Recommendations for the European Strategy for Offshore Renewable Energy „A sustainable Future for the European Union“

With the European Strategy for Offshore Renewable Energy, the European Commission gets the opportunity to pave the ground for becoming climate neutral by 2050 and to reach its biodiversity goals as set out in the EU Biodiversity-Strategy for 2030.

Requirements for a European Strategy for Offshore Renewable Energy

What would be the main characteristics and opportunities for offshore renewable energy to enable a climate-neutral future in harmony with nature?

The development of Offshore Renewable Energy plays an important role for defossilizing the energy system in line with the commitments made under the Paris Agreement. The EU committed not only to keeping the temperature rise to 1,5°C above pre-industrial levels, but to ensuring environmental integrity is maintained when taking measures to reduce greenhouse gas emissions, with particular reference to biodiversity[1]. To achieve this, an integrated, interdisciplinary and holistic approach is necessary.

The marine renewable energy production sector of the energy system currently includes activities related to wind energy, wave energy, tidal energy, thermal energy and energy derived from the different salt content of freshwater and saltwater, and the transmission of electricity. Also new renewable technologies, such as floating wind and floating solar, are being developed and introduced. If the development of Offshore Renewable Energy is promoted by the European Union, it needs to be clear from the start that the extent of renewable energy installation and related grid infrastructure is limited by the carrying capacity of marine ecosystems, and that the cumulative effects of all anthropogenic activities on the marine environment need to be fully taken into account.

NABU and BirdLife Europe therefore consider that the following recommendations should be reflected in the new strategy:

- The backbone of the strategy should be a win-win solution for energy generation and nature conservation that reflects the recovery of nature set out in the EU Biodiversity Strategy for 2030 as well as environmental strong sustainability[2].
- The strategy should be compatible with the goals of the Paris Agreement and climate neutrality before 2050. By 2030, renewable offshore energy should help reduce greenhouse gas emissions by 65 percent by 2030 compared to 1990 (without offsets), while ensuring these targets do not come at the expense of biodiversity in the marine environment.
- Scenarios and modelling should provide the basis for nature-compatible offshore renewable development that is realistic, feasible, and fully considers nature-

[1] Recital, paragraph 13. Article 4, point 13. Article 6, point 1 and point 2. https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[2] The term “strong sustainability” should be used as defined by Neto et al in “A framework of actions for strong sustainability” - https://www.sciencedirect.com/science/article/abs/pii/S0959652618317177.

sensitive indications on how much offshore capacity can be developed in European seas while accounting for the carrying capacity and pressures from competing uses of the sea. Well-justified assumptions should be based on sound available evidence.

- Spatial planning on Member States and EU-level, should identify areas to be preserved and suitable and nature-compatible areas for the use of offshore renewable energy, focusing on low impact areas based on the sensitivity of protected species and habitats. Early avoidance of biodiversity impacts from the outset of planning and development activities should be in line with the mitigation hierarchy[3]. The ecosystem based approach requires to look at the entire sea basin and ecosystems at a whole, therefore it is necessary to strengthen regional and transitional planning and cooperation through networks, platforms and a harmonization.
- The planning of offshore renewable energy and offshore grid development should be coordinated with an ambitious and well-resourced effort to restore the ecological health of marine areas and marine food chains, in particular by setting aside areas for marine ecosystem restoration, eliminating other causes of human induced mortality of vulnerable species (eg. fishing by catch) and reducing fishing pressure to allow build-up of food resources for seabirds and other species
- Offshore renewable energy installations and electricity grid network infrastructure should contribute to achieving the objectives of environmental legislation, in particular the Birds Directive and the Habitats Directive. Legal obligations of the EIA- Directive need to be taken into account and foster the submission of an Environmental Impact Assessment of each project, in order to verify an area as being suitable. Mitigation measures should be put in place wherever necessary.
- Ban further development of fossil fuel energy infrastructure and harmful subsidies and reorient investment to nature-sensitive renewable energy. Policies, regulations and incentives to promote such investments and a technology transfer should be introduced. The development and integration of nature-compatible offshore renewable energy into the energy system, as well as the adaptation and development of the existing grid infrastructure to current developments (decentralization, flexibility) are required.
- Prioritise energy efficiency as set out in the EU Governance of the Energy Union Regulation and ensure cost-efficient energy savings. The reduction of the final energy consumption through extensive energy efficiency efforts in all sectors, including the reduction of energy demand due to increased ambitions have to trigger the implementation of stronger strategies and measures for energy efficiency and sufficiency.

