

The Great Grid Upgrade

Eastern Green Link 5 (EGL 5)

Preliminary Environmental Information Report

Volume 2

Part 1

Appendix 5.A Outline Register of Design Measures

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5.A. Outline Register of Design Measures

5.A.1 Introduction

- 5.A.1.1 As described in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**, environmental measures are split into three categories and include avoidance, best practice, and design commitments, which are classified into ‘design measures’, and ‘control and management measures’ (referred to collectively as ‘environmental measures’). The design measures are defined as modifications to the location, design or operation of the English Onshore Scheme and English Offshore Scheme (together referred to as ‘the Project’) made during the pre-application phase that are an inherent part of the Project.
- 5.A.1.2 These measures may have been identified through the preliminary Environmental Impact Assessment (EIA) process to avoid or reduce potential significant effects that may otherwise be experienced during construction and, operation and maintenance of the Project. For example, anything that has been added to the design purely to mitigate an effect such as landscape planting. The EIA will continue to influence the design, whereby environmental measures may be embedded into the design, to help avoid and reduce potential significant effects arising from the Project.
- 5.A.1.3 This appendix sets out the design measures that have been identified for the Project through the preliminary environmental assessments presented in the Preliminary Environmental Information Report (PEIR) to avoid or reduce potential significant effects. Compliance with these measures will be secured via the Development Consent Order (DCO) and will be kept under review (along with the proposed securing mechanism) as the design of the Project develops and confirmed within the application for development consent.
- 5.A.1.4 This appendix should be read alongside the following chapters presented in **Volume 1**:
- **Part 1, Chapter 1: Introduction;**
 - **Part 1, Chapter 4: Description of the Project;** and
 - **Part 1, Chapter 5: PEIR Approach and Methodology.**

5.A.2 Mitigation measures

- 5.A.2.1 **Table 5.A-1, Table 5.A-2 and Table 5.A-3** present the design measures that have been identified during the assessment of preliminary environmental effects process as being necessary to avoid or reduce potential significant impacts on the environment. This report focuses on design measures embedded during the design and operation phases. **Volume 2, Part 1, Appendix 5.B: Outline Code of Construction Practice (CoCP)** identifies the mitigation measures to be implemented during the construction phase for the English Onshore Scheme. **Volume 2, Part 1, Appendix 5.C: Outline Construction Environmental Management Plan (CEMP)** identifies the mitigation measures to be implemented during the construction phase for the English Offshore Scheme.
- 5.A.2.2 These design measures have been identified in the PEIR topic chapters as being required and will be kept under review (along with the proposed securing mechanism) and confirmed within the application for development consent.
- 5.A.2.3 Measures listed in **Table 5.A-1, Table 5.A-2 and Table 5.A-3** have been assigned references, for example AS01. Mitigation measures will be split between the English Onshore Scheme and English Offshore Scheme, as described in **Volume 1, Part 1, Chapter 4 Description of the Project**. These align with the references provided in each aspect chapter included in the following parts:
- **Volume 1, Part 2, English Onshore Scheme;**
 - **Volume 1, Part 3, English Offshore Scheme;** and
 - **Volume 1, Part 4, Project Wide Scheme.**
- 5.A.2.4 Any references identified with ID MT or OMT (for example, MT01 or OMT01) include measures which may also be listed in other aspects considered as part of this PEIR therefore have been identified as measures which apply to multiple but not all aspects. OMT refers to measures relevant across multiple English Offshore Scheme topics. For ease of cross-reference, the general measures that may apply across all aspects considered in the PEIR, has been assigned a reference number, for example (GG01).

Table 5.A-1 – English Onshore Scheme Design Measures

Ref	Description of design measures
General Commitments	
GG01 (D)	The English Onshore Scheme would be designed to comply with design safety standards including National Electricity Transmission System Security and Quality of Supply Standards and the suite of National Grid policies and processes which contains details on design standards required to be met when designing, constructing and operating its project.
Multiple Topic Commitments	
MT01 (D)	The English Onshore Scheme design would be compliant with the policy framework for electric and magnetic fields set out in the National Policy Statement (NPS) for Electricity Networks Infrastructure (EN-5), which requires compliance with relevant Government Electromagnetic Field (EMF) policy, exposure guidelines and

