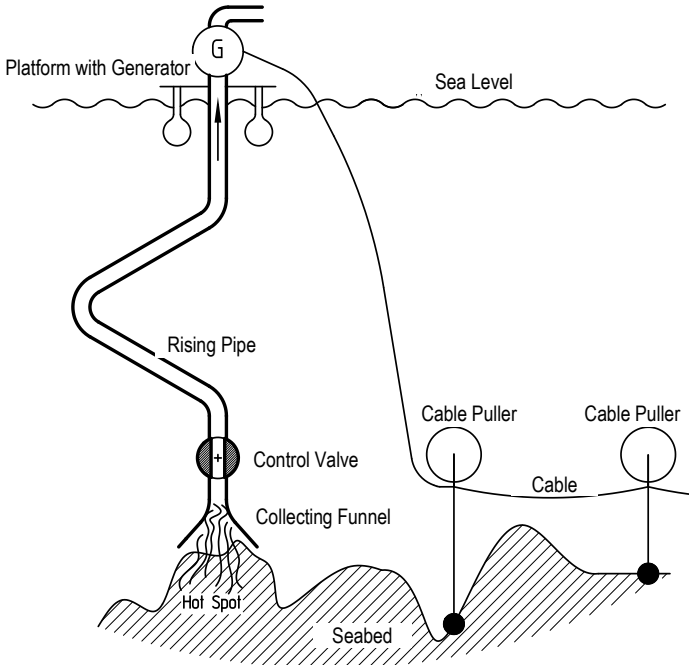
Electricity generation and storage by hot spots on the seabed

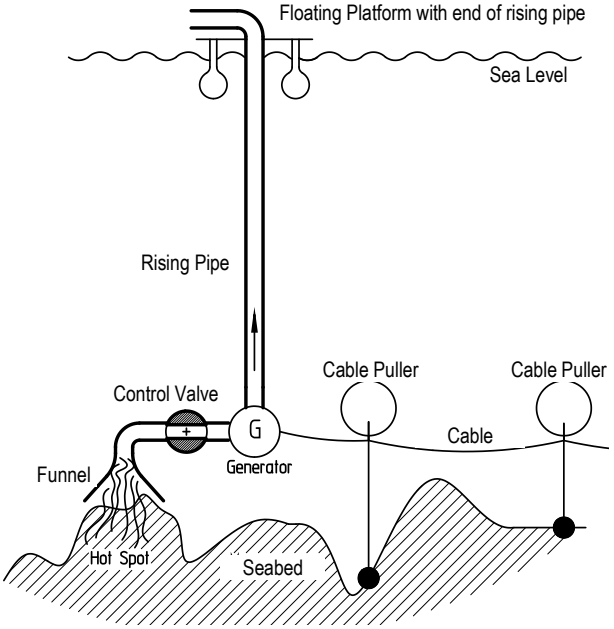
Hot spots are heat sources at the bottom of waters. Often they appear close to the frames of the tectonic continental plate shifts in the middle of the central oceans, and are usually found at great depth. Their existence is known only recently, but it is estimated that they occur millions of times. They represent a completely new and sustainable energy potential. Here are some suggestions how to make use of these energy sources:



← Example 1:
Use of a hot-spot by a power plant above the water surface (steam power plant)

The power station generates electricity through a generator driven by a steam turbine. It is built on a floating platform. The hot water from the hot-spot is collected by means of a funnel suspended below the platform and conveyed upwards by a rising pipe. Since hot water is lighter than cold, the water in the pipe is pushed upwards with great force by the water pressure at the bottom. In this process, it begins to evaporate due to the pressure drop, thus becoming lighter again and therefore increasing the pressure difference which can be utilized by the steam turbine at the end of the riser. The flow rate is adjusted by means of a regulating valve in such a way that no cold ground water is entrained and only steam is fed to the turbine. The decisive factor for the energy yield is the amount of steam and pressure that can be generated by the heat energy provided by the hot-spot.

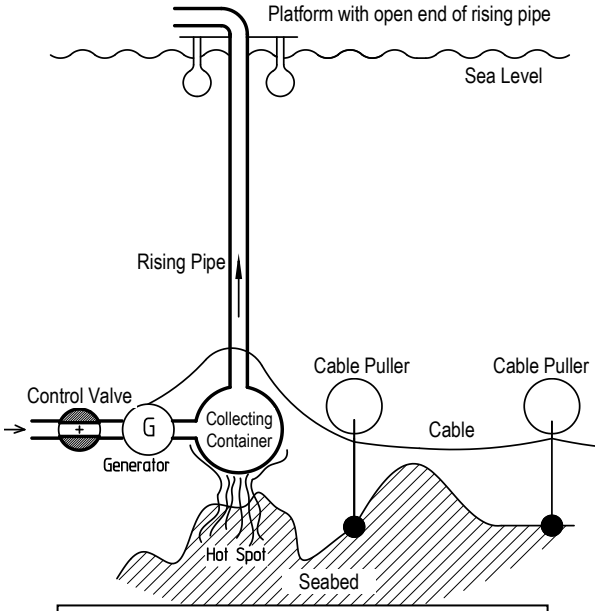
The transport of electricity takes place via cables fixed to floats, which are anchored at a constant distance from the upper sea level. This allows the cables to be laid in a straight and shorter line, they are better cooled than embedded in the ground, easier to access and do not interfere with crossing ships.



Example 2: ➔
Use of a hot spot by an underwater power plant (hydro-electric power station)

The power station is located under water in a pressure-proof capsule near the hot spot and consists of a generator driven by a water turbine. Here, the hot water is also collected above the hot spot in a funnel hanging under a platform, but is already used (in contrast to example 1) before it is led upwards by the riser and before it is evaporating completely or partially.

A valve is used as well to control the flow to the turbine. The riser ends above the sea level. However, it can also terminate at a small distance below the surface of the water if the power plant capsule is firmly installed and connected on the seabed. A platform is then no longer needed, there is nothing more to be seen above water, and there is no obstacle to the shipping. Decisive for the energy yield here is the flow rate delivered by the hot spot and the difference of pressure before and after the water turbine. The energy yield is dependent on the heat energy supplied by the hot-spot.



← Example 3:
Use of a hot spot by an underwater power plant for peak power generation combined with energy storage

In this example, a large volume collection container is shown suspended under a floating platform. This container is open at the top through a pipe connected to the atmosphere above the water surface. When the regulating valve is opened, the water shoots with the full pressure at the seafloor over the water turbine into the empty container, until the container is filled. Thereafter, the valve is closed and the collected water in the container is evaporated by heat exchange over a hotspot and vented via the upper water surface. Thereafter, a new power generation cycle can begin.

At appropriate intervals, the collection container is rinsed or pulled upwards to remove the salt residues left by the sea-water evaporation.

This kind of use has several advantages: 1) The system is a real energy storage and functions in principle as a pumped storage hydro power station. The storable energy is determined by the volume of the collecting container and the water depth. 2) The system allows a temporary unlimited peak power regardless of the continuous energy output of the hot-spot. 3) The system can be mobile and is not tied to the location of a hot spot, since electricity is generated with cold water. This means that power connections and cables do not necessarily have to be routed to the system. And the mobile power plant can also be connected to the electric grid in any other place (since the laying of cables in areas with hot spots could be problematic). After releasing the stored energy, it returns to the hot spot for a new cycle.

Note: The weight of the underwater part of the installation must be so large that the collecting container does not float even in the empty state. And the load-bearing capacity of the platform must still be sufficient for a filled collecting container.

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