Main Obstacles

What are the main obstacles to a EU Strategy for Offshore Renewable Energy that need to be addressed?

- The development of offshore renewable energy and the associated grid infrastructure can have damaging consequences to the environment and to biodiversity, especially if sited in important areas for wildlife and this is recognised across several international fora. Instead, less damaging alternative projects should be enacted following a process that incorporates: (i) national assessment of

[3] Practical guidance document highlighting the importance of the first stage of the mitigation hierarchy – Phalan, B., Hayes, G., Brooks, S., Marsh, D., Howard, P., Costelloe, B., Vira, B., Kowalska, A. and Whitaker, S. (2018). Avoiding impacts on biodiversity through strengthening the first stage of the mitigation hierarchy. Oryx, 52(2), 316-324. (doi: 10.1017/S0030605316001034)

emission reduction solutions, (ii) comprehensive data collection and modelling of habitats and species, (iii) production of ecological sensitivity map, (iv) Strategic Environmental Assessment and the creation of national government's Marine Spatial Plans (MSPs), (v) and project specific Appropriate Assessments (within the EU) and Environmental Impact Assessments before any project consents are issued Pilot studies assessing potential impacts on biodiversity are furthermore paramount. Site allocation in line with the carrying capacities of the sea and respecting the marine environment while taking into account migratory bird routes are the main challenges to the development of offshore wind.

- Protected areas, together with a buffer zone, are generally highly sensitive and are very unlikely to be suitable for any development, and should, for precautionary avoidance and legal certainty, be as much as possible excluded from any offshore infrastructure development, where in some countries they already exclude offshore wind in national decree. This should not preclude assessing the sensitivity of other areas beyond these areas.
- When the EU prioritizes ocean energy and offshore wind, human pressures on marine ecosystems further increase. According to the EU-Nature Directives (Habitats Directive, Birds Directive, Marine Strategy Framework Directive) these pressures need to be reduced. The challenge is to align and integrate all marine and commercial uses (e.g. fishing, shipping, energy generation, military uses, environmental conservation and restoration) with these conservation goals and ensure that their pressures do not exceed the carrying capacity of our seas.
- Investments and subvention of energy infrastructure that are directly or indirectly based on fossil fuels and projects that are not in line with nature protection must be dismantled. Individual damaging renewable offshore energy and electricity grid network infrastructure cannot be permitted on the basis of "Public Interest" without taking mitigation and non-generation measures.
- In its EU Long Term Strategy „A Clean Planet for all", the European Commission included 230 – 450 GW of offshore wind until 2050. However, these figures still do not consider the carrying capacity of the sea and how to integrate all marine and commercial uses in line with strictly protecting marine areas for conservation purpose. Realistic assumptions and strategies can give further planning security to project promoters. New Projections for the renovated European Commission's Long-Term Strategy and offshore renewable energy should be based on assumptions that take into account latest scientific research and scenario-related work under both the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and ecological limits. Scenarios should include at least a 1,5 LIFE Scenario with benchmarks to increased energy efficiency, energy savings, grid flexibility and to minimize the need for new generation capacity and infrastructure. Scenarios must achieve the goals of the Biodiversity-Strategy for 2030 which entails having 10 % of EU sea as strictly protected and legally protect a minimum of 30 % of the EU's sea area.
- There is still no integrated cross-border cooperation and joint regional planning of the European energy infrastructure. A joint planning and designation process should ensure the designation of suitable, cost-efficient and nature-compatible areas, protect habitats and vulnerable species and that conclusions are drawn based on climate protection and marine conservation. The optimization of cross-border cooperation and joint regional planning that takes into account species protection and nature conservation will speed up the energy transition and allows for forward-looking investment decisions.

Integration of Offshore Renewable Energy in the future European Energy system
Where are Synergies and Opportunities for the future energy system?

A holistic, cross-sectoral approach is needed to achieve the goals of the Paris Agreement. This can be ensured, among other things, by an integrated energy system[4] based on the broad electrification of all sectors, while prioritizing energy efficiency and energy savings.

