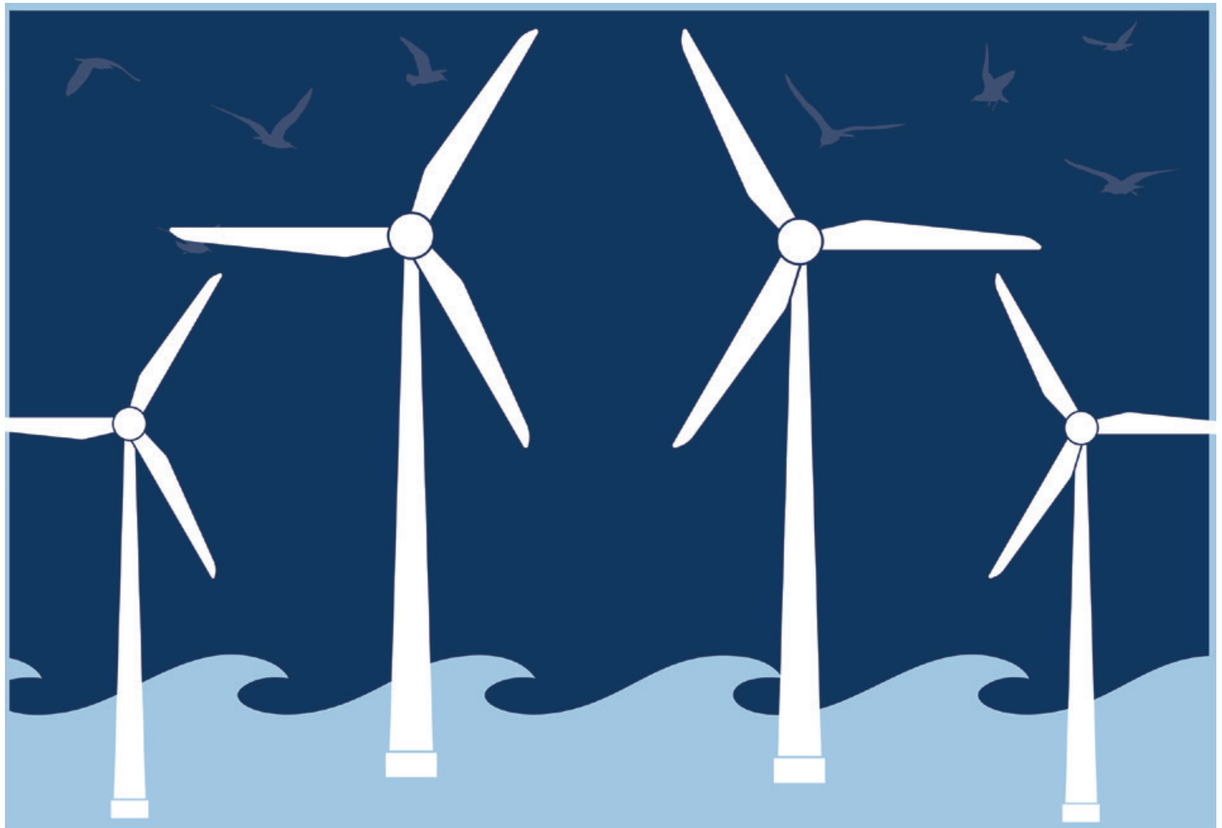
Offshore Wind for Nature

Can Offshore Wind Development Have a Net Positive Impact on Biodiversity? Regulatory and Scientific Perspectives and Considerations



ACKNOWLEDGMENTS

We are grateful for those who traveled to be here and contribute to this symposium as guests, panelists and moderators, some coming from a very great distance. We are grateful for the enthusiasm they expressed for this topic and the symposium. Very special thanks to the Marine Affairs Institute at Roger Williams University School of Law and the Rhode Island Sea Grant Legal Program, a national leader in marine and coastal law for 25 years, for agreeing to co-develop and co-host this symposium with The Nature Conservancy.

Julia Wyman, director of the Marine Affairs Institute, and Emily Migliaccio, staff attorney at the Marine Affairs Institute, worked tirelessly and enthusiastically with Tricia K. Jedele, Atlantic Coast offshore wind policy manager at The Nature Conservancy, who initiated this topic, to conduct approximately 70 scoping calls and three listening sessions to identify speakers and develop and refine the agenda over many months. Together, their contributions and effort made this symposium possible. Special acknowledgment also to Roger Williams University and the School of Law for their logistical, technical, and communications support, especially Chelsie Horne, Molly Perkins, and Christopher Perett.

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COVER PHOTO: Block Island Wind Farm. © Ayla Fox

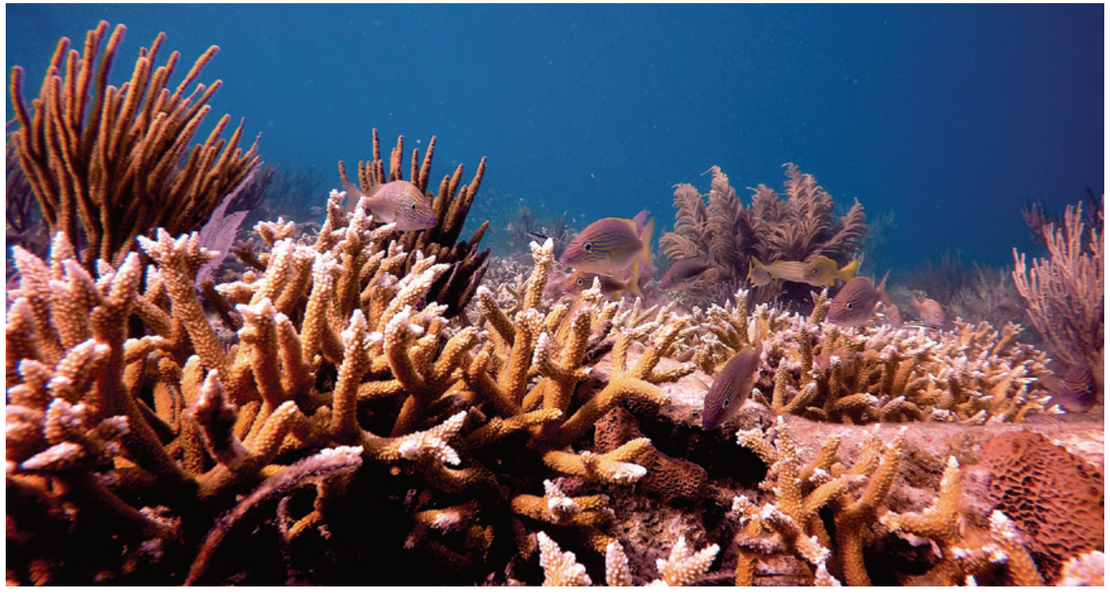
Adding value to the marine environment

The pace and scale of offshore wind development in the United States and in the North Sea has focused increased attention on the need to ensure that this development contributes to global biodiversity goals and the marine environment.

The concept of adding value to the environment is sometimes referred to as creating a "net positive impact on biodiversity" (NPI). NPI means that after a project has addressed the negative impacts caused by its construction and operation, it can engage in additional environmental mitigation or restoration projects, other design elements, or other activities that create and support habitat, attract and support species, or support and enhance important ecological functions and services, thereby helping to reverse biodiversity loss. The successful implementation of this concept at a project or seascape level requires consistent, credible, science-based approaches.

Unfortunately, for offshore wind development, there is no consistent, credible, or science-based approach to implementing NPI. There are no agreed-upon metrics, frameworks, or regulatory schemes for integrating biodiversity goals into new offshore wind projects.

The Marine Affairs Institute at Roger Williams University School of Law and The Nature Conservancy, co-hosted a Marine Law Symposium on April 20–21, 2023, titled *Can Offshore Wind Development Have a Net Positive Impact on Biodiversity? Regulatory and Scientific Perspectives and Considerations*. This was a public event designed to be future-oriented, educational, and neutral. It took place at Roger Williams University School of Law in Bristol, Rhode Island. The symposium featured seven panels with 46 speakers and moderators, including representatives from United States-based and Dutch-based companies that support offshore wind development in various ways; federal and state government officials from the United States, the Netherlands, and the United Kingdom; marine ecologists; other scientists and researchers; and consultants working on offshore wind and/or studying the marine environment. The panelists were identified after organizers conducted more than 70 scoping calls and held four public listening sessions.



Coral planting. Dry Tortugas, Florida Keys. © Rachel Hancock Davis/TNC

Block Island Wind Farm. © Ayla Fox

The president of Roger Williams University, Ioannis Miaoulis, welcomed 150 registered attendees to the symposium. Julia Wyman, director of the Marine Affairs Institute at Roger Williams University School of Law and the Rhode Island Sea Grant Legal Program, and Tricia K. Jedele, Atlantic Coast offshore wind policy manager for The Nature Conservancy, detailed how the agenda was developed and panelists were identified; outlined the objectives for the two-day event, and; articulated suggestions to enable and support productive and civil discourse throughout the symposium.

The symposium sought to address specific question through the panels. This document, the Summary of Proceedings, summarizes answers to these questions that were culled from the presentations and discussions, and highlights Panel Headlines and Panel Recommendations. The Summary of Proceedings, along with PowerPoint presentations, a video trailer summarizing the symposium, the videos of each presentation, Useful Resources, Glossary, Agenda, and Speaker Biographies are available on the Marine Affairs Institute's webpage.

The symposium was structured to provide two days of learning that built knowledge panel-to-panel. Day one consisted of a high-level overview of the regulatory paradigm for offshore wind in the United States, with specific reference to the points in the regulatory timeline that contemplate the mitigation hierarchy. It also included the scientific perspectives of how the concept of NPI relates to the mitigation hierarchy and what is needed to achieve NPI in the marine environment. Day two included panels structured to more fully examine the policy and economic drivers for NPI, implementing mechanisms and opportunities for NPI, the offshore wind industry's approach to NPI, and technological applications, science needs, and challenges.

Overall Headlines from the Symposium

Seabed landscape with kelp forests and a starfish in the foreground.
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- To achieve a **net positive impact on biodiversity the project must go above and beyond the mitigation hierarchy**. In other words, it must go from -1 to 0 in terms of impacts, and then must go to +1. NPI does not supplant existing requirements for mitigation.
- NPI should be **applied throughout the planning, design, development, operations, and decommissioning processes** (*e.g.*, siting correctly, integrating nature inclusive designs, building artificial reefs at decommissioning).
  - > Net gain needs to begin with the siting process: site right to avoid biodiversity impacts. Avoidance is the first step in the mitigation hierarchy and also makes achieving net gain easier and less costly.
    - – Identify deconflicted/low-impact areas to allow for accelerated permitting.
    - – Marine spatial planning is needed to get to marine net gain: MSP can support net gain by siting right and avoiding impacts in the first place.
- The most effective NPI approaches will **consider an ecosystem/seascape approach**, with site-based solutions as part of a wider socio-ecological structure. This will allow for more transformative, scaled, and ecosystem-based approaches, and will recognize that marine systems are more dynamic and marine taxa are more migratory than in terrestrial systems.
  - > Net gain actions may include **active restoration or passive recovery** (including reducing pressures on habitats/species).
  - > Onsite interventions may include actions such as nature-positive design and creation of artificial reefs.
  - > **Offsite interventions may deliver greater net gain** and be more cost-effective. Offsite actions may include coastal, marine or colony habitat restoration, removal of fishing or other pressures on habitats, and removal of invasive species.
  - > Marine net gain cannot be achieved without **effective fisheries management.**
  - > All speakers emphasized the importance of **adaptive management** and noted that any net gain frameworks must be flexible to respond to changing environments and emerging evidence. Lessons learned should be applied to ensure that net gain is being achieved.
- Successful NPI approaches will **require data collection, monitoring and evaluation**, and research and development. Developers and research efforts must make data available publicly in order to support wider, regional and strategic marine initiatives.
  - > Speakers discussed the relative merits of biodiversity vs. environmental net gain, which goes beyond just biodiversity, recognizing the ecosystem and social benefits of biodiversity.
    - – The UK is trying to take this approach, but it requires a framework that includes socio-ecological data, ecosystem services, and aims for social equity.
- **Metrics may not be an appropriate tool**.
  - > Metrics can minimize the complexity of the marine environment. In such a dynamic and data-poor environment, metrics may do more harm than good and may be resource intensive for developers.
  - > An alternative to a standardized, reductive metric would be a payments-based approach, in which a developer pays a financial contribution to a pooled fund in lieu of attempting restoration directly. This fund would be easier to govern and would be able to deliver strategic, seascape-wide approaches, including distant offsite interventions such as in bird colonies. It would also reduce burdens on developers.
  - > However, **most developers favored some kind of standardized metrics** because they provide certainty in terms of targets, funds, loans, bonds, and mitigation actions. They need to be able to measure what they have achieved and report on it.
- **Non-cash bidding factors could support NPI.**
  - > In the United States, the non-cash portion of bids (associated with environmental mitigation or demonstration of net environmental benefit) for either lease auctions or state energy contracts are given relatively low weight compared with price. In the Netherlands, the non-cash portion of the bid for demonstration of ecological benefit is weighted to equal 50% of the overall score.
  - > Non-cash factors must be additional and cannot replace mitigation requirements.
  - > Potential non-cash factors could include commitments to biodiversity net gain; nature-positive design; open-source modelling and data analysis; commitments to support data portals, research efforts, and studies to estimate take and improve on models; or commitments to take actions in future as research and data deem necessary.
  - > Non-cash factors may enable better connection between strategic, regional approaches and individual onsite interventions.

