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BOEM 2021-032

Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States

US Department of the Interior
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Bureau of Ocean Energy Management
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DISCLAIMER

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ABOUT THE COVER

Cover photo by Justin J. Bedard.

On June 26, 2020, installation was completed on the first wind turbines installed in U.S. Federal waters. The offshore wind project went into full operation in autumn, 2020.

The Coastal Virginia Offshore Wind pilot project is designed to demonstrate a grid-connected, 12-megawatt (MW) offshore wind test facility (two 6 MW wind turbines) on the Outer Continental Shelf about 27 miles off the coast of Virginia Beach. The site is leased by the Commonwealth of Virginia's Department of Mines Minerals and Energy. Dominion Energy was designated as the lease operator, Ørsted Energy constructed the offshore wind energy generation facilities, and L.E. Myers Company designed and constructed the onshore electrical facilities.

Justin Bedard of the Bureau of Ocean Energy Management took the photo while participating in a U.S. Coast Guard drill conducting a mock rescue of an injured maintenance worker stranded on top of the wind turbine's nacelle. The U.S. Coast Guard helicopters and water vessels seen in the photo were part of the drill.

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List of Abbreviations and Acronyms

AOL	aviation obstruction lighting
BLM	Bureau of Land Management
BMP	Best Management Practice
BOEM	Bureau of Ocean Energy Management
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
COP	Construction and Operations Plan
DOI	U.S. Department of the Interior
DTT	Department of Trade and Industry
EIS	Environmental Impact Statement
EPAct	Energy Policy Act of 2005
ft	foot (feet)
GIS	Geographic Information System
GLVIA3	*Guidelines for Landscape and Visual Impact Assessment*, 3rd edition
IEAA	Institute of Environmental Management & Assessment
in.	inch(es)
km	kilometer(s)
KOP	key observation point
LCA	landscape character area
LI	Landscape Institute
LORs	laws, ordinances, and regulations
m	meter(s)
mi	mile(s)
MNL	marine navigational lighting
MW	megawatt(s)
MWh	megawatt-hour(s)
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
nm	nautical mile(s)
NPS	National Park Service
NHRP	National Register of Historic Places
OCA	Ocean Character Area
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
PDE	Project Design Envelope
RFPA	Reasonably Foreseeable Planned Action
SCA	seascape character area
SLIA	Seascape/Landscape Impact Assessment
SLVIA	Seascape/Landscape and Visual Impact Assessment
USFS	U.S. Forest Service
VIA	Visual Impact Assessment
ZTV	Zone of Theoretical Visibility

Executive Summary

As the United States begins large-scale deployment of offshore wind energy facilities, an important challenge for developers and regulators is the assessment of potential seascape, landscape, and visual impacts on important coastal scenic, historic, and recreational resources; Native American tribal properties and treasured seascapes; commercial interests dependent on tourism; and the private property of coastal residents. This document describes the methodology for seascape, landscape, and visual impact assessment (SLVIA) that the U.S. Department of the Interior (DOI) Bureau of Ocean Energy Management (BOEM) uses to identify the potential impacts of offshore wind energy developments in Federal waters on the Outer Continental Shelf (OCS) of the United States. This methodology document describes what is considered in the SLVIAs submitted by offshore wind project developers to BOEM and how decisions about expected impacts of offshore wind developments are made. This SLVIA methodology applies to any offshore wind energy development proposed for the OCS and considered by BOEM, as directed by the Energy Policy Act of 2005 and in compliance with the Outer Continental Shelf Lands Act and the National Environmental Policy Act of 1969 (NEPA).

The SLVIA has two parts: seascape and landscape impact assessment (SLIA) and visual impact assessment (VIA). SLIA analyzes and evaluates impacts on both the physical elements and features that make up a landscape or seascape and the aesthetic, perceptual, and experiential aspects of the landscape or seascape that make it distinctive. These impacts affect the “feel,” “character,” or “sense of place” of an area of landscape or seascape, rather than the composition of a view from a particular place. In SLIA, the impact receptors (the entities that are potentially affected by the proposed project) are the seascape/landscape itself and its components, both its physical features and its distinctive character.

Visual impact assessment (VIA) analyzes and evaluates the impacts on people of adding the proposed development to views from selected viewpoints. VIA evaluates the change to the composition of the view itself and assesses how the people who are likely to be at that viewpoint may be affected by the change to the view. Enjoyment of a particular view is dependent on the viewer, and in VIA, the impact receptors are people. The inclusion of both SLIA and VIA in the BOEM SLVIA methodology is consistent with NEPA’s objective of providing Americans with aesthetically and culturally pleasing surroundings and its requirement to consider all potentially significant impacts of development.

The BOEM SLVIA methodology is modeled on the methodology in use in the United Kingdom. It considers SLIA and VIA as two closely related but separate impact assessments: Both use similar impact assessment processes, and the majority of potential impacts for both the SLIA and the VIA are associated with the visibility of the offshore and onshore wind project components. However, the SLIA impact receptors and types of potential impacts differ from those in the VIA, leading to different conclusions about the ultimate effects of the project on seascape/landscape (assessed in SLIA) and on people (assessed in VIA).

The SLVIA process includes six major phases:

1. The proponent provides the construction and operation plan (COP) that describes the project in detail, any alternatives under consideration, and the project design envelope (PDE), if the PDE approach is being used. Best management practices (BMPs) for mitigating the seascape, landscape, and visual impacts of the project that are incorporated into the project design and included in the COP are assumed to be implemented for purposes of the SLVIA.

2. The geographic scopes of the SLIA and the VIA—that is, the areas within which impacts will be assessed—are identified.

3. Descriptions of impact receptors and existing conditions for use in the SLIA and the VIA are prepared:

    a. For the SLIA, this step includes describing the seascape/landscape character and the contributing elements of the potentially affected seascape/landscape character areas (SCAs/LCAs).

    b. For the VIA, this step includes describing the important views, the potentially affected viewers, the viewpoints where the viewers are located, and the existing conditions at and around the viewpoints.

    c. Applicable laws, ordinances, and regulations (LORs) are also reviewed for applicability to the SLIA and VIA.

4. The potential impacts of all phases of the proposed project and alternatives, including the PDE (if applicable), are identified and described, and the impact levels determined. Potential seascape and landscape impacts are identified separately from visual impacts. The assessment of visual impacts is based, in part, on the use of visual simulations of the proposed project and alternatives, and simulations may also be used for assessment of seascape and landscape impacts. After the nature and extent of the impacts have been identified, the levels of the potential impacts are determined. This requires combining judgments about the sensitivity of the seascape/landscape and visual impact receptors and the magnitude of the impacts, and then combining the sensitivity and magnitude judgments to determine the overall level of the impacts. Although the evaluation of impact level is ultimately a professional judgment, as are the evaluations of the individual criteria, the method by which the evaluation is made is systematic, based on accepted criteria, and clearly documented.

5. Assessment of impacts from reasonably foreseeable planned actions for both seascape/landscape and visual resources are conducted. After the nature and extent of these impacts have been identified, the impact levels are evaluated.

6. Additional recommended mitigation measures beyond those included in the COP may be identified. These could include mitigation required by BOEM as a condition for approval of the project or other mitigation actions agreed to by the developer.

The project proponent engages and involves stakeholders throughout the SLVIA process. Stakeholders are consulted early in the project design process for the following input:

- Provide information about their concerns and sensitivity to seascape, landscape, and visual impacts;
- Identify visually and culturally important areas and identify potential key observation points (KOPs);
- Evaluate potential project designs;
- Review the impact analysis and simulations; and
- Suggest and evaluate mitigation measures.

BOEM will engage stakeholders as part of the public involvement process required by NEPA.

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1 Introduction

This document describes the methodology for seascape, landscape, and visual impact assessment (SLVIA) that the U.S. Department of the Interior (DOI) Bureau of Ocean Energy Management (BOEM) uses to identify the potential impacts of proposed offshore wind energy developments in Federal waters on the Outer Continental Shelf (OCS) of the United States.

1.1 Need and Purpose for Document

Wind turbines have been installed offshore in a number of countries to harness the energy of the wind moving over the oceans and convert it to electricity. The potential seascape, landscape, and visual impacts of offshore wind energy development on coastal lands and waters have emerged as concerns in the development of offshore wind facilities in the United States and elsewhere. As the United States begins large-scale deployment of offshore wind energy facilities, an important challenge for developers and regulators is to minimize potential seascape, landscape, and visual impacts on important coastal scenic, historic, and recreational resources; Native American tribal resources and treasured seascapes; commercial interests dependent on tourism; and the private property of coastal residents. This document provides a methodology for assessing the potential seascape, landscape, and visual impacts of proposed offshore wind energy developments situated in Federal waters on the OCS that is consistent with the requirements of the National Environmental Policy Act of 1969 as amended (NEPA).

1.2 Context: Legislative and Policy Direction

In 2009, the DOI announced the final regulations for the OCS Renewable Energy Program, which was authorized by the Energy Policy Act of 2005 (EPAct). These regulations provide a framework for issuing leases, easements, and rights-of-way for OCS activities that support production and transmission of energy from sources other than oil and natural gas. BOEM is responsible for overseeing offshore renewable energy development in Federal waters. The authority derives from amendments to subsection 8 of the Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1337), as set forth in section 388(a) of the EPAct. The Secretary of the Interior delegated to BOEM the authority to regulate activities under section 388(a) of the EPAct. Since the regulations were enacted, BOEM has worked diligently to oversee responsible renewable energy development in an environmentally sound manner.

1.3 SLVIA and the Project Planning and Approval Process

Title 30 of the *Code of Federal Regulations* (CFR) Part 585, Subpart F, Plans and Information Requirements, provides guidance on survey requirements, project-specific information, and information to meet the requirements of OCSLA, NEPA, and other applicable laws and regulations. It specifies the various plans that must be submitted and related activities that must be undertaken to obtain approval from BOEM to develop and operate an offshore wind facility on a lease or grant on the OCS. It also specifies that in order to comply with NEPA and other relevant laws, the construction and operation plan (COP) for a proposed development must include a detailed description of those resources, conditions, and related activities that could be affected by the proposed project and related activities, including visual resources and various social and economic resources that would be addressed in an SLVIA.

Subpart F also states that after determining whether the submitted COP is complete and sufficient to conduct BOEM's technical and environmental reviews and notifying the developer when the submitted

COP lacks any necessary information, BOEM prepares an appropriate NEPA analysis. Upon completion of BOEM's technical and environmental reviews and other reviews required by Federal law, BOEM may approve the COP, disapprove it, or approve it with modifications.

In order for BOEM to consider a COP complete and sufficient pursuant to 30 CFR 585, the developer must submit a SLVIA with its COP. BOEM then independently analyzes the submitted SLVIA as part of its NEPA review. The NEPA review serves as a partial basis for BOEM's decision to approve, deny, or request modifications to the COP.

1.4 Document Scope

This document provides a method for assessing the potential seascape, landscape, and visual impacts for proposed utility-scale offshore wind energy developments on the OCS approved by BOEM. It discusses BOEM's approach for determining the scope of the assessment; defines seascape, landscape, and visual impacts; identifies which impacts are included in the assessment; and identifies how impacts are assessed and described and how the nature, magnitude, and impact level of potential impacts are determined. It also presents the rationale and scientific basis for the impact assessment approach proposed.

1.5 Intended Use and Users

This document provides the methodology to be used for assessing the potential seascape, landscape, and visual impacts of proposed offshore wind energy developments on the OCS under BOEM's authority. It is intended primarily for use by landscape professionals who are preparing a SLVIA for a wind energy development evaluated by BOEM, by BOEM staff reviewing the SLVIA for offshore wind developments, and by other project stakeholders who are interested in how impacts are assessed by BOEM. Its use will help ensure that a consistent, defensible, and documented approach to the assessment of seascape, landscape, and visual impacts of offshore wind projects is employed by the various offshore wind project proponents and by BOEM. The methodology is specific to offshore wind energy developments under BOEM's approval authority but may be useful for other purposes and readers.

Note that while the information gathered to conduct the SLVIA and parts of the SLVIA itself may be useful to the process of cultural resource impact analysis conducted for offshore wind projects under NEPA, the SLVIA is not a substitute for, nor does it assess the same type of impacts as, a cultural resource impact assessment (see Section 2.2, and Sullivan, Meyer, and O'Rourke 2018).

1.6 Organization of this Document

The remainder of this document is divided into nine sections. Chapter 2, Impact Assessment Methodology Principles and Goals, discusses key principles and goals of the SLVIA methodology. Chapter 3, Impact Assessment Process Overview, provides brief descriptions of the various steps in the SLVIA process. Chapter 4, Project and Alternatives Description, provides details of the purpose, nature, and content of the project description and alternatives. Chapter 5, Determination of Geographic Scope of Potential Impacts, describes how the geographic scopes of the two impact assessments (seascape/landscape and visual) are determined. Chapter 6, Seascape and Landscape Impact Assessment, describes the seascape and landscape impact assessment (SLIA) process in detail. Chapter 7, Visual Impact Assessment, describes the visual impact assessment (VIA) process in detail. Chapter 8, Assessing Effects of Reasonably Foreseeable Actions (RFPA), describes the RFPA impact assessment process for both seascape/landscape impacts and visual impacts. Chapter 9, References, lists cited references. Chapter 10, Glossary, provides definitions of technical terms.

Two appendices provide supplementary material. Appendix A, Viewshed Analysis, specifies the protocol for viewshed analyses conducted for the SLVIA. Appendix B, Mitigation of Seascape/Landscape and Visual Impacts from Offshore Wind Facilities, describes best management practices (BMPs) for mitigating seascape, landscape, and visual impacts from both the offshore and onshore components of offshore wind energy projects.

2 Impact Assessment Methodology Principles and Goals

This chapter defines and discusses key terms and principles generally related to the assessment of seascape, landscape, and visual impacts as well as key goals and issues specifically related to the SLVIA methodology presented in this document.

2.1 Introduction

The methodology for the BOEM SLVIA process is modeled on the SLVIA methodology used for offshore wind developments in the United Kingdom, as described in the Landscape Institute and Institute of Environmental Management & Assessment’s *Guidelines for Landscape and Visual Impact Assessment,* third edition (GLVIA3) (LI and IEMA 2013). For many readers, including many VIA professionals practicing in the United States, SLIA is an unfamiliar term and concept, primarily because most environmental impact assessments in the United States contain only VIAs, which are different from, but closely related to, SLIAs. This chapter defines seascape and landscape impacts and visual impacts, explains the differences between them, describes at a summary level how a SLIA differs from a VIA, and explains why both types of impact assessment are appropriate to incorporate into the SLVIA methodology BOEM uses for offshore wind developments on the OCS.

This chapter also examines key goals and principles specific to the BOEM SLVIA methodology. These can be thought of as the specifications for developing the methodology, such as the types and magnitudes of impacts and impact receptors assessed, the need for flexibility in assessing impacts that may change as the design of the proposed facility evolves, and the need to include the public and other potentially affected stakeholders in the SLVIA process.

2.2 What Is SLVIA?

As defined by GLVIA3 (LI and IEMA 2013), SLVIA is an impact assessment tool for identifying and evaluating the likely significance of the effects of change resulting from development on both seascapes and landscapes as environmental resources in their own right, and on the people who experience particular views that they value (see **Figure 2.2-1**). With respect to the BOEM SLVIA methodology, landscape and seascape are defined as follows:

- *Landscape* is an “area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors” (LI and IEMA 2013).
- *Seascape* is “a discrete area within which there is shared inter-visibility between land and sea. Every seascape therefore has three defined components:
  - An area of sea (the seaward component);
  - A length of coastline (the coastline component); and
  - An area of land (the landward component).” (DTI 2005).

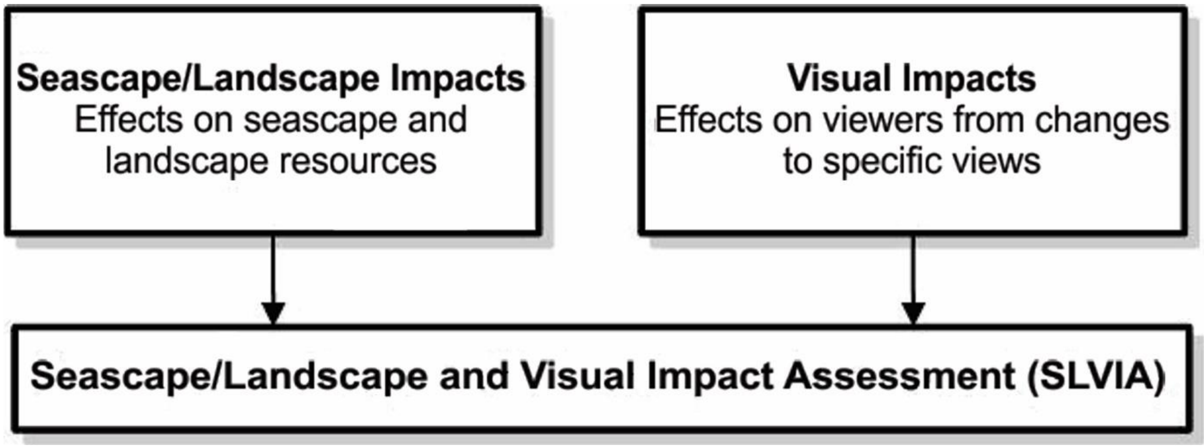

Figure 2.2-1. Both seascape/landscape impacts and visual impacts are assessed in SLVIA.

For the purposes of the BOEM SLVIA methodology, seascape and landscape as "resources in their own right" refers primarily to *seascape and landscape character*. As noted in GLVIA3 (LI and IEMA 2013), “landscape results from the interplay of the physical, natural and cultural components of our surroundings. Different combinations of these elements and their spatial distribution create the distinctive character of landscapes in different places, allowing different landscapes to be mapped, analyzed and described. Character is not just about the physical elements and features that make up a landscape, but also embraces the aesthetic, perceptual and experiential aspects of the landscape that make different places distinctive.” Assessing seascape and landscape impacts thus means assessing impacts on seascape and landscape character, including the following:

1. The physical elements and features that make up a landscape or seascape area; and
2. The aesthetic, perceptual, and experiential aspects of the landscape or seascape area that make it distinctive.

The inclusion of “aesthetic, perceptual, and experiential aspects” in the impact analysis implies more than simply assessing the effects of development on a view from a particular place or places. “Aesthetic, perceptual, and experiential aspects” are clearly not limited to visual experience. They could include other sense modalities, such as sound, smell, or touch, but they also involve how people think about (perceive) and experience a seascape or landscape, which includes the meaning that humans assign to the seascape/landscape, such as historic or cultural associations, wilderness values, tranquility, or what is often referred to as “sense of place.” Because of offshore wind developments’ distance from shore, sounds and smells are not likely to be affected. However, note that while much of an area’s character is identifiable to people based on its visual qualities, the perceptual and experiential aspects of landscapes and seascapes are clearly not limited exclusively to their visual qualities.

VIA in the BOEM SLVIA methodology assesses the impacts of a proposed offshore wind development on people who would see the project from particular viewpoints. VIA evaluates how the addition of the visible elements of the proposed project to the view (or the associated removal or change to existing visual elements) would change the composition of the views, and how those changes would affect people’s experience of the view.

The SLVIA is not a substitute for a cultural resource impact assessment conducted for offshore wind projects under NEPA or historic property visual effects assessment under the National Historic Preservation Act (NHPA). Section 106 of NHPA requires Federal agencies to consider the effects, including visual effects, of their undertakings on the ability of historic properties to convey their historic significance. Visual impacts of Federal agency actions must also be considered under NEPA for their potential to affect cultural resources, scenic resources present in the landscape, and the scenic experiences of people who view the landscape. There are important differences between the VIA under Section 106 and the SLVIA under NEPA. In essence, the VIA under Section 106 looks at impacts on properties, while a NEPA SLVIA includes impacts on the people at those places and on the larger and broader environment within which historic properties exist. The SLVIA does not assess effects on the integrity of historic properties listed or eligible for listing on the National Register of Historic Places (NRHP), or their ability to convey their historical significance. Where there are potential visual impacts on both scenic values and historic properties, VIAs under both NEPA and Section 106 must be conducted (Sullivan, Meyer, and O'Rourke 2018).

2.3 Relationship of SLIA to VIA

In the United States, in many cases, environmental reviews conducted under NEPA (typically environmental impact statements, or EISs) do not formally include the SLIA; that is, they do not consider the effects of change resulting from development on seascapes and landscapes separately from the effects on viewers. However, seascapes and landscapes are clearly resources with values other than the scenic quality of views to and from them. In the United States, EISs are typically limited to the VIA, that is, effects of development on people's experience of particular views. Elements of a SLIA are sometimes incorporated into a VIA, but not formally or completely (Sullivan, Meyer, and O'Rourke 2018). However, consideration of all potentially significant impacts is required by NEPA and discussed in case law (NHCRP 2013, 14–15). In the BOEM SLVIA methodology, SLIA is a formal process performed separately from the VIA in order to more completely assess the impacts of the proposed development. Together, SLIA and VIA form the SLVIA.

It is very important to understand the difference between SLIA and VIA and why both types of assessments are appropriate to include in the BOEM SLVIA methodology. As noted above, SLIAs assess impacts on the *physical elements and features* that make up a landscape or seascape and the aesthetic, perceptual, and experiential aspects of that landscape or seascape that make it distinctive. These impacts affect the "feel," "character," or "sense of place" of an area of landscape or seascape, rather than the composition of a view from a particular place. Landscape and seascape effects, in essence, are a measure of the degree of compatibility of the character of the development, which might be, for example, "industrial," with the character of the landscape or seascape it is in or is visible from, say, "wilderness" or "tranquil." The impact receptor is the potentially affected landscape or seascape.

In contrast, VIAs assess impacts on *viewers* caused by adding the proposed development to views from selected viewpoints, as seen by particular people. Examples include a view of the development from a residential area where it will be seen by residents, a view from a popular beach where it will be seen by people engaged in recreational activities, or a view from the battlements of a historic fort where it will be seen by heritage tourists. VIAs analyze the change to the view itself caused by the addition of the development. It also analyzes how the change will affect the visual experience of people who are likely to be at the viewpoint, and how they are likely to respond to the change. The effect of seeing the facility on viewer experience depends in part on what the viewers are doing when viewing the facility, and their response depends in part on who they are and how much they value the view. Enjoyment of a particular view is dependent on the viewers, and in VIA, the impact receptors are people, not the landscape or seascape.

It is important that the BOEM SLVIA include both SLIA and VIA. Seascape and landscape character is only partly visual in nature, but visibility of an offshore wind development could significantly affect this fundamental and sometimes highly valued quality of landscapes and seascapes that contributes to character. VIA is limited to assessing the likely effects of the proposed project on the qualities of the visual experience of valued views, and it is not capable of fully capturing impacts on seascape and landscape character. SLIA is the appropriate tool for assessing impacts on the seascape and landscape themselves, and the aesthetic, perceptual and experiential aspects of seascapes and landscapes that contribute to their distinctive character. However, stakeholders often are also very concerned about changes to valued views, for example, the view from their home or a favorite scenic overlook in a National Park. They may be personally affected by changes to a particular view. SLIA does not assess the effects on viewers of the changes in views from particular viewpoints. VIA is the appropriate tool for assessing impacts on people's enjoyment of views. Therefore, both SLIA and VIA are needed to fully assess the impacts of visibility of an offshore wind development.

2.4 Goals and Requirements of the SLVIA Methodology

The following major goals were considered in the design and development of the BOEM SLVIA methodology:

1. *The methodology must be consistent with the requirements of NEPA.* A stated purpose of NEPA is to "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings" (NEPA 1994). NEPA requires Federal agencies to assess the environmental effects of their proposed actions prior to making decisions, including decisions on permit applications and the adoption of federal land management actions (EPA 2017).
2. *The methodology must be systematic.* The SLVIA methodology must use a prescribed and structured approach for assessing impacts that may be applied consistently from project to project.
3. *The methodology must be based on accepted professional practices.* The SLVIA methodology must be based on sound, documented, and accepted professional practices.
4. *The methodology must support documentation of its application.* The SLVIA methodology must utilize an approach that can be documented, so that BOEM and other stakeholders can review the assessment and clearly understand the information used and the evidence and logic supporting the assessment's findings.
5. The methodology must be comprehensive with respect to assessing all important potential impacts resulting from the visibility of offshore wind developments. The SLVIA methodology must include procedures for assessing all important impacts arising from the visual presence of offshore wind developments.
6. *The methodology must be flexible enough to accommodate changes in facility design that might occur during the approval process.* The SLVIA methodology must accommodate a phased approach to offshore wind development, using "project design envelope" (PDE, also referred to as the Rochdale Design Envelope) concepts and procedures described in *Phased Approaches to Offshore Wind Developments and Use of the Project Design Envelope* (BOEM 2017) and *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan* (BOEM 2018). See Sections 2.6 and 4.4 for further discussion of design envelope considerations.
7. The methodology must be flexible enough to accommodate the imprecise nature of determining the magnitude and significance of potential impacts. The SLVIA methodology must avoid relying solely on "automated," "formula-based" findings of magnitude and significance of impacts, because judging the magnitude and significance of aesthetic impacts and effects on landscape/seascape character integrity involves multiple complex factors, some of which are inherently qualitative. Formulaic methods could fail to capture important considerations for project-specific issues and could also "force" findings of magnitude and significance that are not justified because of imprecision in the contributing variables.