Ref	Description of design measures
	<p>associated Codes of Practice. Compliance with these detailed guidelines is demonstrated through the EMF Study presented in Volume 2, Part 1, Appendix 4.A Electromagnetic Field (EMF) Study.</p>
MT02 (D)	<p>Watercourse diversions are proposed to be avoided wherever possible, unless absolutely necessary and agreed with the key stakeholders. Watercourse diversions, where they are unavoidable (namely at the converter station site), will be designed to mimic natural fluvial form and function and maintain passage / connectivity for aquatic species, where applicable.</p>
MT03 (D)	<p>The English Onshore Scheme would be designed to comply with appropriate design specifications. Specifically, at sensitive crossing locations (e.g., main rivers / Water Framework Directive (WFD) watercourses), temporary bridges would be used in preference to culverts for construction access and any permanent crossings would be bridges. Where temporary culverting of sensitive watercourses would be required, these would either be arch culverts, leaving the natural bed undisturbed, or they would be box culverts, installed with the invert set below the natural bed level for a semi-natural bed to establish within the culvert, where practicable.</p> <p>Where required, culverts would be orientated to reduce culvert lengths to a practicable minimum and avoid narrowing of natural channel width to maintain fish passage and allow light to penetrate.</p> <p>Where required, culvert design should seek to meet the criteria specified in the Institute of Fisheries Management (IFM) Fish Pass Manual. This is to ensure the culvert could, in theory, be passed by fish known to be present. Where practical, culverts should seek to reduce the impacts on aquatic species by using designs that simulate natural channel conditions, for example, by providing roughened beds, baffles, and refuge areas (such as masonry with cavities) through long culverts, or those with steep (>2 percent (%)) gradients. This is to encourage fish movement through long culverts, or over steep gradients.</p> <p>Culvert design on other watercourses would be subject to the watercourse characteristics and would be agreed with the relevant authority.</p> <p>Drainage design and surface water runoff systems including basins, sustainable drainage systems (SuDS) and outfalls should be designed in order to prevent the ingress of fish from existing watercourses. This is to prevent fish species from becoming entrained / entrapped during low flow and drought conditions.</p>
MT04 (D)	<p>Where appropriate, trenchless crossing methods (such as HDD) would be used at sensitive locations (for example the landfall and main rivers) to avoid or reduce impacts during construction.</p> <p>Where a main river is crossed by a trenchless crossing, the cables would be laid at least 1 m below the hard bed level of the river and would remain at or below this level for a distance of not less than 3 m from the brink of the riverbank before rising at a slope no greater than 1 m vertical in 1.5 m horizontal. Marker posts shall also be positioned on each bank of the river to indicate the location of the under-crossing and the nature of the works.</p>
Ecology and Biodiversity	
B01 (D)	<p>Where practical, sensitive habitats including statutory and non-statutory designated sites, ancient woodland and Habitats of Principal Importance (HPI) have been avoided by design (siting and alignment) of the English Onshore Scheme. At</p>

Ref	Description of design measures
	<p>discrete locations, should these emerge during the design process, avoidance would also be sought when micro-siting the likely working areas. This measure would be updated with specific details, with micrositing or other actions of avoidance (as required) overseen on site by the Ecological Clerk of Works (ECoW).</p>
B02 (D)	<p>Where a haul road intersects a linear habitat feature (including hedgerows, tree lines, woodland strips, watercourses, ditches), the width of the haul road would be reduced to a width sufficient for a single vehicle, where practicable, with passing places either side of the linear feature. This approach will be adopted as part of the haul road design specification.</p> <p>In addition, where a linear habitat feature is crossed by the English Onshore Scheme, topsoil and subsoil bunds would be placed within the adjacent fields either side of (rather than across) the linear habitat feature to reduce the length of the linear habitat feature impacted by construction. This design principle will be captured within the Soil and Aftercare Management Plan.</p>
B03 (D)	<p>In relation to design associated with operational lighting at permanent infrastructure, a suitable lighting design will be developed with consideration of best practice guidance on lighting with regards to bats, as published by the Institution of Lighting Professionals (ILP) & Bat Conservation Trust (BCT) (Ref 6.10). This would include:</p> <ul style="list-style-type: none"> ● Avoidance of direct lighting of bat roosts (or features that may potentially support a bat roost); ● Positioning of lighting columns away from habitats of value to foraging and commuting bats (hedgerows, trees) to ensure there is minimal light spill onto such areas; ● Minimisation of light spill using directional and / or baffled lighting; ● Reducing the height of lighting columns to reduce light spill onto adjacent habitats, where possible; and ● Avoid use of blue-white short wavelength lights and high ultra-violet content.
B04 (D)	<p>Where watercourses are to be crossed by construction traffic, measures that would be applied include the use of temporary culverts or temporary spanned bridges. The design (type and size) of any temporary culvert or bridge would be informed by baseline and / or future pre-construction surveys to maintain connectivity for water vole. Where water vole are confirmed as present, a clear span bridge / box-shaped culvert (or similar) would be implemented. The temporary culvert design would be discussed and agreed in advance with the ECoW.</p> <p>The haul road design specification would be informed by baseline water vole surveys. It will outline the design principles for the haul road pertaining to water vole presence, which could also be applied reactively in response to the results of pre-construction or construction monitoring surveys.</p>
B05 (D)	<p>Repair and maintenance work would be subject to appropriate ecological assessment to safeguard biodiversity. This will involve, as a minimum, engagement with a suitable experienced ecologist in advance to discuss the proposed works and determine the potential need for ecological survey, engagement with third parties (for example where works may be in proximity to a designated site), mitigation and species licensing. The suitably experienced ecologist will then advise the Applicant</p>

