

Offshore wind projects: Assessing the environmental impact

An overview of rules and developments
in Australia, Germany, Japan, Mexico,
the UK and the US



Contents

Australia

Page 2

Germany

Page 6

Japan

Page 12

Mexico

Page 16

United Kingdom

Page 22

United States

Page 26

Conclusion

Page 32

Navigating environmental issues in offshore wind project development

Around the globe, opportunity is on the rise, but regulatory and political challenges persist

Throughout the world, many national and local governments are creating regulatory and commercial environments to encourage developers, lenders and investors to build, finance and invest in offshore wind energy. This has led to an upswing in the number of offshore wind projects being planned and built around the world. Renewable energy generated by offshore wind power is typically consistent with nations' climate change commitments under the Paris Agreement to reduce greenhouse gas emissions. However, offshore wind farms have unique impacts, which are addressed through environmental and natural resource policies and rules.

Governments in many of the key markets for offshore wind investment typically require the environmental and social impacts of a proposed offshore wind project to be assessed and mitigated. The complexity, sophistication and duration of the environmental impact assessment process varies across jurisdictions, and must be carefully evaluated by potential developers and investors. Project proponents also need to be mindful that in most jurisdictions, although to varying degrees, the environmental and social impact assessment is subject to public scrutiny and comment, and can also be vulnerable to legal challenges.

This report offers an overview of key environmental risks raised by offshore wind projects in six key jurisdictions: Australia; Germany; Japan; Mexico; the UK; and the US. Offshore wind farms operate in many of these jurisdictions. In others, they are increasingly attractive because of higher offshore wind speeds and capacity factors, shallow ocean depths and supportive government policies. We summarize how regulators in these jurisdictions require project proponents to consider impacts to birds, bats, fish and marine mammals during the development process. We also assess how noise associated with the construction and operation of offshore wind projects must be addressed. Finally, we focus on the aesthetic considerations, decommissioning requirements and impacts to fishing, navigation and transportation that arise in the planning, construction and operation of an offshore wind project.

Australia

Offshore wind projects face challenges that are not addressed by the regulatory system established for onshore projects

By Tim Power

The Australian government's mandatory renewable energy target (MRET) supports investment in renewable energy, requiring that renewable energy make up the equivalent of 20 percent of the nation's electricity by 2020.

The Australian Clean Energy Council reported that in 2018, wind generation produced 33.5 percent of the nation's renewable energy and 7.1 percent of its overall electricity. The contribution of wind energy to meeting the MRET is expected to grow, with nine onshore wind farms starting operations in 2018 and another 24 under construction or financially committed. Given this track record of nearly 20 years of onshore wind farm developments, a fairly stable regulatory system exists for evaluating and regulating their environmental and social impacts.

The same cannot be said for Australia's nascent offshore wind farm industry. There is growing interest in taking advantage of higher wind speeds and capacity factors off Australia's shores, particularly in the country's southeast, with its shallower seas and proximity to the onshore national electricity grid. However, prospective developers and Commonwealth and state government authorities are still grappling with the processes for securing title to the seabed and for assessing, approving and regulating offshore wind farms.



20%

MRET requires that renewable energy make up 20% of the nation's electricity by 2020

COMMONWEALTH AND STATE RESPONSIBILITIES FOR WIND FARM DEVELOPMENT

Australia's states and territories are primarily responsible for the environmental impact assessment, approval and regulation of onshore wind farm development. However, the Commonwealth retains important responsibilities for legislating to give effect to Australia's international environmental treaty obligations and to protect matters of national environmental significance. The key Commonwealth environmental legislation that can affect wind farm development is the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Under Australia's constitutional setup, the jurisdictions of the states only extend three nautical miles offshore. Beyond that limit, the remainder of Australia's territorial sea and exclusive economic zone is administered by the Commonwealth, and is referred to in the EPBC Act as the "Commonwealth marine area."

This means the Commonwealth government will have primary responsibility for assessing and

approving any offshore wind farms proposed within the Commonwealth marine area. For these projects, the states and territories will have a secondary but important role in assessing and approving transmission line connections to the onshore electricity grid, construction and operational ports, and other ancillary aspects of the wind farm project.

Environment Protection and Biodiversity Conservation Act

The EPBC Act protects a number of "matters of national environmental significance." These include listed threatened flora and fauna species and ecological communities, listed marine species, the Commonwealth marine area, world heritage properties, Ramsar Convention wetlands and places inscribed on the National Heritage List. Under this Act, a wind farm proponent refers the project to the Commonwealth Minister for Environment for a determination of whether, based on its likely impacts on matters of national environmental significance, the project must undergo environmental impact assessment and approval



There is growing interest in taking advantage of higher wind speeds and capacity factors off Australia's shores, particularly in the country's southeast, with its shallower seas and proximity to the onshore national electricity grid.



from the Commonwealth government. The referral is placed on public exhibition for ten days before a decision is made.

The Commonwealth has entered into bilateral agreements with the states and territories that limit the potential for duplicating Commonwealth and state/territory environmental impact assessments. For most onshore wind farm projects in Australia, this has meant that proponents have only been required to prepare an environmental impact assessment that complies with the requirements of the state and territory land-use planning and environmental assessment laws. The Commonwealth has then relied on the outcome of that assessment to decide whether to approve the wind farm.

The situation for offshore wind farms is more complicated because the bilateral agreements do not apply to projects that extend outside

the jurisdiction of the relevant state or territory. This means that any project that includes a wind farm in the Commonwealth marine area and ancillary infrastructure within a state or territory will require a bespoke, integrated impact assessment to be agreed upon and coordinated by both tiers of government. While no law requires this, often the Commonwealth and the relevant state and territory government agree to an integrated impact assessment that addresses the legal and policy requirements of both tiers of government.

IMPACTS TO BIRD AND BAT SPECIES

Wind farm project proponents are required to assess whether the wind farm will have significant or unacceptable impacts on native bird and bat species, focusing particularly on potential collision with turbines or barotrauma for bat

species. Assessing the impacts of proposed onshore wind farms can be time- and resource-intensive, especially undertaking bird and bat utilization surveys for listed threatened species. In some instances, surveys can be required over several years. Anabat detectors have been deployed at ground level and hub height to evaluate whether a proposed wind farm site is being used by protected bat species, and collision risk modeling and population viability assessments are sometimes required to quantify potential bird and bat mortality due to collision with turbines and the effects of this mortality on the long-term species' viability.

While there are, as yet, no offshore wind farm projects for which environmental approval has been sought, we anticipate that survey efforts of similar intensity and duration may be required to satisfy Australian regulators about

any project's potential impacts to seabirds, migratory bird species and marine species.

Legislative regime

The Commonwealth EPBC Act makes it an offense to undertake any project that will have a significant impact on the environment in the Commonwealth marine area or on listed threatened species or communities, listed migratory species or listed marine species. The list of protected species includes migratory bird species protected under the Bonn Convention on the Conservation of Migratory Species of Wild Animals and bilateral agreements between Australia and the People's Republic of China and Japan.

However, a wind farm developer will have a defense if the wind farm has been referred to the Commonwealth and it has decided that the project does not require its approval, or if the project has undergone the impact assessment, public comment and approval process set out in the EPBC Act. This legal protection often underpins wind farm proponents'

decisions to refer their wind farm projects to the Commonwealth under the EPBC Act, even if the environmental studies indicate that the particular project's impacts on wildlife are likely to be low.

In addition to these project approvals, the EPBC Act requires a permit to "take" various marine species, in particular marine mammals. This means a permit can be required to undertake survey activities, such as baiting and tagging, and permit applications are also made available for public notice. However, for marine survey purposes, they are typically non-contentious. Unlike in other jurisdictions such as the US, incidental "take" permits are not required to authorize a project's impacts on species if the project has been approved following the referral and environmental impact assessment procedure described above.

Each state and territory also has its own wildlife protection laws, which typically make it an offense to take any native species without a permit. These permit requirements can also capture

certain marine survey activities, but the need for public notice varies between jurisdictions.

VISUAL IMPACTS OF ONSHORE WIND FARMS

Significant landscapes can be protected under the EPBC Act if they are inscribed on the World Heritage List maintained by UNESCO, or on the National Heritage List maintained by the Commonwealth Department of Environment and Energy. Significant landscapes can also be identified and protected by local planning instruments by virtue of their scenic, geomorphological or other notable characteristics.

This makes it important for wind farm developers to select and procure potential wind farm sites that avoid locations protected by the EPBC Act or state land use planning and heritage laws, including onshore landscapes in the vicinity of the proposed wind farm site.

For onshore wind farm proposals, a planning application must typically be accompanied by a landscape and visual impact assessment (LVIA). While a number of states



and territories have issued generic guidelines for assessing the impacts of wind farms, only draft National Guidelines and a NSW Planning Bulletin provide a framework for undertaking a systematic and repeatable impact assessment of the landscape and visual impacts of proposed wind farms.

It is typical for LVIA's to be accompanied by computer-generated photo montages of the wind farm viewed from public locations and, sometimes, from private dwellings in the vicinity of the wind farm. Generally however, provided a wind farm site and its locality avoid identified important or significant landscapes, localized visual impacts of wind farms are accepted by state land-use planning systems if the turbines are a reasonable distance from the nearest non-participant dwellings.

To address potential concerns of residents in the vicinity of wind farms (typically three to five kilometers from turbines), wind farm developers are usually required to offer landscaping at such residences to shield them from views toward the wind farm.

Once again, there are no guidelines or protocols for assessing the landscape and visual impacts of offshore wind farms. However, environmental and land-use laws and guidelines to protect the amenity and ecological processes along the Australian coast will undoubtedly give high prominence to the importance of assessing and reducing the visibility and visual impact of offshore wind farms, especially when viewed from beaches or national parks. Similarly, it can be assumed the methodologies and parameters developed to assess the landscape and visual impacts of onshore wind farms over the past two decades will be used or applied to assess the effects of offshore wind farm proposals.

NOISE

In Australia, the potential effects of aerodynamic noise from turbines on the health and well-being of nearby residents has been a key high-profile

issue associated with onshore wind farms. Each state and territory has published noise criteria, with which onshore wind farms must comply.

For offshore wind farms, it is expected that the construction and operation of the projects' onshore elements, such as ports or substations, and underwater effects associated with the installation of offshore turbines, will be the focus of environmental regulations and communities alike.

Onshore noise guidelines

Each Australian state and territory has laws, implemented by an Environment Protection Authority, that regulate environmental noise. These regulations address construction and operational noise, either through statutory policies or non-statutory guidelines. Given that offshore infrastructure associated with offshore wind farms will most likely be situated adjacent to regional onshore areas with low ambient noise, it will be important to select appropriate locations for port facilities, substations and transmission line alignments to optimize the prospects of satisfying state and territory EPA laws and noise guidelines.

Underwater noise

Underwater noise from the construction of offshore wind farms, especially from pile-driving turbine foundations, and its effects on marine fauna has been a significant issue for a number of projects around the globe. In Australia, the regulation of underwater noise to date has mostly focused on seismic exploration for oil and gas, and the Commonwealth has set sound energy-level criteria and recommended best practice management to reduce the effects of seismic operations on marine mammals. The South Australian government has also published underwater pile-driving guidelines to protect marine mammals, and in 2017 the Great Barrier Reef Marine Park Authority published an Issues and Options Paper for developing and enforcing underwater noise guidelines.

While there are no underwater noise standards for offshore wind farms, it can be assumed that approaches and guidelines for the offshore oil & gas industry, as well as overseas guidelines and precedent, will inform the Australian governments' methods for evaluating the effects of underwater noise from offshore wind operations on marine fauna.

DECOMMISSIONING AND REPOWERING

As yet, no Australian wind farms have been decommissioned, nor have they been repowered when the turbines reach the end of their useful life. Nevertheless, the state and territory wind farm guidelines and the conditions of consent for onshore wind farm planning approvals typically require wind farms to be decommissioned or repowered in accordance with plans endorsed by the planning authority. In their applications, wind farm applicants typically contemplate that decommissioning plans might allow for turbine footings and other buried infrastructure, as well as access tracks and water dams that are useful to the landowner, to remain in place, while turbine, transmission line and substation infrastructure is removed and the site is rehabilitated. None of the wind farm guidelines require or encourage the wind farm developer to provide a bond or other financial security to cover rehabilitation costs.

