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5.6. Reverse Electrodialysis with brackish water and concentrated brines: up-scaled pilot plant operating in a real environment

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Reverse electrodialysis (RED) using brackish water and brines is a remarkable step forward to produce electric energy from salinity gradients. Recently, a demonstration plant was built in the South of Italy as final accomplishment of the REAPower project, operating with brackish water and concentrated brines from saltworks. This work focuses on the scaling up of the REAPower plant through the installation of two larger RED modules (500 cell pairs each). In its final configuration, the plant is constituted by three 44x44 cm² RED units, with more than 400 m² of total membrane area installed. The plant was tested both with natural feed streams (brackish water and brine) and artificial NaCl solutions. An overall power production of almost 700 W was achieved using artificial NaCl solutions with the same conductivity of natural streams. Using real brine and brackish water, a power output of nearly 330 W was reached: such reduction can be mainly attributed to the presence of different ions (especially Mg²⁺) in the natural feed. After six-month operation with real brackish water and brine, the REAPower plant demonstrates the scaling-up feasibility of reverse electrodialysis as viable technology to produce sustainable energy in the near future.