Based on these goals, the following requirements were incorporated into the design and development of the BOEM SLVIA methodology:

1. *The methodology includes both SLIA and VIA.* The inclusion of both SLIA and VIA in the BOEM SLVIA methodology is consistent with NEPA's objective of providing Americans with aesthetically and culturally pleasing surroundings and its requirement to consider all potentially significant impacts of a proposed action. It is also consistent with accepted best professional practice in the United Kingdom, where offshore wind energy developments are common and where seascape and landscape impacts of development are routinely considered for offshore wind developments.
2. *The methodology assesses all non-negligible impacts.* Visibility of an offshore wind project does not necessarily indicate that there will be non-negligible seascape, landscape, or visual impacts. While impacts are sometimes of insufficient magnitude to be considered significant, the methodology is designed to disclose all impacts that may be non-negligible. Offshore wind facilities have been shown to be visible for distances exceeding 25 mi (40 km) (Sullivan et al. 2013a), and while impacts at longer distances might be found to be minor or negligible in magnitude, they could potentially affect several thousand square miles of seascape/landscape. Given the sensitivity of seascapes and landscapes along the U.S. coast and the very large populations within some of these areas, it is appropriate to disclose these potential impacts.
3. *The methodology relies on professional judgment for evaluating impact levels.* Issues surrounding the evaluation of landscape and visual impacts are discussed at length in GLVIA3 (LI and IEMA 2013), and VIA methods in use in the United States are reviewed in NCHRP (2013). GLVIA3 states the following: "While there is some scope for quantitative measurement of some relatively objective matters, for example, the number of trees lost to construction of a new mine, much of the assessment must rely on qualitative judgments, for example, about what effect the introduction of a new development or land use change may have on visual amenity, or about the significance of change in the character of the landscape and whether it is positive or negative." GLVIA3 goes on to say, "In all cases there is a need for the judgments that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others." Clarity and transparency in documenting the decisions are essential as a basis for the public and other stakeholders to provide informed opinions about the final decisions that BOEM will make when evaluating the SLVIA. GLVIA3 notes that using multiple evaluators to make determinations about impact levels can reduce problems associated with individual bias.

Based on these goals and requirements, BOEM has determined that a SLVIA approach modeled on the methodology for landscape and visual impact assessment presented in GLVIA3 (LI and IEMA 2013), with modifications required to include seascape assessment, is consistent with NEPA, and can otherwise be adapted for use with offshore wind energy developments in the United States.

Beyond meeting the goals and requirements BOEM set for the SLVIA, basing the methodology on GLVIA3 provides additional advantages:

1. The GLVIA was written and revised by highly qualified landscape professionals and extensively peer reviewed. The United Kingdom is a world leader in offshore and onshore wind energy development and has a long history of concern for and dedicated effort towards seascape, landscape, and aesthetic resource management.
2. The GLVIA has been in use for more than 25 years and is now in its third edition. It has been subjected to much legal and professional scrutiny. The last revision was made in 2013, so it reflects relatively recent academic progress on approaches to seascape, landscape, and visual impact assessment.

3. GLVIA3 has been applied to dozens of offshore wind projects, and numerous environmental assessments from real-world projects are available that provide a rich body of literature for examining how a SLVIA is conducted in practice.

In short, GLVIA3 provides a proven approach to the SLVIA process that has been refined based on repeated application and extensive input from a wide range of stakeholders.

2.5 Scope of SLVIA for Offshore Wind Facilities on the OCS

The BOEM SLVIA methodology is intended to assess the potential seascape, landscape, and visual impacts of construction, operation and maintenance, and decommissioning of proposed utility-scale offshore wind energy developments on the OCS of the United States, as well as any residual impacts that may remain after decommissioning. Temporary impacts from site testing and evaluation, construction, and decommissioning as well as long-term impacts from operation are assessed. Impact sources included in BOEM SLVIAs include all above-waterline offshore project components, including wind turbines, electrical service platforms, turbine lighting, and boat and helicopter traffic during all phases of development. Onshore impact sources include substations built as a direct result of the proposed project, transmission lines, cable landfalls, and other components associated with the construction, operation, and decommissioning of the wind facility, but not fabrication projects or expanded port facilities. The methodology assesses impacts for daytime and nighttime viewing conditions separately and assesses impacts on both offshore and onshore receptors, including landscapes and seascapes for the SLIA portion of the assessment and people—on both land and sea (recreational boaters, fishers, ferry passengers, Native American tribal members engaged in cultural practices, and the like)—for the VIA portion of the assessment. Impacts on crews of cargo ships and other commercial/working vessels, e.g., fishing boats, are not included in the assessment.

The geographic scopes of the seascape/landscape and the visual impact assessments include all areas of land and sea from which the components included in the assessments are visible, as indicated by viewshed analysis, to a distance that varies depending on the size of the wind turbines or other project components proposed for the project. The geographic scope of the SLIA and the VIA may not be identical, although they generally are similar. See Chapter 5 for information on determining the geographic scope of a SLIA and VIA for a particular project.

2.6 Design Envelope and Phased Development Considerations in SLVIA

In January 2018, BOEM issued *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan.* (BOEM 2018). The guidance describes BOEM's plans to allow wind developers to use a PDE approach. A PDE approach allows offshore wind project proponents to identify in their COP a reasonable range of potential project design parameters for certain key components of a development, including, for example, type and number of turbines, foundation type, location of the export cable route, location of an onshore substation, location of the grid connection point, and construction methods and timing. BOEM then uses the PDE approach to assess potential impacts on key resources, focusing on the design parameters that represent the greatest potential impact on each resource—referred to in the guidance document as the "maximum design scenario." BOEM's assessment may result in the approval of a project constructed within that range. If BOEM approves a COP that used a PDE approach and the project proponent's final design does not stay within the approved range of design parameters in the COP, BOEM conducts further review before allowing construction to begin. The PDE approach is also a mechanism through which phased development may be presented, interpreted, and assessed. See Section 4.4 for additional information on use of the PDE approach.

2.7 Involving Stakeholders in the SLVIA Process

BOEM sees public input as a critical component of the safe and responsible exploration and development of offshore resources (BOEM date unknown) and provides *A Citizen's Guide to the Bureau of Ocean Energy Management's Renewable Energy Authorization Process* (BOEM 2016b), which is available on the BOEM website, https://www.boem.gov/KW-CG-Broch/.

Stakeholder involvement is particularly important with respect to seascape, landscape, and visual impacts, because these are social impacts that collectively affect both people and the seascapes and landscapes within which people live, work, and play, and to which they may attach strong cultural and spiritual values.

GLVIA3 (LI and IEMA 2013, 43), which also stresses early and frequent engagement with stakeholders, states the following:

> *Well-organized and timely consultation and engagement with both stakeholders and public can bring benefits to a project, including improved understanding of what is proposed and access to local environmental information that might otherwise not have been available to the assessment. This can be of benefit to LVIA in providing better understanding of the landscape and of local attitudes to it. In its most useful form, participation in consultation will improve the quality of the information influencing the scheme design,and may result in positive changes to the design.*

GLVIA3 also offers the following best practices advice (LI and IEMA 2013, 45):

- Consultation must be genuine and open. The temptation to make the most of consultation for information gathering while being reluctant to disseminate information should be resisted.
- Requests for participation by stakeholders and the public should be timely. There is no point in seeking ideas and views if it is actually too late for the scheme design to be modified.
- Sufficient time must be allowed for those consulted to be able to consider and act on the information provided.
- The objectives of consultation should be clearly stated. Information presented to consultees should be appropriate in content and level of detail, clearly identifying those issues on which comment is being sought.

In assessing seascape, landscape, and visual impacts for proposed offshore wind developments, BOEM considers public and other stakeholder comments in BOEM's environmental review process and expects that stakeholders will be actively engaged throughout the project design and environmental review process.

3 Impact Assessment Process Overview

This chapter summarizes the major steps in the SLVIA process for offshore wind projects submitted to BOEM. More detailed information about each step is provided in Chapters 4–9.

3.1 Major Phases of the Impact Assessment Process

The SLVIA process has six major phases:

1. The proponent provides the COP that describes the project in detail, any alternatives under consideration, and the PDE, if the PDE approach is being used. BMPs to avoid or reduce the seascape, landscape, and visual impacts of the project incorporated into the project design are assumed to be implemented for purposes of the SLVIA.

2. The geographic scopes of the SLIA and VIA, that is, the areas within which seascape and landscape impacts and visual impacts will be assessed, are identified.

3. The descriptions of impact receptors and existing conditions for the SLIA and VIA are prepared. Applicable LORs for both assessments are identified and described. In an EIS, this section is usually referred to as the *Affected Environment*.

4. The potential impacts of all phases of the proposed project and alternatives, including the PDE (if that approach is used), are identified and described. Potential seascape and landscape impacts are identified separately from visual impacts. In an EIS, this section is often referred to as *Environmental Consequences*. After the nature and extent of the potential impacts have been identified, determinations of the corresponding impact levels are made. *Impact level* refers to the importance of the impact: negligible, minor, moderate, or major (see Section 3.6 for further discussion of impact levels). Impacts are evaluated for each impact receptor.

5. Assessments of impacts from reasonably foreseeable planned actions (RFPA) for both seascape/landscape and visual resources are conducted. After the nature and extent of the these impacts have been identified, the evaluations of the impact levels are made.

6. Additional recommended mitigation measures beyond those assumed to be in place for the impact analysis may be identified. These could include mitigation required by BOEM as a condition for approval of the project or other mitigation actions agreed to by the developer.

Each step in the SLVIA is examined in more detail below. The report prepared from the assessment is then used by BOEM to help prepare the EIS for the project.

3.2 Project and Alternatives Description

The COP provides a detailed description of the project, including its location and the project components. The COP should provide detail sufficient for the SLVIA preparer to determine the physical properties of the proposed project relevant to the SLVIA as well as how these may vary between alternatives and within the PDE, if used. This information is needed in order to identify all the possible sources of seascape/landscape and visual impacts of the project and its alternatives for all phases of development. It is also needed to determine the geographic scope of the impact assessment.

Critical information includes but is not limited to, the turbine number and location, models, physical dimensions, lighting, and color, and the same information for electrical service platforms and onshore components included in the SLVIA. Activities that could create seascape/landscape or visual impacts should also be described for each project phase, as well as any BMPs or other mitigation that will avoid, minimize, or rectify the potential seascape/landscape and visual impacts. No assumptions regarding *potential* mitigation measures are made, and if the mitigation is not included in the COP, it is not assumed to be implemented for the purposes of conducting the SLVIA. Based on the results of the SLVIA, BOEM may require additional mitigation before approving the COP.

3.3 Determination of Geographic Scope of Potential Impacts

After the height and location of wind turbines and other visible project components included in the assessment have been identified, viewshed analyses (a geographic information system [GIS] analysis process) are conducted to identify all areas from which project components could theoretically be visible. The viewshed analysis for onshore components (e.g., substations associated with the project) is run separately from the viewshed analysis for the offshore components (wind turbines and electrical service platforms) because of the very large difference in size and height between the onshore and offshore components.

Once the GIS-based viewshed analyses have identified locations from which the project theoretically might be visible, the viewshed results, as verified by fieldwork, are used to identify seascape character areas (SCAs) and any landscape character areas (LCAs) that may be affected and thus are included in the seascape and landscape impact assessment. SCAs and LCAs are discrete areas of seascape or landscape, each with its own character and identity. SCAs are discrete areas of coastal landscape and adjoining areas of open water, within which there is shared inter-visibility between land and sea, that include an area of sea (the seaward component), a length of coastline (the coastline component), and an area of land (the landward component). LCAs are inland areas similar to SCAs in terms of having unique character and qualities, but do not include coastline or sea.

The area of ocean within the project viewshed but outside of any SCAs within the viewshed is referred to as an Ocean Character Area (OCA). The OCA includes the offshore components of the project and thus is subject to both seascape/landscape impacts, and viewers within it may be subject to visual impacts from the project as well. There is one OCA for each proposed project.

For the SLIA, the geographic scope of the impact assessment covers the OCA and all SCAs and any LCAs from which the components would be visible, from the project itself out to a distance that would vary depending on the size of the wind turbines proposed for the project. This means that an offshore wind project located in the OCA, with onshore components in an SCA or LCA, may cause impacts in other SCAs or LCAs. Similarly, actions associated with the project, such as construction, maintenance, and decommissioning activities, may cause impacts outside of the OCA, the SCA, or LCA in which they occur.

In many cases, impacts are limited to the OCA and the SCA(s) closest to the proposed offshore wind energy facility; however, in some cases inland LCAs may have visibility of the proposed offshore facility, from mountains or hilltops, for example, or from areas behind dunes or other screening elements, and would thus be included in the SLIA.

Similarly, the verified viewshed analysis results are used to identify the spatial extent of visual impact consideration. For the VIA, all locations from which the project may be visible (based on the limits and extent of the viewshed analysis) are considered to be potentially affected.

3.4 Impact Receptor Identification and Description

The receptors for potential seascape and landscape and visual impacts within the OCA and the potentially affected SCAs and LCAs are identified and described below.

- For the SLIA, the impact receptors are the OCA, the potentially affected SCAs, and any LCAs from which the project may be visible. They are described primarily through the process of seascape and landscape character assessment. The descriptions include a specified list of characteristics for the OCA and SCAs/LCAs for use in the SLIA. Effects of the visual presence of the project on the character of the OCA, SCAs, and any LCAs are the basis for the SLIA.

- For the VIA, the impact receptors are the people who will have views of the project. After providing a general description of the visual properties of the project area (both offshore and onshore), viewer groups that may experience views of the project are identified and described. Important views and viewpoints from which the project components would be visible are then identified, including specific views and viewpoints (referred to as key observation points or KOPs) that will be used in the impact assessment. The nature of the view toward the project area from each KOP is then described. Effects of the visual presence of the project on these views are the basis for the VIA.

For the tasks above, stakeholder input is critical to identifying relevant values and concerns for the SLIA, key views, and, for the VIA, the people who would experience those views.

Applicable LORs for both assessments are identified and reviewed.

3.5 Impact Identification and Description

After the affected environment has been described, impact assessments are conducted. The impact assessments include short-term, long-term, temporary, permanent, positive, and negative impacts of the construction, operations, and decommissioning phases of the proposed project. The impact assessments also include any effects that occur later in time or farther removed in distance, as well as any effects of reasonably foreseeable planned actions (RFPAs) (see Section 3.7 below). Impacts from onshore and offshore facilities are assessed separately. Assessments include both daytime and nighttime impacts.

Although they differ in details, the same general process is used for impact assessment in the SLIA and VIA. In both types of impact assessment, the sensitivity of the receptor is determined for each affected impact receptor, based on its susceptibility to impacts and its perceived value, and the magnitude of the impact is determined by considering the size and scale of the change to existing conditions caused by the project, the geographic extent of the area subject to the project's effects, and the effects' duration and reversibility. The sensitivity of the receptor and the magnitude of the impact are then combined to determine the level of impact.

As noted in Section 3.4, the impact receptors for the SLIA are the OCA and the seascapes and landscapes —and the elements, features, and key characteristics that give each area its distinct character—from which the proposed project would be visible, and the impacts that are assessed primarily concern the consistency of the proposed project with the various aspects of seascape and landscape character in the potentially affected areas (see Section 6.2.2 for additional information on seascape/landscape receptors). For the OCA and each affected SCA or LCA, the sensitivity of the receptor is determined based on its susceptibility to impacts and the perceived value of the affected seascape, landscape, or affected element or aspect that contributes to the character of the area. The magnitude of the impact is determined by considering its size/scale, geographic extent, and duration and reversibility. A variety of tools can be used as aids in identifying seascape/landscape impacts, including the following:

- Viewsheds;
- Wireframe views of the project;
- Photos of facilities similar to the proposed project; and
- Visual simulations produced for the VIA (see below), and, in sensitive cases, additional simulations developed specifically for the SLIA.

The impact receptors for the VIA are the people for whom the project and associated activities would be visible, and the impacts that are assessed concern the visual contrast created by the project as seen in specific valued views, the resulting change to viewers' visual experience of the view, and their affective response to the change. Visual simulations of the proposed project as it would be seen in views identified as being of concern are prepared by visualization professionals as one (but not the only) tool for the assessment of the nature and magnitude of the potential visual impacts of the proposed project. The impact assessment is similar, at a general level, to that used for the SLIA: It is based on the sensitivity of the receptor and the magnitude of the visual impact. The sensitivity of the viewers is determined based on (1) who they are—for example, residents, visitors, workers—and the activities in which they are engaged that determine their level of engagement with the visual environment, and (2) the value placed on the view, through either official recognition or designation or recognition in the media and other indirect indicators of value. The magnitude of the visual impact is determined by considering the size or scale of the change to the view, the geographic extent of the area experiencing impacts, and the duration and reversibility of the expected impacts. The size or scale of the change to the view refers not to the size or scale of the project itself, but rather the relative degree of change to the view caused by the visual presence of the project, as determined by assessing its visual contrast.

3.6 Judging the Level of Impact

The final steps for both the SLIA and VIA processes are to combine the sensitivity and magnitude judgments for each impact to determine the level of the impact (*negligible*, *minor*, *moderate*, *major*). Although the judgment about impact level is ultimately a professional one, as are the assessments of sensitivity and magnitude, the method by which the determination is made is systematic, based on accepted criteria, and clearly documented. The generalized impact assessment process for both the SLIA and VIA is summarized in **Figure 3.6-1.**

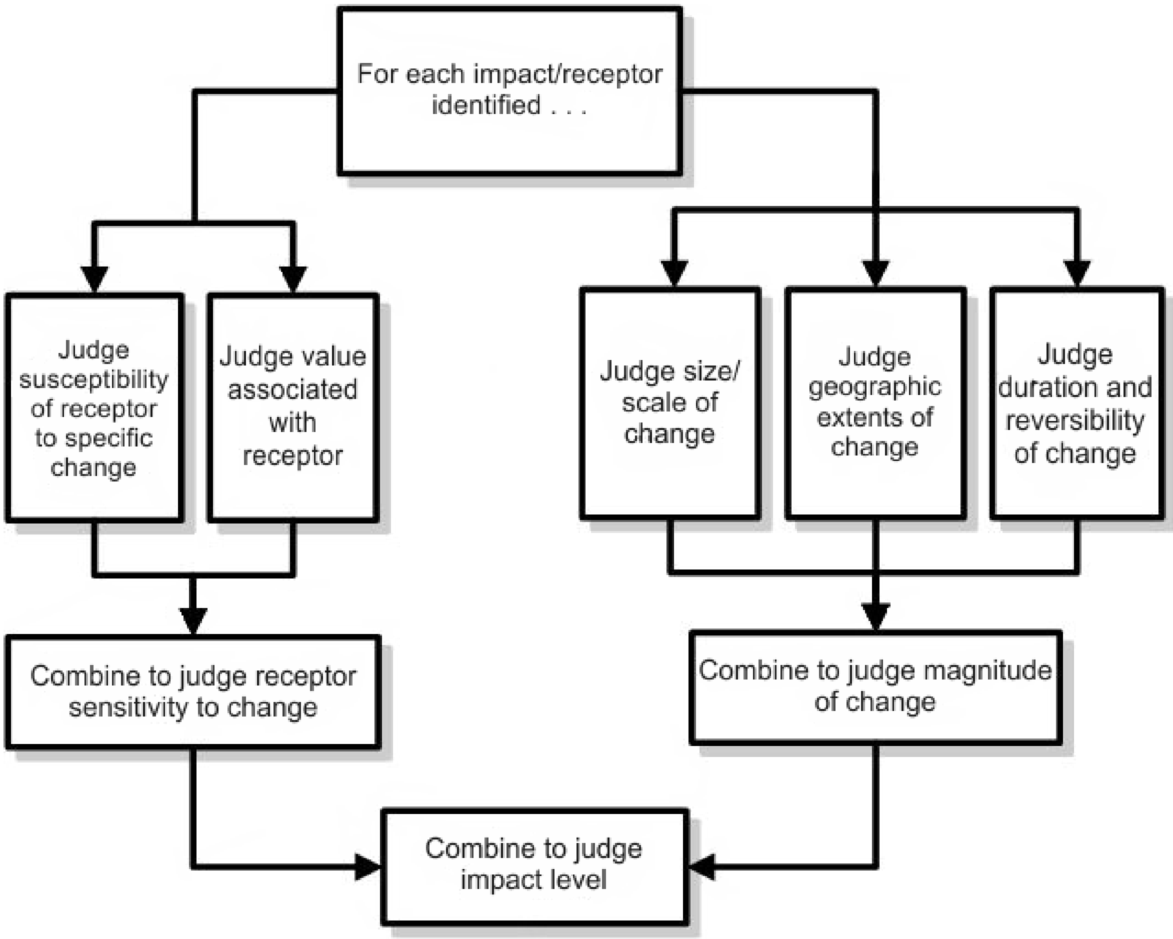

Figure 3.6-1. Generalized impact assessment process

Seascape and landscape impacts are assessed separately for the OCA and for each SCA and LCA included in the assessment. Visual impacts are assessed separately for each KOP included in the assessment. The details of the SLIA process are discussed in Chapter 6. The details of the VIA process are discussed in Chapter 7.

3.7 Assessing Impacts of Reasonably Foreseeable Planned Actions

The impact assessment includes the effects of reasonably foreseeable planned actions (RFPAs). In each case, other existing and proposed projects and actions within a specified distance of the proposed project are examined to determine their potential to interact with the impacts of the proposed project. Effects on landscape/seascape can include the presence of multiple projects that when considered together change the essential character of the seascape or landscape. Visual impacts may arise from seeing multiple projects simultaneously in the same view or in sequence as one moves through the landscape. The procedure for assessing the effects of RFPAs is presented in Chapter 8.

3.8 Additional Mitigation Measures

In light of the impact level findings, additional mitigation measures that could further reduce project impacts may be identified. In some cases, these mitigation measures must be used in order to reduce the potential impacts of the project to a level acceptable for approval of the project. In other cases, these mitigation measures, while voluntary for the project developer, increase public acceptance of the proposed project in addition to reducing impacts on seascape/landscape or visual resources. Best management practices for reducing visual impacts of the offshore and onshore components of offshore wind energy facilities are presented in Appendix B.

4 Project and Alternatives Description

This chapter provides details on the project and alternatives description's purpose, nature, and content.

4.1 Introduction

In order to conduct the SLVIA, the analyst must have a thorough understanding of the visual properties (those aspects of the project with the potential to affect the visual environment) of the proposed project (including the various scenarios in the PDE if one is being proposed) at a level of detail sufficient to identify the potential seascape, landscape, and visual impacts accurately. This information should be included in the COP in order to properly conduct the SLVIA; however, if this information is not included in the COP, then other sources must be used or additional field work conducted to generate this information. The visual properties of the project throughout all phases of development should be identified for all project elements to be included in the SLVIA. The SLVIA includes assessment of impacts for alternatives and for phased developments. The PDE (if that approach is used) should be included in the project and alternatives description. The design of the project should incorporate BMPs and mitigation measures to avoid, reduce, repair, and/or compensate for the likely impacts of the project (see Appendix B). BMPs and mitigation measures incorporated into the COP are therefore assumed to be in effect for the purposes of conducting the impact assessment.

4.2 Proposed Project Description

The proposed project description for the SLVIA provides critical information about the visual properties of the proposed project that form the basis for the assessment of its visual impacts. Because the primary aspect of an offshore project with respect to seascape and landscape effects is its visual presence, the seascape and landscape impacts also rely on the proposed project description. It describes the location and visual properties of all visible components for both offshore and onshore facility components for all phases of development, and for any elements still visible after decommissioning. The project description includes onshore substations and their ancillary facilities, such as transmission lines, equipment laydown areas, roads, communication towers, and similar elements, that may not ordinarily be thought of as part of the project but are built and operated as part of the project, at least temporarily, as in the case of equipment laydown areas. Note that the project description in the COP may include other project elements not included in the SLVIA. The project description also includes all visible activities associated with the project, such as construction, maintenance, and decommissioning activities. The description addresses all facility elements and activities likely to cause non-negligible visual impacts, and describes these impact sources in terms of their general appearance, approximate size dimensions (not limited to height, but also including length/width where known), surface colors, and textures. Activity descriptions include schedules and durations for the activities.

4.3 Incorporation of Project Phases in the Impact Assessment

The SLVIA includes assessments of all project phases, not simply the operation phase. As a result, the project description, consideration of the affected environment, determination of the geographic scopes of the assessments, and the impact assessments themselves all should consider the location and impacts resulting from the structures and other facility components as well as the activities associated with site testing and evaluation, construction, operation, and decommissioning of the proposed facility. In addition, the SLVIA should consider and assess any residual impacts of the project that remain after decommissioning, such as permanent alteration of terrain that might result from siting a substation.

