LLŶR FLOATING OFFSHORE WIND PROJECT

Llŷr 1 Floating Offshore Wind Farm

Environmental Statement

Volume 6: Appendix 4D - Assumptions Log

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Document Status

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Acronyms and Abbreviations

Acronym or Abbreviation	Definition	Acronym or Abbreviation	Definition
GIS	Geospatial Information Systems	m / m^2 / m^3	Meters / meters squared / meters cubed
HDD	Horizontal Directional Drilling	TLP	Tension Leg Platform
IAC	Inter Array Cable	WTG	Wind Turbine Generators
LAT	Latitude	SuDS	Sustainable Drainage Systems

Glossary of Project Terms

Term	Definition
The Applicant	The developer of the Project, Llŷr Floating Wind Limited
Array	All wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the Array Area, as defined, when considered collectively, excluding the offshore export cable(s).
Array Area	The area within which the wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure will be located
Floventis Energy	A joint venture company between Cierco Ltd and SBM Offshore Ltd of which Llŷr Floating Wind Limited is a wholly owned subsidiary.
Landfall	The location where the offshore export cable(s) from the Array Area, as defined, are brought onshore and connected to the onshore export cables (as defined) via the transition joint bays (TJB).
Llŷr 1	The proposed Project, for which the Applicant is applying for Section 36 and Marine Licence consents. Including all offshore and onshore infrastructure and activities, and all project phases.
Marine Licence	A licence required under the Marine and Coastal Access Act 2009 for marine works which is administered by Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh Ministers.
Offshore Development Area	The footprint of the offshore infrastructure and associated temporary works, comprised of the Array Area and the Offshore Export Cable Corridor, as defined, that forms the offshore boundary for the S36 Consent and Marine Licence application
Offshore Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OfECC)	The area within which the offshore export cable circuit(s) will be located, from the Array Area to the Landfall.
Onshore Development Area	The footprint of the onshore infrastructure and associated temporary works, comprised of the Onshore Export Cable Corridor and the Onshore Substation, as defined, and including new access routes and visibility splays, that forms the onshore boundary for the planning application.
Onshore Export Cable(s)	The cable(s) that transmit electricity from the landfall to the onshore substation
Onshore Export Cable Corridor (OnECC)	The area within which the onshore export cable circuit(s) will be located.
proposed Pcroject	All aspects of the Llŷr 1 development (i.e. the onshore and offshore components).

Term	Definition
Onshore Substation	Located within the Onshore Development Area, converts high voltage generated electricity into low voltage electricity that can be used for the grid and domestic consumption.
Section 36 consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.

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4.D – ASSUMPTIONS LOG

Table 4D-1 Assumptions Log

Parameter	Value	Description / Calculation	Chapter 04 Reference
Maximum hub height above water level	177 m	Based on TLP at LAT therefore exposed height = 172.7m (exposed TLP + tower + nacelle) + 3.7m (difference between mean sea state and LAT) + 0.5m (tolerance) = 176.9m, round up to 177m above water at LAT	Table 4-5
Maximum rotor swept area	63,794 m^2	Based on a radius of 142.5 m (i.e. 285 m)	Table 4-5
Minimum separation distance between Wind Turbine Generators (WTGs) (tower centre to tower centre)	1,000 m	n/a	Table 4-5
Lubrication oil per WTG (gearbox, yaw drive, pumps etc.)	1,500 litres	industry information	Table 4-6
Hydraulic oil per WTG	700 litres	industry information	Table 4-6
Cooling agent per WTG	600 litres with ~50% glycol to prevent freezing	industry information	Table 4-6
Diesel fuel for generators per WTG	One generator per WTG	industry information	Table 4-6
Maximum visible footprint area above the water line per floating platform	155 m^2 to 6500 m^2	Supply chain information	Table 4-7
Maximum column distance (centre to centre)	55 to 100m	The distance between the major components within a foundation I.e. maximum of 100m between those columns per foundation For TLP there is one column only	Table 4-7
Maximum proportion of mooring line that may come into contact with the seabed	**TLP** – zero **Catenary Spread –** 150 m	Estimate based on cable mooring, supply chain information	Table 4-8
Maximum spread (radius) of mooring lines (based on maximum water depths)	**TLP** – 130 m sided triangle/square **Catenary Spread –** 1,350 m	Supply chain information	Table 4-8
Maximum horizontal excursion extent	**TLP** – 35 m **Catenary Spread –** 54 m	Supply chain information	Table 4-8
Maximum seabed footprint of clump weights (per mooring line)	**TLP** – zero **Catenary Spread –** 100 m^2	Supply chain information	Table 4-8

