

**UNITED STATES DEPARTMENT OF THE INTERIOR**  
**Bureau of Ocean Energy Management**  
**Office of Renewable Energy Programs**

**October 2019**

**Draft Proposed Guidelines for Providing Information on Lighting and Marking of Structures Supporting Renewable Energy Development**

**I. Introduction**

This guidance is intended to make recommendations regarding lighting and marking design for wind energy facilities on Federal renewable energy leases on the Outer Continental Shelf (OCS) and outline the types of information that BOEM requests from lessees as part of their Site Assessment Plan (SAP), Construction and Operations Plan (COP), or General Activities Plan (GAP), as applicable. This information is intended to assist BOEM in determining whether the lighting and marking of offshore wind energy facilities:

- are safe;
- do not unreasonably interfere with other uses of the OCS;
- do not cause undue harm or damage to natural resources; life (including human and wildlife); property; the marine, coastal, or human environment; or sites, structures, or objects of historical or archaeological significance;
- use best available and safest technology; and
- use best management practices.

BOEM will review lighting and marking information, in consultation with other Federal agencies, as part of its plan review and approval process. Pursuant to 30 CFR 585.701, BOEM may request more detailed lighting and marking specifications in a lessee's Facility Design Report following plan approval. The BOEM recommendations are offered to assist lessees in demonstrating that their plans adequately address the concerns enumerated above. They are guidance and do not prescribe additional regulatory requirements.

**II. Authorities and Regulations**

The Bureau of Ocean Energy Management (BOEM) is responsible under the Outer Continental Shelf Lands Act (43 U.S.C. § 1337(p)(4)(A)) and its implementing regulations(30 CFR part 585) for ensuring that activities on Federal renewable energy leases are carried out in a manner that provides for safety and protection of the environment. BOEM regulations require lessees to include a description of the project design as part of its plan submittals (*See* 30 CFR 585.610(a)(6) (SAP), 30 CFR 585.626(b)(6) (COP), 30 CFR 585.645(b)(6) (GAP)). BOEM interprets this project design description to include lighting and marking information.

The Federal Aviation Administration (FAA) and the United States Coast Guard (USCG) both have regulatory requirements for the lighting and marking of offshore structures. For structures more than 200 ft (61 m) in height above the sea surface and within 12 nm(22.2 km) from shore, a lessee must file a Notice of Proposed Construction or Alteration with the FAA per Federal

aviation regulations (14 CFR 77.7 and 14 CFR 77.9). This filing is necessary if the structure's height exceeds any other obstruction standard contained in 14 CFR part 77. The FAA will then conduct an obstruction evaluation analysis to determine whether the structure would pose a hazard to air traffic, and if it does not, the FAA will issue a Determination of Hazard/No Hazard. The FAA recommends voluntary marking or lighting, or both, of a meteorological evaluation tower less than 200 ft (61 m) in height above the sea surface to address safety impacts to low-level operations and to enhance the conspicuity of these towers in remote and rural areas.<sup>1</sup>

Offshore wind lessees are also required by USCG to obtain a permit for private aids to navigation (PATONs), which USCG defines to cover all structures located in or near navigable waters of the United States (*see* 33 CFR part 66). PATON regulations require individuals or organizations to mark privately owned marine obstructions or other similar hazards. The USCG's marking requirements are found in 33 CFR Part 64. Unlike FAA regulations, PATON requirements apply beyond the 12 nm (22.2 km) territorial sea boundary. BOEM will include as a condition of plan approval for SAPs, COPs, and GAPs a requirement that lessees submit a copy of any PATON applications to BOEM. USCG has also informed BOEM that it requires meteorological towers and/or buoys to be displayed on the National Oceanic and Atmospheric Administration nautical charts. The USCG *Aids to Navigation Manual* established requirements for offshore wind facilities in Chapter 4, Section G.

### **III. BOEM Recommendations**

The following is guidance and is not intended to prescribe additional regulatory requirements. Lessees may propose alternative design parameters to provide for aviation safety, avoid harm to wildlife, avoid interference with other users, and/or further other criteria for plan approval.

#### **A. Navigation And Aviation Safety Recommendations**

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<sup>1</sup> For more detailed information on the marking and lighting of wind turbines, see Chapter 13 of the FAA Advisory Circular (AC) 70/7460-1L Obstruction Marking and Lighting. FAA guidance applies equally to both onshore wind facilities and offshore wind facilities sited within 12 nm of shore. ([https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/AC\\_70\\_7460-1L\\_Change\\_2.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_Change_2.pdf)).

For BOEM-approved facilities, BOEM recommends the following lighting and marking design parameters:

Paint and Marking (recommended for all structures)

- The turbine and tower paint color should be no lighter than RAL 9010 Pure White and no darker than RAL 7035 Light Grey.
- The foundation base of all turbines should be painted yellow.
- Ladders at the foundation base of all turbines should be painted in a color that contrasts with the recommended yellow. Painting the ladders in a distinguishable color will allow for ease of identification for operations and maintenance personnel.
- Each turbine should have a distinct identifier or number to allow for quick location if there is an incident or accident.

