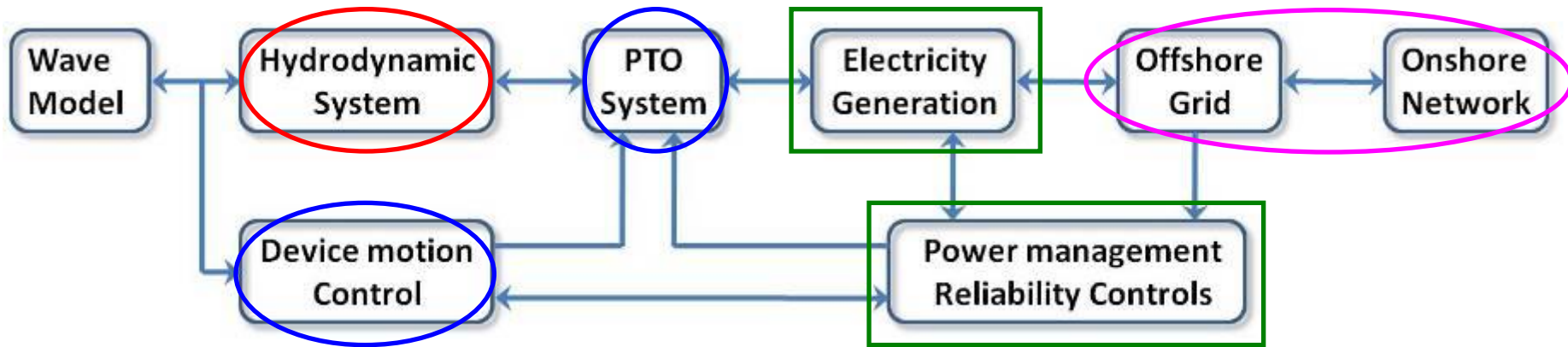




# An Integrated Full Wave-To-Wire Array Model

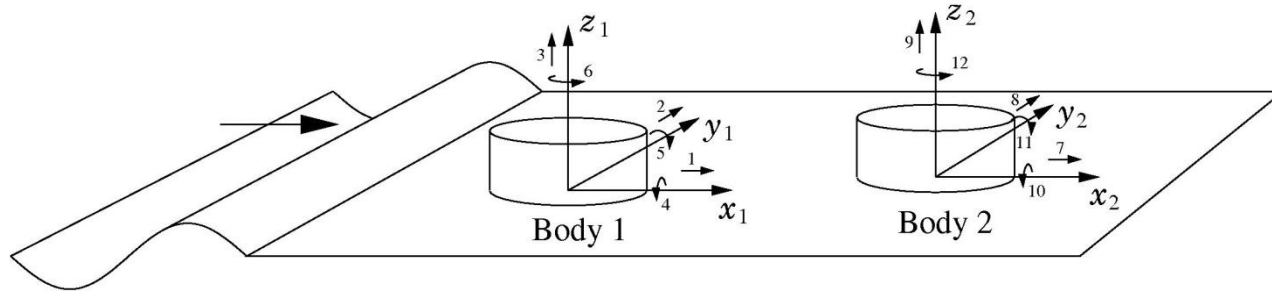
Dr David Forehand & Dr Aristides Kiprakis  
Institute for Energy Systems  
The University of Edinburgh

