fencing), will be of a "deer fence" design, with wooden post supports and metal stock fencing.
	Design	A steel palisade security fence will encircle the electrical compound within the bund at finished ground level, with

Element of Development	Parameter Type	Design Principle
		CCTV and lighting. This fence will not exceed the height of the flood protection bund (5.316 m AOD).
	Design	No lighting will be permanently operated.
	Design	Operational lighting will be directed within the order limits i.e., not principally towards land outside the order limits.
Internal access tracks	Design	The only new permanent roads within work no. 4 will be the spine road, the site access road in work no 6, and the internal access roads in work no. 2 and 3.
	Location	A spine road will be constructed within Work No. 4, broadly following the existing 400 kV overhead lines, from Work No. 6 to provide access to all parts of Work No. 1 except Fields Q/U, V, W and X.
	Design	The spine road will be located at least the minimum 'pillar of support' clearance distances specified by National Grid away from the overhead line towers on the ZV 400 kV transmission route (as referred to in Document Reference: 6.4.17.2).
	Scale	The spine road will be of running width up to 4 m, with additional passing places, spurs into adjacent fields to provide access, and a turning area at the western end.
	Design	The spine road will be of permeable stone construction.
Culverts	Design	Culverts to facilitate the spine road and fences crossing drainage ditches will be upgraded (if they currently exist and require upgrading) or constructed.
Drainage Ditches	Scale	There will be no net loss of drainage ditch length or volume.
Permissive paths / Public Rights of Way	Location	A permissive path will be created linking public right of way ZR484 (the Saxon Shore Way) with ZR488 along the alignment shown in green on the Rights of Way Plan [APP-008].
	Design	The permissive path will be constructed so as to minimise puddling, and will be a grass/stone finish.
	Design	The surface of the path ZR485 that passes through the Development site will be grassed and maintained.
	Design	The permissive path will include interpretation boards covering cultural heritage considerations including the WWII crash site.
	Implementation	Following consultation with the Kent County Council Public Rights of Way and Access Service, the Applicant will enter into a licensed permissive path agreement, with the terms and conditions to be agreed with the local highway authority.

Element of Development	Parameter Type	Design Principle
Cable circuits	Design	The maximum underground cable depth will be 2 m below finished ground level or ditch bottom (except where other separation is required to avoid existing services).
Undergrounding of existing overhead line	Location	The existing 11 kV overhead line will be removed and replaced with an underground 11 kV cable. These works will be undertaken within the Order Limits. The undergrounding will cease within the order limits, at which point the line will become overhead (as existing) before crossing outside the order limits.
Temporary Construction Compounds	Location	The main temporary construction compound will be established within the electrical compound (Work No. 2 & 3) on the site of the energy storage facility prior to installation of the energy storage infrastructure.
	Location	Small unsurfaced temporary compound with welfare facilities and storage of tools and materials will be located adjacent to the spine road (for all fields except Q/U, V, W and X) and at least 10 m away from the nearest drainage ditch (for all fields). No fuel or oil will be stored in these areas.
Work No.5— works to lay cables connecting Work No. 3 and the existing substation and works to create and maintain means of access connecting to the existing access road in Work No.7.		
Grid Connection	Location	The grid connection from the electrical compound to the existing Cleve Hill Substation will be located within the area marked Work No. 5 on the Works Plan (Appendix C and Document Reference: 2.2).
	Design	The cable between the electrical compound and the existing Cleve Hill Substation will be underground at a maximum depth of 2 m (except where other separation is required to avoid existing services).
Work No.6— works to create and maintain a means of access connecting Work Nos 1, 2 and 3 with the existing access road in Work No. 7; and **Work No.7**— works to alter and maintain the existing access road;		
Site Access	Location	For all traffic relating to construction, operation and decommissioning activities, the existing site entrance to the existing Cleve Hill Substation from Seasalter Road at NGR TR 05734 63925 will be used as marked as Work No. 7 on the Works Plan (Appendix C).
	Location	The site access road will follow the route marked as Work No. 6 and 7 on the Works Plan (Appendix C and Document Reference: 2.2) between the existing site entrance and the junction between the spine road and electrical compound access.
	Design	The site access road will be tarmacadam within work no. 6, between the existing site entrance and the electrical compound marked as Work No. 2 & 3 on the Works Plan (Appendix C).
	Design	The site access road will link to the spine road described in Work No. 4).
	Design	The site access road will be located at least the minimum 'pillar of support' clearance distances specified by National Grid away from the overhead line towers on the ZV 400 kV

