



TRANSPORTATION RESEARCH BOARD

OF THE NATIONAL ACADEMIES

Worker Health and Safety on Offshore Wind Farms

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Committee

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- Dr. Jennifer L. Schneider, Rochester Institute of Technology
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- Dr. David H. Wegman, University of Massachusetts, Lowell (emeritus)

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Current CFR SMS Requirements

- 30 CFR 585.810 – Safety Management System
- Requires an SMS describing:
 - How you will ensure safety of personnel or anyone on or near your facility
 - Remote monitoring, control, and shut down capabilities
 - Emergency response procedures
 - Fire suppression equipment, if needed
 - How and when you will test the SMS
 - How you will ensure personnel who operate your facilities are properly trained
- Recognizing that these requirements are vague, BOEM commissioned the TRB to undertake a study

Study Tasks

- Identify unique risks to worker health and safety on wind farms, as compared with oil and gas operations on the OCS;
- Identify any gaps or overlaps in jurisdictional authority; and
- Evaluate the adequacy of existing regulations and recommend enhancements to regulations for worker health and safety on OCS wind farms.

Common Hazards for Offshore Wind Farms

Assembly and fit-up (**installation only**)

Chemical exposure

Confined space entry

Crane and lifting

Demolition (**decommissioning only**)

Diving

Dropped objects

Electrocution and arc flash

Emergency evacuation

Electric/magnetic field exposure

(**operations only**)

Falls from height

Fire

Human factors health issues (climbing, awkward postures)

Human factors safety issues (pinch points, rotating equipment)

Noise exposure

Personnel transfers (falls into the water); access by boat; access by helicopter

Slips and trips

Vibration

Weather exposure

This list of hazards is not comprehensive and is not a substitute for a formal hazard analysis that is part of the safety management system development process.

Source: Generated by the committee.

Risks Compared to Offshore Oil and Gas

- Most hazards identified by the committee posed similar risks as compared to those encountered by workers on offshore oil and gas facilities, e.g.,
 - Diving hazards
 - Manual material handling
- Hazards with higher risks on offshore wind turbines include:
 - Electrical injuries
 - Personnel transfers
- Hazards with lower risks on offshore wind turbines include:
 - Explosions
 - Chemical Exposure

Findings related to Hazards

1. OSHA standards and USCG regulations can be applied to some potential hazards in the offshore wind industry.

USDOI's Regulatory Responsibility and Resources (1982 to Present)

Responsibility	Resource Area			
	Oil and Gas and Renewable Energy (After 2005)	Oil and Gas and Renewable Energy	Oil and Gas	Renewable Energy
Promote resource development	MMS	BOEMRE	BOEM	BOEM
Economic analysis				
Leasing				
Environmental assessment				
Safety and environmental enforcement		BSEE		
Revenue collection	ONRR after October 1, 2010	ONRR	ONRR	
	1982 to May 2010	May 2010 to October 1, 2011	Since October 1, 2011	

Source: Generated by the committee.

Summary of Health and Safety Jurisdiction for Offshore Wind Farms

Regulator	Jurisdiction of Offshore Wind Farm	
	State Waters and the Great Lakes	Outer Continental Shelf (OCS)
BOEM	No jurisdiction*	Jurisdiction of wind farms on the OCS including SMS. The scope of the SMS should discuss all activities and all facilities, regardless of jurisdiction.
BSEE	No jurisdiction	No jurisdiction
USCG	Safety of navigation, life, and property on inspected and certain other vessels	Safety of navigation, life, and property on inspected vessels on the OCS, but interaction between vessel and facility for wind farms on the OCS is still unclear.
OSHA or state OSHA	Jurisdiction and regulations for specific hazards of offshore wind farms in state waters and the Great Lakes	No jurisdiction; BOEM intends to exercise statutory authority.
Federal Energy Regulatory Commission	No jurisdiction	No jurisdiction
USACE	No jurisdiction	No jurisdiction.

*BOEM does not have jurisdiction in State waters; however the wind farm SMS should discuss all activities and all facilities from fabrication through decommissioning regardless of jurisdiction

Findings Related to Jurisdiction

1. BOEM is responsible for regulating worker safety on offshore wind farms on the OCS.
2. BOEM's SMS covers all activities and all facilities described in and conducted under a lessee's SAP, COP, or GAP, regardless of jurisdictional boundaries
3. MOA between BOEM and USCG; MOU between USCG and OSHA; are unclear with respect to health and safety regulations and enforcement

Common Elements Across Safety Management Systems

1. Safety policy and organization
 1. Policy for ensuring worker health and safety
 2. Authority and responsibilities for key positions
 3. Personnel qualifications, training, competency
 4. Management commitment and employee participation
2. Planning
 1. Hazards analysis
 2. Health and safety hazard mitigation, hierarchy of hazard controls
 3. Operating procedures
 4. Management of change
 5. Emergency preparedness, prevention, response
 6. Quality assurance, mechanical integrity, maintenance
 7. Commissioning
3. Implementation
 1. Communication
 2. Procurement
 3. Contracting and contractors
 4. Incident investigation and reporting
 5. Audits
 6. Inspections
 7. Records and documentation
 8. Performance monitoring, measurement, key performance indicators (KPIs)
 9. Corrective and preventive actions
 10. Continual improvement (including program evaluation, management review)

Source: Generated by the committee.

Findings Related to Regulations

1. Worker health and safety regulations on OCS offshore renewable energy installations (OREIs) are not well developed...
2. An SMS can be effective in ensuring worker health and safety...
3. Goal-based regulations could allow the appropriate flexibility needed for technological changes and continued development.
4. Some of the Safety and Environmental Management System (SEMS) requirements for the offshore oil and gas industry would be appropriate for offshore wind farm worker health and safety...

Findings Related to Regulations

5. Central element of designing for safety is a focus on HFE; Prescriptive requirements do not always keep up to date with industry's best practices and design principles, adhering to HFE design standards could address this problem.
6. Valid and reliable data are essential; stakeholders can develop and use KPIs to improve worker safety.
7. BOEM's inspection process for wind turbines is not well developed, nor is an audit process part of the regulations.
8. Neither BOEM nor BSEE has established training programs for offshore wind inspectors.

Other Findings

1. Well-defined federal occupational health and safety regulations for offshore wind farms on the OCS would also provide a resource for OSHA and the state programs.
2. Guidelines for health and safety training lack consistency between manufacturers and operators.

Summary of Recommendations

1. a: (long-term)...Undertake rulemaking and adopt a full SMS rule...
b: (short-term) Develop a clear SMS standard...(and) guidelines and recommended practices...
2. SMS rule should be contained in a single document...encompass all activities... (include all) operators and contractors...(at) all locations, regardless of jurisdiction.
3. BOEM and BSEE should assess in detail the adequacy of current U.S. and foreign regulations and marine construction guidelines in addressing hazards...
4. BOEM and BSEE should require the inclusion of HFE and prevention through design (PtD) elements in any updated SMS requirement for offshore wind farms.

Recommendations, continued

5. BOEM should examine its MOA with USCG, and USCG should review its MOU with OSHA; explore possibility of tripartite MOU.
6. a: BOEM should enlist the help of industry and industry stakeholders in researching and developing standards for KPIs and in collecting, storing, and publishing this information.
b: BOEM should require organizations operating on the OCS to submit all internal audit plans, including relevant KPIs to be collected, electronically.
7. As it updates the inspection process and develops complete audit procedures, BOEM should examine the holistic approach recommended in the recent SEMS report as a model for offshore wind energy.

Questions?