**FINANCIAL ASSISTANCE**

**REQUEST FOR INFORMATION**

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**U.S. Department of Energy**

**Golden Field Office**

**Improving Marine and Hydrokinetic and Offshore Wind Energy Resource Data**

**Request For Information: DE-FOA-0000747**

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**Responses Submitted to:** [**Resource.Characterization@go.doe.gov**](mailto:Resource.Characterization@go.doe.gov)

**Improving Marine and Hydrokinetic and Offshore Wind Energy Resource Data**

**DOE Request for Information (RFI)   
DE-FOA-0000747**

**Program Manager** / **Area:** Jose Zayas, Program Manager, Wind & Water Power Program (WWPP), Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy (DOE)

**Requested Information Topics**

DOE invites input from the public regarding currently lacking data and technologies for characterization of marine and hydrokinetic (MHK) and offshore wind energy resources in support of deployment of wind and MHK technologies. For MHK power, comments regarding the advancement of wave and tidal resource characterization and data gathering for characterization of far-field hydrological and wave environment interactions with MHK energy devices are specifically requested (**MHK,** **Section A**). For wind power, comments regarding research and observation activities and partnerships for offshore wind energy resource characterization to complement, augment, or expand upon ongoing and planned offshore wind meteorological and oceanographic (metocean) data activities are specifically requested (**Offshore Wind,** **Section B**).

**Request for Information Guidelines**

**Purpose and Need for Information**: The sole purpose of this Request for Information (RFI) is to gain input from industry, academia, local, state and federal government agencies, and other offshore wind and marine and hydrokinetic power stakeholders. The information gathered with this RFI will be used to help inform future strategic considerations and will inform the Wind and Water Power Program’s research and development portfolio with regards to offshore wind and marine and hydrokinetic resource characterization efforts. This does not constitute a request for specific project proposals. DOE will not pay for information provided under this RFI and there is no guarantee that future funding opportunities or other activities will be undertaken as a result of this RFI.

**RFI Guidelines:** DOE will not pay for information provided under this RFI and DOE will notprovide reimbursement for costs incurred in responding to this RFI. This RFI DOES NOTconstitute a solicitation for proposals, IS NOT a FOA, and DOE IS NOT accepting applicationsfor financial assistance or financial incentives under this RFI. Responses to the RFI will betreated as informational only and will not be viewed as a binding commitment for the respondentto develop or pursue the project or ideas discussed. DOE MAY decide at a later date to issue aFOA based on consideration of the input received from this RFI, but there is no guarantee thatfuture funding opportunities or other activities will be undertaken as a result of this RFI.Because information received in response to this RFI may be used to structure future FOAsand/or otherwise be made available to the public, respondents are strongly advised to NOTinclude any information in their responses that might be considered business sensitive,proprietary, or otherwise confidential. If, however, a respondent chooses to submit businesssensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuouslymarked as such in the response.

In order to avoid any possible conflict with future funding opportunities, DOE will not respond to any respondent questions or contacts received after the closure of the submission period for this RFI. DOE thanks you for your assistance and input.

**RFI Response Instructions:** Response to this RFI should be submitted in Microsoft Word or PDF format to Resource.Characterization@go.doe.gov by 5:00 PM Eastern Standard Time on October 1, 2012. Responses should include: cover page, 1 page executive summary, and up to a 5 page full response. Such responses must be provided as an attachment (in Microsoft Word format) to an e-mail message addressed to Resource.Characterization[@go.doe.gov](mailto:HAPHydroRFI@go.doe.gov). The subject line should read "Response to Improving Marine and Hydrokinetic and Offshore Wind Energy Resource Data Request for Information (insert name-organization)”. One inch margins and 12 point font should be used. Please indicate the questions being addressed (e.g., Section A.1. or Section B.2.). Questions regarding the content of this RFI must be submitted to the email address provided above. Respondents are requested to include the following information in their responses to this RFI: Company/institutional name; individual contact (mailing address, phone number, e-mail address); facility location(s) (zip code); and area of expertise/interest. WWPP recognizes that all listed questions may not be applicable to all respondents, and respondents may provide responses to all or a portion of the RFI questions. WWPP requests that respondents focus only on the questions for which they can provide concise, quantifiable information.