Element of Development	Parameter Type	Design Principle
		transmission route (as referred to in Document Reference: 6.4.17.2).
Work No.8— works to create and maintain habitat management areas, comprising— (a) earth works; (b) means of access; and (c) drainage.		
Habitat Management Area	Location	The habitat management areas will be located as marked as Work No. 8 on the Works Plan (Appendix C).
	Design	A 1.2 m high post and wire stockproof fence will be installed alongside Cleve Hill Road. Gates will be installed to ensure continued public access via the public footpath which crosses the area, and to facilitate vehicle access for land management.
	Scale	The arable reversion habitat management area will provide a minimum of 50.1 ha of functional habitat management land for brent geese, lapwing and golden plover. The functional habitat management land will be calculated by subtracting the total area of land within 50 m of the solar PV modules and/or transformers, crest of the flood protection bund, edge of a road surface, and not within an existing designation from the total area set aside for management to the north and east of the electrical compound marked as Work No. 2 & 3 on the Works Plan (Appendix C).
	Design	The surface of the path ZR488 that passes through the Development site will be grassed and maintained and will connect with the permissive path in Work No. 4.
Work No.9 — works to maintain the existing flood defence, comprising— (a) inspection; (b) investigation (above MHWS, inclusive of trial pitting); (c) replacement of expansion joint material; (d) concrete repair (to a standard specified in BS EN 1504); (e) replacement of concrete toe beam; (f) vegetation management (including grass cutting and removal of larger vegetation); (g) replacement of loose and missing block work; (h) repair of voids; (i) fencing repair and replacement; (j) servicing outfalls; (k) cleaning outfall ancillary structures; (l) topping up of embankment crest levels at localised low spots; (m) vermin control; (n) repairs of rutting in crest; (o) repointing of jointed structures; (p) replacing modular blocks; (q) replacement of toe armour as required; (r) reinstatement of timber toe piles; (s) timber groyne plank replacement; (t) replacement of bolts on groyne;		

Element of Development	Parameter Type	Design Principle
(u) placement of timber rubbing boards on groyne; (v) localised movements of beach material; (w) cleaning/dredging of drainage ditch channels; (x) replacement of pitching where present; (y) replacement of access structures; (z) painting; and (aa) any other activities required to be undertaken which— (i) use the same materials as those on the existing flood defence; (ii) do not alter the plan form or cross section of the existing flood defence; (iii) do not provide an overall increase or reduction in flood level; and (iv) do not require excavations of beach material deeper than 1.5 metres.		
Flood Defence Maintenance	Location	Flood defence maintenance activities will be undertaken within the area marked as Work No. 9 on the Works Plan (Appendix C and Document Reference: 2.2).
	Design	Flood defence maintenance activities will include works that: • use the same materials as those present to date; • do not alter the plan form or cross section of the original defences; • do not provide an overall increase/reduction in flood level; and • do not require excavations of beach material deeper than 1.5 m. Examples of flood defence maintenance activities that satisfy the above criteria are provided in ES Chapter 5: Development Description (Document Reference: 6.1.5). If maintenance works are required that exceed these design principles, separate consents will be sought.
	Design	Flood defence works required in an emergency can be carried out without the requirement for additional consents, and are defined as activities carried out in response to any flood, or in response to the imminent risk to property (including the Development infrastructure) from flooding.

Table 2 Construction Principles

Element of Development	Parameter Type	Design Principle
Heavy Goods Vehicle (HGV) movements	Scale	HGV movements during the construction phase will not exceed 80 movements per day (e.g., 40 vehicles entering and leaving site in one day).
Phase Two – Energy Storage Facility Construction	Duration	If Phase Two is undertaken separately from Phase One, it will not exceed a total construction duration of 6 months.