Setting the Stage:

Part 1: What Does Net Positive Impact on Biodiversity (NPI) in the Ocean Mean as It Relates to the Mitigation Hierarchy for Offshore Wind? Regulatory Perspectives

Moderator:
Jackie Rolleri, J.D., deputy chief, Oceans and Coasts Section, Office of the General Counsel, National Oceanic and Atmospheric Administration

Speakers included:
Amy Trice, senior program director, Northeast Regional Ocean Council (NROC)
Edward (Ted) Boling, JD, partner, Perkins Coie (remote participation)
Becca Loomis, JD, project attorney, Natural Resources Defense Council
Matthew Eisenson, JD, fellow, Renewable Energy Legal Defense Initiative, Sabin Center at Columbia University
Stephanie Vail-Muse, regional energy coordinator, United States Fish and Wildlife Service (USFWS)
Grover Fugate, former RI coastal zone management agency director

Research turbine off the coast of Virgina two years after construction.
© INSPIRE Environmental and Dominion Energy

The panel addressed the following questions:

1. What is the existing regulatory framework for offshore wind projects in the United States?

The amendments to the 2005 Energy Policy Act marked the first time that lease issuance for offshore renewable energy was authorized under the Outer Continental Shelf Lands Act (OCSLA). This was an add-on to the existing oil and gas leasing authority and for this reason failed to fully account for needs and opportunities or to require best practices for offshore wind. OCSLA § 8(p)(1) gives the Bureau of Ocean Energy Management (BOEM) authority to grant leases on outer continental shelf lands for energy other than oil and natural gas, and outlines what the Secretary of Interior must consider in granting leases. BOEM must complete a number of steps and address statutory requirements before it can issue a lease under OCSLA. Generally, leases need to balance the interests of various stakeholders like safety, waste prevention, national security, interference with reasonable uses, and environmental impacts.

The first part of the BOEM leasing process is to identify appropriate lease areas. This planning and analysis phase includes a scoping process that begins with a Request for Information covering fairly large Call Areas. During this process, stakeholders have opportunities to engage, and intergovernmental task forces are created, made up of federal and state resource management agencies and tribal partners in coastal communities that may be impacted by planned leasing for offshore wind in adjacent federal waters. The intergovernmental task forces work with BOEM and other user groups and stakeholders to refine the Call Area to specific Wind Energy Areas that will be associated with leases. In order to proceed with leasing, BOEM must determine there is competitive interest in the lease areas or establish that there is no competitive interest. BOEM must also assess whether lease activities associated with lease issuance, which is a major federal action, will have adverse environmental impacts. The environmental review for lease issuance and the proposed lease area activities is conducted under the National Environmental Policy Act (NEPA).

BOEM generally operates on a two-year timeframe, from planning and analysis of a Call Area to the leasing phase. The leasing phase itself can take one to two years. Once a lease has been acquired, the site assessment phase can take two to five years before a Construction and Operation (COP) Plan is submitted to BOEM for review and approval. BOEM is generally on a two-year timeframe from the day it issues a Notice of Intent to Prepare an EIS for a Construction and Operation Plan to a Record of Decision (ROD).

Projects are authorized to use a Project Design Envelope approach for the COP, which allows developers to submit a range of technologies and designs for environmental review, thereby providing flexibility for project specifics as long as they remain within certain bounds. This part of the process requires BOEM to prepare an Environmental Impact Statement (EIS) under NEPA. The process of compiling an EIS requires consultation with other federal agencies that are charged with implementing requirements in other federal statutes, including the Endangered Species Act, The Magnuson–Stevens Fishery Conservation and Management Act, the National Historic Preservation Act of 1966, and the Coastal Zone Management Act (CZMA).

There have been a few efforts to streamline the offshore wind siting, leasing and permitting processes. The Fixing America's Surface Transportation Act was enacted on December 4, 2015. Title 41 of that act (FAST-41) established new coordination and oversight procedures for infrastructure projects that are reviewed by federal agencies. FAST-41 was intended to, among other things, improve early consultation and coordination among government agencies. In addition, the Infrastructure Investment and Jobs Act, signed into law in 2021, invests in infrastructure and programs to support clean and renewable energy sources. Also, BOEM recently published the Renewable Energy Modernization Rule, which proposes flexibility for site characterization activities like geophysical, ground model, marine archaeological surveying and defers the requirement for specific site characterization to the final review. The comment period for the Proposed Rule closed on May 1, 2023.

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States can address their mitigation goals and concerns about habitat and species and require compensation for impacts and adaptive management through the CZMA. The CZMA establishes an "effects test." When a state can demonstrate that a project occurring in federal waters will have "reasonably foreseeable effects" on the state's natural resources and enforceable policies, the project proponent must mitigate impacts and certify that its planned activities are consistent with the state's enforceable policies.

States may acquire the ability to review a consistency certification in three ways:

1) Unlisted review occurs when the state can document that the proposed project will have reasonably foreseeable effects on state resources and enforceable policies. NOAA reviews the state demonstration and determines whether unlisted review is warranted.
2) A project proponent may voluntarily submit to a state's consistency review to signal the intention to cooperate and coordinate with the state as the project advances.
3) The state may apply for a Geographic Location Description (GLD). A GLD requires the state to identify a specific area and list activities that, if conducted in the specified area, would have reasonably foreseeable effects on the state's natural resources or policies. The GLD must also be approved by NOAA. Having access to spatial data, especially from fisheries management, makes it easier to build the GLD request form.

Once a state makes a consistency determination in favor of the applicant, that determination cannot be further enforced, and the project is released from state control and oversight. The drawback to using its consistency review authority, for a state, is that it requires a fair amount of planning and forethought about impacts associated with projects in advance. State enforceable policies tend to focus on impacts to commercial fisheries and the need for mitigation agreements. States generally take a "do no harm" approach and do not have policies that are designed to advance net positive impacts or enhancements.

2. How are impacts and mitigation addressed within this framework?

The existing legal and regulatory framework for offshore wind is not well designed for the rapidly evolving industry. The BOEM lease approval process for offshore wind, which only applied to oil and gas leasing prior to 2009 (and has changed little since then), does not include all of the needs for renewable energy development and does not incorporate best practices and ocean spatial planning into offshore wind siting and design.

For example, consider the EIS, the most frequently challenged portion of the lease process. An EIS can only provide limited information about impacts. It addresses the environmental impacts of the proposed action, any adverse impacts that cannot be avoided, and reasonable alternatives to the proposed action. Relative to how useful the EIS is to understand and comparatively evaluate environmental impacts and risks, there was discussion about how detailed the EIS needs to be to address regulatory requirements. Courts have interpreted NEPA as requiring agencies to "take a hard look" at other alternatives to the action, including consideration of a "no action" alternative. BOEM considers offshore wind development to be better than the no action alternative. But some impacts associated with the various alternatives are easier to evaluate than others. One of the main challenges to an EIS is that it is not sufficiently comprehensive and would be of greater value in avoiding impacts if it were done before leasing. BOEM's response to the idea of carrying out an EIS before leasing is that because the lease does not allow the developer to start construction (only to begin site surveying and characterization studies) and because these surveying activities do not cause "significant environmental impacts," the need for an EIS is not triggered. One of the deficiencies in the EIS analysis is that it simply describes a variety of impacts without doing further analysis and synthesis. Finally, the ROD is essentially set in concrete because changes would require a separate NEPA analysis. This makes it difficult, if not impossible, to use enforceable and measurable adaptive management strategies.

Federal Consulting Agency Perspective: USFWS applies the mitigation hierarchy in its consultations with BOEM on offshore wind energy projects. Early involvement in the lease process is key to avoiding surprises later in the

process and helps to avoid potential impacts on wildlife. USFWS typically starts the process by asking whether the impact can be avoided altogether. If the impact cannot be avoided, then the agency focuses on how the impact can be minimized. If USFWS cannot minimize the impact of the project, the next step is compensatory mitigation.

USFWS is operating under a "no net loss" policy rather than a "net positive impact" policy. This means that under the current mitigation hierarchy, the agency implements compensatory mitigation only to the extent necessary to compensate for the harm caused by the project. While USFWS looks at the impacts to both listed and non-listed species, BOEM only looks at impacts to species that are listed under the Endangered Species Act. This limitation is compounded by the paucity of data available on species impacts. At present, there are only seven offshore wind turbines in the United States, so there is very little data on how species are impacted by offshore wind development. However, the industry is voluntarily helping to fill in the data gaps.

State Coastal Zone Management Agency Perspective: Under the CZMA, any federal activity that may affect state waters must undergo a consistency review. The review is meant to ensure that the federal action does not contradict any applicable enforceable state policies for the coastal zone. It enables states to get involved in offshore wind development in federal waters. States may incorporate NPI measures into coastal zone management regulations in order to encourage federal implementation of those measures through a consistency review. One of the limitations of this approach is that a state must have enough information to be forward-thinking. If a state does not incorporate NPI measures into its coastal zone management regulations before a project is proposed, then it cannot enforce those measures as part of the state's coastal plan with relation to that project.

Project-Specific Example: The Vineyard Wind project requested to deploy a LiDAR buoy rather than meteorological towers in its site assessment for the project. LiDAR buoys have less of an impact on the environment than meteorological towers, which must be driven into the seafloor. It took BOEM over a year to approve the deployment of the LiDAR buoy. BOEM is now proposing to allow less intrusive methods of site assessment, such as LiDAR buoys and remote operated vehicles, but it takes so long to approve new measures that this is a limiting factor in the incorporation of new technologies and policies in the site assessment process.

Coral reef at Key Largo, Florida Keys. © Rachel Hancock Davis/TNC

Lease Area Example: In the Pacific Wind Lease sale, a 5% credit was offered to developers if they had a concrete plan to execute a community benefit agreement. In order to qualify for the credit, bidders were required to describe the method for identifying impacted communities, strategies to mitigate potential impacts, and mechanisms for collaboration and issue resolution. The Pacific Wind Lease sale was a step in the direction of multi-factor auctions, but it was limited in scale.

