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WAIV — wind aided intensified evaporation for brine volume reduction and generating mineral byproducts

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ABSTRACT

In this study bench pilot WAIV units (~1 m^2 evaporation area loaded on 0.17 m^2 footprint) were operated on two different desalination brines (RO and ED) as well as on a mineral brine concentrate under arid conditions of the Negev Highlands. The evaporation rate with the WAIV unit on these feeds often gave evaporation rates per footprint that were 10-fold or greater than the pan evaporation rate obtained from the local meteorological station at Sde Boker. Desalination brines were concentrated up to 23% TDS when operating on ED concentrate. The evaporation from the WAIV unit demonstrated enrichment in the magnesium ion compared to the calcium and the sodium ion, including over a two-fold enrichment of magnesium relative to calcium as would be expected by the equilibrium solubilities of the different minerals. Despite precipitation of minerals, there is not a large buildup of deposit on the flexible evaporation surface, and this helps establish the feasibility for recovering minerals from the desalination brine by using WAIV unit. For the ED-RO hybrid desalination process which provided one of the feeds to the WAIV unit, WAIV capital costs will only be about 5.5% of the annualized desalination costs (CAPEX and OPEX).

Keywords: Inland desalination; Brine disposal; Concentrate management; Evaporation ponds

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