APPENDIX A – FIELD DATA

Field Information		Design Principles		
Field	**Area of Field (ha)**	**Maximum Surface Area of Solar PV Modules within Field (ha)**	**Field Flood Level (+300 mm) above ground level**	**Maximum Height of Solar PV Modules Above Ground Level**
A	15.79	12.2602	1.7	3.5
B	22.01	16.8973	1.8	3.6
C	27.46	21.6970	2.1	3.9
D	16.12	12.3176	2	3.8
E	10.83	7.6567	1.7	3.5
F	11.53	8.4821	1.5	3.3
G	10.53	7.7643	1.5	3.3
H	6.54	4.8333	1.6	3.4
I	8.40	5.6659	1.7	3.5
J	0	0	N/A	N/A
K	9.54	7.4126	1.5	3.3
L	1.40	0.9667	1.2	3
M	16.27	12.3942	1.6	3.4
N	20.76	15.9593	1.5	3.3
O	18.33	14.2103	1.5	3.3
P	7.39	5.7042	1.6	3.4
Q	10.05	7.5370	1.4	3.2
R	Included with M	Included with M	1.2	3.0
S	Included with N	Included with N	1.2	3.0
T1 / T2	Included with O	Included with O	1.2 / 1.8	3.0 / 3.6
U	Included with Q	Included with Q	1.6	3.4
V	7.09	5.4171	1.4	3.2
W	3.89	2.7133	1.3	3.1
X	8.52	6.4507	1.5	3.3
Y	0	0	N/A	N/A
Z	0	0	N/A	N/A
Total	**232.45**	**176.3399**	**N/A**	**N/A**

APPENDIX B - CANDIDATE DESIGN PARAMETERS

Table references are as per Environmental Statement Chapter 5 - Development Description [APP-035].

Solar Photovoltaic Arrays

Table 5.3 Solar PV Arrays Design Parameters

Solar PV Modules Candidate Design		
Indicative Number of Solar PV Modules	884,388 See Technical Appendix A5.1, Field Data, for number of solar PV modules in each field.	
Indicative Solar PV module capacity watt peak (Wp)	395	
Indicative Solar PV Module Dimensions	Width (mm)	992
	Length (mm)	2010
	Depth (mm)	40
	Area (m^2)	1.994
Indicative Slope of Solar PV Modules from Horizontal	8 degrees	
Minimum height of flood sensitive equipment above ground level (AGL)	1.2 m See Technical Appendix A5.1, Field Data, for the lowest heights in each field.	
Maximum height of solar PV modules AGL	3.9 m See Technical Appendix A5.1, Field Data, for maximum heights in each field	
Indicative Solar PV Module Colour	Dark Blue (visualisations show RGB 37,61,109)	
Frame type	Anodized Aluminium Alloy	
Indicative Number of Pyranometers	15	
Solar PV Module Mounting Structures		
Indicative Table Width (incl. Ridge Break)	Width (east to west) (m)	24.3
Minimum Width of Ridge Break (mm)	300	
Minimum East/West Distance Between Tables (no transformers)	2.5 m	
Indicative East/West Distance Between Tables (Transformer Rows)	10 m	
Indicative Mounting Structure Material	Galvanised steel	
Indicative Foundation Type	Driven-piles	
Indicative Total number of piles	196,539 See Technical Appendix A5.1, Field Data, for number of piles per field	
Depth of piles below ground level (m)	1 to 2	

Solar PV Modules Candidate Design		
Inverters		
Indicative Number of String Inverters	3,071	
Indicative Inverter Dimensions	Height (mm)	1,075
	Width (mm)	605
	Depth (mm)	310
Transformer		
Indicative Number of Transformers	80	
Indicative Power Rating (MVA)	2.5 to 5	
Indicative Transformer Dimensions	Length (mm)	8,200
	Width (mm)	2,300
	Height (mm)	3,000
Indicative Transformer Foundation Dimensions (below ground level)	Length (mm)	10,700
	Width (mm)	5,100
	Height (mm)	2,300
Maximum ascent of platform base in flood scenario (m)	2.1	
Indicative Transformer Colour	Grey (visualisations show RGB 128,128,128)	
Electrical Cabling		
DC Cables from Solar PV Modules to Inverters and Combiners	Above ground, in racking secured to solar PV mounting structure.	
AC Cables from Inverters and Combiners to Transformers	Above ground, secured to solar PV mounting structure, and underground.	
AC Cables from Transformers to Development Substation	Underground	

Electrical Compound

Table 5.4a Electrical Compound Design Parameters

Flood Protection Bund Candidate Design	
Bund height (m above ordnance datum)	5.316
Bund Width (m)	Varies - approximately 35
Bund Materials	Predominantly site won clay and topsoil
Bund Construction	Impervious foundation (likely imported) Core trench (suitable site won material) Impermeable core (suitable site won material) Topsoil (suitable site won material)
Estimated volume of material required to create bund	75,000 m^3
Estimated volume of material expected to be won onsite	63,750 m^3