Lighting (recommended for structures 200 ft (61 m) or more in height above the sea surface beyond

12 nm (22.2 km) from the coast, i.e., outside of FAA jurisdiction)

- Red wavelength LED lighting should be in the infrared portion of the spectrum between 675 and 900 nanometers.
- Lights should have photometric values of an FAA Type L-864 medium intensity red obstruction light.
- Lights should flash simultaneously at 30 flashes per minute (FPM).
- Structure lights should be visible in all directions in the horizontal (i.e., visible spread from 360 degrees).
- Lighting should be placed at the highest point of the turbine nacelle, and mid-mast lighting for turbines above 699 ft.
- Every turbine should be outfitted with a light, but not all turbine lights need to be turned on as long as there are no unlit separations or gaps of more than .5 statute miles (804 m) around the perimeter of the entire facility (or cluster of turbines within the facility).
- There should be no unlit separation or gaps of more than 1 statute mile (1.6 km) within the facility (or cluster of turbines within the facility).

As demonstrated in Attachment A to this guidance, the lighting recommendations are designed to be consistent with FAA regulatory requirements that apply to structures sited within 12 nm of shore.

In consultation with the FAA and DoD, BOEM will consider the use of aircraft detection lighting systems or dimming technologies to minimize visual impacts from lighting. BOEM is not mandating use of these technologies.

## **B. Environmental Recommendations**

Based upon review of existing studies and literature related to impacts to birds, bats, marine mammals, turtles, and fish from offshore lighting, and the experiences gained from reviewing operational offshore wind facilities' lighting, BOEM recommends the following:

- Minimize lighting whenever and wherever possible, including number, intensity, and duration.
- For aviation obstruction lighting (AOL), favor red lighting over other colors whenever practicable.
- Use flashing lights instead of steady burning lights whenever practicable and use the lowest flash rate practicable for the application to maximize the duration between flashes. BOEM recommends 30 FPM to be a reasonable rate in most instances.
- Avoid direct lighting and minimize indirect lighting of the water surface to the extent practicable once the wind facility is in operation.
- Direct the lighting to where it is needed and avoid general area “floodlighting.”
- Limit area and work lighting to the amount and intensity necessary to maintain worker safety.
- Consider using automatic timers or motion-activated shutoffs for all lights not related to AOL or Marine Navigation Lighting.
- Use AOL that is most conspicuous to aviators, and the lighting spread below the horizontal plane of the light should be minimal but still within the Photometric values of a FAA Type L-864 medium intensity red obstruction light.
- Allow for the automatic reduction of AOL intensity when visibility sensors indicate that the meteorological visibility is conducive to safely do so—for example, reducing the AOL to 30 percent when visibility is 3.1 mi (5 km) or greater and to 10 percent when visibility is 6.2 mi (10 km) or greater.

Additional lighting and marking information may be recommended on a project-specific basis. For example, if the project design includes transit corridors through the facility to reduce conflicts with other ocean users such as recreational boaters or commercial fishermen, such corridors may need additional markings to fulfill that purpose.

## **IV. Resources for Additional Information**

### **Bureau of Ocean Energy Management:**

BOEM OCS Study 2013-0116 (<https://www.boem.gov/ESPIS/5/5298.pdf>): *Evaluation of Lighting Schemes for Offshore Wind Facilities and Impacts to Local Environments.*

BOEM OCS Study 2016-002 (<https://www.boem.gov/offshore-lighting-guidance/>): *Development of Guidance for Lighting of Offshore Wind Turbines Beyond 12 Nautical Miles.*

U. S. Coast Guard:

USCG Navigation and Vessel Inspection Circular No. 01-19  
(<https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/2019/NVIC%2001-19-COMDTPUB-P16700-4-dtd-01-Aug-2019-Signed.pdf?ver=2019-08-08-160540-483>).

Aids to Navigation Manual ([https://media.defense.gov/2017/Mar/29/2001724016/-1/-1/0/CIM\\_16500\\_7A.pdf](https://media.defense.gov/2017/Mar/29/2001724016/-1/-1/0/CIM_16500_7A.pdf)), Chapter 4, Section G on Offshore Renewable Energy Installations.

Federal Aviation Administration:

Advisory Circular (AC) 70/7460-1L  
([https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/AC\\_70\\_7460-1L\\_Change\\_2.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_Change_2.pdf)): Chapter 13 - Marking and Lighting Wind Turbines.

International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA):<sup>2</sup>

IALA Recommendation O-139 (<http://www.iala-ism.org/product/markings-of-man-made-offshore-structures-o-139/>): Marking of Man-Made Offshore Structures O-139.