Maximizing the energy saving potential and using various offshore renewable energies, as well as onshore renewable energies, to drive the decarbonisation of various sectors is proven to be an economically viable option. The electrification potential for Europe lies between 50 to 85 percent by 2050 and can cut emissions of transport, building and industry. Decreasing prices for offshore wind and solar electricity will compete with fossil fuel power generation and will make direct and indirect electrification a solid and supporting pillar of a future energy system. Through nature-compatible development of cost-efficient offshore renewable energies, the need for flexibility in the system increases and generation and consumption must be more closely interlinked. Consumers who feed energy into the system via decentralized generation and storage systems (PV, electromobility, heat storage, heat pumps, etc.) and react flexibly to fluctuations in generation can contribute to system security meaning that inefficient, expensive fossil fuels based technologies and reserve capacities can be phased out faster. Also storage technologies and more efficient network management will enable a smart and future-oriented integrated energy system.

The electrification of an integrated energy system based on nature-compatible renewable energy must be part of an overall concept for the European Energy Transition. The Energy and Transport transition are to be embedded in a smart way, for a sustainable Offshore Renewable Energy Strategy. Among other things, these result in the need to save electricity, significantly reduce the end use energy and the use of cars, make vehicles more efficient and to promote its shared use.

The integration of offshore renewable energy should go hand in hand with nature-compatible electricity grid development. Missing energy infrastructure should neither become a bottleneck for the development of offshore renewable energies, nor should it deepen the EU's dependence on fossil fuels or create stranded-assets. Therefore, the European Union must act according to a principle of nature-compatible development of electricity infrastructure with appropriate incentives and support measures that are compatible with the European Green Deal with the Paris Agreement and the biodiversity goals. Financial investments in a new gas infrastructure would deepen fossil fuels dependencies; these unnecessary investments along with investments in projects that are not in line with the Habitats Directive should not be supported by the European Union.

The nature-sensitive planning of energy infrastructures must be improved across Europe and must enable strengthened regional cooperation and cross-border cooperation. A stronger coordination of planning at EU-level might facilitate this. Enhanced cross-border cooperation can enable authorities to adequately take into account species and nature conservation. Furthermore, it provides legal certainty, security for planning and makes the energy transition attractive for further investment. This includes taking an ecosystem based approach (see for BL-expectations towards this approach p. 6) which involves analysing the sensitivity of species and habitats to different activities (including the cumulative impacts) which helps inform on exclusion areas at a regional level. The ecosystem based approach in terms of energy infrastructure should also be reflected in flexibility and nature

[4] NABU (2020): Smart Sector Integration Strategy (in German): https://www.nabu.de/imperia/md/content/nabude/klimaschutz/200608__nabu_stellungnahme_smart_sector_integration_strategy.pdf

based decisions on the transmission through subseacables, taking into consideration the main environmental sensitivity and topographical limitations of a project instead of political determination. Before individual transmission networks are to developed or receive funding, they must already be included in national development plans and the European Ten-Year Network Development Plan (TYNDP) must assess whether a more cost-effective solution without additional infrastructure is possible and how negative effects on the environment can be minimized. A Strategic Environmental Assessment should be done already in the TYNDP-process, as legally required by the SEA-Directive Article 2 & 3.

A Win-Win for Energy and the Marine Environment

In how far should the status of the marine environment be considered and how could its development be supported by the EU?

Europe's coastal areas and seas have been significantly altered through severe cumulative anthropogenic pressures that result in a poor environmental and ecological status. Large areas of the seabed have been disturbed and depleted, various fish stocks are not being sustainably fished and seabird populations are struggling. More than 200,000 seabirds are killed as bycatch every year in EU waters[5]. About 25% of Europe's marine mammals are threatened[6]. Biogenic reef structures have largely disappeared. A considerable amount of marine species and habitats assessments show an „unfavourable conservation status" despite legal obligations through the Habitats Directive[7]. Marine conservation targets such as in the Marine Strategy Framework Directive (MSFD) have been missed.

