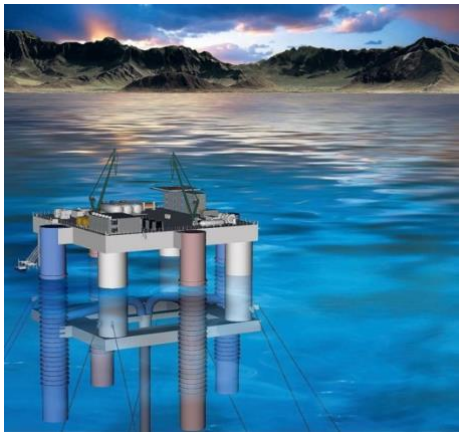
IDAF E&T – Ocean thermal

First of all…

In this showcase I try to illustrate how energy is extracted from the sea 100 years ago and today. For this I will create a comparison. In this comparison both ways to gain energy will be explained and if necessary illustrated with pictures.

100 years ago…	Today…
Description: The attainable output of a watermill is determined by the head, the flow velocity, the water quantity and the efficiency. A watermill structure usually consists of three parts, which are explained below: • Hydraulic structures for guiding and storing the whipping water • Drive consisting of the water power machine (water wheel, water turbine) and the power transmission to the working machine • Production plant (mill in the narrower sense) with the grinding mills or other working machines	Description: A ocean thermal power plant is a gradient power plant. It uses the temperature difference between the warm and cold water masses at different depths of the sea to generate energy. The working medium is fed through the different water layers in pipes in a closed, open or hybrid circulation system. The cycle is comparable to the Organic Rankine Cycle. It consists of a pump, an evaporator, a steam turbine and a condenser. The evaporator is positioned in the upper warm water layer and the condenser in the lower cold water layer. With the help of the cold seawater, the vaporous working medium is condensed and increases the temperature of the seawater accordingly. The condensate is then pumped to the surface to the evaporator. There, thermal energy is supplied to it for evaporation with the help of the warmer surface water. In the process, the surface water cools down and the working steam drives the downstream turbine.
Visualization:  [https://www.tagesspiegel.de/wissen/ozeane-als-batterie-kapitaen-nemos-kraftwerk/10833132.html]	Visualization:  [https://www.tagesspiegel.de/wissen/ozeane-als-batterie-kapitaen-nemos-kraftwerk/10833132.html]

Ocean thermal in 100 years:

„New forms of storage as competition“

Not even a further expansion of new renewables and thus an increase in the need for storage would guarantee better prospects. This is because alternative storage technologies such as batteries, thermal storage or even power-to-X are becoming increasingly cost-effective and thus threaten to absorb the revenues that could result from any additional demand for flexible electricity provision. In the future, these still rather young technologies are likely to become even more cost-effective, while the already mature technology of pumped storage power plants hardly shows any additional cost reduction potential.

„Maybe there is no new technology necessary, hope for seasonal storage“

In addition to these negative developments for hydropower, however, there are also some positive aspects. Storage power plants are likely to remain in demand in the future as a very cost-effective seasonal storage technology. When the storage lakes in the Swiss Alps are completely full at the beginning of October, they will hold enough water to produce seven to eight terawatt hours of electricity. After all, that is around ten to twelve percent of Switzerland's annual electricity consumption.

Fun fact: This is the biggest dam wall in Switzerland named „Grand Dixence“ and located in Valais.

[Foto: Grande Dixence; Shutterstock / Ristic Sacha]