# The Wave-To-Wire Model



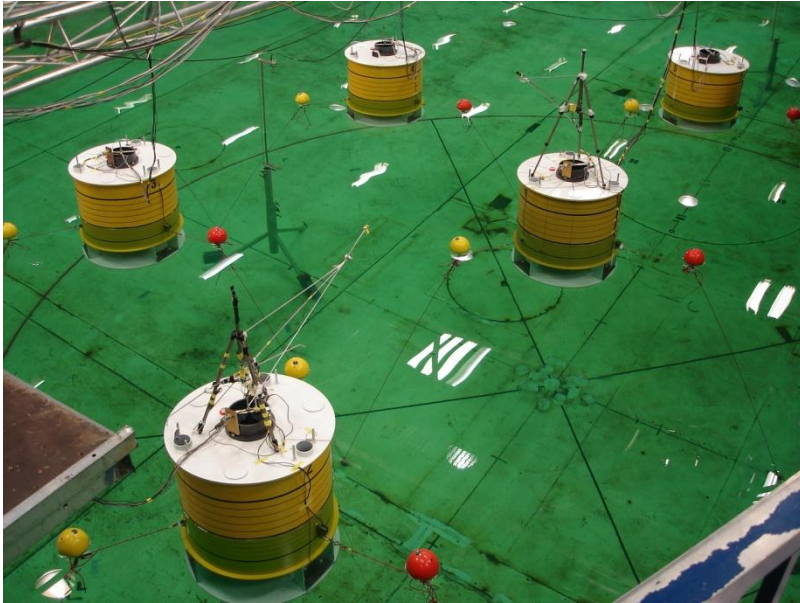
- We have developed a novel wave-to-wire array model.
  - Hydrodynamics – David Forehand
  - PTO, control and system integration – Aristides Kiprakis
  - Electromagnetics, electrical and generator – Markus Mueller
  - Off- and on-shore network and interaction – Anup Nambiar

# Hydrodynamic Array Model

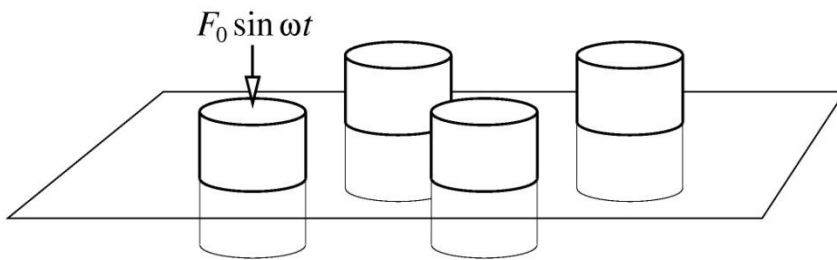


- A *new automatic, time-domain*, hydrodynamic wave energy converter array model has been developed.
- It takes into account *all* the hydrodynamic interactions between *all* the converters.
- It models *any number, shape* and *configuration* of devices in an array, each moving in up to 6 degrees of freedom.
- It works from WAMIT<sup>®</sup> data.
- It is *fast* (not a computationally demanding CFD solver) but captures all of the essential physics.

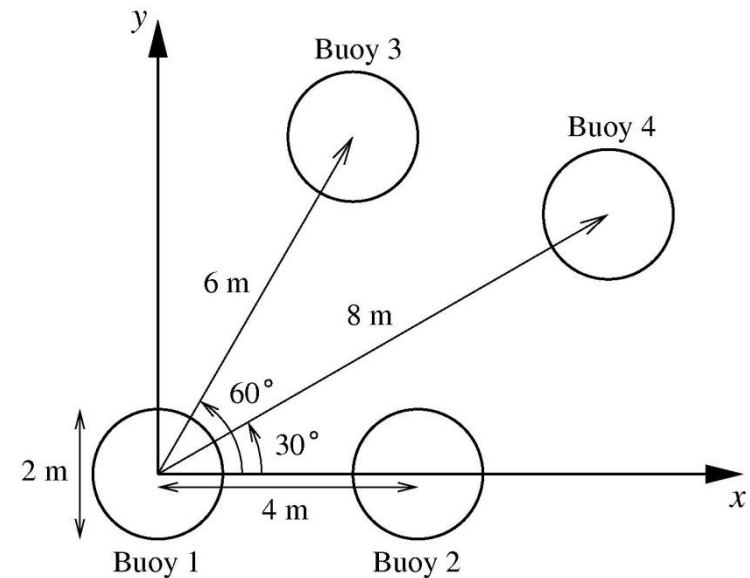
# Example: Four Interacting Buoys



- Based on the Trondheim tests, this presentation shows four buoys (1 with 1 DoF and 3 with 5 DoFs each, *i.e.* a 16 degree-of-freedom problem):