**Wind and Water Power Program Background**

The Wind and Water Power Program (WWPP) is within the Department of Energy’s Office of Energy Efficiency and Renewable Energy. The WWPP’s mission is to focus the passion, ingenuity, and diversity of the nation to enable rapid expansion of clean, affordable, reliable and domestic wind and water power to promote national security, economic vitality and environmental quality. To find more information about the WWPP, please visit the [Wind Power Program](http://www1.eere.energy.gov/wind/) and [Water Power Program](http://www1.eere.energy.gov/water/) websites.

Both energy ‘resource characterization’ and ‘resource assessment’ activities are discussed within this document. For the purposes of this document, ‘resource characterization’ is defined as any evaluation of the characteristics of an energy resource at both large and small spatial and temporal scales (e.g. including both regional and device/array scale resource evaluation, both long term resource trend evaluation and short term resource forecasting). ‘Resource assessment’, for this document, is defined as a spatially and temporally broad evaluation of the characteristics of an energy resource (e.g. a national scale assessment of annual wave energy) and falls within the purview of ‘resource characterization’ activities.

**Section A: Marine and Hydrokinetic Power**

**Background**

The WWPP supports research, testing, evaluation and development of innovative technologies capable of generating renewable, environmentally responsible and cost-effective electricity from water resources. This includes marine and hydrokinetic technologies, which capture energy from waves, tides, ocean currents, marine thermal gradients, and riverine hydrokinetics. The Program's vision regarding MHK is that effective and efficient investments of U.S. Department of Energy resources will enable a robust and competitive MHK industry in the United States that contributes to our nation's energy portfolio.

The WWPP released two nationwide resource assessments on January 18, 2012 showing that waves and tidal currents off of the nation's coasts could contribute significantly to the United States' total annual electricity production. The wave energy assessment report, titled "[Mapping and Assessment of the United States Ocean Wave Energy Resource](http://www1.eere.energy.gov/water/pdfs/mappingandassessment.pdf)," was prepared by the Electric Power Research Institute (EPRI), with support and data validation from researchers at Virginia Tech and DOE's National Renewable Energy Laboratory (NREL). The report describes the methods used to produce geospatial data and to map the average annual and monthly significant wave height, wave energy period, mean direction, and wave power density in the coastal United States. NREL incorporated the data into a new marine and hydrokinetic energy section in their [U.S. Renewable Resource Atlas](http://maps.nrel.gov/mhk_atlas). The tidal energy assessment report, titled "[Assessment of Energy Production Potential from Tidal Streams in the United States](http://www1.eere.energy.gov/water/pdfs/1023527.pdf)" was prepared by the Georgia Institute of Technology with validation and support by Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory. The report describes the methods used to calculate tidal currents and water levels and tidal kinetic power density. Information on tidal kinetic power density is to be included in the [NREL U.S. Renewable Resource Atlas](http://maps.nrel.gov/mhk_atlas).

These reports quantify the gross magnitude of national wave and tidal current resources and indicate where regions of high wave and tidal energy density exist in the United States. However, the nation-wide focus of these assessments requires that the methodologies used address large scale energy potential. Further efforts may be necessary to provide resource characterization information on a scale salient to MHK deployment activities. There are also three similar national assessments being funded by DOE for intended release during 2012 and early 2013: assessments of national riverine hydrokinetic resources, ocean thermal energy resources, and ocean current resources.

**Requested Information**

One of the goals of the WWPP is to provide information that will reduce the challenges of deploying marine and hydrokinetic technologies in territorial seas and on the U.S. Outer Continental Shelf. In support of this goal, the WWPP invites comments regarding research activities for wave and tidal energy resource characterization that DOE is in a unique position to foster and that will best benefit the MHK energy community as a whole. The specific types of information the WWPP is seeking is illustrated by, but not limited to, the following questions.