Given the nascent state of the Australian offshore wind energy industry, there is as yet no approach to regulating the decommissioning of offshore wind farms. It can be assumed, however, that the federal government may model its overall approach on its current regulation and decommissioning of offshore oil and gas production activities. As with onshore wind farms, this would require decommissioning to be carried out in accordance with an approved plan. However, we foresee that the Commonwealth government may also require financial security to cover any offshore wind farm developer's rehabilitation obligations.

Germany

A complex and sophisticated planning and approval process does not prevent opponents from raising environmental challenges—even after project approvals are awarded

By Anna Burghardt

The German federal government plans to further expand offshore wind use by 6.5 gigawatts (GWs) by 2020 and by 15 GWs by 2030. However, offshore wind projects in Germany face environmental opposition by, in particular, German nature protection associations regarding construction and operation-related impacts on marine species, protected areas, biotopes and habitats. These aspects are reviewed as part of the complex and lengthy planning and approval process for offshore wind farms. During the review, the project proponent and the approval agency examine whether the project is compatible with public interests. But opponents continue to challenge projects for environmental reasons, even after planning approvals have been awarded for individual projects. For instance, in 2014 and 2015 respectively, the German environmental protection association (NABU) filed suit against the offshore wind farm Butendiek, claiming severe infringements of environmental and species protection law (in particular as to loons and porpoises) and arguing that the project's realization would cause unlawful environmental damage.

While offshore wind projects in territorial waters are governed by federal law (Bundes-Immissionsschutzgesetz) and administered by state authorities, offshore wind farms in the German exclusive economic zone (EEZ) (between 12 and 200 nautical miles off the German coast in the North and Baltic Seas) are administered by the Federal Maritime and Hydrographic

Agency (BSH) pursuant to either the Federal Marine Installations Ordinance (SeeAnIV), or for offshore wind farms and related grid connections that start operation after December 31, 2020, pursuant to the Offshore Wind Energy Act (WindSeeG).

KEY PROCEDURAL AND PERMITTING PREREQUISITES

The BSH may authorize the erection and operation of an offshore wind farm in the German EEZ if, among other things, the project has no adverse effects on the safety and efficiency of maritime navigation or national defense; poses no risks for the marine environment, including pollution or bird migration risks; and complies with other requirements under the SeeAnIV/WindSeeG or other public law provisions.

Even if an applicant can show that the project meets these prerequisites, the BSH will exercise its discretion by balancing relevant interests and rights. Before obtaining the planning approval required to construct and operate an offshore wind farm, the applicant will need to conduct extensive investigations. EEZ offshore wind projects consisting of more than 20 wind turbines taller than 50 meters must undergo a statutorily specified formal environmental analysis, the Environmental Impact Assessment (EIA), pursuant to the Federal Act on Environmental Impact Assessments (UVPG). An EIA assesses the environmental and other impacts of a contemplated project throughout its lifespan as well as project alternatives. In an EIA, the project proponent must



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assess the project's impacts on, in particular, benthos, fish, birds, marine mammals, protected areas and biotopes. Based on this analysis the BSH will, following review and comment of other expert agencies, such as the Federal Agency for Environmental Protection (BfN) and the public, decide whether the project is compatible with protecting the marine environment.

The planning approvals awarded by the BSH for an offshore wind farm impose conditions to ensure that the offshore wind farm meets regulatory prerequisites for approval throughout its lifespan. The BSH planning approvals tend to authorize a project only subject to the condition that construction/installation and operation of the wind farm require further authorizing decisions from the BSH. The BSH grants these further authorizing decisions, called releases (Freigaben), to the extent the project proponent shows compliance with the conditions specified in the planning approval (regarding, for example, technical,



Before obtaining the planning approval required to construct and operate an offshore wind farm, the applicant will need to conduct extensive investigations.

engineering, design or monitoring, investigation and reporting requirements) as supplemented by the BSH standards by means of certain expert reports and certifications. The releases function as gatekeepers over the course of an approved wind farm project's implementation. The BSH distinguishes among five principal project phases: (1) development; (2) design; (3) construction; (4) operating; and (5) decommissioning. Typically, three releases must be obtained in addition to the BSH's planning approval.

Given the dynamic character of the regulatory regime, the BSH's planning approvals require environmental impacts of the project to also be assessed following the award of the planning approval. To verify the assumptions made in the EIA underlying the award, operations shall be monitored for a period specified by the BSH (typically, three to five years). Reporting to the BSH shall occur annually through submission of the monitoring data. Based on the monitoring results and other available up-to-date information, the BSH shall determine measures to implement to prevent and mitigate environmental impacts even including, if necessary, the (temporary) shutdown of operations.

IMPACTS TO BIRD AND BAT SPECIES

As part of the EIA, the BSH will review whether offshore wind projects will harm avian species,



including birds or bats. To this end, the project proponent will frequently devote significant resources to environmental-technical expert analysis through surveys (e.g., bird and bat species surveys as well as habitat surveys) regarding whether the project area is relevant for specially protected birds and bats as, for example, habitat, resting or nesting ground, and whether these species are likely to collide with wind turbines.

Importantly, where a project is located in or at such a distance from a Natura 2000 site that it may impact the site, an “appropriate assessment” (FFH-Verträglichkeitsprüfung) must be conducted in line with EU legislation to establish whether significant impacts on the Natura 2000 site and protected species, such as birds and bats, can be excluded. Should an exclusion of significant adverse effects be impossible, the project is, in principle, not suitable for approval, unless its proponent can obtain a derogation from the substantive safeguards afforded to protected sites. Notably, approximately 31 percent of the German EEZ of the North and Baltic Seas are designated as Natura 2000 sites (two bird sanctuaries and eight FFH areas).

Federal Environmental Conservation Law

Offshore wind project proponents prepare assessments and develop related conservation plans to ensure their projects are compatible with the provisions of the German Federal Act on Environmental Conservation (BNatSchG), which transposes the EU Bird and Habitats Directives into national law. Regarding specially protected birds and bats, the BNatSchG generally prohibits: (1) harassing, taking/capture, harming and killing these species as well as capturing, damaging or destroying their eggs; (2) significant disturbance resulting in a deterioration of the conservation status of the local population; and (3) destruction or taking of reproductive or resting places.

Accordingly, the compatibility of a wind farm project with these prohibitions will be reviewed and assessed by the BSH based on technical data such as species surveys. Regarding incidental bird or bat strikes due to animals colliding with wind turbines, the statutory prohibition to harm or kill protected species is not infringed where the wind farm does not significantly increase the collision risk for the affected species, or where such risk can be countered by suitable



Approximately

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measures such as light reflectors or special paint. Further, where a project infringes one of the above-mentioned prohibitions, it might, nonetheless, be allowed through an exemption or derogation issued by the BfN on a case-by-case basis.

Standard planning approval conditions and BSH “Standard Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK4)”

Given the above-mentioned statutory prohibitions, BSH planning approvals tend to address the risk of bird or bat strikes through the following requirements: First, offshore wind farms must be designed and built to cause as little light emission as possible. Second, six months before the start of operations, the project proponent must submit a monitoring concept to the BSH, which will ensure monitoring of impacts to birds for a period of, in general, three to five years. Third, in case of likely intensive bird migration through the project area, project proponents are required to implement measures monitoring the impacts of the wind farm, in particular the occurrence of bird strikes, and to immediately provide monitoring results to the BSH. The BSH will then determine



the appropriate measures to take to protect species based on the monitoring reports and other available data. Importantly, the BSH planning approvals explicitly reserve the BSH's right to order a temporary shutdown of the wind farm.

The StUK4 clarifies the minimum investigations for marine environmental surveys and monitoring required by the BSH for the planning approval procedure, as well as for the monitoring during the construction and operation phase. To obtain the planning approval, the project proponent needs to conduct baseline surveys that establish the pre-construction environmental status of the project site and surrounding environment, identifying the spatial distribution and temporal variability of species.

The baseline study will determine the distribution and abundance of birds and their behavior to determine the area's importance as a resting, feeding and/or molting ground. For migratory birds, the baseline study will record bird movements during main migration periods March to May and mid-July to November through radar and visual flight survey periods of seven days per month covering at least 50 survey days (24-hour days) and 900 total survey hours. Regarding

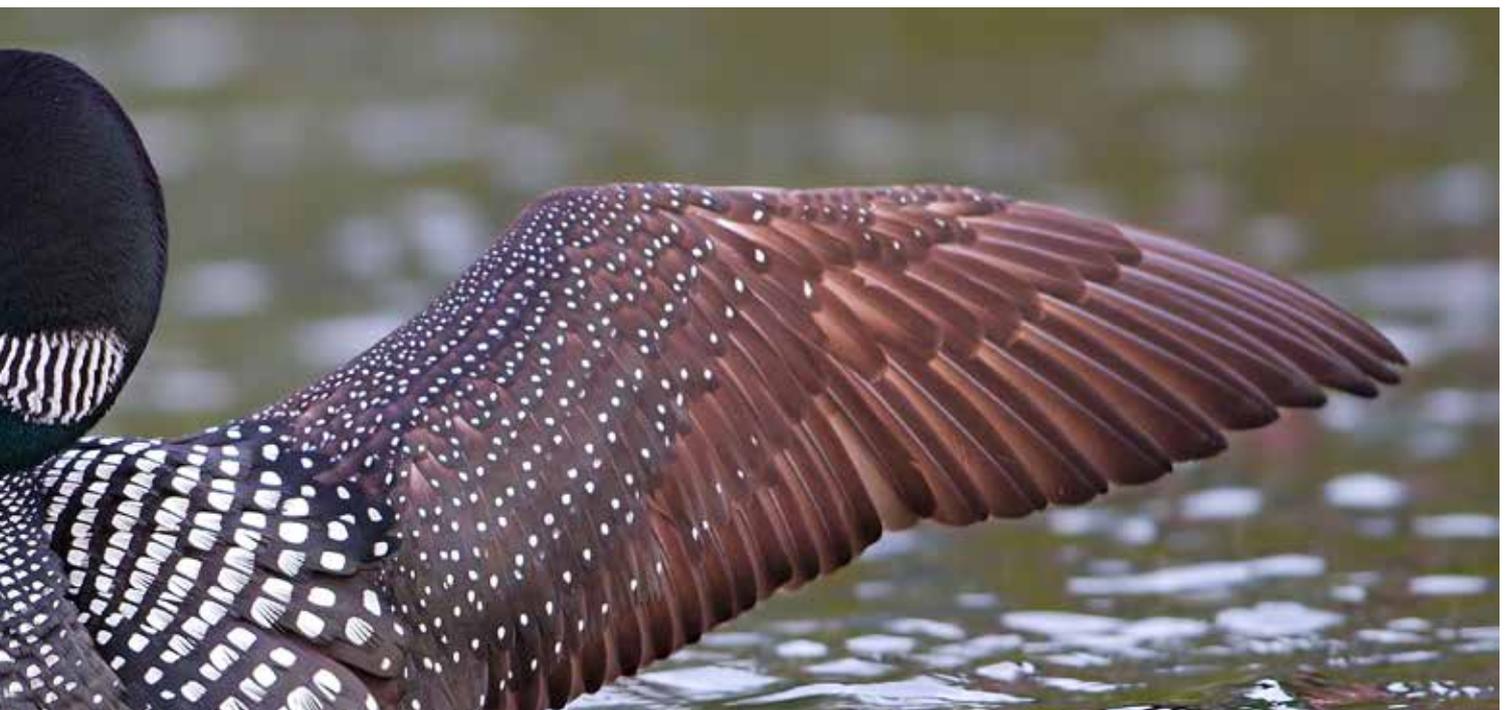
bats, the StUK4 mandates a baseline study of migration to assess the importance of the area as a migratory offshore zone. The surveys should be executed parallel to nighttime flight monitoring of migratory birds on windless nights (up to 3 Bft). The StUK4 provides details on methods, equipment and information on birds and bats to be recorded, and the presentation of results.

Following project approval, construction and operating phase surveys must be conducted to serve as bases for evaluating the project's actual impacts as established by subsequent monitoring to, ideally, verify the EIA's assumptions. The StUK4 therefore, for example, mandates "operation-phase monitoring" to be performed for three to five years once wind turbines become operational. The monitoring data will include documentation on the environmental status both before and after construction. Based on the monitoring result, the BSH will decide on the type and scope of further investigations. While the StUK4 provides recommended timing, scope and technical suggestions for developers, it notes that the avian surveys a developer is required to conduct

may vary significantly depending on the scale and/or complexity of a proposed project, and the availability of existing data.