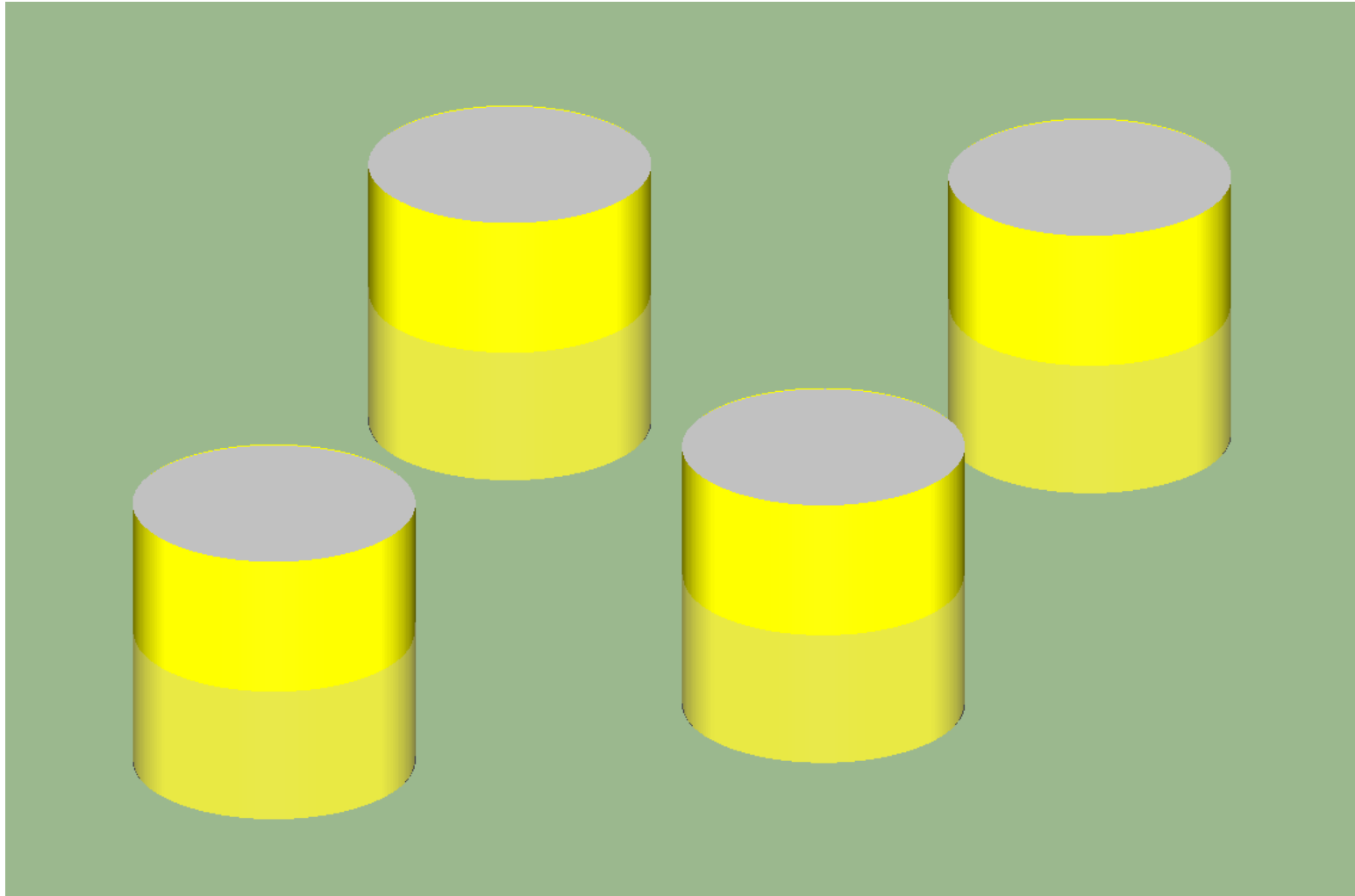


$$F_0 = 3000 \text{ N and } \omega = 2.95 \text{ rad/s}$$

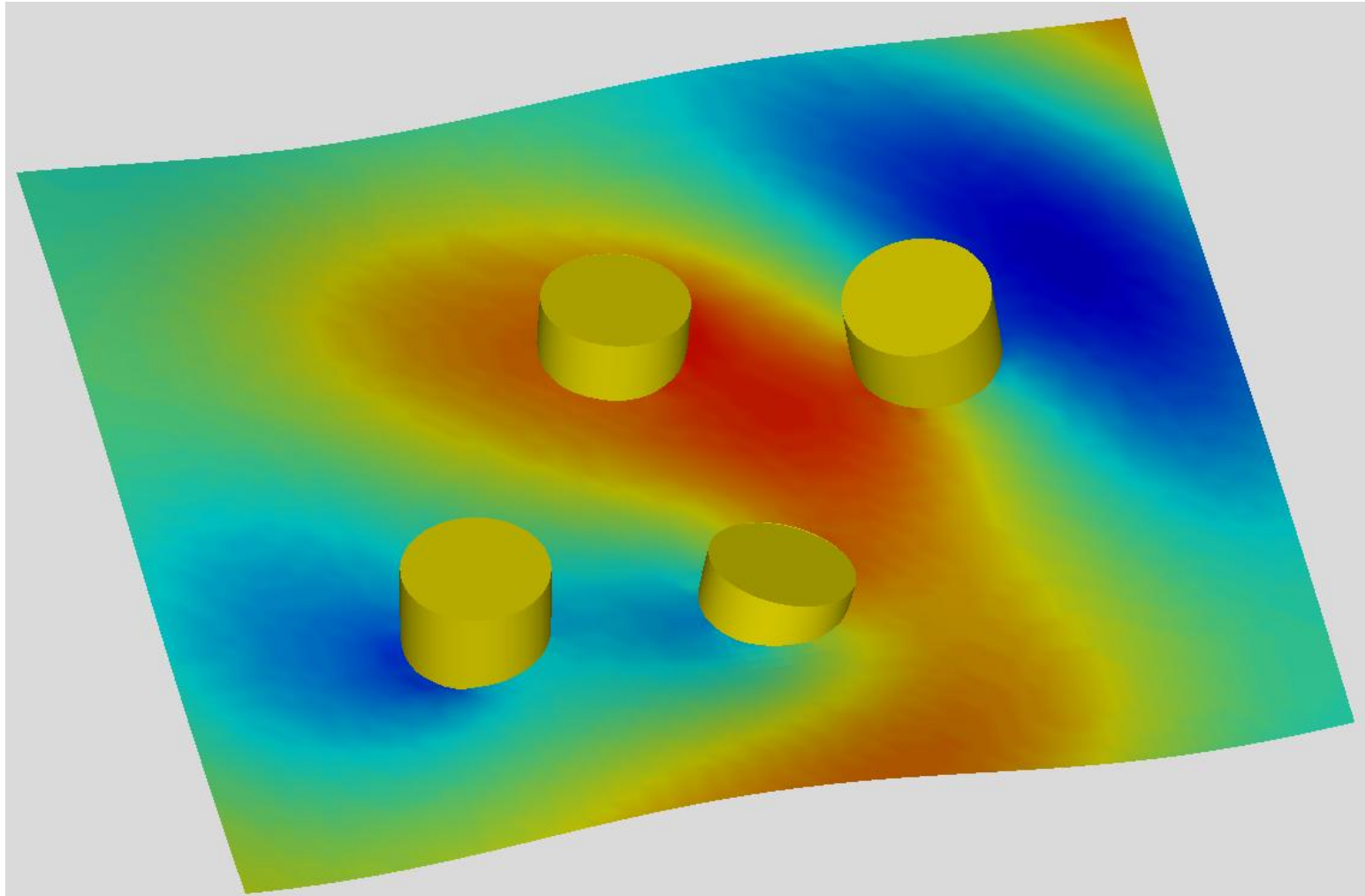