Also management of marine areas is still not sufficient and is not tackling the effects of multiple pressures on Europe's seas due to human activities. Only 10,8 %[8] of Europe's sea areas are designated as MPAs; the majority of these MPAs lack protection measures and are not properly managed. Conservation efforts must be stepped up in line with the Marine Strategy Framework Directive and Member States must set stronger targets and measures to reach a good environmental status of the marine sea areas.

This, in addition to climate change impacts on the marine environment, results in potential ecosystem collapse. To increase resilience to the climate and biodiversity crises, these ecosystems have to be restored, protected and maintained. Healthy marine ecosystems can also play a major role in reducing the effects of the climate crisis[9].

Offshore renewable energy, and related grid infrastructure and other infrastructure need to be progressed with respect for nature conservation if they are to provide a sustainable solution. Research and peer reviews show the potential negative impacts of offshore wind energy farms[10], wave-powered marine renewable energy[11], tidal energy [12] and related grid

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5 Žydelis, R, Small, C & French, G (2013) The incidental catch of seabirds in gillnet fisheries: a global review. Biological Conservation, 162: 76–88. Available at https://www.sciencedirect.com/science/article/abs/pii/S0006320713000979.

6 IUCN Red List (Online: https://www.iucnredlist.org

7 EEA-Report (2019): Marine Messages II: Navigating the course towards clean, healthy and productive seas through implementation of an ecosystem based approach.

8 ETC/ICM - Spatial Analysis of Marine Protected Area Networks in Europe's Seas II, Volume A, 2017

9 IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany.

10 Mendel, B., Schwemmer, P., Peschko, V., Müller, S.,Schwemmer, H., Mercker, M., Garthe, S. (2019): Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (Gavia spp.). Journal of Environmental Management 231 (2019) 429–438;

11 RECIAN, W. J., INGER, R., ATTRILL, M. J., BEARHOP, S., GODLEY, B. J., WITT, M. J. and VOTIER, S. C. (2010), Potential impacts of wave-powered marine renewable energy installations on marine birds. Ibis, 152: 683–697. doi:10.1111/j.1474-919X.2010.01048.x

12 Savidge G, Ainsworth D, Bearhop S, Christen N, Elsaesser B, Fortune F, Inger R, Kennedy R, McRobert A, Plummer KE, Prichard DE, Sparling CE, Whittaker JT (2014) Strangford Lough and the SeaGen Tidal Turbine. In: Whittaker MA, Payne AIL (eds) Marine renewable energy technology and environmental interactions. Springer, New York, pp 153–172

infrastructure[13]. They range from disturbing or driving species away, loss and alteration of habitat and essential feeding areas, to physical injuries and fatal collisions and barrier effects. The impacts of new technologies such as floating solar remain still largely unclear. Also the quantification of the impacts due to a larger roll-out of nature-compatible offshore wind energy (as foreseen by the European Commission) and new concepts like Offshore Energy Hubs while keeping cumulative effects within ecological limits need to be considered. Favourable locations for wind power that are not in line with nature protection, need to be excluded by project promoters from the outset and should not be eligible for funding and denied the status of Project of Common Interest. Independent and further research on environmental impacts of a large-scale roll-out of offshore wind and of new technologies, such as floating solar and concepts such as the Hub-and-Spokes-Concept need to be funded and carried out, before enabling investments into projects which could also enhance other industrial uses of the sea. Without sufficient information, the precautionary principle must be applied.

The overall negative environmental impact of offshore renewable energy and related infrastructure in already degraded ecosystems needs to decrease. Renewable energy projects must not add further pressure to species or habitats with unfavourable conservation status. Enhanced spatial planning that takes into account conservation of marine species and habitats is key. Developments of offshore wind energy must be planned and deployed having in mind commitments to marine ecosystems under the EU Marine Strategy Framework Directive, the EU Nature Directives, the objectives of the Convention of Biological Diversity, the UN Sustainable Development Goals and the Biodiversity-Strategy for 2030. To achieve this, the role out of renewable energy at sea will often need to be preceded and accompanied by targeted species and habitat protection and restoration programmes carried out, or coordinated, by national or regional governments. In some cases this may be funded directly or indirectly by project proponents. The planning of new renewable energy infrastructure can be an opportunity to reduce the effects of other human activities in the marine environment by replacing destructive marine activities, such as benthic fishing practices. As mentioned in the EU Biodiversity Strategy the “EU will prioritise solutions such as ocean energy, offshore wind, which also allows for fish stock generation”[14].

