Abstract Submitted
for the NES15 Meeting of
The American Physical Society

The basic physical principles involved in the conversion of vibrational energy to electrical energy in off-shore ocean wave energy systems

AMADOU THIAM, Boston University — While details of the currently most publicized devices for ocean wave energy conversion to electrical energy are generally not disclosed in the open literature, the author believes that, for devices not on the coastline, the common transduction mechanism involves electromagnetic induction with conducting wires moving relative to permanent magnets. A general discussion is given of how such a mechanism can be used in this application. The overall analysis of the mechanical system with lumped or distributed masses and elastic elements driven by buoyancy forces associated with incident ocean waves is facilitated, if the transduction system is modeled as linear mechanical dashpots, and the procedures for deriving effective dashpot constants are described. The analysis suggests that, for waves in a general frequency range, there is an optimal choice for the parameters of the mechanical system, so that the maximum electrical power can be harvested. The optimal energy extracted per wave cycle is invariably much less than the total mechanical energy of the oscillating components of the system. A distinction is made between freely floating systems and systems anchored to the ocean bottom and between systems driven near a resonant frequency and those driven substantially below resonance.

Amadou Thiam
Boston University

Date submitted: 13 Apr 2015 Electronic form version 1.4