Estimated volume of material expected to be imported to form bund	11,250 m^3

Table 5.4b Energy Storage Facility Design Parameters

Energy Storage Facility Candidate Design			**Containerised Solution**
Containers	Number of Containers		300
	Approximate total energy storage capacity		630 MWh
	Cell Type		Lithium-ion
	HVAC - Heating / Cooling System		Climate Control - Chilled Water / Direct Expansion / Evaporator
	Dimensions	Length (mm)	12,200
		Width (mm)	2,438
		Height (mm)	2,890
	Foundation Type		Concrete sleepers
Inverters	Number of Inverters		90
	Cooling System		Climate Control - Chilled Water / Direct Expansion / Evaporator
	Dimensions	Length (mm)	12,200
		Width (mm)	2,438
		Height (mm)	12,200
	Foundation Type		Concrete sleepers
Controllers	Number of Controllers		N/A. The controllers are sited within the containers in the containerised solution.
	Dimensions	Length (mm)	
		Width (mm)	
		Height (mm)	
	Foundation Type		
33 kV / 415 V Transformers	Number of Transformers		130
	Dimensions	Length (mm)	4400
		Width (mm)	4100
		Height (mm)	2245

Energy Storage Facility Candidate Design		Containerised Solution
	Foundation Type	Concrete pad

Table 5.4c Electrical Compound Design Parameters

Development Substation Candidate Design			
33 kV Equipment			
33 kV Zig Zag Transformer	Number	2	
	Dimensions	Length (mm)	3700
		Width (mm)	1100
		Height (mm)	8850
33 kV Busbar Post	Number	6	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	8850
Transformer Plinth and Bund	Number	1	
	Dimensions	Length (mm)	25300
		Width (mm)	15075
		Height (mm)	N/A
400 kV Equipment			
Main Transformer, including radiators, fans, conservator and bushings	Number	1	
	Dimensions	Length (mm)	14700
		Width (mm)	7900
		Height (mm)	11085
Transformer Spare Phase	Number	1	
	Dimensions	Length (mm)	3500
		Width (mm)	3000
		Height (mm)	4800
Post Insulators	Number	9	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	7800
Tall Post Insulators	Number	24	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	12800
Busbars, per m	Number	1,137	
	Dimensions	Length (mm)	1
		Width (mm)	350
		Height (mm)	350

Development Substation Candidate Design			
Isolating and Earthing Switch	Number	24	
	Dimensions	Length (mm)	5000
		Width (mm)	500
		Height (mm)	7800
AIS Circuit Breaker	Number	12	
	Dimensions	Length (mm)	5000
		Width (mm)	600
		Height (mm)	7800
Cable sealing end	Number	6	
	Dimensions	Length (mm)	1500
		Width (mm)	1500
		Height (mm)	7800
CT	Number	9	
	Dimensions	Length (mm)	1200
		Width (mm)	1200
		Height (mm)	8600
Pantograph disconnector	Number	6	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	12800
STATCOM / Reactive Compensation			
Building	Number	4	
	Dimensions	Length (mm)	12300
		Width (mm)	10300
		Height (mm)	3000
Reactor	Number	18	
	Dimensions	Length (mm)	2500
		Width (mm)	2500
		Height (mm)	8000
Capacitor Rack	Number	6	
	Dimensions	Length (mm)	2000
		Width (mm)	2000
		Height (mm)	7500
Post Insulator	Number	12	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	7800
Tall Post Insulator	Number	6	
		Length (mm)	1000

Development Substation Candidate Design			
	Dimensions	Width (mm)	1000
		Height (mm)	12800
Pantograph Disconnector	Number	12	
	Dimensions	Length (mm)	1000
		Width (mm)	1000
		Height (mm)	12800
Cable sealing end	Number	6	
	Dimensions	Length (mm)	1500
		Width (mm)	1500
		Height (mm)	7800
Harmonic Filter			
Capacitor Rack	Number	18	
	Dimensions	Length (mm)	2000
		Width (mm)	2000
		Height (mm)	7500
Reactor	Number	18	
	Dimensions	Length (mm)	2000
		Width (mm)	2000
		Height (mm)	8000
CT	Number	12	
	Dimensions	Length (mm)	1200
		Width (mm)	1200
		Height (mm)	8600
Resistor	Number	6	
	Dimensions	Length (mm)	3500
		Width (mm)	2000
		Height (mm)	6500
Surge Arrestor	Number	6	
	Dimensions	Length (mm)	1650
		Width (mm)	1650
		Height (mm)	7800
Cable sealing end	Number	6	
	Dimensions	Length (mm)	1500
		Width (mm)	1500
		Height (mm)	7800
Deluge System			
Pumphouse	Number	1	
	Dimensions	Length (mm)	9164
		Width (mm)	2538

