

Technology Assessment & Research (TA&R) Program

Project Number	636
Date of Summary	July 18, 2011
Subject	Characteristics, Behavior and Response Effectiveness of Spilled Dielectric Insulating Oil in the Marine Environment
Performing Activity	Louisiana State University
Principal Investigator	Dr. Edward Overton Mr. Scott Miles, Ms. Buffy Ashton, and Mr. Robert Wong
Contracting Agency	BOEMRE
Estimated Completion	Completed
Description	<p>Planned wind projects on the U.S. Outer Continental Shelf could consist of wind turbine generators connected to a centralized electrical service platform (ESP). The ESP could contain approximately 40,000 gallons of dielectric insulating oil and approximately 2,000 gallons of assorted oil-based fluids (diesel fuel, lubricating oils, etc.) stored on site for facility maintenance. In addition, each wind turbines could have several hundred gallons of lubricating fluid. The dielectric insulating fluid used in the ESP is typically a mineral oil, but vegetable based oils (soybean oil) may also be used. Several concerns have been raised by regulatory agency and environmental conservancy groups as to the environmental effects of a possible oil spill due to accidental vessel collision or natural catastrophe. The two main concerns addressed were probability of oiling and the minimum transit time of the oil to area and resources at risk.</p> <p>Numerous toxicological studies have been performed on mineral and vegetable-based oils over the last decade. Mineral and vegetable-based oils display low direct toxicity because they do not contain the water soluble and multi-ringed poly-nuclear aromatic hydrocarbons typically found in petroleum-based oils. Due to their low toxicity and usage, little research has been performed on the response options available to cleanup a spill of dielectric fluids on the marine environment. In the unlikely event of a spill, how would the dielectric insulating oil be removed from our oceans and shorelines? How persistent are these oils in the marine environment?</p> <p>To provide a comprehensive analysis of the possible fate and effects of spilled dielectric insulating oil, LSU and BOEMRE will conduct a collaborative one (1) year project to provide a detailed literature review and scientific information on the characteristics, weathering behavior, and window of opportunity for using short-term response options for removal of spilled dielectric fluids in the marine environment. The goals of this project will be achieved through a series of laboratory and field-scale studies conducted at research facilities in Baton Rouge, Louisiana (LSU) and Leonardo, New Jersey (Ohmsett). The results from this project will have a direct effect on the spill response policies and decision-making of federal and state agencies when dealing with accidental releases of dielectric insulating fluids in the marine environment. Results from this study will aide planning and management personnel when designing coastal use permits for future offshore wind generation systems.</p> <p>Objectives: The goals of this one (1) year scientific project are to provide detailed literature review and produce valid data and results on the characteristics, weathering behavior, and window of opportunity for using short-term response options for removal of spilled dielectric fluids in the marine environment. The goals of the proposed project will be achieved through a series of six (6) tasks:</p>

	<ol style="list-style-type: none"> 1. An intensive literature review of US and European sources 2. A series of laboratory flask studies to determine weathering characteristic, product dispersibility, and accurate analytical methodology 3. A field study to accurately determine applicability of in-situ burning as a response tool 4. A laboratory flask study to measure the affects of long-term weathering and biodegradation on dielectric insulating fluid in the marine environment 5. A series of field studies to accurately determine capabilities/limitations of conventional response tools for removal of dielectric fluids from the marine environment 6. Preparation and submittal of a final draft and report to BOEMRE <p>All tasks, except task No. 5, will be performed at LSU in Baton Rouge, Louisiana. Task No. 5 will be completed at the Ohmsett facility in Leonardo, New Jersey.</p>
Progress	<p>BOEMRE has researched, selected and sourced 1,000 gallons of MIDEL 7131 dielectric insulating oil (transformer Fluid) from M&I Materials, Manchester, UK. Samples of this oil were sent from the Ohmsett facility to Louisiana State University's (LSU) Department of Environmental Science for analyses.</p> <p>From April 12-16, 2010, experiments were conducted at the Ohmsett facility to determine the capabilities and limitations of using conventional mechanical response equipment, namely oleophilic skimmers (disc, drum, rope mop) to recover the dielectric fluid. Experiments will be conducted to determine the dispersibility of the MIDEL 7131 dielectric insulating oil using Corexit 9500 dispersant. For the mechanical recovery experiments, two additional oils a Hydrocal (a medium viscosity lubricating oil and diesel fuel will be used for comparative purposes. Mechanical recovery experiments will follow American Society of Testing and Materials (ASTM) F 2709-08. Research scientists from LSU participated in the Ohmsett experiments. A representative from M&I Materials, Manchester, UK traveled to Ohmsett to observe the mechanical recovery and dispersant experiments.</p> <p>Long term weathering and biodegradations experiments are complete. BOEMRE has received the draft final report for this project. Revisions to the final report have been delayed due to the principal investigators involvement on scientific research cruises following the Deepwater Horizon oil spill. The revised draft final report is expected by April 22, 2011.</p> <p>The final report was received On July 12, 2011. BOEMRE has reviewed and accepted the final report for the project.</p>
Report	<p>Final Report: "Characteristics, Behavior and Response Effectiveness of Spilled Dielectric Insulating Oil in the Marine Environment"</p>
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