CNADS

National Council for the Environment and Sustainable Development

POSITION ON THE PROPOSED ALLOCATION PLAN FOR OFFSHORE RENEWABLE ENERGIES (PAER)

(REFERRING TO THE VERSION IN PUBLIC CONSULTATION BETWEEN OCTOBER AND DECEMBER 2023)

27th May 2024

Preamble

As part of the public consultation on the proposed Offshore Renewable Energy Allocation Plan (PAER)[1] drawn up by the Directorate-General for Natural Resources, Safety and Maritime Services (DGRM), and taking into account the issue in question, the National Council for the Environment and Sustainable Development (CNADS) set up a Working Group (WG) with the aim of commenting on that document.

This WG, coordinated by Councillor Henrique Queiroga, and including Council members Emanuel Gonçalves, Jaime Braga, Luísa Schmidt and Nuno Ribeiro da Silva, was mandated to reflect on the aforementioned draft plan and draw up a draft position to be submitted to the plenary at a later date.

This Position was unanimously approved at the 3rd Ordinary Meeting of the CNADS, held on the 27th of May 2024.

Framework

The Final Report of the Working Group on the planning and operation of power plants based on renewable energy sources of ocean origin or location (Order No. 11404/2022, of 23 September)[1] characterised the conditions under which this component of the National Plan on Energy and Climate 2030 (PNEC 2030) could be implemented. Based on this report, a proposal for an Offshore Renewable Energy Allocation Plan (PAER) and the corresponding Preliminary Environmental Report - Strategic Environmental Assessment were developed.

The importance of the offshore wind component in meeting the objectives set out in the PNEC 2030, which correspond to commitments made by Portugal to the European Union, is unquestionable. However, as a result of the reflection carried out by the CNADS Working Group set up for this purpose, technical and economic constraints were identified, as well as uncertainties and potential environmental impacts, which deserve consideration, as presented below.

[1] https://www.lneg.pt/wp-content/uploads/2023/07/20230531-GTOffshore_RelatorioFinal_vfinal.pdf

Technical and economic constraints

The National Energy and Climate Plan (PNEC 2030) establishes a target for the reduction of greenhouse gas emissions by 2030, from which is derived a very ambitious set of objectives by technology for 2030[2] to meet the country's electricity needs[3]:

- 8,100 MW of hydroelectricity;
- 20,400 MW of solar photovoltaic, of which 14,900 MW in large units and 5,500 MW in small installations spread across the territory;
- 10,400 MW in onshore wind farms and 2,000 MW in offshore wind operations, to which should be added 8,000 MW that are expected to be at an advanced stage of licensing by then;
- 5,500 MW of installed capacity in electrolysers for the production of green hydrogen;
- 1,000 MW of installed capacity in batteries for electricity storage.

However, although the determination to decarbonise, both nationally and in Europe, remains unchanged, there are a significant number of barriers and unfavourable economic and financial conditions:

a) Licensing is necessarily complex;
b) Major and certainly time-consuming investment in the electricity transmission and distribution networks;
c) Some technologies, particularly storage, need to mature;
d) Rising costs of metals and other materials, with a major impact on the final value of projects;
e) Higher financing costs;
f) Increasingly long delivery and work execution times.

In addition to these barriers, it is feared that the rules of the European electricity market, which are currently resulting in historically low electricity prices, will prevent many projects from being realised due to a lack of interest from potential promoters.

In fact, as far as offshore wind technology is concerned, the difficulties listed are clearly applicable.

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[3] NATIONAL ENERGY AND CLIMATE PLAN 2021-2030 (PNEC 2030) - Update/Revision (as defined in Article 14 of Regulation (EU) 2018/1999 of 11 December)
https://apambiente.pt/sites/default/files/_Clima/Planeamento/PNEC%20PT_Template%20Final%20-%20vers%C3%A3o%20final_30_06_2023.pdf

Examples include the recent auction held in the UK, which offered a guaranteed tariff of 132 euros/MWh[3] and receive no expressions of interest from bidders, and, more recently, the auction held in France, which resulted in a winning bid with a tariff of 86 euros/MWh[4].

Returning to the objectives set out in the PNEC 2030, the British example suggests that with average electricity prices today well below 90 euros/MWh, and average daily wholesale prices of around 20 euros/MWh, as was the case in March 2024, the tariff needed to cover the supply of energy, plus the cost of grounding cables, infrastructure and the operating costs related to the maintenance of facilities, will be much higher, resulting in a very significant increase in system costs, with implications for the economic health of the country and the ability of citizens to pay the cost of this basic necessity.