Marine Spatial Planning

How should the Maritime Spatial Planning Directive interact with the European Strategy for Offshore Renewable Energy?

Determining the sensitivity of biodiversity to these developments is a fundamental requirement prior to the development of spatial plans. These sensitivity assessments should take place nationally and ensure regional cooperation to ensure assessments are carried out at a sea basin scale in an effort to decrease the negative effects of plans/programmes on marine biodiversity and aid decision-making. Sensitivity maps should identify known potentially sensitive locations, locations that are considered to have low implications for wildlife, and locations for which further information is needed to determine whether or not construction and operation of renewable energy installations in these areas are compatible with biodiversity conservation priorities. All stages of the life cycle and the habitats and locations that support essential functions (including – for example in the case of birds – feeding, breeding, moulting, resting, and non-breeding, including migration stopovers) need to be taken into account. Sensitivity maps should be regularly updated and should be funded and promoted by national, regional, or local

[13]Ospar Commission: Assessment of the environmental impacts of cables: http://qsr2010.ospar.org/media/assessments/p00437_Cables.pdf

[14] EU Biodiversity Strategy for 2030: https://ec.europa.eu/info/sites/info/files/communication-annex-eu-biodiversity-strategy-2030_en.pdf

governments. Energy planning should prioritise use of available low ecologically sensitive areas.

EU Member States have to deliver marine spatial plans conforming to the Maritime Spatial Planning Directive by March 31 2021 for marine waters using an ecosystem based approach. A number of countries, such as Germany, will miss the deadline and will submit their plans at a later stage.

Marine Spatial Plans need to respect the carrying capacity of the sea, which means no species loss and no significant population decline. The Maritime Spatial Planning Directive also states that the plans need to contribute to achieving the aims of the Birds and Habitats Directives. However, no Member States has so far looked at the sensitivity of each specie and habitat protected under the Birds and Habitats Directive. Only Sweden comes close to the required level by doing a general ecosystem component (e.g. “bird”, “seal”, “reefs”) sensitivity, as can be seen in the Symphony project 15 (i.e. Symphony project: this obviously aggregates different behaviours of birds and does not apply to the strict protection of the Birds Directive). It will be important that these challenges are addressed and solved in the Strategy for Offshore Renewable Energy. A coherent policy framework means that energy, climate and marine should not contradict each other. The Strategy and the Maritime Spatial Planning Directive need to reinforce each other and create the ground for coherent and nature-sound offshore renewable energy development.

The Marine Spatial Planning Directive requires an ecosystem based approach without providing a definition of the term, however, the regulation does refer to the Marine Strategy Framework Directive, which states that “Marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations“[16]. Guidance from the European Commission on the ecosystem based approach for Marine Spatial Planning is still missing, which is a major shortcoming. According to BirdLife the ecosystem-based approach requires to look at the entire sea basin and the marine ecosystem at a whole, across national borders and including the coastal environment. Currently, the plans do not apply to coastal waters unless Member States choose to do so. This is a major shortcoming, as there are more MPAs designated in coastal waters than in offshore water[17].

For coherent Marine Spatial Planning all anthropogenic activities and their cumulative, in-combination and transboundary impacts at sea and in coastal areas need to be fully considered and collective pressure needs to be within limits that enable the achievement of good environmental status. In the national processes, it is already clear that not all relevant marine sectors are included, therefore, it cannot be expected to result in holistic plans. Also a fragmented governance by the EU with reference to the Marine Strategy Framework Directive and the Marine Spatial Planning Directive and by coordinating bodies for countries entails a sector by sector planning.

[15] Symphony-Project: https://www.havochvatten.se/en/swam/eu--international/marine-spatial-planning/symphony---a-tool-for-ecosystem-based-marine-spatial-planning.html
[16] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)
[17] EEA: https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/marine-protected-areas

Power-to-X and Hydrogen

What is the role for Hydrogen and Power-to-X and how could its development be supported by the European Union?