3. Can NPI be connected to the mitigation hierarchy and the regulatory scheme that are currently in place?

If a project implements mitigation and addresses NPI at an early stage, these measures can be more effective once a site is selected. BOEM uses the National Centers for Coastal Ocean Science (NCCOS) model to improve site selection for offshore renewable energy infrastructure. It is a tool to assign suitability scores and statistically determine which areas are most suitable. To date, BOEM has used this model to assign suitability scores and statistically determine which areas are most suitable in the Gulf of Mexico and for the Central Atlantic Planning Area. BOEM invites stakeholder comments based on the NCCOS model scores. The challenge is that the NCCOS model only looks at available data and in a lot of cases we are still collecting data. So, if the data does not yet exist, it does not go into the model. In addition, the NCCOS model looks more to the presence and vulnerability of species, which is important for NEPA analysis, but may not provide the best information for siting. The model is also limited to addressing impacts associated with siting and does not consider construction and operation impacts. But despite the limitations of the NCCOS model, it could still be used to advise NPI if the process is expanded, impacts are considered in more detail, and construction and operation impacts are integrated into the process.

The multi-factor bidding process for lease sales may be another opportunity to address mitigation more fully. BOEM is beginning to incorporate non-monetary factors, such as supply chain development and other public policy considerations, into the bidding process. In multi-factor auctions, BOEM evaluates whether a bidder will contribute to specified public policy objectives (e.g., fisheries compensation, supply chain or work force development). The bidders know in advance whether they qualify for the credit (a non-cash credit worth up to 25% of the cash bid).

The panel discussed whether NPI could be implemented through multi-factor auctions and identified several challenges: NPI strategies must go above and beyond mitigation; NPI cannot replace required mitigation in lease stipulations; and the success of the strategies must be measurable long term if a developer is going to get credit for that strategy as part of its bid. Incorporating recommendations into the leasing and permitting framework can facilitate the integration of the mitigation hierarchy into project siting and design.

- The current legal and regulatory framework was not designed to establish best practices for the rapidly evolving offshore wind industry.
- The siting, leasing, and permitting processes are complex and time consuming.

PANEL HEADLINES

- NCCOS modeling only looks at best available data, so there are knowledge gaps in the siting analysis.
- NPI needs to go above and beyond addressing adverse impacts to the mitigation hierarchy. The mitigation hierarchy must be satisfied first.
- NPI strategies must be effective and measurable.
- The focus to date has been on impacts to Endangered Species Act–listed species. There is little data on impacts to non-listed species. But, for a landscape-scale approach, we need to consider all species.
- Assessing incremental impacts on biodiversity are not as straightforward for wildlife, as it is for flora.
- NPI takes planning, time, and conversations, especially at a seascape scale. Early conversations are needed to address what is effective, what is working, and what is concerning.
- There are no requirements to acquire baseline environmental data before projects are built.
- We need to address data gaps and missing knowledge across all platforms to move toward NPI.
- There is no oversight of environmental impact post-construction.
- We must make it a priority to avoid the highest risk areas and identify appropriate spatial modeling (as well as improve future models).
- States may express their concerns about impacts to resources through the CZMA consistency review process, but this process requires baseline data, site information, and sufficient knowledge of resources and anticipated impacts.
- Investors need certainty that they can actually implement these projects.

PANEL RECOMMENDATIONS

Policy and Accountability

- ✓ Pass a comprehensive ocean statute, comparable to public lands, to establish a mechanism for seascape-level conservation.
- ✓ Revise OCSLA to include a title that is specific to offshore wind.
- ✓ No-action alternative assessments under NEPA should include climate change impacts.
- ✓ Identify impacts associated with the life cycle of a project as early as possible.
- ✓ Establish a mechanism for post-construction oversight of impacts, adaptive management, and long-term monitoring.
- ✓ Establish requirements through BOEM for measuring baseline conditions of habitat and contributing to NPI.
- ✓ Include biodiversity factors in the next phase of leasing (*e.g.*, Gulf of Maine).

Convenors and Collaboration

- ✓ Use Northeast Regional Ocean Council as a convenor to discuss biodiversity and seascape priorities.
- ✓ Industry partners are expressing voluntary interest in monitoring and mitigation for non-listed species.
- ✓ Develop best practices, guidelines, and targets to effectively monitor and implement NPI.
- ✓ Ensure oversight of environmental impact post-construction.
- ✓ Address data gaps and missing knowledge across all platforms.

Leasing and Procurement

- ✓ Establish binding criteria for non-cash portions of lease auctions that include support for studies to estimate take and improve on existing models; contribute to establishing baseline habitat conditions; plan for adaptive management; innovate with respect to new technologies to mitigate impacts or enhance biodiversity; address data gaps and missing knowledge across all platforms to move toward NPI; and conduct post-construction monitoring.
- ✓ Establish similar binding criteria for non-cash portions of state solicitations through the state procurement process.
- ✓ Assign a portion of revenue from lease sales to addressing data gaps, platform development, and maintenance.

Setting the Stage:

Part 2: What Does NPI in the Ocean Mean as it Relates to the Mitigation Hierarchy for Offshore Wind? Science Perspectives

Moderator:
Jessica Wilkinson, senior policy advisor for Energy and Infrastructure, The Nature Conservancy

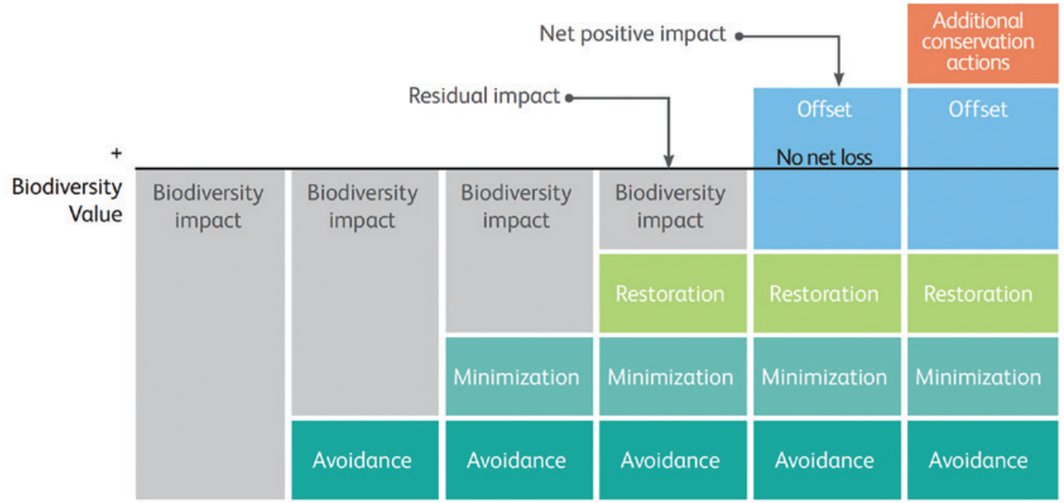
Speakers included:
Aisling Lannin, head of evidence and Marine Pioneer Programme lead, Marine Management Organisation, United Kingdom
Melanie Austen, professor of Ocean and Society at University of Plymouth, United Kingdom
Sarah Cooley, director of climate science, Ocean Conservancy
Neil Cousins, founder and director, Bluedot Associates, Ltd. (remote participation)
Aspen Ellis, graduate student, University of California, **Santa Cruz**, and co-author of a 2022 report regarding net gain and marine birds
Claire Fletcher, senior principal consultant, The Biodiversity Consultancy (remote participation)
Kate Williams, director, Center for Research on Offshore Wind and the Environment, Biodiversity Research Institute

The panel addressed the following questions:

1. How does the concept of NPI relate to mitigation hierarchy and global biodiversity goals generally?

The mitigation hierarchy refers to the primarily sequential, but also iterative, approach to avoid, minimize, and mitigate impacts associated with project development. All the panelists agreed that the first step to achieving NPI should be to move sequentially through the mitigation hierarchy to avoid impacts to ecologically sensitive areas through best siting practices and then to take all feasible steps to minimize impacts. Avoidance was recognized as the best, most cost-effective, and most quantitatively successful measure for achieving NPI. It is still quite difficult to achieve no net loss through the application of the mitigation hierarchy, and the group was very hesitant to embrace offsets as a means of achieving no net loss. They noted the International Finance Corporation Performance Standard 6 application of the mitigation hierarchy, which is defined as reducing the extent of residual effects and determining whether an offset or an additional conservation action is appropriate, either to address a specific residual impact or to demonstrate NPI. Caution was advised that offsets can be "feel good" measures that do not actually address the impact that was created by the project and can distract from the work needed to further minimize impacts. Many countries are now moving away from strict site-based mitigation and there is emerging emphasis on the need to develop more transformative, scaled, system-based approaches to mitigation.

Divers prepare cement blocks in a water nursery for growing coral near the Florida Keys. © Meaghan Johnson/TNC



This panel also discussed the relationship between the mitigation hierarchy and project-level mitigation objectives and the United Nations' Global Biodiversity Framework, which is designed, among other things, to guide action on biodiversity loss, halting human-induced extinction, reducing the rate of extinction ten-fold, and increasing funding for biodiversity protection. They emphasized that the global goals of cutting greenhouse gas emissions, safeguarding biodiversity, and supporting equitable development must be pursued separately but in consideration of one another—a three-legged stool.

2. Is it possible to achieve NPI for offshore wind?

Yes, although it will be challenging. Because offshore wind will likely be subject to a much higher level of scrutiny than other offshore activities to date, there is a real opportunity to do things right. One panelist described the opportunity to plan for NPI outcomes from offshore wind development as "a moment" and expressed concern that if we do not collaborate and plan for it, the moment may pass. The concept of net gain started as a land-based idea and has been applied in that context with mixed results. Given the few examples of successful application of NPI on land, it is unclear that it can be applied successfully in the ocean, which is a completely different environment. Still the panel proposed a number of ideas to achieve NPI including: a need for bigger picture thinking, identifying regionally-scaled goals and desired outcomes, a system-approach with site-based solutions contributing to a larger socio-ecological structure, flexibility with monitoring and evaluation to allow for adaptive management as we learn; a regulatory sandbox approach to allow communities and regulatory agencies to really focus on testing demonstration mitigation so that we can start learning now, not in a decade; identifying priority features susceptible to impacts, or in response to stakeholder input; looking for synergies between project-level mitigation, which might be possible with multi-platform surveys; establishing a baseline for key priority features that can be quantified by monitoring methods that are repeatable and consistent for the monitoring phase; identifying features that can be improved with actions on site (in-setting) or actions off site (offsetting); relying on transparency and confidence to address uncertainty; consider a process for combining the results from all of the individual priority features at

the project level to determine whether NPI has been achieved at the project level, and then to aggregate projects across a corporate portfolio and then aggregate the projects across a seascape portfolio; develop a decision-making framework that acknowledges the complexity of the ocean without being overly complex; focus on how projects can contribute to the larger goals and values and do not focus on site-specific biodiversity improvement alone; forward looking perspective that takes into account climate change itself.

There was a good deal of discussion about the role of data in establishing baselines and metrics. Equivalence metrics can be helpful, but they do not always provide a complete picture of what is going on. For example, their application could obscure complexities of the ocean that are not yet known. The use of metrics in achieving NPI would make it simple to measure success, but it is unlikely that that those metrics would capture the whole picture. The use of equivalence metrics could also fail to take into account mobile species. Habitats have limited use as proxies for mobile species, so a healthy habitat does not necessarily equal a healthy species.

One specific approach to achieving NPI in the offshore wind context could be a payments-based approach. Under this approach, developers would pay into a fund to develop better mitigation procedures. This approach is less complicated than ecological equivalence metrics and is used globally. It may also produce stronger strategic outcomes, as marine developers prefer offsite mitigation options. Developers would only need to focus on their own projects, and the funds that they pay could be used to restore habitats elsewhere. The United Kingdom followed this approach with aggregate extraction, in which the aggregate industry was prepared to pay a percentage into the fund. Another example in which this approach was applied is the Scottish Marine Environment. A later panel discussion at the symposium (Session 3, Part 2) mentioned the use of mitigation banking in wetlands and in-lieu fee programs.

Achieving NPI in the context of offshore wind may take the form of active restoration or passive recovery. Active restoration is direct action that seeks to restore a particular species or habitat, such as through nature-inclusive designs and habitat restoration. This is a more intensive and expensive form of restoration. Passive recovery is the

removal of pressures that are causing environmental damage. It is not directed at the particular habitat but rather at external factors; examples include collection of marine debris and regulation of commercial fishing.

