

Technology Assessment and Resource (TA&R) Program

Renewable Energy Studies

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Atlantic Wind Energy Workshop July 12-14, 2011

Bureau of Ocean Energy Management,
Regulation and Enforcement

TA&R Program Meeting Objectives

- Provide an Update on TA&R Projects
- Identify Key Data Needs and Research Gaps
- Develop Potential Research Topics



TA&R Program

Review of Renewable Energy Studies

The following TA&R studies (completed or in progress) were reviewed. In addition updates were provided on **IEC TC 88** and the **TRB “Structural Integrity of Offshore Wind Turbines”** report and the **FAU MHK Current Project**.

The PowerPoint presentations and discussion will be included in the final report.

- **TA&R 634 “Mitigation of Underwater Pile Driving Noise During Offshore Construction”**
- **TA&R 651 “Evaluate the Effect of Turbine Period of Vibration Requirements on Structural Design Parameters”**
- **TA&R 633 “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”**



TA&R Program

Review of Renewable Energy Studies Cont.

- TA&R 671 “Offshore Electrical Cable Burial for Wind Farms: State of the Art; Standards and Guidance; Acceptable Burial Depths and Separation Distances; and Sand Wave Effects”
- TA&R 656 “Seabed Scour Considerations”
- TA&R 627 “Assess/Develop Inspection Methodologies for Offshore Wind Turbine Facilities” and TA&R 650 “Offshore Wind Turbine Inspection Refinements”
- TA&R 669 “Floating Wind Turbines” and TA&R 670 “Design Standards for Offshore Wind Farms”
- TA&R 672 “Development of an Integrated Extreme Wind, Wave, Current, and Water Level Climatology to Support Standards-Based Design of Offshore Wind Projects”



Key Data Needs & Research Gaps Identified & Prioritized

- 1 (KDN) Wind Turbine Condition Monitoring for Safety and Inspection.**
- 2 (RG) MHK Mooring Space and Use Conflicts**
- 3 (RG) Gulf Stream/OCS Mooring Issues**
- 4 (KDN) Example Formats/Templates/Go-Bys**
- 5 (RG) Fatigue Design Methodologies and Design Criteria**
- 6 (RG) Study of Fundamental/Structural Soil Conditions Requirements**
- 7 (KDN) Audit Standards/Procedures Template**
- 8 (KDN) Incident Reporting and Lessons Learned for development of Safety Management Systems**
- 9 (RG) Design Guideline for Stationkeeping Systems of Floating Wind Turbines**
- 10 (RG) Managing Risk for Multiple Uses of Wind and MHK projects**

KDN - Key Data Need
RG – Research Gap



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Potential Research Topics

Key Data Needs

Wind Turbine Condition Monitoring for Safety and Inspection.

Structure monitoring is not currently required, therefore:

- Develop Structural monitoring requirements as contrasted to monitoring output and efficiency
- Identify opportunities to add onboard monitoring to optimize or reduce inspection requirements, measure fleet-wide response of structural systems, and determine response to structure over time to project practical design and life extension of structures/project?
- Identify instrument available state of the art technology options
- Determine how data should be interpreted/used?
- Determine what levels initiate action – What Action?
- Require industry/manufactures to supply some set of specifications that could be monitored and action levels for monitoring data.
- Determine how the data should be collected: real time; some regular interval; after extreme event; or black box?



Potential Research Topics

Key Data Needs cont.

Example Formats/Templates/Go-Bys

- Develop Safety Management Plan (example)
- Develop Facility Design Report template consistent with regulatory requirements
- Develop Fabrication and Installation Report template consistent with regulatory requirements

Audit Standards/Procedures Template

Develop Safety Management System Criteria for Audit of systems/facilities (turbines and cables) to support Industry system integrity management & Audit Checklists for regulators.

Incident Reporting and Lessons Learned for Development of Safety Management Systems

High failure rates have occurred over time with concerns over timely/accurate/complete reporting. Need timely feedback to the industry.



Potential Research Topics

Research Gaps

MHK Mooring Space and Use Conflicts

- Estimate density of proposed systems as function of device type
- Evaluate proposed mooring systems for installation practicality and safety
- Identify marine mammal entanglement potential
- Identify fisheries conflicts by gear type and mooring type

Gulf Stream/OCS Mooring Issues

- Evaluate mooring load and power transmission requirements and systems
- Analyze station keeping alternatives for optimizing device capacity factor
- Develop model inputs/outputs relative to Guidelines API RP 2SK and other applicable class rules

Fatigue Design Methodologies and Design Criteria

- Study fatigue design methodologies applicable to complex fixed and floating offshore wind turbine support structures
- Recommend a rational, practical fatigue design method for offshore wind turbine support structures
- Evaluate fatigue design criteria for offshore wind turbine support structures



Potential Research Topics

Research Gaps cont.

Study of Fundamental/Structural Soil Conditions Requirements

- Lateral load deformation predictions based on methodology used for oil and gas API-RP 2A unverified for large diameter relatively short monopiles.
- Industry needs improvement in the ability to predict the long term performance and response of foundations.

Design Guideline for Stationkeeping Systems of Floating Wind Turbines

- Study simulation methods for the design of stationkeeping systems of floating wind turbine and identify critical design parameters for various types of stationkeeping systems (mooring, tendon, anchor, etc.) of floating wind turbines
- Recommend a design guideline for stationkeeping systems of floating wind turbines
- Initiate/Cooperate in international Studies to Support IEC Standard Development, particularly differences between offshore floating wind and MHK.

Managing Risk for Multiple Uses of Wind and MHK Projects

- Project developer risk for damage to vessel or injury to personnel
- Vessel operator risk for damage to project facilities
- Exclusion zone requirements (turbine vs. electric service platform)
- Surveillance/deterrent technology evaluation

