East Anglia ONE North and East Anglia TWO Offshore Windfarms

Deadline 3 Project Update Note

Applicants: East Anglia ONE North Limited and East Anglia TWO Limited
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Applicable to East Anglia ONE North and East Anglia TWO

Revision Summary				
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Description of Revisions			
Rev	**Page**	**Section**	**Description**
01	n/a	n/a	Final document submitted to Examination at Deadline 3

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Glossary of Acronyms

AOD	Above Ordnance Datum
DCO	Development Consent Order
EDR	Effective Disturbance Range
MMMP	Marine Mammal Mitigation Protocol
SPA	Special Protection Area

Glossary of Terminology

Applicants	East Anglia TWO Limited / East Anglia ONE North Limited
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia TWO project	The proposed project consisting of up to 75 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia TWO / East Anglia ONE North project Development Consent Order but will be National Grid owned assets.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia TWO / East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia TWO / East Anglia ONE North project Development Consent Order.
Construction, operation and maintenance platform	A fixed structure located within the windfarm area, housing or incorporating temporary accommodation, landing ports for vessels and helicopters, standby electricity generation equipment, marking and lighting and other equipment facilities to assist in the co-ordination of marine activities related to the authorised development
Offshore electrical platform	A fixed structure located within the windfarm area, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Offshore platform	A collective term for the construction, operation and maintenance platform and the offshore electrical platforms.
Onshore substation	The East Anglia TWO / East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.

1 Project Update Note

1. This project update note has been prepared by East Anglia TWO Limited and East Anglia ONE North Limited (the Applicants) to provide details of key project updates for the East Anglia TWO project and East Anglia ONE North project (the Projects) and their Development Consent Order (DCO) applications (the Applications).

2. This project update note supplements the ***Project Update Note*** (REP2-007) submitted at Deadline 2.

3. This document is applicable to both the East Anglia ONE North and East Anglia TWO applications, and therefore is endorsed with the yellow and blue icon used to identify materially identical documentation in accordance with the Examining Authority's procedural decisions on document management of 23rd December 2019. Whilst for completeness of the record this document has been submitted to both Examinations, if it is read for one project submission there is no need to read it again for the other project.

2 Onshore Update

2.1 Onshore Substations

2.1.1 Overview

4. Since submission of the Applications, the Applicants have undertaken further engagement with their design teams and supply chain regarding the design of the onshore substations in order to seek to reduce the visual impact and provide greater certainty on the maximum visual envelope of the onshore substations and National Grid substation.

5. This has been achieved through:

   a) A reduction in the onshore substation maximum building and external electrical equipment heights specified within the updated ***draft DCO*** (document reference 3.1) submitted at Deadline 3 (***Section 2.2*** below);

   b) Refinement of the estimated finished ground levels of the onshore substations and National Grid substation (***Section 2.3*** below); and

   c) The combination of a) and b) above, has provided the Applicants with sufficient certainty in the design to confirm the maximum vertical datum height (expressed in meters Above Ordnance Datum) of the onshore substations and the National Grid substation ***(Section 2.4*** below). This will be incorporated within an updated ***Outline Onshore Substation Design***

Principles Statement (APP- 585) and an updated ***Outline National Grid Substation Design Principles Statement*** (REP1-046) which will be submitted at Deadline 4.

6. With the above approach, the Applicants retain the necessary flexibility at the detail design stage of the Projects to deliver the Projects within the maximum visual envelope (and indeed reduce this further where practicable) whilst ensuring the maximum building, external equipment and lightning protection mast heights specified within the draft DCO are not exceeded.

2.1.2 Onshore Substation Height Reductions

7. Further review of the project design envelope and early supply chain engagement has allowed the Applicants to reduce the height of the buildings and external equipment within the onshore substations. It has not been possible at this stage to reduce the heights of buildings or external equipment within the National Grid substation as National Grid has not yet progressed their design from that submitted with the Applications.