The Role of Offsets in Achieving NPI for Seabirds: One panelist discussed offsets as the only possible pathway for achieving NPI for certain species of seabirds. These highly mobile species are often concentrated at refined breeding sites. Species accruing impacts in one place could be breeding in entirely different regions or in other places in the world and therefore the most concentrated and important areas for restoration might be other than the project site. To achieve NPI for these species, we need to implement conservation actions in the places that will be most effective for them. For colonial nesting species, shore bird species, and some others, offsets will be challenging because we do not have established metrics to understand what measures could boost these populations.

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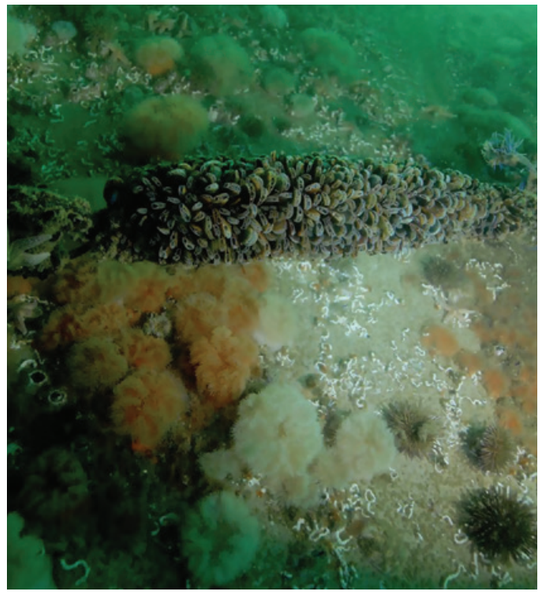
The panel presentation outlined how to assess the impact trajectory from collision or displacement for the seabird population over a set time period. The mitigation hierarchy was applied sequentially, first reducing residual impacts through site selection, then minimizing impacts with audiovisual deterrence or curtailment, then offsetting to achieve no net loss or a net positive impact. But depending on the region, avoidance and minimization approaches may have significant limitations, because many of these approaches have not been tested on seabird populations. For this reason, offsetting may be the best approach to boost seabird population sizes. The presentation focused on the report referenced in the Useful Resources document, which describes a methodology for using existing modeling tools to better prioritize the species that are most appropriate for offsetting approaches and identifies the research needed to boost those populations.

3. What are the challenges and obstacles to implementing and demonstrating success?

As indicated by the seabird discussion above, one challenge to the successful implementation of NPI is that mitigation efforts limited to the project site may have no real effect on global migratory species. To achieve NPI for global migratory species and complex marine habitats, a system-level approach is needed. But a system-level approach requires government frameworks, metrics, and data. Without a regulatory directive, the implementation of NPI will be voluntary and will likely occur only at the project or site level. The few examples of successful implementation of net gain are limited to subsets of species and specific ecological features. The panel cautioned that concentrating on project-level impacts will not deliver a net gain.

Government frameworks need to establish the baselines, the management scenarios, and possible outcomes. Without this guidance, the expectation for NPI will not be met and will not contribute to net positive holistic outcomes. As mentioned in earlier discussions, aggregations also pose a challenge. The process for combining results from all of the individual priority features at the project level to determine whether NPI has been achieved is important to establish credibility and to satisfy corporate sustainability disclosure requirements. There is a significant lack of data on baseline biodiversity at project sites. This means that even if a certain NPI measure is effective, the developer may not be able to prove it. The issue becomes what metric, if any, to use to determine net positive success. Equivalence metrics are simple and easy to digest, but they do not capture a comprehensive picture of the marine environment, so they are not an accurate measure of success.

Collecting the data to establish baselines may prove challenging and expensive. Some population declines may be caused by factors other than offshore wind development, or the turbines may cause behavioral changes that cannot be determined on site. These data collection challenges are often the same challenges that developers face when they try to mitigate harm and demonstrate net positive impact. It is also important to consider how mitigation technologies can transfer to low-income developing nations and areas experiencing rapid biodiversity loss. Encoding and encouraging net positive principles through leasing, permitting, and other paradigms make take years. A seascape approach requires the evaluation and prioritization of ecosystem benefits and functions. Monitoring, transparent data sharing, and stakeholder engagement are required to do this effectively and equitably.



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4. Is it appropriate to talk about "net" gain?

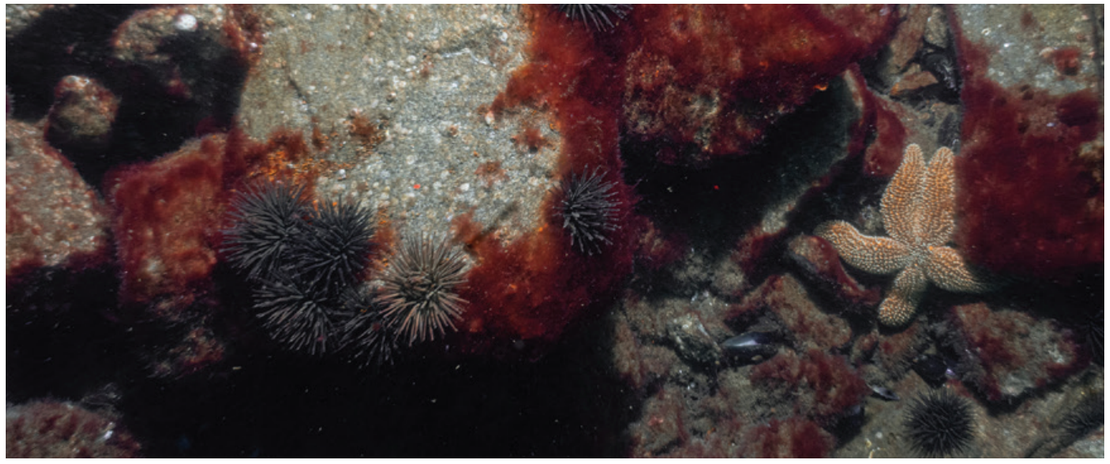
Net gain is not really a new principle. It has been embedded in international safeguard standards and policy for some time. The term feels new for the offshore wind industry because for the most part, this industry has been supported by private financing, and the international finance standards may not have guided corporate practice to date. Net gain is used interchangeably with net positive impact. Offshore wind developers more often use the term NPI to reflect corporate focus at a project level, while regulators used the term net gain to reflect an evolution to a systems-based approach. The application of net gain, like NPI, happens autonomously by individual companies. Although developers may want to contribute to a seascape approach, they cannot drive the prioritization of seascape values and are dependent on a specific strategic framework to contribute to seascape goals.

Both net gain and NPI seek to go beyond simply mitigating the harm caused by human action, and to leave the impacted area or resources better than they were found. Both require best practices, environmental impact assessment, transparency with the impacted communities, long-term monitoring, an eye to addressing not just direct impacts but cumulative impacts associated with construction and operation and a plan for decommissioning, looking to the future, accounting for climate change, careful planning, and documentation. The use of the term net gain is therefore appropriate to the discussion of NPI.

Nature positive is an emerging term, and there has been a good deal of confusion about what it means and how it relates to net positive. Net gain and net positive are more operational terms, whereas nature positive seeks to halt and reverse global biodiversity loss and is a global, holistic cumulative goal achieved once all the deliverables are made. Nature positive efforts are conducted at scale and go beyond biodiversity services into wider conservation and human components. An individual organization cannot be nature positive but can contribute to nature positive outcomes by undertaking activities with net gain or NPI.

5. Is biodiversity the right metric?

Biodiversity can be understood as the integrity, connectivity, and resilience of marine ecosystems that have maintained genetic diversity, in places where natural ecosystems and the species that depend on them have been restored and enhanced. Several panelists suggested that the focus on biodiversity alone is limiting and preferred the term environmental net gain. They noted that on its own, biodiversity does not provide the complete picture of how an ecosystem is functioning. Conversely, the richness of a habitat does not necessarily equate to the health of species in that habitat. Biodiversity may not be the right metric on its own, but it may be appropriate when used in conjunction with other metrics, especially when connecting back to the global goals. There was general agreement that the use of metrics other than biodiversity alone might be appropriate.



Research turbine off the coast of Virgina two years after construction.
© INSPIRE Environmental and Dominion Energy

PANEL HEADLINES

- The mitigation hierarchy should be applied consistently, sequentially, and iteratively. Avoidance is the best and most cost-effective path to NPI.
- For many taxa, avoidance or minimization of onsite impacts will not be possible.
- Think strategically, not site-by-site. Achieving net positive will require a systems-based approach and one that focuses on achieving wider net gains for related goals: halting biodiversity loss, reaching net zero emissions, supporting socioeconomic values, and enabling long-term sustainable growth.
- Focus on practicality over comprehensiveness. Very prescriptive quantification is not realistic because it is not easily applicable across taxa and habitats. Equivalence metrics are helpful, but numbers do not always tell us if we are successful.
- The burden for achieving NPI should not fall only on the offshore wind industry.
- NPI on biodiversity cannot occur separately from fisheries management.
- Collision risk modeling and population viability analysis tools can be used to identify the offsets for some seabird species. For some species, offsets are the only way to achieve no net loss and NPI at a species level.
- Consider environmental impacts broadly, not just impacts on biodiversity.
- Consider impacts on non-listed species, even if this consideration is voluntary initially.
- Flexibility will be essential as the giant experiment plays out. This means that testing, pilot project, monitoring, and evaluations need to be built into the NPI approach.
- Monitoring approaches must be standardized (quantifiable, repeatable, simple, and transparent).
- Data and lesson sharing will be critical to demonstration of NPI.

PANEL RECOMMENDATIONS

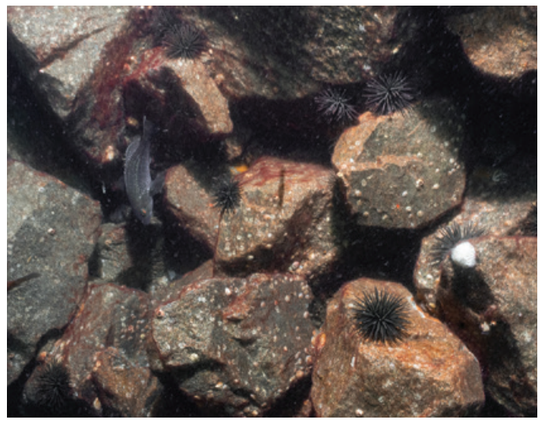
- ✓ Support research and monitoring at or near offshore wind facilities. Ensure that data and learning are accessible and shared in a timely manner.
- ✓ Consider a structure that can support collaborative approaches. Consider co-creating and co-designing a framework rather than staying in the voluntary vs. regulatory mindset.
- ✓ Evaluate the benefit of using a natural capital ecosystems approach.
- ✓ Pool compensatory funds and apply to regional restoration objectives. Consider the value of independent third-party entities that can accept and direct funds for research and mitigation efforts, and the role of third-party funders to support offsets for migratory species.
- ✓ Consider how an individual offshore wind project can autonomously add benefit in a systems-based approach.
- ✓ Establish a framework to implement feasible and effective conservation actions where results from autonomous projects can be combined to achieve NPI.
- ✓ Invest in research and development, monitoring, and mitigation technologies.
- ✓ Encourage cross-sector collaboration between biologists and turbine engineers, research and development, monitoring efforts, and mitigation technologies to test and integrate more effective approaches in offshore wind design and operation plans.
- ✓ Break paradigms of like-for-like mitigation and measurability against particular losses.
- ✓ Apply NPI considerations throughout the process: area identification, lease issuance, site assessment, construction, operations, decommissioning.
- ✓ Establish mechanisms that incentivize and reward offshore wind companies for engaging in NPI efforts.

