

FUGRO'S CAPABILITIES FOR OFFSHORE WIND PROJECTS IN NORTH AMERICA

Fugro Overview

Fugro NV is the world's largest and most technologically-advanced firm that specializes in the collection, interpretation, and analyses of data from and below the earth's surface. Fugro is unique in our nearly 60-year history of providing such data and consulting services for offshore and coastal energy developments around the world while maintaining a broad and diverse base of clients in other sectors. Fugro NV is a financially stable and well capitalized firm and is a member of the MidKap Index of the Amsterdam stock exchange.

Fugro's specialties include: geotechnical engineering; marine, terrestrial and airborne survey; metocean data collection, evaluation and instrumentation systems; GIS database development and administration, and related services. Today, Fugro is the world's largest supplier of geoscience services for marine projects and operates in more than 55 countries. Fugro is unique in that we own and manage many of the vessels, vehicle-mounted, and airborne platforms used to collect data from and below the earth's surface.

Fugro has provided data collection and professional services to the offshore wind industry for most of the offshore wind energy projects operating and planned in Europe and the U.K.



Fugro Atlantic (in Norfolk Virginia)

Fugro Atlantic's primary focuses are geotechnical and survey activities (data collection and consultancy) for: 1) coastal infrastructure (primarily in the Mid Atlantic region) and 2) offshore (renewable) energy (offshore the US East Coast and in the Great Lakes). Fugro Atlantic is currently executing the geotechnical design studies and providing marine survey data for the largest port and harbor, river crossing, and navy shipyard projects in the Hampton Roads area of Virginia.

Fugro Atlantic was established in summer 2007 at the request of one of our clients to provide the geotechnical engineering and marine survey services for several large coastal infrastructure and port development projects in Hampton Roads area of the Virginia Tideland. Fugro Atlantic's specific market objectives, when established in 2007, included the pending offshore renewable energy industry. In recognition of the immediate project needs and future marine energy opportunities, to establish Fugro Atlantic, Fugro transferred marine- and coastal-focused staff, so as to offer Fugro's clients the complete range of Fugro survey and engineering services along the U.S. East Coast.

Fugro Marine Energy Industry Expertise

Fugro is a firm that is well known and respected in the marine energy industry. Fugro is the only geosciences firm to have ever received the prestigious Offshore Technology Conference's *Award of Excellence*. For more than 50 years, Fugro has provided siting studies and design investigations for structures installed in the U.S. Outer Continental Shelf (OCS) under the jurisdiction of the U.S. Minerals Management Services (MMS), who are anticipated to be the lead federal regulator for offshore, OCS wind energy projects. The name Fugro is a trusted name that is recognized by the MMS.

Fugro Offshore Wind Power Development Experience

In Europe. Over the last 15 years, as the offshore wind industry has developed in Europe, Fugro has provided our data collection and consultancy services for offshore wind projects in eight countries. To date Fugro has provided the geophysical surveys and/or geotechnical site investigations, together with the related charting and foundation evaluations, for more than 100 installed or proposed offshore wind farms (and the associated cable routes). These projects include more than 3/4th of the developed and proposed offshore wind projects in Europe.

In addition to those site evaluation services, Fugro has also provided the offshore wind energy industry: 1) geological and/or metocean desktop studies; 2) wind, wave and tidal measurements; 3) predictive metocean assessments for design and installation planning; 4) instrumentation and installation of met towers; and 5) cable route selection, design and instrumentation. Fugro Seacore has also installed the foundations or towers for a number of European met towers and turbines.

Technical evaluations for offshore wind developments that are commonly a part of Fugro's scope of work include: scour assessments, foundation type selection, foundation capacity predictions and load-deformation evaluations, driven/vibratory pile installation studies, and cable routing and cable burial assessments.



