Politecnico di Torino
Department of Mechanical and Aerospace Engineering

MARINE OFFSHORE RENEWABLE ENERGY LAB

DIMEAS
Department of Mechanical and Aerospace Engineering

MSC THESIS PROPOSAL | MORENERGY LAB

Solar power at sea: wave-induced dynamics of offshore floating photovoltaic arrays and energy losses

How do waves shake a solar farm at sea, and how much energy is lost?

Floating PV | Nonlinear dynamics | 6-month MSc thesis

THE CHALLENGE

Floating photovoltaics (FPV) is expanding from sheltered lakes and reservoirs to nearshore and offshore sites, where space is abundant but waves are much more energetic. Offshore FPV systems are often made of many floating modules connected by hinges or flexible joints, forming large articulated arrays. Their wave-induced motions affect the structural loads on connectors and moorings, as well as the orientation of the panels and therefore electricity production.

WHAT YOU WILL DO

1. Develop a multibody dynamic model of a modular FPV array (hydrodynamic interaction, connectors, moorings).
2. Evaluate motions and connector loads in operational and extreme sea states.
3. Couple motions with a PV production model to quantify energy losses due to panel tilting and mismatch.
4. Perform a parametric design study (module size, connector stiffness, layout).

WORK PLAN

MONTHS 1-2
FPV technologies, multibody hydrodynamics, PV yield models

MONTHS 3-4
Array model development and dynamic analysis

MONTHS 5-6
Coupled energy-yield analysis, parametric design, writing

REQUIRED SKILLS

Dynamics of mechanical systems; basics of fluid mechanics and photovoltaic systems; MATLAB or Python. Knowledge of hydrodynamics or multibody dynamics is a plus.

WHO WE ARE LOOKING FOR

- Mechanical, Energy, Electrical or Aerospace student
- Interested in solar energy and offshore structures
- Comfortable with MATLAB or Python

WHAT YOU WILL GAIN

- Expertise in a fast-growing offshore renewable sector
- Multibody and hydrodynamic modelling skills
- A view that combines structural dynamics and energy yield

TOOLS

MATLAB, WEC-Sim, Python (Capytaine, pvlib)

Interested? Send a short email with your CV and transcript of records. Informal chats are welcome.

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WHERE YOU WILL WORK

A young and informal working environment: you will be fully integrated within a large lab of MSc students, PhD students and researchers, working side by side in a shared open space.

BEYOND THE THESIS

For motivated students, research opportunities beyond the thesis will be promoted: scientific publications, research grants and PhD positions at the MOREnergy Lab.

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