NPI Targets in Offshore Wind

Part 1: Why Set NPI Targets in Offshore Wind? Varying Policy and Science Perspectives

Moderator:
Amber Hewett, program director, Offshore Wind Energy, National Wildlife Federation

Speakers included:
Boze Hancock, senior marine restoration scientist, U.S. and global projects, The Nature Conservancy
Laura Harland, marine net gain team leader, U.K. Department of Environment, Fisheries and Rural Affairs (remote participation)
Atma Khalsa, environmental affairs manager, Avangrid
Rennie Meyers, senior public affairs advisor for Oceans and Biodiversity, Ørsted
Drew Carey, vice president, Americas, Venterra



Research turbine off the coast of Virgina two years after construction.
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The panel addressed the following questions:

1. If we could implement NPI in offshore wind, what are the benefits to nature, species, and habitat?

There would be numerous benefits to nature, species, and habitat. This is already being demonstrated in countries other than the United States. The restoration community uses the term ecosystem services to describe benefits from the natural habitat. NPI may be happening already in the United States and abroad, but it may be described using the term ecosystem services.

Some of the critical habitats to consider with NPI in the offshore wind context are salt marsh, seagrass, mangrove, giant kelp, and reef (both coral and shellfish). These are important habitats because of their structure and their productivity. The panel discussed the restoration of an oyster reef to achieve NPI. Limestone and granite are ideal materials to provide structure on the sea floor. Coincidentally, these materials are often used for scour protection in the offshore wind industry; a rock pad is laid beneath the monopile structure, and then additional stone is placed around the base. The offshore wind industry is already constructing the most expensive part of the oyster reef and adding the biological component would be a smaller additional cost. In the North Sea, there is significant offshore wind development permitted or planned, and historic oyster reefs existed in many of the places where offshore wind is being developed. This location is therefore a potential area for NPI through oyster reef restoration.

In England, the Department for Environment, Food, & Rural Affairs (Defra) is thinking about policy in relationship to marine net gain and offshore wind development. The policy being developed is an approach to development that aims to leave the natural environment in a measurably better state than beforehand. The aim is to reverse the loss of marine biodiversity by embedding environmental improvements into infrastructure planning and development, securing additional recovery and restoration measures to contribute to national and international targets, reducing cumulative impacts, and identifying opportunities for enhancement. The government's 25-year environment plan is driving the net gain policy, The Environment Act, both on land and offshore. In England, net gain policy is not new—it has been a requirement in national planning policy on land since 2012.

England has created a set of principles to define marine net gain and what it should include. These include assessing losses/impacts and requiring developers to deliver additional biodiversity enhancements to achieve overall gain; delivering net gain through planning/licensing regimes; continuing to use the mitigation hierarchy; using a strategic approach; using active restoration/enhancement, assisted recovery, and natural recovery through pressure reduction all in scope; and considering options for delivery through a contributions-based approach and metrics.

Defra uses the Offshore Wind Environmental Improvement Package (OWEIP) to support the British Energy Security Strategy and Growth Plan. This will accelerate deployment while enhancing and protecting the marine environment. It includes reforms to Habitats Regulations Assessments for offshore wind; establishing a Marine Recovery Fund to deliver strategic environmental compensation for environmental impacts; delivering Offshore Wind Environmental Standards; and implementing a strategic approach to environmental monitoring.

From a company perspective, Ørsted has placed an emphasis on balancing energy growth with nature. Ørsted has set a goal that all new renewable energy projects commissioned from 2030 onward should deliver a net positive biodiversity impact, keeping the green energy build-out in balance with nature. To do this, Ørsted has a dedicated biodiversity program that seeks to meaningfully measure biodiversity impact in the dynamic ocean environment, invest more in ambitious biodiversity projects across the world backed by science, and drive the international debate to address both climate and biodiversity goals. Ørsted works on projects in five primary areas: birds, intertidal habitats, benthic habitats, fish, and marine mammals. Strategically picking projects that can meet these biodiversity goals, and selecting partners to work toward those goals, are key approaches. Some projects are strategic compensation projects that target a direct impact of development, such as kittiwake artificial nesting structures for the black-legged kittiwake, a seabird species that can be displaced by offshore wind development. Other projects are biodiversity projects that benefit the ecosystem more broadly.

Placing reef balls at Sabin Point in Riverside, Rhode Island.
© Timothy Mooney/TNC

A lot of baseline scientific data already exists for marine habitats and ecosystems. From a science perspective, it is critical to have quantitative, tested metrics in order to assess whether marine habitats and ecosystems have been "enhanced." "Enhancement" is a concept grounded in social terms. Nature has many synergistic processes established through millennia of adaptive evolution to changing environmental conditions. Judgment of fitness is harsh and generational with no consideration of a human-value structure. Some of the hesitancy about NPI efforts in the context of offshore wind development is concern about how actions will be judged.

Can the nature of habitats be enhanced to create NPI? It is important to develop a framework for assessment of enhancement and NPI; without clear guidelines, any evidence of change can be interpreted across a wide range of values. Benthic habitats are the starting point for examining cumulative impacts to marine ecosystems from offshore structures, because the structures introduce benthic habitat and then have cascading effects on surrounding habitat. Four effects of this introduction are benthic habitat modification, enrichment and benthic–pelagic coupling, connectivity and habitat expansion, and habitat suitability. Examining the function of the ecosystem, in addition to biodiversity, should be part of examining NPI.

2. Are there other policy or science reasons, including financial and corporate drivers, for implementing NPI in offshore wind?

A scientific reason for implementing NPI in offshore wind is the location of these projects. In many cases, offshore wind is being developed or proposed in areas that have been historically rich in biodiversity. For example, the North Sea offshore wind development is taking place in areas that historically contained many oyster reefs. Including oyster reefs in the development of the offshore wind may restore the areas to historical levels of productivity or beyond. If designed well, these NPI efforts can produce benefits for nature, people, places, and the economy. Efforts can support net zero goals, promote sustainable development, and protect the environment and biodiversity.

Project finance and lenders may be an important driver in developing NPI in the offshore wind space. Project finance is a common funding mechanism for infrastructure projects, in which debt and equity used to finance the project are paid back from the cash flow generated by the project. Many lenders have environmental and social standards, most based on guidance from the International Finance Corporation (IFC). In addition, commercial banks have adopted these standards through the Equator Principles, a financial benchmark for determining, assessing, and managing environmental and social risk in projects.

One of the World Bank Group's five institutions, the IFC provides financing to private sector businesses doing business in developing countries. Clients must follow performance standards to obtain financing, including properly handling environmental assessments, ensuring stakeholder engagement, and managing contracts. Performance Standard 6 (PS6) defines biodiversity requirements. PS6 has a requirement for net gain for critical habitat and no net loss for natural habitat. Since 2006, PS6 has offered significant resources to assist clients in achieving their net positive goals, including baselines, critical habitat assessment, mitigation design, offset design, and monitoring and evaluation. These features are required by lenders for projects in developing countries, but have a more limited application in the United States; however, many international companies have integrated them into internal corporate standards.

The private sector may be motivated to strive for NPI for multiple reasons: investor interest; environmental, social, and governance (ESG) reporting frameworks and taxonomies, Blue Bonds, and the Global Diversity Framework. Target 15 of the Framework requires companies to disclose their interaction with nature and take action on those interactions. Companies may also be driven to incorporate NPI into projects due to regional drivers, such as marine net gain (UK), tender criteria (the Netherlands), and biodiversity credit schemes (Australia).

SESSION 2 | PART 1

PANEL HEADLINES

- Working toward NPI in offshore wind will require regulators, industry, and environmental non-governmental organizations (ENGOs) to work together.
- Defining the benefits of specific actions to the ecosystems, and creating metrics to measure those benefits, will be beneficial to all partners in offshore wind.
- Aligning work with regional, national, and global efforts on biodiversity will help move new efforts forward.
- Specific biodiversity efforts from other countries are not necessarily replicable in the United States, but the concepts and processes are.
- At a project level, the metrics with these efforts are complicated, but at a national level, metrics are less complicated because they can include more project-level diversity.

PANEL RECOMMENDATIONS

- ✓ Work toward a common framework and consistent language across sectors to alleviate confusion from sector to sector.
- ✓ Work toward clarity on what NPI is and when it is achieved. This understanding will enable all sectors to feel more confidence in efforts.
- ✓ Funding mechanisms—public or private—are necessary to move NPI forward.

Wind farm. © Red Vault

Regulatory Opportunities

Part 1: How Can NPI Be Advanced in Offshore Wind Projects? An Examination of the Solicitation Process and Other Possible Implementing Mechanisms for NPI

Moderator:
Mark James, visiting assistant professor and senior energy fellow in the Institute for Energy and the Environment, Vermont Law and Graduate School

Speakers included:
Ruud de Bruijne, tendering manager, Netherlands Enterprise Agency (remote participation)
Egbert Jansen, team manager of contracting, construction, and operations, Pondera (remote participation)
Remco van Sliedregt, lead counsel legal and regulatory, USA, Boskalis
Kate McClellan Press, senior project manager, Environmental Research, New York State Energy Research and Development Authority (NYSERDA)
Michael Richard, commissioner, Maryland Public Service Commission (remote participation)
Martin Heinze, economist, BOEM

The panel addressed the following questions:

1. How are non-price criteria for ecological benefits incorporated into solicitations for offshore wind in the United States and in the Netherlands, and how are they qualitatively evaluated?

The panel, which included speakers from the Netherlands and the United States, highlighted the differences between the two countries' regulatory processes for deploying offshore wind. Below is a high-level overview of each country's regulatory framework for soliciting offshore wind development and how non-price criteria are incorporated into the processes and qualitatively evaluated (if at all).

Block Island Wind Farm. © Ayla Fox

In the United States

Federal Government (BOEM) Multi-Factor Leasing Process

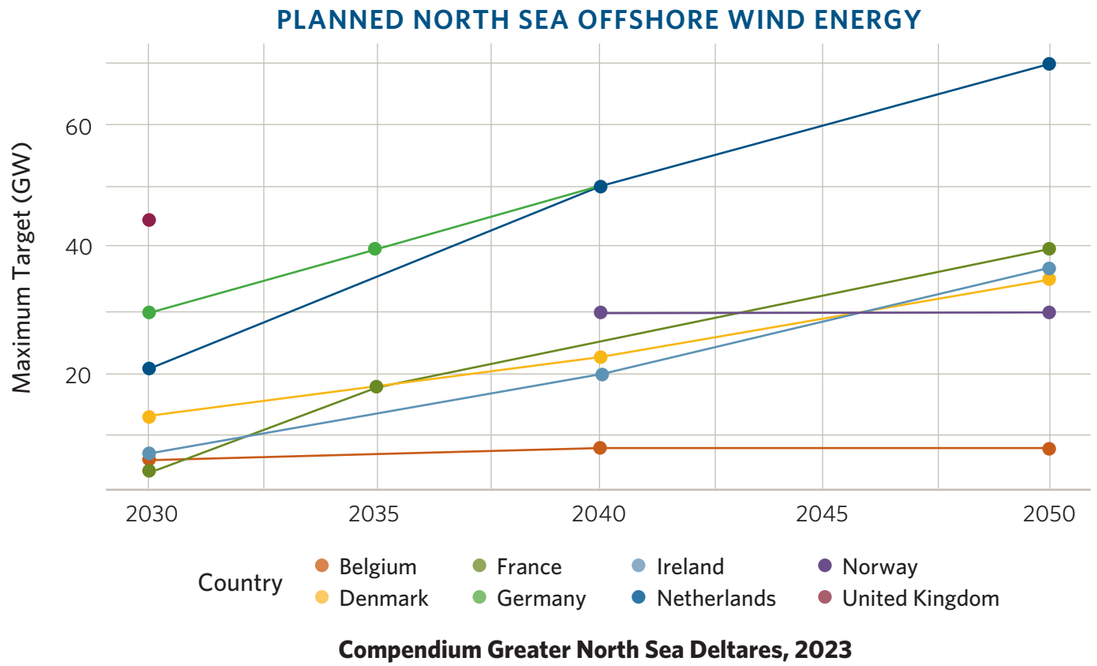
Developing offshore wind energy projects in the federal waters of the United States involves various regulatory processes at the federal, state, and local government levels. One federal process is the leasing of the government's submerged public lands to wind energy developers. The agency responsible for leasing such land, BOEM, is authorized to do so utilizing a multi-factor auction format with a multi-factor bidding system. BOEM has offered, or is proposing to offer, bidding credits as a non-cash component when auctioning offshore wind leases. Its authority to offer such bidding credits is granted under a federal law known as OCSLA, which requires BOEM to balance expeditious and orderly development with other aspects, such as safety, protection of the environment, a fair return to the public, and prevention of interference with reasonable uses of the high seas, including fisheries and navigation. Current federal policy prioritizes bidding credits for projects that support the domestic supply chain for the offshore wind energy industry, workforce development for the offshore wind energy industry, and compensatory mitigation for fisheries. In advance of any lease sale, the bidder must submit a conceptual strategy outlining how they plan to meet the objectives of the bidding credit. BOEM then evaluates the credit proposals on a pass/fail basis (not a qualitative ranking). Compliance and enforcement provisions apply later in the lease development process.