VISUAL IMPACTS, NOISE AND HISTORIC MONUMENTS

Under the StUK4, as to visual impacts, a photorealistic simulation of the landscape affected by a wind farm project will be presented as part of the baseline study, unless the project is to be located more than 50 kms from the coast. Due to their locations at significant distances from the coast, EEZ offshore wind farms do not generally create significant visual impacts. Therefore, this aspect tends not to be particularly significant in the permitting process. The same applies for noise in relation to humans (in contrast to drilling noise in relation to marine mammals). Preservation of historic monuments is accommodated in the planning and permitting process. The BSH's planning approval decisions customarily oblige the project developers to investigate the project area for wrecks and cultural heritage, for example. If applicable, the BSH must be informed of any relevant presence and protective measures must be adopted.



IMPACTS ON MARINE SPECIES

Offshore wind farms in the German EEZ have the potential to impact a wide range of marine life, including marine mammals and sea birds. Species of particular relevance in this context are porpoises, seals and loons. As a result, German wind project developers are generally required to ensure that marine species are appropriately considered to avoid significant impacts during construction, operation and decommissioning. According to the BfN, to prevent significant impacts, the following prevention and mitigating measures must be adopted:

- Selection of suitable locations to prevent or minimize (i) loss of habitats (e.g., resting, molting and/or feeding areas) due to, in particular, construction activities and (ii) barrier effects (e.g., blocking of paths between different resting and/or feeding areas)
- Selection of the least noise-intensive foundation types (e.g., heavy load or bucket foundations) or use of noise-minimizing measures during drilling works (e.g., bubble curtains)
- Ban of noise-intensive construction works during mating and calving periods
- Lighting that does not attract birds and installation of equipment effecting shutoff during times of intensive bird migration

Applicable laws

Many marine species are listed as endangered or threatened, and protected by the BNatSchG and underlying EU legislation such as the Birds and Habitats Directives. The BNatSchG protects all wild animals, including marine mammals, by generally prohibiting their killing or harassment. In addition, specially protected species are subject to the species protection regime outlined above.

To assist the necessary species protection review and assessment of project-related impacts during the planning approval process, the Federal Ministry for the Environment, Nature Conservation

and Nuclear Safety (BMU) issued guidance on methodology to use regarding key species: (1) the Concept for the Protection of Porpoises From Noise Emissions During Construction of Offshore Wind Farms in the German North Sea (Noise Mitigation Concept) and (2) the Position Paper on Cumulative Assessment of Habitat Loss of Loons due to Offshore Wind Farms in the German EEZ of the North and Baltic Seas.

Standard planning approval conditions and StUK4

The StUK4 prescribes fish baseline surveys to be conducted over at least two consecutive pre-construction seasonal cycles describing fish in the project area and reference areas as well as seasonal spring and autumn conditions. This baseline study shall serve as a reference point for assessing the wind farm's impacts. In addition, surveys shall be conducted during the first, third and fifth year of the operation phase. Regarding marine mammals, the investigations and monitoring shall consist of both visual ship-based and eight to ten annual aircraft-based digital surveys, as well as stationary acoustic (click) detectors to survey abundance and distribution, surveys of habitat use and surveys of noise emission. The StUK4 explicitly provides that, depending on the characteristics of the construction site, additional measures may be prescribed as necessary for conservation and protection, particularly where there are cumulative effects (e.g., several projects and/or shipping and other

EEZ uses). Monitoring shall also take place throughout construction and during the operation phase for three to five years. The StUK4 provides details on methods, equipment and information on birds to be recorded, and the presentation of results.

As to porpoises, BSH planning approvals routinely provide that first, installation of the wind farm foundations must be conducted according to state-of-the-art methods (detonations are prohibited) aiming at minimum noise emissions, with installation to be materially completed within 18 months. Second, the project proponent must implement a noise mitigation concept tailored to the chosen foundation type and installation process, ensuring that sound exposure levels exceed neither 160 dB at a radius of 750 meters nor a peak level of 190 dB. In addition, a detailed plan for implementing noise-minimizing and prevention measures in accordance with the noise mitigation concept must be submitted to the BSH at least three months before installation starts. This plan will also provide a detailed technical description of the relevant measures, including method statements, procedural manuals and a description of how the measures' effectiveness shall be monitored. If not yet tested, identified noise minimizing measures shall be tested in advance and respective testing documentation must be submitted to the BSH at least three months before the scheduled start of installation. Third, the effectiveness of the noise-minimization and prevention measures during



German wind project developers are generally required to ensure that marine species are appropriately considered to avoid significant impacts during construction, operation and decommissioning.

installation must also be monitored in accordance with the BSH's "Measuring Instructions for Underwater Sound Monitoring." Monitoring shall pertain to construction-related noise from vessels and pile-driving, with measuring to take place at 750 and 1,500 meters from the pile-driving as well as, if applicable, in any potentially affected protected area. In addition, porpoise detectors or similar equipment shall be employed. In the case of monopiles, pile-driving must be completed within 180 minutes per pile. Further technical details are set forth in the BSH's "Predictions for Underwater Sound Monitoring (Minimum Requirements and Documentation)" and "Measuring Specification for the Quantitative Determination of the Effectiveness of Noise Control Systems."

To verify compliance with the noise-mitigation requirements, reporting to the BSH in accordance with its standards is required during the construction period, with respective specifics to be coordinated with the BSH, at the latest within 24 hours of the completed pile-driving for the last pile.

DECOMMISSIONING

Applicable laws

Pursuant to both the SeeAnIV and the WindSeeG, an offshore wind farm shall be dismantled to the extent necessary to protect the marine environment. To ensure dismantling, the BSH may require the project proponent to provide a decommissioning security prior to starting installation works. The amount of this security can be subsequently adjusted to ensure that it provides adequate financial coverage for expected dismantling costs. Typical types of security are lump sum payments, guarantees or corporate group pledges. Under the WindSeeG, in case of a planning approval transfer, the original planning approval holder will remain liable for decommissioning until the transferee provides an adequate substitute security.



Standard planning approval conditions

BSH-issued approvals generally authorize offshore wind farms to operate for up to 25 years. Further, standard auxiliary conditions stipulate that where the planning approval loses its validity for any legal reason, the offshore installations must be dismantled (along with accessory installations and crossing structures) and disposed of onshore. Foundation components installed into the seabed must be dismantled in a way that ensures that any parts remaining in the seabed are deconstructed to at least a depth that avoids risks to shipping and fisheries, even in the case of soil movements. In practice, the project developer tends to be obligated to establish the type, scope and amount of the security, and a calculation of the expected decommissioning costs along with a validation of the cost calculation by a recognized financial auditing firm. Further, it is not uncommon for BSH planning approvals to

provide that determinations of type, scope and amount of the security shall be re-verified throughout the project's life.

Projects are required to address decommissioning impacts and to submit a decommissioning concept that includes planned decommissioning activities, resources or activities that could be affected by the proposed decommissioning activities, results of biological surveys and mitigation measures that will be used to protect environmental resources and prevent unauthorized discharge of pollutants. The successful completion of the decommissioning phase must be documented in a certificate of conformity summarizing all the individual inspection reports. This must be submitted to the approval authority. The decommissioning phase ends with the BSH's verification that decommissioning has been fully effected.

Japan

Despite strong government support and growing capacity, a lengthy approval process may slow progress

By Ayako Kawano and Kazuo Kasai

In November 2018, the National Diet of Japan enacted the Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources. This new act establishes a legal framework for the approval of project proposals in a bid to provide greater certainty and transparency to investors and developers. The offshore wind market in Japan has already received significant attention from domestic and overseas investors, not least because Japan is a large consumer of electricity and an island nation with surrounding territorial waters and an exclusive economic zone that totals approximately 4.47 million kms. However, the marine environment and seafloor topography surrounding Japan are not homogenous, and prospective investors and developers need to carefully examine each proposed project site to account for this.

Offshore wind farms with a capacity of 61.6 megawatts (MWs) are operating in Japan, based on public information as of January 2017. Most of these are small-scale projects operating single or a few wind turbine(s).

As of December 2018, the cumulative capacity of operational onshore and offshore wind farms in Japan had increased to 3,653 MWs, with a total of 441 wind farms operating 2,310 wind turbines, based on information published by the Japan Wind Power Association. One driver for this growth in wind power generation is the strong government backing of these projects, given the Japanese government's goal of increasing the operational capacity of



Total wind farm capacity as of December 2018

3,653
MWs

with a total of

441

wind farms operating

2,310

wind turbines

both onshore and offshore wind farms to approximately 10,000 MWs by 2030.

However, large-scale wind farm project development must occur under the Environmental Impact Assessment Act (described below), and the mandated environmental impact assessment process can take four to five years to complete. The long lead time to conduct this process has been cited as one bottleneck for developing offshore wind farms in Japan, and it is predicted that the government's 2030 goal will only be achieved if, among other factors, the average lead time is halved.

ENVIRONMENTAL IMPACT ASSESSMENT ACT (EIA ACT)

The EIA Act governs the compulsory environmental impact assessment process, and an amendment that took effect in April 2013 broadened the act's scope to include wind power development projects. The act classifies wind power projects into three categories based on the following power outputs:

Category	Total power output
Class 1 projects, which are invariably subject to EIA procedure	at least 10 MWs
Class 2 projects, which are subject to EIA procedure upon screening	at least 7.5 MWs but less than 10 MWs
Non-applicable projects	less than 7.5 MWs



As offshore wind farms are relatively large in scale and will invariably produce more than 10 MWs, they will typically be subject to a Class 1 project classification under the EIA Act. This means that, without exception, these projects will require environmental impact assessment procedures. If a project falls under a Class 2 project classification, the government will determine whether environmental impact assessment procedures should be carried out on a case-by-case basis.

Broadly, five stages of the environmental impact assessment procedure must be conducted before construction commences: (1) primary environmental impact consideration; (2) scoping; (3) survey, forecast and evaluation; (4) drafting an environmental impact statement; and (5) producing an environmental impact statement. Notably, all of these stages except the third involve consultation with the public and relevant authorities.



The Ministry of Economy, Trade and Industry (METI) and the Ministry of the Environment (MOE) have undertaken various efforts to accelerate the environmental impact assessment procedure. These include a verification project administered by the New Energy and Industrial Technology Development Organization that examined the procedure in project applications received between 2014 and 2017. One of its recommendations was to introduce a front-loading survey, forecast and evaluation procedure without

delaying the process to hear public opinion and consult with relevant authorities to select the evaluation items as well as the survey, forecast and evaluation methods. Traditionally the actual survey, forecast and evaluation procedures started after the hearing, consultation and selection process. Whether this front-loading procedure is undertaken largely depends on the project parties' risk appetite because potentially, the already-started process will not be fully confirmed later and some additional assessment may be conducted.

IMPACTS TO BIRD AND BAT SPECIES

Impacts to "seabirds" must be addressed under the environmental impact assessment procedure. To assess the impact to seabirds, wind project proponents must follow a survey method to "grasp the current situation based on review of past questionnaires and interviews with experts and bird-related organizations," a prediction method based on past survey materials to "qualitatively predict the degree of seabird distribution, habitat modification, etc.," and an evaluation method based on these prediction results to qualitatively "compare and examine the seabirds' distribution area and the habitat modification."

By following these methods, the environmental impact assessment must address items such as (1) the reduction, deterioration, loss of avian habitat and movement (including path inhibition and/or blocking); (2) the possibility of



The Japanese government seeks to increase the operational capacity of both onshore and offshore wind farms to approximately 10,000 MWs by 2030.

interference from birds on proposed equipment or property; and (3) the attraction of birds due to night lighting. In 2011, the MOE issued a "Guideline for Optimizing the Location of Wind Power Generation Facilities regarding Birds," which was revised in 2015. The MOE guideline mentions cases where certain conservative measures, and the review of business plans, may be required to protect seabirds.

Other applicable regulations include the Act on Protection of Wildlife and Optimization of Hunting (Wildlife Act) and the Act on Conservation of Endangered Species of Wild Fauna and Flora (Conservation of Species Act). Under the Wildlife Act, hunting is forbidden in wildlife protection zones, and in special protected areas, permission is required for proposed development activities. Similarly, under the Conservation of Species Act, permission is required for proposed development activities in administrative districts or monitored districts in habitat-protected areas.

