Engineering and Design Information Received from Ocean Era

Sent by Ocean Era on 04/08/25

The engineers are cautious about providing any certification in advance, for any specific storm event designations for the net pens. The SeaProtean net pen system by Innovasea is based off of the PolarCirkel-style net pen systems that have been successfully used worldwide for decades, in highly exposed waters in sites such as Norway, Newfoundland, and the Canary Islands. Historic empirical data on submersible net pens constructed and deployed by Innovasea worldwide, clearly demonstrates the structural integrity of their net pens (including the mooring systems). The following list of major storms, category 3 or greater typhoons/ hurricanes, that have either directly or indirectly hit their (Innovasea's) submerged equipment without incident (i.e., no fish escaping or no major damage to the net pen system) serve as prime examples: (1) 2004 Hurricane Frances (Category 4) - direct hit in Eleuthera, Bahamas; (2) 2012 Typhoon Bolaven (Category 4) - direct hit in Jeju, Korea; (3) 2016 Hurricane Otto (Category 3) - indirect hit in Panama; and (4) 2023 Hurricane Norma (Category 4) - direct hit in La Paz, Mexico.

With regard to current speeds, the historic (2017 – 2024) Gulf of Mexico (GoM) current speeds documented from a NOAA buoy in proximity to the proposed Velella Epsilon (VE) Demonstration site have an average range from 11.86 cm/s to 36.50 cm/s, with average maximum current speeds with a range from 44.93 cm/s to 72.60 cm/s. During higher current speeds and higher wave height conditions (tropical storms and hurricanes), the net pen would be fully submerged. Most localized oceanic currents in proximity to the VE Demonstration site are wind-driven, and wind-driven currents see reduced velocity, as well as dramatically reduced forces due to waves, as one moves deeper toward the seafloor (the submersible net pen state during storms). Thus, moving out of the highest energy state at the surface will result in reducing (exponential energy reduction with depth) the loading experienced on the net pen system.

As stated in an earlier communication, facility operating procedures during emergency situations like tropical storms or hurricanes would include the lowering of the net pen system to the submerge position, after which all surface equipment would be loaded onto the tender vessel, and the vessel(s) would return to harbor for safe mooring and/or dockage.

Sent by Ocean Era on 02/28/25

We connect with our ocean engineer yesterday who had the following to say about question 1.

1) Could you provide a certification that the facility has been designed to a certain storm event (i.e. 25-year, 50-year, etc.), water current speed, and/or other safety factor to meet the appropriate engineering standards?

Innovasea can only speak generally because we haven't undertaken extremes analysis for their site and certain storm events.

1) There are multiple versions of SeaProtean to handle different environmental conditions.
2) The SeaProtean has been analyzed in current speeds up to 1 m/s
3) The SeaProtean has been analyzed in wave fields up to 4m waves, with indications that it could handle larger depending on the currents on site.
4) In general, Innovasea does not adhere to a single standard but follows internal design standards that use existing standards as reference points.

Regarding question 2, an emergency response plan is developed by each farm and depends on resources, boats, etc. A SeaProtean pen can be submerged by opening a single valve so that element of a response plan will be minor. Based on the farm environment, some farms lower their pens each night, while others lower them when rough weather is forecasted. In either case, its not a large burden on operations.

Sent by Ocean Era on 11/01/24

Revised Facility Damage Prevention and Control (FDPC) Plan dated November 2024

Structural Integrity Highlights:

- Withstand 200-Year Storm Submerged 40 Feet Below Surface
- Retains the net pen's position, regardless of the prevailing current and/or wind direction