8. In undertaking this review, the Applicants have committed to the revised maximum building and external equipment heights presented in ***Table 2.1*** below (heights presented are above finished ground level):

Table 2.1 Revised Building and External Equipment Heights

Building / External Equipment	Building or External Equipment Height Presented within the Applications	Revised Maximum Building or External Equipment Height Committed to at Deadline 3	Notes
Harmonic filters	18m	**14m**	4m reduction in maximum height achieved
Statcom building	15m	**12m**	3m reduction in maximum height achieved
GIS building	15m	**14m**	1m reduction in maximum height achieved
Lightning protection masts	25m	**20m**	5m reduction in maximum height achieved

9. The maximum height of buildings within the onshore substations is now 14m above finished ground level. The maximum height of external electrical equipment within the onshore substations is now 14m above finished ground level. The maximum height of lightning protection masts within the onshore substations is now 20m above finished ground level. The Applicants have incorporated the above within the updated ***draft DCO*** (document reference 3.1) submitted at Deadline 3.

2.1.3 Finished Ground Levels

10. The Applicants have further considered the finished ground levels of the onshore substations and National Grid infrastructure adopted for the Applications. Whilst acknowledging the need for future geotechnical and detail design studies to be undertaken (in order to establish the soil properties, bearing capacity, groundwater levels etc.), further refinement to the estimated finished ground levels has however been possible at this early stage.

11. In considering revisions to the estimated finished ground levels, the following key principles have been followed which are considered reasonable for the current pre-consent/pre-detailed design phase of the Projects:

- Maintain the height differential in finished ground levels between each onshore substation and the National Grid substation at no more than 0.5m for constructability and maintenance reasons.
- Ensure any excess material from ground levelling is not unreasonably excessive so as to have a consequential impact on assessed vehicle movements.
- Seek reductions in the finished ground levels compared to that presented within the visualisations which accompany ***Chapter 29 – Landscape and Visual Impact*** (APP-077) and therefore seek to reduce the environmental effects of the Projects.

12. In undertaking this review, the Applicants have revised the estimated finished ground levels (expressed in Above Ordnance Datum (AOD)) as presented in ***Table 2.2*** below.

Table 2.2 Revised Finished Ground Levels

Substation	Level on which Photomontages were based (Chapter 29 (APP-077)	Revised Finished Ground Level (Estimated)	Notes
Onshore Substation – Eastern Location*	20.7 AOD	**18.7m AOD**	2.0m reduction in finished ground level achieved
Onshore Substation – Western Location*	18.2m AOD	**18.2m AOD**	No change
National Grid Substation*	18.9m AOD	**18.2m AOD**	0.7m reduction in finished ground level achieved
* Refer to Figure 1 of the Project Update Note (REP2-007) for locations of the substations			

2.1.4 Maximum Visual Envelope

13. As noted above, given that the Applicants have yet to undertake ground investigations it is not yet possible to establish the final finished ground levels at this stage of design.

14. The Applicants note, however, that stakeholders would prefer a level of certainty in establishing the maximum visual envelope of the Projects. To balance the uncertainty and necessary flexibility in the design of the onshore substations and National Grid substation with certainty in the maximum visual envelope, the Applicants intend to update the ***Outline Onshore Substation Design Principles Statement*** (APP-585) and the ***Outline National Grid Substation Design Principles Statement*** (REP1-046) to include a maximum vertical datum height in respect of buildings, external equipment and lightning protection masts (expressed in m AOD).

15. The Applicants will therefore retain the necessary flexibility at the detail design stage of the Projects to balance the finished ground levels and (within the limitations of the draft DCO) the heights of buildings and external equipment to achieve (and where possible, improve on) the maximum vertical datum height (expressed in m AOD).

16. The maximum building height, maximum external equipment height and maximum lightning protection mast height expressed in AOD, are presented in Table 2.3 below. An updated ***Outline Onshore Substation Design Principles Statement*** (APP- 585) and an updated ***Outline National Grid Substation Design Principles Statement*** (REP1-046) will be submitted at Deadline 4 to reflect this detail.