4.4 Incorporating PDEs and Phased Development into the Impact Assessment

The SLVIA methodology accommodates a phased approach to offshore wind energy facility development, using the PDE concepts and procedures as described in *Phased Approaches to Offshore Wind Developments and Use of the Project Design Envelope* (BOEM 2017) and *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan* (BOEM 2018).

BOEM is providing lessees with the option to submit COPs that use a PDE approach. A PDE approach allows the project developer the option to submit a reasonable range of design parameters within its COP and allows BOEM to then analyze the maximum impacts that could occur from the range of design parameters and potentially approve a project constructed within that range. The PDE approach is used to describe project parameters and undertake “maximum design scenario” or “worst-case scenario” assessments of environmental impact against the project parameters.

The draft PDE guidance (BOEM 2018) notes that there could be multiple “maximum design scenarios” for certain resources, and uses visual resources as an example. In the example, the size of turbines affects the density of turbines in the wind facility and the distance at which those turbines are visible from shore. Accordingly, there could be two different “maximum design scenarios” for visual impacts of the project. A larger turbine would be visible from a greater distance; therefore, the larger turbines present the “maximum design scenario” in that respect. However, because of the greater turbine density required for smaller turbines, more turbines could be visible from shore, presenting a different kind of “maximum design scenario.” Therefore, it may be necessary for a lessee to prepare a visual assessment for each end of its range of potential turbine sizes.

The SLVIA is conducted consistent with the draft PDE guidance, and this could mean that multiple assessments for SLVIA may need to be conducted, potentially involving different landscape/seascape areas, viewsheds, and potentially affected populations and viewpoints.

Note that if a PDE is used, there still may be project alternatives that are considered separately in the assessment. This could occur if, for example, alternatives for an offshore wind project include different project locations with very different impacts, because the worst-case scenario assessment for the alternative with more significant impacts might not be approved, and therefore the project itself would not be approved. If, however, the project alternatives are similar enough in impacts that all alternative project designs can reasonably be included in the PDE, there would be no need to formally examine alternatives beyond the “proposed action” and “no-action” alternatives. If the PDE approach is not used, separate SLVIAs would be required for each project alternative, although typically alternatives assessment would build on the assessment for the proposed action.

4.5 Incorporation of Mitigation in the Impact Analysis

BOEM expects that every COP will incorporate BMPs for seascape, landscape, and visual impact mitigation into the design of the project, in selecting locations for individual turbines, using color to minimize visual contrast, minimizing lighting impacts, and so on. As noted previously, mitigation to avoid or reduce seascape, landscape, and visual impacts included in the COP is considered to be implemented for the purposes of conducting the SLVIA. No assumptions regarding mitigation are made, and if the mitigation is not included in the COP, it is assumed to be not implemented for the purposes of conducting the SLVIA. Based on the results of the SLVIA, BOEM may require additional mitigation before approving the project.

5 Determination of Geographic Scope of Potential Impacts

This chapter describes how the geographic scope of the SLIA and the VIA, that is, the area within which impacts are considered, is determined.

5.1 Introduction

The SLVIA requires determining the area of land and sea to be included in the SLIA and the VIA. Ultimately, because offshore wind turbines are far enough offshore that their impacts on both seascapes/landscapes and views occur almost exclusively because of the visual presence of the facilities and activities associated with them, the primary determinant of the geographic scope of the analyses is visibility of the project components, both offshore and onshore.

Potential visibility of the project is determined through viewshed analysis. A viewshed is an area potentially visible from a specified location. Viewshed analysis for SLVIAs is performed using GIS tools.

5.2 Relevant Factors in Determination of Geographic Scope of Impact Analysis

In the case of offshore wind energy development, the primary determinant of the geographic scope of possible impacts is visibility of the components of the project; that is, wherever there is potential visibility of the project, there is a potential for seascape, landscape, and visual impacts, though they may be negligible. As noted in Section 2.5, all offshore and certain onshore components of the project are included in the SLVIA, for all phases of the project and for both daytime and nighttime views. As a result, in the SLVIA, the potential visibility of all the components as they would appear in all phases of the project both day and night is determined.

Many variables, including the physical characteristics of the project, atmospheric conditions, earth curvature, and the like, affect the actual visibility of the project, and these are considered in the SLVIA. These variables are referred to as visibility factors and are described in Section 5.3.

The geographic scope of the SLIA and the VIA may not be identical, although they generally are similar and are both ultimately derived from the same viewshed analysis. For the VIA, after certain visibility factors that can be determined relatively precisely have been accounted for, the geographic scope of the analysis is derived directly from the viewshed analysis. For the SLIA, the area of analysis is derived indirectly from the viewshed analysis, because the SLIA includes SCAs/LCAs that may in some cases extend beyond the boundaries of the viewshed. In other words, SCAs/LCAs from which any portion of the project is visible are included in the analysis in their entirety, even though the project may not be visible from all locations within the SCAs/LCAs. The portion of the SCA/LCA that falls within the project viewshed is measured by acreage and by percentage of the total area of the SCA/LCA, and incomplete visibility is considered in the SLIA analysis.

As discussed in Section 3.4, while all offshore wind energy projects visible from shore will affect the OCA and at least one SCA, not all offshore wind energy projects necessarily affect an LCA unless the project is visible sufficiently far inland to affect non-coastal areas. Throughout this document, the terms “seascape/landscape” and “seascape and landscape” are used, but readers should note that in many, if not most cases, only SCAs will be affected.

5.3 Project Visibility Factors

As noted above, variables affecting the actual visibility of an object in the landscape are referred to as project visibility factors. A detailed discussion of project visibility factors is provided in Appendix B of the *Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects* (Sullivan and Meyer 2014).

There are eight major types of visibility factors that affect visual perception of objects in the landscape:

1. Viewer characteristics: visual acuity, viewer engagement, and viewer motion;
2. Viewshed limiting factors: viewer height and elevation, project component height and elevation, topographic, vegetative, and structural screening, earth curvature, and atmospheric refraction;
3. Lighting factors: solar altitude and azimuth, weather, and climate;
4. Atmospheric conditions: the presence of water vapor (humidity) and particulate matter (dust, air pollution, and other particles) in the air between the viewer and the project components;
5. Distance: the distance from the viewer to the components of the project;
6. Viewing geometry: the vertical and horizontal angle of view from the viewer to the components of the project;
7. Backdrop: the degree to which the color and texture of the backdrop visible beyond the project contrast with the color and texture of the project components; and
8. Object visual properties: inherent visual properties of the project components, including the facility and component size, the scale relative to other objects in view, the form, line, surface colors, and textures of the components, any visible motion of the facility components, and the luminance, color, and other properties of any project lighting.

All the visibility factors and their spatial relationships in the landscape are depicted conceptually in **Figure 5.3-1**.

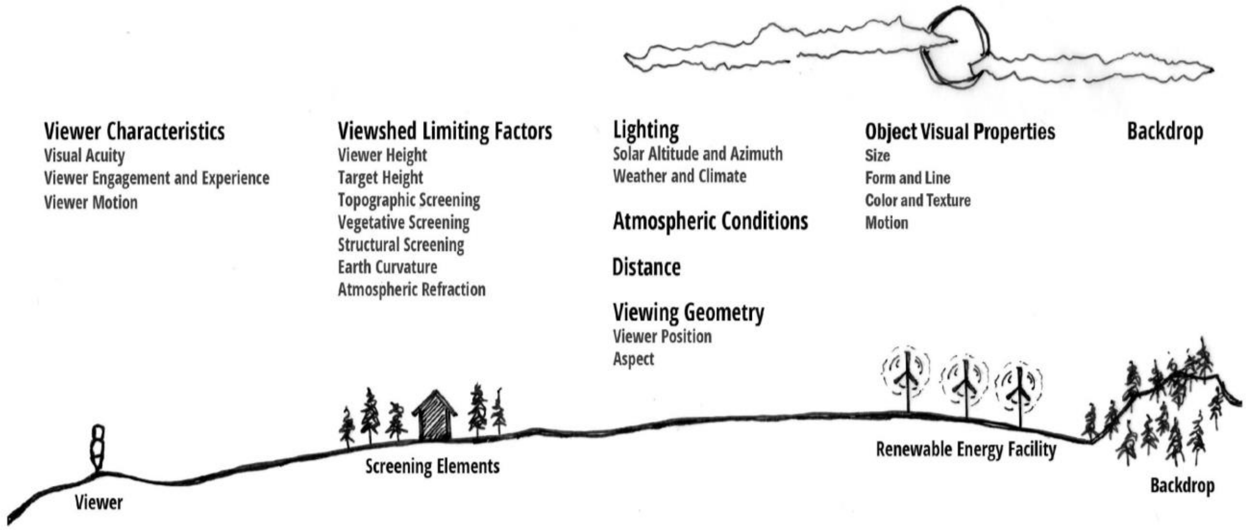

Figure 5.3-1. Schematic diagram of visibility factors in the landscape (Credit: Argonne National Laboratory)

For a view of a proposed project from a given location, some of these visibility factors can be precisely determined in advance of the SLVIA, such as object visual properties, viewer height and elevation, project component height and elevation, distance from viewer to project, topographic screening, and viewing geometry. Other visibility factors may fall within a predictable range but vary over time or between viewers, such as solar elevation and azimuth, atmospheric conditions, atmospheric refraction, and visual acuity. And finally, some visibility factors vary unpredictably and sometimes very quickly: for example, if a cloud happens to be passing over the sun at a particular time or the wind direction and speed affect the visibility and speed of spinning blades of wind turbines. And of course, the visibility factors do not operate in isolation; at any given time from any given location, they interact in complex ways, such that the actual appearance of the facility depends on the unique combination of these factors, some of which can change substantially in a matter of minutes or even seconds.

Various field-based research projects have been conducted for BOEM, the Bureau of Land Management (BLM), the National Park Service (NPS), and the Department of Energy (DOE) evaluating the visibility and visual characteristics of renewable energy facilities (including onshore/offshore wind and solar energy) and electric transmission facilities (Sullivan et al. 2012a,b, 2013a,b, 2014). These studies have repeatedly verified that the appearance of large energy facilities varies greatly depending on the interactions between the various visibility factors. The visibility of a given facility could vary dramatically in just a few minutes or even seconds as a passing cloud shadows the facility. Two of these studies examining the visibility and visual properties of onshore (Sullivan et al. 2012a) and offshore wind facilities (Sullivan et al. 2014) showed that blade motion was a significant factor in the visibility of wind farms at certain distances, and that the flashing of aviation obstruction lighting increased the visibility of wind farms at night.

These studies showed that, as a result of the complex and changing interactions of visibility factors and viewers, the visual experience of a wind project is highly dynamic in nature and that the appearance of a facility at a given time as viewed from a given viewpoint is impossible to predict with certainty. However, with sophisticated software tools and best practices, it is possible to depict in simulations the range of possible appearances of the facility with reasonable accuracy and realism, although some evidence suggests that even well-executed simulations may sometimes under-represent project visibility (Sullivan et al. 2012a; Sullivan et al. 2013a; Sullivan et al. 2014; Palmer and Sullivan 2020). In those cases, using sound professional judgment to account for the dynamic qualities of the viewing experience and the range of effects from visibility factors, the analyst can assess the overall impact for the "worst-case scenario" with a reasonable degree of certainty.

In the SLVIA in practice, the challenge of predicting the visibility of a proposed offshore wind facility subject to the complex interaction of visibility factors is dealt with by conservatively setting the outer boundary of impact assessment to include all areas where non-negligible visibility of the project could reasonably be expected to occur under favorable viewing conditions.

5.4 Viewshed Analysis and Zone of Theoretical Visibility

Viewshed analysis is conducted using GIS software to determine the potential visibility of the surrounding seascape/landscape from a designated location. Viewshed analysis has two uses in the SLVIA: (1) determination of areas from which some part of the project can be seen and (2) determination of which portion of the project, if any, is visible from a particular viewpoint. For the purposes of determining the geographic scopes of the VIA and the SLIA, only the first type of viewshed analysis is of concern, that is, the identification of an area of the surrounding seascape/landscape from which some portion of the proposed project would be visible if it were built in a particular location. Viewshed analyses use elevation data to determine whether topography and, in some cases, vegetation and structures block views of the project from other locations in the area of the viewshed analysis. Viewshed analyses are approximations of visibility and in practice must be supplemented by fieldwork that confirms the visibility of the project area from particular viewpoints.

The viewshed analysis for a SLVIA for BOEM-reviewed projects requires high-quality elevation data and specific procedures in order to obtain acceptable results. Viewshed analysis should be done in accordance with the protocol specified in Appendix A, Viewshed Analysis.

An important viewshed concept relevant to the SLVIA methodology is the zone of theoretical visibility (ZTV), that is, the viewshed that results from ignoring all screening elements except topography. ZTV analysis is performed using a digital elevation model that provides the elevation of the surface of the earth (and/or a body of water) and does not consider the potential for screening from vegetation, buildings, or other structures. This type of elevation model is referred to as a digital terrain model (DTM). Because these obstructions may significantly reduce visibility in some seascapes/landscapes, the ZTV generally overestimates visibility of the project and can be considered a "worst-case scenario" for project visibility. While consideration of the ZTV during impact assessment is appropriate in those situations where relatively open vegetation may lose foliage seasonally, substantially reducing its effectiveness as a screening element, in the SLVIA, the ZTV is generally used for determining the geographic scope of the analysis only.

An elevation model that includes vegetation, buildings, and other structures is referred to as a surface elevation model (SEM). This is the preferred model for the impact assessment. Use of an SEM (verified by field surveys) allows the presence of vegetative and structural screening elements to be accounted for when analyzing project visibility, and it is this elevation model that is preferred as the basis for the selection of viewpoints for the VIA and for impact assessment for both the SLIA and the VIA.

5.5 Bounding the Outer Limit of Impact Analysis

An important question for SLVIA is the determination of the outer boundary of the impact assessment: in other words, how far away from the project impacts should be considered, given that at some certain distance the project might technically be visible, but would create such a low level of visual contrast that it could not have a detrimental effect on seascape/landscape character or views and visual amenity. If the distance is set too low, impacts that would be of concern may be missed. If the distance is set too high, resources are wasted analyzing impacts that are negligible or even nonexistent.

There are several factors to consider in determining the extent of the area of impact analysis:

1. The likely maximum distance of visibility of offshore wind facilities during the day;
2. The likely maximum distance of visibility of offshore wind facilities at night;
3. The magnitude of impact considered to be important enough to discuss in the impact assessment; and
4. The distance at which the threshold of impact considered important is crossed.

In theory, the outer boundary of impact assessment must be equal to or closer than the limit of visibility of offshore wind farms in daytime and nighttime views (whichever is farther), if that distance were known. Also, theoretically, it would be equal to the threshold distance for the lowest magnitude of impact of concern, if such a standard existed and the threshold for that distance could be determined.

Unfortunately, none of the distances above are known. Although it is theoretically possible to calculate the absolute limit of daytime visibility of a wind turbine of a given size and color and the absolute limit of nighttime visibility of a given light source, there are so many variables involved in the field situation that to do so is not meaningful.

Several empirical studies of wind farm visibility have been conducted, including one on offshore wind farms in the United Kingdom by Sullivan et al. (2014) that showed that under favorable viewing conditions, 3.6 MW wind turbines with hub heights of 75 m (236 ft) and height to blade tip of 103.5 m (428 ft) were just barely visible to the naked eye at a distance of 44 km (23.5 nm). Wind farms with similar-sized turbines were sometimes easily noticed at distances exceeding 29 km (15.6 nm). Blade motion was visible at distances as great as 42 km (23 nm) and routinely visible at distances of 34 km (18 nm) or less. In this study, aviation obstruction lighting was visible at night from as far away as 41 km (22 nm) and conceivably may have been visible at much greater distances if further nighttime observations of more distant wind farms had been made.

An earlier study of onshore wind-farm visibility by Sullivan et al. (2012a) showed maximum visibility distances of moderately sized wind turbines at much greater distances than the offshore study cited above, likely because of very low humidity and high air quality in the study area. In daytime views, wind turbines were just barely visible at a distance of 58 km (31 nm). At night, the red flashing aviation obstruction lights were plainly visible at the same distance and may have been visible at greater distances if further nighttime observations of more distant wind farms had been made. Blade motion was just barely visible in one observation at 47 km (25 nm).

Both studies established that even moderately sized wind farms with modestly sized turbines can be visible both day and night at very long distances. Both studies also discuss the ongoing trend toward ever larger turbines, especially offshore wind turbines, which as of 2020 may exceed 210 m (853 ft) in height (to blade tip), with even larger turbines being designed (De Clercq 2018). Current heights for proposed offshore wind energy facilities far exceed those observed in the studies discussed above, and the results of these studies, while relevant, cannot be considered to apply to turbines currently used or proposed for offshore wind projects. It can be assumed that at a given distance, larger turbines would create larger visual contrasts and, up to some limit, would be visible at longer distances. Visibility of aviation obstruction lights at night is relatively unaffected by turbine size except when the distance is far enough that the hub (and therefore the lighting) is below the horizon as seen from a viewpoint of interest. However, until further research determines the limits of lighting visibility, it cannot be assumed that daytime visibility distances are equivalent to nighttime visibility distances.

The trend toward ever larger turbines argues against setting a "one-size-fits-all" distance for impact analysis for the SLVIA. For VIAs for projects considered by BOEM, where the closest turbine is located more than 43 km (23 nm) from shore (the approximate limit of blade motion visibility in the daytime), the area of impact analysis for the VIA is determined by running a viewshed from the height of the top of the nacelle of the proposed project turbines until the line of sight is intercepted by terrain (adjusted for viewer height and elevation) or limited by earth curvature, but not exceeding 74 km (40 nm) in any event, on the assumption that regardless of turbine size or the lighting, the wind facility would create only a negligible impact beyond that distance.

For VIAs for projects where the closest turbine is located less than 43 km (23 nm) from shore, the area of impact analysis for the VIA for daytime impacts is determined by running a viewshed from the blade tip height of the proposed project turbines until intercepted by terrain (adjusted for viewer height and elevation) or limited by earth curvature. A second viewshed is run from the height of the top of the nacelle of the proposed project turbines for assessment of nighttime impacts. Neither viewshed shall exceed 74 km (40 nm).

The rationale behind this approach is that for projects within 43 km (23 nm) of shore, blade motion is sometimes visible during the day and therefore blade tip height should be considered in determining project visibility. At night, blade movement is not visible but aviation obstruction lighting could be, and therefore the height of the top of the nacelle (where the light is mounted) should be considered in determining project visibility. Beyond 43 km (23 nm), blade motion is not likely to be visible, or if it were, its effects would be negligible, and the height of the top of the nacelle should be considered in determining project visibility for both daytime and nighttime views.

This approach is conservative, and it should be noted that simply being visible does not necessarily constitute a non-negligible impact. However, this approach ensures that any place where the project would be visible is considered in the analysis, even though the impact might be very minor. It is also flexible enough to accommodate taller and larger wind turbines as they are developed and deployed. Note that BOEM may change these limits in the future, based on changes in turbine sizes, better information about project visibility, or other considerations.

For SCAs/LCAs for which any portion falls within the VIA viewshed, the entire SCA/LCA is to be included in the SLIA. As noted previously, this means that in some cases multiple SCAs and LCAs may be affected by offshore wind energy development

6 Seascape and Landscape Impact Assessment

After the geographic scope of the SLIA and the VIA has been identified, the SLIA and VIA processes diverge substantially, so they are treated separately in Chapters 6 and 7, respectively.

6.1 Introduction and Summary

As noted in Section 2.3, the SLIA assesses impacts on the physical elements and features that make up a seascape or landscape and the aesthetic, perceptual, and experiential aspects of the seascape or landscape that contribute to its distinctive character. These impacts affect the "feel," "character," or "sense of place" of an area of seascape or landscape, rather than enjoyment of a particular view; impacts on view experience are assessed in the VIA. The visibility of offshore wind developments may affect the aesthetic, perceptual, and experiential aspects of the seascape or landscape and thus its distinctive character. For offshore wind projects, the SLIA primarily measures the compatibility of the character of the offshore and onshore components of the project with the aspects that contribute to the distinctive character of the seascape and landscape areas from which the project is visible. Onshore components of offshore wind facilities may alter the physical elements of the area in which they are located, which can also affect the character of the area, and this should also be taken into account in the SLIA.

6.1.1 Seascape and Landscape Character Assessment

The SLIA requires a description of the affected environment, which for BOEM-reviewed offshore wind projects includes conducting seascape character assessments and possibly landscape character assessments (if the development is potentially visible inland in landscapes not connected to the sea). These assessments first identify potentially affected SCAs and LCAs that are discrete areas of seascape or landscape, each with its own character and identity, as expressed through similar geology, topography, drainage patterns, vegetation, historical land use and settlement patterns, and perceptual and aesthetic attributes within the area. The assessment describes the important seascape and landscape attributes that contribute to character, such as the presence of industrial elements or the presence of historic structures obviously associated with maritime heritage, and human values associated with these attributes, such as a deep connection to the sea among residents or heavy use by tourists. These attributes are the components of the seascape/landscape that contribute to its distinctive character, and they may be affected by the development.

6.1.2 Seascape and Landscape Impact Assessment

The information from the seascape and landscape character assessments is used to identify potential impacts from the proposed development. The impact assessment is based on the sensitivity of the receptor (the potentially affected seascape and landscape) and the magnitude of the seascape and/or landscape character changes brought about by the proposed project. For the OCA, and for each affected SCA and any affected LCAs, the sensitivity of the receptor is determined, based on its susceptibility to impact and its perceived value, and the magnitude of the impact is determined by considering the size and scale of the change to existing conditions caused by the project, the geographic extent of the area subject to the project's effects, and the effects' duration and reversibility. After the nature and magnitude of the impact have been determined, its impact level is evaluated. The SLIA process is summarized in **Figure 6.1-1**.

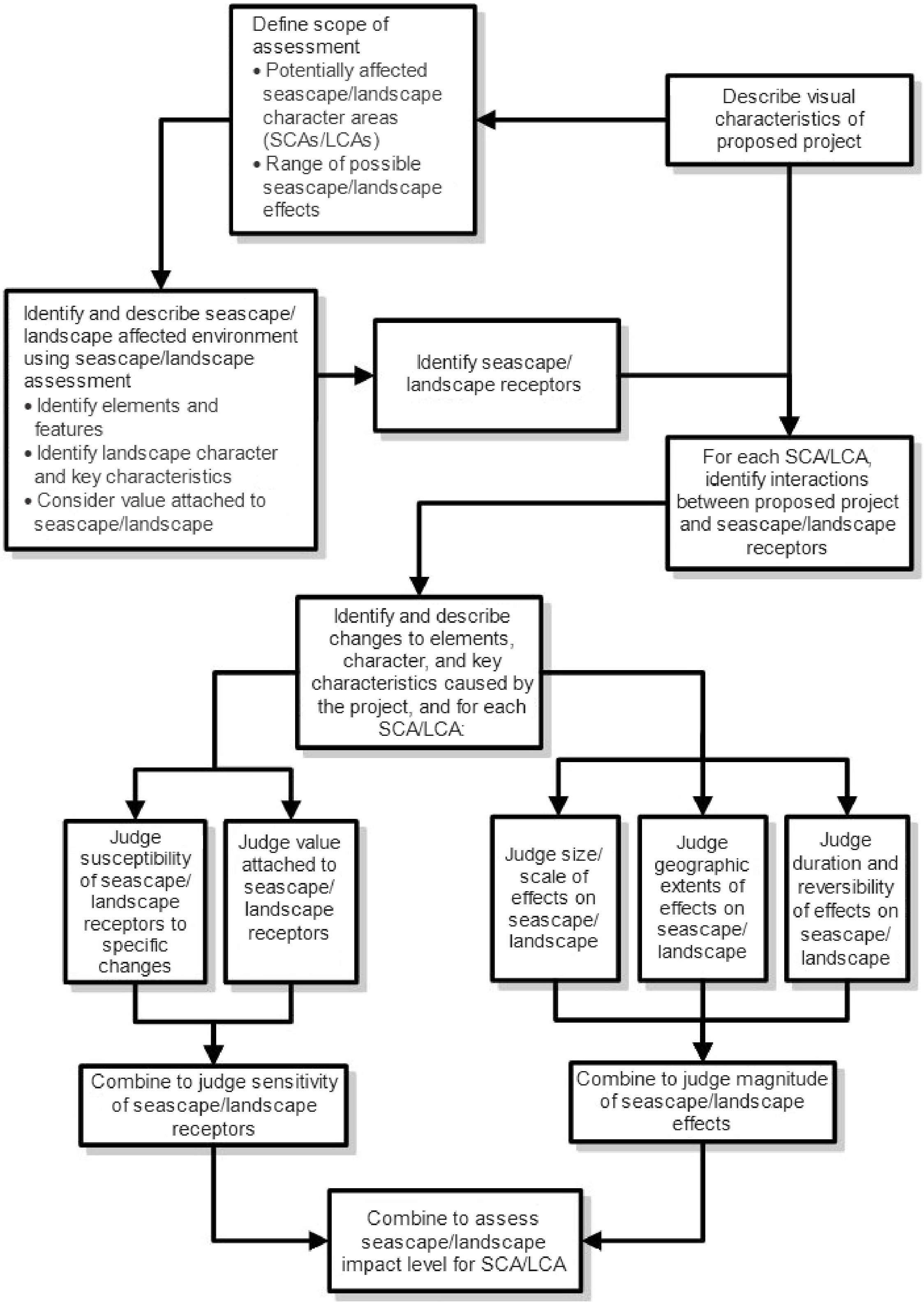

Figure 6.1-1. SLIA impact assessment process (Source: LI and IEMA 2013, 71)

6.2 Affected Environment Description and Impact Receptor Identification

In order to identify the particular seascape and landscape impact receptors that may be affected by a proposed offshore wind energy development, and to assess potential impacts on the receptors, baseline information regarding the seascape and landscape is gathered. The processes used to gather the necessary information are referred to as seascape character assessment and landscape character assessment, respectively, and are discussed in Section 6.2.1. Additional guidance from BOEM on conducting seascape and landscape and character assessments is forthcoming.