As it relates to ecological benefits and NPI, BOEM does not currently incorporate non-price criteria for ecological benefits in its multi-factor auction process, though, it could conceivably offer a bidding credit for an NPI or no net loss policy by, for example, requiring a monetary contribution to marine net gain efforts. However, BOEM does not currently believe it has the authority to enforce NPI under the National Environmental Policy Act.

State Government – Offshore Wind Energy Solicitations

State governments set their own offshore wind energy procurement goals and have their own regulatory structures and agencies responsible for soliciting offshore wind and approving energy contracts or buying Offshore Renewable Energy Credits. This panel discussed solicitation frameworks in two states (New York and Maryland) and how non-price criteria for ecological benefits are incorporated into those frameworks and evaluated.

In New York, NYSERDA is authorized by the state's public service commission to procure offshore wind credits and is given great flexibility in writing solicitations and evaluating proposals. Early in the solicitation process, NYSERDA collects stakeholder input in various ways, including through meetings with offshore wind technical working groups, to better inform the development of a solicitation. Its solicitations to offshore wind developers specify eligibility requirements, contract requirements, and evaluation criteria based on mandates of the public service commission and stakeholder input. Notable ecology-related contract requirements include commitments to fisheries compensation, participation in offshore wind technical working groups, support for regional monitoring of wildlife



Compendium Greater North Sea Deltares, 2023

and key commercial fisheries, site and environmental data transparency, membership in regional science organizations, and noise mitigation requirements and noise attenuation monitoring. NYSERDA evaluates its solicitations based on the following structure: 70% on offer price, 20% on economic benefits to the state, and 10% on viability (which incorporates a wide range of factors, including fisheries and environmental mitigation plans).

Maryland's progressive climate change and clean energy policies are an important driver of its offshore wind program. As a deregulated state, Maryland, like New York, awards Offshore Renewable Energy Credits through competitive bidding to offshore wind developers, which enables the state to purchase preferred clean energy resources and work directly with developers to advance large clean energy projects. Maryland's public service commission is required to consider a number of factors in the selection of offshore wind projects, including net environmental and health benefits to the state. Upon receipt of applications, the commission begins evidentiary proceedings that include opportunities for public comment and hearings that enable participation from applicants and from the public at large.

In the Netherlands

The Netherlands' approach to soliciting offshore wind energy bids is very different from that of the United States. In the Netherlands, the government sets offshore wind energy goals and runs a proactive tendering process that results in the issuance of a permit to a developer to build an offshore wind energy farm.

The Dutch government is currently operating under a roadmap for ambitious deployment of offshore wind—21 GW by 2030 and 70 GW by 2050. Before issuing a tender, the government performs all site investigations, including predesign environmental and geotechnical inspections. In addition, its national transmission system operator (TenneT) starts working on grid connection and determines the commission date for the platforms where wind turbines can be connected to the grid. The government also issues a consent (decision) outlining the location of the site and the conditions under which it may be constructed and operated, including ecological considerations. These government-led steps enable the tenderer to focus on the design of the wind farm. The government issues a draft tender and consults with developers before issuing the final criteria. The tender includes requirements relating to the technical and economic feasibility of the bid and the financial strength of the developer. The tender is transparent regarding the criteria that will be used for ranking the bids.

All bids must meet the requirements of the tender (and typically they do). To rank the bids, the government awards up to 60 points based on financial bids, and up to 400 points based on qualitative criteria. Qualitative criteria include various social and environmental criteria, such as prevention of bird collisions and nature reinforcement. Independent experts assess the non-financial criteria and advise the government on them, while the government reviews the financial criteria.

After the government has selected a winning bid, the bidder receives a permit to build and operate the windfarm. The permit includes conditions with which the bidder must comply. The bidder also has to meet certain strict financial requirements within four weeks, including providing a bank guarantee and reimbursing the costs of the government's site investigation.

2. What are the challenges to using the solicitation process to choose projects that provide ecological benefits and improvements?

There are several challenges to choosing projects through this process:

- Adding ecological benefits to the solicitation process can be convoluted compared with other ways to improve ecology and biodiversity.
- Doing so requires information to be shared about the baseline ecological conditions at the site to ensure a level playing field for all bidders
- There is a risk that bidders will submit opportunistic proposals that may not be realized given the uncertainty in the permit process.
- It may be difficult to assign scores to proposed solutions that do not have a proven, measured track record.
- There are potential litigation risks in shifting from assessing one objective criterion (price) with an indisputable outcome to assessing several, often more subjective criteria with a potentially contentious outcome.

PANEL HEADLINES

- Words, mandates (statutes, regulations, etc.), and processes (actors, actions, etc.) all matter.
- The Netherlands' tendering process was co-created by the government and industry in an effort to reduce the risks of development (i.e., reduce risks of litigation and investment loss).
- Transparency in the tender/solicitation award process is key to encouraging competition and innovation, and ultimately driving positive ecology goals.
- Early and routine stakeholder involvement in the development of solicitations and auctions can benefit the process in many ways, including reduction of litigation risks.
- In the United States, state legislatures often determine whether and to what extent non-price criteria can be included in any solicitation process, and few states mandate non-price criteria such as whether a project can provide ecological benefits.
- There are many benefits to including ecological criteria in offshore wind energy tenders. For example, it creates an early focus on achieving ecological benefits and encourages all the bidders to deliver a certain "market standard" minimum that conceivably could increase in quality over time.

PANEL RECOMMENDATIONS

- ✓ When changing any existing tendering process, or creating any new process, consider "co-creating" with the impacted industry to get buy-in and reduce the risk of litigation.
- ✓ Gather stakeholder input early in any solicitation process. For example, create and utilize technical working groups to inform the criteria for solicitations and issue draft solicitations for market/developer input.
- ✓ Require transparency in any tender/solicitation award process to encourage competition and innovation, and ultimately drive positive ecology goals.
- ✓ Develop guidance for site and environmental data sharing with any solicitation.
- ✓ Apply the lessons learned from prior solicitations to future solicitations.
- ✓ Any inclusion and evaluation of non-price criteria in a tendering process must also account for the impact on the cost of energy to the consumer.

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Regulatory Opportunities

Part 2: How Can NPI Be Advanced in Offshore Wind Projects? An Examination of Existing Restoration Analysis and Mitigation Models and Possible Applicability to NPI

Moderator:
Dr. Di Jin, senior scientist, Marine Policy Center, Woods Hole Oceanographic Institution

Speakers included:
Jason Kinnell, principal economist and president, Veritas Economics Consulting
Michelle Mattson, ecologist, compensatory mitigation subject matter expert, Institute for Water Resources, U.S. Army Corps of Engineers
Aisling O'Shea, in-lieu fee program administrator, Massachusetts Department of Fish and Game

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The panel addressed the following questions:

1. Are there aspects of existing analytic approaches or regulatory schemes that could improve the way we measure and track the success of NPI goals in offshore wind?

Two existing restoration analysis and mitigation frameworks could improve the way we measure and track NPI in offshore wind: Natural Resource Damage (NRD) assessments and compensatory mitigation.

NRD Assessments: An NRD assessment is a process utilized by certain government agencies to determine the appropriate type and amount of restoration needed to offset impacts to various ecological services (e.g., wildlife, habitats) or human use services (e.g., fishing trips, quality of camping trips) caused by the release into the environment of oil or another hazardous substance. This assessment is intended to quantify more than just the cost of cleaning up the release (damages), and also capture restoration benefits. The typical steps in an NRD assessment are:

1) injury determination (has a hazardous substance been released that can injure natural resources and/or affect ecological services?);
2) injury assessment (has the release injured natural resources and/or affected services?);
3) damage determination (how much have natural resources or services been affected?); and
4) restoration evaluation (what is the cost to restore, rehabilitate, replace, or acquire the equivalent lost resources and/or affected services?).

The main technique for measuring damages to ecological services and restoration benefits in the NRD assessment framework is resource equivalency analysis (REA), which uses discounted service acre years (DSAYs) as the measurement unit. REA focuses on individual species or a set of species and is measured in DSAYs to capture the fact that damages to and restoration benefits for various species occur at different points in time.

One restoration project in North Carolina is a good example of how an NRD assessment can provide valuable ecological service benefits. In 2014, a release of 39,000 tons of coal ash at the Dan River Steam Station in North Carolina contaminated the Dan River and the broader watershed. The damages assessment involved a review of the entire watershed and river, focusing on primary ecological impacts to benthic habitat, benthic organisms, fish, and freshwater mussels, and resulted in the identification of multiple restoration projects. There was no clear restoration project in the river for one endangered species, Roanoke log perch. However, an adjacent watershed—the Pegg River watershed—could be restored to provide not only general ecological benefits to the watershed but also targeted improvement to the Roanoke log perch by removing a dam and returning 70 miles of stream to its natural, free-flowing state. This particular project resulted in ecological gains not only in the Dan River watershed but also in the Pegg River watershed.

Compensatory Mitigation: Compensatory mitigation describes actions to offset unavoidable adverse impacts to various resources (after all possible avoidance and minimization have been achieved). The U.S. Army Corps applies compensatory mitigation under Section 404 of the Clean Water Act by issuing a permit. Such mitigation can take the form of restoration, enhancement, establishment, or preservation of an aquatic site. A final rule issued in 2008 by the U.S. Army Corps and the Environmental Protection Agency clarified requirements regarding compensatory mitigation, which established the framework for compensatory mitigation as it exists today.

Of note, the rule changed the requirements for the type and location of any mitigation project, focusing on a watershed approach that can account for habitat diversity,

Placing reef balls at Sabin Point in Riverside, Rhode Island.
© Timothy Mooney/TNC

connectivity, land use trends, and compatibility with adjacent sites, with some exceptions for marine resources. The rule also created a hierarchical preference for the types of mechanisms for providing compensatory mitigation (listed here in order of preference):

1) mitigation banks;
2) in-lieu fee programs;
3) permittee-responsible mitigation under a watershed approach;
4) onsite and/or in-kind permittee-responsible mitigation; and
5) offsite and/or out-of-kind permittee-responsible mitigation.

The first two mechanisms involve offsite compensation activities that are generally conducted by a third party (a mitigation bank sponsor or an in-lieu fee sponsor, respectively). The last three mechanisms leave the responsibility for ensuring that required compensation activities are completed with the permittees.

The Massachusetts In-Lieu Fee Program (ILFP) sponsored by the Massachusetts Department of Fish & Game (DFG) is a relatively new in-lieu fee program approved by the U.S. Army Corps in 2014. Under the ILFP, permittees are allowed to pay the DFG rather than mitigating onsite, and the DFG uses the payments to fund larger mitigation projects. In assessing the success of any project, the DFG is subject to both contract performance standards and ecological performance standards (i.e., species diversity and production). In determining cost per credit (restoration costs), the ILFP takes into account various multipliers and ratios to account for any uncertainties, the time lag to achieve restoration, and the ability of a project to achieve the goal of no net loss. Since the ILFP's inception, project impacts and restoration in Massachusetts have occurred mostly in coastal areas. Currently, the DFG has six coastal (tidal) restoration programs underway.