In March 2018, the MOE published the Sensitivity Map for Wind Power Evaluation Site Review (Sensitivity Map Report), which examined the site location of a wind power project, and the influence this had on birds. In creating the Sensitivity Map Report, ten bird species were designated as "important species." These were the eagle, eastern marsh harrier, Von Schrenck's bittern, Eurasian bittern, Blakiston's fish owl, mountain hawk, white-tailed eagle, red-crowned crane, Steller's sea eagle and stork. These designations have provided important clarity to offshore wind farm developers in their environmental impact assessments.

VISUAL IMPACTS

Impact to "landscape" is another environmental impact assessment evaluation item. This assessment of visual impact is conducted by using sightseeing maps, online information and field surveys, and selecting various viewpoints of historical and/or cultural

significance from which to visually predict and evaluate any changes a project is expected to have on the relevant landscape. This is done by predicting the viewing distance, viewing occupancy and anticipated angle, and producing a photo montage. Each photo montage created by these methods is examined thoroughly from these various viewpoints, and

questionnaires are often provided to local residents for feedback.

Furthermore, wind farm development projects are typically subject to the Landscape Act. Under the Landscape Act, municipalities may, in their ordinances, restrict the installation and development of certain facilities in a "Landscape District" to maintain an appropriate landscape.



Many local municipalities enact these landscape-related ordinances, making early consultation with the local government an important step in the landscape and visual impact assessment, as it is important to understand the local government's perspective on the proposed project's visual elements, such as the color and arrangement of wind farm equipment.

IMPACTS TO MARINE SPECIES

The environmental impact assessment covers evaluation items such as "benthic living organisms," "fishes" and "marine mammals." The influence of turbidity, transmission of soundwaves underwater and the potential for the disappearance of habitat are required to be investigated, predicted and evaluated based on past data and materials concerning flow direction, flow speed, water quality and other factors during and after the construction period.

Other applicable regulations include the Conservation of Species Act, the Act on the Protection of Fishery Resources (Fisheries Act) and the Marine Fishery Resources Development Promotion Act (Marine Resources Act). Under the Conservation of Species Act, proposed development activities require prior permission if they occur in administrative districts or monitored districts in habitat-protected areas. Under the Fisheries Act, any construction such as landfilling within an area of protected water requires permission from the prefecture or the Ministry of Agriculture, Forestry and Fisheries. Under the Marine Resources Act, notification is required for any proposed acts that potentially change the traits of the sea floor in the designated coastal areas.

In Japan, fishing is traditionally regarded as a critical industry. To obtain a municipality-issued "occupy permit" in a maritime area for offshore wind farm development, consensus from the local fishing union is typically necessary. This consensus is usually provided based on

indemnifications made by the project parties to the union.

NOISE

"Noise and vibration" impacts must also be evaluated in the environmental impact assessment. Noise and low-frequency sound are usually predicted based on past surveys, and will be evaluated through comparison with environmental standards.

The MOE launched a study committee in 2013 on methods for evaluating noise impacts from wind power generation facilities, and published the "Countermeasure against Noise Generated from Wind Power Generation Facilities" report in November of 2018. The report provides certain evaluation standards. However, these have been received as guidelines, rather than national uniform standards, given that the degree of noise from wind farms differs depending on the size of the facility, the wind conditions of the project site, the topography of the project site, the type of land use and the distance between the noise source and the noise recording device(s).

Other applicable laws include the Noise Regulation Act, and noise regulation standards set by the prefectural governor, which regulate the timing and permitted areas for noise pollution in designated noise regulation areas. As such, prior notification is required when installing a wind turbine and conducting specific construction work in designated noise regulation areas.

It is worth noting that, in 2015, a lawsuit on claims of moral rights violations from noise produced by certain onshore wind power generation facilities was unsuccessful. This onshore wind farm started operation in 2007, so it was not subject to the environmental assessment process under the EIA Act. The complainant did not obtain compensation or an injunction restricting the facilities' operations. The key issue in that case was whether the noise produced fell outside the tolerance limit.



Prior notification is required when installing a wind turbine and conducting specific construction work in designated noise regulation areas.

DECOMMISSIONING

Decommissioning is not evaluated through the environmental assessment process, but is assessed under the Japanese Feed-in-Tariff Act. Under this Act, project developers must make appropriate decommissioning plans for a project at the 20-year mark when they submit an application for certification of the business plan to METI, and these plans must include decommissioning costs (to be determined based on estimates by waste disposal companies). The "Business Plan Guideline" published by the Agency for Natural Resources and Energy recommends that, if it is difficult to obtain an estimate of decommissioning costs from waste disposal companies, such cost is expected to be calculated in the amount of 5 percent or more of the construction cost.

Further, after power generation facilities are removed and decommissioned, they must be treated, in principle, as "industrial waste" under the Waste Management and Public Cleansing Act. Usually, a wind power generation provider is required to dispose of and recycle these facilities in accordance with this act and related regulations.

Mexico

With no offshore precedents, project proponents may find complexity, inconsistency and opportunity

By Pedro Morales

In Latin America, Mexico has been a leader in the development of onshore wind energy plants. However, no offshore projects have yet been developed. Given the lack of offshore precedents in Mexico, the following summarizes most important environmental provisions that should apply.

THE GENERAL LAW FOR ECOLOGICAL BALANCE AND ENVIRONMENTAL PROTECTION

The General Law for Ecological Balance and Environmental Protection (General Law) was originally enacted in 1988 to serve as a general code covering all areas of environmental law, from which secondary provisions would be enacted. While subsequent environmental laws covering specific areas such as biodiversity protection, renewable energy, forest land and climate change superseded the General Law, it still regulates the Environmental Impact Authorization (EIA), one of the most important and complex authorizations required by any wind project.

The General Law's Regulations on Environmental Impact Assessment require an EIA issued by the Federal Ministry of Environment and Natural Resources (SEMARNAT), which will review the environmental impact statement (MIA) filed by the developer. The MIA, a complex legal and technical document, serves primarily to identify and mitigate environmental impacts applicable to all project phases, from site preparation, construction, operation, maintenance and decommissioning, to proving compliance with applicable federal, state and

local environmental and land use regulations.

When a specific activity is not regulated by a secondary provision, especially an Official Mexican Standard (NOM), SEMARNAT has considerable discretion for performing the environmental impact assessment. Although a NOM project was published in 2006 for regulating wind farms to be established in rural areas, it was canceled in 2014 before it could be enacted as an enforceable standard. There is no NOM for offshore wind farms.

As a result, the process for securing an EIA may prove lengthy, and criteria may differ for similar projects when analyzed by different officials or offices of the ministry (either the central Direction General for Environmental Impact and Risk or state delegations of SEMARNAT).

Local governments are also consulted during the environmental impact assessment procedure to confirm that the project will comply with local environmental and land provisions. In some cases, SEMARNAT may decide to open the environmental impact assessment to community consultation, where the project proponents will have to discuss the details of the works to be performed, their potential impacts, as well as mitigation, prevention and compensation measures to be undertaken.

Community consultation has raised problems because it commonly delays SEMARNAT's environmental impact assessment and may draw the attention of several interest groups that may decide to oppose the project based on environmental, social or cultural





arguments (especially in cases where indigenous communities may be affected). Offshore projects could provide solutions that avoid raising social issues commonly associated with onshore wind farms, although some specific communities, such as fishing towns, could still raise complications.

In addition to the EIA, the social impact authorization (SIA) is also important. Issued by the Ministry of Energy prior to construction of new projects, it is required to obtain other permits and approvals from the energy authorities.

The forest land use authorization, required for removal of vegetation and also granted by SEMARNAT, is commonly required for onshore projects. But it could also be required for an offshore project given the effects of the transmission line and any other infrastructure to be built on land. It is important to consider that there



Offshore projects could provide solutions that avoid raising social issues commonly associated with onshore wind farms.

are legal restrictions regarding the removal of some flora species, such as the mangrove, which are further explained below.

Projects that could affect indigenous communities may require prior consultations with those communities. Related to this, places with an important archaeological or historical value, such as the Mayan coast, may also require prior consent from the federal authorities. These

consultations and authorizations, as well as the SIA, are not strictly environmental, but may influence SEMARNAT in its environmental impact assessment regarding the authorized uses of the project area.

IMPACTS TO BIRD AND BAT SPECIES

Mexico is a mega-diverse country, meaning it has some of the world's most important populations of flora and fauna. These are protected



by Mexican environmental laws, as well as several international treaties to which Mexico is a party, such as the Convention on Biological Diversity and the Ramsar Convention. These treaties protect specific fauna species—including birds and bats—or their habitats, which may include maritime areas.

Several bird and bat species are classified under a determined legal protection scheme, pursuant to the General Law of Wildlife and NOM-059-SEMARNAT-2010, and SEMARNAT will require more stringent mitigation and prevention measures to be offered and implemented by project proponents when a wind farm may affect protected species. Even if there is no NOM that establishes technical requirements in this regard, developers are commonly required to establish a bird and bat protection plan, preferably based on international

or foreign standards, which will include monitoring requirements to undertake before construction and until the operation phases end.

More stringent requirements may be issued or an EIA may be denied when a project is intended for development in a natural protected area, as further explained below.

After issuance of an EIA, project developers will be required to file with SEMARNAT a periodical report addressing the results of the monitoring activities performed pursuant to the mitigation plan presented to the authority, or required to be prepared pursuant to the terms and conditions of the authorization.

VISUAL IMPACTS

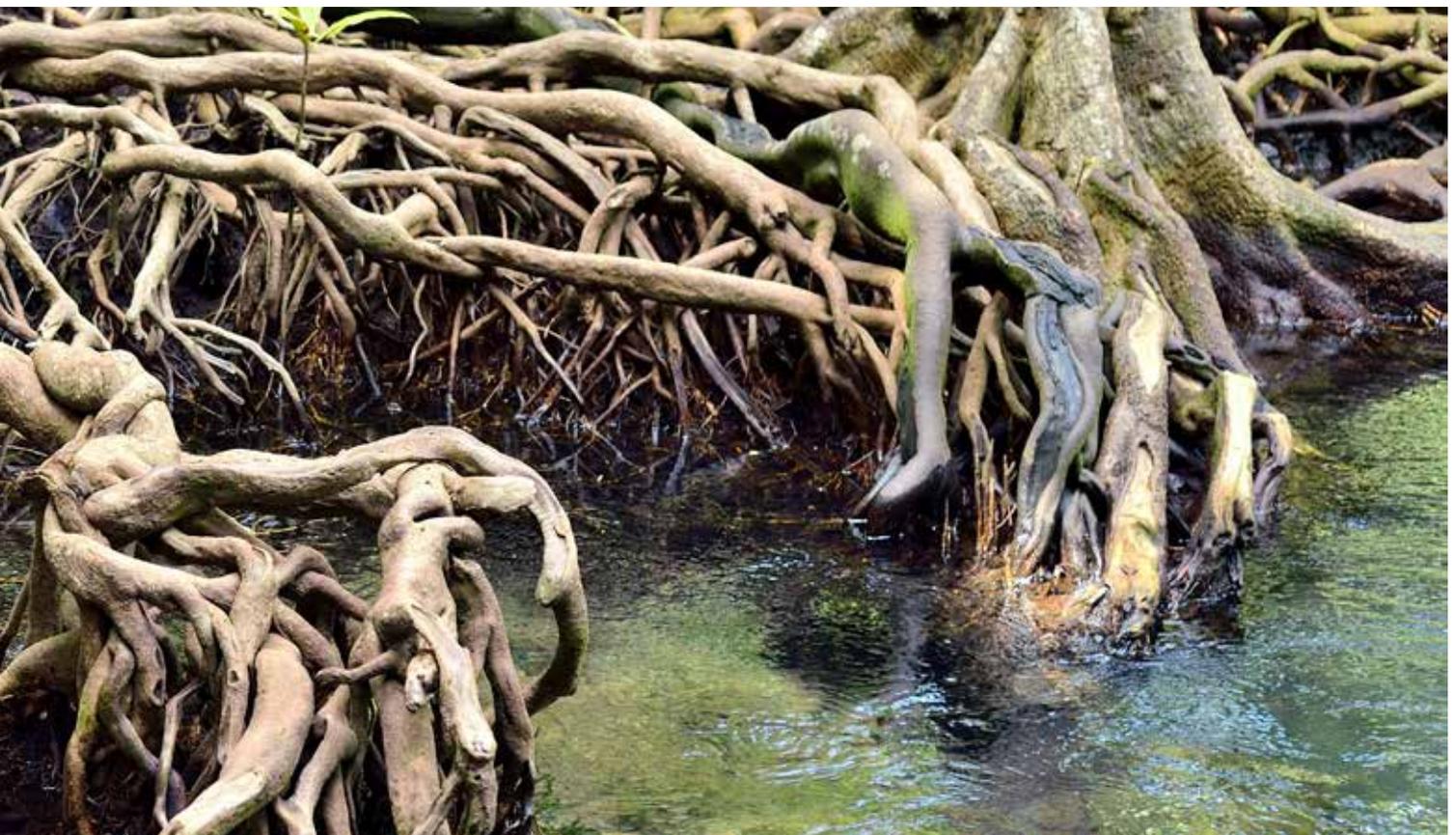
Visual pollution is poorly regulated in Mexico, since the General Law merely mentions it in its article 155, forbidding the “generation of visual pollution,” pursuant to

the limits specified in NOMs.

