

ECO 611
**Offshore Wind Energy – Environmental Impacts, Siting, Permitting,
and Stakeholder Engagement**

Meeting Time:

Online, Asynchronous

3 Credits

Instructor:

Dwayne Breger, Ph.D.
Environmental Conservation

Weekly Online Synchronous

Sessions:

Office hours, content review, guest speakers or on-line contact time

Teaching Assistant:

Max Dilthey

Course Description:

Before construction begins on an offshore wind farm, there is a rigorous process of assessing ecological and environmental impacts, obtaining any Federal and State permits, and engaging with stakeholders. This process is expensive, and vital to the successful installation of an offshore wind farm. A thorough understanding of these procedures is essential to all professionals in the offshore wind industry. This course is designed to guide the student through this process, from the time the potential offshore wind development site has been identified, until construction is complete and the wind farm is operational.

The on-line course will consist of recorded lectures with slides, assigned readings, problem sets, and two exams. Students will engage with the instructor and fellow students through robust on-line discussion sessions and postings.

Learning Objectives:

Upon successful completion of this module, students will understand:

- Ocean and benthic environment and ecology;
- Threatened/endangered/commercial species of concern;
- Pre-and post-construction monitoring;
- Impacts of offshore wind construction and operation;
- Impact mitigation;
- Federal and State ocean jurisdictions;
- BOEM – leasing and auctioning for offshore wind development rights;
- Environmental and other permits under NEPA and other laws;
- Permitting of subsurface cables, landfall, and interconnection;

- Key stakeholder groups and perspectives;
- Engagement, understanding, and finding common ground;
- Surveying opinions of stakeholders and general public; and
- Rules and best practices on public hearings and transparency.

Reading Materials:

Readings will be assigned from academic literature and applied professional and governmental reports on present-day offshore wind developments. There is no assigned textbook for the class. All readings will be listed and posted to Moodle. You should complete the assigned readings prior to engaging with the corresponding on-line course module.

Course Outline:

The course outline below is representative. Detailed information including schedule, topics, readings, and assignments will be provided at the start of the semester.

Date (vary)	Topics Covered	Readings & Assignments Due
TBD	Course Introduction Offshore Wind Scale & Potential Wind Energy Basics Wind Turbines, Arrays, Cables: from Land to Sea	None
TBD	Timeline: Offshore Wind Leasing Process - Planning, Leasing, Permitting, Construction & Operations, Decommissioning Regulation of Offshore Wind: Agencies, Authorities	<ol style="list-style-type: none"> 1. Wind Energy Fundamentals: Kalmikov 2017; 2. Floating substructures: Garrad & Atcheson 2016 3. Foundations review 2019 (skim) 4. Carbon Trust Foundations 5. Review the website for BOEM
TBD	Offshore Substructure Presentations National Environmental Policy Act (NEPA); role of NEPA in environmental permitting for offshore wind	Assignment Due: Group Substructure Presentations <ol style="list-style-type: none"> 1. NEPA Overview – CEQ 2. NEPA Overview – BOEM
TBD	Federal Process: Site Assessment Plans (SAP); Construction and Operations Plan (COP) 30 CFR 585 regulations State Process: Coastal Zone Management Act	<ol style="list-style-type: none"> 1. 30 CFR 585 Regulations: Leasing Authority & Process (original & updated) 2. NEPA: A Citizen’s Guide 3. NEPA – Leasing in New York 4. NEPA – Site Assessment Plan - MA/RI 5. NEPA – Construction & Operations Plan – MA/RI 6. MA-RI Bidding for Lease Sales –

