

Power Engineering 2017- Challenges and progress in wave energy technologies - Wanan Sheng - University College Cork

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Abstract

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.

One of the significant impediments with any wave asset study is absence of long haul sea wave estimations inside the 100-meter-profundity form, where refraction impacts bring about spatially inhomogeneous wave boundaries. Absence of information makes it troublesome or difficult to stamp the ideal areas for WECs. Visual examinations could prompt spots with great however transient yield or to places with irregular floods surpassing the wellbeing edge. A perfect WEC site would gracefully predictable force consistently, which obviously is blocked via occasional climate variety and wind designs. These unavoidable varieties in wave boundaries additionally force changes in WEC yields. At the point when the WEC runs at wave conditions underneath what it is intended for, it is called part-load activity. Essentially, wave conditions surpassing structure conditions force over-burden activity. At these two

working conditions, WEC yield is diminished (i.e., the vitality change productivity drops). The over-burden could likewise prompt noteworthy auxiliary harm. Consequently, load variety is unavoidable in WECs, and the varieties can be inalienable to the pattern of the wave itself or could be forced because of outer conditions, for example, climate profile, bathymetry and surface grinding.

The weight applied on a WEC by a rising water segment alters in amount and course, maxing not long before the wave stature tops. At that point, both the stream rate and the compel drop to zero during the progress, when the stream bearing changes from hit to attractions. Notwithstanding the outside elements affecting WEC load, this wave cycle additionally forces a variable burden on change gadgets, and it is intrinsic to the wave marvel. For some random wave stature and period, the part-load range can be anticipated, and WEC gadgets can be fit to be less affected by this interior burden variety. In this way, a WEC framework must be measured for greatest effectiveness at part load, however it likewise ought to be structured with adaptability to catch all or the majority of the accessible wave vitality. Adjusting these two goals stays a genuine test to creating WECs. Just extraordinary estimations of climate conferred load varieties can be evaluated. Up until this point, these outrageous qualities, for example, uncommon and momentarily solid waves, can be obliged more as security factors than for vitality recuperation. Other testing issues incorporate distinguishing reasonable destinations for arrangement and coordinating an appropriate innovation to such locales. Unwavering quality, practicality, network association and framework control likewise stay genuine difficulties.