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Challenges and progress in wave energy technologies

Background & Aim: Utilization of the ocean energy will significantly provide the security and diversity of energy supply in Europe, as well as to contribute European blue economy. However, the current wave energy technologies are faced many technical and non-technical barriers. In the technical aspect, there are still some fundamental problems including technology convergence and how to design a wave energy converter with very high reliability and durability in the severe marine environments for long-term energy production. This presentation will discuss the challenges and the possible solutions for wave energy development.

Challenges: Wave energy production is significantly different or even opposite from those conventional power conversions, with the large wave forces and low velocities being the inherent features. These basically challenge the wave energy production with very low reliability and energy conversion efficiency. In addition, wave energy converters are designed to take energy out from waves, hence they must be deployed in the energetic areas for efficiently extracting wave energy. The harsh conditions apply severe challenges to the reliability and survivability of the wave energy converters for the devices which must survive for more than 20 years in seas for generating power continuously and efficiently.

Progress & Technical Solutions: Recent progress and technical solutions for wave energy focus on how to improve the reliability in the long term wave energy conversion. The issues may be on fundamental issues, including theory and methodology development, with the progress in the following areas: 1. Fundamental issues: theory and methodology development, 2. Device optimization, 3. PTO optimisation and control, 4. New materials for reliability and durability.

Cost-reduction Approaches: Following the similar cost reduction strategies in the other power generation systems, a significant cost-reduction in wave energy production can be achieved through the learning curves if the reliability problem can be solved.

Biography

Wanan Sheng is a Senior Research Fellow and Lead Hydrodynamicist at the Centre for Marine and Renewable Energy Ireland (MaREI), Environmental Research Institute (ERI), University College Cork, Ireland. His research work is mainly concentrated on the device and technology development for marine renewable energy. His research on the fundamental problems in wave energy conversions and on the cost reduction of wave energy production has led to fruitful publications and technology improvements. He has published 35 peer-reviewed journal papers and 29 peer review conference papers, together with 4 book chapters. He is an Editorial Board Member for *Renewable Energy*, and serves as member of several scientific committees, including the International Conference on Ocean, Offshore and Arctic Engineering (OMAEE), Renewable Energies Offshore (RENEW), the International Ship and Offshore Structures Congress (ISSC), and the International Electrotechnical Commission (IEC) national expert.

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