For more cost, energy, material and resource efficiency, the direct use of electricity from offshore renewable energy and energy efficiency potentials should be leveraged instead of focussing on Power-to-X (PtX) and the production of hydrogen based on offshore renewable energy. Electricity serves as the main energetic input into PtX production and considerable conversion losses occur along the process chain, which also leads to high costs[18]. More capacities for the generation of nature-compatible offshore energy will be required, if PtX and the production of non-fossil based hydrogen are to be further developed and renewable energies that are a rare resource should be used as efficiently and sufficiently as possible.

Indirect electrification through Power-to-X based on renewable offshore energy sources can help storing power surpluses and can pose a solution for energy carriers with high energy density. More demand for electricity based on renewable energy from PtX production can lead to even more emissions in the energy system, also the technological potential is less than commonly expected. Another limiting factor for the production volume and the scaling of PtX production might be the sustainable access to water and land[19]. Problems in finding space for onshore grid landing points should not result in fostering the development of renewable hydrogen, as the conversion of electricity to gas would also require space.

The specific application areas of PtX products need to be carefully assessed against environmental and social sustainability criteria. Also for imported renewable energy and for whole amortisation periods of PtX-plants, that entail 20 years or more, these assessments need to apply. Criteria for the use of PtX and the operation of PtX-plants need to be compatible with more ambitious emission reduction targets by the EU for 2030 and with reaching Climate Neutrality well before 2050. Only Power-to-X products that can reduce absolute emissions from the entire life cycle, that are in line with nature conservation goals and that reduce the use of resources should receive funding from the European Union.

Based on this, for hard to decarbonise industries, the use of non-fossil hydrogen based on renewable offshore energy should be considered. Possible areas of application for this renewable hydrogen are high-temperature industrial processes and heavy vehicles (trucks), air transport, ocean shipping and the steel industry. It should not be used for passenger cars, for the heating sector and for the reconversion of hydrogen into electricity. Quotas for green hydrogen from renewable sources, as laid out in the European Hydrogen Strategy, need to be sufficiently high to enable a phase out of fossil fuels.

The Clean-Hydrogen Alliance, as announced by the Industrial Strategy, should with sufficient participation of civil society and independent experts, balance social and ecological criteria with economic criteria, as they often implicate diametric contrasts. Furthermore the Alliance must ensure that only hydrogen based on nature-compatible renewable energy is used.

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[18] Öko-Institut e.V. (2019). Not to be taken for granted: Climate protection and sustainability through PtX (Online: https://www.oeko.de/fileadmin/oekodoc/Impulse_paper_criteria_for_e-fuel_production.pdf)

[19] Öko-Institut e.V. (2019). Not to be taken for granted: Climate protection and sustainability through PtX: https://www.oeko.de/fileadmin/oekodoc/Impulse_paper_criteria_for_e-fuel_production.pdf

Circular Economy and Waste resources

How can the circular economy be fostered and resources used more sustainably and cost-efficient?

Considering current and future developments, waste from the wind industry and other offshore renewable industries are expected to increase. After 20 to 30 years, wind turbines reach their end of service life. A lot of components of wind turbines, such as the foundation, tower, gear box and generator are recyclable and processes are in place to recycle these. The wind industry is also a consumer of glass-fiber (GFRP) reinforced plastics composites, usually to be found in older wind turbine blades, which pose a challenge in terms of type of material and composition[20]. Cost-intensive thermal pyrolysis is the only possible way of treating GRFP waste; logistics for incineration in cement plants are difficult and thermal treatment in conventional waste incineration plants is not recommended[21]. The new trend of using carbon fiber reinforced polymers (CFRP) is also cost-intensive and leads to downcycling; incineration in conventional waste incineration plants would lead to increased lung cancer risks.

The European Union has to ensure the creation of a robust circular economy framework for the design of offshore renewable energy that not only looks at building infrastructure, but already designs for the requirements of decommissioning. In order to strengthen qualitative recycling, the European Union is recommended to use specific targets[22], ideally material-specific targets to overcome issues of specific waste streams. In the light of developing new technologies, it needs to be always checked whether the dismantling of wind turbines are inherently necessary and whether repowering while reusing components, poses a more environmentally sound option, according to EU-Waste hierarchy, with a focus of waste prevention.