These conditions are not at all conducive to investment in offshore wind, not least because the investment requirements for other components are very significant and the procedures involved are lengthy. It is worth mentioning the need to create a fleet and maritime services to support the construction and maintenance of platforms and generators, the response of the metalworking sector to meet the volume of demand, the need to ensure the increased risks of highly specialised personnel in a particularly aggressive working environment, as well as the creation of manufacturing units in ports and the adaptation of ports for the movement of platforms.

Overall, the total target for all technologies selected in the PNEC 2030 is 47 000 MW of installed power for electricity production, compared to 24 600 MW in service in 2023.

The difficulties described in relation to the technical and economic environment, as well as the complexity and natural slowness of the processes, suggest that the objectives set for this technology should be reconsidered, taking into account the foreseeable costs and the relative assessment uncertainty of the electricity consumption forecasts that formed the basis for the proposed dimension and spatial occupation.

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[3] https://eco.sapo.pt/2023/09/18/leilao-desastroso-no-reino-unido-recomenda-cautela-em-portugal-especialistas-em-eolicas-offshore-pedem-menos-ambicao/

[4] https://presse.economie.gouv.fr/le-gouvernement-annonce-le-laureat-du-premier-appel-doffres-eolien-flottant-au-sud-de-la-bretagne/#:~:text=Bruno%20Le%20Maire%20a%20d%C3%A9clar%C3%A9,au%20sud%20de%20la%20Bretagne.

Uncertainties and potential environmental impacts

The PAER is designed to avoid overlap with nature conservation areas, with the preferred areas coinciding with regions of lower Marine Biological Value on the Portugal's continental shelf identified in the scientific literature (Gomes et al 2018). The PAER Strategic Environmental Assessment, also identifies various possible impacts on birds and marine mammals caused by the mechanical action of the wind turbines and the underwater noise they generate, and recommends various measures to minimise these impacts. These provisions are commendable and have the potential to mitigate several of the known harmful effects of wind farms. It is also worth highlighting the positive effect that banning benthic trawl fishing in the area of wind farms will have on the biogenic structure, species richness and biomass of the seabed, effects that are well documented in the scientific literature (Hiddink et al 2017).

However, the Strategic Environmental Assessment of the PAER ignores two types of impact on the marine environment that the full development of the Plan will bring. The most immediate is the physical impact that removing energy from the atmosphere will have on the surface layer of the ocean. This impact includes the local and regional effects of decreased wind intensity (Akhtar et al 2022) and currents, the formation of upwelling-downwelling dipoles, modifications to thermohaline stratification and changes in the rate of sedimentation (Daewel et al 2022). Some of these modifications can affect the ecological functioning of the ocean, notably with regard to the renewal of nutrients at the surface and phytoplankton primary production.

However, probably the greatest impact on the marine environment will be the introduction of artificial hard substrate on an unprecedented global scale, with multiple ecological impacts whose direction and magnitude are difficult to quantify. The North Sea is currently the region with the highest offshore wind production globally. Although some of the environmental consequences of the renewables industry in this sea are relatively well known (but not all; see DELTARES 2018), the lessons learnt are not directly applicable to the Portuguese case. Here, each wind turbine will be supported by a floating structure, as a result of the depths of our coastline, with a much larger immersed area than the monopile or jacket used to secure each turbine in the shallow North Sea.

HyWind and WindFloat are the flotation solutions to support wind turbines that currently seem to be the most mature. Using these examples, whose immersed areas are around 1,500 and 4,500 square metres respectively (Utne-Palm et al 2023, WavEC, Júlio de Jesus Consultores 2018, Ghigo et al 2020), and considering that the PAER, once fully developed, foresees the installation of 10 GW of power, it is possible to estimate the total area of artificial substrate that will be introduced: 1 to 3 square kilometres, depending on the type of solution, of 667 platforms, if each is equipped with a 15 MW generator (the maximum power expected in the future for this type of technological solution), 2 to 5 square kilometres, of 1163 platforms, if each is equipped with an 8.6 MW generator (the power of each of the Hywind and WindFloat generators).

As shown in the scientific literature (Degraer et al 2020), and acknowledged in the Strategic Environmental Assessment of the PAER itself, the submerged surface will be abundantly colonised by algae, mussels and other benthic organisms. The total area of artificial substrate created, when the entire plan is operational, will be of the same order of magnitude as the area of natural mussel substrate on the Portuguese coast. There are no assessments available in the scientific literature of the impact on the functioning of the marine ecosystem, positive or negative, of a change of this magnitude. In fact, it will, be a completely new ecosystem.