In North America. Fugro is currently under contract and providing the following services for offshore renewable energy projects in North America:

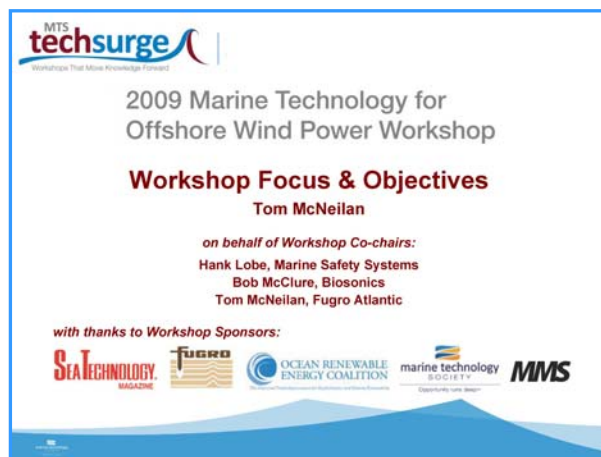
- Regional Desktop Studies for several proposed offshore wind developers and governmental agencies.
- Project Desktop Studies for three proposed commercial offshore wind projects.
- Geophysical surveys, geotechnical site investigations, and foundation design studies for proposed meteorological tower installations for offshore renewable energy projects.
- Preliminary geophysical surveys and site investigations for three proposed offshore kinetic energy projects.

- An initial site planning feasibility studies to regionally prioritize development areas and approaches.

Fugro's Commitment to Offshore Wind Development in North America

In recognition of the importance of offshore North American wind (and other alternate) energy development, Fugro is:

- Sponsoring a research fellowship (at the University of Wisconsin) to develop *Foundation Solutions for Offshore Wind Turbines*.
- Organized and co-sponsored (along with MMS) the June 2009 Marine Technological Society's 2-day *Marine Technology for Offshore Wind Power Workshop* in Washington D.C., which focused on the technical considerations of siting, design and installation of offshore wind facilities.
- An active member of AWEA Offshore Wind Working Group, and the OWWG's Federal Legal and Financial Assurance subgroup.
- An industry partner of the Virginia Coastal Energy Research Consortium (VCERC).



A Summary of Fugro Qualifications for Offshore Wind

Fugro provides a unique combination of engineers, geologists, survey professionals and GIS analysts whose complimentary expertise allows important information to be interpreted in the context of the regional conditions and project requirements. Most importantly, our interpretations of the implication of the conditions relative to offshore wind development can provide high value to our clients at an early stage of their project development.

Only Fugro provides the combination of:

- Offshore marine survey (and site exploration) experience on the Outer Continental Shelf (OCS) of the United States for energy development regulated by the Minerals Management Services (MMS),
- Past participation in many of offshore wind energy developments in place, in design, or planned in nine different European countries,
- Installation and instrumentation experience on several of the installed and operating European offshore wind energy developments,
- Health, Safety, and Environmental (HSE) standards that are appropriate for conducting the highly visible marine activities that will be required to plan, design and install the wind farm structures,