However, since no NOMs have been issued regarding visual pollution, the authorities have little guidance as to implementation.

Nonetheless, visual impacts may be relevant when the federal and local authorities prepare land use plans, specifying which activities are allowed in specific and well-defined regions. When preparing an environmental land use plan, or in the case of an offshore project, an environmental maritime use plan, authorities may address other intended uses of the areas, such as tourism, and forbid certain activities in such locations due to their visual impacts.

When SEMARNAT conducts an environmental impact assessment to decide whether to grant an EIA, it addresses those use specifications for a specific area established in the environmental maritime use plan. If an EIA is issued, SEMARNAT



focuses on the same specifications to determine the terms, conditions and limits or mitigating measures to establish for the project.

Local authorities may also play an important role in the process of securing authorizations for an offshore project if they determine that potential visual impacts make the wind farm incompatible with the area's other uses (mainly tourism or cultural). Even an offshore wind farm may require a transmission line or other infrastructure to be built inland. This would require obtaining a concession for the use of the federal maritime land zone from SEMARNAT. In the application process, it is necessary to obtain a consent letter from the local authority specifying that the use for the concession is compatible with other land uses authorized by the municipality. If the local authority determines that the project, due to its visual impacts, may affect other intended uses of the area, it can decline to issue the required consent letter, preventing SEMARNAT from granting the required concession.

IMPACTS TO MARINE SPECIES

The impacts to marine species will be commonly addressed by the authorities when preparing an environmental maritime use plan for a specific region. Also, a natural protected area may be established in a zone that has specific relevance for biodiversity effects due to the existence of important species of flora or fauna. In the case of fauna species, marine mammals and sea turtles are especially relevant, as well as some species of fish and maritime invertebrates.

In the case of sea turtles, NOM-162-SEMARNAT-2012, issued in 2013, establishes technical requirements for their protection, recovery and management in their breeding habitats. For projects that will affect the coast in areas where sea turtles breed and make their nests, it is common for SEMARNAT to require the establishment of a breeding center for turtles to be managed by the developer, following the requirements of

this standard and of the General Law of Wildlife, as a condition for the project's authorization.

As for flora species, it is important to note that the mangrove has been awarded a special kind of protection by the General Law of Wildlife. In addition, the mangrove was already included in the list of NOM-059 as a specially protected species. When amended in 2007, the General Law of Wildlife included article 60 TER, which established a prohibition on performing any work or activity that may affect the hydrological flow of the mangrove, its ecosystem and its area of influence, as well as interactions between the mangrove, rivers, dunes, corals and the adjacent maritime area.

This new provision resulted in controversies, and several offshore or coastal projects planned for, or influencing, coastal areas ultimately were not approved. Opinions differ within SEMARNAT regarding the interpretation of article 60 TER. As a result, similar projects obtained different results when submitted for their environmental impact assessments.

Currently, NOM-022-SEMARNAT-2003 is a useful guideline for determining if a project may affect the mangrove and if its impacts may be properly mitigated. It establishes technical specifications for the preservation, conservation, sustainable use and restoration of coastal wetlands in mangrove areas. This standard, though issued prior to the amendment of the General Law of Wildlife, is commonly used

during environmental impact assessments to confirm whether a mangrove area will be affected. It provides a more certain guideline that has limited the discretion of the environmental authorities when evaluating a project for purposes of granting an EIA, or a forest land use change authorization when other flora species are to be removed (usually required for the transmission line).

Finally, it is important to note that Mexico has established several federal natural protected areas, including maritime ones, where many activities are strictly forbidden or limited. Areas with an important environmental context, such as the Sea of Cortez, may present extreme complications for a project's implementation, not only due to existing legal restrictions, but also to social opposition that may negatively influence the authorities in their environmental impact assessment.

NOISE

In addition to prohibiting visual pollution, article 155 of the General Law prohibits the emission of noise, vibrations, thermal and luminous energy beyond the limits established by applicable NOMs.

In this regard, NOM-081-SEMARNAT-1994 was issued to establish maximum allowable limits for noise emissions generated by fixed sources, as well as the method for measuring noise. SEMARNAT will request compliance with this standard for all phases of the project, including its construction and operation. The original text of



Mexico has some of the world's most important populations of flora and fauna, which are subject to several international treaties.

this standard established maximum allowable levels of 68 A-weighted decibels (dBA) from 6:00 a.m. to 10:00 p.m., and of 65 dBA from 10:00 p.m. until 6:00 a.m.

However, the standard was modified in 2013, establishing maximum allowable limits depending on the kind of area where the facility is located—residential, commercial and industrial, schools or ceremonial and entertainment—so it should not apply to offshore wind farms. It is likely that for an offshore project, SEMARNAT could consider the limits established by the standard prior to the amendment, or request a specific study for limits that could prevent any major impacts for the specific area where the project is to be developed.

DECOMMISSIONING

Although no provisions address the decommissioning of wind farms, SEMARNAT will commonly require project developers to include it within the MIA environmental impact projections and to establish related mitigating and preventive measures. Absent proper regulation, this phase of any wind project remains quite open to SEMARNAT's discretion while performing an environmental impact assessment.



United Kingdom

A global leader in offshore wind power capacity, the UK has seen rapid expansion in the sector

By Tallat Hussain

Government policy and strong investor interest have resulted in robust growth in the development of offshore wind farms in the UK. According to the industry association Wind Europe, between 2010 and 2017 the UK attracted 48 percent of new offshore wind investments in Europe, worth a total of approximately €40 billion. The latest data from Renewable UK indicates that as of March 2019, there were 36 operational offshore wind projects in the UK, composed of 1,932 turbines and representing approximately 7,895 MWs of power.

LEGISLATIVE AND REGULATORY REGIMES

Depending on the jurisdiction and the size of the wind farm, the planning application process to obtain development consent varies.

The main pieces of legislation for the construction and operation of offshore wind farms in England, Scotland and Wales are the Electricity Act 1989 (Electricity Act), the Planning Act 2008 (Planning Act), the Marine and Coastal Access Act 2009 (Marine and Coastal Access Act) and the Marine (Scotland) Act 2010. There are currently no offshore windfarms in UK waters off the coast of Northern Ireland.

Planning regime

Under the Planning Act, any offshore wind power project in England and Wales with more than 100 MWs of capacity is classified as a Nationally Significant Infrastructure Project (NSIP) and requires a Development Consent Order (DCO) from the Secretary of State (or the Welsh Ministers for

projects in Wales). Projects with less than 100 MWs of capacity must obtain consent under section 36 of the Electricity Act ("s.36 Consent"). In English waters, the consent is granted by the Marine Management Organisation (MMO).

In Scotland, all wind farms in excess of 20 MWs are considered major developments and must be approved by the Scottish Ministers and granted a 36 Consent.

Leases from the Crown Estate

Almost all of the seabed within UK territorial waters is owned or vested in the Crown Estate (for Scotland, this would be the Crown Estate Scotland). The Crown Estate is responsible for managing the rights to develop renewable energy within UK territorial waters and within any Renewable Energy Zone (REZ), which are areas outside of the UK territorial waters over which the UK has exclusive rights for energy production from wind or water. The Crown Estate is responsible for granting leases over the seabed or seabed rights to wind farm developments, although it will not typically do so until the developer has obtained all applicable statutory consents and satisfies any other conditions set out in the agreement for lease.

Transmission line licenses

Depending on the location of the proposed installation, a marine license granted by the MMO, Marine Scotland or Natural Resources Wales, is also required under the Marine and Coastal Act for the installation of offshore wind farm cabling to connect the project to the electricity grid.



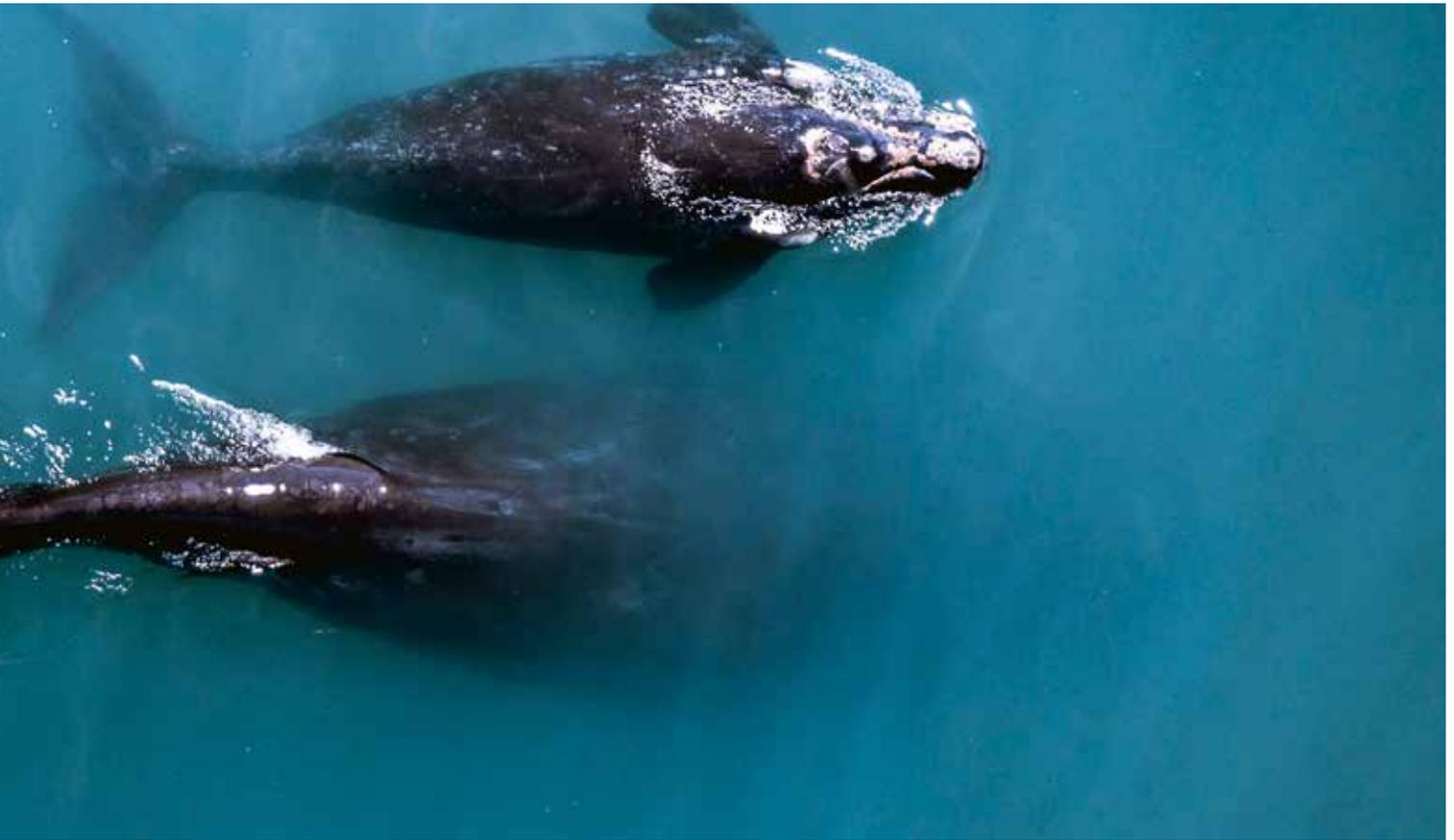
IMPACTS TO SEA ANIMALS AND BIRDS

For large offshore wind projects, an Environmental Impact Assessment (EIA) is required, unless the relevant authority (e.g., the Secretary of State in England) grants an exemption. An EIA assesses all potential environmental impacts of a project during construction, operation and decommissioning, and any associated mitigation measures.