Parameter	Value	Description / Calculation	Chapter 04 Reference
Total seabed footprint of anchors and chains per WTG	**TLP** – 100 m^2 **Catenary Spread** – 700 m^2	Supply chain information	Table 4-8
Seabed footprint per anchor/pile	**Drag embedment anchor** – 76.5 m^2 **Drilled piles** – 15 m^2 **Driven piles** – 15 m^2	Supply chain information	Table 4-9
Total anchor/pile footprint	**Drag embedment anchor** – 6120 m^2 **Drilled piles** – 1200 m^2 **Driven piles** – 1200 m^2	Based on 80 anchors / piles x seabed footprint (8 anchors / piles per WTG x 10)	Table 4-9
Maximum distance of anchor drag during installation	**Drag embedment anchor** – 75 m **Drilled piles** – n/a **Driven piles** – n/a	Supply chain information	Table 4-9
Maximum number of days when piling may take place	**Drag embedment anchor** – n/a **Drilled piles** – n/a **Driven piles** – 45	Supply chain information	Table 4-9
Minimum number of days when piling may take place	**Drag embedment anchor** – n/a **Drilled piles** – n/a **Driven piles** – 20	Supply chain information	Table 4-9
Maximum volume of drill arising per pile	**Drag embedment anchor** – n/a **Drilled piles** – 529 m^3	Pile radius = 1.75 gives surface area of over 9.622 m^2 and depth of 55 m = up to 529 m^3 per pile drill.	Table 4-9
Maximum volume of drill arising across the Array Area	**Drag embedment anchor** – n/a **Drilled piles** – 42,300 m^3	80 piles x 529 m^3 = 42,300 m^3	Table 4-9
Average length of each Inter Array Cable (IAC)	1.6 km	17.31 km (based on an assumed total array cable length) / 11 inter-array cables	Table 4-10
Maximum length of each IAC on seabed	1.55 km	Assumed water depth to platform connection point + lazy wave = 50m cable in water	Table 4-10
Maximum length of touchdown movement for each IAC	150 m	Supply chain information	Table 4-10
Maximum footprint of touchdown movement for each IAC	4,000 m^2	Supply chain information	Table 4-10
Maximum length of IAC cable protection	3,420 m (total length)	Total IAC length = 17.31 km Total IAC on seabed (total IAC minus length in water column) = 17.10 km (worse case) 20 % for cable protection, of length of IAC on seabed = 3420 m	Table 4-10

Parameter	Value	Description / Calculation	Chapter 04 Reference
Maximum area of IAC cable protection	15,660 m^2	3,132 x 5m cable protection = 15,660 m^2	Table 4-10
Maximum trench width for export cable installation	25m	Industry information, per cable	Table 4-10
Maximum length of each export cable requiring cable protection (not including nearshore articulated pipe protection measures)	2,400 m (4.9%)	Total length of export cable = 49,000 m (identified via GIS) Worst case is 4.9% of 49 k m = 2,400 m	Table 4-11
Maximum length of each export cable requiring iron articulated pipe protection	Up to 11,000 m (22.4%)	KP 38 to KP 48 = 10,000 m (identified via GIS) + 10% contingency (to allow for potential deviations and micro siting) = 11,000m (represents 22.4 % of 49 km)	Table 4-11
Maximum volume of cable protection (IAC and offshore export cables)	61,650 m^3	Assumption of 20% IAC on seabed needing protection 15,660 m^2 (5m berm width x 3,132 m length), based on the assessment of the geophysical survey data of the array area. Assumption of 21% of export cables needing protection 9,795 m x 5 m berm width = 48,975 m^2 per cable (x2) 97,950 m^2 Total footprint for IACs and export cables: 113,610 m^2 x 1.5 m height = 170,415 m^3	Table 4.-12
Maximum scour protection footprint per anchor	up to 310 m^2	Industry information	Table 4-12
Maximum volume of scour protection per anchor	310 m^3	Industry information	Table 4-12
Maximum seabed footprint of scour protection across the Array Area	24,800 m^2	310 m^2 x 80 anchors	Table 4.-12
Maximum volume of scour protection across the Array Area	24,800 m^3	310 m^2 x 80 anchors x 1m height	Table 4-12
Horizontal Directional Drilling (HDD) drill cuttings volume (total)	1,700 m^3	Volume of drill cuttings per cable (850 m^3) x 900 mm diameter of the reamed borehole plus a 25% bulking factor = 1700 m^3 660mm diameter x 1300 m HDD length x 2 ducts	Table 4.25

