

Giovanni Bracco is Associate Professor at the Department of Mechanical and Aerospace Engineering (DIMEAS) of the Politecnico di Torino in Italy. His research activities focus on the production and management of Marine Renewable Energy such as Wave and Wind Energy. Giovanni obtained the Master of Science Cum Laude in Mechanical Engineering in 2006 and the PhD in Mechanics in 2010 at the Politecnico di Torino, defending a thesis on Marine Renewable Energy.

During his career Giovanni explored the Marine Renewable energy field, with focus on Floating Wind farms and Wave Energy Converters. His expertise ranges from mathematical modelling and optimization of wind and wave energy systems, control of the generator, design of innovative layouts and experimental modelling. Regarding to this project Giovanni was responsible of the installation of the wind gauge in the Island of Pantelleria and on the top of the Politecnico di Torino. He was co-supervisor of the experimental tests in CNR Insean in Rome regarding a scaled model of a floating wind turbine in 2022 and main PI on several contracts regarding the use of micro-wind systems at National level.

Main Infrastructures that the Politecnico will share in this project are: 6 nodes (24 cores each) on the Polito HPC (High Performance Computing) cluster, 2 wind gauge and related data (3 year logging data), licences on CFD (Computation Fluid Dynamics) modelling, numerical code MOST (Matlab for Offshore Wind Turbine System Modeling).

Publications

Cottura L., Caradonna R., Ghigo A., Novo R., Bracco G., Mattiazzo G. (2021). Dynamic Modeling of an Offshore Floating Wind Turbine for Application in the Mediterranean Sea. *ENERGIES*, doi: 10.3390/en14010248.

Ghigo A., Cottura L., Caradonna R., Bracco G., Mattiazzo G. (2020). Platform optimization and cost analysis in a floating offshore wind farm. *JOURNAL OF MARINE SCIENCE AND ENGINEERING*, vol. 8, p. 1-26, ISSN: 2077-1312.

Sirigu M., Faraggiana E., Ghigo A., Petracca E., Mattiazzo G., Bracco G. Development of a simplified blade root fatigue analysis for floating offshore wind turbines (2023) *RENEW 2022*, pp. 935 – 941 DOI: 10.1201/9781003360773-103.

Novo R., Minuto F., Bracco G., Mattiazzo G., Borchiellini R., Lanzini A. (2022). Supporting decarbonization strategies of local energy systems by de-risking investments in renewables: a case study on Pantelleria island. *ENERGIES*, doi: 10.3390/en15031103.

Pozzi N., Bracco, G., Passione B., Sirigu S.A., Mattiazzo G. (2018). PeWEC: Experimental validation of wave to PTO numerical model. *OCEAN ENGINEERING*, vol. 167, p. 114-129, ISSN: 0029- 8018, doi: 10.1016/j.oceaneng.2018.08.028

Its activities in the marine energy field relate to the research and development of Wave Energy Converters (WECs) dedicated to the use in the Mediterranean Sea, such as ISWEC, PEWEC (Pendulum Wave Energy Converter) and point absorbers. The activities involve the definition of non-linear numerical models aimed at evaluating the productivity of a WEC, its survivability and the estimation of the energy cost, duration and environmental impact of the converter. The models are of the type “wave to wire”, able to describe all the subsystems of the WEC and to estimate the electric produced power from the incoming wave field. The models include non-linear 3DOF mechanics and hydrodynamics, quasi-static mooring, and PTO (Power Take Off) efficiency.

Model validation was achieved through the design and execution of experimental campaigns in wave climate controlled basins such as the INSEAN facility in Rome, the Naval Basin at the University Federico II in Naples, the test flume at the Politecnico di Torino and the semicircular wave basin of the University of Edinburgh. The activities are carried out with small-scale models (1:50) for the preliminary assessment of the WEC conversion capacity and medium-scale (1:8-1:12) for the model validation and full-scale predictions.

As part of the Technology Transfer, he is co-author of two patents on the ISWEC device and is a founding member of the spin-off Wave for Energy, born in 2010 to industrialize and market the ISWEC converter. In 2015 the company in collaboration with the Politecnico di Torino has installed in the island of Pantelleria a ISWEC demonstrator with power rating of 100 kW. The company is currently working together the main Italian players in the energy field to completely industrialize the device, with a second deployment occurred in early 2023.

The R&D activities deriving from the wave power fields have been incorporated in the design of offshore hybrid platforms (wave and wind energy), with emphasis on regenerative platforms with gyroscopic stabilization. The activities on the platforms include the analysis of the sites of interest at European and World level, the definition of specific prototype installation sites, the design and numerical simulation of the platforms, with construction of small-scale models.

The teaching activities relate to the courses of Mechatronics, Machine Mechanics and Control of Mechanical Systems for a total of about 300 hours of academic instruction. Giovanni has held seminars and courses on wave energy at the KTH (Royal Institute of Technology in Stockholm, Sweden) in 2012 and at MIT (Massachusetts Institute of Technology in Cambridge, USA) in 2016.

Giovani is author of over 100 scientific articles in International Journals and Conferences in the field of Renewable Energy and Applied Mechanics and he has been a speaker at 20 international conferences.