

## WEC SIM DEVELOPMENT AND APPLICATIONS FOR HYDRAULIC PTO, LOAD ANALYSIS AND CONTROL

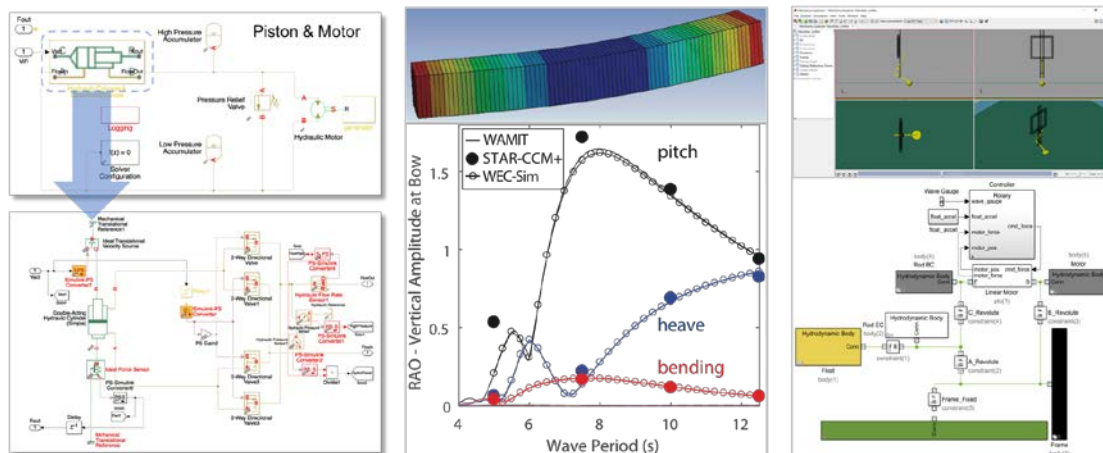
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WEC-Sim (Wave Energy Converter Simulator) is an open-source wave energy converter simulation tool jointly developed NREL and SNL. WEC-Sim has the ability to model devices that are comprised of rigid bodies, power-take-off systems, and mooring systems. This poster will present the latest development efforts and applications of WEC-Sim on three different topics, including (1) hydraulic power take-off (PTO) simulation; (2) modal-based structure analysis method development; (3) the supporting effort for the WEC Control Competition (WECCOMP).

WEC-Sim was developed to provide a general platform for WEC design analysis and can be customized to meet individual needs. The hydraulic PTO simulation will demonstrate how a detailed hydraulic PTO can be developed using Simscape Fluids (MATLAB) and coupled to WEC-Sim to better understand the PTO efficiency and to investigate the effectiveness of different types of power smoothing methods as well as the dynamics of the PTO subcomponents. The modal-based structure analysis method section will introduce the latest developed effort of a reduced-order, generalized modes method in WEC-Sim, which provides the capability to model flexible WEC designs and to simulate the dynamic responses of WEC component structural deformations under wave loading. Examples and a verification study will be presented. Finally, a brief description on the development and validation of a numerical model of the Wavestar device in WEC-Sim for the support of WECCOMP will be presented. WECCOMP is an open competition with the objective of maximizing WEC power production through innovative control strategies. It has two stages: numerical implementation of control strategies, and experimental implementation. The poster will focus on the support of the stage one numerical implementation, where contestants are provided a WEC-Sim model of the Wavestar device to develop their control algorithms.



**FIGURE 1. LATEST DEVELOPMENT AND APPLICATIONS OF WEC-SIM, (LEFT) HYDRAULIC PTO SIMULATION; (MID) MODAL-BASED STRUCTURE ANALYSIS METHOD DEVELOPMENT; (RIGHT) WEC CONTROL COMPETITION**

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