Overcoming Environmental Deployment Challenges for Ocean Renewable Energy

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**Water Team Mission:** Develop and employ novel technologies, improved operational procedures, and rigorous analysis to:

1) assess the potential extractable energy from domestic rivers, estuaries and coastal waters; and

2) support industry to harness this renewable, emissions-free resource through environmentally sustainable and cost-effective electric generation.
1. Data is often scarce and expensive
2. Magnitude of potential environmental effects has not been assessed
3. Siting, permitting, and mitigation require a wealth of environmental data
4. Lack of pre-deployment and monitoring standards leads to regulatory uncertainty
Data is often scarce and expensive

Environmental effects data necessary for pre-deployment permitting is either lacking, proprietary, or difficult to obtain—leads to increased costs and length of pre-deployment environmental studies.

DOE Approach - Data and Information Management:

• Knowledge Management System (known as “Tethys”)
  – “Smart” searchable data base
  – Houses MHK environmental data and information
  – Support risk framework
  – Project underway, scheduled completion in FY2012

• Annex 4
  – Will incorporate international data from nine member nations into the Knowledge Management System
  – Will gather environmental data and evaluate effects, monitoring methods, and mitigation strategies
  – Project underway, completed in FY2012

Tethys—Greek titaness and aquatic sea goddess
Magnitude of potential environmental effects has not been assessed

There are many perceived environmental risks, but risks have not been comprehensively analyzed or prioritized at the pilot or commercial scale—results in heavy environmental research burdens for pioneer projects.

DOE Approach - Risk Analysis:

- **Environmental Risk Evaluation System**
  - Uses attributes of technologies, receptors, water bodies in real case studies
  - Determine most important environmental interactions
  - Allow regulators & project proponents to agree on monitoring and mitigation
Magnitude of potential environmental effects has not been assessed

Assessing the system wide effects of devices is complex and expensive, but may be required in pre-deployment studies.

DOE Approach – Lab-led Computational and Conceptual Modeling of Physical and Ecosystem Effects:

- Conceptual models to understand relationships and predict interactions
- Computational models to rapidly assess potential ecosystem effects and adapt technology or siting practices to mitigate these effects
- Understand and evaluate effects of commercial arrays

Research areas include:
- What happens when energy is extracted from a system?
- Near- and far-field changes in flow
- Far-field changes in water quality (tidal)
- Changes in sediment transport (wave, riverine, tidal)
Siting, permitting, and mitigation require a wealth of environmental data

Collecting new baseline data to satisfy pre-deployment regulatory requirements is prohibitively expensive for a nascent industry.

DOE Approach - Support for Site Specific Research:

• Direct assistance to industry for site specific environmental studies
  – Answering key regulatory and siting questions for initial deployments.
  – Projects underway, scheduled completion in FY2012
  – Multiple industry partners

• Lab and university studies of effects on aquatic organisms
  – Targeted research on questions likely to be important across the industry
  – Project underway, scheduled completion in FY2012
  – ORNL, PNNL, National Marine Renewable Energy Centers

Research areas include:
  – Acoustic effects of tidal power turbines
  – Direct effects of MHK devices on fish and marine mammals
  – EMF
  – Mitigation and deterrence
  – Benthic and sediment transport issues
Lack of pre-deployment and monitoring standards leads to regulatory uncertainty

Collaboration and coordination between regulators, industry, and researchers needs to improve to ensure environmental study requirements are achievable and research is targeted and effective.

DOE Approach – Regulatory and Stakeholder Outreach and Coordination:

• Tools that allow developers to understand stakeholder views and effectively incorporate input into the process.

• Participation in policy formulation efforts and stakeholder outreach to ensure that renewable energy equities are represented in coastal and marine spatial planning efforts.

• Coordination with agency partners through MOUs, interagency working groups, and joint interagency funding opportunities.
Offshore Wind: Challenges and Activities

Key Challenges

High cost of energy
  High capital costs
  Reliability & maintenance challenges
  Perceived technology risks
Permitting processes and siting considerations
  Radar interference
  Environmental and siting risks
  Regulatory timelines
Technical challenges
  Domestic supply chain development
  High cost of grid connection
  Incomplete knowledge of offshore resource

DOE Activities

Technology Development
  Innovative system concepts
  Component development & testing
  Design codes, methods, and verification
  Testing facilities; manufacturing process research
Reducing Market Barriers
  Interagency coordination & collaboration
  Siting & permitting strategies
  Offshore wind resource characterization
  Transmission planning strategies
  Environmental data gathering & sharing

Advanced Technology Demonstration
Market Barrier Removal

- DOE will contribute unique technical knowledge and R&D capabilities to address these barriers.
- DOE can’t go it alone: collaboration with federal & state agencies is essential.
Siting and Permitting: Market Analysis and Public Acceptance

• Challenges
  – Lack of credible, objective analysis to inform stakeholders of costs & benefits of projects

• Solutions
  – Develop methods for evaluating offshore wind costs & benefits
  – Support objective analysis of policy & regulatory options
  – Improve understanding & mitigation of public acceptance risks
Siting and Permitting: Regulatory Processes

- **Challenges**
  - Untested permitting processes
  - Hundreds of environmental, competing-use factors must be considered in permitting

- **Solutions**
  - Build on work with regulators, states to maximize efficiency of project permitting regimes
  - Tools to build confidence and clarity: standardized protocols, adaptive management
• Challenges
  – Major environmental data gaps delay project permitting
  – Burden of research on first-generation projects

• Solutions
  – Aggregate and disseminate existing information
  – Improve methods of collecting necessary enviro. data
  – Site-specific enviro. studies
  – Broad-scale enviro. studies
Siting and Permitting: National Security Concerns

• Challenges
  – Turbine-radar interference
  – Operational & training areas
  – Navigation & airspace

• Solutions
  – Develop & deploy radar system upgrades to mitigate turbine interference
  – Engage DOD to ensure that offshore wind priority areas reflect DOD training & operations equities
Interagency Environmental Collaboration: Broad Agency Announcements

BOEM, DOE, & NOAA BAA

✓ Funds environmental monitoring and protocol development for ocean renewable energy
✓ $5 million in research funding under eight topic areas
✓ Addresses immediate and long-term environmental information needs of both the offshore wind and marine and hydrokinetic industries.

Topics:

• Characterization & Potential Impacts of Noise Producing Construction & Operation Activities on the Outer Continental Shelf
• Protocols for Baseline Studies and Monitoring for Ocean Renewable Energy
• Evaluation of Environmental Monitoring Technologies for Offshore Renewable Energy
• Sub-Seabed Geologic Carbon Dioxide Sequestration Best Management Practices
• Renewable Energy Visual Evaluations
• Ocean Renewable Energy Siting in the Context of Coastal and Marine Spatial Planning.
Interagency Collaboration

- BOEM & DOE recently signed an MOU for the coordinated deployment of MHK and offshore wind on the OCS.
  - Environmental research and permitting
  - Resource characterization
  - Technical standards
  - Stakeholder outreach
  - Deployment goals

- DOE to be active in the new National Ocean Council and in the CMSP process.

- DOE leads the Federal Renewable Ocean Energy Working Group
  - Increase Federal communication
  - Facilitate partnerships
Ultimately MHK & offshore wind face many similar barriers to deployment

Barriers will need to be addressed through interagency and stakeholder collaboration, in addition to targeted DOE efforts

In the face of climate change it is imperative that we move quickly and collaboratively to address these barriers