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TITLE: Towards 1 kW power production in a reverse electrodialysis pilot plant with saline waters and concentrated brines

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ABSTRACT:

Reverse electrodialysis (RED) is a promising technology to extract energy from salinity gradients, especially in the areas where concentrated brine and saline waters are available as feed streams. A first pilot-scale plant was recently built in Trapani (Italy), and tested with real brackish water and brine from saltworks. The present work focuses on the scale-up of the pilot plant, reaching more than 400 m2 of total membrane area installed and representing the largest operating RED plant so far reported in the literature. With a nominal power capacity of 1 kW, the pilot plant reached almost 700 W of power capacity using artificial brine and brackish water, while a 50% decrease in power output was observed when using real solutions. This reduction was likely due to the presence of non-NaCl ions in relatively large concentration, which negatively affected both the electromotive force and stack resistance. These results provide relevant and unique information for the RED process scale-up, representing the first step for the feasibility assessment of RED technology on large scale.

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