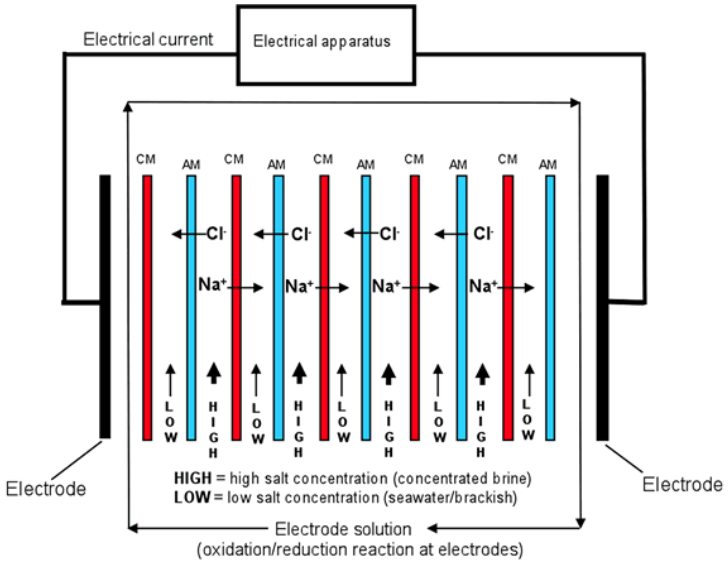
REAPower

COOPERATION

TECHNOLOGY DESCRIPTION

Energy can be harvested from the different salinity concentrations between two water solutions, referred to as osmotic energy or salinity gradient power (SGP). One of the ways to extract this energy is **Reverse Electrodialysis** (RE). In reverse electrodialysis, cation and anion conductive membranes are placed in an alternating way in order to produce diluate and concentrate compartments as illustrated in the Figure.

The concentrate compartment (HIGH) is then filled with the high concentration salt solution while the diluate compartment (LOW) is filled with the low concentration salt solution. The salt concentration difference (salt gradient) between both compartments in the cell pair creates a Nernst potential across the cell pair which causes an electrical current to flow through the electrical load connected to the electrodes.



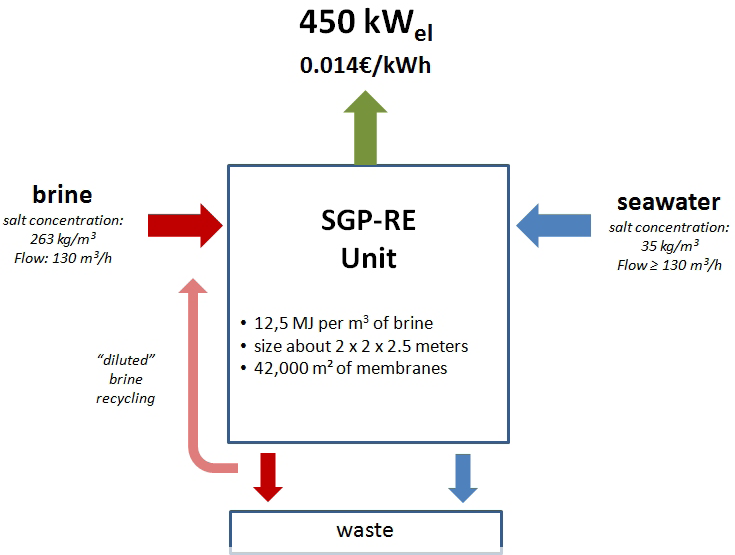
REVERSE ELECTRODIALYSIS
ALTERNATIVE POWER PRODUCTION

PROJECT SCOPE

Up to now, SGP research focused mainly on the combination of fresh water as the low concentration solution and seawater as the high concentration solution. However this approach limits the productivity of reverse electrodialysis as the low salinity water increases the electrical resistance of the overall system.

To deal with the existing limitations, the **REAPower project** uses seawater as the low concentration solution and brine as the high concentration.

Theoretical calculations, assuming similar conditions to the salt pond where the first RE stack for brine and seawater reverse electrodialysis will be installed, show that the theoretical osmotic energy content of the brine could result in a power output of 450 kW generating electricity at a very attractive cost, as illustrated in the scheme.



The consortium is working according to a detailed work-plan designed to achieve the following objectives:

(i) Create/select and optimise materials and components tailored to the requirements of the SGP-RE technology operating with high salinity brine and seawater. These include the membranes, spacers, electrodes and electrolytes.

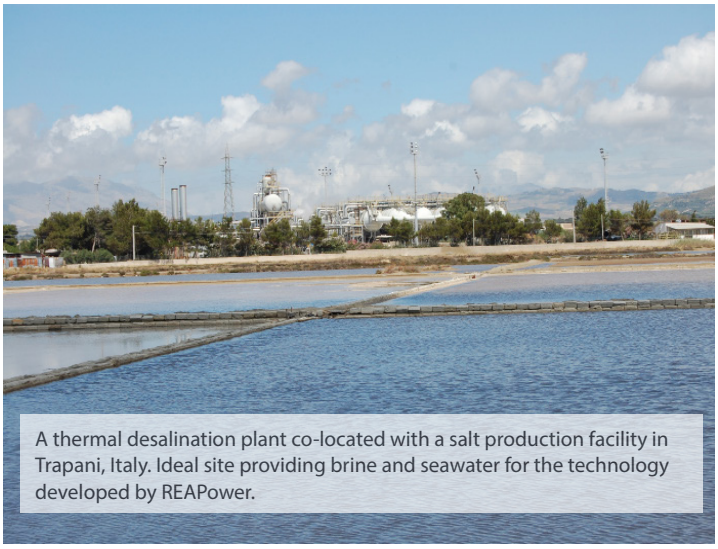
(ii) Optimise the design of the SGP-RE cell pairs and stack using a computer modelling tool developed for that purpose

(iii) Verify the model, and assess the developed materials, components and design through tests on laboratory stacks.

(iv) Evaluate and improve the performance of the overall system through tests on a prototype fed with real brine from a salt pond.

(v) Evaluate the results, analyse the economics and assess the perspectives of the technology.

(vi) Define the next R&D activities that are needed, aiming at an eventual commercialisation of the technology.



A thermal desalination plant co-located with a salt production facility in Trapani, Italy. Ideal site providing brine and seawater for the technology developed by REAPower.

For more information about the project and its activities, please contact the project coordinator:

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