Floating solar: Beyond the state of the art technology

Floating Solar: Beyond the State of the Art Technology

Integration of solar photovoltaics with floating systems has resulted in the emerging technology "floating solar". The technology has seen substantial developments in installed capacities in the past decade and rapid growth is expected as efforts to decarbonise energy supply intensify. Development of design standards and codes of practice for floating solar technologies deployed on both inland water-bodies and offshore is required to ensure robust and reliable systems that do not have detrimental impacts on the hosting water body. Moreover, integration of floating solar PV with other resources, for example, wind power, might improve economics and supply-demand dynamics. Further, the environmental impact of these structures and the use of water bodies and social acceptance of this new means of photovoltaic deployment needs to be understood. To fill the critical knowledge gaps, researchers need to investigate many facets, including resource potential, functionality, structural integrity, power performance and dynamics of the system, societal response, economics, and interactions with the hosting water body. For example, to reduce the capital and operational costs, a proper understanding of the responses of the structure subjected to wave and wind loads needs to be investigated. To support this, both numerical and experimental aero-hydrodynamic considerations and structural assessments are needed. Moreover, since water bodies provide many goods and services to the society, for example, food and water supply, understanding how the deployment of floating solar changes water body processes and the implications of system design and location choice is critical. This special issue has gathered the most up to date research in the field of floating solar covering the aforementioned aspects. The paper "The booming of floating PV" provides a good introduction to this emerging technology, and also gives very informative data to show how and why this industry is developing so fast. Three papers on different aspects of environmental impacts are present in this special issue: namely, a perspectives piece on "Environmental impacts and benefits of marine floating solar", "The cooling effect of floating PV in two different climate zones: A comparison of field test data from the Netherlands and Singapore", and "Floating photovoltaics could mitigate climate change impacts on water body temperature and stratification". The benefits of floating solar technology to mitigate climate change have been investigated thoroughly. There are two papers on the engineering side discussing the design and numerical methods needed for floating solar technology, "Analytical method for loads determination on floating solar farms in three typical environments" and "Numerical Simulations of Wind-Loaded Floating Solar Panels". These papers are extremely important because the determination of hydrodynamics, wave loads, mooring loads, aerodynamics and wind loads has a major influence on design and decision-making to develop proper engineering solutions needed. Moreover, two papers in the present special issue deal with power performance of the floating solar systems considering the humidity and marine environment, "Power Performance of High-Density Photovoltaic Module Using Energy Balance Model under High Humidity Environment" and "Performance Loss Rates of Floating Photovoltaic Installations in the Tropics". Last but not the least, a paper considering the combined floating solar and wind farms presents the techno-economic aspects of offshore solar units when combined with other sources of energy production offshore, "Pooling the cable: a techno-economic feasibility study of integrating offshore floating photovoltaic solar technology within an offshore wind park".

Guest Editor,
Madjid Karimirad,
School of Natural and Built Environment, Queen's University Belfast (QUB), UK
madjid.karimirad@qub.ac.uk

Associate Editors:
Marco Rosa-Clot (University of Florence, Italy); Alona Armstrong (Lancaster Environment Centre, Lancaster, UK); Trevor Whittaker (Queen's University Belfast, UK)

List of Papers:

- The booming of floating PV [SE-D-20-01961]

- Environmental impacts and benefits of marine floating solar [SE-D-20-01930]
- The cooling effect of floating PV in two different climate zones: A comparison of field test data from the Netherlands and Singapore [SE-D-20-02337]
- Floating photovoltaics could mitigate climate change impacts on water body temperature and stratification [SE-D-20-03051]

- Analytical method for loads determination on floating solar farms in three typical environments [SE-D-20-01827]
- Numerical Simulations of Wind-Loaded Floating Solar Panels [SE-D-20-01964]

- Power Performance of High-Density Photovoltaic Module Using Energy Balance Model under High Humidity Environment [SE-D-20-01946]
- Performance Loss Rates of Floating Photovoltaic Installations in the Tropics [SE-D-20-02308]

- Pooling the cable: a techno-economic feasibility study of integrating offshore floating photovoltaic solar technology within an offshore wind park [SE-D-20-01963]