Development Substation Candidate Design			
		Height (mm)	2691
Tank	Number	1	
	Dimensions	Length (mm)	8000
		Width (mm)	8000
		Height (mm)	3000
Site Office, Storage and Welfare and Diesel Gensets			
Site Office, Storage and Welfare Building	Number	1	
	Dimensions	Length (mm)	20200
		Width (mm)	19300
		Height (mm)	4770
Diesel Genset	Number	3	
	Dimensions	Length (mm)	3100
		Width (mm)	1200
		Height (mm)	1630

Grid Connection

Table 5.5 Grid Connection to the National Grid Design Parameter

Grid Connection to the National Grid	
Indicative number of 400 kV circuits	1
Conducting cores forming the 400 kV circuit	3
Number of trenches	1
Approximate trench depth (m)	1.4
Approximate trench width (m)	1.3
Approximate length of cable system between edge of electrical compound and NGET substation building (m)	200

Site Access

Table 5.6 Site Access Design Parameters

Site Access Candidate Design		
Tarmacadam Access Road		**Southern Route**
	Length of existing tarmac road utilised (m)	1,068
	Length of new tarmac road created (m)	503
	Total length of finished tarmac road (m)	1,571
	Width of new tarmac road (m)	4 to 7.25 (+ passing places)

Site Access Candidate Design		
	Area of new tarmac road (m^2)	3,654
	Estimated volume of road material required (m^3)	9,160
Stone Spine Road	Length of new stone road created (m)	2,160
	Width of new stone road (m)	4 (+ passing places)
	Area of new stone road (m^2)	12,100
	Estimated volume of stone required (m^3)	6,713

Habitat Management Area

Table 5.7 Habitat Management Area Design Parameters

Habitat Management Areas Candidate Design		
Arable Reversion (AR HMA)	Size (ha)	55.5
	Primary Purpose	To mitigate for the loss of foraging and roosting habitat for overwintering birds on the arable land within the Development site by managing the land as a grassland habitat designed to consistently support overwintering birds.
	Summary of Management Prescriptions	The management of the mitigation grassland has been agreed with Natural England to be focussed on provision of optimal foraging conditions for brent goose. This will involve summer grazing by cattle and/or sheep, application of organic fertiliser (e.g. farmyard manure) equivalent of up to 50 kg N per hectare and late summer/autumn cutting if required to provide a nutritious, short-sward grassland capable of supporting 2,097 goose-days per hectare through the winter. The establishment and effectiveness of the HMA will be monitored. It is agreed to continue ongoing consultation with the HMSG through the construction and operational phases of Development.
Freshwater Grazing Marsh (FGM HMA)	Size (ha)	36.6
	Primary Purpose	To provide support to the landowner for the ongoing management of the SSSI land to complement the management of the adjacent arable reversion land.
	Summary of Management Prescriptions	Water, drainage and grazing management in consultation with the HMSG and the landowner.
Graveney Hill Lowland Grassland Meadow (LGM HMA)	Size (ha)	13.3
	Primary Purpose	To provide a different range of biodiversity enhancements relating to ground nesting birds, small mammals, birds of prey, pollinators etc. in a

Habitat Management Areas Candidate Design		
		publicly accessible area of the Development site (crossed by public footpath ZV488).
	Summary of Management Prescriptions	Establishment of a diverse grassland sward and managed grazing to encourage a lowland meadow habitat to establish.
Existing Cleve Hill Substation complementary management (CHS HMA)	Size	2.0
	Primary Purpose	To influence the management of habitats adjacent to other habitat management areas to be complementary to the adjacent management.
	Summary of Management Prescriptions	Unknown, likely related to mowing / grazing frequency and encouraging floristic diversity.

