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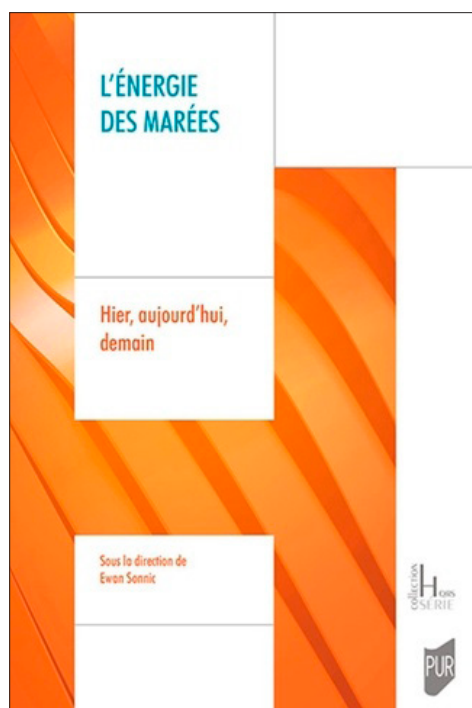
L'énergie des marées. Hier, aujourd'hui, demain (Ewan Sonnic [dir.], 2021)

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Ewan Sonnic (dir.), *L'énergie des marées. Hier, aujourd'hui, demain* (Rennes : Presses Universitaires de Rennes, 2021).

Abstract

Tidal energy has undoubtedly a history but also a future whose contours remain to be defined. This renewable energy has left many archaeological traces, in particular tidal mills frequent on both sides of the Atlantic. Then, in the 20th C., after many studies, tidal power plants became a reality, in particular with the construction of the Rance, the largest plant of this type in the world for 40 years. Despite this, why so few achievements? The book puts forward some interesting explanations. However, the current environmental demands could give a second chance to this technology. In the end however, the technical, financial, and human obstacles along with the choice of alternative solutions prove to be a brake to the expansion of tidal power.



- 1 The title and the subtitle clearly announce the aim of the book: to sum up the developments of a renewable energy with a past, a present and a future. It is therefore not only a history book but an international overview of projects, the oldest of which date back to the Middle Ages. Numerous specialists have collaborated in this book that, moreover, is well illustrated, perfectly documented, and supported by an alluring bibliography. The energy of the tides has long been a dream. It seems to be inexhaustible, regular, and adjustable. However, in spite of a few successful attempts, it still seems to have to prove itself, even if environmental requirements have given it a renewed interest. Of course, tide mills have been known since the early Middle Ages and the still-visible heritage underlines the quality of the engineers of the past. In particular, Brittany can be proud of the fact that tidal energy has been used on its coastline without interruption for 100 years e.g., the case of the Rance estuary.
- 2 The book is the result of an international symposium that testifies to the vigor and diversity of research on this reality that affects all continents. The book focuses on potential tidal energy i.e., based on the level differences between the sea on the one hand, and a dyke or dam on the other. Other forms of marine energy are possible and are mentioned in the book, but they are

not the heart of the matter. There are therefore heritage, archaeological, historical, geographical, technical, and economic approaches which follow one another and intersect throughout the book.

The journey begins very early because tide mills are found from the 6th C. to the 7th C. Their existence since Antiquity raises debates between specialists because some ruins remain difficult to interpret. In any case, the Iberian Peninsula, France, and Great Britain group together most of the mills that generally operated at ebb tide, rarely according to the ebb and flow – this is however the case of a Spanish mill illustrated by a quite exceptional drawing from the 16th C. – with mostly horizontal wheels. It is difficult to know if the oldest tide mill is Irish or Breton, but it was built around the 7th C. The technical issues (reservoir, wheels) interested hydraulic engineers for centuries, in particular during the 18th C., as the famous case of Bernard Forest de Bélidor proves. One might think that the tide mills mainly concerned flour milling: in fact, many industrial applications were possible thanks to this energy, such as the chocolate industry in the United States or the drilling of cannons in France. As for the distribution of past tide mills, one detects a certain concentration on both sides of the Atlantic, with a particularly high density in the state of Maine. In any case, topography had the upper hand even if the inventiveness of the technicians was remarkable to adapt them to all the grounds. Belgium and the Netherlands, South America and Australia still have vestiges which show that the tide mill (even in low tidal areas) is almost universal. This first phase has left enough archaeological traces to prove the strength of the phenomenon, even if it was far from the multitude of water mills that populated the countryside.