Consultation bodies (such as Natural England), members of the public and interested third parties have the right to submit representations about any potential environmental impacts, which the planning authority must consider.

National wildlife laws

For marine areas in the UK, the Conservation of Offshore Marine Habitats and Species Regulations 2017 (OMHSR) implements the EU Habitats Directive (92/43/



EEC) and the EU Birds Directive (2009/147/EC). These directives require the designation of Special Areas of Conservation (SAC) for the protection of certain habitats and species, and Special Protection Areas (SPA) for the protection of certain wild bird species. Offshore marine SACs and SPAs are known as European Marine Sites.

The OMHSR requires the Secretary of State, the UK nature conservation bodies and the relevant competent authority to make an “appropriate assessment” of a project’s implications on European Marine Sites or a marine conservation zone prior to granting any planning consents. In the UK, the appropriate assessment would be a Habitats Regulations Assessment (HRA). The Secretary of State may only grant consent to an offshore wind project if it has ascertained that the integrity of a European Marine Site will not be adversely affected. The

only exception is where there are no alternatives to the project and there are “imperative reasons of overriding public interest.”

In addition, a marine wildlife license may also be required under the Conservation of Offshore Marine Habitats and Species Regulations 2017 for any activity that disturbs or harms species protected under the EU Habitats Directive, known as European Protected Species (“Protected Species”). Animals protected under this legislation in UK waters include certain species of whales, dolphins, porpoises, turtles and the Atlantic sturgeon. The licenses are issued by the MMO (for England and offshore waters), Scottish Natural Heritage or Natural Resources Wales, as applicable. These are generally granted as a last resort, as the relevant authority will normally try to include appropriate mitigation measures within the construction and/or operation license so that

Protected Species are not adversely affected.

A marine wildlife license is only necessary if mitigation measures cannot remove or sufficiently reduce risks to Protected Species.

Based on past marine licenses granted by the MMO and UK government policy, mitigation measures that may be included in marine license conditions relate to:

- a. Timing (e.g., restricting the period of time during which an activity may be undertaken, to avoid or reduce disturbance to marine animals)
- b. Monitoring (post-consent monitoring is normally required to ensure that EIA and HRA predictions on impacts are correct, provide evidence on the effectiveness of mitigation measures and allow the identification of unforeseen impacts)
- c. Action (agreed measures the license holder must undertake,

e.g., ensure enhanced acoustic monitoring of the zone before beginning construction activities at times of poor visibility)

For a marine wildlife license to be granted, there must be no “satisfactory alternative” to the proposed project and the activities authorized must not be detrimental to achieving favorable conservation status of any Protected Species in its natural range.

Impact assessment methodology for birds

The UK government has released interim advice on presenting assessment information on the effects of offshore wind farms on birds (“Assessment Advice”). The Assessment Advice gives detailed guidance on how to assess the impacts of an offshore installation on bird disturbance at the construction, operation and decommissioning stages. The assessment may also need to take collision risk modeling into account (e.g., in case birds are at risk of colliding with the rotating blades of wind turbines).

According to government policy, shutting down turbines during peak migration periods is unlikely to be suitable mitigation for migration corridors, as the timing of migration events is inherently uncertain. Mitigation measures for birds must therefore be tailored for each offshore wind project.

Impacts on marine animals and noise

The potential effects of construction and decommissioning activities on marine species, in particular marine mammals, is a key focus of the EIA for UK offshore wind farm projects.

Under the EU Marine Strategy Framework Directive (2008/56/EC), (implemented in the UK through the Marine Strategy Regulations 2010), the UK must achieve “good environmental status” by 2020. For a member state to achieve “good environmental status,” the introduction of energy, including underwater noise, must be at levels that do not adversely affect the marine environment.

The UK government considers noise from offshore wind farm operations unlikely to have significant effects on Protected Species, although it recognizes the potential for installation and decommissioning to have a significant impact. Nevertheless, important guidance on mitigating the effects of wind farm construction and decommissioning includes:

- A protocol released by the Joint Nature Conservation Committee to mitigate the effects of drilling and piling during wind farm construction
- Guidance released by the UK government to minimize the impact of explosives use during decommissioning on marine mammals

Project developers must assess the likelihood that marine mammals and Protected Species will be adversely affected by construction and decommissioning at the EIA stage, and mitigation measures must be incorporated within the project’s decommissioning plan. The National Policy Statement for Renewable Energy Infrastructure (Renewables NPS) requires assessments to contain a broad range of data, including information on marine mammal activities in the area, baseline noise levels, construction noise and operational noise.

VISUAL IMPACTS

Under the Renewables NPS, visual considerations are a key element of the NSIP planning decision process. Proposals for renewable energy infrastructure should demonstrate good design regarding changes to the landscape (i.e., from construction, operation and decommissioning) and effects on the visual amenity of the area from people’s property and nearby public spaces. Other than where a wind farm is not visible from the shore, the developer must undertake a Seascape and Visual Impact Assessment (SVIA) as part of the EIA process to identify a site location with the least adverse visual impacts.

Developing SVIAs is an iterative process through which alternative sites and designs are proposed, assessed and amended. SVIAs identify preferred site and design options and assess the final proposal for predicted residual impacts on the seascape, in each case, balancing environmental, technical and economic considerations.

SVIAs are an important part of the planning process in the UK, and the Renewables NPS requires that the relevant authority (e.g., in England, the Secretary of State) must not refuse consent for a development solely on the grounds of adverse effects on the seascape or visual amenity unless:

- a. An alternative layout within the identified site could be reasonably proposed that would minimize any harm, taking into account other constraints that the applicant has faced such as ecological effects, while maintaining safety or economic viability of the application or
- b. The harmful effects are considered to outweigh the benefits of the proposed development

Impacts on visual amenity are given considerable weight in wind farm planning applications in the UK. For example, in 2015 the Secretary of State refused development consent for the Navitus Bay Wind Park. Despite the presumption in favor of granting development consent for certain kinds of energy NSIPs, the Secretary of State’s decision letter goes into great detail concerning the effects of the project on seascape, landscape, visual amenity and protected areas in the vicinity of the proposed development, in particular the project’s visibility along a 30-km stretch of the Dorset coast, which is a designated UNESCO World Heritage Site.

DECOMMISSIONING

The UK Energy Act 2004 (Energy Act) governs the decommissioning of offshore renewable energy installations. The Energy Act empowers the relevant authority (e.g., in England, the Secretary of

State) to require a project operator to submit a decommissioning program for the wind farm. Anyone who submits a decommissioning program will be liable for its successful execution. If a project operator fails to decommission an installation, the relevant authority may undertake the work and recover costs from, and impose penalties on, those responsible for decommissioning.

For NSIP projects, the DCO will typically prohibit the commencement of any development activities until a decommissioning program has been submitted in accordance with the Energy Act and approved by the relevant authority.

In addition to these requirements, the Crown Estate will always require the developer to reinstate the site at the end of its lease pursuant to its approved decommissioning program.

The UK government has also produced the Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004: Guidance notes for industry (Decommissioning Guidance). The Decommissioning Guidance specifies that the “ideal” decommissioning program removes the whole of any disused installations or structures. It also sets out a presumption in favor of removing the whole installation to shore, where it can be reused, recycled or incinerated with energy recovery. The only exceptions are if:

- a. The installation could serve a new purpose (although the decommissioning program would still need to set out the eventual measures for when the reused installation becomes disused)
- b. The entire removal would involve “extreme cost” (for instance, deep foundations)
- c. Entire removal would involve an unacceptable risk to personnel or the environment or
- d. The installation or structure weighs more than 4,000 tons in air or stands in more than 100 meters of water and could be left wholly or partially in place without causing unjustifiable interference with other uses of the sea.

Navitus Bay Wind Park planning permission timeline



United States

As the offshore wind industry begins to take off, environmental impacts remain key concerns

By Seth Kerschner and Brittany Curcuro

The development of offshore wind projects in the US has been hindered by environmental opposition to their visual effects, impacts on marine and other species, and interference with commercial activities, including tourism. Due to the all-encompassing environmental review and permitting process US projects undergo, opponents have been able to challenge them repeatedly and at multiple junctures throughout the process—in the case of one proposed wind farm, filing more than two dozen lawsuits. Despite this deterrent, the US offshore wind industry is gaining momentum. The first commercial offshore wind farm in the US became operational in 2016. Projects representing more than 25,000 megawatts (MWs) of planned generating capacity are currently under development, with projects generating 2,000 MWs expected to begin commercial operation by 2023, according to the federal Department of Energy. Still, to succeed in the US, offshore wind project proponents will have to continue to carefully review and manage environmental impacts.

THE NATIONAL ENVIRONMENTAL POLICY ACT

The federal National Environmental Policy Act (NEPA) is the principal US environmental law that typically dictates the environmental permitting and review process for offshore wind projects in US waters. Opponents often use the NEPA process to challenge wind projects. NEPA applies to projects that have a federal nexus, such as the need for a significant federal permit or the involvement of federal land, federal

money or a federally managed transmission line. The NEPA process is public and, if triggered, can significantly delay a project.

Prior to permitting and construction, an offshore wind project subject to NEPA will undergo an environmental analysis called an Environmental Assessment (EA). Generally, an EA assesses the need for the proposed project, any alternatives, and the environmental social, economic and cultural impacts of the proposed project and alternatives. Based on the EA's results, the federal Bureau of Ocean Energy Management (BOEM) may then prepare a more rigorous assessment providing for public review and comment, and responses to substantive comments. This more rigorous assessment is an Environmental Impact Statement (EIS). BOEM acts as the lead agency for an EIS and coordinates with other federal and local agencies throughout the process to ensure all relevant federal and state requirements are considered before taking any action. In the US, each of the following key environmental impacts associated with a wind project typically arises during the NEPA process in both the EA and EIS.

IMPACTS TO BIRD AND BAT SPECIES

US onshore wind project proponents often assess whether a proposed wind project will harm birds or bats, frequently devoting significant resources to analyzing whether birds are likely to be harmed in collisions with a wind farm's turbines. Over the past decade, US onshore wind project proponents routinely

commissioned bird and bat species, and habitat surveys and conservation plans that aligned with federal government-issued guidance. The nascent US offshore industry has begun to follow suit.

Federal wildlife laws

Project proponents typically prepare these assessments and develop related conservation plans to avoid liability under the following US federal wildlife laws related to avian species: Migratory Bird Treaty Act (MBTA) protecting most migratory birds; Bald and Golden Eagle Protection Act (BGEPA) protecting bald and golden eagles; and Endangered Species Act (ESA) protecting species and habitats designated as endangered or threatened by the Fish and Wildlife Service (FWS), the US federal agency that manages fish and wildlife, including avian species.

These laws generally prohibit the unauthorized "take" of listed bird or bat species. The term "take" is defined broadly as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect. If a protected bird, for example, is harmed in a collision with a



An environmental analysis assesses the need for the proposed project, any alternatives, and the environmental social, economic and cultural impacts of the proposed project and alternatives.



wind farm turbine, the wind farm operator could be subject to liability under one of these laws. However, FWS may allow a wind energy project an “incidental take” of an endangered or threatened species by issuing an incidental take permit. Wind project proponents often obtain these permits to protect themselves from future liability.

Prudent wind project developers frequently work with federal regulators during a project’s pre-construction and construction phase to try to obtain a determination that the project is unlikely to affect any listed or endangered species or critical habitat; and that no permits are needed under the ESA, BGEPA or similar federal laws. This type of determination protects against claims for injunctions by private plaintiffs and reduces the likelihood that federal agencies will pursue enforcement actions in the event of a “take” of an endangered species in connection with a wind project.

To evaluate impacts to birds and bats, the FWS cooperates with BOEM throughout the NEPA review process, providing technical and biological information for use in the review to ensure that such species are considered during project planning. The ESA requires that a federal agency such as BOEM informally consult with FWS to ensure that its actions are not likely to jeopardize the continued

existence of any endangered or threatened species.

If a proposed offshore wind farm may affect a protected avian species or critical habitat, BOEM must prepare a Biological Assessment (BA) to evaluate the potential effects of the proposed action on the endangered or threatened species or critical habitat listed (or proposed to be listed) under the ESA. If, based on the BA, the action is likely to adversely affect a listed species, formal consultation or conference with FWS is required.

