

Model basin testing of a floating solar system compared to analysis for establishment of design verification culture

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ABSTRACT

This paper compares numerical analysis to model basin testing for a floating solar system. The system consists of solar panels distributed on a horizontal, flexible membrane at the water surface as seen in Figure 1. The analyses are based on FEM and loads from waves and currents are applied in time domain simulation to calculate coupled hydroelastic response. The paper presents theory for calculation of loads and response for tarpaulins at the water surface (surface tarpaulins). Basic loads such as drag and pressure from hydrostatic and hydrodynamic loads are included. There is a suction effect occurring between the water surface and the tarpaulin inducing forces in the horizontal plane of the surface tarpaulin. This is included in the analysis and presented.

Model basin testing has been carried out. Results from analysis is compared to the findings in the model basin. Results show good correspondence. Sensitivity studies are carried out and applicability for full scale design verifications of surface tarpaulin membranes carrying solar panels is discussed.

Keywords: Floating solar; Model basin testing; Finite element analysis; Hydrodynamics; Hydroelasticity; Wave theory; Surface suction; Horizontal membrane; Surface tarpaulins



Figure 1 Floating photovoltaic power plant by Ocean Sun.