6.2.1 Seascape and Landscape Character Assessment

Seascape and landscape character assessment are two very similar processes for systematically describing the salient existing features of SCAs and LCAs to establish the existing baseline conditions. The two processes combine desktop and field analysis to identify the characteristics and qualities of the natural environment, cultural and social characteristics, and perceptual, experiential, and aesthetic qualities of the potentially affected seascapes/landscapes, including:

- The elements that make up the seascape/landscape in the impact assessment area:
    - Physical influences, such as geology, soils, landform, drainage, and water bodies;
    - Individual noteworthy physical features and elements of the seascape/landscape;
    - Land cover, including different types and patterns of vegetation and development;
    - The influence of human activity, including land use and management, the character of settlements, structures, and transportation infrastructure, and the pattern and type of fields and enclosures (in rural areas) or open spaces (in other settings);
- The aesthetic, experiential and perceptual aspects of the landscape, such as, for example, its scale, complexity, openness, tranquility or wildness, and the general character of its views; and
- The overall character of the landscape in the study area, including any distinctive areas that can be identified, and the particular combinations of elements and aesthetic and perceptual aspects that make each area distinctive, referred to as its *key characteristics*.

This information is used to identify areas of homogenous character that are then used to define and map the SCAs and LCAs included in the SLIA, unless a preexisting classification of character areas exists, which is the case for some areas, particularly coastal areas. The process above is adapted for characterizing the OCA.

Seascapes, landscapes and their features, elements, and aspects all have values associated with them by society, and these values are identified as part of the seascape and landscape assessments. The value assessment is based primarily on any special designations at national, state, and local levels, and, where there are no designations, judgments based on other criteria that can be used to establish seascape/landscape value. These criteria can include the value of individual contributors to seascape/landscape character, which may include individual elements of the landscape, particular landscape features, or notable aesthetic, perceptual, or experiential qualities, alone or in combination.

Accordingly, specially designated areas within the project viewshed are identified and described. Specially designated areas with potential scenic resource value include, but are not limited to, national, state, or local parks, seashores, and monuments; historic and scenic trails and byways; historic and scenic sites; Native American tribal sites or cultural landscapes; and wildlife refuges. Agencies and local stakeholders should be consulted during scoping to identify undesignated important/sensitive scenic resource areas and other important seascape/landscape features that may contribute to perceived seascape/landscape value, such as areas of high scenic quality, historic sites or trails, or sacred sites.

GLVIA3 (LI and IEMA 2013, 84) suggests a partial list of factors that could contribute to seascape/landscape value, including the following:

- *Seascape/landscape quality or condition*. The extent of character expression in individual areas, intactness of character, or physical condition of individual elements;
- *Scenic quality*. Aesthetic appeal (primarily visual);
- *Rarity*. The presence of rare seascape/landscape elements or features or a rare seascape/landscape type;
- *Representativeness*. Whether an area contains character, features or elements that are considered to be particularly good examples of their type;
- *Conservation interest*. Nonvisual values such as important wildlife habitat, unusual geology, historic importance, and the like;
- *Recreation value*. Use of an area for recreational purposes that depend on seascape/landscape qualities, such as landscape photography or birdwatching;
- *Perceptual values*. Landscape value for perceptual qualities, such as solitude, tranquility, or wildness; and
- *Associations*. Areas associated with important people or historical events that positively affect the perception of beauty in the seascape/landscape.

Cultural and historic heritage resources are considered in the SLIA affected environment analysis, because these resources may contribute in important ways to seascape and landscape character. Links between the existing seascape and landscape character and historic/cultural heritage values are particularly important to identify, because many coastal areas in the United States have important historic value and/or important cultural value to Native American tribes and other cultural groups that may be sensitive to offshore development.

For example, Newport, Rhode Island, has many historic buildings associated with whaling and the slave trade, as well as the Newport mansions. The town has a very long and close association with the sea. Its proximity to the sea and its many views of the sea are an important part of the urban but distinctly maritime character of Newport. The value of these elements and the distinctive character of Newport are recognized through many historic designations at the Federal, state, and local levels. It is an internationally recognized tourist destination, in part because of its unique seascape character. Within this highly valued seascape, there are many individual buildings that are also valued in and of themselves, as demonstrated by, for example, their being listed on the NRHP. There are many scenic designations within Newport as well, such as the Cliff Walk, which is a designated National Recreation Trail. These designations would be identified in the seascape assessment for Newport as a measure of societal value placed on the Newport seascape and particular elements within it, but important values associated with seascape/landscape elements without these designations, such as areas of Native American tribal importance, roadways, and other points of interest, would be included in the seascape and landscape assessment as well.

The discussion of seascape/landscape character includes an assessment of night skies and natural darkness. Any designations related to night skies or natural darkness are identified, such as designation as a Dark Sky Park, and any use of the area for night-based recreation and tourism, astronomical activities (both professional and amateur), or other darkness-dependent activities is identified and described as a measure of value placed on the night sky and natural darkness.

Obviously, conducting a high-quality seascape or landscape assessment requires the landscape professional conducting the SLVIA to consult with other resource professionals, in particular, cultural resource specialists. It also requires consulting with the public and other stakeholders to identify and establish values for important elements, features, and characteristics of the seascapes and landscapes included in the SLIA.

6.2.2 Seascape and Landscape Impact Receptors

In a SLIA, the impact receptors are the potentially affected SCAs and LCAs (as well as the OCA) with views of the project and their component parts rather than people, as is the case in a VIA. Even though "character" and "aesthetic, perceptual, and experiential value" are human constructs, they are traits of the seascape/landscape itself, determined by its physical elements and features in combination with its aesthetic, perceptual, and experiential aspects. Changes to seascape/landscape character and to these elements, features, and aspects are changes to the seascape or landscape itself, and these individual elements, features, and aspects can be impact receptors as well.

Examples of impacts on seascape and landscapes could include the effects of visible offshore wind turbines on the experiential aspects of "tranquility" or "wildness" of a National Park or their incompatibility with the residential character of an area. Onshore components, such as a substation, might negatively affect the aesthetic character of a historic town center or could result in the alteration or loss of a local landscape feature, such as a notable rock formation. Seascape and landscape impacts are discussed further in Section 6.3.

6.2.3 Applicable Laws, Ordinances, and Regulations

Depending on the project location, a variety of Federal, state, and local laws, ordinances, and regulations (LORs) and agency policies concerning seascape/landscape and visual resource protection and management may apply to offshore wind projects. As an early step in the SLVIA process, the analyst gathers and reviews applicable LORs and agency policies. There may also be a variety of other planning documents that should be reviewed, such as coastal resource management plans. The applicable LORs must be described in the SLIA.

6.3 Identification and Description of Potential Seascape and Landscape Impacts

This section defines seascape and landscape effects and discusses how they are identified and described in the SLIA.

6.3.1 Introduction

Once the affected environment information has been collected—that is, the ocean, seascape and any necessary landscape character assessments have been completed—that information can be combined with the information about the proposed offshore wind project in order to identify and describe the project's potential seascape and landscape impacts.

The project description (see Section 4.2) describes which components of the project are likely to cause seascape/landscape impacts during all phases of the project and the parameters of those components, such as height, color, and shape, that are capable of causing impacts. The first step in predicting and describing potential seascape/landscape impacts is to identify the receptors that may be subjected to impacts from the project, such as the general character of the seascape/landscape and the key characteristics and individual elements, features, or aesthetic, experiential, or perceptual aspects that contribute to that character. The second step is to identify how the impacting components of the project will affect these receptors. Once the nature of the interaction between components of the project and the potentially affected receptors has been identified and described, the impact level is determined. The end product of the process is a description of the nature of the impact, its cause, the conditions under which it will occur, and the expected impact level.

6.3.2 Impacts Included in SLIA

The SLIA identifies and assesses positive, negative, temporary, and permanent impacts of a proposed offshore wind energy development, including any effects that occur later in time or farther removed in distance, as well as any RFPA effects.

These impacts from development can generally be described as arising from one of three causes:

- *Change or loss of existing elements, features, or aesthetic/perceptual/experiential aspects.* Change or complete or partial loss of elements, features, or aesthetic, perceptual, or experiential aspects that contribute to the distinctive character of the seascape/landscape;
- *Addition of elements or features***.** Addition of new elements and/or features that may affect the distinctive character of the seascape/landscape; or
- *Combined effects on overall character.* Change in the overall character of the seascape/landscape resulting from the combined effects of the changes, losses, or additions described above.

The project components included in the SLVIA are listed in Section 2.5. Impacts are identified and described for all phases of the project (and residual impacts remaining after project decommissioning), for both daytime and nighttime conditions and for all alternatives that differ substantially in their visible properties.

6.3.3 Describing Impacts in the Assessment

Each major project component (e.g., offshore facilities, onshore facilities) included in the SLIA, in each phase of the project, is described as follows:

1. The general nature of the impact is identified.
2. The particular impacting component(s) of the project is identified, as well as the characteristics of the component(s) that cause or are relevant to the impact, such as incompatibility between the modern appearance of wind turbines and an SCA with a distinctly historic character.
3. The specific impact receptor(s) is identified and described, including its susceptibility and value (see Section 6.4), such as the sense of solitude in a wilderness area susceptible to degradation by the visible presence of human development.
4. The magnitude of the impact is described in terms of scale and size of the effect, its duration and reversibility, and the geographic extent over which the impact occurs (see Section 6.4). For example, the operations phase of a project may create a large-scale change in character that is of long duration, is fully reversible, and is visible within 30,000 acres (40%) of a SCA, and related road construction may cause the permanent and irreversible loss of a rock outcropping visible over 15,000 acres (20%) of the same SCA.
5. The level of each impact is determined (see Section 6.4), such as the minimal visibility of a project judged to constitute a minor impact.

In addition to the seascape/landscape assessment and the project description (used to evaluate the compatibility of the project with the character of the potentially affected seascape/landscape), a variety of tools can be used as aids in assessing seascape/landscape impacts, including viewsheds, wireframe views, photos of existing character elements or of similar projects, simulations produced for the VIA (see Section 7.4.4), and any simulations developed specifically for the SLIA.

All impacts considered likely to occur are described as fully as possible, and their locations are mapped wherever possible and illustrated with photos and simulations where appropriate. Because evaluations of the nature of the impact and the likely impact level are based on professional judgment, the SLIA provides sufficient *relevant* detail and appropriate visualizations (where feasible) so that as much useful information as possible is available when the judgments are being made, and the information used in the assessment is documented and available for review.

6.4 Evaluation of Impacts

This section explains the evaluation of seascape and landscape impacts and the factors that are considered in the evaluation. This is a key step in the SLIA process.

6.4.1 Introduction

A decision by BOEM to approve the COP for a proposed offshore wind energy project rests in part on the extent and importance of the various potential impacts from the project, considered for all resources examined in the EIS. Both the offshore and onshore components of an offshore wind facility could create seascape and landscape impacts, and for both offshore and onshore components the degree of impact (referred to as the *impact level*) is evaluated.

Assessing the impact level of seascape/landscape impacts is ultimately a matter of professional judgment. In general, a large loss or irreversible adverse impact over an extensive area, on elements and/or aesthetic and perceptual aspects that are key to the character of highly valued seascapes or landscape, is likely to be considered a major impact. On the other hand, reversible adverse impacts of short duration over a restricted area, on elements and/or aesthetic and perceptual aspects that contribute to but are not key characteristics of the distinctive character of seascapes/landscapes of lower value, are likely to be judged to be less important. Regardless of the judgment made, the basis and reasoning for the judgment should be documented and clearly explained, so that stakeholders have a good understanding of how the judgments were made and the rationale behind them.

The impact level is a function of both the impact receptor and the nature of the impact. The key factors are referred to as the *sensitivity* (see Section 6.4.2) of the receptor and the *magnitude* of the effect (see Section 6.4.3). The sensitivity factor has two components: *susceptibility* and *value*. The magnitude factor has three components: the *size and scale* of the change to existing conditions caused by the project, the *geographic extent* of the area subject to the project's effects, and the effect's *duration and reversibility*. Each factor and its components are rated on an ordinal scale with three levels, which in some cases use different terms for semantic reasons but are considered equal in importance; in other words, a rating of "high" is considered equivalent in importance to a rating of "large" or "good." Similarly, a rating of "low" is considered equivalent to a rating of "small" or "poor." These relationships are shown in **Table 6-1**.

Table 6-1. Impact rating factors, components, and importance levels

Factor	Component	Importance level
Receptor sensitivity		High, medium, low
	Susceptibility	High, medium, low
	Value	High, medium, low
Impact magnitude		Large, medium, small
	Size and scale of effect	Large, medium, small
	Geographic extent of effect	Large, medium, small
	Duration and reversibility	Good, fair, poor

6.4.2 Sensitivity of Seascape/Landscape Receptors

The sensitivity of a seascape/landscape impact receptor is dependent on its susceptibility to change and its perceived value to society.

6.4.2.1 Susceptibility to Change

The susceptibility of a seascape/landscape receptor to change is its ability to accommodate the impacts of the proposed project without substantial change to the basic existing characteristics of the seascape/landscape (as described in the Affected Environment section). This applies to the overall character of a particular seascape/landscape area, or an individual element and/or feature, or a particular aesthetic, experiential, and perceptual aspect that contributes to the character of the area.

For example, the character of a historic district with a high level of historic integrity in buildings and other landscape elements might be highly susceptible to effects from a visible modern development that would clash very conspicuously with the landscape character and possibly the aesthetic aspect of the area. On the other hand, the character or aesthetic aspect of an area of mixed modern and historic elements might be less affected by visible new development that is similar in character to some existing development in the area.

The judgment about susceptibility of the receptor to a particular project impact is recorded on an ordinal scale of high, medium, or low, but the determination should be documented and should be based on and consistent with the information provided in the Affected Environment section.

6.4.2.2 Value of Seascape/Landscape Receptors

As discussed in Section 6.2.1, seascapes, landscapes, and their features/elements and aspects have values associated with them by society, and these values are identified as part of the seascape and landscape assessments.

In general, areas of seascape/landscape are likely to be highly valued when their character is judged to be distinctive and where scenic quality, wildness or tranquility, and natural or cultural heritage features make a particular contribution to the seascape or landscape.

Judgments about the relative value of seascapes/landscapes and their components are based on special designations (where they exist), usually in a Federal/state/local hierarchy, but also include other aspects, such as tourism value, locally held values, cultural and historic values, and so on. In areas where seascape/landscape character is valued, when a judgment is being made about the relative value of individual seascape/landscape features and elements and their aesthetic, experiential, or perceptual aspects, special consideration is given to key characteristics—that is, those components that contribute significantly to the distinctive character of the SCA/LCA.

As is the case for susceptibility, the judgment about value of the receptor is recorded on a ordinal scale of high, medium, or low, and the finding should be documented clearly and should be based on and consistent with the information about receptor value provided in the Affected Environment section.

6.4.3 Magnitude of Seascape/Landscape Impacts

The magnitude of an impact on a seascape or landscape depends on the size or scale of the change associated with the proposed project, the geographic extent of the change, and the duration and reversibility of the change.

6.4.3.1 Size or Scale of Change

A judgment is made regarding the degree of change from loss, addition, or alteration of character, features, elements, or aesthetic, experiential, or perceptual aspects of the seascape/landscape likely to occur from the impact under consideration. The change is described, and an assessment is made as to whether the degree of change is large, medium, or small. Considerations include changes to the physical elements of the seascape/landscape, its aesthetic, experiential, and perceptual aspects, and the key characteristics of the seascape/landscape critical to its distinctive character. Note that "size or scale" does *not* refer to the size or scale of the project per se; rather it refers to the size or scale of the change, that is, whether it is a large, medium, or small change with respect to the potentially affected SCA or LCA. Of course, the greater visibility of a large project may contribute to a larger change with respect to seascape/landscape character, or to other valued aspects of a seascape or landscape, but size or scale here refers to the degree of change from existing conditions, not necessarily the actual or apparent size of the project.

For impacts on physical elements, considerations include the total extent of additions, losses, or alterations, the proportion of each with respect to the whole SCA/LCA, and the importance of the affected element to the character of the seascape/landscape. For impacts on aesthetic, perceptual, and experiential aspects of the seascape/landscape, the judgment is made about the degree to which these aspects are affected by the losses, additions, and alterations of features or elements to the seascape/landscape, such as alteration of open skylines by wind facilities. A judgment is also made about the degree to which the impact affects the key characteristics that are critical to the seascape's/landscape's character.

The judgment about size or scale of the impact is documented and justified by information provided in the COP, the Affected Environment section, and applicable research.

6.4.3.2 Geographic Extent

The assessment of impact magnitude also includes consideration of the geographic extent over which the impact will be experienced. For seascape/landscape impacts from offshore wind projects, the geographic extent of most impacts (which ultimately is associated with visibility of the project) is related to the project viewshed, although the potentially affected area may be smaller than the ZTV. For a particular SCA/LCA, the geographic extent of the impact is expressed quantitatively as acreage or square miles within view of the project and also as a percentage of the total area of the SCA/LCA.

The judgment about the geographic extent of a particular impact is recorded on an ordinal scale of large, medium, or small and is documented and justified by information provided in the COP, the Affected Environment section, and applicable research.

6.4.3.3 Duration and Reversibility of Impacts

The third element of assessing the magnitude of a particular impact is the consideration of its duration and reversibility, that is, the length of time over which the impact is likely to occur and the degree to which the currently existing conditions are restored after the impact ceases.

Duration is recorded on an ordinal scale of *short term* (less than 5 years), *long term* (5–30 years), or *considered permanent* (more than 30 years). The judgment regarding duration should take into consideration any residual impacts remaining after decommissioning. Reversibility is recorded on a verbal scale of *nonreversible*, *partially reversible*, or *fully reversible*.

In the assessment of impact level, duration and reversibility are considered together and recorded on a verbal scale of *good*, *fair* and *poor*, with *good* combining short duration with full reversibility, and *poor* combining *considered permanent* with *nonreversible*.

6.4.4 Combining Components to Determine Sensitivity and Magnitude Factors

Once the components for receptor sensitivity (*susceptibility* and *value*) and impact magnitude (*size and scale*, *geographic extent*, and *duration and reversibility*) are rated, the components are combined into the sensitivity and magnitude factor values. As general guidelines for combining the sensitivity component ratings, the combination matrix shown in **Table 6.4-1** is recommended but is subject to change in consideration of individual project circumstances.

Table 6.4-1. Matrix for combining sensitivity components

Value Rating	Susceptibility Rating		
	High	**Medium**	**Low**
High	Sensitivity = high	Sensitivity = high	Sensitivity = medium
Medium	Sensitivity = high	Sensitivity = medium	Sensitivity = low
Low	Sensitivity = medium	Sensitivity = low	Sensitivity = low

As a general guideline for combining the magnitude components, the combination matrix shown in **Table 6.4-2** is recommended but is subject to change in consideration of individual project circumstances.

Table 6.4-2. Matrix for combining magnitude components

Size and Scale Rating	Geographic Extent Rating								
	Large	**Large**	**Large**	**Med**	**Med**	**Med**	**Small**	**Small**	**Small**
Large	Mag=L	Mag=L	Mag=L	Mag=L	Mag=L	Mag=M	Mag=L	Mag=M	Mag=S
Med	Mag=L	Mag=L	Mag=M	Mag=M	Mag=M	Mag=S	Mag=M	Mag=S	Mag=S
Small	Mag=L	Mag=M	Mag=S	Mag=M	Mag=S	Mag=S	Mag=S	Mag=S	Mag=S
Duration/Reversibility Rating									
	Poor	Fair	Good	Poor	Fair	Good	Poor	Fair	Good

6.4.5 Combining Sensitivity and Magnitude Factors to Determine Impact Level

Once the sensitivity and magnitude factors for an individual SCA or LCA have been determined, they are combined into an overall finding of *major*, *moderate*, *minor*, or *negligible* impact for the SCA or LCA. As a general guideline for combining these two factors, the combination matrix shown in **Table 6.4-3** is recommended but is subject to change in consideration of individual project circumstances.

Table 6.4-3. Matrix for combining sensitivity and magnitude to identify impact level

Sensitivity Rating	Magnitude Rating		
	Large	Medium	Small
High	Impact level = major	Impact level = major	Impact level = moderate
Medium	Impact level = major	Impact level = moderate	Impact level = minor
Low	Impact level = moderate	Impact level = minor	Impact level = minor

A finding of *negligible impact* is warranted when there are minimal impacts; that is, the project is not visible or is barely visible, or the potentially affected area is very small, and the other metrics are at medium or low values.

The results of the impact assessment are documented via a matrix that shows each impact considered, its receptors with sensitivity and component value/susceptibility ratings, the impact and its magnitude and component size/scale, geographic extent, and duration/reversibility ratings, and the impact level determined for that impact. An example matrix for seascape/landscape impact level determination for a fictitious SCA is shown in **Table 6.4-4.**

Table 6.4-4. Example impact matrix for a hypothetical SCA: Cape Oceanview SCA

Sensitivity factor		Rationale		Magnitude factor		Rationale
Susceptibility	Medium	Area is mostly natural-appearing, but modern high-rise residential buildings, some roads, boardwalks, and other evidence of humans are visible from much of the area.		Size or Scale	Small	Project will add an obvious human-made element to an otherwise undisturbed seaward view, but other more prominent human-made elements are visible within and around area. Potential minor aesthetic effects.
Value	High	Within National Seashore and contains buildings and structures on National Historic Places Register. Contains large tracts of apparently undisturbed land valued for recreation. Heavily visited, so few opportunities for solitude.		Geographic Extent	Medium	Entire project will be visible from approximately 40% of SCA. Partial views from an additional 40% of SCA.
Sensitivity rating	High	Highly valued and heavily used recreation and historic area, but with some obvious modern human-made elements visible in most views.		Duration/ Reversibility	Fair	Long term (30 years). Fully reversible.
				Magnitude rating	Small	As seen from most of SCA, project would have minor aesthetic effect because of distance (18 nm). Long-term impact.

Sensitivity factor		Rationale		Magnitude factor		Rationale
Overall impact level: moderate				Rationale**:** The SCA is highly sensitive, and the project would be clearly noticeable (where visible) in views toward the sea and in seaward views from historic buildings in the SCA. However, the project would be a minor element that would not have a major effect on the SCA's character or key characteristics.		

6.4.6 Summarizing Impacts for Multiple SCAs and LCAs

The impacts of the project on seascape and landscape resources are presented in a summary matrix that includes the impacts for all SCAs and LCAs included in the assessment. The matrix shows each SCA and LCA considered, its receptors with sensitivity and component value/susceptibility ratings, the impact source, and the impact level determined for each SCA and LCA.

7 Visual Impact Assessment

Chapter 7 describes the process used for the VIA.

7.1 Introduction and Summary

As noted in Section 2.3, the VIA for an offshore wind project assesses the impacts of adding the proposed development to views from selected viewpoints (referred to as key observation points or KOPs). The VIA assesses how the change to the view itself caused by the addition of the wind energy project components, such as seeing wind turbines instead of an open ocean horizon, affects people who are likely to be at the viewpoint. The change to the view as a result of adding the proposed project may affect viewers' experience of that particular view. How the addition of the project to the view affects the viewers' experiences and their responses depends in part on who they are, what they are doing when viewing the facility, and how much they value the view. The experience of a particular view is dependent on the viewers, and in the VIA, the impact receptors are people, rather than the seascape or landscape itself.

The VIA also requires a description of the affected environment, including identifying important views and viewpoints that would likely have visibility of the project, and information about the impact receptors, that is, the people who would likely experience the views.

The VIA uses verbal descriptions and visual simulations (realistic representations of what the operating project would look like from a given viewpoint) to characterize the change to the valued views from the relevant viewpoints as well as more general views of the project, and this information is combined with information about the potentially affected viewers to determine the likely effects on people's enjoyment of the views and the visual experience of their surroundings. The VIA process is summarized in **Figure 7.1-1**.