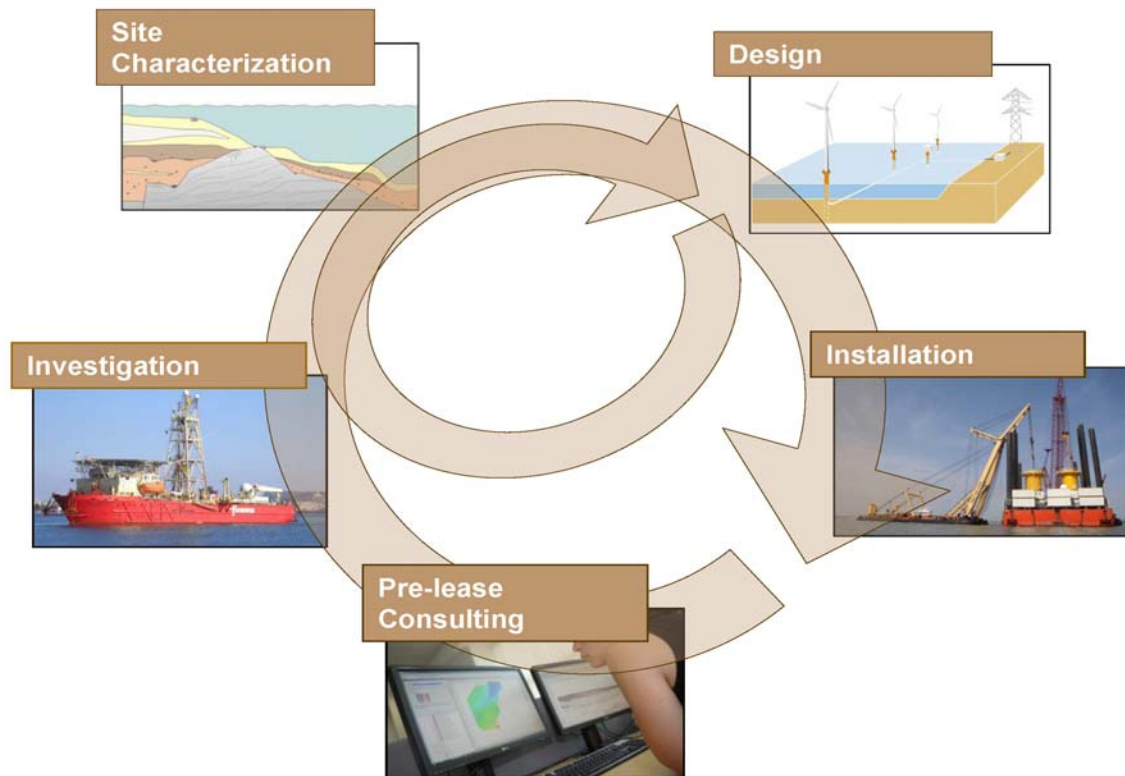
- The history of providing high-value integration of geophysical data and subsurface exploration data for offshore development,
- The broad range of relevant services that Fugro brings to the offshore wind energy industry,
- A U.S. East Coast office staffed by engineers, geologists, and surveyors whose careers have focused on marine and coastal energy and infrastructure projects.

In summary, only Fugro provides the experience with offshore wind, the offshore U.S. Oil & Gas industry, and the U.S. regulatory requirements that will be required to develop offshore wind on the U.S OCS.

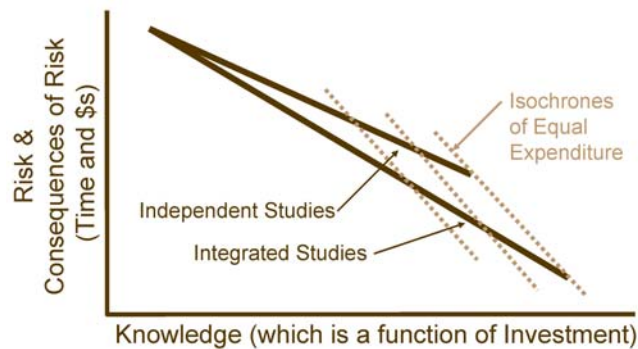
Advantages of Integrated, Holistic Studies

Fugro is unique in the breadth of services and depth of experience that it provides to the offshore energy industries. We routinely collect and integrate different types of data that define the character of the seafloor, subsurface, water column and atmosphere. Those data collection and the subsequent data interpretation, data management, engineering design are provided throughout the project development cycle from: project planning (Desktop Studies), to preliminary investigation and site characterization to preliminary design, to project siting and final investigation, characterization and design, and to structure installation.

Fugro is uniquely qualified and experienced to provide and integrate data collection and design throughout the project development cycle



When integrated together those different types of data provide more knowledge of the site than when the various data are evaluated independently. The integration process directly adds knowledge that reduces project uncertainties and the need for project contingencies. Thus, the integration and continuity of services through the various phases of the project reduce project risk and project development costs.



Additional Services and Industry Focus of Fugro Atlantic on U.S. East Coast

Fugro has decades of experience applying our expertise with various geotechnical investigative techniques and analysis to a wide variety of onshore and coastal projects. Some of these types of projects include:

- **Ports and harbors development** - including land and marine surveys; geotechnical investigations and analyses; dredged material evaluation, management and disposal/re-use; and pile and foundation design and monitoring.
- **Transportation infrastructure** – including highway and rail corridor mapping, planning and design; subsurface investigation and characterization relating to tunnel placement and design; and bridge monitoring and scour analysis.
- **Levee and waterway evaluations** – including high-resolution bathymetric and LIDAR surveying, soil and sediment structural analysis and modeling; dredging and dredged material concerns; geotechnical engineering and replacement of failure-prone areas.
- **Coastal Flooding** – including levee and waterway evaluations in urban areas, beach profile and erosion analysis supporting long-term beach nourishment planning; local and regional subsidence analysis; structural flood protection retrofit and design.

