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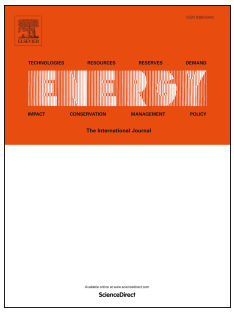

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A continuous concentration gradient flow electrical energy storage system based on reverse osmosis and pressure retarded osmosis

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Abstract

A continuous concentration gradient flow electrical energy storage system is presented to store the electricity generated by the renewable energy power, which consists of reverse osmosis, generating concentrated salty streams under the external power input, and pressure retarded osmosis, extracting electricity from the produced Gibbs free energy of mixing. The hybrid system is simulated on the module scale under the perfect membrane assumption. The operation parameters that impact the overall performance of the proposed system are systematically investigated. Results reveal that there exist optimal reverse osmosis and pressure retarded osmosis operation pressures leading to a maximum round-trip energy efficiency under given feed solution distribution factor. The distinct thermodynamically limiting operation regimes are identified based on analytical calculation. In the feed limited regime (FLR), a round-trip energy efficiency of 38.27% has been achieved, indicating its