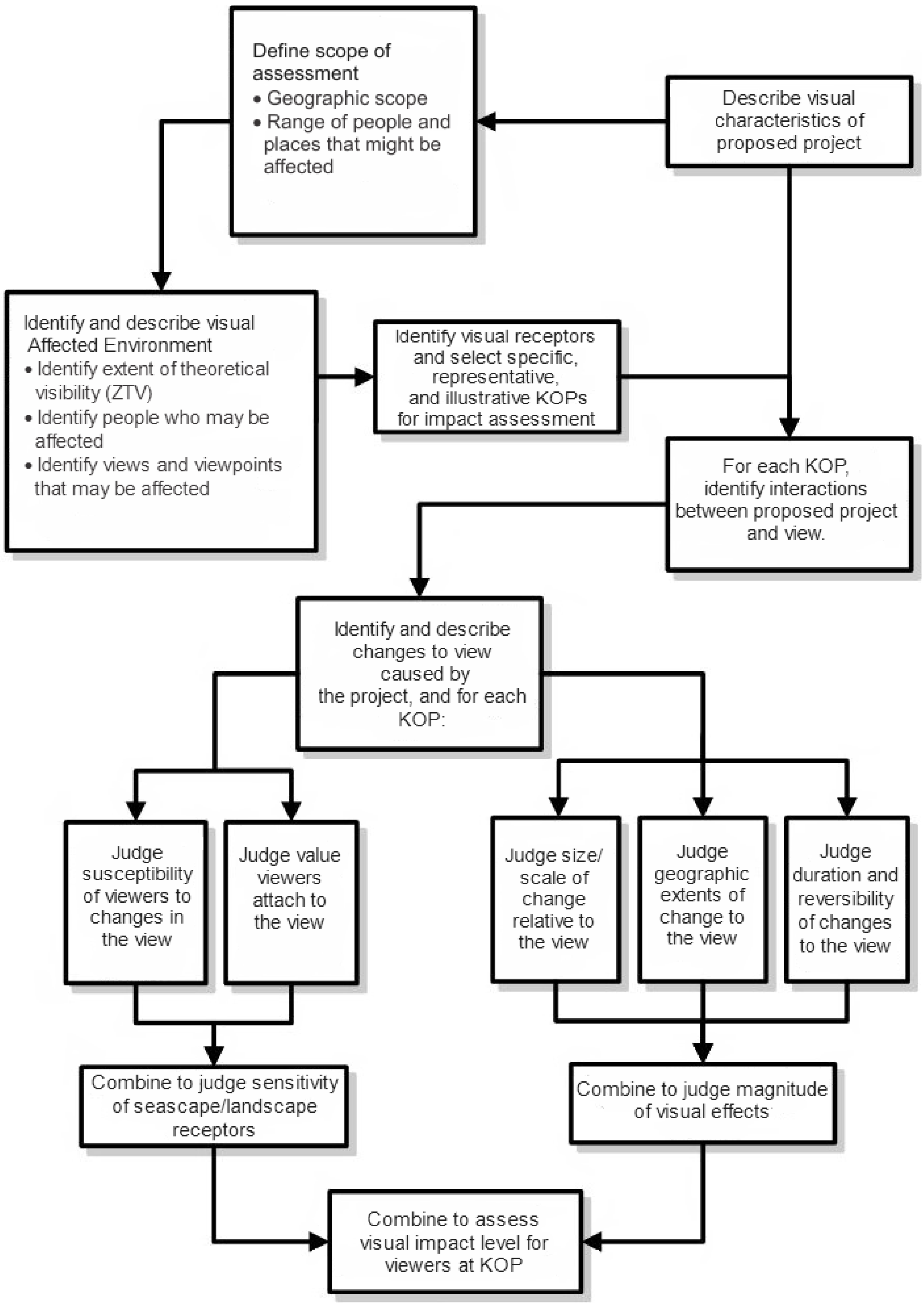

Figure 7.1-1. VIA process (after LI and IEMA 2013, 99)

7.2 Visual Impact

Visual impact includes three types of effects:

1. **Visual contrast created by the addition of project elements and associated activities to an existing view.** *Visual contrast* is the difference in color and brightness between objects in a view that allows them to be distinguished from each other. Visual contrast can be created when elements of a proposed project are added to an existing view—it is what makes the project visible to the viewer. For example, if wind turbines are introduced into a sea view, the introduction of the tall shapes of the towers, their white color, long vertical lines, smooth textures, moving blades, and flashing lights at night create visual contrasts that may be readily apparent to viewers. In general, where added project elements repeat the forms, lines, colors, and textures of the existing seascape or landscape (including both natural and built elements), the visual contrasts created by the project will be low. Where the project elements have forms, lines, colors, and textures dissimilar to their surroundings, visual contrast will be higher. The creation of visual contrast can change the scenic qualities of the view, for example, by increasing visual variety and complexity, adding or changing focal points, or reinforcing or upsetting the visual "balance" or harmony of the view. To continue the wind energy example above, if the structure of the existing ocean view is visually simple and dominated by the horizon line, the introduction of tall, white wind turbines into the sea view may change the view to one dominated by the vertical elements of the wind turbine towers and the movement of the turbine blades.
2. **The effect of visual contrast on viewers' experience of the view.** Changes to the view may affect the viewers' *visual experience*. The degree to which the visual experience of the view is affected varies for different viewers and depends in part on the activities in which viewers are engaged while they experience the view. Some viewers, such as landscape photographers, may be very focused on the scenery, while others may be engaged in activities that are not focused on or dependent on scenery, such as picnicking, reading, or engaging in team sports. These activities may affect the time spent viewing the landscape and the visual attention devoted to it, as well as the perceived importance of the scenic quality of the view.
3. **The viewers' response to the effects on their experience.** *Viewer response* to the changes to their experiences may be positive or negative. If viewers feel that the change to the view caused by the addition of the project improves their experience, they will perceive the project's visual impact as positive. If viewers feel that the change to the view worsens their experience, they will perceive the project's visual impact as negative. Some viewers may experience the addition of wind turbines as an improvement to the view, perhaps because it adds visual interest, a pleasing focal point, and a dynamic quality to an otherwise basically static scene. For these people, the visual impact of the wind turbines is positive. Other viewers may experience the wind turbines as adding visual clutter or interfering with the unbroken view of the sea they enjoy. For these viewers, the visual impact of the wind turbines is negative. Both viewer reactions are human responses to the changes in the visual quality of the view caused by the introduction of the project.

In essence, in the VIA for BOEM-reviewed offshore wind projects, the assessment does the following:

- Identifies and describes the nature and extent of visual contrasts caused by the proposed project in important views;
- Determines the resulting changes to the visual qualities of the views and the potential effects of these changes on the visual experience of people at the viewpoint; and
- Assesses the likely response of the viewers to the change in their visual experience.

7.3 Affected Environment Description and Impact Receptor Identification

The VIA requires an analysis of the affected environment, which includes the following:

- Includes fieldwork to check the viewshed analysis results to further establish the area from which the development may be visible;
- Identifies and describes the visual properties of the project area (both offshore and onshore);
- Identifies the different groups of people who may experience views of the project;
- Identifies important views and viewpoints from which the project components would be visible;
- Identifies certain views and KOPs to be used in the impact assessment;
- Describes the nature of the view toward the project area from each KOP; and
- Identifies applicable LORs.

7.3.1 Project Area Description

The Affected Environment section of a VIA for a BOEM-reviewed offshore wind project includes a detailed description of the physical environment in which the project is sited, the visual properties of the project area, and its scenic quality. Any designated areas within the project viewshed identified as part of the SLIA affected environment description are also reviewed. Any important viewpoints, such as scenic overlooks, historic sites or trails, or sacred sites, are identified and described, as points within these areas are typically used as KOPs in the impact assessment (see below). During the scoping process, agencies and local stakeholders are consulted to identify important views and viewpoints, including those from undesignated visually sensitive areas, such as residential areas.

The discussion of visual properties and scenic quality describes the project area in terms of the basic design elements of form, line, color, texture, scale, and motion. For projects on non-private lands administered by agencies with visual resource management programs or recommended practices, the appropriate scenic quality inventory units and descriptors should be referenced. For example, for onshore components of projects on United States Forest Service (USFS) lands, scenic classes, user concern levels, and scenic integrity information and maps should be presented and discussed, and the landscape’s visual qualities should be discussed in terms appropriate to the USFS Scenery Management System (USFS 1996). Similarly, for onshore components of projects on USDOI Bureau of Land Management (BLM) administered lands, scenic inventory classes, visual resource management classes and maps should be presented and discussed, and the landscape’s visual qualities should be discussed in terms appropriate to the BLM Visual Resource Management System (BLM 1984).

The discussion includes an assessment of night skies and natural darkness. The level of existing lighting is identified and described, with photographs. Any important views and viewpoints related to night skies (e.g., a location for “star parties” or amateur astronomical events) or natural darkness are identified.

Cultural and historic heritage resources are considered in the VIA affected environment analysis because of the potential effects of views of the project on enjoyment or appreciation of these resources. For example, views from historic sites that are important to persons visiting these sites for recreational or educational purposes, or seascape views important to Native American tribes, are included in the VIA, and generally are not included in cultural resource impact assessments (Sullivan, Meyer, and O'Rourke 2018). Consultation with cultural resource professionals is used to identify important viewpoints and their associated values, as well as the nature and approximate numbers of people who may visit or use the cultural/historic resources.

7.3.2 Visual Impact Receptors

Information about the visual impact receptors (typically referred to as *viewers*) is critical to an accurate VIA. Understanding the characteristics of viewers is important because the project's effects on the viewer experience and the viewer response to these effects contribute to the visual impact. Viewer information included in the VIA affected environment analysis falls into five broad categories:

1. *Knowledge about the likely number of viewers***.** In general, it is assumed that if other factors are held constant, the size of the impact is directly proportional to the number of viewers; that is, for a given project viewed from a given location, if there are more viewers, the impacts are greater, and if there are fewer viewers, the impacts are lower. Seasonal variability in viewer numbers is noted.
2. *Knowledge about the likely frequency and duration of views.* It is assumed that if other factors are held constant, the size of the impact is directly proportional to the frequency and duration of views of the affected landscape; that is, longer or more frequent viewing is associated with greater impacts, and shorter or less frequent viewing is associated with lower impacts.
3. *Knowledge about the viewers' familiarity with the landscape in which the proposed facility is located***.** It is assumed that people who live in or near the project area or are regular visitors may be more "invested" in the existing view, that is, develop a feeling of attachment or "ownership" that makes them more sensitive to changes in the view than people who are less familiar with the landscape and therefore are less "attached" to the view.
4. Knowledge about the activities in which the viewers are engaged while viewing the landscape in which the proposed facility is located**.** It is assumed that certain activities that involve more active viewing of the seascape/landscape may depend more on the visual quality of the seascape or landscape for maximum enjoyment, which could lead to greater sensitivity to changes in views. For example, people who are visiting a scenic overlook specifically to enjoy the view are more likely be engaged with their visual surroundings and concerned about seascape/landscape visual quality as part of their experience. Thus they may be more sensitive to changes in the view than people engaged in an active recreational activity, such as playing volleyball at a day-use area, where the scenery functions as a backdrop for their recreational activity.
5. *Knowledge about viewer concern for the landscape in which the proposed facility is located.* While the extent to which viewers would potentially be concerned about visible changes to the seascape/landscape in which the proposed facility is located can be inferred (to a degree) from the information discussed in items 1 through 4, any specific and direct statements of concern for the project area from visitors, interest groups, and other stakeholders are sought through stakeholder forums, government-to-government consultations, and user surveys.

For each KOP, potential viewers and their sensitivities are described to the extent such information is available. The number of viewers per year is specified or estimated, and the types of viewers (e.g., residents, hunters, hikers, and birdwatchers) are identified, along with seasonality of use. The degree of potential visual sensitivity of the viewer groups is discussed as well.

7.3.3 KOP Selection and Description

The viewshed analysis is checked by field visits and refined to eliminate (where warranted) viewpoints that do not currently have visibility of the project area and to add viewpoints where imperfections in the viewshed analysis incorrectly resulted in a finding that the project or activity would not be visible. The important viewpoints (KOPs) from which the project components will be seen by people are identified as viewpoints to be used in the assessment. They typically include the following:

- Scenic overlooks and other viewpoints within specially designated areas;
- Roads, trails, and other transport routes (on land and on sea);

- Places where people work;
- Places where people engage in recreational activities; and
- Places where people live, that is, residential areas.

The KOPs to be used in an assessment of visual effects may be selected initially through discussions with BOEM staff, staff from other agencies, and other interested parties both at the scoping stage and through subsequent stakeholder involvement activities. However, selection is also informed by the viewshed analysis, by fieldwork, and by desk research. At each potential KOP, baseline photographs are taken to record the existing views.

As noted in GLVIA3 (LI and IEMA 2013), KOPs selected for inclusion in the assessment and for illustration of the visual effects fall broadly into three groups:

1. Specific KOPs are chosen because they are known locations where the view is valued, such as scenic overlooks in parks or on roadways, historic buildings, and recreation beaches
2. Representative KOPs are chosen to represent the general nature of views of users of a larger area that lacks specific viewpoints, such as some wilderness areas, or a linear feature, such as a scenic trail. Representative KOPs are not randomly selected locations. Whenever possible, points that people are known to visit are selected as representative KOPs; otherwise, KOPs are chosen to show typical views within the area where views differ in their characteristics, e.g., at different distances, in different terrain, or with different vegetation types. Representative KOPs may also be useful as points for assessing seascape and landscape impacts, as they can be selected to represent views from areas of particular seascape or landscape character.
3. Illustrative KOPs are chosen specifically to demonstrate a particular effect or specific issues, such as the restricted visibility at certain locations of great concern to stakeholders, e.g., a nationally significant historic site.

Depending on the project, it may not be necessary to analyze all the potential KOPs identified in the affected environment analysis in the VIA, and a subset may be selected for full analysis in the impact assessment. The selection of the final KOPs used for the VIA takes into account a range of factors, including the following:

- Accessibility to viewers;
- The potential number and sensitivity of viewers who may be affected;
- The viewing direction, distance (i.e., short-, medium-, and long-distance views), elevation, and seasonal differences in visibility;
- The nature of the viewing experience (e.g., static views, views from residential areas, and brief glimpses from sequential points along routes);
- The view type (e.g., panoramas, focal views, and enclosed views);
- The potential for simultaneous views of the proposed development and other developments; and
- Absence of screening in the immediate foreground that would obscure the view of the project.

The KOPs used should cover as wide a range of situations as is reasonably possible and necessary to cover the likely range of effects. The reasons for selecting the KOP should be described, e.g., it is a designated scenic viewpoint, it represents a typical view from a residential area, or it is a view from a heavily visited day-use area. For representative KOPs, information should be provided about the degree to which the KOP is representative of a larger area, such as specifying how much and which segments of a scenic trail are subject to views similar to that seen from the KOP. For each selected KOP, a view description is also prepared that provides the photopoint location (the exact location from which photographs are taken that represent the view from the KOP), view direction, distance to project, likely viewer types and numbers, the nature and composition of the view, visible existing development, and other information necessary to assess the visual contrasts caused by the project, the effects of those contrasts on the view, and the likely impacts on the viewers (see Section 7.4.5, and Section 7.5).

7.3.4 Laws, Ordinances, and Regulations

Depending on the project location, a variety of Federal, state, and local LORs and agency policies concerning visual resource protection and management may apply to offshore wind projects. As noted in Section 6.2.3, an early step in the full SLVIA process is to gather and review applicable LORs and agency policies for both the SLIA and the VIA. The applicable LORs are described in the VIA.

7.4 Identification and Description of Potential Visual Contrasts and Impacts

This section discusses the methodology for identifying the visual contrasts and impacts that would be created by the proposed project.

7.4.1 Introduction

As noted in Section 7.2, the VIA bases the assessment of visual impacts in part on the identification and description of visual contrasts caused by the introduction of project components into the views. To the extent that the forms, lines, colors, and textures of the project, along with its size and any motion it exhibits, differ from these same properties in the project's visual backdrop, visual contrast is created. Depending on its apparent size, relative scale, and spatial relationship to other elements in the view, the contrast may have a noticeable effect on the quality of the view perceived by viewers, who may regard the change to the view as a positive or negative impact. Visual simulations are used as important aids in identifying visual contrasts.

7.4.2 Impacts Included in VIA

Positive and negative, temporary and permanent impacts of a proposed offshore wind energy development, including any effects that occur later in time or further removed in distance, as well as any RFPA effects are identified and considered in the VIA. For each view, the visual impacts from development can generally be described as arising from the change or loss of existing visual elements or features, the addition of elements or features, or the combined effects of changes, losses, and additions of elements or features on the view at a KOP.

The project components included in the VIA are listed in Section 2.5. Impacts are identified and described for all phases of the project (including residual impacts that may remain after project decommissioning), for both daytime and nighttime conditions, and for all alternatives that differ substantially in their visible characteristics.

7.4.3 Describing Visual Impacts in the Assessment

The description of each project component included in the VIA and each phase of the project includes the following:

1. The general nature of the contrast and resulting visual impact is identified.
2. The contrasting component of the project is identified, as well as the properties of the component that cause or are relevant to the visual contrast, such as the vertical line contrast of the turbine towers with the horizon line, color contrast between wind turbines and backdrop, visibility of blade motion, flashing lights, and clearing of vegetation.

3. The impact receptor(s) is/are identified and described, including susceptibility and value (see below).
4. The magnitude of the impact is described in terms of the scale and size of the visual change, geographic extent, duration, and reversibility (see Section 7.5).
5. The level of each impact is evaluated (see Section 7.5).

All impacts considered likely to occur are described, and their locations are mapped wherever possible and illustrated with example photos from other existing facilities where appropriate. Because identifying the nature of the impact and the likely impact level is based on professional judgment, the VIA provides sufficient *relevant* detail and appropriate visualizations (where feasible) so that as much useful information as possible is available for the judgments, and the information used in the assessment is documented and available for review.

7.4.4 The Use of Visual Simulations to Determine Potential Visual Contrasts

In VIAs for BOEM-reviewed offshore wind projects, professionally prepared photographic-quality visual simulations (photosimulations) and video simulations of the operating project and its surroundings are used as aids in visualizing the appearance of the proposed project for the purpose of identifying visual contrasts. The simulations are used in the field, at the KOP, in order to make judgments about potential visual contrasts.

Simulations are generally prepared only for the operations phase of the project. Visual contrasts of other phases of development may be shown in photographs of similar existing projects.

Visual simulations are typically the primary basis for determining the visual contrasts associated with operating renewable energy facilities in VIAs, although they are not the only basis for contrast assessment. Typically, analysts rely heavily on the visual simulations prepared for the VIA as the basis for contrast determination, in part because the simulations are the most realistic available representation of what the project will actually look like when it is built. However, while simulations are a very useful tool for visual contrast assessment, they have important limitations and may be subject to various errors both in production and in presentation. They do not always portray contrasts accurately, and in some situations they may tend to under- or overrepresent contrasts (Sullivan and Meyer 2014). Thus, they are not the only basis for contrast determination in a VIA for a BOEM-reviewed offshore wind project.

For the SLVIA, simulations are supplemented by documented knowledge of such variables as typical atmospheric conditions, prevailing winds, and direct experience repeatedly observing wind farms in the field. While not shown in a simulation, noting and considering the effects of all the visibility factors in the impact assessment, such as the number of days per year during which a project would be expected not to be visible because of atmospheric conditions, is critical to accurately understanding the full extent of the potential visual contrast. Photographs and site visits to existing offshore wind projects can also be very useful for evaluating potential visual contrast.

Best practices for photosimulations are discussed in detail in NPS's publication *Evaluating Photosimulations for Visual Impact Assessment* (Sullivan, Meyer, and Palmer 2021); however, key principles for producing accurate, realistic, and useful photosimulations include the following:

- **Photosimulations must be spatially accurate.** All project and other elements must be shown in the right locations, at the right size, and in correct visual perspective.
- **Photosimulations must be realistic.** Photosimulation should look like a high-quality photograph of a real project.
- **Photosimulations must depict important views.** The views depicted in photosimulations must include views important to stakeholders, based on stakeholder consultation.

- **Photosimulations must depict the "worst case lighting scenario."** Photosimulations should depict weather and lighting conditions that show the maximum visual contrast that could reasonably be expected on a regular basis, supplemented by views showing other conditions where necessary.
- **Photosimulations must be properly presented and documented.** Photosimulations must be accompanied by detailed and accurate viewing instructions as well as thorough documentation of the photosimulation process and the photosimulations themselves.

7.4.5 Identification of Visual Contrasts

This section describes the types of contrast the project may create and how they are considered in the contrast assessment. Additional guidance from BOEM on conducting visual contrast assessments is forthcoming.

7.4.5.1 Changes in Form, Line, Color, Texture, Scale, and View Composition

The description of contrasts centers on the simulations; that is, a narrative is prepared for each simulation. Contrasts are described in terms of changes to *form, line, color, and texture*. Effects of the project on scale relationships and composition of the view are also described and assessed, as well as potential changes resulting from the motion of project components. Effects on view composition may include the following:

- Increasing or decreasing the level of visual complexity;
- Disrupting or reinforcing the spatial balance between view elements;
- Changing the view focus or adding focal points that draw visual attention away from existing elements; or
- Introducing new visual elements that are inconsistent with existing elements, such as lighting at night in an otherwise dark area or the introduction of visible motion in an otherwise static view.

The assessment compares those characteristics for the project area before and after implementation of the project, describing the important differences between the "before" and "after" characteristics. The magnitude of the potential contrasts or effects expected is included: "weak contrasts/minor effects," "strong contrasts/major effects," and the like. The description includes the expected duration of the visible effects and how they would change over the lifetime of the project and afterward.

As noted above, simulations are generally prepared only for the project operations phase; however, the VIA includes a detailed discussion of the expected visual contrasts and other effects resulting from the construction and decommissioning of the proposed facility and associated activities (e.g., boat and helicopter traffic) as they would be observed from each of the KOPs, regardless of whether they are KOPs for which simulations are presented in the VIA.

The assessment also addresses any significant changes in visual contrast expected because of seasonal effects, such as leaf drop, changes in vegetation color, or the presence of snow. Any important changes in the appearance of the facility in the course of the day are described. These could include the occurrence of glinting and glare from facility components, silhouetting of components against the rising or setting sun, or contrast variation resulting from the changing sun angle and sky color at different times of the day.

7.4.5.2 Effects from Motion and Lighting

Turbine blade motion can be a significant attractant of visual attention (University of Newcastle 2002; Coates Associates 2007; Sullivan et al. 2012a, 2013a), increasing the noticeability of wind farms. Blade movement cannot be shown in photosimulations based on still photography, so video-based simulations depicting blade motion are also prepared for VIAs for BOEM-reviewed offshore wind projects, although not necessarily for all views for which photosimulations are prepared. Video-based simulations are provided so that simulation evaluators have a basis for judging the increased impacts that may result from blade motion where it is visible. Note that the resolution of video simulations is more limited than that achievable with high-resolution photosimulations, introducing some degree of nonrealism to the video simulation.

Similarly, video simulations are prepared for nighttime views, because at least some of the lighting on wind farms is flashing lighting (Orr et al. 2013). Flashing generally increases the visibility of lighting (Bullough 2011), and showing simulations that omit the flashing of aviation obstruction lighting and marine navigation lighting would likely underrepresent the visibility of the lighting of the operating facility. The VIA includes video-based simulations of facility lighting at night so that simulation evaluators have a basis for judging the increased impacts that may result from flashing lighting, where it is visible. As for blade-motion simulations, video-based simulations for nighttime views would not necessarily be provided for all views for which photosimulations are prepared.

7.4.6 Flexibility for Inclusion of Simulations in Assessment

In more sensitive situations, the VIA depicts additional seasons, times of day, and lighting conditions in simulations. However, high-quality simulations are expensive and time-consuming to produce. A reasonable balance should be achieved between producing enough simulations to show the range of impacts from all important KOPs and other typical viewing situations and spending excessive money and time either producing or redoing simulations that do not add significantly to an understanding of the impacts. For example, where potential KOPs are closely spaced and have very similar views of the project, the VIA may include one representative simulation rather than multiple simulations that show essentially the same view and visual contrasts.

Similarly, the use of simulations to show negligible or no visual contrasts is to be avoided except for highly sensitive KOPs. The use of simulations for viewpoints without visibility of the project is to be entirely avoided, unless visibility is questionable (because of possible screening, not because of atmospheric conditions), and it is necessary to show a lack of visibility of the project from a place of particular concern to stakeholders.

7.4.7 Discussion of Weather and Visibility

The VIA also usually includes a discussion of weather and visibility. Because offshore wind farms are generally several miles or more off the coast, there are usually some weather conditions, such as fog, in which visibility of the wind farm is limited or nonexistent. Average visibility conditions can be determined and discussed in the VIA but are only one consideration in the determination of potential impact, in part because on average more people tend to view the ocean from the seacoast and other viewpoints during clearer weather conditions.

7.5 Evaluation of Impact Levels

This section explains how the visual impact levels (major, moderate, minor, or negligible) of recorded impacts are evaluated and the factors considered in identifying the levels.

