

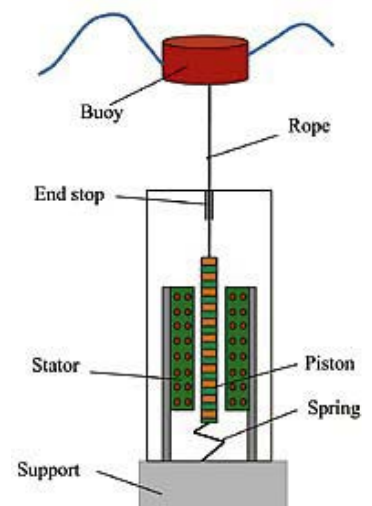
MMI Engineering delivers specialist integrated engineering and safety services to its clients in the renewable energy, oil and gas, petrochemical, and security industries.

MMI Engineering's work with clients involved in offshore wind and wave power projects is focused on providing technical leadership in structural design and analysis, and presenting effective solutions to safety management challenges.

Wind power generators have given many years of service in onshore wind farms. This experience has provided the industry with an understanding of complex wind loading and the associated design requirements for the generator, its support structure and foundation. While there is significant understanding of land-based wind farms, experience of offshore wind farms is more limited. The codes and standards that have been developed for the design of land-based wind turbine structures have been adapted to address the issues associated with the marine environment. These additional requirements have focused primarily on the loads that are generated from waves and currents, and the effect of these loads on the design of the support structures and foundations.



As wind farms move further offshore, new hazards to personnel arising from transport to and from remote structures, as well as working on them, will be encountered. MMI has extensive experience of assisting clients in the oil and gas sector in managing hazards of this type. MMI has been involved in a number of structural studies supporting offshore wind and wave energy, including:-



- Completion of a study for a UK offshore wind operator to assess the effects of scour on OWT foundations
- A study to evaluate and compare the API and IEC standards in terms of their common applications on conventional offshore wind turbine support structures. This comparison was intended to evaluate the levels of structural reliability that are produced for common structures that are designed following the requirements of either standard. The results of this study were intended to provide all stakeholders (i.e. regulatory bodies and the industry) with specific guidance to support the definition of a standard for the design of offshore wind turbine support structures in U.S. waters
- Completion of a concept development study aimed at assessing the state of the practice in offshore wind systems, and developing new support structures to expand their range of applicability, given deeper water and harsher environmental conditions
- Assessing new technologies and requirements for building larger wind systems in deeper water locations and at greater distances from shore (working with the US National Renewable Energy Laboratory)
- Working to assess the next generation of support systems for offshore wind turbines, including the development of a floating support system, which would function without regard to water depth, thus allowing developments to be sited further offshore - avoiding visual impact concerns

Regarding Wave Energy Conversion (WEC's) or powerbuoys[™], MMI has completed conceptual layouts of the mooring system through detailed strength and fatigue design, and specification of mooring system components. MMI has worked on WEC systems for the U.S. and has also been involved in the design of mooring systems for installations offshore Spain and Scotland.

In the field of technical safety assessment, MMI has developed a methodology for quantifying the risks to people in the vicinity of wind turbines. While this work is primarily of relevance to onshore turbines, it is also pertinent to people and vessels working around offshore facilities.

MMI has a wide experience of assisting clients in the offshore oil and gas industry with a range of safety services, including:-

- Major hazards modeling; structural collapse, fire & explosion
- Structural analysis and design of foundations, jackets & topsides
- Safety case development & supporting studies, including escape & evacuation risk assessment, HAZID, HAZOP, SIL, & FMEA

MMI brings these services to the offshore renewable energy sector, applying past experience to provide effective solutions to clients' current concerns.