Basic Knowledge

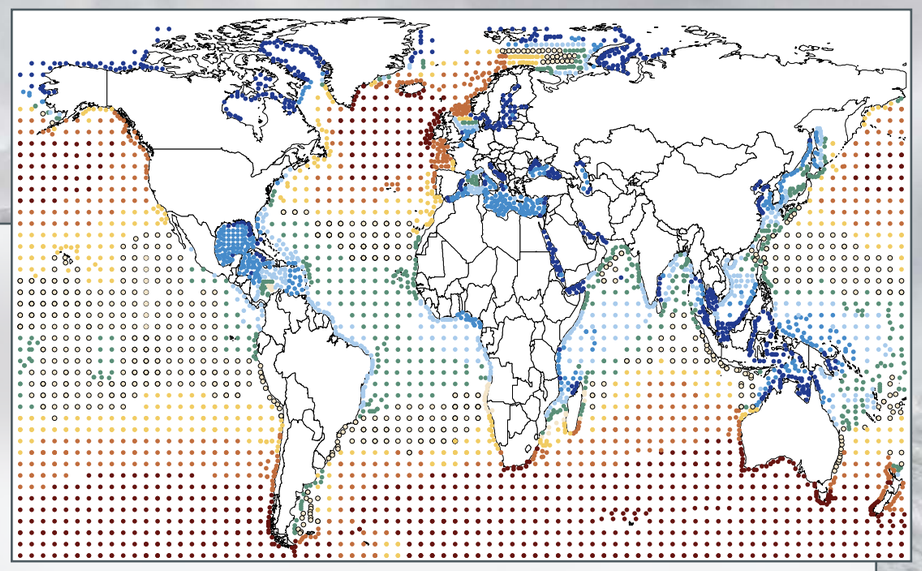
Wave Energy

The ocean's waves contain an inexhaustible reserve of energy. They are caused by wind, gravitational forces and atmospheric pressure differences.

The International Energy Agency estimates the possible global contribution of wave energy to the power supply at more than 10 %.

The main challenge in constructing wave power stations is not least that of designing systems that can withstand the sometimes destructive natural conditions. The integration of chamber systems following the principle of the oscillating water column (OWC) has proven promising in existing coastal defence structures.

Annual average power of ocean waves (kW/m)



The map shows the average annual wave power. It assumes power along a coastline or along a wave crest. The power densities are specified in kW/m. It should be noted that high powers can be found at latitudes far from the equator and on the west coasts of the continents.

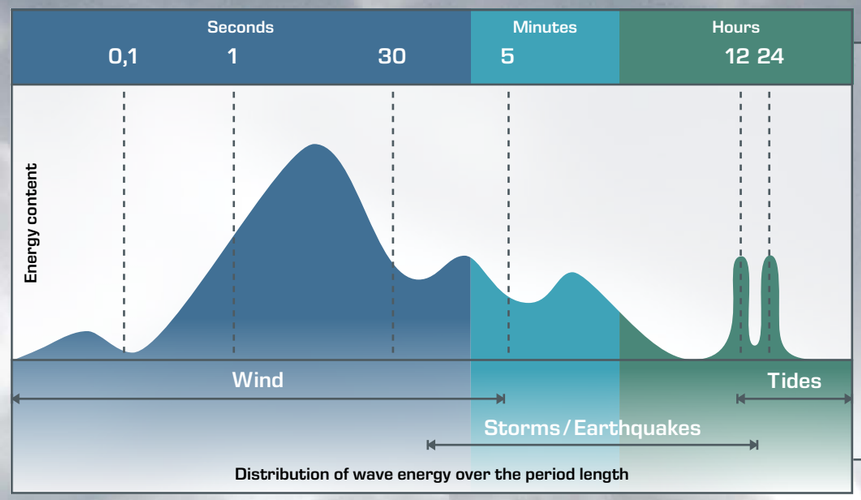
Source: Centre for Renewable and Sustainable Energy Studies, Stellenbosch University

Linear wave theory provides an estimate for the energy flow of a wave:

$$P \sim T * H^2$$

We can see that the power **P** is linearly dependent on the period length **T** and quadratically dependent on the height of the wave **H**.

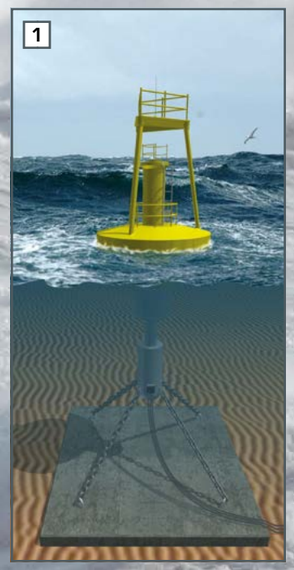
Distribution of the wave energy supply

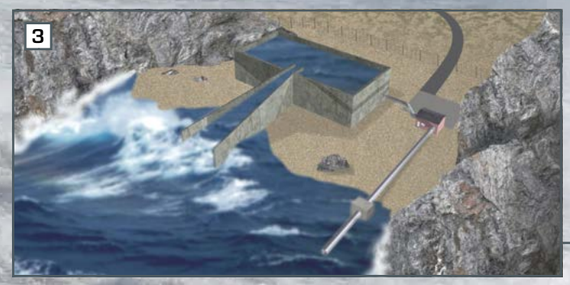


Distribution of wave energy over the period length

When designing systems to use wave energy, the distribution of the wave energy supply is particularly important. Results from global studies show that the largest percentage of wave energy can be assigned to a period length between 1 and 30 seconds.

Basic mechanical principles for using wave power





Systems for using wave energy which have been proposed in the past and also partially put into practice can be classified in the following categories according to the underlying principle:

1. floating systems
2. chamber systems (OWC)
3. overflow systems