7.5.1 Introduction

As noted in Section 6.1, the impact level is a function of both the characteristics of the impact and the impact receptor. As is the case for the SLIA, in the VIA the key characteristics are referred to as the *sensitivity* of the receptor and the *magnitude* of the impact. Sensitivity is broken down into *susceptibility* and *value*, while magnitude is broken down into *size/scale, geographic extent*, and *duration and reversibility* of impacts. Although the general approach to determining impact levels is similar for the SLIA and the VIA, because the impact receptors are different there are some differences in exactly what is assessed at the detailed level. The receptors for visual impacts are always people, while the receptors for SLIAs are the seascapes and landscapes themselves.

7.5.2 Sensitivity of Visual Receptors

The sensitivity of a visual impact receptor (a person or group of people) is dependent on their susceptibility to change in particular views and also on the value they place on those views.

7.5.2.1 Susceptibility to Change

Impacts on people who are particularly sensitive to changes in views are more likely to be considered important than the same impacts would be to someone who is less sensitive to the quality of views. The relative susceptibility of viewers to changes in views is primarily a function of the degree to which the activities in which the viewers are engaged focus attention or interest on the seascape/landscape view.

As noted in GLVIA3 (LI and IEMA 2013), the visual receptors most susceptible to change may include the following:

- Residents with views of the proposed project from their homes;
- People engaged in outdoor recreation whose attention or interest is likely to be focused on the seascape/landscape and on particular views;
- Visitors to historic or culturally important sites, where views of the surroundings are an important contributor to the experience;
- People who regard the visual environment as an important asset to their community; and
- People traveling on scenic highways, railroads, or other transport specifically for enjoyment of views.

In addition, people with a strong cultural, religious, or spiritual connection to landscape or seascape views, for example, Native American tribes, may also be highly sensitive to changes to these views.

For example, landscape photography requires close attention to the features of the seascape/landscape, and photographers may therefore be very sensitive to changes in the elements of a particular view they wish to photograph. Hikers may be very interested in particular views from scenic overlooks. Those interested in historic battle reenactment may be very sensitive to changes in historic views. People who moved to a particular community “for the views” may also be very sensitive to changes in views, particularly if they would see the project from their homes.

Viewers who, on average, may be less sensitive to changes in views include

- People engaged in outdoor recreation whose attention or interest is unlikely to be focused on the landscape and on particular views because of the type of activity in which they are engaged, such as volleyball players; and
- People at their place of work (inside or outside) whose attention is generally focused on their work, not on scenery, and where the seascape/landscape setting is not important to the quality of working life.

Commuters and other travelers on non-scenic routes are generally regarded as moderately sensitive viewers (LI and IEMA 2013).

Note that the assignments of sensitivity to particular groups are generalizations. Individuals obviously vary in their sensitivity to the visual environment, and some commuters may be very sensitive to their surroundings. To the extent possible, the VIA considers the specifics of particular people potentially affected by a proposed project through investigation and consultation with stakeholders in the course of the affected environment analysis. The conclusions regarding sensitivity should be supported by documented evidence.

As is the case for the SLIA, the judgment about susceptibility of the receptors to a particular visual impact is recorded in the VIA on an ordinal scale of high, medium, or low, but the determination should be documented and should be based on and consistent with the information provided in the Affected Environment section.

7.5.2.2 Value Attached to Views

Impacts on people at heavily visited, widely recognized, and highly valued viewpoints are more likely to be important. Relative judgments about the values viewers attach to particular views are determined in a variety of ways, including the following:

- The number of likely viewers, as known, estimated, or judged;
- Designation as a scenic viewpoint, especially within a designated scenic area such as a scenic roadway, river, or national park;
- Association with a historic or culturally important site or sites, especially within a designated area;
- Appearances in guidebooks, tourist maps, web sites, online photo collections, and social media;
- References to the views in literature or art;
- Provision of facilities for view enjoyment, such as parking, restrooms, interpretive panels, and telescopes; and
- Consultation with residents, visitor’s bureaus, tourism service providers, and other local entities.

As is the case for judgments about susceptibility of viewers to a particular visual impact, judgment about the value of a view is relative and is recorded in the VIA on a verbal scale of high, medium, or low. Again, the determination should be documented and based on and consistent with the information provided in the Affected Environment section.

Note that when considering impacts, tradeoffs between sensitivity and value factors may be required. For example, there are many situations, such as some roadways, where there may be a large number of viewers but few viewers attach value to the view, and other situations, such as a wilderness area, where the number of viewers is very small, but their sensitivity to changes in views is very high. There are no accepted rules or conventions for making these types of tradeoffs; each instance’s unique circumstances must be considered in making a professional judgement.

7.5.3 Magnitude of Visual Impacts

Large-scale changes that introduce new, non-characteristic, discordant, or intrusive elements into the view are likely to be more important than small changes or changes involving features already present within the view. The magnitude of visual impacts expected from the proposed project is similar to that used for the SLIA and is based on the size or scale of the change, the geographic extent of its effects, and its duration and reversibility.

7.5.3.1 Size or Scale of Change

Using primarily the available simulations and the text descriptions of the project's likely visual contrasts, as well as firsthand experience viewing existing wind energy projects, a judgment is made regarding the degree of change to the view quality from loss, addition, or alteration of features or elements of the view. Considerations include the following:

- The scale of the change in the view with respect to the loss or addition of features in the view and its composition, including the percentage of the view the project occupies;
- The degree to which added features or changes to the view contrast with existing elements in terms of form, line, color, and texture, and any effects of the added elements or changes on scale relationships, spatial composition of the view, and motion.
- The degree to which the project components, or the project as a whole, draw visual attention away from existing features of the view; and
- The nature of the view of the proposed development in terms of the relative amount of time over which it will be experienced (view duration) and whether views will be full, partial, or glimpses.

For each impact, the change is described as well as its likely effect on the view experience, and an assessment is made as to whether the change is positive or negative and whether the degree of change is large, medium, or small. The assessment is documented and justified by information provided in the COP, the Affected Environment section, and applicable research. As for the determination of magnitude for the SLIA, note that the "size or scale" component as a whole does *not* refer to the size or scale of the project; rather, it refers to the size or scale of the change, that is, whether it is a large, medium, or small change to the potentially affected view. However, apparent size and scale of the project itself are factors when the degree of visual change created by the project is being considered.

7.5.3.2 Geographic Extent

The geographic extent of a visual impact varies as seen from different viewpoints and reflects the following:

- The angle of view in relation to the viewer, for example, whether the project is in the center of the view or in the periphery of the view. If the project is closer to the center of the view, the effect will be larger.
- The apparent size of the proposed project within the view. Projects that appear larger to the viewer will have a greater effect on the view.
- The extent of the area over which essentially the same changes would be visible, that is, whether the impact of the project on the view is evident only in the immediate vicinity of the photopoint or over a wide area in and around the KOP. This assessment is derived from the project's viewshed. Projects that are visible over a larger area result in greater impact.

The judgment about the geographic extent of a particular impact is recorded on a verbal scale of large, medium, or small, and is documented and justified by information provided in the COP, the Affected Environment section, and applicable research.

7.5.3.3 Duration and Reversibility of Impacts

The method for assessing duration and reversibility of visual impacts is identical to that used for the SLIA. As discussed in Section 6.4.3.3, "duration" refers to the length of time the impact is likely to occur (from *short term* to *considered permanent*), and "reversibility" refers to the degree to which the currently existing conditions are restored after the impact ceases (i.e., *nonreversible*, *partially reversible*, or *fully reversible*, and taking into consideration any residual impacts remaining after decommissioning).

7.5.4 Combining Components, Factors, and Impacts on Multiple KOPs

As is the case for the SLIA, once the potential visual impacts are documented, the impact level is determined. For each visual impact, in addition to identifying the impact as positive or negative, a determination is made as to whether the impact is considered *major*, *moderate*, *minor*, or *negligible*.

As with the SLIA, the impact level of visual impacts is ultimately a matter of professional judgment. The basis and reasoning for the judgments is documented (including all simulations created) and clearly explained, so that interested parties understand how the judgments were made.

Although at a detailed level the information used in the impact analysis for the VIA differs from that used for the SLIA, the components and factors are the same. The process for combining the sensitivity components (susceptibility and value) and the magnitude components (size or scale of change, geographic extent, and duration/reversibility of the impact), and the process for combining the sensitivity and magnitude factors to determine the impact level for a given KOP, are identical to those used for the SLIA and use the same matrices (see Sections 6.4.4–6.4.6). An example matrix for evaluating the impact level for a hypothetical KOP is shown in **Table 7.5-1.**

Table 7.5-1. Example visual impact matrix for a hypothetical KOP: KOP 1, Cape Oceanview Lighthouse

Sensitivity Factor		Rationale		Magnitude factor		Rationale
Susceptibility	High	Visitors' attention or interest is likely to be focused on the seascape/landscape and on particular views. Sea views from lighthouse important to visitor experience. Visitors climb tower specifically to enjoy the views from this historic structure.		Size or scale	Large	Will create focal point for seaward views. Verticality and color of wind turbines will contrast strongly with background. Blade motion will be clearly visible. Marine paint will be clearly visible. Turbines and project occupy a substantial portion of the seaward view.
Value	High	On National Register of Historic Places, in National Seashore. 175,000 visits annually. Heavily promoted by National Park Service and state as tourist destination. Referenced in artworks and literature. Provides facilities for view enjoyment (interpretive panels).		Geographic extent	Medium	Project is approximately 60 degrees right of center of view. Horizontal angular extent of project is 25 degrees. KOP is in an open flat area. View of project is essentially the same for a large area around the KOP.
Sensitivity rating	High	Important historic structure in National Seashore heavily visited specifically for enjoyment of sea views. Visitors likely very sensitive to changes in seaward views.		Duration/ reversibility	Fair	Long-term (30 years). Fully reversible.
				Magnitude rating	Large	Large, high-contrast project that will strongly attract visual attention. Long-term impact.
Overall impact level: major				Rationale: The KOP is a major tourist destination in the state with two national-level designations, and a major purpose of visiting is to enjoy the seaward views, within which there are currently no artificial structures visible from the lighthouse.		

8 Assessing Effects of Reasonably Foreseeable Planned Actions

This chapter presents the methodology for assessing reasonably foreseeable planned action (RFPA) effects on seascape/landscape and visual resources.

8.1 Introduction

RFPA effects occur when two or more activities affect an environmental resource, ecosystem, or human community. The effect is the result of all impact-causing activities that affect a resource while the impacts of the proposed action are occurring or remain in effect. A particular action may cause only minor adverse (or beneficial) effects on the environment; however, when it is added to the effects of other activities, the combined effect may be substantial. In some cases, the effects of a project, when combined with those of other activities, cause synergistic effects that are different from those of the projects individually and could be important (CEQ 1997). Effective assessment of RFPA effects requires careful scoping and involves a higher degree of uncertainty than assessing the proposed project's effects.

The NEPA requirement to assess RFPA effects arises from the recognition that while the impact of a single project considered by itself may be small, it must also be considered as an incremental addition to a variety of other activities that may be affecting the area around the project. In the case of offshore wind facilities, the activities could include the development and/or operation of similar offshore wind facilities as well as the development and/or operation of any other type of facility, such as offshore oil and gas facilities, or even actions that do not involve facilities at all, such as conversion of lands to agricultural or other uses.

RFPA effects on seascape/landscape and visual resources can occur in several ways:

- Where multiple facilities are seen within the same view without the viewer turning his/her head (the facilities may be juxtaposed so that one is seen "through" the other);
- Where multiple facilities can be seen successively if the viewer turns his/her head; or
- Where sequential viewing occurs, that is, multiple facilities are viewed in succession as the viewer moves through the landscape (e.g., driving on highways or hiking on trails).

These effects could include direct physical effects on the seascape/landscape or changes to the distinct character of the seascape/landscape. Visual impacts could include changes to valued views due to the presence of multiple facilities or activities that are visible, such as increased ship traffic. RFPA effects are particularly important with respect to utility-scale wind facilities because the facilities' high visibility over long distances increases the chances that multiple facilities are in view at the same time. The widespread rapid development of both renewable and fossil energy resources in the United States also involves new or upgraded electric transmission, pipelines, roads, communications towers, increased traffic, dust, and light sources at night, which taken together have the potential to cause seascape/landscape and visual impacts over large areas in a relatively short timeframe.

The assessments of RFPA effects for seascape/landscape resources and visual resources are conducted separately. Both assessments require determination of the scope of the assessment, description of the affected environment, and determination of the environmental consequences. The development of additional visual simulations may be required for assessment of RFPA effects, but in general, the level of detail for analysis of other projects included in the assessment is more limited than the analysis of the proposed project, because the assessment of RFPA effects addresses only the relationship between the proposed project and the other projects included in the impact assessment. It does not assess the seascape/landscape or visual impacts of the other projects. **Figure 8.1-1** summarizes the steps in the SLVIA process for assessment of RFPA effects.

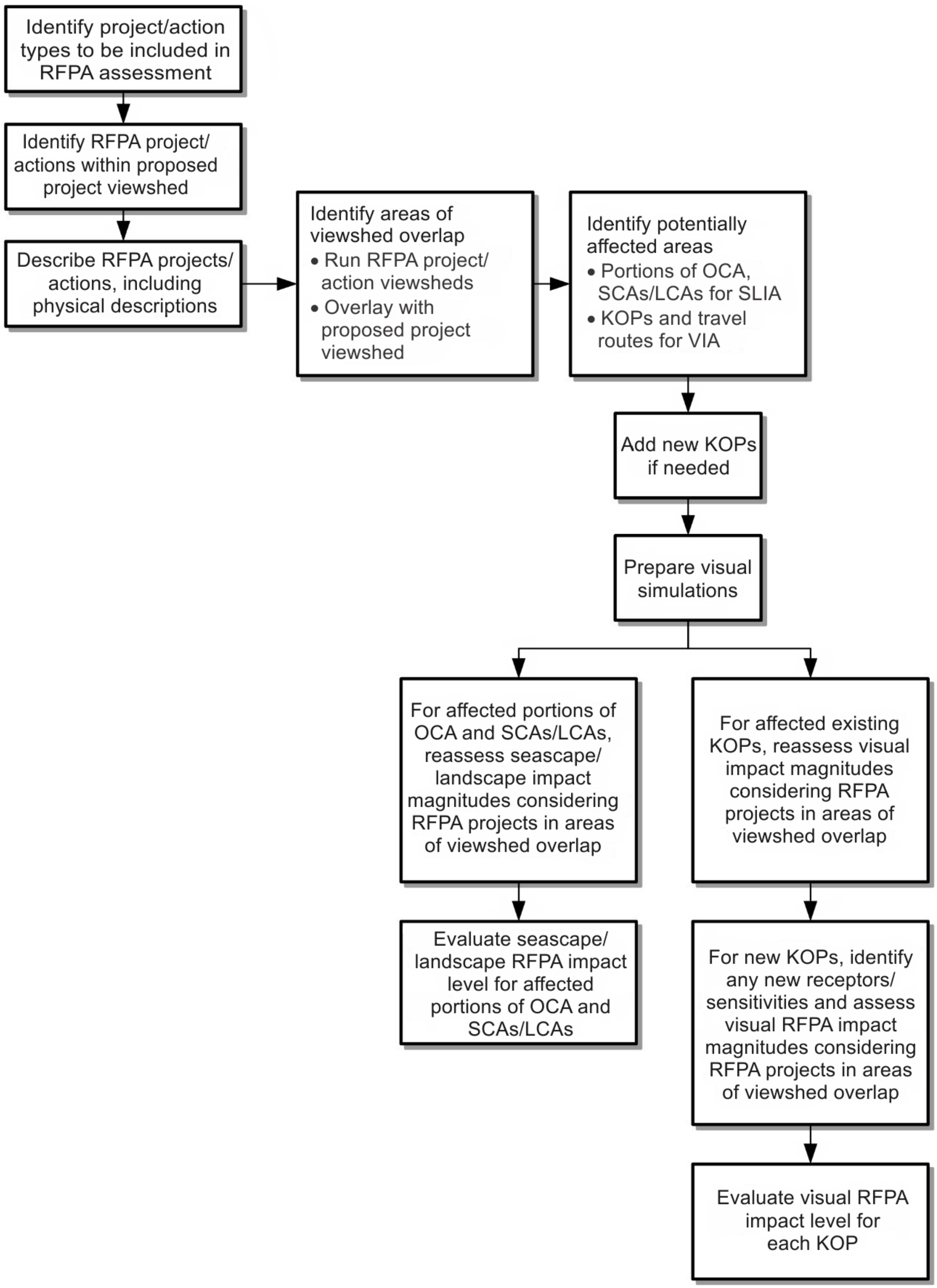

Figure 8.1-1. SLVIA RFPA effects assessment process

8.2 Scope of the RFPA Effects Assessment

The scope of the RFPA effects assessment has four dimensions:

1. Identifying the types of RFPA effects associated with the proposed project;
2. Establishing the geographic extent of the assessment;
3. Establishing the temporal component of the assessment; and
4. Identifying other actions/projects that might affect the seascape/landscape or visual resources within the geographic and temporal scope of the assessment.

The affected environment considered in a RFPA effects assessment includes the same resources, ecosystems, and human communities that could be affected by the proposed project.

8.2.1 Types of RFPA Effects

Seascape/landscape and visual effects from RFPA that may need to be considered in the impact assessment include the following:

- The effects of adding to an existing project (e.g., successive phases) or the addition of a new project of the same type that extends or intensifies the seascape/landscape and/or visual effects of the proposed project (note that impacts of successive project phases may already be assessed if a PDE approach is used). The combination of these incremental changes may substantially alter the seascape/landscape resource (e.g., change its physical elements, its distinctive character, or aspects that contribute to its character) and/or views, even though the individual effects from the originally proposed project do not.
- The "filling in" of an area of the visible seascape or landscape with either the same or different types of projects over time, such that it may be judged to have substantially altered the seascape/landscape resource and/or views;
- The interactions between different types of projects, each of which may have different seascape/landscape and/or visual impacts and where the total effect is greater than the sum of the parts;
- Seascape/landscape and/or visual effects resulting from all future actions that remove something from the existing landscape that may have consequences for other existing or proposed developments, for example, clearing trees that reveals views of existing or proposed projects that would otherwise remain screened (LI and IEMA 2013).

8.2.2 RFPA Effects Associated with a Proposed Offshore Wind Project

For both seascape/landscape and visual impacts, the primary RFPA effects are associated with the visibility of the project components, especially offshore turbines, because of their large size, large spatial extent, blade movement, and lighting at night. The electrical service platforms and any substation built for the project have substantially smaller effects because of their smaller size and extent, the lack of movement of their parts, and, with good mitigation, their reduced lighting requirements. However, even though the potential RFPA effects for seascape/landscape arise largely from the same causes, they are different from those for visual resources, primarily because the impact receptors differ.

The types of RFPA effects associated with the proposed project for seascape/landscape resources are discussed in Section 8.3 and for visual resources in Section 8.4.

8.2.3 Geographic Extent of the RFPA Effects Assessment

The spatial boundaries of the RFPA effects assessments are usually different from the spatial boundaries of the impact assessment for the proposed project, because the RFPA effects assessment includes only those areas that fall within the areas of overlap between the proposed project's viewshed and the viewsheds of other existing or planned projects and activities. This can still be a large area, especially for RFPA effects associated with wind energy facilities, because the facilities and structures are very large and can be seen for long distances both day and night, thus creating large potential areas of overlapping visibility.

The geographic extent of RFPA effects assessment is generally different for the SLIA and the VIA. The process for identifying the geographic extent of the RFPA effects assessment for seascape/landscape resources is discussed in Section 8.3.1 and for visual resources in Section 8.4.1.

8.2.4 Temporal Limits of the RFPA Effects Assessment

The temporal limits of the RFPA effects assessment often extend beyond the period of time considered in the impact assessment for the proposed project alone. This is because the RFPA effects assessment must address projects/activities that occurred before the proposed project is built as well as after the proposed project is decommissioned, if those activities could affect one or more of the same resources potentially affected by the proposed project.

For purposes of the SLIA and VIA RFPA effects assessment, BOEM includes in the impact assessment a combination of development within the 17 active wind energy lease areas (16 commercial and 1 research), which include named projects and assumed future development in the lease areas outside of named project boundaries. For a specific proposed project, determination of projects to be included in the RFPA effects assessments will require consultation with BOEM.

8.2.5 Types of Projects/Activities Included in the RFPA Effects Assessment

In order to address RFPA effects of offshore wind energy development on the OCS, information is needed on past, present, and future activities and proposals for the OCS and nearby state-administered waters. Projects/activities that would likely be addressed as potential impact sources in the impact assessments for both seascape/landscape and visual resources include, but are not limited to, offshore and onshore wind development, oil and gas and other energy production and transport projects and activities, dredging, Department of Defense activities, sand and gravel excavation, other mineral leases, and other activities such as transportation. These activities could occur in state waters and along coastlines as well as on the OCS. The actual projects/activities included in a given assessment would be determined as part of the assessment. Because including too many projects would result in an unwieldy assessment, some projects may be able to be eliminated from the assessment if it can be easily determined that they are likely to result in negligible RFPA effects.

Of particular concern for both SLIA and VIA RFPA effects assessments are the potential effects of other offshore (and potentially onshore) wind energy projects. As noted elsewhere, the size and extent of wind energy projects as well as the visual properties of wind turbines may make them visible for long distances. This increases the chance that multiple projects are visible from a given OCA, SCA, LCA, or KOP, which could result in RFPA effects on seascape or landscape character and/or RFPA effects on views from KOPs.

Because of the high likelihood of important seascape/landscape and visual RFPA effects from offshore wind energy development, it is important to develop visual simulations for RFPA effects where the proximity of other projects suggests there may be RFPA effects associated with these projects. As noted previously, simulations are useful for understanding the likely appearance of a proposed project and are routinely prepared for offshore wind SLVIAs. Their use for RFPA effects assessment for offshore wind facilities will be of significant help in visualizing the relationship between the proposed project and other projects already proposed or under consideration, as well as the total impacts of multiple offshore wind projects and onshore projects that may be visible from one or more locations along the coast.

8.3 RFPA Effects Assessment for the SLIA

This section describes procedures used for the RFPA effects for the SLIA, which examine potential effects of the proposed project along with other past, present, or future projects and activities on the seascape/landscape resources within the geographic scope of the SLIA RFPA effects assessment.

8.3.1 Geographic Scope of the SLIA RFPA Effects Assessment

Based on the assumption that any OCA, SCA or LCA within the viewshed of the proposed project is potentially subject to seascape/landscape RFPA effects, the geographic scope of the RFPA effects assessment for seascape/landscape impacts necessarily includes all SCAs/LCAs (and the OCA) of which any substantial part falls within the areas of overlap between the viewshed of the proposed project and the viewsheds of other projects included in the RFPA effects assessment. What portion of the OCA or SCA/LCA constitutes a "substantial part" is determined on a case-by-case basis, because in cases in which a very small portion of an SCA/LCA falls within the viewshed of multiple projects, but is heavily populated or includes features of significant value, it may need to be included in the assessment. On the other hand, if the very small area is highly fragmented and/or consists of lands/waters of minimal importance, it can be excluded from the analysis.

8.3.2 Seascape and Landscape Description for RFPA Effects Assessment

The affected environment description for the SLIA RFPA effects assessment usually builds on the affected environment description in the main impact assessment, that is, the seascape/landscape character assessments and receptor information prepared for the proposed project. However, the assessment may include more limited areas within SCAs/LCAs and therefore require modified SCA/LCA character assessments and brief descriptions of the other projects and activities included in the RFPA effects assessment. The seascape/landscape description process is the same as that described in Section 6.2 but not as detailed. However, enough information is included so that sound conclusions about potential RFPA effects, potentially requiring additional fieldwork, can be made.

8.3.3 Identification of Seascape/Landscape RFPA Effects

Once the geographic extent of the SLIA RFPA effects assessment is known, the affected environment is described, and the activities/projects to be included are determined, a short description of the characteristics of each project included in the assessment is prepared and serves as the basis for determining the seascape/landscape RFPA effects of that project. This includes a viewshed analysis for each project, which is used to determine areas where visibility of the proposed project overlaps that of other projects. (When planning data for proposed projects are not available, BOEM will provide assumptions about the height and potential locations of the projects). Areas and routes that fall within the viewsheds of multiple projects are subject to seascape/ landscape RFPA effects from the visibility of multiple projects at the same time.

Seascape/landscape RFPA effects could include the following types of impacts:

- On the physical components of the seascape/landscape resulting from removal, addition, or changes to individual elements or features of the seascape/landscape;

- On the aesthetic aspects of the seascape/landscape, such as scale, balance, diversity, composition of form, lines, colors, and textures, and/or on its perceptual or experiential attributes, such as a sense of naturalness, remoteness, or tranquility;
- On the availability and spatial distribution of views of the ocean that are free from development; and
- On the distinctive character of the seascape/landscape as a result of the changes described above, if they are substantial enough to lead to modification of key characteristics and possibly a new type of seascape/landscape character (LI and IEMA 2013).