Parameter	Value	Description / Calculation	Chapter 04 Reference
Maximum excavated material of onshore export cable corridor	18,744 m^3	1.2 m x 1.1 m x 7,100 m = 9372 m^3 9372 m^3 * 2 cables = 18,744 m^3	Table 4.15
Maximum substation compound footprint (excluding SuDs and laydown area)	15,000 m^2	105 m x 140 m compound dimensions = 14,700 m^2 plus contingency	Table 4.17
Additional area required for Sustainable Drainage Systems (SuDS)	1.15 ha	Proposed substation platform assumed approximately 1.4 ha - less permeable areas (i.e., landscaping) 0.25 ha = 1.15 ha.	Table 4.17
Maximum length of export cable requiring sandwave levelling (per cable)	10,351 m	Where sandwaves are observed within available bathymetry (from the geophysical survey data, or publicly available bathymetry) sandwave levelling is assumed. Approximately 200m either side of the observed sandwaves is included within the length of sandwave levelling.	Table 4.18
Maximum area of seabed requiring sandwave levelling (per cable, including 20% contingency)	310, 524 m^2	For sandwaves observed in the geophysical survey bathymetry, measured widths and lengths were used to calculate the approximate area of sandwave levelling. For indicative sandwave areas observed in the publicly available bathymetry (lower resolution), the average of the above observed sandwaves was taken to calculate an approximate area. Total lengths of sandwaves: 10,350.8 m Worst-case scenario disturbance from sand-wave levelling: 30 m, including 5m contingency 10,350.8 m x 30 m = 310,524 m^2.	Table 4-18
Maximum volume of material to be moved from sandwave levelling	900,520 m^3	As above: where sandwaves have been observed using geophysical survey bathymetry data, measured length, width and height data has been	Table 4-18

Parameter	Value	Description / Calculation	Chapter 04 Reference
		used to calculate the volume of material to be moved from sandwave levelling. Where indicative sandwaves have been observed using publicly available bathymetry survey data (lower resolution) an average from the measured sandwaves is taken and used to calculate approximate volumes. Total lengths of sandwaves: 10,350.8 m Worst-case scenario disturbance from sand-wave levelling: 30 m corridor width. Average depth of sand wave crest: 2.9 m. 10,350.8 m x 30 m x 2.9 m = 900,520 m3	
Maximum % of offshore export cables requiring cable protection	4.9%	Based on previously provided length of cables needing protection (2,400 m per cable)	Table 4-21
Maximum seabed footprint of export cable protection (per cable)	12,000 m^2	2,400 m x 5m berm width	Table 4-21
Maximum volume of export cable protection (total)	36,000 m^3	Based on total lengths, width (5m) and height (1.5m) of total cable protection	Table 4.16
Maximum % of IAC requiring cable protection	20%	Based on analysis of the geophysical and benthic survey data indicating ground conditions.	Table 4-22
HDD compound area	7500 m^2	100 m length x 75 m width = 7,500m^2	Table 4-25
Soil waste generated during onshore construction	52,100 m^2	Maximum soil waste anticipated to be generated during construction of onshore export cables. Includes 25,000 m^2 of top soil and 27,100m^2 of sub surface generated soil waste	Section 4.8.10