Ref	Description of design measures
	<p>on the appropriate course(s) of action to follow. Where required, the proposed works would be undertaken under the supervision of an ECoW, employing similar mitigation measures (where relevant and appropriate) to those identified for the construction phase.</p>
Cultural Heritage	
CH01 (D)	<p>Designs have kept potentially significant effects to a minimum.</p> <p>Selection of indicative zone for the underground cable route and detailed consideration of the English Onshore Scheme's placement has been undertaken to avoid as far as possible direct impacts on designated heritage assets and to minimise change to setting.</p> <p>Planting (once established) to visually screen elements of the English Onshore Scheme, for example the converter station, to reduce potential adverse effects on the setting of heritage assets. Elements on planting will be detailed further within the LEMP, secured via the DCO.</p>
CH02 (D)	<p>Selection of Indicative Cable Route and detailed consideration of the placement of the English Onshore Scheme has been undertaken to avoid, as far as possible, and to minimise change to sensitive historic landscape features.</p>
Landscape and Visual	
LV01 (D)	<p>As the key components of the English Onshore Scheme comprise a cable corridor, with land use restored after completion, the mitigation will focus on reinstatement and consideration of potential enhancements along the High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) corridors.</p> <p>An Outline Landscape Strategy will be prepared for the converter station, encompassing a collaborative approach to delivering landscape and biodiversity mitigation as well as biodiversity net gain (BNG). It will be developed in recognition of local landscape policies and character, considering opportunities to enhance local landscape and biodiversity, and will continue to be developed as part of the iterative design and assessment process.</p>
LV02 (D)	<p>The design of the converter station, including the building form and external materials, will be developed through consultation and stakeholder feedback. Landscape architects will also feed into the development of the design, drawing on best practice examples from the industry and using professional judgement. A Design Code for these buildings will be provided with the application for development consent, providing guidance on the design intent and principles to be adopted and embedded in the detailed proposals for this structure.</p>
LV03 (D)	<p>A five-year aftercare period will be established for all reinstatement and mitigation planting.</p>
Water Environment	
W01 (D)	<p>Suitable flood resilience and surface water drainage provisions would be embedded within the design for any operational Above Ground Infrastructure (AGI) in line with national and local policy, and guidance requirements of the relevant Lead Local Flood Authority (LLFA).</p>

Ref	Description of design measures
	<p>Where new permanent areas of impermeable land cover are created, the drainage design will be in accordance with the requirements of the relevant Internal Drainage Board, in addition to the Lincolnshire County Council (2025) Guidance for developers: Carbon Management Plan (CMP) and SuDS method statement and will include allowances for climate change in accordance with current (May 2022) Environment Agency requirements. The drainage infrastructure will provide the storage necessary to achieve discharges at greenfield rates and will not significantly alter groundwater recharge patterns by transferring a significant recharge quantity from one catchment to another. A specialised drainage contractor will review the designs and will provide advice to NGET and its contractor during relevant construction and reinstatement activities.</p> <p>The converter station drainage system will be designed to accommodate runoff from the 1 in 100 year storm, inclusive of the recommended 40% allowance for climate change.</p>
W02 (D)	<p>In discussion with the Environment Agency, where placement of AGI cannot avoid floodplains, measures to mitigate flood risk effects (as far as possible) would be provided.</p>
W03 (D)	<p>Where works are proposed to cross beneath flood defences, appropriate construction methodologies would be adopted. The Contractor would agree with the relevant party any relevant monitoring requirements to ensure no effects on their integrity.</p>
W04 (D)	<p>Temporary culverts would be sized appropriately to ensure the watercourse's capacity is maintained and to prevent any local constriction of the flow, and maintain natural riverine connectivity throughout the year, at both high and low flows and kept free from debris. The inlets and outlets of culverts will be designed such that there is no edge or disruption to flow into or out of the culvert. They will also be designed to maintain natural slope/water velocities and have buried inlet/outlets. For crossings of smaller ditches, these culvert design criteria may be varied, in agreement with the relevant authority (Internal Drainage Board/Lead Local Flood Authority).</p>
W05 (D)	<p>Temporary bridges on Environment Agency main rivers will be designed with soffits that are raised 600 mm above the flood level in accordance with Environment Agency requirements and appropriate design specifications and will be set back 8 m (or distance otherwise agreed with the Environment Agency) from the river's edge. Appropriate flood levels would be agreed with the Environment Agency and specified in the Flood Risk Activity Permit applications for these structures. On navigable waterways, bridges would be of sufficient size and designed these requirements agreed with the navigation authority.</p>
W06 (D)	<p>Where the underground cables cross IDB watercourses 3 m clearance below the hard bed of the watercourse would be maintained and a 10 m clearance from top of bank and any construction activity where feasible.</p>
W07 (D)	<p>Surface water runoff from operational above ground infrastructure would be managed in accordance with the requirements and standards of the relevant Lead Local Flood Authorities and adopt suitable sustainable drainage techniques.</p>