2. How can we implement aspects of the above-described analytic approaches and regulatory schemes in any new regulatory scheme for offshore wind?

There are challenges to implementing restoration and mitigation models in any new regulatory scheme for offshore wind, given that the ocean environment is much more dynamic and uncertain than terrestrial environments, and that the regulatory frameworks for approving offshore projects are much more complex than those for onshore developments. The panelists identified some concepts to consider in any implementation of these frameworks in the offshore wind context.

Single reef ball Sabin Point. © Heather Kinney/TNC

NRD Assessments: NRD assessments, particularly REA, provide a useful framework for evaluating potential ecological mitigation projects for offshore wind, given its species-specific focus. Concerns with offshore wind development are often focused on impacts to specific species, such as North Atlantic right whales. Other important components of NRD assessments for implementation in offshore wind include the fact that the measurement of potential impacts to species takes into account the timing of such impacts, and the fact that the optimal restoration location is not always the location where the damages occur and that the analysis can account for spatial and biodiversity differences between damages and restoration.

Compensatory Mitigation: The compensatory mitigation mechanisms utilized for mitigating aquatic resources could have useful application for offshore wind, particularly offsite/out-of-kind restoration. The framework's focus on a watershed approach to achieving no net loss is superior to focusing only on the damaged/impacted site.

SESSION 3 | PART 2

PANEL HEADLINES

- Implementing restoration and mitigation models in any new regulatory scheme for offshore wind will be challenging, given that the ocean environment is much more dynamic and uncertain than terrestrial environments, and the regulatory frameworks for approving offshore projects are much more complex than those for onshore developments.
- The NRD assessment framework, particularly the REA model, has promising application for offshore wind, given its focus on restoring at a species-specific level.
- Compensatory mitigation mechanisms also offer a promising avenue for achieving positive biodiversity goals in offshore wind development, particularly offsite/out-of-kind restoration.

PANEL RECOMMENDATIONS

- ✓ In any new regulatory scheme for offshore wind, consider implementing aspects of (1) the NRD assessment framework, such as the species-driven approach to selecting restoration projects and selection of restoration sites that account for spatial and biodiversity differences between damages and restoration; and (2) the offsite/out-of-kind compensatory mitigation model.
- ✓ With respect to any restoration or mitigation program developed for offshore wind projects, build a comprehensive and shareable database of the sites and raw data for better collaboration and data sharing.

Block Island Wind Farm. © Ayla Fox

Opportunities and Challenges

Application Opportunities and Challenges of NPI in Offshore Wind Industry: U.S. and Beyond. Company Perspectives

Moderator:
Maija Benitz, Ph.D., assistant professor of engineering, Roger Williams University

Speakers included:
Atma Khalsa, environmental affairs manager, Avangrid
Rick Robins, marine affairs manager, RWE
Paul Phifer, permitting and developing director, Attentive Energy
Anthony Dvarskas, biodiversity lead for offshore North America, Ørsted
Jennifer DuPont, strategic permitting manager, Equinor

The panel addressed the following questions:

1. What are the approaches to setting and meeting NPI goals in the offshore wind space

Many wind development companies have made strategic commitments to NPI goals. In the absence of government direction, corporate commitment to NPI goals at upper company levels and internal policies aimed at reaching these goals are crucial factors in the success of NPI goals. The ambitious NPI goals set by companies can spur innovation and the development of technologies and practices that are useful in achieving those goals. To implement these policies, companies have created internal standards for the development of offshore wind projects.

A key to meeting these internal standards is having robust baselines for understanding the current state of the environment so that companies can prove their NPI

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efforts were successful. Some companies have developed internal biodiversity accounting frameworks to quantify impacts to species. The frameworks are based on internally developed metrics and collection methods. They can be used to create biodiversity action plans. Developers have begun to require that all projects include such a plan. These plans identify species and habitats of concern; set measurable, achievable, and time-bound goals; define strategies and actions to achieve the goals; and monitor and review progress toward the goals. Many of these standards were developed in conjunction with ENGOs and other partners.

Some companies have developed their own NPI goals through collaboration with the scientific community, stakeholders, and ENGOs. Working together, the parties can begin to implement NPI goals and develop standards of practice and evaluation that are otherwise missing. These partnerships allow the industry to acknowledge and address the concerns of stakeholders, such as the commercial fishing industry. By addressing these concerns early, they can avoid potential harm from the outset.

2. What are the challenges to achieving these goals in the United States?

One of the primary challenges to achieving NPI goals for offshore wind in the United States is cost. Developing offshore wind energy is already costly compared with developing other energy sources. That cost includes following the mitigation hierarchy and possible planning for compensatory mitigation. The addition of NPI efforts would drive the cost even higher and could make it prohibitively expensive to achieve NPI goals. One solution is to offer credits to companies that invest in NPI to offset the cost of that investment.

The cost of achieving NPI goals is not limited to initial investment in projects. The continued monitoring of those efforts is also costly, and credits offered for those efforts would also incentivize industry action. In addition, to date, efforts to achieve NPI goals have largely been led by the offshore wind industry. The industry cannot shoulder the responsibility, or the cost, of achieving NPI on its own. NPI should occur through public–private collaboration.

The current policy framework for offshore wind leasing does not promote NPI, which has placed the onus on the industry to develop standards for NPI. These standards vary by company and are not always consistent. Without standardized regulatory language, companies will start to make up their own definitions and standards for NPI. Government policy and regulation can create an industry standard for NPI and how it is achieved and monitored. Private companies have no incentive to work with each other to achieve NPI as they are competing in the same market.

The current federal regulations that govern offshore wind energy development are over 50 years old and were originally designed to prevent pollution and unfettered growth. The offshore energy industry is changing, and the regulatory framework could change to incorporate and promote NPI rather than inhibit industry action. Regulatory frameworks can provide clear standards of review as well. There are existing models for reviewing NPI progress; however, they are often based on a single metric, such as habitat, rather than biodiversity.

Kelp forest. © fdastudillo/iStock

Even if a standard review model and definitions existed, collecting and sharing data across the industry would still be a challenge. Like most activities offshore, monitoring and collecting data costs time and money. Once a company collects data on NPI progress, it has no incentive to share the information with anyone outside the company. But data sharing is crucial to achieving NPI in a meaningful and far-reaching way.

3. How are offshore wind companies implementing NPI and achieving these goals in Europe and elsewhere?

Many offshore wind companies have committed to requiring that all new projects have goals for achieving NPI by certain dates. Most companies, including Ørsted and RWE, set goals to achieve by 2030. However, Equinor has set a goal that all projects that go to final investment after 2023 must have an NPI action plan. This requirement applies to the Empire Wind project currently under development off the coast of New York. In addition, RWE has committed to investing 50 billion Euros in gross across green energy development by 2030 and has committed to 50 gigawatts of green net capacity by the same year. In the U.K., TotalEnergies (the parent company of Attentive Energy) has set a goal of net gain impact on biodiversity for its offshore wind site known as Outer Dowsing.

In addition to setting future goals, many offshore wind companies are conducting mitigation efforts around the world. Avangrid has completed several projects aimed at mitigating harm caused by offshore wind development and even improving biodiversity. These include artificial reefs in Japan, aquaculture operations around wind farms, and kittiwake nesting structures to benefit seabird populations. Ørsted has been experimenting with artificial reef projects at wind farms by installing cod pipes near the base of turbines. These concrete pipes provide habitat and feeding areas for cod, and their placement at the turbines makes it easy to monitor this species of concern. Ørsted is also experimenting with a concept called ReCoral, off the coast of Taiwan. This program incubates coral larvae in a laboratory, then places the larvae on cages affixed to the base of wind turbines. The project is a proof-of-concept, but it may expand to other project sites.

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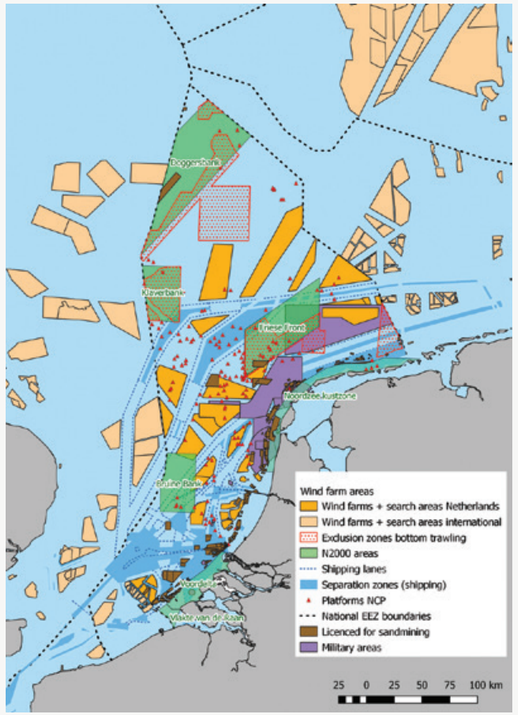
PANEL HEADLINES

- To measure the success of NPI in offshore wind, we need robust baselines.
- To establish the baselines, we need advanced monitoring.
- Internal biodiversity accounting frameworks are required for the industry to quantify impacts to threatened and endangered species, ecosystems, and habitats.
- One of the main challenges in implementing NPI in offshore wind is the cost of development and monitoring.
- Developers need a way to offset the cost of implementing NPI.
- There is no set industry standard defining NPI or how to measure success.
- There is a great deal of inconsistency within the industry in terms of models of review and metrics.
- Without consistent standards, companies may make up their own standards and no actual progress will be made.
- Currently, no regulatory drivers exist in the United States for NPI. Corporate ambition is the primary driver for NPI. Private–public partnerships are a better route to achieving NPI.

PANEL RECOMMENDATIONS

- ✓ Government regulations that promote NPI are needed. Bidding credits that reward NPI would go a long way to reducing the cost for developers.
- ✓ Industry standards need to be established so that all have a clear understanding of what NPI is and how it may be achieved.
- ✓ Regulatory baselines must be established to provide developers with a starting point from which to measure success or shortfalls.
- ✓ State Requests for Proposals should elevate NPI.
- ✓ Regulators should incorporate nature-inclusive design into the permitting process. They should provide clear guidance and incentivize nature-inclusive designs (materials, opportunities to reduce risk, rules for decommissioning).
- ✓ The industry and regulators should utilize host community agreements as a local linkage between biodiversity and coastal resilience. This can be a win-win for the host community (e.g., co-locating sewer improvement lines with export cables).
- ✓ Data sharing across the industry must happen. It could take place through public–private partnerships or regulatory requirements.



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Key Challenges

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Achieving net positive impact (NPI) in offshore wind development poses several challenges.

Science and Data:

Verifying that NPI strategies have been successful over the long-term will be difficult. We need good baseline data so that we know what is in the marine environment and can compare it after offshore wind is developed. We also need to develop standardized best practices for monitoring protocols, ensure access to shared data portals, provide transparent and timely sharing of data and lessons learned, and agree on research needs and priorities. Assessing incremental impacts on biodiversity is not as straightforward for wildlife as for flora. Right now, we only assess species that are listed as endangered or threatened. Non-listed species could be impacted as well, but are not being studied. If industry partners voluntarily express interest in non-listed species, it could help regulators value them more.

Consensus on How to Measure and Demonstrate Success:

We need to agree on definitions of the terms marine net gain, net positive impact on biodiversity, and nature positive, as well as the frameworks that will be used to measure success. (For example, we cannot have one offshore wind company identifying killer whales as the priority species and another company identifying dolphins as the priority species without consideration of species-level and ecosystem-level impacts.)

Stakeholder and Community Support:

Siting decisions for offshore wind projects do not exclusively consider environmental impacts. These decisions also try to avoid conflicts with other ocean uses (especially commercial fisheries) and government priorities. Community acceptance regarding project location may be more of a driver than science when it comes to choosing the least impactful and most ecologically beneficial project location or design. There are better areas with less conflict, but finding these spaces requires going to federal and state partners early so that we also know how endangered and non-listed species use these spaces (e.g., Gulf of Maine).

