SIDEBAR 4. The History of Ocean Power

Modern ocean power devices are the product of highly advanced industrial and technological systems, yet their earliest antecedents date back over 200 years. The first patent for an ocean energy device was filed in Paris by French mathematician Pierre-Simon Girard in 1799; the first operational plant was built in 1910 and was used to light and power a home. From 1855 to 1973, the United Kingdom alone granted over 300 patents for wave energy devices. Attempts to develop ocean thermal energy conversion (OTEC) started in the 1880s, and the first plant was built in Cuba in 1930, generating 22 kW of electricity before being destroyed in a storm.

The first large-scale ocean power facility, the La Rance tidal barrage in France, was built in the 1960s using proven hydropower turbine technologies. However, other methods for generating electricity from the ocean did not attract significant interest until the oil crisis of the 1970s. The US government invested USD 260 million in research and committed to producing 10 GW of electricity from OTEC systems by 1999, but ultimately no plants were commissioned[i]. The UK Department of Energy commissioned studies and ran a wave energy programme aimed at upscaling prospective devices, and the University of Edinburgh developed a device prototype and installed the first wave tank. As the oil crisis eased, interest waned and ocean power was largely abandoned, receiving very little funding in the 1980s and 1990s.

From the early 2000s onwards, ocean power experienced a resurgence, spurred by concerns about climate change and by the adoption of ambitious renewable energy objectives and policies. International co-operation was strengthened in 2001 with the establishment of the Ocean Energy Systems technology collaboration programme under the auspices of the International Energy Agency. The European Marine Energy Centre (EMEC) was established in 2003, providing an essential proving ground for devices by allowing for grid-connected testing in harsh weather conditions. More than 20 developers have since tested devices at EMEC.

In 2016, MeyGen deployed the first turbine of a planned 86 MW tidal stream array in the Pentland Firth, Scotland, marking a key milestone on the path to commercialisation. Progress has also been made in developing novel applications for ocean power technologies. In 2017, for example, EMEC began harnessing the excess electricity generated at one of its tidal testing sites to produce hydrogen, which is then used in a variety of fuel, power and heat applications. In 2018, Naval Group deployed a 450 kW Microsoft data centre at an EMEC wave test site, using wave energy to power the device and seawater for cooling.

The trajectory of ocean power has been volatile. On the one hand, a number of countries have invested considerable public funds into R&D, and large companies and private investors have become increasingly involved in device and project development. The EU turned its attention to ocean power for its potential to increase energy security and lower greenhouse gas emissions, while also creating jobs amid an economic downturn. On the other hand, government funding has been inconsistent, while the industry, in a bid to entice investors, overpromised what it could deliver in the near term and underestimated the technical challenges and costs. A number of bankruptcies ensued, large investors and energy companies withdrew, and the momentum generated by past public support slowed as private sector investors lost confidence.

Overall, the outlook for ocean power is positive. Costs are declining, and capital expenditure is lower than expected at this stage of development. Ongoing technological progress and development activity are encouraging, with the industry moving beyond pilot projects towards semi-permanent installations and arrays of devices exporting electricity to the grid, and significant investments and deployments were planned for 2020 and beyond.

i A 50 kW plant was tested for three months in 1979. The Department of Energy was poised to award a contract for a 40 MW pilot plant in 1982, but this did not come to fruition because of a change in the administration.

Source: See endnote 1 for this section.