Ref	Description of design measures
W08 (D)	Permanent drainage systems shall be designed to accommodate runoff from the 1 in 100 year storm, inclusive of the recommended 40% allowance for climate change (in accordance with Environment Agency guidelines).
W09 (D)	Temporary drainage system shall be designed to accommodate runoff from the 1 in 10 year storm as a minimum with no allowances for climate change uplift.
W10 (D)	Where new or additional surfacing may be required on any access tracks and compound areas, permeable surfaces and materials would be used where practicable and where ground conditions allow. The English Onshore Scheme would incorporate appropriate surface water drainage measures into its final design for the haul roads and access tracks so that they do not lead to a significant increase in flood risk.
W11 (D)	The converter station would be constructed with finished floor levels above the 1 in 1,000 year flood level, with an allowance for climate change and an additional freeboard allowance to be confirmed as part of the pre-construction assessment.
W12 (D)	Where there are temporary or permanent works within the defended floodplain of tidally dominated watercourses, provision of floodplain compensation storage is not required.
Geology and Hydrogeology	
GH01 (D)	Mitigated through assessment of ground investigation data and through engineering design (in accordance with the relevant building regulations).
GH02 (D)	A simple assessment, based on a conceptual model approach, is to be undertaken and reported within the Environmental Statement (ES). The results from this will identify any related risks and these will be discussed with the Environment Agency.
GH03 (D)	Good practice measures to be employed in the design of relevant trench sections to impede potential drainage, e.g., insertion of barriers.
Agriculture and Soils	
AS01 (D)	The design will be rationalised to minimise the total quantum of land required as far as practicable.
Traffic and Transport	
TT01 (D)	All changes to the highway are to be designed in accordance with appropriate design guidance ensuring they are to standard.
Noise and Vibration	
NV01 (D)	Proposed above ground infrastructure and underground infrastructure will be designed such that noise and vibration from their normal operation is mitigated to a minimum in line with the aims of the Noise Policy Statement for England (NPSE), National Policy Statement for Energy (EN-1) (NPS EN-1) and in the context of sustainable development. Sourcing equipment and defining mitigation requirements (such as noise enclosures etc.) within the proposed converter station in accordance with NGET technical

Ref	Description of design measures
	specifications which include requirements regarding audible noise and confirmation by type testing and sample testing.
Air Quality	
	No design measures specific to this topic have been identified at this stage.
Socio-economics, Recreation and Tourism	
	No design measures specific to this topic have been identified at this stage.
Health and Wellbeing	
	No design measures specific to this topic have been identified at this stage.