Survey guidelines

In May 2017, BOEM issued Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf (ASG). These provide recommended timing, scope and technical suggestions for developers, but note that the avian surveys a developer is required to conduct may vary significantly depending on the scale and/or complexity of a proposed project, and the availability of existing data. BOEM recommends two annual cycles of boat-based surveys, traditional aerial surveys or high-resolution digital aerial surveys to determine spatial temporal distribution, abundance and behavior of avian species. If more data or analyses are needed to satisfy all state

and federal environmental review processes, BOEM may require additional avian surveys before, during or after construction.

For example, Block Island Wind Farm, the only operating commercial offshore wind farm in the US, completed a three-year site-specific pre-construction avian and bat survey and committed to conducting additional post-application avian and bat surveys under a protocol reviewed and approved by FWS. Post-application surveys include bat acoustic monitoring (during construction), ship-based bird monitoring (two years during operation), nocturnal migrant collision monitoring (three non-consecutive years during operation) and avian radar monitoring (three non-consecutive years during operation).

VISUAL IMPACTS AND THE NATIONAL HISTORIC PRESERVATION ACT

Because of their coastal locations, many proposed offshore wind farms in the US are near areas with high concentrations of recreation and tourism activities. Visual impacts to historic or culturally sensitive properties can be more significant if the proposed project is near a historic property or culturally sensitive resource. Cape Wind, one of the most highly publicized failed offshore wind projects in the

US, was ultimately unsuccessful largely due to opposition from property owners concerned about adverse visual effects of a proposed offshore wind farm in Massachusetts' Nantucket Sound.

While no laws or regulations specifically govern visual impacts in the US, the National Historic Preservation Act (NHPA) requires that federal agencies like BOEM consider the adverse impacts of their actions on properties that may be eligible for or listed in the National Register of Historic Properties (NRHP). The NRHP includes districts, sites, buildings, objects and cultural resources. Further, BOEM must allow the Advisory Council on Historic Preservation (ACHP) an opportunity



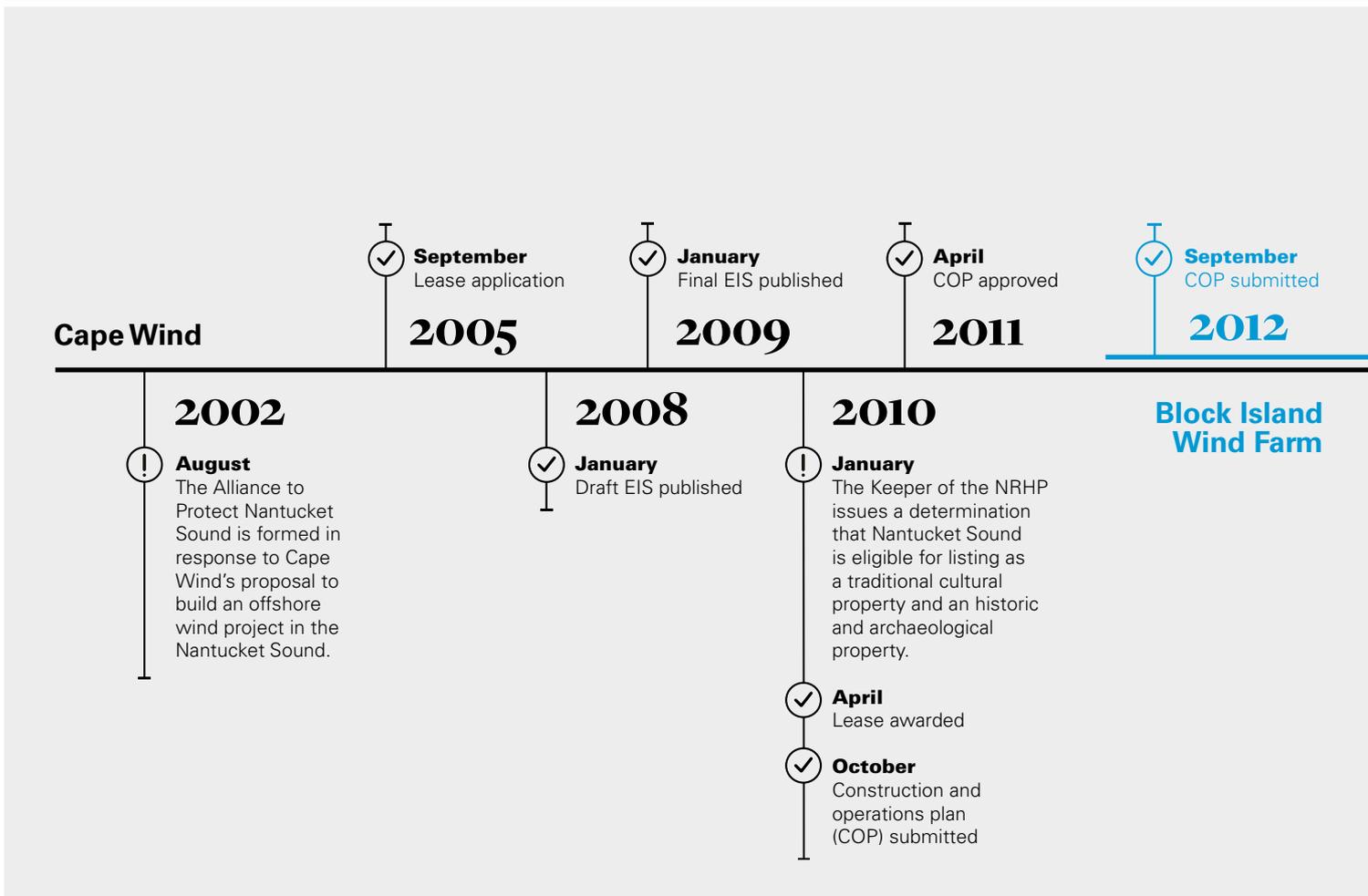
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to comment, and must consult with state historic preservation offices and representatives of federally recognized Native American tribes.

In the Cape Wind example, it was determined that ocean views from historic Massachusetts

landmarks would be adversely impacted by the proposed project, so the ACHP was invited to consult. Similarly, the US Department of the Interior was asked to consult due to anticipated impacts on views from Native American tribal sites

Permitting timelines for Cape Wind, Block Island Wind Farm and Vineyard Wind



in Massachusetts. Ultimately, ZCape Wind's opponents could not use the federal environmental permitting process to halt construction of the project, and instead had to rely on other avenues, such as lobbying, to prevent the project from being awarded state-mandated energy purchase contracts and prevent the wind farm from moving forward. Nevertheless, the Cape Wind example demonstrates that BOEM is required to consult under the NHPA if a proposed offshore wind farm introduces visual elements that are out of character with the historic setting of structures or landscapes, and the historic setting contributes to a property's NRHP eligibility.

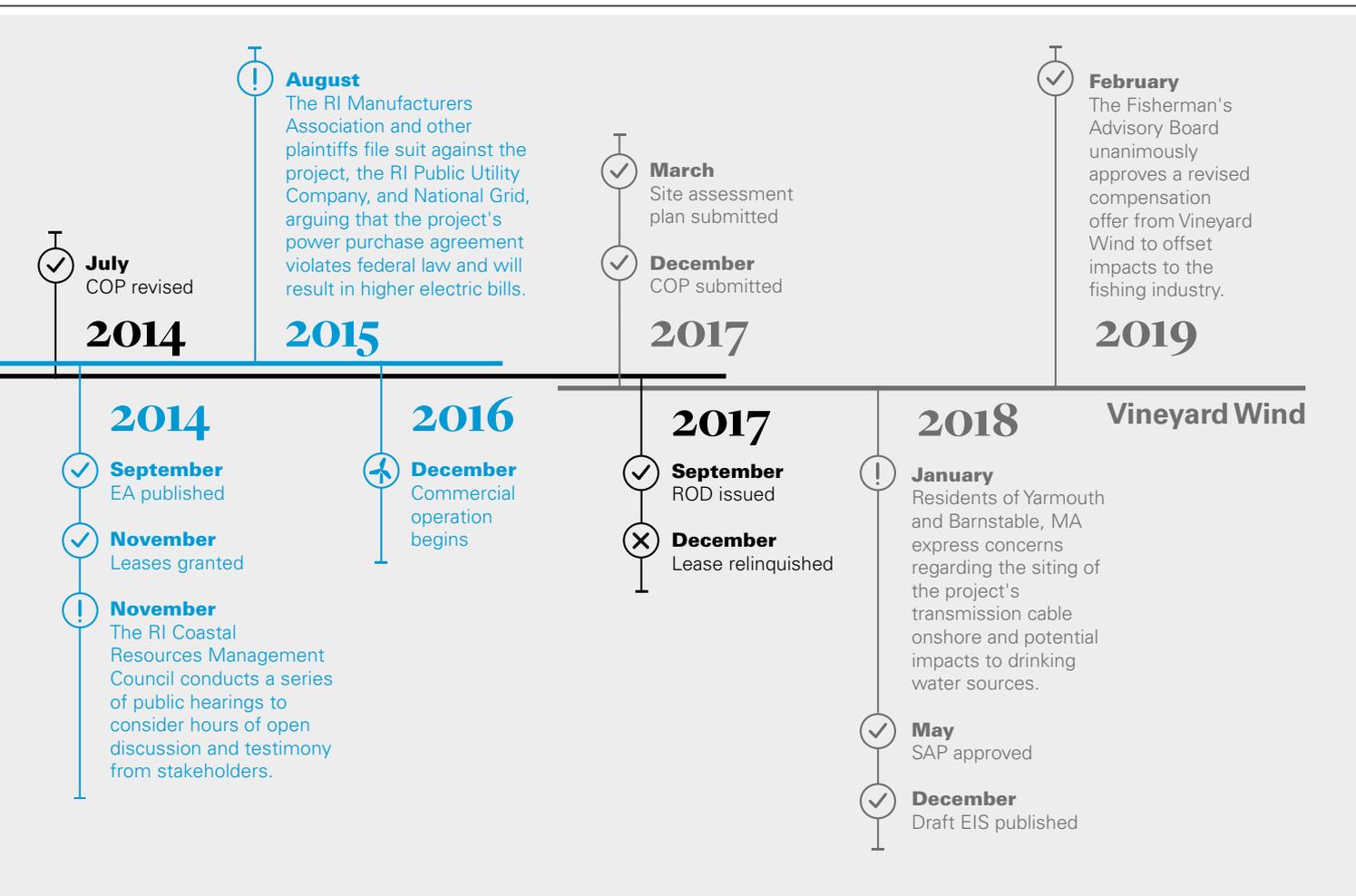
To determine whether the landscape can absorb the visual change resulting from a proposed wind project without significantly affecting scenic quality or viewer enjoyment, a project proponent generally prepares a Visual Impact Assessment (VIA). The VIA uses techniques such as distance modeling, visual simulations, and professional rating panels to quantify the potential effects and their impact on stakeholders. Ultimately, the VIA determines whether the threshold of acceptable visual impact will be exceeded and considers any measures that will reduce or mitigate visual impact, such as uniform design, lighting and siting.

