Down-Wave WEC-Array Simulation Verification Using a Spectral Wave Model (SNL-SWAN) and BEM Modeled Wave Fields

Aaron Porter[1^], Cameron McNatt[2*], Kelley Ruehl[3#], Jesse Roberts[4#]

^Mott MacDonald
Edmonds, WA, USA
[1]aaron.porter@mottmac.com
[*]Mocean Energy LLC
Greensboro, MD, USA
[2]cameron.mcnatt@moceanenergy.com
[#]Sandia National Laboratories
Albuquerque, New Mexico, USA
[2]kmruehl@sandia.gov
[3]jdrober@sandia.gov

Sandia National Laboratories has developed SNL-SWAN, which includes a modification of the open-source spectral wave model, SWAN, to more accurately model wave energy converters array effects on the nearshore wave climate. The WEC-module in SNL-SWAN accounts for device specific power performance via frequency-dependent absorption. The lack of deployed wave farms does not allow for direct measurement of the effects of Wave Energy Converter (WEC) arrays on near-field and nearshore wave propagation. Validation against experimental laboratory data and verification against other codes of WECs in spectral wave models is also limited. Furthermore, implementation of WECs in spectral wave models via 2D transmission and reflection coefficients only partially describes the physics of the WEC-wave interaction.

This work will build on existing experimental validation, and verify the SNL-SWAN wave field against the results of the phase-resolved linear wave model, WAMIT. The focus is on the wave shadow (Figure 1), that is, the region down-wave which will have the greatest impact on nearshore processes. Comparison against the validated WAMIT code also allows for high-density wave field data without experimental variation (such as gage noise), relative to experimental wave gage data. The goal of this work is to evaluate appropriateness and best practices for implementing WECs in spectral wave models such as SNL-SWAN.

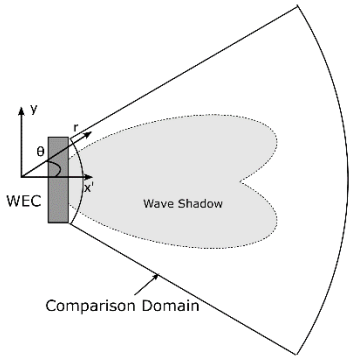

Fig. 1 WEC wave shadow and domain of comparison