# LLŶR FLOATING OFFSHORE WIND PROJECT

## Llŷr 1 Floating Offshore Wind Farm

## Environmental Statement

## Volume 4: Chapter 29 – Climate

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## Acronyms and abbreviations

| Acronym or Abbreviation | Definition | Acronym or Abbreviation | Definition |
|---|---|---|---|
| BEIS | Department for Business, Energy & Industrial Strategy | IPCC | Intergovernmental Panel on Climate Change |
| CCC | Committee on Climate Change | IMO | International Maritime Organisation |
| $CO_2$ | Carbon Dioxide | INNS | Invasive Non-Native Species |
| FLOW | Floating Offshore Wind | UKCP | UK Climate Projections |
| GHG | Greenhouse Gas | | |

## Glossary of terms

| Term | Definition |
|---|---|
| Carbon dioxide | A naturally occurring gas, a by-product of burning fossil fuels and biomass, as well as of land-use changes and other industrial processes. It is the principal human caused greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured |
| Climate | Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. |
| Climate change | Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. |
| Emissions | The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere. |
| Embodied greenhouse gases | Embodied greenhouse gases are the total emissions linked to a product's entire lifecycle, from raw material extraction to disposal, measured in $CO_2$ equivalents, reflecting its full environmental impact |
| Greenhouse gases | Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride. |
| Net zero | Net zero implies balancing emitted greenhouse gases with removed ones, achieved by offsetting or reducing emissions, crucial for limiting global warming and avoiding severe climate change consequences. |
| Renewable energy | Energy resources that are naturally replenishing such as biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action. |
| 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 |

| Term | Definition |
|---|---|
| | 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 Project | All aspects of the Llŷr 1 development (i.e. the onshore and offshore components). |
| 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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# 28. CLIMATE CHANGE

## 28.1 Introduction

1. This chapter identifies the impacts on climate as a result of the proposed Project, and outlines how the proposed Project will adhere to climate change legislation included in **Chapter 02: Regulatory and Planning Policy Context**. It also identifies the vulnerability of the proposed Project to climate change. For more details about the proposed Project, refer to **Chapter 04: Description of the Proposed Project**.

2. The UK has committed to net zero carbon emissions by 2050 through the Climate Change Act 2008 (as amended) and the Welsh Government has also set a legal commitment to achieve net zero by 2050, with a push to "get there sooner" (Welsh Government, 2021). Renewable energy is seen as a primary method of reducing emissions of greenhouse gases, particularly carbon dioxide ($CO_2$). Floating offshore wind (FLOW) will play a key part in this, with the UK Government announcing an initial target for FLOW to deliver 1GW of energy by 2030 (BEIS, 2020), with this target then increased to 5GW by 2030 in 2022 (HMSO, 2022).

3. The EIA Scoping Report (Llŷr Scoping Report, 2022) stated:

   *'The 2017 amendments to the EIA Regulations require that the EIA considers the vulnerability of the proposed Project to climate change, natural disasters and major accidents. This assessment will be included within the EIA; either incorporated into topic chapters, or in a separate section. The scope of this assessment will be informed by NRW's advice on the nature and scope of natural disasters and major accidents that are relevant to the proposed Project.'*

4. The Project has been designed to adequately future proof it against events such as flooding and increased sea levels as a result of climate change.

5. Key climate change issues raised in the Scoping Opinion and how these have been addressed in the ES are contained in **Appendix 5C: Scoping Opinion Response**.

## 28.2 Legislation, Policy and Guidance

6. This section identifies key relevant legislation and policy relating to climate. Further details regarding legislation, policy and guidance can be found in **Chapter 02: Regulatory and Planning Policy Context**, which also discusses the offshore wind renewable energy generation target of delivering 5GW from floating offshore wind energy by 2030 to which the proposed Project would contribute (Department for Business, Energy and Industrial Strategy, 2022a).