Technology, Innovation and Infrastructure:

Because we have a limited understanding of the impacts of offshore wind development and operation on biodiversity and because the marine environment is a dynamic one, we may need to experiment and to experience some failures as we learn. Permitting costs and uncertainty limit innovation rather than incentivizing it. We need to have early conversations with regulators and resource managers to address what approaches are effective, what is working, and what is concerning.

Climate Change:

Climate change is altering the marine environment in real time. Habitats and the successful use of habitat by species are shifting. This means that what might be important habitat for foraging or shelter today may not support these same species ten years from now, and how certain species use a particular area in the ocean will also likely change.

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Technology and Innovation

Moderator:
Chris McGuire, director of Massachusetts' Ocean Program, The Nature Conservancy

Speakers included:
Sharon Tatman, expert advisor and research coordinator, North Sea, Deltares
Annie Murphy, senior scientist, INSPIRE Environmental
Heather Kinney, coastal restoration scientist, The Nature Conservancy
Jamie Lescinski, business development director for US Offshore Wind, Boskalis
Adam Baske, vice president of coastal markets and restoration, Running Tide
Emily Shumchenia, director, Regional Wildlife Science Collaborative for Offshore Wind (RWSC)

The panel addressed the following questions:

1. What are the opportunities to improve habitat and ecosystem functions through offshore wind design and material selection?

There is a lot of interest in the North Sea, especially on the Dutch side, to resolve and explore issues with geographical space limitations (multi-use), ecological space (poor ecosystem health), and mitigation of impacts. The EU sets strict legislation for member states to mitigate impacts related to offshore wind construction. Recent tender decisions used ecological factors as deciding factors, which demonstrates a desire to drive innovation to improve the environment.

In the North Sea, several opportunities are being considered for nature-inclusive designs at wind farms. These include mitigating the effects of pile driving, including adding scour protection that is more eco-friendly and attractive to wildlife; building reefs around the pilings; and reducing the electromagnetic

fields around cables. By working to eliminate problems at the building stage, projects can avoid creating some negative impacts. In addition, because monopiles have holes in them for corrosion purposes, the monopiles themselves may provide habitat. Some research indicates that animals use these holes, and additional research is ongoing to learn why they are attracted to these spaces. During offshore wind farm development, it is important to consider what species and habitat can and should be enhanced, and to address all species and habitat.

The introduction of novel structures to the offshore environment, such as wind turbines, causes ecological shifts at multiple levels. These can include changes in species distribution, including benthic species colonizing the structure; changes in community structure and diversity; facilitation of poleward expansion of species; and a new opportunity for colonization by non-indigenous species. The different species distribution also changes the distribution of energy and carbon in the area. It is important to consider the changes in ecosystem function overall, not just the changes in biodiversity. For example, a shift that delivers organic carbon to a spot where it remains for a long time may help to mitigate climate change and achieve NPI.

A reef ball deployment project in Rhode Island provides an example of how to build habitat and measure attraction value, diversity, and abundance in near-shore environments. Adding value to these environments may be a good NPI strategy for offshore wind development. The first artificial reef with reef balls was piloted in the Providence River in 2019. It included 64 cement reef balls placed about 120 feet from a fishing pier, in an area measuring about 200 ft x 200 ft. The project was designed to examine how artificial reef balls can be used to enhance habitat in estuaries and to support community recreational fishing. The site was monitored before and after construction, and continues to be monitored through dive surveys using a modified kelp ecosystem ecology network approach, which is a standardized monitoring approach used around the world. Since 2019, there has been an increase in fish biomass and colonization of shellfish at the site. The project can serve as a model for future artificial reef structures.

Sensors can also be a good tool for monitoring ocean health. More automation in monitoring could improve overall monitoring efforts.

2. What data and monitoring are needed to demonstrate gains or improved function?

There are a lot of unknowns related to offshore wind development. Developing metrics for success for nature-inclusive design will be critical for overall success. Many ideas for nature inclusion are at the pilot stage and are being explored in only one or two projects. It will be important to develop metrics for these examples to scale up their use in larger projects.

The Growth through Research, development & demonstration in Offshore Wind (GROW) initiative researched and wrote Roadmap for Technological Advancements for Symbiosis-Inclusive Design in Offshore Wind, a resource that may be useful in designing future offshore wind projects. GROW worked with several research institutes (Deltares, MARIN, and TNO), and industrial parties (Van Oord, Boskalis, Seaway7, TenneT, Shell, and RWE) to investigate the available options for co-use in offshore wind farms. The research is based on stakeholder interviews, interactions with regulatory bodies, workshops, and case studies. The initiative paid special attention to the potential risks of symbiotic design, interfaces between various functions, and opportunities for technological advancements in order to draft a roadmap for symbiosis-inclusive design of offshore wind farms.

Monitoring of NPI in offshore wind projects must be hypothesis-driven. A project can aim for NPI, but what is the specific goal? What is being targeted? What is the expected outcome (the hypothesis)? We can use these questions to design monitoring to test the hypothesis and answer whether the goal was accomplished, the target met, and the hypothesis supported by the data. Many developers are already using this approach. In addition, monitoring should occur throughout the life cycle of a project, not just during one part.

Some of the same maritime equipment and tools used for offshore energy development can be used for increasing NPI. These include offshore substations, foundations, floating wind farms, installation frames, and seabed preparation. There are opportunities at every stage of development to install nature-inclusive elements. These elements should be planned from the beginning so their cost can be included in contracts.

Block Island Wind Farm. © Ayla Fox
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Quantifying impacts to the environment can be complex. Various technologies, such as sensors and eDNA, can assist with quantification and overall monitoring of ecosystem health. Companies like Running Tide collect data from a variety of sources, analyze it, verify it, and share the information showing quantified ecosystem services with end-users through customer data portals and websites.

It is important to use the same data sets to monitor changes in ocean health. The NROC and Mid-Atlantic Regional Ocean Council (MARCO) both facilitate data and information exchange through the Northeast Ocean Data and Mid-Atlantic Ocean Data Portals. The Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS) and Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS) are also critical institutions that gather data.

The Regional Wildlife Science Collaborative for Offshore Wind (RWSC) was cooperatively established and is led by four sectors—federal agencies, states, ENGOs, and the offshore wind industry. It supports research and monitoring of wildlife in the offshore wind context. The Collaborative developed an Integrated Science Plan for Wildlife, Habitat, and Offshore Wind Energy in the U.S. Atlantic that reflects the research and data collection needs of the four Sectors with input from the science community; coordinating and aligning funding to meet those priorities, and; ensuring appropriate data and standards are in place to support science priorities. RWSC restated the need for automated and real-time data for best monitoring. RWSC also has the ability to receive and distribute funds for NPI projects

Boskalis assesses its portfolio against each of the United Nations Sustainable Development Goals over the course of a year by looking at every single project. Its restoration projects are a collaboration with partners, which adds intrinsic value to the long-term monitoring, learning, and publication of the projects. Boskalis wants to know what is happening to the projects once construction is completed so that it can evolve its approaches and assist with NPI as well. Partnerships between construction companies and developers can lead to great successes. There is a great deal of downtime between phases of operation. This means that vessels are sitting idle, either on site or in port. While the vessels and equipment are idle, companies lose money. Companies must pay berthing fees while they are in port, as well as covering salaries, fuel, and other costs. If they can utilize vessels for other projects, when they would otherwise sit idle, they may be able to cut costs. For example, the primary purpose of some equipment is to install and maintain offshore wind farms, but it can be used to install nature-inclusive and restoration elements as well. The key to doing this is contracting to add these elements at the same time that a company is contracting to develop wind turbines.

Digital twin developments may also be a pivotal tool in the next few years. A digital twin is a 3D model created for an offshore development. The model can be used for safety planning, biodiversity impacts, social impact assessments, and more.

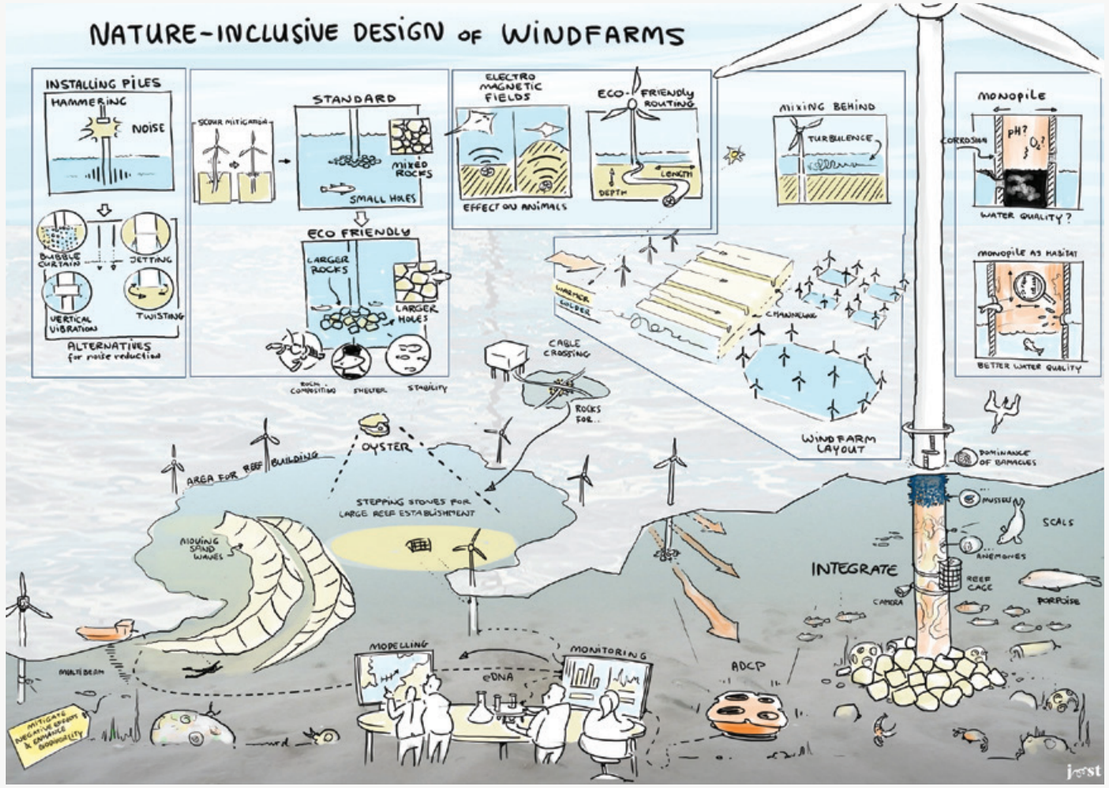
3. Other challenges and limitations (cost, time, regulations, etc.)?

The technology for monitoring and supporting innovation exists, and it is not directly hindered from contributing to the development of nature-inclusive design or to NPI. The hindrances are unclear legislation for permitting and decommissioning, the lack of a traditional business case, a complex field of stakeholders and conflicting interests, no standardization in monitoring, and a lack of proven concepts and track records.

The panel identified several technology and innovation challenges: the terminology used from sector-to-sector and country-to-country is not always the same, though the concepts may be the same; it is necessary to include all the costs for nature inclusion at the start of a project; and the corporate approach for assessing overall sustainability varies. Some companies look at NPI project-by-project, and others as part of their overall portfolio. Another challenge is the cost of equipment needed to operate in the marine environment. Mobilizing, running, and demobilizing equipment is extraordinarily expensive.

PANEL HEADLINES

- Partnerships between governments, indigenous communities, developers, academia, ENGOs, commercial and recreational fishing communities, marine contracts, and all stakeholders in the planning, developing, and monitoring of these areas will lead to more success.
- The technology to monitor wind farms properly exists, and there are multiple options for monitoring environments.
- Project-by-project approach will not allow us to scale up for effective advancement and standardization of technologies; we need a system-based approach.
- Sharing data is crucial to success. Many organizations are already collecting data



Block Island Wind Farm. © Ayla Fox

The Nature Conservancy

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