Plan View

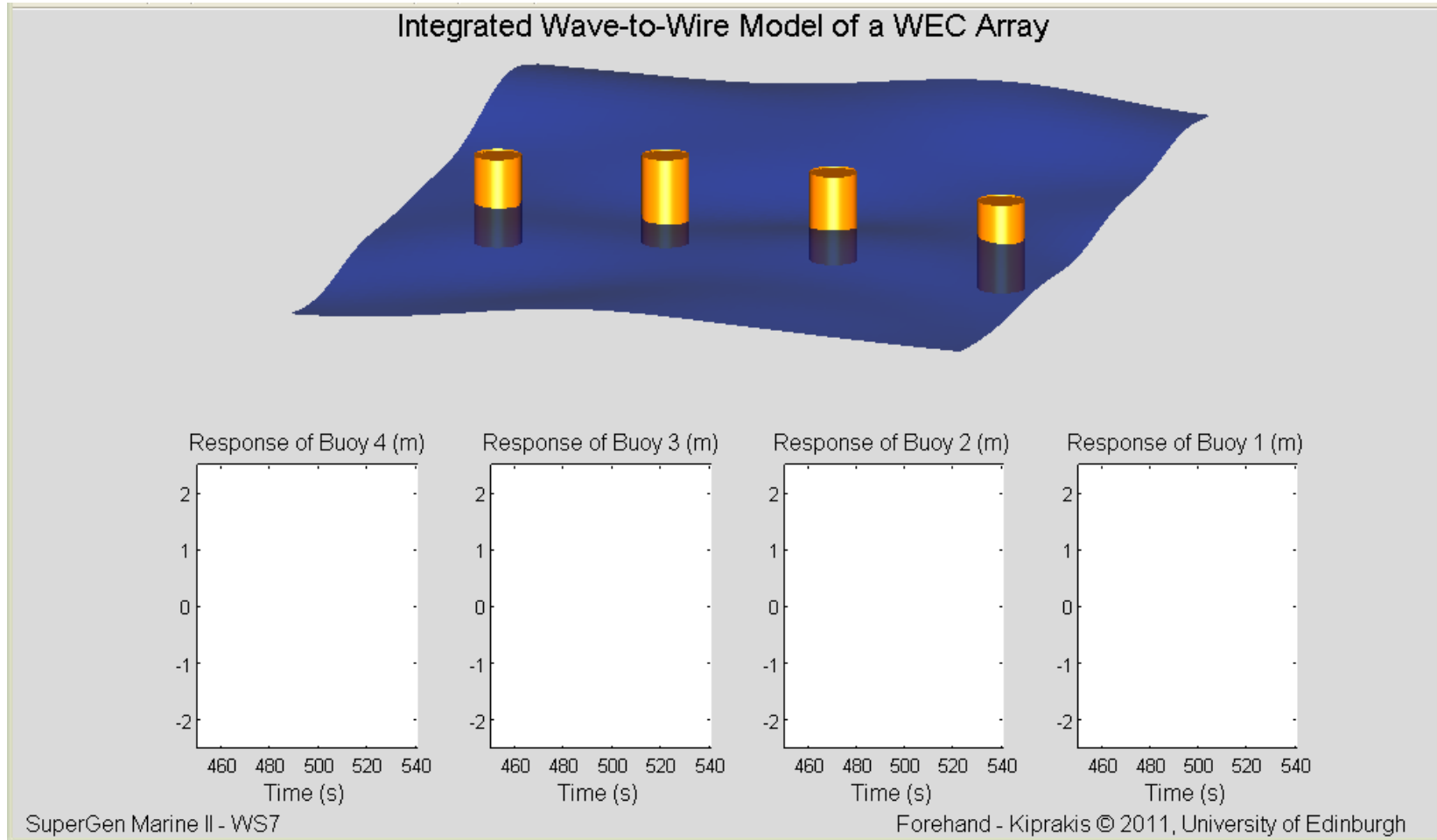
# Animation of the Four Buoys



# The Four Buoys in