### *28.2.1. Climate Change Act 2008*

7. The UK established a legally binding framework to cut carbon emissions via the Climate Change Act (2008). The Climate Change Act 2008 (2050 Target Amendment) Order 2019, published in 2019 by the UK Government commits the UK government by law to reduce emissions by 100% of 1990 levels by 2050 replacing the previous 2008 commitment of an 80% reduction (UK Government, 2019). Monitoring by the Committee on Climate Change (CCC), to identify if the UK is on track to meet this target, confirmed that the first (2008-12) and second (2013-17) carbon budgets have been met, and that the UK is on target to meet the third (2018-22). Although 2018 records show UK carbon emissions are 44% below 1990 levels (CCC, 2019b), the UK is not, currently, on track to meet the fourth (2023-27) target.

*28.2.2. Carbon Budget Order 2021*

8. In line with the level advised by the CCC, the UK government set the sixth carbon budget (for the years 2033-2037) at 965 $MtCO_2e$. This is established within The Carbon Budget Order 2021 which limits the total amount of greenhouse gases (GHG) the UK can emit over a five-year period (as defined by Section 27 of the Climate Change Act 2008).

*28.2.3. Well-being of Future Generation (Wales) Act 2015*

9. The Well-being of Future Generations Act (Welsh Government, 2015) sets forth well-being indicators to improve the social, economic, environmental and cultural well-being of Wales, making specific reference to renewable energy and GHG emissions. In accordance with the sustainable development principles set out in the Act, the proposed Project does not compromise the ability of future generations to meet their own needs. Specific indicators are identified to meet the goals of the Well-being of Future Generations Act (Welsh Government, 2015), which include indicators relating to renewable energy, global footprint and GHG emissions. Indicators are discussed in further detail in **Chapter 02: Regulatory and Planning Policy Context.**

*28.2.4. Environment (Wales) Act 2016*

10. As a devolved administration the Welsh Government created the Environment (Wales) Act 2016, which sets emission reduction targets for Wales. In response to the CCC May 2019 paper, Wales has accepted the recommendation for a 95% reduction in emissions by 2050, with an ambition to reach net-zero by 2030 (CCC, 2019b).

*28.2.5. The Welsh National Marine Plan (2019)*

11. The Welsh National Marine Plan (Welsh Government, 2019) recognises the importance of marine renewable energy in helping Wales achieve the legal targets in the Environment (Wales) Act 2016, making specific reference to climate change through SOC 10 (Minimising climate change) and SOC 11 (Resilience to climate change). In the context of the Welsh National Marine Plan, "marine renewable energy" includes energy generated from wave, tidal stream, tidal range, offshore wind and other forms of low carbon energy.

12. Policy SOC 10 (Minimising climate change) states that:

13. 'Proposals should demonstrate that they have identified the potential for greenhouse gas emissions and set out the measures they have included to avoid, minimise or mitigate these impacts. Minimisation measures could include, for example, increasing energy efficiency and utilising low carbon technologies such as renewable energy sources. Where significant emissions remain, proposals should provide a clear and convincing case for proceeding'.

14. Policy SOC 11 (Resilience to climate change) states that:

'*Proposals should demonstrate consideration of the potential future impacts of climate change over the lifetime of a development*'.

15. The Welsh National Marine Plan identifies offshore wind energy as a proven and strategically important technology with considerable scope for further large-scale development (including potential for floating structures offshore) and through Policy ELC_01 new development is supported.

## 28.3 Climate Change Resilience

16. Climate change has the potential to impact the proposed Project through changes to climatic conditions and extreme weather events impacting the installation, operation and / or decommissioning phases.

17. The United Kingdom Climate Projections 2018 (UKCP18) (Met Office, 2018) (and 2022 updates (Met Office, 2022)) provide the most up-to-date assessment of how the climate may change up to 2100 and post-2100. The UKCP18 uses Representative Concentration Pathway 2.6 and Representative Concentration Pathway 8.5 for the low and high emission scenarios (as presented in the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC, 2014)).

18. By the end of the 21st century, all areas of the UK are projected to be warmer with the high emissions scenario amounting to a temperature increase of between 1.3°C and 5.1°C in summer and between 0.6°C and 3.8°C in winter. Rainfall patterns across the UK are not uniform however data suggests that future warming will bring about a change in the seasonality of extremes (Met Office, 2022).