* Considering the national resource assessments already completed by DOE:
  + What other activities are needed at a national or regional scale for the characterization of wave or tidal energy resources?
  + How is a lack of such activities and their products slowing or inhibiting the development of the wave or tidal energy industry?
  + Are there partnerships that DOE can foster to advance wave and tidal resource characterization activities? What assets might the potential partnering institutions offer for advancing wave and tidal resource characterization activities?
* Models exist or are currently being developed to characterize the interaction between the far-field hydrodynamic and wave environment and MHK devices. For example, such models might allow for examination of MHK device effects on sediment erosion and deposition or the removal of energy from the marine environment by tidal turbines or wave energy converters.
  + Are there critical shortcomings in these modeling efforts due to lack of data?
  + Is there currently existing capability to gather this data?
  + How can existing federal efforts be augmented to gather this data using the current capabilities?
  + If the capability does not exist, is there a need for new instrumentation for gathering this data?
  + Are there partnerships that DOE can foster to address these issues? What assets might the potential partnering institutions bring to bear on these issues?

**Section B: Offshore Wind Power**

**Background**

The WWPP funds research nationwide to develop and deploy offshore wind technologies that can capture wind resources off the coasts of the United States and convert the wind out at sea into electricity. Offshore wind resources are abundant, stronger, and blow more consistently than land-based wind resources. Data suggest a more than 4,000 GW gross total offshore wind energy resource exists in state and federal waters along the United States and the Great Lakes coasts, approximately four times the combined generating capacity of all U.S. electric power plants.

Over the next five years, the Program and the Department of the Interior are advancing a national strategy for offshore wind research and development. The WWPP is leading market analysis and technology development research that will overcome key barriers including the relatively high cost of energy, the mitigation of environmental impacts, the technical challenges of project installation, and grid interconnection.

The Department of Energy, in collaboration with other agencies and institutions, has initiated a broad campaign for addressing offshore energy resource and design conditions data needs through establishing common databases, new measurement initiatives, and supporting development of advanced instrumentation technology. Accurate and comprehensive information on offshore wind resource characteristics across a range of spatial and temporal scales, and data on other external conditions such as waves and currents, and seabed properties is critically important to achieving cost-effective and reliable siting and design of offshore wind energy systems. To further those efforts, in 2011 DOE’s WWPP issued two Funding Opportunity Announcements (FOAs) for technology development and market barrier removal. 42 projects were selected for award, including 8 focused on offshore wind resource and design condition challenges ([wind.energy.gov/pdfs/mb\_abstracts.pdf](http://www1.eere.energy.gov/wind/pdfs/mb_abstracts.pdf)). These resource assessment and design conditions efforts are a key part of DOE’s offshore wind strategy as laid out in “[A National Offshore Wind Strategy: Creating an Offshore Wind Industry in the United States](http://www1.eere.energy.gov/wind/pdfs/national_offshore_wind_strategy.pdf)”. On 1 March 2012, the WWPP announced the [Advanced Technology Demonstration FOA](http://www.grants.gov/search/search.do;jsessionid=2DY8PQsPRtJQ1cxnPz7tK4BhQGXp6CfFfhz4yWZQGCh1XdLJdSKn!-213555334?oppId=148294&mode=VIEW) to install innovative offshore wind systems in U.S. waters and expedite the development and deployment of innovative offshore wind systems to help reduce the levelized cost of energy (LCOE). The WWPP is seeking to build on these initiatives with a focus towards expanding the existing information and knowledge-base of the nation’s offshore wind energy resource.

In June 2011, the WWPP held the Offshore Resource Assessment and Design Conditions Public Meeting which focused on defining what meteorological and oceanographic measurements and data are critical for successful deployment of offshore renewable energy wind and marine and hydrokinetic (MHK) technologies. Input from the representatives of industry, academia, and governmental agencies that attended this meeting was combined with input from a panel of experts to produce a DOE report “The Offshore Resource Assessment and Design Conditions: A Data Requirements and Gaps Analysis for Offshore Renewable Energy System”. This report serves the dual purposes of providing an overview of information required by stakeholders to effectively deploy wind and MHK energy systems offshore and identifying gaps in that required information. One of the key information gaps identified in the report is the lack of in-situ wind measurements at typical hub height in the offshore environment.

The WWPP is developing a concept to employ an existing offshore platform to allow for continuous collection of resource and other environmental data, including in-situ wind information at 75 or more meters, to be accessible to a broad array of users. This concept, the Reference Facility for Offshore Renewable Energy (RFORE), when realized, will allow partnership activities to address key metocean research programs and specific offshore renewable energy questions, as well as provide an opportunity for use of the platform by the stakeholder community to advance their own efforts.