Algae are very efficient at using nutrients available in the water column, which then become less available for primary production by phytoplankton (Slavik et al 2919). Mussels are bivalves that filter large volumes of water on a daily basis, consuming the phytoplankton they feed on (Riisgård 1991). Given the biomasses that these species can reach in these structures, these two processes have the potential to decrease the biomass of phytoplankton available to the pelagic trophic web, affecting its integrity.

The total mass of algae and mussels will easily reach tens of thousands of tonnes. These are engineered species, creating habitat for other benthic species and increasing species richness and biological production locally (with potential negative impacts on pelagic biological production). This type of structure also has a concentrating effect on pelagic fish that find protection and food there (biomass increases locally, but without a demographic increase in populations), and it is not scientifically clear that the potential decrease in mortality of the juvenile stages of some of the species results in an overall increase in fish biomass (Mcreadie et al 2011, Degraer et al 2020).

The biomass of mussels and other benthic fauna will result in the deposition and accumulation of organic matter on the bottom through the sinking of faecal particles, a well-known effect in the shellfish aquaculture industry (Zuñiga et al 2016). Using reference values from the literature, it is possible to estimate that the biodeposition of organic matter will be in the order of tonnes (or even tens of tonnes) per day. The organic carbon content of faecal particles is around 10% (Zuñiga et al 2016). Some of this organic matter is decomposed aerobically, resulting in a release of carbon, but some will be broken down anaerobically and could become a carbon sink in the future (DeBorger et al 2021).

The biomass that accumulates on floating structures and mooring lines will also have consequences for the wind industry's own financial return, an effect that offshore oil and gas exploration companies are well aware of. In addition to the potential effects on the buoyancy and dynamic balance of floating structures, this biomass will have to be periodically removed in order to inspect the physical integrity of the structures. Currently, the oil and gas industry uses water jets operated by divers or remotely controlled vehicles to remove the fouling biomass, which will be deposited on the bottom (Pedersen et al 2022). Per generator, each operation can result in the deposition of several tonnes of biomass.

Whatever the origin, magnitude and destination of the biomass deposited on the bottom, it will give rise to local changes in benthic communities (Hutchison et al 2020), potentially identical to those caused by sources of organic pollution (DeBorger et al 2021).

One of the consequences of the wind farms to be created is the exclusion of benthic trawling and other types of fishing that use mobile nets (e.g. purse seining). The Strategic Environmental Assessment recognises the beneficial effect that the exclusion of benthic trawling will have on the recovery of the ecological integrity and production of the benthic system, with a positive impact on pelagic food chains. However, if the trawler fleet is not reduced, this fishery will be relocated to other areas. Available ecological modelling indicates that this relocation will have negative consequences outside wind farms, including in environmental protected areas, unless additional measures and increased monitoring are implemented (Püts et al 2023).

The Strategic Environmental Assessment recommends making wind farms compatible with trap fishing and shellfish aquaculture. However, it is difficult to foresee how these activities might develop. On the one hand, the mooring "footprint" of each floating wind turbine has a radius of several hundred metres (WavEC, Júlio de Jesus Consultores 2018), which depends on the depth and length of the anchor cables. It's not clear how it will be possible to fish with traps without these, and the cables that connect them, interfering with the anchoring cables of the floating platforms, with damaging consequences in both cases. As for shellfish aquaculture, considering the distance the wind farms will be from the coast, it is difficult to predict whether this activity will be logistically and economically viable. In addition, the use of the floating platforms themselves to support the ropes for attaching the shellfish entails an increase in the friction surface of the ocean currents and waves, which could affect the stability of the anchoring structures. Alternatively, the submerged surface of the platforms themselves could be used as a growing surface for mussels with a view to their commercial exploitation, with the advantage of reducing the organic load that will be deposited on the bottom. In any case, aquaculture will depend on technical and entrepreneurial innovations on the part of the farmers.

The installation of floating structures along the coast, given their density and spatial arrangement, will be an important way of dispersing algae, invertebrates and benthic fish, particularly those with a planktonic phase in their life cycle, which will use the floating platforms as stepping stones (Nolasco et al 2018). These new populations will interact demographically with populations in natural habitats, leading to genetic homogenisation that could reduce the adaptive capacity of the species. In addition, the colonisation of wind turbine attachment structures by exotic species has been documented in the literature (Adams et al 2014, Coolen et al 2020). Given the north south orientation of the Portuguese coast and the layout of the preferred areas in the same direction, wind farms will be an important route for colonisation by subtropical and tropical species, especially in the current scenario of rising global temperatures.