		Final Pricing
TBD	Siting a Wind Farm: Using mapping and data to identify optimal wind farm locations; Marine Spatial Planning In-Class Activity: Data Scavenger Hunt (Please bring your laptops to class; we will be conducting a data search exercise and work in mapping databases)	<ol style="list-style-type: none"> 1. Northeast Ocean Plan - Read Chapters 1 & 2; skim chapter 3 2. Coastal & Marine Spatial Planning Initiative - website 3. Download KMZ & Shapefiles for case study area <p>Assignment: Data Scavenger Hunt – Due end of class</p>
TBD	Defining major habitats – Regional management, ecosystem-based management (EBM) Marine Mammals & Sea Turtles I: Conservation status, species distribution	<ol style="list-style-type: none"> 1. BOEM Marine Mammal & Sea Turtle Survey Guidelines 2. Bates et al 2016: Effects of the Offshore Wind Industry on Marine Mammals. 3. Brandt, et al (2011). Responses of harbour porpoises to pile driving at the Horns Rev II offshore wind farm in the Danish North Sea. <i>Marine Ecology Progress Series</i>, 421, 205-216. 4. Bailey, H., et al. (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. <i>Marine pollution bulletin</i>, 60(6), 888-897. 5. Nehls, G., et al. (2016). Noise mitigation during pile driving efficiently reduces disturbance of marine mammals. In <i>The Effects of Noise on Aquatic Life II</i> (pp. 755-762). Springer, New York, NY. 6. NOAA Marine Mammal Acoustic Guidelines <p>2/19: Presentations: Marine Mammal Species Overviews, Impacts, & Mitigation</p>
TBD	Marine Mammals & Sea Turtles II: impacts from offshore wind: pre-construction, construction, operations & maintenance, decommissioning. Environmental Impact Statements.	
TBD	NO CLASS (Presidents Day)	
TBD	Marine Mammals & Sea Turtles III: Marine Mammal Permitting: MMPA, ESA Data Collection – Desktop review, baseline data collection Mitigation Plans for Marine Mammals <i>Presentations</i>	
TBD	Birds & Bats I: Species distributions, conservation status, management. Major protections including MBTA, Bald & Golden Eagle Protection Act	<ol style="list-style-type: none"> 1. BOEM Avian Survey Guidelines 2. Vineyard Wind Draft EIS 3. USFWS: Wind Energy Technical Guidelines
TBD	Birds & Bats II: impacts from offshore wind: Surveys, Construction, Operations & Maintenance	<ol style="list-style-type: none"> 4. USFWS: Biological Opinion, Vineyard Wind

		5. Fox, A. D., & Petersen, I. K. (2019). Offshore wind farms and their effects on birds. <i>Dansk Ornitologisk Forenings Tidsskrift</i> , 113, 86-101.
TBD	Birds & Bats III: Surveying, Monitoring, Mitigation	
TBD	Fish I: Benthic & Pelagic Fish, Essential Fish Habitat, Ranges, Conservation status	1. NOAA Fisheries 2. New England marine Fisheries Management Council – Website
TBD	Fish II: Major protections including Magnuson Stevens Act, Fish & Wildlife Coordination Act	3. FishWatch Seafood Facts: Commercially Harvested Species
TBD	Fish III: impacts from offshore wind: Surveys, Construction, Operations & Maintenance Surveying, Monitoring, Mitigation	4. Reubens, J. T., Degraer, S., & Vincx, M. (2014). The ecology of benthopelagic fishes at offshore wind farms: a synthesis of 4 years of research. <i>Hydrobiologia</i> , 727 (1), 121-136. 5. Langhamer, O. (2012). Artificial reef effect in relation to offshore renewable energy conversion: state of the art. <i>The Scientific World Journal</i> , 2012. 6. Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England – BOEM 2019
SPRING BREAK		
TBD	State/Federal Consistency; Coastal Zone Management Act	1. Firestone, J., Bates, A. W., & Prefer, A. (2018). Power transmission: Where the offshore wind energy comes home. <i>Environmental Innovation and Societal Transitions</i> , 29, 90-99.
TBD	State & Local Permits, Cables & Landing Locations	2. South Fork Wind Farm Consistency Determination 2019 3. NOAA CZM Program Website Due: MIDTERM ESSAY
TBD	Public Perceptions – community members, special interest groups, activists, residents. Baseline surveys, public opinion, NIMBY	1. Dwyer, J., & Bidwell, D. (2019). Chains of trust: Energy justice, public engagement, and the first offshore wind farm in the United States. <i>Energy Research & Social Science</i> , 47, 166-176.
TBD	Stakeholders & Engagement. Roles and opportunity to engage with offshore wind process. procedural & distributive justice.	2. Firestone, J., Bidwell, D., Gardner, M., & Knapp, L. (2018). Wind in the sails or choppy seas?: People-place relations, aesthetics and public support for the United States' first