Table 5.A-2 – English Offshore Scheme Design Measures

Ref	Description of design measures
Multiple Topic Commitments	
OMT01 (D)	The Intertidal Zone would be crossed by a trenchless technique to avoid disturbance to intertidal sediments and habitats.
OMT02 (D)	The trenchless construction technique exit will be below the 3 m Lowest Astronomical Tide (LAT) depth contour.
OMT03 (D)	The cables shall be buried in the seabed, except in areas where burial is not possible e.g. where ground conditions do not allow or at infrastructure crossings.
OMT04 (D)	External cable protection features would only be installed where considered necessary for the safe operation of the English Offshore Scheme. This includes the repair of cables due to accidental damage, where target burial depth is not achieved and at infrastructure crossings.
OMT05 (D)	In sites designated for benthic features, external cable protection materials would be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter as the receiving environment should be used as an alternative to the current normal approach of using terrestrially sourced granite, where feasible).
OMT06 (D)	HVDC poles would be bundled to minimise the effects of Electromagnetic Fields (EMF).
OMT07 (D)	Designated (and as minimal as possible) anchoring areas and protocols shall be employed during marine operations to minimise physical disturbance of the seabed.
OMT08 (D)	No cable burial trial trenching will be undertaken within the Holderness Offshore Marine Conservation Zone, unless otherwise agreed in writing by the MMO.
OMT09 (D)	A Cable Burial Risk Assessment (CBRA) will be undertaken to identify appropriate target depth of burial based on geology, water depths and Automatic Identification System (AIS) data. A risk based burial approach will be used, assessing external cable protection risk factors such as sediment type, shallow geology, sediment mobility, fishing activity, shipping movements and anchor deployment along the route.
Coastal and Marine Physical Processes	
MPP01 (D)	Sediment displaced for exit pits and cable installation (sandwave clearance and trenching) will be side cast / locally placed or dispersed to maintain sediment within the local system to facilitate recovery to baseline conditions.
MPP02 (D)	The profile of rock berms used for external cable protection would be designed to minimise the potential for scour to occur as much as possible (including alignment with flow and profiling).

Ref	Description of design measures
Intertidal and Subtidal Benthic Ecology	
BE01 (D)	Any material introduced into the marine environment, such as rock protection material, will be from a suitable source or cleaned to ensure no marine invasive non-native species (MINNS) can be introduced.
Fish and Shellfish	
No design measures specific to this topic have been identified at this stage.	
Intertidal and Offshore Ornithology	
No design measures specific to this topic have been identified at this stage.	
Marine Mammals and Marine Reptiles	
No design measures specific to this topic have been identified at this stage.	
Shipping and Navigation	
SNV01 (D)	External cable protection features would only be installed where considered necessary for the safe operation of the English Offshore Scheme in line with Marine Guidance Note 654 Safety of Navigation: OREIs – Guidance on UK navigational practice, safety and emergency response.
Commercial Fisheries	
CF01 (D)	Where rock protection is used for external cable protection, consideration will be given to design that minimise the risk of fishing gear snagging (i.e., use of 1:3 profiles).
Other Marine Users	
No design measures specific to this topic have been identified at this stage.	
Marine Archaeology	
No design measures specific to this topic have been identified at this stage.	

Table 5.A-3 - Project-wide Design Measures

Ref	Description of design measures
Greenhouse Gases	
GHG01	<p>The Project would consider a range of design optimisation measures to reflect the carbon reduction hierarchy (detailed below and found in clause 6.1.4 of PAS 2080:2023:</p> <ul style="list-style-type: none"> • Reduce the number of elements required for the Project; • Reduce the requirement for construction materials by smart design; • Substitute-in and use alternative raw materials and resources with lower embodied carbon; and • Efficient construction processes, such as embracing design for manufacture and assembly.
GHG02	<p>The Project will maximise the opportunity to use more sustainable materials by specifying, in procurement documentation, that materials and products with reduced embodied carbon emissions, and materials / resources featuring recycled content (where safe and of sufficient integrity for engineering).</p>
GHG03	<p>Designing, specifying and constructing the Project with a view to maximising the operational lifespan and minimising the need for maintenance and refurbishment (and thus reducing the frequency of releasing associated Greenhouse Gas (GHG) emissions).</p>
GHG04	<p>The Project's ancillary infrastructure and equipment (such as lighting and telecommunications) will comply with the relevant design standard and specifications and will be selected for its durability and energy efficiency credentials.</p>
GHG05	<p>All design decisions to be framed by the six principles of circular economy set out in BS8001:2017. Resource Efficiency targets will include diversion of 100% of avoidable waste streams from landfill and a minimum overall recycling rate of at least 80% as well as an average recycled content by value of 30% for applicable construction materials.</p>
GHG06	<p>To meet NGET's environmental commitment to a 50% reduction in Sulphur Hexafluoride (SF₆) emissions from a 2018/19 baseline by 2030, and environmental ambition to eliminate SF₆ equipment by 2050, the procurement of new SF₆ equipment is no longer acceptable. Where use of SF₆-free technology for a specific application is not technically viable, or is commercially restrictive, a deviation shall be sought as an exceptional case.</p>

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