



Creating a Techno-Economic Tool to Add Structure to the Wave Energy Innovation Process

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Abstract

Initiatives now underway to develop wave energy assumes that existing designs can succeed via constant learning and cost-based improvement. However, It's possible that this isn't the case and that promising innovations have been passed over. The situation creative tool given in this study offers an organised approach for the first design phases in the growth of technology. The scenario development tool's primary purpose is to produce and rank the user on the locations by providing scenarios of probable Wave Energy Converter (WEC) characteristics that are most likely to lead to commercial success in the parameter space. This technologically based gadget employs a structured innovation method with a scoring system based on the cost and performance of each scenario to find commercially appealing and technically feasible possibilities. To do this, thresholds are defined by using performance and cost data from cutting-edge wave energy converters while also establishing theoretical upper bounds. In the conclusion, a list of scored options is produced based on the resource level, form, size, material, degree of freedom for power extraction, and efficiency of the wave energy converter hull. This scenario-creation tool can help technology developers and academics find new opportunities for innovation as well as private and public investors to advise a strategy for future funding requests.

Introduction

As a plentiful and sustainable energy source, wave energy has long been acknowledged to have the potential to considerably aid in the global energy transition. The development of devices that harness the energy of ocean waves is difficult, though. These gadgets must be entirely operational, and deployable inexpensively, and they resist harsh weather conditions while also capturing wave energy is simple to deploy, recover from, and maintain while operating well in a variety of water conditions. Hence, the technology must immediately become cost-competitive with more established methods. if it is to be incorporated into the mix of energy sources. Radical innovation as soon as possible wave energy cost reduction can fluctuate dramatically at some technical design phases. However, there are several Wave Energy Converter (WEC) designs that compete. To enable the step change in cost, efforts have been initiated to achieve design consensus and accelerate development by giving the innovation process structure. In 2016, the U.S. Department of Energy sponsored the Wave Energy Prize competition, an 18-month public design, construct, and test competition. Wave energy technologies competed to offer a successful design at the Department of Energy (DOE) Water Power Technologies Office.

The Wave Energy Scotland (WES) stage gate programme, another strategy, has been in operation since 2014 and pits participating developers against one another for financing by meeting important economic and performance standards. At each financing step, the number of initiatives is lowered to ensure that the most promising innovations get the greatest money. Two wave energy systems are being tested in open water at half-scale as part of this effort and will eventually be deployed in the first commercial arrays at the commercial size.

While this initiative has been crucial in fostering industry trust and the SEAWEED project, is attempting to find and allow improved technological development in the wave energy sector by providing a systematic method to

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wave energy idea creation, which contains a further promise for cost reduction through innovation and economies of scale. The designed scenario development tool will provide the early stages of wave energy innovation some structure as concepts are developed based on their potential to be both technically and financially feasible. Despite the significant degree of uncertainty, it has already been acknowledged that a more objective technology evaluation strategy is required from the earliest phases of development. The largest range of concepts should be able to be created using a systematic concept generation technique. Believed to enable a thorough exploration of the parameter space and prevent a focus on particular qualities.

A collection of 2nd generation advanced design tools have been created by the DTOceanPlus project, which is supported by the European Commission's Horizon 2020 programme, for the selection, development, and deployment of ocean energy systems. To fill the gap in early-stage idea generation, the Scenario Creation tool, a part of DTOceanPlus, generates scenarios for possible WECs by integrating important parameters/attributes into a scenario where variables are addressed separately. These speculative situations are graded on their commercial viability and technological viability. In conclusion, situations compared to benchmarks established in this work and filtered out if they are unappealing, impractical, or unattainable. The connections between the scenario's elements and these thresholds are developed utilising several fundamental wave energy connections. The engineering, physics, and underlying economic principles that underlie these essential linkages early phases of evaluating a concept's appeal are driven by relationships. They are established using information that is readily available from the wave energy industry, such as data from programmers working on the WES projects (herein referred to as WES developers), numerical optimization modelling, as well as information from related industries.

The scenario-creation tool's potential customers include public-sector financing organisations. Private investors and technology developers might benefit from the tool's ability to make more educated decisions. The purpose is to promote innovation in fields of the parameter space with the best likelihood of success discovered. For scenario generation, as well as the techniques employed to identify the essential thresholds relationships. Example findings are provided to illustrate the tool's functionality and possible advantages as well as its outputs for further investigation. This session also covers how the outcomes of the scenario creation tool might open up intriguing directions for innovation.