Environmental Studies Program: Ongoing Study

Title	A Parametric Analysis and Sensitivity Study of the Acoustic Propagation for Renewable Energy Sources and Projects (NSL #At-16-05)
Administered by	Office of Renewable Energy Programs
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Conducting Organizations(s)	CSA Ocean Sciences Inc.
Total BOEM Cost	$334,693
Performance Period	FY 2017–2020
Final Report Due	October 2019
Date Revised	Mary 15, 2019
PICOC Summary	Write one or two sentences for each of the following elements, as appropriate. If not appropriate, write N/A.
Problem	Pile driving during installation of offshore wind turbine foundations produces intense sound. Models are used to predict this sound based on known or estimated parameters and develop mitigation measures.
Intervention	Understanding the parameters that are important to modeling the sound will improve the model output and result in better mitigation.
Comparison	Different models may be used by the developer and regulator, resulting in concern about the most effective mitigation.
Outcome	Improved modeling and mitigation development that will result in both an effective and efficient mitigation strategy.
Context	Wind development is anticipated along the entire Atlantic Coast over the next 20 years.

BOEM Information Need(s): BOEM Office of Renewable Energy is required by the Endangered Species Act, Marine Mammal Protection Act, and the National Environmental Policy Act to assess the potential for impact for all of its projects. These assessments typically address the acoustic energy produced during the requisite activities for the construction and operation of these projects including: High Resolution Geophysical (HRG) surveys, construction noise, support vessel noise and operational noise. To date, these projects and analyses have been spread out in time and location and handled individually. However, as the number of projects increases, there is an increasing need to consistently and thoroughly manage the overall acoustic modeling effort. A prerequisite to managing this modeling is a clear understanding of the variability of the model's critical input parameters and how they constrain and drive the acoustic model results. This study will quantify those parameters and the modeling results they help to produce.

Background: Many renewable energy projects consist of component activities that have common noise sources and occur in similar environmental conditions. Some of these commonalities include: 1) a limited number of sources many (e.g., pile driving for

either a meteorological tower, wind turbine, or servicing platform)), 2) limited ranges of the source level (SL) and frequencies, 3) activities typically occur on the continental shelf, in similar types of shallow water areas (e.g., in water <50 m deep) with similar propagation modes, 4) activities occur in areas with similar bottom types (e.g., typically sand, gravel, rock areas) with relatively strong acoustic reflection characteristics, and 5) activities may require similar oceanographic conditions (e.g., low sea states or wind speeds) in order to complete the activity. This study will focus on sound generated by pile driving and evaluation of the models used to estimate the sound field.

The similarities of the sources employed during renewable activities, the environmental and acoustic characteristics of the areas where these source operate and the operational characteristics of the activities (e.g., duration of operations, depth of water in the operations area, etc.) indicate that the range of potential acoustic propagation fields and levels may be amenable to parametric analysis and characterization. By identifying and applying constraints to these parameters, modeling efforts will become more efficient for both industry and the government by standardizing the approaches to modeling and focusing attention only on those variables that could lead to adjustments in mitigation. Additionally, at the very least, this study should be able to quantify the ranges of the important parameters and provide an assessment of the sensitivity of the acoustic modeling output to these parameters.

Objectives: The objective of this study is to standardize modeling for sound propagation from activities associated with offshore renewable energy development with a focus on pile driving.

Methods: The study will be conducted in two phases. Phase one will conduct a technical analysis of the acoustic propagation and modeling on the Atlantic continental shelf in order to provide: 1) recommendations for a consistently underwater acoustic modeling approach across the numerous renewable energy projects including the recommendation of models, databases and methodologies, to cover pile driving 2) a baseline of expected range of expected modeling results including impact volumes around “typical” sources, 3) identify a baseline variability for the expected acoustic modeling results based on the variability of the critically modeled parameters, 4) results which can serve as a sensitivity study for inclusion in future compliance documents, and 5) identify sources or systems involved with renewable activities which have negligible potential for environmental impact. Phase two will use data collected from European wind facility construction where monopoles were used.

Specific Research Question(s): Which parameters most affect the outcome of modeling sound from pile driving?

Current Status: The kick-off meeting was held in January 2017. The datasets for model validation were selected in March 2017. Modeling using those datasets is underway. Draft reports for several tasks were reviewed. The final report is anticipated in September 2019.

Publications Completed: None.

Affiliated WWW Sites: None.