Waves

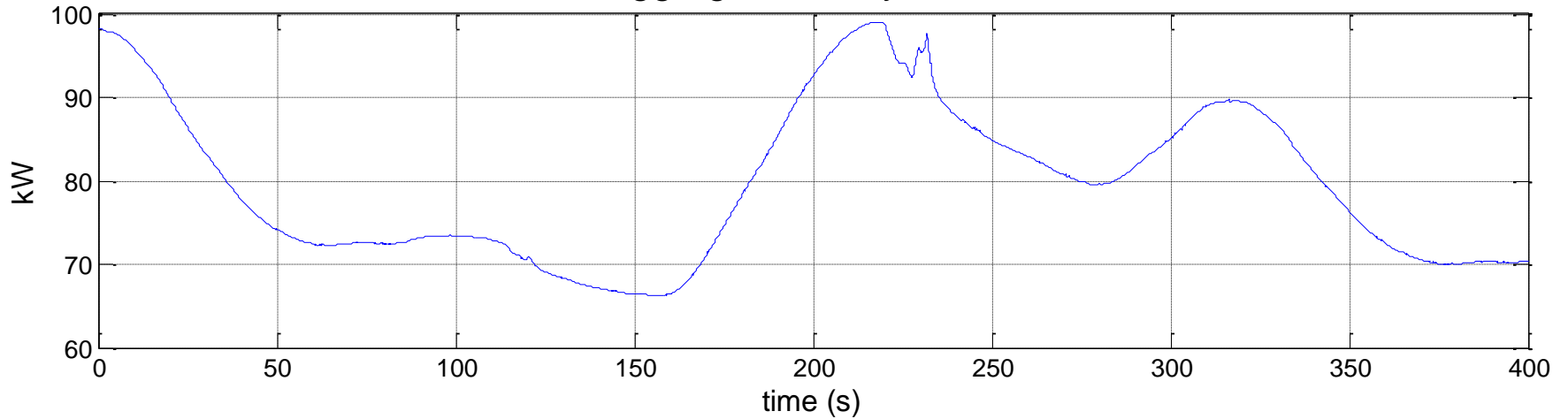


# Wave-to-Wire Model (Irregular Sea)

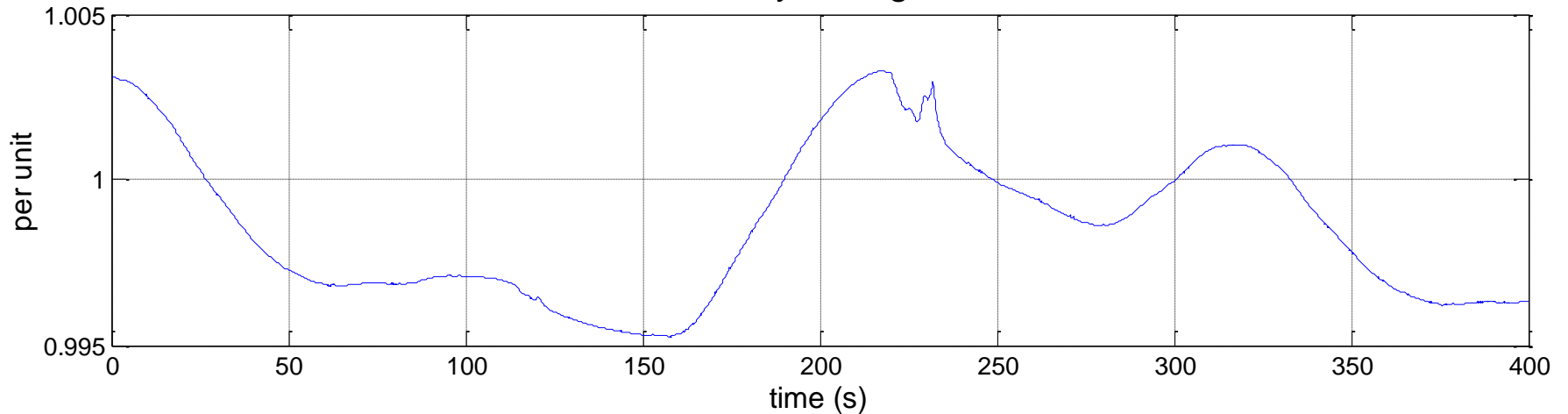


# Array Simulation in Irregular Seas

## Aggregated Array Power



## Array Voltage





# Array Response to Network Event