Table 2.3 Maximum Heights

Substation Parameter	Maximum Height (AOD)	Change to Visual Envelope assessed within Chapter 29 (APP-077)
Onshore Substation (Eastern Location) - Maximum Building Height	32.7m AOD	3m reduction
Onshore Substation (Western Location) - Maximum Building Height	32.2m AOD	1m reduction
Onshore Substation (Eastern Location) - Maximum External Equipment Height	32.7m AOD	6m reduction
Onshore Substation (Western Location) - Maximum External Equipment Height	32.2m AOD	4m reduction
Onshore Substation (Eastern Location) – Maximum Lightning Protection Height	38.7m AOD	7m reduction
Onshore Substation (Western Location) – Maximum Lightning Protection Height	38.2m AOD	5m reduction
National Grid Substation (AIS Technology) – Maximum Building Height	24.2m AOD	0.7m reduction
National Grid Substation (GIS Technology) – Maximum Building Height	34.2m AOD	0.7m reduction
National Grid Substation – Maximum External Equipment Height	34.2m AOD	0.7m reduction

2.1.5 Conclusion

17. The combination of the above-mentioned reductions in building/external electrical equipment heights and the refinement of the finished ground levels have been possible through the Applicants' review of the project design envelope and early supply chain engagement. In doing so, the Applicants seek to further reduce the environmental effects of the Projects by reducing the maximum visual envelope of the onshore substations and National Grid substation.

18. Changes to the maximum building, external equipment and lightning protection mast heights are reflected in the updated ***draft DCO*** (document reference 3.1) submitted at Deadline 3. The maximum vertical datum height of the buildings, external equipment and lightning protection masts will be reflected in an updated ***Outline Onshore Substation Design Principles Statement*** (APP-585) and an updated ***Outline National Grid Substation Design Principles Statement*** (REP1-046) which will be submitted at Deadline 4.

2.2 Aldeburgh Road and Hundred River

19. Following oral submissions made at Issue Specific Hearing 1, the Applicants have committed to a reduced working width of 27.1m where both Projects are constructed (or 16.1m where one project is constructed) where the cables cross the woodland immediately to the east of Aldeburgh Road to the point 40m from the Hundred River's western bank. This mirrors the existing commitment to the west of Aldeburgh Road.

20. In doing so, the Applicants are seeking to reduce the impact of the Projects at this location by reducing the area of vegetation / tree clearance required to accommodate the Projects.

21. The Applicant has also reduced the working width of the onshore cable route where the cables cross the Hundred River, from 50m to 40m (see Requirement 12(14)(b) of the ***draft DCO*** (and updated version has been submitted at Deadline 3, document reference 3.1) as a result of further consideration of the conceptual design of the crossing. This working width applies for a distance of 40m from the Hundred River's western and eastern banks (the Hundred River crossing buffer). The Order limits remain unchanged.

22. The 40m buffer from the western bank of the Hundred River which is subject to a 40m working width of the onshore cable route, is necessary in order to accommodate the transition between the deeper and wider spaced onshore cables as they pass under the Hundred River, to the reduced onshore cable corridor to the east of the Aldeburgh Road.

23. Subject to ground conditions, the design of the Hundred River crossing will in any event seek to minimise the actual width of the onshore cable route as it passes the Hundred River in order to minimise the need to remove vegetation (including trees) along its western bank.

3 Offshore Update

3.1 Reduction in the size of the East Anglia ONE North windfarm site to increase the distance to the Outer Thames Estuary SPA

25. In response to stakeholder concerns relating to the proximity of the East Anglia ONE North windfarm site relative to the Outer Thames Estuary Special Protection Area (SPA) and potential impacts on red-throated diver, the Applicants have undertaken a review of site conditions data, existing and future constraints and other requirements and have determined that the windfarm site can be reduced at its western end to increase the distance to the boundary of the Outer Thames Estuary SPA to a minimum of 2km;

26. This reduction in the size of the East Anglia ONE North windfarm site will reduce the area over which the wind turbines may potentially influence the distribution of red-throated diver within the Outer Thames Estuary SPA.

27. This commitment to a 2km buffer is secured through the updated grid co-ordinates presented in the ***draft DCO*** (document reference 3.1) together with a revision to the ***Offshore order limits boundary co-ordinates plan)*** (document reference 2.12) and the ***Works Plans (Offshore)*** (document reference 2.3.1) also submitted at Deadline 3. Further information on the 2km buffer commitment is provided in the ***Offshore commitments*** (document reference ExA.AS-21.D3.V1) report and updated ***Displacement of red-throated divers in the Outer Thames Estuary SPA*** (document reference ExA.AS-4.D3.V1), both submitted at Deadline 3.