Steep increase in demand for rare earth elements (e.g. neodymium, praseodymium, dysprosium, terbium used in wind turbines), due to an increase in offshore renewable energy may lead to supply insecurity, but also to unsustainable terrestrial mining and unsustainable deep sea mining. It needs to be ensured that offshore renewable energies, such as offshore wind turbines, are designed, repowered and decommissioned according to circular economy principles and adherence to responsible sourcing of metals according to environmental and human due diligence standards is paramount.

Legislative Measures

Which political activities and legislative measures could the European Commission use to promote offshore renewable energy?

- Introduction of policies in line with the Paris Agreement and the 1.5 ° C target, the European Green Deal, the biodiversity goals as set out in the 2030 Biodiversity Strategy and the goal of Climate Neutrality. To be able to define and shape these measures, a new scenario for European energy supply based on 100 % nature-compatible renewable energies in line with the carrying capacities of ecosystems must be developed and implemented. This scenario should be integrated into the

[20] Jensen, Skelton (2018): Wind turbine blade recycling: Experiences, challenges and possibilities in a circular economy: https://www.sciencedirect.com/science/article/abs/pii/S1364032118306233)

[21] UBA (2019):Entwicklung eines Konzepts und Maßnahmen für einen ressourcensichernden Rückbau von Windenergieanlagen: https://www.umweltbundesamt.de/publikationen/entwicklung-eines-konzepts-massnahmen-fuer-einen

[22] Topham, E. Et al. (2019): Reycling offshore wind farms at decommissioning stage: https://strathprints.strath.ac.uk/67103/1/Topham_etal_EP_2019_Recycling_offshore_wind_farms_at_decommissioning_stage.pdf)

new European long-term strategy.

- The nature-friendly development of offshore renewable energy should be incentivized though a more ambitious EU- climate target for 2030 which helps to reduce greenhouse gas emissions by 65 percent by 2030 compared to 1990 (without offsets). Increased emission reduction targets must adjoin with policy that ensure that the targets do not come at the expense of (marine) biodiversity.
- EU-2030 energy targets for nature-compatible renewable energy and energy efficiency should simultaneously increase to set a strategic direction for the transformation of the energy system.
- A new legal framework for the restauration, protection and maintenance of ecosystems with binding targets as set out in the 2030 Biodiversity Strategy should ensure healthy marine ecosystems that are more resilient to the climate crisis.
- The European Union should provide the legal foundation to prioritize offshore ocean energy solutions that allow for fish stock generation by replacing and reducing destructive marine activities.
- The EU must provide a sound framework that enable collaboration across national borders and foster Members States and EU-level responsibility for applying the ecosystem based approach in Marine Spatial Planning while acting under the guiding principles of no species loss and no significant population decline.
- Investments and subvention of energy infrastructure that are directly or indirectly based on fossil fuels and projects that are not in line with nature protection must be dismantled through adequate policy measures. Investments should be redirected to benefit nature-compatible renewable energy.
- The Trans-European energy infrastructure Regulation (TEN-E) must be revised in line with the Paris Agreement and biodiversity goals. In order to optimize the integrated planning of energy infrastructure the TYNDP-process must be optimized to entail a Strategic Environmental Assessment. The TEN-E Regulation must be strengthened to enable smart choices for locations of marine energy infrastructure and processes that do not contradict EU Nature Directives. When considering infrastructure for hydrogen based on renewable offshore energy, retrofitting of existing gas pipelines must be mandatory before allowing to build new infrastructure.
- Renewable energy and related infrastructure projects must not add any further pressure to species or habitats with unfavourable conservation status and should not be permitted because of Imperative Reasons of Overriding Public Interest.
- The development of hydrogen based on renewable offshore energy must be assessed in line with the Paris Agreement and should ensure that the most energy efficient choice is taken when considering building offshore wind farms and converter platforms for this purpose. Only so-called renewable gases which throughout their lifecycle account for nature conservation and absolute emission and resource use reduction should be promoted through the European Union. Decarbonised Gases that are based on fossil fuels should not be promoted.
- The European Commission should create a sound framework to promote the eco-design of offshore renewable energy that not only looks at building infrastructure, but already designs for the requirements of decommissioning. This should entail investment into research of recycling of wind turbines and setting a clear date for full recyclability of offshore renewable energy while prioritizing reuse and waste prevention.

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