19. Sea level rise projections for Cardiff, as the closest UK Climate Projections (UKCP) database location to the proposed Project, using the low emission scenario are between 27cm to 69cm whereas the high emissions scenario projects a 51cm to 113cm rise by 2100 (UKCP18). Additional sea level rise could occur if there is large-scale melting of ice sheets. Risk of coastal flooding from storm surges and high tides will increase as sea levels rise. Beyond 2100 sea level rise will continue however the change is less certain. Detailed sea level rise data along the UK coastline can be downloaded from the Met Office UKCP18 website (Met Office, 2019).

20. The UKCP18 projections suggest there will be an increase in the near surface wind speeds over the UK for the second half of the 21st century. However, these increases in wind speed are likely to be modest compared to natural variability experienced throughout the year, so confidence is low (Met Office, 2018). Therefore, climate change could increase or decrease wind speeds, which could be both beneficial and harmful to the proposed Project. Whilst increased wind speeds would amplify energy generation, very high wind speeds can result in turbine shutdown and equipment damage. Decreased wind speeds will reduce the predicted energy generation of the proposed Project. Wave heights in the north-east Atlantic Sea are expected to increase by 5% to 8% by the end of the 21st century. However, given the 30-year operational life of the proposed Project the direct impact of climate change induced wind speed changes is not considered to pose an operational risk to the proposed Project.

21. Future impacts of climate change could include increasing water depth due to sea level rise and changes to wave patterns associated with changes to wind, which over the lifetime of the proposed Project may result in more frequent storms which have the potential to impact benthic ecology through increasing the effects of scour around hard structures, or cause erosion to coastlines. Refer to **Chapter 17: Physical Environment** and **Chapter 19: Benthic Ecology** for further details on the effects of potential future changes in climate on marine and coastal processes and benthic ecology.

22. Increases in sea temperature are expected to occur in the future which may impact species distributions and increase the risk of introduction of Invasive Non-Native Species (INNS). The proposed Project will not cause thermal discharges, and therefore increases in sea temperature will not be increased as a result of the proposed Project. All proposed Project vessels will comply with the International Maritime Organisation (IMO) International

Convention for the Prevention of Pollution from Ships (MARPOL) standards. Refer to **Chapter 19: Benthic Ecology** for further details on the risk of INNS from vessel activities and potential impacts on marine habitats.

23. Refer to **Chapter 04: Description of the Proposed Project** and **Chapter 30: Major Accidents and Disasters** for a discussion of potential interactions between the proposed Project and major accidents and disasters that are related to climate change, along with **Chapter 10: Water Environment** which presents the potential effects on water resources and flood risk.

## 28.4 Lifecycle GHG Emissions

24. Some GHG emissions are inevitably anticipated during the installation and decommissioning of the proposed Project. These will arise from the use of materials (embodied GHGs) and fuel use during installation and from electricity and increased vehicle usage for the additional staff employed during operation and maintenance activities. The proposed Project has a generating capacity of up to 100 MW and would be expected to generate more than 355 GWh of renewable electricity per annum, which could supply more than 100,000 homes every year. As such the operation of the proposed Project would avoid more than 150,000 tonnes of carbon dioxide emissions per annum from electricity supplied from non-renewable sources. This data follows the guidance and methodology identified by RenewableUK (2022) and the capacity factors and statistics published by the Department of Business, Energy and Industrial Strategy (2019 and 2022b), using an offshore wind load factor of 40.58% for new build offshore wind, an average domestic electricity consumption per household of 3.509 MWh and an emissions statistic of 424 tonnes of carbon dioxide per GWh of electricity supplied from non-renewable fuels.

25. The proposed Project would contribute to the Well-being of Future Generations Act (outlined in **Section 28.2.3** above) national indicators 12, 14, 41 and 42, identified pursuant to Section 10 of the Act in the National Indicator Technical Descriptions and Data Links document (2021). These four indicators relate to renewable energy, global footprint and GHG emissions, respectively and several of the overarching goals of the Act for a prosperous, resilient, healthier and globally responsible Wales of cohesive communities (Welsh Government, 2015). Overall, the proposed Project has the potential to contribute to national and international carbon reduction and net zero targets and contribute to the decarbonisation of the UK's energy system by providing offshore renewable wind energy generation. By providing renewable energy into the grid, operation of the proposed Project would support national policy ambitions for a renewable and low carbon energy generating and distribution network and net zero targets.

## 28.5 References

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