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Technical and Non-Technical Issues towards the Commercialisation of Wave Energy Converters

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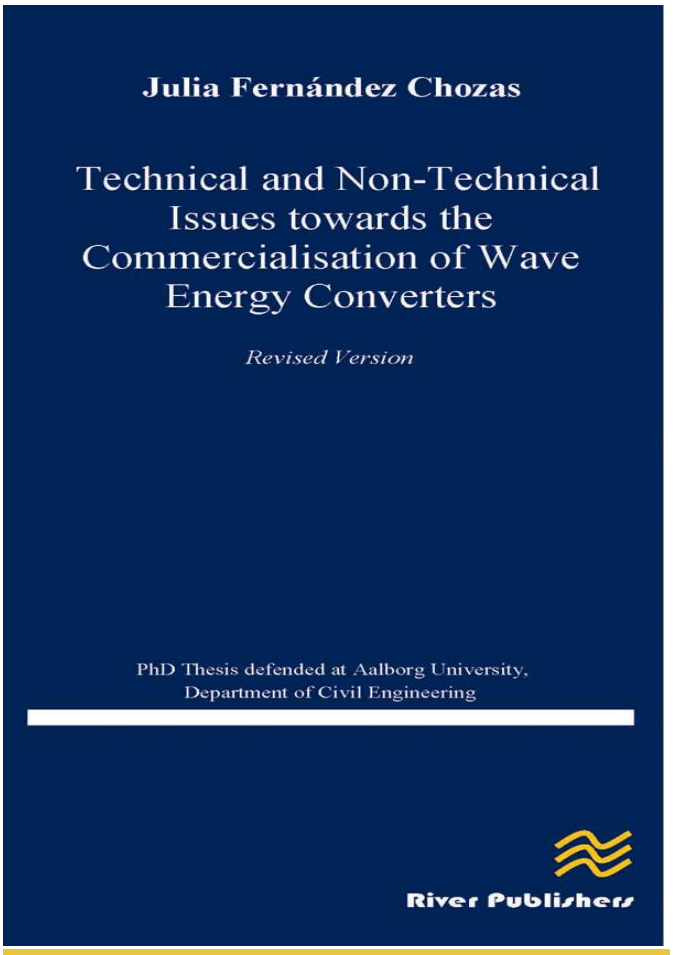
The thesis elaborates on the necessary steps and on the different difficulties that appear during the development of a wave energy converter (WEC). It focuses on seven key areas which appear when a WEC is going through the initial sea trials. As examined throughout the thesis, all these subjects are of relevance to successfully reach the commercialisation of WECs and need attention from the sector as such, not least from device developers.

The thesis is presented in two parts: a main introduction and a collection of papers. The first part provides a brief history of wave energy, introduces the research topic, describes the different disciplines addressed in the thesis and relates them. The eight papers comprise the core part of the work. The papers address the research topic in different ways: from a legal, social, technical and economic viewpoint, and from various WEC development stages. All the analyses are carried out from the perspective of device developers. The understanding of WEC developments has been central to the outline of the thesis, as it has formed the framework of the work. The developments considered cover all the stages from the WEC initial concept to its final commercial reality. Experience has emphasised the importance in structuring the various development stages, due to the fact that step-by-step advancements help to mitigate financial and technical risks throughout the development.

As a result, the thesis first identifies the phases that generally appear within WEC developments, it then determines the stages where there is a gap in research, and lastly, it analyses the identified key subjects. Accordingly, the thesis elaborates on seven areas:

- It examines regulatory frameworks for wave energy developments and how they affect project execution.
- It investigates the role of stakeholder´s and of the public's opinion on project's implementation.
- It addresses the need to evaluate the power performance of WECs in sea trials, and explains a recently-developed methodology to do it.
- It investigates the opportunities to grid-connect offshore wave energy projects and the synergies in this area with offshore wind energy projects.
- It studies the benefits of including wave energy in diversified renewable energy systems, chiefly with respect to power output variability and availability.
- It evaluates one of the most commonly claimed advantages for the wave energy sector: the predictability of waves, and assesses the value of wave forecasting in electricity markets.
- Lastly, it reviews the economic assessment of wave energy projects.

The scope of the thesis is broad and embraces subjects that can be categorised within technical and non-technical disciplines. This combination of findings leads to an overview of the wave energy field and of WEC developments. It underlines hindrances that can affect developments when WECs are commissioned and the benefits wave energy brings to energy systems, especially when wave and wind generation is combined.



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