		offshore wind project. <i>Energy research & social science</i> , 40, 232-243.
TBD	Commercial & Recreational Fisheries I: Resolving Spatial Conflicts; Tourism & Recreation	1. Fisheries Economics of the United States, 2018 2. Court Case: Fisheries Survival Fund v. Jewell
TBD	Commercial & Recreational Fisheries II: Economic Valuation	3. RODA Website 4. NPR Marketplace Article Sept 2019 Choose ONE of the following peer-review articles to review: 1. Alexander et al 2013 (Fishers Attitudes on Wind) 2. Jin et al 2013 (Economics of Fishing) 3. Reilly et al 2018 (Fishers Compensation) 4. Stelzenmuller et al 2016 (co-location with aquaculture) 5. White et al 2012 (tradeoffs analysis)
		DUE: Economic Analysis
TBD	Archaeological & Cultural impacts, Tribal Consultations; Cape Wind study of Mashpee Wampanoag	1. Review NHPA Website (NPS) 2. Klain, S. C., Satterfield, T., MacDonald, S., Battista, N., & Chan, K. M. (2017). Will communities “open-up” to offshore wind? Lessons learned from New England islands in the United States. <i>Energy Research & Social Science</i> , 34, 13-26.
TBD	National Historic Preservation Act	3. Spinelli, D. (2010). Historic Preservation & Offshore Wind Energy: Lessons Learned from the Cape Wind Saga. <i>Gonz. L. Rev.</i> , 46, 741.
TBD	No Class – Patriots Day	
TBD	Permits related to human uses of the ocean and airspace: FAA, military, Socio-economic components of the EIS	1. Department of Defense Offshore Wind Mission Compatibility Assessments 2. FAA: Lighting and Marking of Offshore Wind Turbines
TBD	Other Environmental Permits: Clean Water Act, National Marine Sanctuaries Act, Rivers & Harbors Act	1. EPA Clean Water Act website 2. NOAA; Stellwagen Bank National Marine Sanctuary 3. Army Corps RHA Website
TBD	Wind Farm Decommissioning	Assign Final Exam

Course Policy and Requirements:

This course does not have any predetermined scheduled meeting times and the course site and modules can be accessed at any time during the semester. A weekly course calendar is provided to suggest the reading and lecture schedule. However, homework assignments and exams will be subject to strict timeframes and due dates, and will not be accepted late without express advance permission from the instructor. Homework assignments will be graded with feedback provided.

There will be 5-10 homework sets given during the course of the semester. There also will be one mid-term exam, and one final exam. The exams will be taken on your own time but during a prescribed time period. All homework sets and exams will be subject to the UMass Academic Honesty Policy, and work is to be completed individually by each student.

Homework sets and exams are required to be submitted as PDF files through Moodle, and will undergo similarity checks.

Grading Scale and Criteria:

Individual grades for the course will be based on the following scale.

A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
F	Per policy of the Graduate School, grades below a C will result in a failing grade

Students who are taking the course as an elective graduate course, and who are not taking the course in fulfillment of the Offshore Wind Professional Certificate, may elect to take the course as an Optional Letter Grade (OPG).

The weights of course assignments and activities are as follows.

Exam 1	25%
Exam 2	25%
Participation	10%
<u>Homework</u>	<u>40%</u>
Total	100%

*As an on-line course, participation will be evaluated based on 1) evidence (available from the on-line platform) that the student has spent the expected time engaged with each asynchronous module/lecture, 2) student engagement in accessing and contributing to on-line posts prompted throughout the course, and 3) active engagement of student in weekly real-time discussion sessions with instructor.

Academic Honesty Policy Statement:

The integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, and academic honesty is required of all students at the University of Massachusetts.

Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair.

For more information about what constitutes academic dishonesty, please see <https://www.umass.edu/honesty/>.

The procedures outlined at the website listed above are intended to provide an efficient and orderly process by which action may be taken if it appears that academic dishonesty has occurred and by which students may appeal such actions. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent.

Accommodations:

The University of Massachusetts is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you are in need of accommodation for a documented disability, register with Disability Services to have an accommodation letter sent to your faculty. It is your responsibility to initiate these services and to communicate with faculty ahead of time to manage accommodations in a timely manner. For more information, consult the Disability Services website at <http://www.umass.edu/disability/>.