Tidal energy – the inexhaustible power of the tides

It is one of the main ocean energies and one of the most promising renewable sources due to its regularity and predictability of frequency. Thanks to all its potential, it could become the focus of a significant part of future investments in the energy sector.

Few phenomena in nature are as intriguing as tides. Inlets, bays, and estuaries become dry every six hours and fill with water and life again after the same period of time. Beaches that measure fifteen meters one day and the following week have become immense sandbanks. This movement of enormous masses of seawater, caused by the gravitational attraction of the moon and the sun on the Earth and enhanced by atmospheric conditions —high and low pressures— generates a large amount of kinetic and potential energy. Researchers have been studying how to turn it into a clean, endless source of electrical production for years.

Tidal energy seeks to **take advantage of tidal cycles to generate electricity,** thanks to turbines and alternators, which can be stored and distributed efficiently and constantly to a consumption network. Of the different ocean energies –tidal, wave (which we discussed in the Magazine), floating photovoltaic, offshore wind, and onshore wind– tidal energy has the highest production capacity (512.5 megawatts), according to data from the study conducted by IRENA (International Renewable Energy Agency) in 2020. It is also one of those that will concentrate part of the investments of the main companies in the industry, as demonstrated by an ambitious transnational plan launched by the European Commission for the development of ocean renewables, which the European body itself estimates will require a cumulative investment of €800,000 million up to 2050.

> **The European Union has also made a firm commitment to this path, promoting numerous projects in different countries**

The most attractive ocean renewable energy

There are several reasons why tidal energy can become one of the mainstays of investment in the sector:

Potential. Today it still accounts for a small percentage of the renewable energy produced, despite having started in the 1960s with the French Rance River power plant. However, it already has major projects underway in countries such as Canada, England, Australia, South Korea, and Spain, in addition to the French pioneer. According to the Institute for Diversification and Saving of Energy (IDAE [*Instituto para la Diversificación y Ahorro de la Energía*]), a tidal power plant can

be installed on any beach or bay where there is over 5 meters between high tide and low tide, which represents a wide range when looking for locations. It also has a long way to go around the world, especially in countries and regions with scarce resources where the use of their coasts can be an interesting way to generate wealth.

Reliability. Unlike other renewables such as solar photovoltaic or wind power, which depend on variable meteorological phenomena, tides are infallible. Whatever happens, the tide always goes up and down.

Regularity. Moreover, tides are predictable and it is possible to know with complete certainty when the sea level will rise and fall. This is a clear advantage for equipment efficiency and optimizing performance-consumption in the power generation process.

On the technical side, there have been many advances in recent times and generation, initially divided into three types of power plants —dam, run-of-river, and hybrid— is now at a very mature stage with numerous models and technologies successfully established and tested. In all of them, the displacement of water masses caused by the **tides moves turbines connected to an alternator,** which converts the movement into electricity. A seemingly simple process that found its great challenge in storing and transporting this electricity to an onshore power plant for distribution. Thanks to the progress made by other renewables at this stage of the process, tidal power is also ready to overcome this last hurdle, which opens the door to a promising future in the coming years.

A promising outlook

The tidal power generation capacity currently installed around the globe comprises projects at different stages of maturity. While a large amount belongs to a first phase of large commercial wind farms (7.8 MW) and a small part belongs to completed smaller commercial projects (1.7 MW), there are also large-scale demonstration plants (1 MW) and sub-scale test plants (0.1 MW). The latter two types of plants are pilot projects to test technologies, demonstrate their feasibility and effectiveness, and present them to attract investment for commercial projects.

Everything suggests that tidal energy is ready to take off as another alternative

This scenario demonstrates a strong trend towards direct commercialization, particularly because the aforementioned 7.8 MW is part of four planned tidal arrays with a total potential capacity of up to 570 MW. Up to a dozen more large-scale tidal “farms” are also under development. Most of them will be carried out in the United Kingdom, a world leader in tidal energy in terms of production capacity, but other countries such as **Australia, Canada, Djibouti, France, Indonesia, and South Korea** also have ambitious projects involving this ocean renewable energy. It is precisely the aforementioned South Korea that leads the ranking in number of patents filed, which reflects a clear intention to develop this industry over the long term.

For its part, the European Union has also made a firm commitment to this path, promoting numerous projects in different countries through the European Commission's plan for the development of marine energy up to 2050. In this regard, there are numerous public-private collaboration initiatives to attract investment to the sector. **Therefore, with a finally mature and efficient technology, a favorable predisposition of public administrations, and a clear willingness to invest by the private sector,** everything suggests that tidal energy is ready to take off as another alternative in the production of clean, low-cost, and practically inexhaustible energy.

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