

Large-scale deployment of marine energy technologies – what could be the benefits of a strong national market?

As a central element of national sustainable energy transitions, large-scale deployment of different low-carbon power technologies will be required. In light of the substantial learning effects that are still expected for many of these technologies, both national developments and their integration in global innovation systems must be accounted for when analysing the possible contribution of individual technologies. This study utilises marine technologies in the UK to investigate these intertemporal and national-global trade-offs.

The UK has a large potential for marine technologies and is currently one of the most important research and emerging market players in this area. However, these technologies are mostly still in the prototype stage and thus immature as well as costly when compared with other low-carbon options. With already considerable public funding in the past, further significant strategic investments would be required to reach commercialization.

Against this background, this study looks at the potential benefits and costs from the strategic development of a national market for wave and tidal technologies in the UK from an energy systems analysis perspective. Using a comparative scenario analysis based on the new national energy system model UKTM, it is examined under which conditions marine technologies could play a significant role in the long-term decarbonisation of the power sector. Special attention is paid to the interplay between potential first-mover advantages from a national market in early development stages and the long-term benefits from global technology learning. Sensitivity analyses are conducted around the expected learning rates and global deployment levels, the development of alternative low-carbon technologies like nuclear energy and carbon capture and storage as well as potential learning spillovers with the offshore wind market.

The results of the model-based analysis indicate that given the availability of alternative low-carbon options for the electricity sector, marine technologies are rather unlikely to make a sizeable contribution to the UK energy system by 2050. Significant deployment levels can only be observed with ambitious learning rates and significant global deployment or in the case of failure of competing technologies. Hence, there is a strong risk that the required high strategic investments in the national market will not directly pay off in the long term. There might be other benefits from the deployment of marine technologies, e.g. to hedge against failure in other low-carbon technologies, and from the development of a national marine industry, e.g. export opportunities, job creation as well as regional development. Based on the insights from the sensitivity analysis, these benefits would have to be quite significant under most circumstances to justify substantial public investments.