If the tide mills were numerous, the evolution of energy production techniques (coal, oil, electricity) reduced their use and lessened their economic interest during the industrial revolutions. However, the idea was far from dead. After having evoked the relevance of past times, the book thus approaches the present; that is to say the most contemporary achievements since the most famous work – the Rance plant – was inaugurated

in 1966 by General de Gaulle representing the largest tidal power plant in the world until 2011, when South Korea inaugurated the Sihwa power station – a little larger than its French counterpart. However, the Breton or North American sites suitable for the expansion of “blue coal” were explored from the very end of the 19th C. A fundamental question therefore arises: with so many projects, why were there so few achievements? The explanations have to do with the local topography – cutting an estuary, as in the case of the Rance, is not a neutral decision with respect to maritime traffic – the environmental consequences, the investments required, the place in the electrical network and so on. However, it should be added that there have been many smaller projects – Rance is 230 MW of installed capacity – ranging from 20 MW to less than 10 MW, particularly in China. Admittedly, the development of the tidal heritage – e.g. Pen Castel in Brittany – has not been abandoned, but the old uses remain of a demonstrative nature and urban or industrial pressure has limited the experiences of safeguarding and reactivation. The safeguarded buildings today often have no connection with their former functions – they have become residential places, shops, or eco-museums. One must not hide the fact that the development of a tidal power plant leads to major modifications in maritime flows, possible siltation, and neighborhood conflicts – all residents do not have the same interests – in particular for commercial or pleasure ports affected by a blocked estuary. All these disadvantages have been revealed over the years and explain the few projects that have come to fruition for two generations. Technological leaps were not easy to make either, if one thinks for example of the very large project of the Chausey Islands which did not see the light of day despite the numerous calculations of Robert Gibrat. Admittedly, environmental imperatives and the necessary diversification of the production chain – a very interesting argument in the case of Brittany, clearly under-equipped – have given new arguments for prolonging certain experiments. However, the promoters of tidal power plants have come up against the development of new technologies, such as tidal turbines which are now operational. This implies

that tidal technology still have to reinvent itself, taking advantage of new expectations, a topic which informs the third part of the book.

Here, readers are shown that tidal power must 5
compete with other renewable energy sources, mainly wind and solar energy. The Swansea tidal power plant project in Wales, despite its strengths, still fails to find sufficient funding or political will to become a major achievement. The same goes for China, Russia, India, United States, Canada... Africa has potential but will need Western know-how and financial support. Various authors in this third part of the book insist on the necessary social acceptance of these projects – this is in fact the case for all industrial projects, although it can be added that certain countries take little account of their public opinion.... The small, rehabilitated power plants, which follow a patrimonial rather than an industrial logic, keep the flame of hope alive. The future may lie perhaps in the inventiveness that would combine different sources of renewable energy. One of the most interesting ideas is to build tidal power plants that ensure the longest possible service, using both ebb and flow, multiplying the reception basins.

From then on, the intermittency that plagues 6
certain renewable energies will no longer be an obstacle – especially since the frequency of the tides are within the realm of basic knowledge. There are thus avenues for the future of tidal power even if contingencies are encountered in the descriptions of this third part. However, several texts show the variety of solutions and the strong usefulness resulting from the achievements (and choices) of the past. The fact remains that in multi-year energy production plans, wind power (offshore and onshore), solar power, nuclear power and hydrogen take the lion’s share. Tidal power plants, still too rare, nevertheless have a very real technical, economic, and even imaginary potential – humanity being able to use the lunar cycles offered by Nature – as the book under the direction of Ewan Sonnic convincingly shows, although without being able to affirm that all the obstacles that have slowed down the progress of this technology have been removed.