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[1] Buscheck, T. A., Sun, Y., Chen, M., Hao, Y., Wolery, T. J., Bourcier, W. L., … Aines, R. D. (2012). Active CO 2 reservoir management for carbon storage: Analysis of operational strategies to relieve pressure buildup and improve injectivity. International Journal of Greenhouse Gas Control, 6(May), 230–245. http://doi.org/10.1016/j.ijggc.2011.11.007 [2] NETL. Carbon Dioxide Enhanced Oil Recovery: Untapped Domestic Energy Supply and Long Term Carbon Storage Solution; 2010. [3] Ziemkiewicz, P.; Stauffer, P.; Sullivan-Graham, J.; Chu, S.; Bourcier, W. L.; Buscheck, T. A.; Carr, T.; Donovan, J.; Jiao, Z.; Lin, L.; et al. Opportunities for increasing CO2 storage in deep saline aquifers by active reservoir management and treatment of extracted water: Case study at the GreenGen IGCC facility, Tianjin, PR China. Int. J. Greenh. Gas Control 2015, submitted. [4] Kenny, J. F., Barber, N. L., Hutson, S. S., Linsey, K. S., Lovelace, J. K., & Maupin, M. a. (2009). Estimated Use of Water in the United States in 2005 Circular 1344. Water (Vol. 1344). Retrieved from http://hbg.psu.edu/etc/Newsletter/doc/October2009.pdf [5] Bielicki, J. M., Peters, C. A., Fitts, J. P., & Wilson, E. J. (2015). An examination of geologic carbon sequestration policies in the context of leakage potential. International Journal of Greenhouse Gas Control, 37, 61–75. http://doi.org/10.1016/j.ijggc.2015.02.023

THE PRODUCTION OF WATER FROM SALINE AQUIFERS THROUGH CARBON DIOXIDE CAPTURE AND STORAGE OPERATIONS

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The gap between an energy sector that relies on fossil fuels and one that relies on renewable resources may be bridged by systems that conserve resources, use closed-looped processes, and reduce carbon dioxide (CO_2) emissions. CO_2 capture and storage (CCS) technology may reduce CO_2 emissions by injecting CO_2 captured from power plants into deep saline aquifers for sequestration, but these systems have additional water and energy requirements that may impede deployment due to regional water stress and increased energy costs. CO_2 capture, utilization, and storage (CCUS) operations that use Active CO_2 Reservoir Management (ACRM) can manage pressure and provide additional CO_2 storage capacity by producing brine from reservoirs through enhanced water recovery (CO_2-EWR) [1,2]. Produced brine can be treated by desalination for beneficial use and provide a source of water that could partially or fully offset water requirements by facilitating a closed-loop water source for CCUS with the potential to produce additional water for power plant cooling or other societal needs [3]. Further, the energy of this pressurized brine can be used during the reverse osmosis process to substantially reduce the treatment costs and make CO_2-EWR a feasible CO_2 emission reduction technology.

We investigated the viability of CO_2-EWR to reduce CO_2 emissions and offset water requirements from thermoelectric power plants in Michigan and Colorado. Both states have extensive histories of oil and natural gas production and thus subsurface geological and produced water salinity data are available. These states were also chosen because of their sufficiently high CO_2 storage capacity in subsurface aquifers [5]. Further, the level of water stress differs between the states; Michigan is a water-rich state, whereas Colorado is more arid. Existing thermoelectric power plants from the Environmental Protection Agency's Emissions and Generation Resource Integrated Database (eGrid) were mapped in relation to saline aquifer formations from the National Energy Technology Laboratory's National Carbon Sequestration Database and Geographic Information System (NATCARB) data. Using salinity data for produced brine from NATCARB and the United States Geologic Survey National Produced Waters database, CO_2 injection sites near thermoelectric power plants were investigated to determine viable saline aquifers with ideal brine salinity levels for CO_2 capture and produced water treatment. We found that CO_2-EWR can be viable in each state, but that the value of producing water in Colorado was higher than in Michigan.

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