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<sup>2</sup> The IALA is a not-for-profit international technical association that offers assistance to navigation authorities, manufacturers, and consultants to develop and apply effective and harmonized marine Aids to Navigation.

## V. Contact Addresses

For further information or inquiries regarding these guidelines, please contact the BOEM Office of Renewable Energy Programs by telephone (703-787-1300) or by email (renewable\_reporting@boem.gov).

**Table 1**  
**Mailing Locations for BOEM Inquiries**

Project Location by State (Offshore)	Filing Address
<b>Maine</b> <b>New Hampshire</b> <b>Massachusetts</b> <b>Rhode Island</b> <b>New York</b> <b>New Jersey</b> <b>Delaware</b> <b>Maryland</b> <b>Virginia</b> <b>North Carolina</b> <b>South Carolina</b> <b>Georgia</b> <b>Florida (South Atlantic and Straits of Florida Planning Areas)</b>	Bureau of Ocean Energy Management Office of Renewable Energy Programs 45600 Woodland Road Mail Stop VAM-OREP Sterling, Virginia 20166 Phone: (703) 787-1320
<b>Florida (Eastern Gulf of Mexico Planning Area)</b> <b>Alabama</b> <b>Mississippi</b> <b>Louisiana</b> <b>Texas</b>	Bureau of Ocean Energy Management New Orleans, Louisiana Office Attn: Renewable Energy Program Mail Stop 5400 1201 Elmwood Park Boulevard New Orleans, Louisiana 70123-2394 Phone: (800) 200-GULF
<b>Alaska</b>	Bureau of Ocean Energy Management Anchorage, Alaska Office Mail Stop 8200 Centerpoint Building 3801 Centerpoint Drive, Suite 500 Anchorage, Alaska 99503 Phone: (907) 334-5200
<b>Washington</b> <b>Oregon</b> <b>California</b> <b>Hawaii</b>	Bureau of Ocean Energy Management Camarillo, California Office 760 Paseo Camarillo, Suite 102 Camarillo, California 93010 Phone: (855) 320-1484

**Table 2**  
**Additional Contact Information**

<b>Bureau of Safety and Environmental Enforcement Submittal Address</b>	
<b>Safety Management System</b>	Bureau of Safety and Environmental Enforcement Office of Offshore Regulatory Programs 45600 Woodland Road Mail Stop VAE-ORP Sterling, Virginia 20166 E-mail: bseerenewableenergy@bsee.gov

**VI. Paperwork Reduction Act Statement**

These guidelines are included in the requirements contained in 30 CFR Part 585, subpart F. The Office of Management and Budget (OMB) has approved the information collection requirements for these regulations and assigned them OMB Control Number 1010-0176.

## A Comparison of FAA Requirements and BOEM Guidance

This table is provided to illustrate the consistency of the Federal Aviation Administration (FAA) requirements and the Bureau of Ocean Energy Management (BOEM) guidance for lighting and marking of structures 200 feet (ft; 61 meters [m]) or more in height above the sea surface.

Topic	FAA	BOEM	Comment
Paint Color	RAL 9010 Pure White RAL 7035 Light Grey	RAL 9010 Pure White RAL 7035 Light Grey	Same as FAA, no additional striping, blades the same color as structure. Note: Base of structure will be yellow up to 15 meters (m) above sea surface per US Coast Guard (USCG).
Lighting Color	Red	Red wavelength - infrared between 675 and 900 nanometers (LED light source)	Wavelength stipulated by Department of Defense (DoD) and USCG
Light Range/Intensity	L-864 medium intensity	L-864 medium intensity	Same as FAA
Lighting State	Flashing, strobe, or pulsed. Synchronized to pulse simultaneously.	Flashing simultaneously 30 flashes per minute (FPM)	Red flashing lights at 30 FPM are most conspicuous for pilots and minimize bird impacts
Spread	Visible from 360 degrees	Visible from 360 degrees	Same as FAA
Placement	Highest point of the turbine nacelle. Mid-mast lighting for turbines above 699 ft.	Highest point of the turbine nacelle. Mid-mast lighting for turbines above 699 ft.	Same as FAA
Distribution of lights across farm	No unlit separations or gaps more than .5 statute mile (804 m) around the perimeter. No unlit separation or gaps of more than 1 statute mile (1.6 kilometers [km]) within the grid or cluster of turbines.	Every turbine outfitted with a light, but not turned on. No unlit separations or gaps more than .5 statute mile (804 m) around the perimeter. No unlit separation or gaps of more than 1 statute mile (1.6 km) within the grid or cluster of turbines.	Functionally the same as FAA, a spacing between offshore wind turbines is assumed to be greater than the minimum recommended distance in FAA guidance.
Aircraft Detection Lighting System	Case by case	Case by case	Resolved through consultation with other Federal agencies. Technologies are currently under review by DoD.
Dimming System	Currently under review	Case by case	Resolved through consultation with other Federal agencies.



