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Navigating the Tides of Change: The Crucial Role of Wave and Tidal Marine Renewable Energy Resource Characterization and Assessment Research

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Within the context of renewable energy, the vast power of the oceans remains one of humanity's most promising frontiers. As the world grapples with the urgent need to transition away from fossil fuels to address climate change, wave and tidal renewable energy conversion could provide a significant sustainable resource. To fully unleash the potential of these natural forces, dedicated research into wave and tidal energy resource assessment and characterization has been essential. As researchers delve deeper into wave and tidal resources available globally, they unlock opportunities for technological breakthroughs. Improved wave energy converter designs, more efficient turbines, and innovative deployments, are just a few examples of how this research could lead to leaps in efficiency and cost-effectiveness. This virtual special issue 'Marine Renewable Energy: Site assessment and application design' highlights work across a range of topics that will help further enable progress in marine renewable energy by understanding the resource and addressing the challenges.

The first set of papers highlights wave energy. These assessments provide a comprehensive understanding of candidate wave energy regions across the globe. By accurately evaluating the resources, developers and stakeholders can make informed decisions regarding the feasibility and design of wave energy conversion systems. These assessments not only aid in selecting optimal locations for wave energy farms but also assist in the efficient allocation of resources and the development of robust infrastructure. Ultimately, thorough wave energy resource assessments contribute to advancing the utilization of clean energy.

The second set of papers highlights tidal energy resources and design aspects of tidal energy development. The research highlighted here offers a deeper understanding of tidal energy potential, enabling informed decision-making and strategic planning. By further assessing turbulence associated with tidal energy, these papers provide insights into the optimal designs for tidal energy conversion systems. This knowledge is essential for unlocking the power of tides, diversifying energy portfolios, and contributing to long-term energy security.

The work into wave and tidal renewable energy resources here provides a significant step forward in the path to a sustainable, resilient, and carbon-neutral future. By rallying behind and investing in this critical research, we support its potential to reshape our energy landscape and pave the way for a brighter, cleaner tomorrow.