Example Coastal Infrastructure Projects in the Mid Atlantic and Hampton Roads Area

Examples of the types and complexity of infrastructure projects being conducted by Fugro Atlantic in the mid Atlantic and Hampton Roads region include:

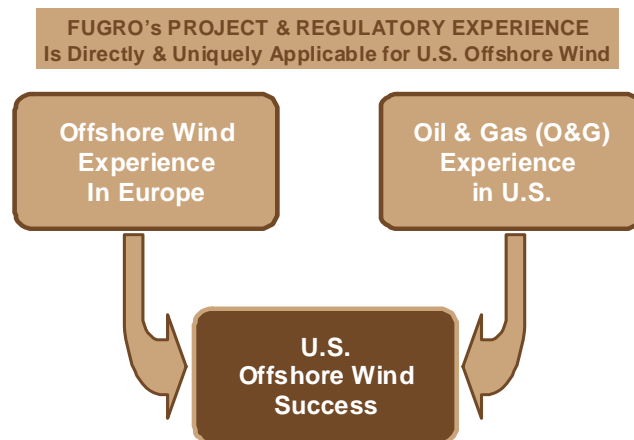
- The Craney Island Eastward Expansion and Marine Terminal project in Portsmouth Virginia. This joint local (Virginia Port Authority) – federal (USACE) project will add 500 acres to the existing dredged material area and stimulate the development of a 4th container cargo terminal. The site conditions and complexity of the geotechnical design challenges have required the application of advanced investigation methods and engineering analyses procedures.
- Recognizing that the definition of river bottom and subsurface conditions are a key to the success of their proposed design-build-finance project, VDOT hired Fugro Atlantic to characterize those conditions for the proposed 2nd Tube of the Midtown Tunnel crossing beneath the Elizabeth River between Norfolk and Portsmouth.

- The Norfolk Naval Shipyard, Pier 5 reconstruction project, which is the Navy's largest east coast shipyard project. This project is anticipated to include larger pile sizes, lengths, and loads than have historically been used for conventional shipyard and harbor facilities in the area.
- Tide gauge installations and the development of a city-wide model to predict coastal flooding and prepare for future changes in flooding exposure within the City of Norfolk due to sea level rise and other variables.
- A self-funded prediction of ground subsidence, during the past 20 years, in the greater Hampton Roads area using proprietary techniques and historical radar satellite data; application of these techniques for the Thames River Barrier project have proven the ability to differentiate annual subsidence rates in the greater London to sub millimeter precision.

Concluding Comment

Successful development of the initial U.S. offshore wind farms requires an understanding and evaluation of the often underappreciated engineering aspects of siting, investigating, designing, installing, and maintaining structures in the Outer Continental Shelf (OCS). Because wind energy has not yet been developed offshore the U.S, the knowledge that is required is based on: 1) European offshore wind developments and 2) U.S. offshore Oil and Gas (O&G) developments. The recently-released MMS *Guidelines* confirms their expectation that the emerging U.S. offshore wind industry will be required to meet standards that have been used to regulate offshore O&G developments.

We suggest that Fugro's experience with both the European offshore wind industry and the U.S. O&G industry is unique and directly of value to the initial U.S. offshore wind developers. Hiring survey and/or engineering firms that lack the above experience unnecessarily exposes offshore wind projects to delays and directly increases the potential that the project schedule and objectives will not be met.



In conclusion, Fugro Atlantic would like to thank you for the opportunity to explain a little about our company and qualifications. We feel that the skills and capabilities of Fugro Atlantic and Fugro NV are unmatched along the U.S. East Coast and around the globe, respectively. Worldwide, the name Fugro is associated with ability, quality, integrity, timeliness and fiscal responsibility. We look forward to demonstrating these qualities on future projects and continuing our mission to further the state of practice, and to develop the state of the art, of geotechnical survey, investigation and engineering.

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