3.2 Inclusion of monopile foundations for the offshore platforms

28. The draft DCO submitted with the Applications allowed for construction and operation of up to four offshore electrical platforms and one construction, operation and maintenance platform (the 'offshore platforms') fixed to the seabed by one of three foundation types; namely jacket on suction caissons, jacket on piles or gravity base.

29. Engagement with the supply chain as part of the procurement of East Anglia Hub have determined that a monopile foundation is also a viable foundation type for the offshore platforms.

30. The maximum diameter of the monopile foundation will be 15m, which accords with the maximum diameter of the wind turbine monopile foundation option assessed in the Applications. All other parameters associated with use of a monopile foundation for the offshore platforms accord with the wind turbine monopile foundation including;

- Seabed preparation;
- Footprint at the seabed;
- Drilling arisings;
- Scour footprint and volume; and
- Duration of piling and number of 26km radius 'effective disturbance range' (EDR) events.

31. The worst case assumptions assessed in the Applications identified 'jackets with 8 legs on suction caissons' and 'jackets with 8 legs on pin-piles' as the worst case for interactions with the seabed and water column and generation of underwater noise through piling, respectively.

32. ***Table 4*** compares the worst case assumptions used in the assessments against the inclusion of the monopile foundation to determine whether their inclusion falls within the envelope assessed. In all cases the monopile foundation worst case lies within the worst case assessed.

33. The ***draft DCO*** submitted at Deadline 3 has been revised to include the monopile foundation option for offshore platforms.

Table 4. Comparison of worst case assumptions made for offshore platform foundations with monopile foundations for relevant receptors.

EIA receptor	Impact	Worst case assumption for offshore platform foundations	Comparison of worst case assumption with a 15m diameter monopile foundation	Does the monopile foundation exceed the worst case assumption assessed?
Marine Geology, Oceanography and Physical Processes	Impact 1: Changes in Suspended Sediment Concentrations due to Foundation Installation Impact 2: Changes in Sea Bed Level due to Foundation Installation	*Worst case for individual platform*		No
		Footprint - Foundation only Jacket with suction caissons (5,676m^2)	**Footprint - Foundation only** Monopile (177m^2)	
		Footprint - Foundation and scour protection Jacket with suction caissons (15,276m^2)	**Footprint - Foundation and scour protection** Monopile (4,418m^2)	
		Near-surface sediment disturbance construction/ decommissioning) Jacket with suction caissons (133,760m^3)	**Near-surface sediment disturbance construction/ decommissioning)** Monopile (9,000m^3)	
		Sub-surface sediment disturbance (construction/ decommissioning) Jacket with pin piles (8,641.89m^3)	**Sub-surface sediment disturbance (construction/ decommissioning)** Monopile (7,953 m^3)	
		Worst case for all offshore platforms		No
		Footprint - Foundation only - Jackets with suction caissons (28,380m^2)	**Footprint - Foundation only** Monopile (885m^2)	

EIA receptor	Impact	Worst case assumption for offshore platform foundations	Comparison of worst case assumption with a 15m diameter monopile foundation	Does the monopile foundation exceed the worst case assumption assessed?
		Footprint - Foundation and scour protection Jackets with suction caissons (76,380m^2)	**Footprint - Foundation and scour protection** Monopile (22,090m^2)	
		Near-surface sediment disturbance (construction/ decommissioning) - Jacket with suction caissons (668,800m^3)	**Near-surface sediment disturbance construction/ decommissioning)** Monopile (45,000m^3)	
		Sub-surface sediment disturbance (construction/ decommissioning) Jacket with pin piles (43,209.45m^3)	**Sub-surface sediment disturbance (construction/ decommissioning)** Monopile (39,765m^3)	
Benthic communities	Impact 1: Temporary physical disturbance Impact 6: Habitat Change Resulting from Sea bed Preparation / Sediment Disposal	**Sea bed preparation area** 5 platforms each with a sea bed preparation area of 37,312m^2 = 186,560m^2.	**Sea bed preparation area** 5 platforms each with a sea bed preparation area of 2,888m^2 = 14,440m^2.	No
Fish and Shellfish	Impact 1 Physical disturbance and temporary loss of sea bed habitat, spawning or nursery grounds	**Sea bed preparation area** 5 platforms each with a sea bed preparation area of 37,312m^2 = 186,560m^2.	**Sea bed preparation area** 5 platforms each with a sea bed preparation area of 2,888m^2 = 14,440m^2.	No

