SCOUR/TURBINES (from page 31)

Structures such as reef balls (The Reef Ball Foundation, 2020) and Surgebreakers (Havelin, 2012) are more complex and provide more structure and more energy absorption than solid structures that are used in breakwaters. These complex structures can be used in the relatively low energy environments at the base of offshore wind turbines.

From The Reef Ball Foundation

Both of these structures are fabricated out of concrete. **Reef balls** are semi-spherical structures typically up to 6 feet diameter and 5 feet high weighing up to 6000 pounds each.

Surgebreaker is a modular device constructed with patented 3,700-pound, precast, reinforced concrete modules with vent holes to release wave pressure buildup. The triangular modules are 4 feet high and 7 feet wide (Havelin, 2012). An advantage of these more complex structures is that they are designed to become fouled with marine growth such as macro algae over time. This marine growth will act as a "soft structure" to further reduce current flow as the structure ages, with the advantage that it has developed naturally in-situ after placement of the complex scour protection structures.

Surgebreaker, from Havelin, 2015

From elements of design used in scour pad construction and reef ball placement it appears that a combination of a single layer of rock approximately 1 foot thick extending out from the edge of the tower base 150 feet in all directions topped with a continuous layer of either 5-foot-high reef balls, 5-foot-high Surgebreakers or similar complex structures would comprise a design worth implementing.

Some commercial fishers, particularly draggers have indicated that they are not in favor of these enhanced scour pads. This seems very short sighted and ill advised. Since scour pads are already incorporated in the design of turbine bases, draggers will be prohibited from bottom dragging that close to the turbine bases even with the standard scour pad in place. These same fishermen would potentially benefit from enhanced fish, invertebrate and squid abundance spilling over into adjacent dragger fishing areas. In addition, if these scour pads extend 150 feet out from the monopile it will only be 0.025 nm out of the 1.0 nm spacing fort a total of about 5% of the distance between the turbines.

By employing smart design and installation of complex structures with designed voids at the base of each turbine, developers can both provide improved scour protection and provide habitat that could enhance fish, invertebrate and squid stocks in the area. With all of the potential negative impact associated with wind energy development this seems to be an easy modification that may provide positive impact for the marine environment.

These alternatives certainly demand consideration and inclusion in final construction design. It may be possible to employ a group such as the Ocean Engineering Department at the University of Rhode Island to test a scaled version of this proposed modification in one of their existing test tank facilities prior to construction. In this way existing or new structures can be evaluated versus the standard solid rock scour pad that has typically been used.

For references to parts of this report contact Rich Hittinger via email: hittinger@risaa.org

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