Flood Defence Maintenance

Table 5.8 Flood Defence Maintenance Design Parameters

Flood Defences Candidate Design		
Examples of Flood Defence Maintenance activities have been agreed with the Environment Agency and the Marine Management Organisation, and included within the design principles definition (non-exhaustive)	(i)	Inspection
	(ii)	Investigation (above MHWS, inclusive of trial pitting)
	(iii)	Replacement of expansion joint material
	(iv)	Concrete repair (to BS EN 1504)
	(v)	Replacement of concrete toe beam
	(vi)	Vegetation management (grass cutting, removal of larger vegetation)
	(vii)	Replacement of loose and missing block work
	(viii)	Repair of voids
	(ix)	Fencing repair / replacement
	(x)	Servicing outfalls
	(xi)	Cleaning outfall ancillary structures
	(xii)	Topping up of embankment crest levels at localised low spots
	(xiii)	Vermin control
	(xiv)	Repairs of rutting in crest
	(xv)	Repointing of jointed structures
	(xvi)	Replacing modular blocks
	(xvii)	Replacement of toe armour as required
	(xviii)	Reinstatement of timber toe piles (on river frontage)
	(xix)	Timber groyne plank replacement
	(xx)	Replacement of bolts on groyne
	(xxi)	Placement of timber rubbing boards on groyne
	(xxii)	Localised movements of beach material
	(xxiii)	Cleaning/dredging of drainage ditch channels
	(xxiv)	Replacement of pitching where present
	(xxv)	Replacement of access structures

Flood Defences Candidate Design		
	(xxvi)	Painting
	(xxvii)	Any other activities required to be undertaken within the four parameters set out in the Outline Design Principles document.
Emergency Works		

Other Infrastructure

Table 5.9 Other Infrastructure Design Parameters

Other Development Candidate Design		
Fencing	Length of Perimeter Fencing (km)	15
	Fence Type	Deer Fence Treated wooden poles Stock netting
	Fence Height (m AGL)	2
CCTV	Number of CCTV Cameras	240
	Support Column Details	100 mm box section galvanised steel column or wooden pole
	Camera Height (m AGL)	3
	Camera Position	1 m inside the fence boundary
	CCTV Lighting	Infrared outside daylight hours (not visible light)
Lighting	Solar PV Array transformers	Manually operated lighting PIR motion sensor activated security / emergency lighting.
	Electrical Compound	Manually operated lighting Passive infra-red (PIR) motion sensor activated security / emergency lighting.

APPENDIX C – WORKS PLAN (WITH FIELD REFERENCES)

CLEVE HILL SOLAR PARK

ARCUS

- Order Limits

Work Number

- Work No. 1
- Work No. 2 and 3
- Work No. 4
- Work No. 5
- Work No. 6
- Work No. 7
- Work No. 8
- Work No. 9

Work No. 1 A
Work No. 1 B
Work No. 1 C
Work No. 1 D
Work No. 1 E
Work No. 1 F
Work No. 1 G
Work No. 1 H
Work No. 1 I
Work No. 1 K
Work No. 1 L
Work No. 1 M
Work No. 1 N
Work No. 1 O
Work No. 1 P
Work No. 1 Q
Work No. 1 R
Work No. 1 S
T1
T2
Work No. 1 U
Work No. 1 V
Work No. 1 W
Work No. 1 X
Work No. 4
Work No. 9
Work No. 8
Work No. 2 and 3
Work No. 7
Work No. 5
Work No. 6

West Area Plan - Figure 2

East Area Plan - Figure 3

0 100 200 m

1:5,000 Scale @ A1

NORTH

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Checked By: MB	Date: 13/11/2019

Outline Design Principles- Key Plan
Figure 1

Cleve Hill Solar Park

P:\Projects\Environment\Environment EIA\2238 Cleve Hill Works Plans.aprx\2238-PUB-088 Outline Design Principles - Overview

CLEVE HILL
SOLAR PARK

ARCUS

Order Limits

Work Number

Work No. 1

Work No. 4

Work No. 9

Work No. 9

Work No. 1
A

Work No. 1
B

Work No. 1
C

Work No. 1
D

Work No. 1
E

Work No. 1

Work No. 1
L

Work No. 4

Work No. 1
K

Work No. 1
M

Work No. 1
N

Work No. 1
O

Work No. 1

Work No. 1
R

Work No. 1
S

T1

0 50 100 m

NORTH

1:2,500 Scale @ A1

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Outline Design Principles- West
Figure 2

Cleve Hill Solar Park

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CLEVE HILL SOLAR PARK

ARCUS

Order Limits

Work Number

- Work No. 1
- Work No. 2 and 3
- Work No. 4
- Work No. 5
- Work No. 6
- Work No. 7
- Work No. 8
- Work No. 9

Work No. 9
Work No. 8
Work No. 1
H
F
I
E
G
Work No. 2 and 3
Work No. 7
Work No. 6
Work No. 5
P
O
Q
U
T2
T1
Work No. 4
V
W
X

1:2,500 Scale @ A1

0 50 100 m

NORTH

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Outline Design Principles- East
Figure 3

Cleve Hill Solar Park

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