In addition to these efforts, a [Small Business Innovation Research (SBIR) FOA](http://science.energy.gov/sbir/funding-opportunities/) was released by the WWPP on 5 March 2012. This FOA seeks to support development of a standardized metocean monitoring package that would serve as one of the core elements of a standardized data collection network for the offshore renewable energy industry. Such metocean measurements are critically needed to better characterize the offshore wind resource.

Geophysical and geotechnical information, such as bathymetry and seabed geology and sediment properties, in combination with metocean data, is essential to successfully designing robust structures and foundations and planning mitigation strategies for seabed scour. Geotechnical and geophysical data gathering is crucial but also requires a substantial outlay of capital. This is a prime activity to target for reducing project costs and time to deployment for offshore renewable energy systems. To ensure offshore wind turbine foundational stability and safety over the lifespan of an offshore wind project, specific geological and sediment distribution information is needed to adequately characterize the project site. Furthermore, sea surface and subsurface information may be necessary for proper placement and installation of ancillary items such as transmission cable and substations. Monitoring of sediment transport and the development seabed scour and other foundation-eroding phenomena may be necessary to ascertain survivability of the offshore wind energy system.

**Requested Information**

One of the goals of the WWPP is to aid in reducing stakeholder challenges in deploying offshore wind technologies on the U.S. Outer Continental Shelf. In support of this goal, the WWPP invites comments on how DOE can address stakeholder needs regarding offshore wind energy resource characterization in United States coastal regions within the framework of metocean observation programs and the RFORE concept:

In retrofitting an existing offshore structure with metocean instrumentation (i.e. the aforementioned RFORE concept):

* What types of instrumentation could be put on the platform that would be most valuable to the offshore wind energy community?
* How can this asset best be developed to address the needs of the community for:
  + Evaluating and improving offshore modeling and forecasting tools?
  + Validating LIDAR or SODAR (LIght or SOnar Detection And Ranging) and other remote sensing systems?
  + Complementing and enhancing other currently existing metocean data sets?
  + Gathering metocean data at key locations for offshore wind and MHK energy resource characterization (e.g. at hub height and at the atmosphere-ocean interface)?
  + Addressing fundamental offshore meteorological, oceanic and wind/wave coupled research questions?
* What other research, observation, and partnership opportunities can be addressed within the framework of the RFORE concept?

For those currently employing or planning to soon employ metocean monitoring programs for evaluation of offshore wind energy resources in the OCS:

* What partnerships is DOE in a unique position to foster to support new and planned offshore metocean monitoring programs?
* How can high-quality coastal monitoring stations be used in tandem with new and planned offshore metocean monitoring programs to further expand knowledge of metocean phenomena as applicable to offshore wind energy technology?
* Within the possible partnership for a metocean monitoring program, what balance between proprietary data confidentiality and data sharing with the government for research purposes would be deemed appropriate?
* How can DOE and its partners be best suited to enable a foundational network of metocean observing systems from the proposed or planned metocean monitoring program? How can such a network be used to analyze near-shore and offshore meteorological conditions and provide opportunities for improvement of observations and modeling of the offshore environment?
* What offshore phenomena or conditions would the resulting data from the metocean monitoring program be well suited for addressing?

Regarding geotechnical and geophysical data for project site seabed geology and sediment properties characterization:

* What are offshore wind industry data needs for sufficient characterization of offshore wind energy site bathymetry and seabed geology and sediment properties to ensure offshore wind turbine foundational stability and proper placement and installation of ancillary items such as transmission cable and substations? Does this data exist and is it publically available?
* What are offshore wind industry data needs for characterizing sediment interactions with offshore wind turbines and associated cables and substations (e.g. sediment transport and deposition and seabed scour)? Does this data exist and is it publically available?
* What partnerships is DOE in a unique position to foster to support collection and dissemination of this data?
* What are the current technologies and best practices employed to obtain geophysical and geotechnical data necessary for offshore wind deployment? What measurement technologies could be improved to make this information easier to obtain or to address gaps in information?
* What technologies could be employed to reduce the time and cost of geophysical and geotechnical site characterization?