EIA receptor	Impact	Worst case assumption for offshore platform foundations	Comparison of worst case assumption with a 15m diameter monopile foundation	Does the monopile foundation exceed the worst case assumption assessed?
	during intrusive works.			
	Impact 2 Increased suspended sediments and sediment re-deposition	**Sea bed preparation** Eight-legged jacket suction caisson foundations for up to 5 platforms would result in a maximum sediment release into the water column of 668,800m^3.	**Sea bed preparation** Max seabed volume removed per monopile (m^3) = 9,000m^3 Monopile foundations for up to 5 platforms would result in a maximum sediment release into the water column of 45,000m^3	No
		Drill Arisings 5 platforms, each with 8,642m^3 of drill arisings = 43,210m^3	**Drill Arisings** 5 platforms with 45m depth drill each with 7,953m^3 of drill arisings = 39,765m^3	No
	Impact 4 Underwater noise impacts to hearing sensitive species during foundation piling	**Number of offshore platforms** 5 x Offshore platforms **Platform foundation options** Offshore platforms = jacket with pin-piles **Number of piles for offshore platforms** Offshore platforms = 5 x 8 pin-piles = 40 pin-piles **Pile diameter – pin-piles**	**Number of offshore platforms** 5 x Offshore platforms **Platform foundation options** Offshore platforms = monopile **Number of piles for offshore platforms** Offshore platforms = 5 x 1 monopiles = 5 monopiles **Pile diameter – monopiles**	No

EIA receptor	Impact	Worst case assumption for offshore platform foundations	Comparison of worst case assumption with a 15m diameter monopile foundation	Does the monopile foundation exceed the worst case assumption assessed?
		Maximum pin-pile diameter of 4.6m for 282m wind turbines and offshore platforms. **Total piling time – per platform foundation** Pin-pile foundation with maximum hammer energy of 2,400kJ (including soft-start and ramp-up in accordance with the Marine Mammal Mitigation Protocol (MMMP) and providing allowance for issues such as low blow rate, refusal, etc.) 199 minutes x 8 pin-piles x 5 offshore platforms = 132.7hrs	Maximum monopile diameter of 15m for 282m wind turbines and offshore platforms. **Total piling time – per platform foundation** Monopile foundation with maximum hammer energy of 4,000kJ (including soft-start and ramp-up in accordance with the MMMP and providing allowance for issues such as low blow rate, refusal, etc.) 325 minutes x 1 monopile x 5 offshore platforms = 27.1hrs	
	Impact 1 Permanent habitat loss (Operation)	The maximum area of baseline habitat lost due to installation of offshore electrical and construction, operation and maintenance platforms on four-legged jackets with suction caissons with associated scour protection would amount to 15,276m^2 per platform. There would be up to five such structures totalling 76,380km^2.	The maximum area of baseline habitat lost due to installation of offshore electrical and construction, operation and maintenance platforms on monopiles with associated scour protection would amount to 4,418 m^2 per platform. There would be up to five such structures totalling 22,090m^2.	No
Marine Mammals	Impacts 3 and 4 Underwater noise during piling	As per Fish and Shellfish Impact 4	As per Fish and Shellfish Impact 4	No

EIA receptor	Impact	Worst case assumption for offshore platform foundations	Comparison of worst case assumption with a 15m diameter monopile foundation	Does the monopile foundation exceed the worst case assumption assessed?
	(represents worst-case scenario for underwater noise, alternative foundation types are also considered)	**Total piling time** 132.6 hours **Number of 26km radius 'effective disturbance range' (EDR) events** Five offshore platforms on jackets with pin pile foundations with a maximum hammer energy of 2,400kJ = 5 x 8 = 40	Total piling time 27.08 hours **Number of 26km radius EDR events** Five offshore platforms on monopiles foundations with a maximum hammer energy of 4,000kJ = 5 x 1 = 5	