Project Number:	633
Category:	*Standards/Regulations*
Dates:	October 2009-November 2010
Subject:	*Wind Farm/Turbine Accidents and the Applicability to Risks to Personnel and Property on the OCS, and Design Standards to Ensure Structural Safety/Reliability/Survivability of Offshore Wind Farms on the OCS*
Performing Activity:	Offshore Risk and Technology Consulting, Inc.
Principal Investigators:	M. Sharples
Contracting Agency:	Bureau of Safety and Environmental Enforcement
Summary:	The project was divided into the following tasks: 1. Document and analyze past damage to wind farms; 2. Provide a template for an SMS for offshore wind facilities; and 3. Determine the required design items to be established for offshore wind farm projects for submission to BOEM for approval in a facility design report (FDR).
Key Findings:	• As designed, under current IEC standards, offshore wind turbines maybe subject to failure from tropical cyclone winds, • Proper cable design, installation, lightning, and fire protection are key issues in reducing the potential for system failure. • The SMS template provides a good basis for safety documents that should be included in future wind farm project submittals. • No current industry standard can be directly applied to the U.S. OCS as complete offshore wind standards.
Recommendations:	• Develop an industry-wide database for tracking accidents and safety incidents. • Include in an FDR the basis, with justification for the project design, as no current U.S. standards exist. • Design turbines with an extended battery life for yaw control during hurricanes or design for omnidirectional loads. • Design turbines as *special S-Class*, rather than standard design class. • The developer should conduct a hazard identification (HAZID) session prior to the design (with the regulator and CVA) to achieve consensus with regard to hazard identification and mitigation. • Lightning, fire, and corrosion protection should be mandatory, along with condition monitoring.
Subsequent Studies/Activities:	• Incorporate recommendations into technical standards rulemaking effort (30CFR, Subpart G). • TAP 709: *Technical and Business Proposal for Example Safety Management System and Audit Criteria/Procedures Template and Checklist for Offshore Wind*

Report Link:	AA: Executive Summary of Research on Offshore Wind Farms on the OCS, May 2010, by Dr. Malcolm Sharples and Brian J.M. Sharples, Offshore: Risk & Technology Consulting, Inc., Houston, TX
	AB: Damage and Critical Analysis of Accidents to Assist in Avoiding Accidents of Offshore Wind Farms on the OCS, May 2010, by Dr. Malcolm Sharples and Brian J.M. Sharples, Offshore: Risk & Technology Consulting, Inc., Houston, TX
	AC: Template for a Safety Management System for Offshore Wind Farms on the OCS, October 2009, by Dr. Malcolm Sharples, Offshore: Risk & Technology Consulting, Inc., Houston, TX
	AD: Structure, Equipment and Systems for Offshore Wind Farms on the OCS, Part 1 of 2 parts – Guideline, March 2010, by Dr. Malcolm Sharples, Offshore: Risk & Technology Consulting, Inc., Houston, TX
	AE: Structure, Equipment and Systems for Offshore Wind Farms on the OCS, Part 2 of 2 parts – Commentary, March 2010, by Dr. Malcolm Sharples, Offshore: Risk & Technology Consulting, Inc., Houston, TX
	AF: Workshop on the Role of the CVA for Offshore Wind Farms on the OCS, November 2010, by Dr. Malcolm Sharples, Offshore: Risk & Technology Consulting Inc., Houston, TX