

GETTING THE SALT OUT: TECHNOLOGIES AND COSTS TO TREAT CBNG WATERS¹

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Abstract: Coalbed natural gas (CBNG) co-produced water in the Powder River Basin (PRB) can contain, among other constituents, sodium ranging from 110-800 mg/L, total dissolved solids ranging from 270-2,010 mg/L, and sodium adsorption ratios ranging from 5.7-33. Untreated CBNG waters may negatively affect aquatic ecosystems, damage soil characteristics, or contaminate aquifers but treated CBNG waters could be a valuable resource for the area. The primary treatment challenge is to cost-effectively remove sodium. Current technologies to treat PRB CBNG waters include ion exchange (Higgins loop or fixed bed processes) and reverse osmosis. Other technologies in various stages of development include: controlled-contact ion exchange, electrodialysis, electrodialysis reversal, high efficiency electro-pressure membranes, electrodeionization, capacitive deionization, advanced zeolites, constructed wetlands, and rapid spray evaporation. Most of the available treatment technologies produce a concentrated brine stream and brine management will likely become the key limiting factor for CBNG water treatment. Brine management options include: deep well injection, evaporation ponds, evaporation crystallization, drying, and constructed wetlands. In this work a toolbox was created for comparing PRB CBNG water treatment and brine management technologies. The technical performance characteristics and cost information for a number of technologies were identified, including the requirements for pre- and post-treatment of the waters as well as brine treatment. The toolbox compares these technologies with respect to both technical performance and cost, using specific CBNG water characteristics and discharge criteria as input, and facilitates rapid identification of suitable technologies while providing a preliminary estimate of the cost.

Additional Key Words: coal bed methane produced waters, treatment processes, brine, sodium, treatment costs

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