Challenges and opportunities

CNADS believes that the full development of the plan is a challenging project with positive implications for the decarbonisation of the Portuguese and European economies. This challenge implies the creation of an entire industrial cluster covering, in particular in the metalworking, shipbuilding and port sectors, but it is also an opportunity for regional development and technological innovation that will boost the creation of specialised jobs in the construction, installation and maintenance of equipment, as well as in the monitoring of the environmental impact of the technological solutions used. Fully developing this opportunity requires an integrated, phased strategy that assesses the effectiveness of technical and economic solutions in relation to their environmental costs.

CNADS notes that offshore wind technology is still underdeveloped and little disseminated, with very high costs compared to other electricity generation solutions. The realisation of the 10 GW of power is heavily dependent, on the one hand, on the construction of consumption centres to distribute the electricity generated, such as green hydrogen production units and data centres, or infrastructures to export it, both of which take a long time to build. On the other hand, the full development of PAER also depends on the creation and adaptation of port infrastructures to allow for the assembly and transport of equipment, as well as the construction of suitable vessels for its maintenance, processes that also take time. Finally, the environmental consequences of creating an artificial ecosystem of this size are largely unknown (Galparsoro et al 2022).

CNADS is aware that the Portuguese Institute for Sea and Atmosphere will be coordinating a study on the preferred areas for the installation of wind farms, which aims to outline the environmental baseline, including marine biodiversity, water quality and the geophysical characteristics of the sites. However, given the uncertainties surrounding the environmental impact of a totally new artificial ecosystem that the PAER will potentially create, without any comparison to current reality, it will be necessary to monitor the different stages of the process in collaboration with the industry, in order to choose environmentally friendly technical solutions and develop effective mitigation measures, in favour of the sustainability and environmental compatibility of the Plan.

As far as CNADS is aware, there is currently only one offshore wind farm in operation (Hywind Tampen, Norway; Utne-Palm et al 2023), which consists of seven generators (eleven, in the future) with a power output of 8.6 MW each. These generators are mounted on spar floats made of cement. Cement is a worse conductor of sound than steel, so it is to be expected that the noise from the operation of the generators will propagate less into the watery environment in this case, compared to what will happen if the floats are made of steel. On the other hand, consideration must be given to the balance between the volume of float required to support each generator under operational conditions and the ecological footprint that each platform will leave behind. As the power/size of each generator is expected to increase during the development period of the PAER, float solutions that are not realistically oversized in relation to the power of the generator to be installed should be used at each stage of implementation.

The implementation of the PAER is incompatible with various types of fishing in the areas where the wind farms are located, particularly trawling. This is a positive factor in terms of restoring the quality of the ecosystem, which is important to emphasise, as this type of fishing is unanimously considered to be one of the most damaging to the marine environment. In this regard, CNADS advocates special attention to two aspects, which are partly interconnected. On the one hand, if vessels are not decommissioned, there is a risk that the trawl fishing effort will be relocated to other areas, without any ecological gain. Monitoring and, possibly, regulation of the current marine protected areas will have to be strengthened in order to preserve their degree of protection. On the other hand, the important inshore trawl fishing fleet should be supported in order to reconvert its activity, either towards other types of fishing with lower environmental impact, or by adapting the current trawlers for wind farm maintenance activities. This reconversion would ensure that the relocation of trawl fishing is reduced or eliminated.

CNADS believes that making wind farms compatible with other fishing activities and aquaculture requires more public discussion and, possibly, public support for the conversion of activities or the development of innovative aquaculture solutions. This implies the involvement government organisations (Secretariat of State for Fisheries, Directorate General for Natural Resources, Safety and Maritime Services) and economic agents in the area (ship owners, aquaculture professionals and fishermen). CNADS is unaware of any studies on the use of floating platforms as a support for shellfish growth ropes that show that the ropes and shellfish biomass do not affect the stability of the float anchors. The exclusion of trawling will result in an increase in the structural complexity and productivity of the benthic ecosystem, which will be reflected in a greater abundance of commercially interesting species. However, it is difficult to foresee how trap fishing could coexist in the same areas, given the length of both the anchor cables and the electrical cables linking the different generators to the electrical substation. There is therefore a risk of damage, both to these cables and to the fishing gear itself, especially as the different platform cables have a large proportion of catenary lines suspended in the water column.

In conclusion, the wide range of uncertainties and constraints suggests the need for a better understanding of them and, given the recognised trends in the technical development of renewable sources and national electricity demand, a reassessment of the balance between the mix of renewable sources and demand that will allow the PNEC 2030 targets to be met on time

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[Unanimously approved at the 3rd ordinary meeting of CNADS in 2024, held on the 27th of May]

The President

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