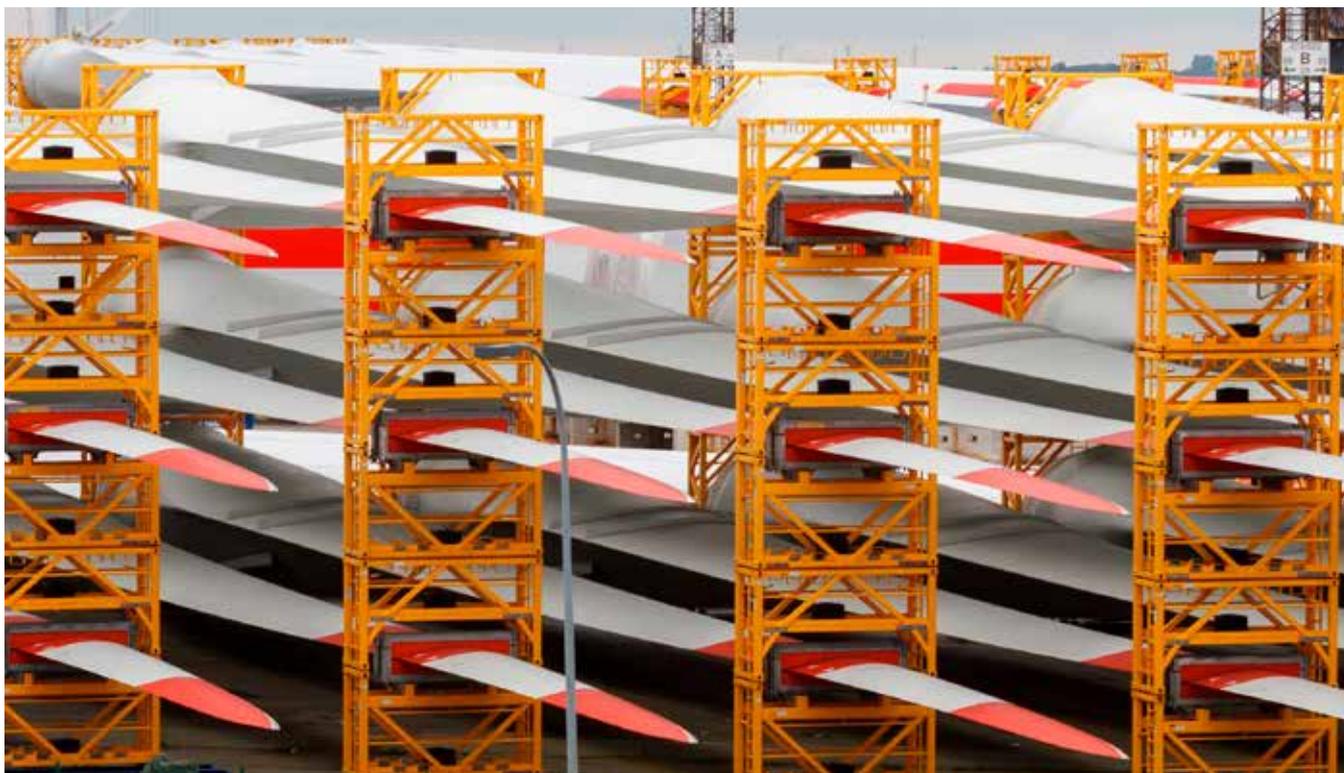
IMPACTS ON MARINE SPECIES

Offshore wind farms in US waters have the potential to impact a wide range of marine life, including scallops, quahogs, clams, finfish, marine mammals and sea turtles. As a result, US environmental law generally requires wind project developers to ensure that impacts to marine species are appropriately considered, site projects to avoid such impacts and implement other mitigation measures.

Applicable laws

While many marine species are listed as endangered or threatened and protected by the ESA, several additional laws intended to protect marine species also apply to offshore wind project





development. The Magnuson-Stevens Act (MSA) governs marine fisheries management, fostering long-term biological and economic sustainability of federal fisheries. Among other things, the MSA protects marine and migratory fish species by establishing essential fish habitats (EFHs)—protected areas such as coral reefs, kelp forests, bays, wetlands and rivers necessary for fish reproduction, growth, feeding and shelter.

The Marine Mammal Protection Act (MMPA) protects all marine mammals, including whales, dolphins and seals, by preventing their killing or harassment. If a proposed wind farm may result in harassment of a marine mammal protected by the MMPA, the project proponent may submit an application to the National Marine Fisheries Service (NMFS) for an Incidental Harassment Authorization (IHA), which authorizes impacts to marine mammals that are no more than negligible, and that have no

“unmitigable” adverse impact. An IHA is effective for up to one year.

The NMFS is the agency generally responsible for implementing these laws. As FWS does, NMFS cooperates with BOEM throughout the NEPA review process to ensure that impacts to marine species within its jurisdiction are considered. If a proposed wind farm may impact threatened or endangered marine species or a species protected by the MMPA that is within NMFS’s jurisdiction, BOEM must submit a BA to NMFS assessing those potential impacts. If a proposed action may adversely affect an EFH, BOEM must consult with NMFS and, if necessary, submit an EFH assessment.

Survey guidelines

In July 2013, BOEM issued Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf (MMSTG). These provide recommendations

for developing information on marine mammals and sea turtles in compliance with BOEM regulations. The MMSTG note that the marine species surveys that a wind project developer is required to conduct may vary significantly based on regional biology, the scale and location of the proposed action and the availability of existing data. Nevertheless, the MMSTG provide recommended timing, scope and technical suggestions for wind project proponents.

BOEM recommends two annual cycles of vessel-based surveys or aerial surveys to determine spatial temporal distribution and abundance of marine mammal and sea turtle species, and two annual cycles of passive acoustic monitoring surveys to establish baseline ambient sound levels and presence of vocalizing marine mammals. To the extent possible, a proposed offshore wind farm should be sited to avoid important habitats, such as eelgrass, that support marine life. In addition, construction activities

can be scheduled to avoid seasons associated with spawning or breeding, and a project proponent may use techniques and equipment that minimize disturbances.

Offshore wind project developers may conduct site-specific surveys before, during or after construction to provide additional assessment and mitigation of potential impacts. For example, Block Island Wind Farm agreed to conduct a four-year post-construction lobster survey to assess impacts to lobsters and shellfish, and a five-year post-construction trawl survey to assess impacts to finfish.

NOISE

To assess the noise impacts of a proposed offshore wind farm, a project proponent in the US will generally conduct in-air and underwater acoustic modeling studies. However, the noise impacts of offshore wind farms are largely unregulated by US federal law.

Some US towns and municipalities have noise ordinances, but operational noise from offshore wind farms is unlikely to violate these ordinances or be considered a significant impact for nearby residents because of the projects' distance from the coast. For example, the Town of New Shoreham, near Block Island Wind Farm, has a nighttime limit of 55 A-weighted decibels (dBA). Acoustic modeling studies for Block Island Wind Farm found that, in all modeling scenarios, sound levels at identified shoreline noise-sensitive receptors were likely to be below 25 dBA. In addition, Block Island Wind Farm is approximately three miles from the coastline, far closer than most proposed US offshore wind projects.

If construction activities associated with a wind project, such as pile-driving, are expected to generate short-term, temporary noise impacts at sensitive onshore receptors, a project proponent may elect to limit these activities to daytime hours to avoid running afoul of nighttime noise ordinances. However, noise impacts during construction are often more

significant for marine species that are sensitive to pile-driving noise. The evaluation of noise impacts on marine mammals is generally performed as part of a biological assessment and submitted to NMFS for review along with the results of any underwater acoustic analysis. NMFS may then assess the significance of any noise impacts on marine life. To alleviate potential mortality, a project proponent may implement mitigation measures such as using fixed passive acoustic monitoring buoys, autonomous passive acoustic monitoring devices and noise reduction technologies. If necessary, the project proponent may apply to the NMFS for an IHA to authorize any potential exposure of protected species to disturbing noise levels.

DECOMMISSIONING

Federal offshore leases issued by BOEM generally authorize offshore wind farms to operate for up to 25 years, although leases may be extended at BOEM's discretion. Projects are required to address decommissioning impacts in their construction and operation plans, and BOEM must assess these impacts in its review of each project. However, BOEM regulations also provide a number of requirements regarding the decommissioning of offshore wind farms, including financial assurance requirements and removal obligations.

Absent permission from BOEM, project proponents must submit a decommissioning application that includes all planned decommissioning activities, any resources or activities that could be affected by the proposed decommissioning activities, results of any recent biological surveys, mitigation measures that will be used to protect archaeological and biological resources and prevent unauthorized discharges of pollutants, and whether the area will be surveyed after removal to determine any effects on marine life. If the proposed decommissioning activities will



Cape Wind was ultimately unsuccessful largely due to opposition from property owners concerned about adverse visual effects of a proposed offshore wind farm in Massachusetts' Nantucket Sound.

result in any significant change to the impacts previously identified in a project's construction and operation plan submitted to BOEM, or require any additional federal permits, BOEM will be required to perform an updated NEPA analysis and other regulatory review as necessary.

Once approved, projects must complete decommissioning within two years of lease termination and either reuse, recycle or responsibly dispose of all materials removed. BOEM regulations require that projects remove or decommission all installations (including cables and pipelines) and clear the seafloor of all obstructions created by the project. All facilities must be removed 15 feet (4.6 meters) below the mudline.

Wind project developers may request that certain facilities remain in place following termination of the lease (i.e., if certain components or equipment, such as the onshore substation, remain fit for continued service). However, BOEM will consider potential impacts to the marine environment, impacts on marine safety and other factors in determining whether to approve such a request. Alternatively, a project may request that certain facilities be converted to artificial reefs or "otherwise toppled in place," subject to BOEM approval.

Offshore wind power gains ground but faces environmental challenges

To maximize its potential, industry players will have to navigate an often-complex web of national, state and local environmental regulation

The growing offshore wind industry is expected to continue to create local jobs, boost regional economies and mitigate the effects of climate change globally. However, offshore wind also raises environmental challenges that are often overlooked.

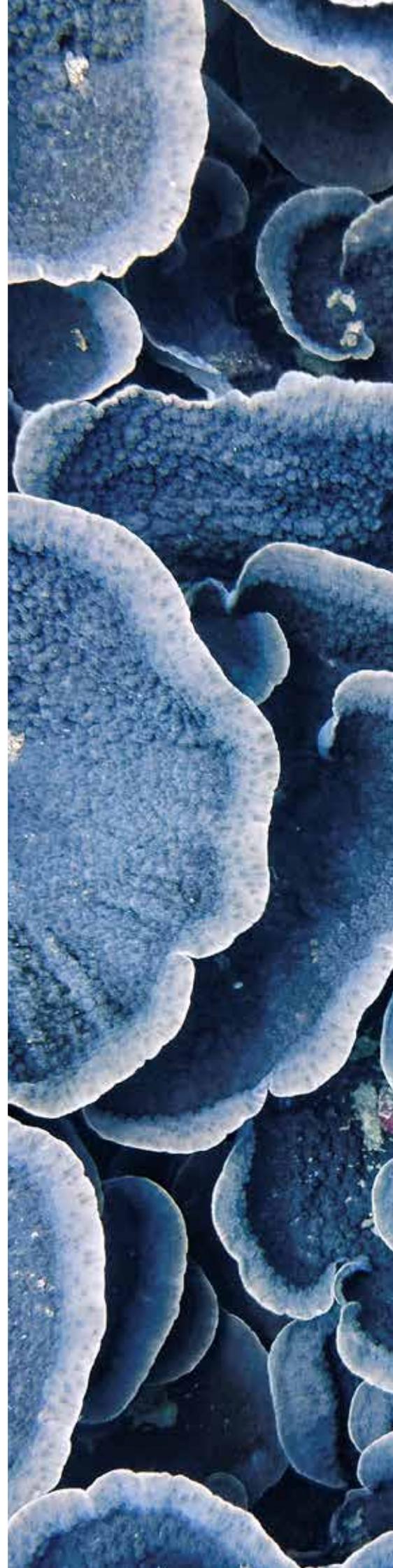
In recent years, the pipeline for new offshore wind farms on the East Coast of the US has grown considerably. Japan's coastal regions are also attracting more interest in offshore wind projects due to strong governmental support. And in Europe, particularly in Germany and the UK, the offshore wind industry is even more advanced. Although clean energy demand in these jurisdictions is expected to spur construction of significant numbers of offshore towers, related environmental risks could delay or ultimately sink an offshore wind project if not managed properly and pursuant to local environmental laws.

While environmental regulators in the regions discussed in this report generally mandate assessments of how offshore wind projects will affect the environment, and how those impacts could be mitigated, offshore projects face varied obstacles based on each jurisdiction's environmental laws. For example, while US offshore projects have met substantial opposition related to visual

impacts, this consideration tends to be somewhat insignificant in the German wind farm permitting process. Further, different countries often require unique mechanisms and solutions to protect different aspects of the local environment that may be impacted by offshore wind farms (for example, endangered North Atlantic right whales off the coast of the Northeastern United States, or northern Eurasian bittern feeding in Japanese waters).

Wind project developers, financiers, investors, acquirers, contractors and materials suppliers should understand the ways that environmental regulators in different regions require offshore wind projects to manage environmental risks and impacts. These regulatory requirements may present companies in the offshore wind space with unique local compliance obligations, along with potential opportunities to take advantage of similarities among regional requirements. Going forward, as national, state, provincial and territorial governments rev up green-power mandates to fight climate change, wind sector participants should recognize the legal risks and opportunities surrounding these issues as they develop, support, finance, acquire, sell and operate offshore wind assets.

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