The seascape/landscape RFPA effects assessment emphasizes changes to the key characteristics of the existing seascape/landscape. Judgments are made about the compatibility of the proposed project with the characteristics of the existing seascape/landscape, taking into account the effects of other planned developments included in the assessment and, if incompatible, what the degree of incompatibility is. The focus of the assessment is on the proposed project, and whether or how it adds to or combines with other existing or planned projects or action to create a non-negligible RFPA effect.

8.3.4 Determination of Seascape/Landscape RFPA Impact Levels

Determining the impact level of RFPA effects on seascape/landscape resources is similar to determining impact levels for the proposed project and considers the following:

- The susceptibility of the seascape/landscape receptor to the type of change under consideration;
- The value attached to the receptor;
- The size or scale of the seascape/landscape RFPA effects identified;
- The extent of the geographic area affected by the seascape/landscape RFPA effects; and
- The duration of the seascape/landscape RFPA effects and the extent to which they are reversible.

The most important seascape/landscape RFPA effects are likely to be those that change the seascape/landscape character through major effects on its key characteristics or that transform it into a different seascape/landscape type entirely. This may happen if the proposed project “tips the scale” by adding its effects to the combined impacts of existing or planned projects/activities.

For the OCA and SCAs/LCAs included in the main project impact assessment, susceptibility and value ratings should not change, so the RFPA effects assessment for these areas consists of reevaluating the magnitude of components given the addition of multiple projects as impact sources. However, the various types of RFPA effects described in Section 8.2.1 should be considered in the assessment. The criteria for determining the level of impact—negligible, minor, moderate, or major—are the same as those used for determining the level of impact of the proposed project as presented in Section 6.4.5.

8.4 RFPA Effects Assessment for the VIA

This section describes procedures used for the VIA RFPA effects assessment, which examines potential RFPA effects of the proposed project along with other past, present, or future projects and activities on important views within the geographic scope of the assessment.

8.4.1 Geographic Scope of VIA RFPA Effects Assessment

The VIA RFPA effects assessment assumes that any location within the viewshed of the proposed project that is also within the viewshed of an existing or proposed project is potentially subject to visual RFPA effects. Thus the geographic scope of the VIA RFPA effects assessment includes all areas within the viewshed for the proposed project that overlap with the viewsheds for other existing and proposed projects. Viewsheds for these projects will have already been identified for the SLIA RFPA effects assessment. In the course of determining viewshed overlap, it is important to track the number of overlapping viewsheds for a given area, because more than two projects may be visible from some locations, and where this is the case there is potential for greater visual RFPA effects.

8.4.2 Affected Environment for VIA RFPA Effects Assessment

The affected environment description for the RFPA effects assessment builds on the affected environment description for the proposed project in the main impact assessment, but may need to include additional views and viewpoints and related information about viewers. The affected environment process is the same as that described in Section 7.3, but less detailed. However, enough information is included so that sound conclusions about potential visual RFPA effects, which may require additional fieldwork, can be made.

8.4.3 Identification of Visual RFPA Effects

Once the geographic extent of the VIA RFPA effects assessment is known, the affected environment is described, and the activities/projects to be included are determined, short descriptions of the characteristics of the projects included in the assessment are used as the basis for determining the visual RFPA effects. Areas and routes that fall within the viewsheds of multiple projects are subject to visual RFPA effects from seeing multiple projects at the same time.

RFPA effects are assessed for the KOPs used for the main impact analysis located in an area where the proposed project viewshed overlaps the viewshed of another project included in the assessment, as the visibility of an additional project could increase impacts on a view. New KOPs could be required in some cases.

Visual RFPA effects include effects resulting from *combined* views of projects, where multiple projects can be seen from one viewpoint without viewers turning their head or if viewers turn their head. Visual RFPA effects could also include effects resulting from *sequential* views of projects, where multiple projects are visible from different viewpoints along a travel route, such as a road or trail. The frequency and duration of the sequential views depend on the traveling speed of the viewer and the distance between the areas of viewshed overlap among projects, as well as the number of projects involved. These variables should be accounted for when assessing impacts and included in the impact description.

Visual RFPA effects can also involve the proposed project “tipping the scale” to seriously detract from the experience of a particular view when considered with other existing and/or proposed projects, even though the project’s individual contribution to visual impacts is relatively small. This can be the case, for example, when the proposed project blocks the remaining clear views of the ocean from viewpoints where other existing or proposed projects have blocked or will block significant portions of the view.

Larger visual RFPA effects may occur when other projects are in close proximity to the proposed project and are or would be clearly visible from one viewpoint. Larger impacts may also occur when several projects are in view from one viewpoint, and although their individual effects are small, their combined effect is larger. This is particularly true if they create an extended visual “wall” across a significant part of the view, they seem to be visible whichever direction the viewer faces, or they are viewed “through one another;” that is, they are in the same line of sight from the viewer, especially if the projects are very different in their visual characteristics.

8.4.4 Determination of Visual RFPA Impact Levels

Determining the level of RFPA effects on visual resources is similar to determining visual impact levels for the proposed project (see Section 7.5). The process considers the following:

- The susceptibility of the viewers to changes in views;
- The value attached by the viewers to the views they experience;
- The size or scale of the visual RFPA effects identified;
- The extent of the geographic area affected by the visual RFPA effects; and
- The duration of the visual RFPA effects and the extent to which they are reversible.

For KOPs included in the main project impact assessment, susceptibility and value ratings should not change, and so the RFPA assessment for these areas consists of reevaluating the magnitude components considering the addition of multiple projects as impact sources. However, the various types of visual RFPA effects described in Section 8.2.1 should be considered in the assessment. The criteria for determining the level of impact—negligible, minor, moderate, or major—are the same as those used for determining the level of impact of the proposed project, as presented in Section 7.5. For any new KOPs included in the visual RFPA effects assessment, the sensitivity components should be evaluated and combined into a sensitivity rating, which is then combined with the impact magnitude rating.

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10 Glossary

Affected Environment section. Section of an EIS that describes existing conditions in the area potentially subject to impacts against which any future changes can be measured or predicted and assessed.

Air quality. Measure of the health-related and visual characteristics of the air to which the general public and the environment are exposed.

Alternative. Within an EIS, a reasonable way to fix the identified problem or satisfy the stated need for which the EIS is written.

Ancillary facility. Built component (e.g., a substation) associated with a project not directly involved in power generation.

Area of impact analysis. The geographic area or areas to be included in an impact assessment.

Aspect. The positioning of a building or thing in a specified direction; the direction that something (such as a building) faces or points toward. The aspect combined with the bearing determines which side of a facility is in view from a particular viewpoint, as well as the angle of the object's vertical surfaces with respect to the viewer.

Atmospheric refraction. The deviation of light from a straight line as it passes through the atmosphere due to the variation in air density as a function of altitude.

Aviation obstruction lighting. Lighting devices attached to tall structures as an aircraft collision avoidance measure.

Azimuth. The horizontal angular distance from a reference direction, usually the northern point of the horizon to the point where a vertical circle through a celestial body (e.g., the sun) intersects the horizon, usually measured clockwise.

Backdrop. The landscape, seascape, or sky visible directly behind the visible elements of a facility, as seen from a particular viewpoint.

Bearing. The compass direction from an observer to a viewed object.

Blade. The aerodynamic structure on a wind turbine that catches the wind. Most utility-scale wind turbines have three blades.

Characterization. The process of identifying areas of similar seascape/landscape character, classifying and mapping them, and describing their character.

Characteristics. Elements, or combinations of elements, that make a contribution to distinctive seascape/landscape character.

Clutter. *See v*isual clutter.

Color. The property of reflecting light of a particular intensity and wavelength (or mixture of wavelengths) to which the eye is sensitive. Color is the major visual property of surfaces.

Construction and operation plan (COP). A project planning document that for offshore wind facilities includes design, fabrication, installation, and operations concepts as well as results of site surveys, offshore and onshore support, decommissioning plans, and a Navigational Risk Assessment.

Contrast. Opposition or unlikeness of different forms, lines, colors, or textures in a landscape.

Council on Environmental Quality (CEQ). A U.S. federal government council established under Title II of NEPA to develop federal agency-wide policy and regulations for implementing the procedural provisions of NEPA, resolving interagency disagreements concerning proposed major federal actions, and ensuring that federal agency programs and procedures are in compliance with NEPA.

Cultural resources. Archaeological sites, structures, or features, traditional use areas, and Native American sacred sites or special-use areas that provide evidence of the prehistory and history of a community.

Decommissioning. All activities necessary to take a facility out of service and dispose of its components after its useful life.

Developer. A person or company that builds or sells buildings or facilities on a piece of land. In the context of visual impact assessments, *developer* usually refers to the project proponent.

Development. Any project that results in a change to the seascape/landscape and/or visual environment.

Digital elevation model. A three-dimensional representation of the surface terrain of an area. A digital elevation model does not take into account trees, buildings, or other screening structures.

Direct impacts. Impacts occurring at or near the place of origin and at the time of a proposed activity, and occurring as a direct result of the activity. An effect that results solely from the siting, construction, operation, or decommissioning of a proposed action without intermediate steps or processes.

Effect. *See* impact

Electrical service platform. An offshore substation, the system that collects and exports the power generated by offshore wind turbines through specialized submarine cables.

Elements. Individual components that make up the seascape/landscape, such as trees, hedges, and buildings.

Environmental Impact Statement (EIS). An environmental impact assessment document required of Federal agencies by NEPA for major proposals or legislation that will or could significantly affect the environment. An EIS must include a description of the proposed action, the environmental setting, and potentially affected areas. It must also include an analysis of reasonable alternatives to the proposed action, all environmental impacts related to the proposed action and its alternatives, and ways to mitigate adverse impacts.

Experiential aspect. Any trait of seascapes or landscapes involving or based on experiences in the seascapes/landscapes.

Facility. An existing or planned location or site at which equipment for converting mechanical, chemical, solar, thermal, and/or nuclear energy into electric energy or for transporting energy is situated, or will be situated, and the equipment itself.

Feature. A particularly prominent or eye-catching element or elements in the seascape/landscape, such as a clump of trees, a church tower, or a wooded skyline.

Form. The mass or shape of an object or objects that appears unified, such as a vegetative opening in a forest, a cliff formation, or a water tank.

Generation (electricity). The process of producing electric energy by transforming other forms of energy; also, the amount of electric energy produced, typically expressed in megawatt-hours (MWh).

Glare. The sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted and that causes annoyance, discomfort, or loss in visual performance and visibility. *See also g*lint.

Glint. A momentary flash of light resulting from a spatially localized reflection of sunlight. *See also g*lare.

Heritage. The historic environment and especially valued assets and qualities such as historic buildings and cultural traditions.

Horizon line. The apparent line in the landscape formed by the meeting of the visible land surface and the sky, or any line of a structure or landform feature parallel to that line.

Horizontal field of view. The horizontal extent of the observable landscape that is seen at any given moment, usually measured in degrees.

Impact (effect). Environmental consequences that occur as a result of a proposed action. Impacts may be caused by the action and occurring at the same time and place, caused by the action but occurring later in time or farther removed in distance but still reasonably foreseeable, or be incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. In National Environmental Policy Act of 1969 (NEPA) documents, *effect* is synonymous with *impact*.

Impact level. A measure of the importance or gravity of an environmental impact, defined by criteria specific to the environmental topic. Characterized as *negligible, minor, moderate,* or *major.*

Key characteristics. Those combinations of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.

Key observation point (KOP). A point at a use area or a potential use area, or a series of points or a segment on a travel route, where there may be views of a management activity, which is used in the VIA as a location for assessing potential visual impacts resulting from a proposed activity, such as the construction and operation of a power generation facility.

Land cover. The surface cover of the land, usually expressed in terms of vegetation cover or lack of it, such barren lands, forests, or water.

Landform. Any recognizable physical form of the earth's surface having a characteristic shape. Landforms include major forms, such as plains, plateaus, and mountains, and minor forms, such as hills, valleys, slopes, and moraine. Taken together, the landforms make up the surface configuration of the earth.

Landscape. An area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors. Landscape includes the expanse of visible scenery, including landforms, waterforms, vegetation, and man-made elements such as roads and structures, as well as its anthropogenic or social patterns.

Landscape character. A distinct recognizable and consistent pattern of elements in the landscape that makes one landscape or seascape different from another.

Landscape character areas (LCAs). Unique areas that are the discrete geographic areas of a particular landscape type, but do not include seacoast.

Landscape character assessment (LCA). The process of identifying and describing variation in the character of the landscape, and using this information to assist in managing change in the landscape. It seeks to identify and explain the unique combination of elements and features that make landscapes distinctive. The process results in the production of a written Landscape Character Assessment.

Landscape character types. Distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation, historical land use and settlement patterns, and perceptual and aesthetic attributes.

Landscape impacts. Impacts on a landscape as a resource in its own right.

Land use. Characterization of land in terms of its potential utility for various activities, or the activities carried out on a given piece of land.

Laydown area. An area that has been cleared for the temporary storage of equipment and supplies for a construction activity; a location where individual components for use in construction are initially offloaded from their transport vehicle. To ensure accessibility and safe maneuverability for transport and offloading of vehicles, laydown areas are usually covered with rock and/or gravel.

Lighting impact. An interference with enjoyment of dark night skies or an effect on nocturnal wildlife resulting from artificial light pollution, such as may be caused by facility or other lighting.

Line. The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture. Within landscapes, lines may be found as ridges, skylines, the edges of structures, the edges of water bodies, changes in vegetative types, or individual trees and branches.

Magnitude (of impact). A term that combines judgments about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible, and whether it is short- or long-term in duration.

Mitigation. Planning actions taken to avoid an impact altogether, minimize the degree or magnitude of the impact, reduce the impact over time, rectify the impact, or compensate for the impact.

Mitigation measures. Methods or actions that reduce adverse impacts from facility development. Mitigation measures can include BMPs, stipulations in right-of-way agreements, siting criteria, and technology controls.

Nacelle. The housing that contains and protects the major components (e.g., generator and gear box) of a wind turbine.

National Register of Historic Places. A comprehensive list of districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. The National Register of Historic Places is administered by the NPS, which is part of the U.S. Department of the Interior.

No-action alternative. A NEPA-required alternative within an EIS that assumes the agency will not implement the proposed action or alternative actions, and in which current conditions and trends are projected into the future without another proposed action. In other words, the alternative that involves no action.

Ocean character area (OCA). The area of ocean within the project viewshed but outside of any seascape character areas (SCAs) within the viewshed. The OCA includes the offshore components of the project. There is one OCA for each proposed project.

Outer Continental Shelf (OCS). All submerged lands, subsoil, and seabed that belong to the United States and lie seaward and outside of the coastal states' jurisdiction.

Perception. Combines the sensory (that we receive through our senses) with the cognitive (our knowledge and understanding gained from many sources and experiences).

Perceptual aspect. Any trait of seascapes or landscapes involving or based on perceptions about the seascapes/landscapes.

Photosimulation. A still image of a highly realistic three-dimensional model of a proposed facility superimposed onto a photograph of the existing landscape.

Pipeline. A line of pipe with pumping machinery and apparatus for conveying liquids, gases, or finely divided solids between distant points.

Project design envelope. A permitting approach that allows a project proponent the option to submit a reasonable range of design parameters within its permit application, allows a permitting agency to then analyze the maximum impacts that could occur from the range of design parameters, and may result in the approval of a project that is constructed within that range.

Receptors. See seascape/landscape receptors and visual receptors.

Reasonably foreseeable planned action (RFPA) impacts. Impacts that could potentially result from incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency (Federal or non-Federal), private industry, or individual undertaking such other actions. RFPA impacts can result from individually minor but collectively significant actions taking place over a period of time.

Renewable energy. Energy derived from resources that are regenerative or that cannot be depleted. Renewable energy resources include wind, solar, biomass, geothermal, and moving water.

Seascape. An area of land that includes coastline and adjacent marine areas, with views of the coast or seas and coasts, and with cultural, historical, and archaeological links with each other.

Seascape and Landscape Impact Assessment (SLIA). Analysis of impacts on both the physical elements and features that make up a landscape or seascape and the aesthetic, perceptual, and experiential aspects of the landscape or seascape that make it distinctive, usually presented as a stand-alone technical report or as part of an EIS.

Seascape character. A distinct recognizable and consistent pattern of elements in the seascape that makes one seascape different from another.

Seascape character areas (SCAs). A discrete area of coastal landscape and adjoining areas of open water, within which there is shared inter-visibility between land and sea and which includes an area of sea (the seaward component), a length of coastline (the coastline component), and an area of land (the landward component).

Seascape character assessment (SCA). The process of identifying and describing variation in the character of the seascape, and using this information to assist in managing change in the seascape. It seeks to identify and explain the unique combination of elements and features that make seascapes distinctive. The process results in the production of a written Seascape Character Assessment.

Seascape, Landscape, and Visual Impact Assessment (SLVIA). A process used to identify, describe, and assess the impacts of development both on the seascape/landscape as an environmental resource in its own right and on people's views of the seascape/landscape.

Seascape character types. Distinct types of seascape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation, historical land use and settlement patterns, and perceptual and aesthetic attributes.

Seascape/landscape receptors. Defined aspects of the seascape/landscape resource that have the potential to be affected by a proposal.

Seascape/landscape value. The relative value that is attached to different seascapes/landscapes by society.

Scenic integrity. The degree of "intactness" of a landscape, which is related to the existing amount of visual disturbance present. Landscapes with higher scenic integrity are generally regarded as more sensitive to visual disturbances.

Scenic quality. A measure of the intrinsic beauty of landform, waterform, or vegetation in the landscape, as well as any visible human additions or alterations to the landscape.

Scoping. An early and open process of identifying the issues to be addressed by an EIS. It is a method of ensuring that an EIS focuses on the important issues and avoids those considered to be less significant.

Screening. A visual barrier consisting of earth, vegetation, structures, or other materials intended to block a particular view, or the actual blocking of a view through the use of a visual barrier.

Seascape impacts. Impacts on a seascape as a resource in its own right.

Sensitivity. A term applied to specific receptors, combining judgments of the susceptibility of the receptor to the specific type of change or development proposed and the perceived societal value of that receptor.

Solar altitude (solar elevation). The angular height of the sun above or below the horizon, usually measured in degrees. Above the horizon, solar altitude is positive; below the horizon, solar altitude is negative. Also referred to as "solar elevation."

Specially designated areas. Areas of seascape/landscape identified as being of importance at international, national, or local levels, either designated by statute or identified in development plans or other documents.

Stakeholder. A person or group who has an interest in or concern about the proposed project.

Substation. A facility containing equipment through which electricity is passed for transmission, transformation, distribution, or switching. Substations generally include switching, protection and control equipment, and transformers, but the equipment present and the size of the substation vary depending on the particular functions of the substation.

Surface elevation model. A three-dimensional representation of the surface terrain of an area that takes into account trees, buildings, or other screening structures in determining elevation.

Susceptibility. The ability of a defined landscape or visual receptor to accommodate the specific proposed development without undue negative consequences.

Texture. The visual manifestations of light and shadow created by the variations in the surface of an object or landscape.

Topography. The shape of the earth's surface; the relative position and elevations of natural and man-made features of an area.

Tower. The base structure that supports and elevates a wind turbine rotor and nacelle.

Tranquility. A state of calm and quietude associated with peace, considered to be a significant asset of a seascape/landscape.

Transmission (electric). The movement or transfer of electricity over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end when the energy is transformed for distribution to the consumer. Also, the interconnected group of lines and associated equipment that performs this transfer.

Transmission line. A set of electrical current conductors, insulators, supporting structures, and associated equipment used to move large quantities of power at high voltage, usually over long distances (e.g., between a power plant and the communities that it serves).

Turbine. A machine for generating rotary mechanical power from the energy of a stream of fluid (such as wind, water, steam, or hot gas), in which a stream of fluid turns a bladed wheel, converting the kinetic energy of the fluid flow into mechanical energy available from the turbine shaft. Turbines are considered the most economical means of turning large electrical generators. *See* wind turbine.

Utility-scale. Descriptive term for energy facilities that generate large amounts of electricity delivered to many users through transmission and distribution systems.

Vegetation. Plant life or total plant cover in an area.

Viewer characteristics. Traits of the individual viewer, such as visual acuity, visual engagement, experience, and viewer motion that affect the viewer's perception of contrast and the ability to discern objects in the landscape.

Viewer motion. Change in position of the viewer within the landscape. The visual experience changes as the viewer moves through the landscape.

Viewing geometry. The spatial relationship of viewer to the viewed object (e.g., a renewable energy facility), including the viewer position and aspect.

Viewpoint. A point from which a landscape is viewed. Also a point from which a landscape view is analyzed and/or evaluated.

Viewshed. The total landscape seen or potentially seen from a point, or from all or a logical part of a travel route, use area, or water body.

Viewshed analysis. A spatial analysis that uses elevation data such as a digital elevation model or surface elevation model to determine which parts of the surrounding landscape are likely to be visible from a designated point or points.

Viewshed limiting factors. Variables that determine the nature and size of the viewshed from a given viewpoint, within the maximum distance of analysis set by the user, so called because they define the spatial limits of the viewshed. Viewshed limiting factors include topography, vegetation, structures, viewer height, target height, earth curvature, and atmospheric refraction.

Visibility. The ability to visually discern an object in the landscape; also the distance an individual can see as determined by light and weather conditions.

Visibility factors. Variables that determine and affect the visibility and apparent visual characteristics of an object in a landscape setting. Visibility factors include viewshed-limiting factors that define the potentially visible area, viewer characteristics, distance, viewing geometry, background/backdrop, lighting, atmospheric conditions, and the object's visual characteristics.

Visual acuity. The acuteness or clarity of vision.

Visual attention. Noticing and focusing of vision on a particular object or landscape element.

Visual clutter. The complex visual interplay of numerous disharmonious landscape characteristics and features resulting in a displeasing view.

Visual contrast. Opposition or unlikeness of different forms, lines, colors, or textures in a landscape.

Visual experience. The observation of an object or of the landscape/seascape.

Visual impact. Any modification in landforms, water bodies, or vegetation, or any loss or introduction of structures or other human-made visual elements, that negatively or positively affect specific views experienced by people.

Visual Impact Assessment (VIA). Analysis of the visual impacts of a proposed project, usually presented as a stand-alone technical report or as part of an EIS.

Visualization. Development of pictorial representation (usually using computer hardware and software) of a proposed facility.

Visual impact mitigation. Actions taken to avoid, eliminate, or reduce potential adverse impacts on scenic resources.

Visual receptors. Individuals and/or defined groups of people who have the potential to be subjected to visual impacts from a proposed project.

Visual resource. Any objects (man-made and natural, moving and stationary) and features, such as landforms and water bodies, that are visible in a landscape.

Visual simulation. A pictorial representation of a proposed project in its landscape setting, as it would be seen from a specified viewpoint, used to visualize the project before it is built, typically in order to determine its potential visual contrasts and associated visual impacts.

Wind energy. The kinetic energy of wind converted into mechanical energy by wind turbines (i.e., blades rotating from a hub) that drive generators to produce electricity for distribution.

Wind facility, wind farm. One or more wind turbines operating within a contiguous area for the purpose of generating electricity.

Wind turbine. A device that converts wind energy into mechanical energy, used to produce electricity.

Zone of theoretical visibility (ZTV). A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

Appendix A: Viewshed Analysis

The primary tool for determining potential project visibility is the GIS viewshed analysis. Given an elevation data set for the area of the analysis, a set target height and location, and a set viewer height and location, the viewshed analysis determines whether a line of sight exists between the viewer and target, taking into consideration topography and other obstructions, such as buildings and vegetation, if they are included in the elevation data. Multiple viewshed analyses are run during the SLVIA, but the most important ones determine the locations that might have visibility of all or part of the proposed project. These viewshed analyses determine the zone of theoretical visibility (ZTV), which shows all locations from which the project *might* be visible, and are also a primary tool for KOP identification and visibility analysis.

A.1 Viewsheds for Offshore and Onshore Wind Energy Facility Components

SLVIAs for projects considered by BOEM include viewsheds for both offshore components (wind turbines and electrical service platforms) and onshore components (substations, operations and maintenance facilities, etc.) included in the SLVIA. Viewsheds for offshore components should include visibility for all wind turbines and electrical service platforms, separately and in combination. Separate viewsheds should be run for turbine nacelle height and maximum blade tip height. Viewsheds for onshore substations and other structures should treat the structures as polygons rather than points, i.e., a viewshed for a substation should not use only the height of the tallest structure within the substation.

A.1.1 Elevation Data

The accuracy of the viewshed analysis depends on the accuracy and quality of the elevation data. Light detection and ranging (LiDAR) data should always be used in the viewshed analysis if available. If LiDAR data cannot be obtained, high-resolution Interferometric synthetic aperture radar (IFSAR) data could be used. The minimum standard for elevation data for use in an SLVIA should be the national 3D Elevation Program (3DEP) dataset.

For the purposes of BOEM-reviewed SLVIAs, elevation data of two different types are used:

- **Digital terrain model (DEM)**: A digital elevation model that provides the elevation of the surface of the earth (and/or a body of water) only, excluding vegetation, buildings, or other structures that may screen views.
- **Surface elevation model (SEM)**: A digital elevation model that includes vegetation, buildings, and other structures.

The viewshed analysis for determining the ZTV should use a digital terrain model (DTM) rather than a surface elevation model (SEM), i.e., it should not include vegetation or structures. However, an SEM is the preferred model for the impact assessment. Use of an SEM (verified by field surveys) allows the presence of vegetative and structural screening elements to be accounted for when analyzing project visibility, and it is this elevation model that should be used as the basis for the selection of viewpoints for the VIA and for impact assessment for both the SLIA and the VIA. While consideration of the ZTV during impact assessment is appropriate in those situations where relatively open vegetation may lose foliage seasonally, substantially reducing its effectiveness as a screening element, in the SLVIA, the ZTV is generally used for determining the geographic scope of the analysis only.

A.1.2 Viewshed Analysis Parameters

Viewshed analyses are not perfectly accurate for a variety of reasons (especially because of limitations in elevation data accuracy); however, incorporating certain parameters into a viewshed analysis will improve its accuracy. All viewshed analyses conducted for SLVIAs considered by BOEM incorporate a viewer height of 1.8 m (5.9 ft), and use accurate elevations for viewpoints used in the SLVIA. That is, viewshed analyses cannot simply assume viewers are standing on the shore; the elevation of the earth surface at the viewpoint, plus any additional height for elevated viewpoints, such as buildings or viewing platforms, are used.

At long distances, the curvature of the earth will begin to conceal objects at the horizon that would be visible in the absence of earth curvature. In addition, the atmospheric phenomenon of refraction will bend light and cause objects that would actually be below the horizon in the absence of refraction to appear above the horizon. All viewshed analyses conducted for BOEM-approved SLVIAs incorporate earth curvature and atmospheric refraction. Given that atmospheric refraction effects on visibility vary over time and at different locations, the GIS software’s default value for atmospheric refraction or a stated and generally accepted value for refraction can be used.

A.1.3 Viewshed Analysis Documentation

The SLVIA should include documentation of the viewshed analysis procedures, parameters, data, and software utilized for the analyses.

Appendix B: Mitigation of Seascape/Landscape and Visual Impacts from Offshore Wind Facilities

This appendix discusses principles for mitigating seascape/landscape and visual impacts from offshore wind facilities, including both offshore and applicable onshore facility components.

B.1 Introduction

Offshore wind facility seascape, landscape, and visual impact mitigation measures are methods or actions that reduce potential adverse impacts from both the offshore and onshore components of offshore wind facility construction, operation, and decommissioning. Impact mitigation measures can include practices to avoid, minimize, rectify, or compensate for adverse impacts and, as such, include actions to be taken when siting and designing the facility, as well as actions to be taken after the facility is sited and designed. The large size of offshore wind projects and the height of individual wind turbines can make them visible for long distances both day and night, and mitigation is important for reducing seascape, landscape, and visual impacts to the extent possible. This chapter presents mitigation measures for both the offshore and onshore components of offshore wind facilities.

This mitigation discussion is presented in the context of avoiding/reducing seascape, landscape, and visual impacts only. All mitigation measures are subject to requirements for worker safety and facility security and may conflict with other resource goals, such as ecological resources, or may be unsuitable for other technical or practical reasons. The selection of mitigation measures should be done on a project-by-project basis and take into consideration possible effects on other resources and project constraints.

B.2 Offshore Versus Onshore Facility Impact Mitigation

For a BOEM-reviewed offshore wind project, seascape, landscape, and visual impact mitigation is specified for both onshore and offshore facility components, for both daytime and nighttime conditions, and for all phases of development.

All offshore structures above the waterline and activities are subject to mitigation, including the following:

- Wind turbines;
- Electrical service platforms;
- Turbine lighting; and
- Boat and helicopter traffic.

Onshore structures and activities that are subject to mitigation include the construction, operation, and decommissioning of the following:

- Substations;
- Electric transmission facilities, including buried cables and cable landfalls;
- Onshore office/ maintenance/ storage buildings;
- Ware-yards;
- Roads;
- Other facilities or facility components built as a direct result of the proposed project; and
- Onshore operations and maintenance activities associated with the project.

In general, mitigation options for offshore wind energy components are limited because of the very open nature of most ocean views, the large size and large number of turbines with spinning blades and flashing lights at night, and the requirement that offshore components be brightly colored for navigation safety purposes. These properties make concealment of offshore wind turbines and electrical service platforms very difficult, and as a result, in some instances their visual presence can cause substantial seascape/landscape and visual impacts. Onshore substations and other onshore components, while in some cases still large-scale facilities, typically offer more opportunities for mitigation. In both cases, however, it is critical that seascape, landscape, and visual issues be considered as early as possible in the project design process, especially for offshore components, because siting the facility to minimize these impacts is the primary means of mitigation.

B.3 Mitigation Planning

Mitigating the seascape, landscape, and visual impacts of an offshore wind facility is most effectively addressed in the planning stages of the project. Consideration of mitigation too late in the project planning process may result in poor project siting, layout, and other issue that lead to significant stakeholder opposition to projects, resulting in costly delays or even cancellations of projects because of potential seascape, landscape, and visual impacts (Sullivan and Meyer 2014; Apostol et al. 2017). This caution and the following mitigation planning BMPs apply to both the offshore and onshore components of offshore wind facilities.

Other important mitigation planning best practices include the following:

- *Having landscape professionals involved in the siting and design process.* While the project siting and design process is primarily driven by engineering and cost considerations, qualified landscape professionals should be involved to raise potentially important SLVIA issues so that they can be considered appropriately in the siting and design process.
- *Using appropriate methods and data for the SLVIA and mitigation planning and design.* Good mitigation requires an accurate understanding of the potential impacts as well as sufficient and accurate elevation and resource data to locate viewpoints, protected areas, etc.
- *Incorporating stakeholder input into the siting and design and mitigation planning processes.* Stakeholder input is important to understanding which views and seascape/landscape traits are valued and what might constitute sufficient mitigation.
- *Identifying LORs that protect scenic, historic, and cultural resources.* It is important that the siting and design process be thoroughly informed about protected scenic, historic, and other seascape/landscape resources that may affect the siting process.
- *Conducting a thorough assessment of existing and potentially affected seascape/landscape and visual resources.* It is important to understand where protected areas and unprotected but sensitive areas are when conducting siting.
- *Developing spatially accurate and realistic photo simulations of project facilities.* In addition to informing impact assessment, visual simulations are useful tools for designing and testing mitigation options, e.g., changing turbine color or layout.
- *Developing a seascape/landscape and visual resource impact monitoring and mitigation compliance plan.* It is important to monitor mitigation for compliance and effectiveness, especially if the mitigation needs maintenance, e.g., painted or coated structures.
- *Developing a decommissioning and site reclamation plan that considers seascape, landscape, and visual impacts.* This is particularly important for onshore components, where there will likely be recontouring of land, vegetation removal, pavement, etc.
- *Including discussion of the seascape, landscape, and visual impact mitigation strategy in a preconstruction meeting.* It is important that both the developer's team and BOEM understand what and how mitigation will be used to avoid and remedy seascape, landscape, and visual impacts.

- *Discussing seascape, landscape, and visual impact mitigation objectives with equipment operators.* This is particularly important for onshore components, where operators play an important role in limiting impacts during construction and implementing mitigation measures.
- *Using offsite mitigation where onsite mitigation is ineffective or infeasible.* In some circumstances, where seascape, landscape, and visual impacts to important resources cannot be avoided or remedied, compensatory offsite mitigation should be considered.
- *Monitor mitigation implementation and effectiveness.* A mitigation monitoring program ensures that mitigation measures included in the COP are implemented and effective.

See the Bureau of Land Management's publication *Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands, 2nd Edition* (BLM [in press]) for more information on these BMPs.

B.4 Offshore Facility Impact Mitigation

B.4.1 Siting and Design

Siting and layout are two of the most important factors in reducing visual impacts to onshore resources (Orr et al. 2013; Apostol et al. 2017):

- Siting offshore wind facility components as far as possible from coastal resources is the single most effective seascape, landscape, and visual impact mitigation strategy (DTI 2005; Orr et al. 2013).
- Where possible, developments should be sited in already developed seascapes, with due consideration for visual absorption capacity and possible effects of other existing or reasonably foreseeable development. (DTI 2005).
- The relationship of the planned development to other existing or planned offshore wind facilities in the area should be considered in terms of siting but also to achieve consistency in layout to the extent possible (DTI 2005).
- Where possible, use intervening headlands to screen project views from sensitive locations (Apostol et al. 2017).
- Avoid creating visual clutter by siting facilities at different distances along the same line of sight, as seen from sensitive locations.
- Cluster or group turbines to break up overly long lines ("walls") of turbines (BLM 2013).
- Avoid creating visual clutter by avoiding siting facilities in front of or near visible headlands or peninsulas that are focal points from the mainland (DTI 2005).
- Facilities should be sited so that they are not framed by landforms in "keyhole" views from highly sensitive inland scenic vistas or other sensitive areas (DTI 2005).
- To the extent possible, the wind facility layout should be designed to minimize the horizontal spread of the layout from shore, particularly from sensitive viewpoints (DTI 2005).
- Where feasible, remove or relocate particular turbines to avoid impacts (BLM 2013).

B.4.2 Structure Design and Materials Selection

- Where possible, use fewer, larger turbines to minimize the horizontal spread of the facility as viewed from shore (BLM 2013; Apostol et al. 2017).
- Within a given project, turbines should be uniform in shape, color, size of rotor blades, nacelles, and towers (Gipe 1998, BLM 2013).

B.4.3 Materials Surface Treatment

- Turbines should use non-reflective paints and coatings to reduce reflection, blade glinting, and glare. (MMS 2007; BLM 2013; Scottish Natural Heritage 2014).
- Turbines should be painted light gray to reduce visual contrast (Scottish Natural Heritage 2014).
- Commercial messages and symbols (such as logos or trademarks) on wind turbines should be prohibited (BLM 2013).

B.4.4 Lighting

The following lighting mitigation measures are found in Orr et al. (2013) and (BLM [in press]). Additional lighting BMPs directed at reducing impacts to wildlife are omitted; only BMPs for seascape, landscape, and visual impacts are included here. However, it should be noted that many lighting BMPs that reduce seascape, landscape, and visual impacts will also reduce ecological impacts.

- Minimize lighting whenever and wherever possible. This includes minimizing the number of lights, the intensity of lights, and the amount of time lights are turned on.
- Lights that appear red to the eye should continue to be preferred for aviation obstruction lighting (AOL) over lights that appear white.
- Use flashing rather than non-flashing lights whenever possible.
- Avoid direct lighting of the water surface, and minimize indirect lighting on the water surface to the extent practicable once the facility is in operation.
- Direct lighting to where it is needed and avoid general area “floodlighting.” Area and work lighting should be limited to the amount and intensity necessary to maintain worker safety.
- Automatic timers and/or motion-activated shutoffs should be considered for all lights not related to AOL or marine navigational lighting (MNL).
- AOL should be most conspicuous to aviators, and the lighting spread below the horizontal plane of the light should be minimal.
- Allow for the automatic reduction of AOL intensity when visibility sensors indicate that the meteorological visibility is conducive to safely do so. For example, reduce the AOL to 30% when visibility is 5 km (3.1 mi) or greater and to 10% when visibility is 10 km (6.2 mi) or greater. Consultation with, and agreement by, the Federal Aviation Administration (FAA) will likely be necessary if this practice is to be considered.
- Except as required to meet the minimum safety and security requirements (e.g., emergency lighting triggered by alarms), all non-AOL and non-MNL permanent lighting should use luminaires with an Illuminating Engineering Society (IES) backlight, uplight, glare (BUG) (U0) rating (formerly referred to as full-cutoff luminaires). These luminaires will not emit light above their horizontal level, significantly reducing skyglow and potential light trespass. Additional side shielding will further reduce skyglow and light trespass. All fixtures should be mounted at the proper angle.
- Use aircraft detection lighting system (ADLS) technology. ADLS is a radar-activated technology that turns AOL on only when an aircraft is within a specified distance of the offshore wind facility; otherwise, the AOL is not on. The use of ADLS will significantly reduce seascape, landscape, and visual impacts from offshore wind facility lighting (BLM 2013). Consultation with, and agreement by, the FAA will be necessary.
- Inspect fixtures periodically for proper aim, fixture damage, lumen depreciation, lens and reflector degradation issues, and dirt that obscures light.

See the Bureau of Land Management's publication *Protecting Night Skies and Dark Environments on BLM Administered Lands: Best Management Practices for Artificial Light at Night* (BLM [in press]) for more information on these and other lighting BMPs.

B.4.5 Reclamation

- Upon facility decommissioning, all offshore structures should be removed to at least below the visible waterline.

B.4.6 "Good Housekeeping"

- Wind turbines should be well maintained for the duration of the operating permit. Nacelle covers and rotor nose cones should always be in place and undamaged. Inoperative turbines should be repaired, replaced, or removed as quickly as feasible (BLM 2013).
- For maintenance activities, reduce unnecessary boat/helicopter traffic by combining activities wherever possible.

B.5 Onshore Facility Impact Mitigation

For BOEM-approved offshore wind facilities, onshore facility components included in the SLVIA include onshore substations and their ancillary facilities, such as transmission lines, equipment laydown areas, roads, communication towers, and similar elements directly associated with the proposed project. The following BMPs are derived from the Bureau of Land Management's publication *Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands* (BLM 2013), and the reader is referred to that publication for additional information on these BMPs.

B.5.1 Siting and Design

- Facilities and their components should be sited outside the viewsheds of highly sensitive viewing locations, and/or areas with limited visual absorption capability and/or high scenic, historic, or cultural integrity. When they must be sited within view of visually sensitive areas, they should be sited as far away as possible. Where full screening of facility views is not possible, siting should take advantage of partial screening opportunities.
- Avoid siting facilities and their components near visually prominent seascape/landscape features that naturally draw an observer's attention. Do not site facilities so that they are visually aligned with prominent seascape/landscape features as seen from KOPs.
- Siting should take into account the impacts of lighting on the night sky and naturally dark areas. Avoid siting in areas where potential viewers and wildlife are most sensitive to night-sky/darkness impacts.
- Where feasible, facilities and their components should be sited in already developed industrial landscapes, avoiding residential landscapes, tourism-based commercial areas, etc.
- Where feasible, in forested areas or shrublands, site facilities and their components in existing clearings.
- A careful study of the project site should be performed to identify appropriate colors and textures for materials. The siting and design of the facility, structures, roads, and other project elements should match and repeat the form, line, color, and texture of the existing landscape to the extent possible. Bright colors should be avoided in favor of darker colors with gray content in order to visually recede and not attract visual attention
- Facilities and their components should be sited in a location with stable soil that is favorable for revegetation and reclamation/restoration.

- Siting should take advantage of available topographic, vegetative, and structural screening opportunities.
- Through site design, the number of permanent structures required should be minimized. Activities should be combined and carried out in one structure, or structures should be collocated to share pads, fences, access roads, and lighting.
- Structures should not be placed on ridgelines, summits, or other locations where they would be silhouetted against the sky.
- Structures should be designed and located to minimize cut and fill.
- During construction, avoid siting staging and laydown areas in visually sensitive areas.

B.5.2 Structure Design and Materials Selection

- Facility design should incorporate measures to minimize the profile of all facility-related structures, particularly for facilities proposed within proximity to sensitive viewing locations.
- Where screening topography and vegetation are absent, natural-looking constructed landforms and vegetative or architectural screening should be used to minimize visual impacts.
- The use of permanent signs and project construction signs should be minimized. Beyond those required for basic facility and company identification for safety, navigation, and delivery purposes, commercial symbols or signs and associated lighting on buildings and other structures should be minimized.

B.5.3 Materials Surface Treatment

- Facility components should be specified with a low-reflectivity, neutral finish. Insulators at substations and on transmission lines should be non-reflective and non-refractive. The surfaces of structures should be given low-reflectivity finishes with neutral colors to minimize the contrast of the structures with their backdrops. Chain-link fences surrounding the substations and other structures should have a dulled, darkened finish to reduce contrast.

B.5.4 Lighting

- Minimize lighting whenever and wherever possible. This includes minimizing the number of lights, the intensity of lights, and the amount of time lights are turned on.
- Except as required to meet the minimum safety and security requirements (e.g., emergency lighting triggered by alarms), all permanent lighting should use luminaires with an IES backlight, uplight, glare (BUG) (U0) rating (formerly referred to as full-cutoff luminaires). These luminaires will not emit light above their horizontal level, significantly reducing skyglow and potential light trespass. Additional side shielding will further reduce skyglow and light trespass. All fixtures should be mounted at the proper angle.
    - Use retro-reflective or luminescent markers in lieu of permanent lighting.
    - Encourage use of headlamps and flashlights where possible.
    - Use lighting controls effectively, including motion sensors, photo sensors, timers, and dimmers.
    - Use vehicle-mounted lights or portable light towers for temporary task lighting.
    - Direct lighting to where it is needed and avoid general area “floodlighting.” Area and work lighting should be limited to the amount and intensity necessary to maintain worker safety.
    - Inspect fixtures periodically for proper aim, fixture damage, lumen depreciation, lens and reflector degradation issues, and dirt that obscures light.

- Unless particular tasks require highly accurate color rendition, use “wildlife friendly” light sources that emit narrow-spectrum, long-wavelength (greater than 560 nm) light, such as amber, orange, or red light emitting diodes (LEDs). Broad spectrum, bluish-white lighting or lighting rich in UV light should not be used in permanent outdoor lighting. If safety-related lighting requirements for particular tasks call for accurate color rendition that precludes the use of narrow-spectrum long-wavelength light sources, broad-spectrum light sources with a correlated color temperature (CCT) of 2200 K or below should be used in combination with lighting controls such as motion sensors, timers, dimmers, etc.

See the Bureau of Land Management’s publication *Protecting Night Skies and Dark Environments on BLM Administered Lands: Best Management Practices for Artificial Light at Night* (BLM [in press]) for more information on these and other lighting BMPs.

B.5.5 Avoiding Disturbance

- Minimize the project footprint and associated disturbance during and after construction. The number, size, and length of roads, temporary fences, laydown areas, and borrow areas should be minimized. Existing rocks, vegetation, and drainage patterns should be preserved to the maximum extent possible. All construction and maintenance activities should be conducted in a manner that will minimize disturbance of vegetation, soils, drainage channels, and intermittent and perennial stream banks.
- Personal vehicles, sanitary facilities, and work areas should be confined to clearly delineated construction boundaries specified in the plan of development. During construction and prolonged operations and maintenance projects, maintenance equipment, materials, and vehicles should be stored at the sites where activities will occur, or at specified maintenance yards.
- Provide maps of avoidance areas to construction personnel; the maps should include established work zones and right-of-way areas where overland travel should be avoided. Use survey staking to delineate avoidance areas in conjunction with avoidance area maps.
- Neither paint nor permanent discoloring agents should be applied to rocks or vegetation to indicate survey limits.
- Allow only overland driving in areas where recontouring is not required.

B.5.6 Soils and Erosion Management

- Dust abatement measures should be implemented in arid environments and areas with air quality regulations (i.e., air quality non-attainment and maintenance areas) to minimize the impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils. This may also require limiting the types of equipment, vehicle speeds, and routes utilized during construction.
- Erosion and sediment control measures should be in place and functioning before construction or decommissioning activities occur. Preserve as much existing vegetation as possible. Sediment controls should be installed and maintained along the site perimeter on all down-gradient sides of the construction.
- Temporary and/or permanent soil stabilization measures should be applied immediately on all disturbed areas as grading progresses. These measures should be utilized appropriately until construction is complete, and all vegetation is established.
- Strip, stockpile, and stabilize topsoil from a site before excavating earth for facility construction. Topsoil should not be screened because retaining the original soil components will help reestablish the surface texture that existed prior to disturbance. Stockpiled soil should be placed in a stable location and configuration.

- Topsoil from cut and fill activities should be spread on freshly disturbed areas to reduce color contrast, reestablish surface textures, and aid rapid re-vegetation. Apply an approved erosion control stabilizer or approved seed mix as a temporary erosion control mix on the stockpiled soil to control fugitive dust and preserve topsoil quantity. Topsoil should be placed at natural slope angles.

B.5.7 Vegetation Management

- Openings in vegetation for facilities, structures, and roads, should be feathered and shaped to repeat the size, shape, and characteristics of naturally occurring openings.
- Vegetation clearing should be minimized. Brushbeating, mowing, or using protective surface matting rather than removing vegetation should be employed. Trim trees in preference to cutting trees, and cut trees in preference to bulldozing them.
- In construction areas where recontouring is not required, cut vegetation crowns and roots should be left undisturbed to avoid root damage and to allow for re-sprouting.
- Installation of underground features (e.g., buried power and signal cables) should be completed using directional drilling rather than excavation, and compatible utilities should share underground rights-of ways and trenches.
- In order to protect valuable trees and other scenic attributes, clear only to the edge of the designed grade manipulation and not beyond, and use retaining walls or berms to protect tree roots and stems from construction activities. Use fences or markings to delineate trees or other features within the project site that should be preserved.
- Slash piles should not be left in sensitive viewing areas. Slash from vegetation removal should be mulched and spread to cover fresh soil disturbances (the preferred methodology) or should be buried.
- Where existing vegetation in areas to be cleared is of appropriate size and density, it should be mulched and spread. Furrow slopes (i.e., cut grooves or create narrow, shallow trenches), and use planting holes or planting pockets (to be filled in with growing media) on slopes.
- Disturbed surfaces should be revegetated using salvaged native vegetation or using BOEM-approved seed mixes consisting of weed-free native grasses, forbs, and shrubs representative of the surrounding and intact native vegetation composition.
- Vegetation from areas that are to be cleared or thinned for construction or visual mitigation should be transplanted into areas that were disturbed and cleared during construction where feasible.
- The project developer should monitor and maintain revegetated surfaces. Corrective measures should be conducted as needed until a self-sustaining stand of preferred (i.e., non-invasive) vegetation is re-established and visually adapted to the undisturbed surrounding vegetation. No new disturbance should be created during operations without approval by the authorized officer.

B.5.8 Reclamation

- A reclamation plan should be prepared in consultation with BOEM when necessary. The plan should address surface reconstruction and stabilization, topsoil management, soil preparation and seed mix(es), and invasive plant management.
- Begin site reclamation activities during construction and during operations, as soon as possible after disturbances.
- Recontour soil borrow areas, cut and fill slopes, berms, waterbars, and other disturbed areas to approximate naturally occurring slopes.

- Cut slopes and recontoured areas should be randomly scarified and roughened to reduce texture contrasts with existing landscapes and aid in revegetation.
- Rocks, brush, and woody debris should be salvaged and replaced to approximate pre-project visual conditions.
- Temporary roads should be removed, and the land restored to its natural state, as soon as possible. All new access roads that are not needed or required for maintenance should be closed using the most effective and least environmentally damaging methods appropriate to that landscape setting.
- Above-ground structures and near-ground pipelines, conduits, and other connecting structures should be removed upon completion of a project.
- Gravel and other surface treatments should be removed or buried as part of project decommissioning.

B.5.9 "Good Housekeeping"

- "Housekeeping" procedures should be developed for the project to ensure that the project site and lands adjacent to the project site are kept clean of debris, garbage, graffiti, fugitive trash, or waste generated onsite. Procedures should extend to control of "trackout" of dirt on vehicles leaving the active construction site and controlling sediment in stormwater runoff.
- The substation and offsite surrounding areas should be kept clean of debris, fugitive trash or litter, and graffiti. Surplus, broken, and used materials and equipment of any size should not be allowed to accumulate. Scrap heaps and materials dumps should be prohibited. Materials storage yards should be kept to a minimum.
- The burning of trash should be prohibited during construction, operations, and decommissioning; trash should be stored in containers and/or hauled offsite.
- Construction sites should have entrances, exits, and parking areas with exit tire washes and/or vehicle tracking pads to reduce the tracking of sediment onto roads; these areas should be kept clean.
- Transformers and other components should be cleaned periodically to remove any spilled or leaking fluids and the dirt and dust that accumulates on them (BLM 2013).
- The substation should be well maintained for the duration of the operating permit. Inoperative components should be repaired, replaced, or removed as quickly as feasible (BLM 2013).
- For maintenance activities, reduce unnecessary traffic by combining activities wherever possible.
- Strict attention should be paid to rapid and complete removal of excess materials and trash generated during construction, operation, and decommissioning activities.
- All stakes and flagging should be removed from the construction area and disposed of in an approved facility.
- During construction, temporary chain-link fences surrounding the material storage yards and laydown yards should be covered with fabric.

Department of the Interior (DOI)

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

Bureau of Ocean Energy Management (BOEM)

The mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.

BOEM Environmental Studies Program

The mission of the Environmental Studies Program is to provide the information needed to predict, assess, and manage impacts from offshore energy and marine mineral exploration, development, and production activities on human, marine, and coastal environments. The proposal, selection, research, review, collaboration, production, and dissemination of each of BOEM's Environmental Studies follows the DOI Code of Scientific and Scholarly Conduct, in support of a culture of scientific and professional integrity, as set out in the DOI Departmental Manual (305 DM 3).