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Next generation of CO_2 enhanced water recovery with subsurface energy storage in China

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Carbon dioxide (CO_2) utilization and storage (CCUS) is very popular in comparison with traditional CO_2 capture and storage (CCS) in China. In particular, CO_2 storage in deep saline aquifers with enhanced water recovery (CO_2-EWR) [1] is gaining more and more attention as a cleaner production technology. The CO_2-EWR was written into the "U.S.-China Joint Announcement on Climate Change" released November 11, 2014. “Both sides will work to manage climate change by demonstrating a new frontier for CO_2 use through a carbon capture, use, and sequestration (CCUS) project that will capture and store CO_2 while producing fresh water, thus demonstrating power generation as a net producer of water instead of a water consumer. This CCUS project with enhanced water recovery will eventually inject about 1.0 million tonnes of CO_2 and create approximately 1.4 million cubic meters of freshwater per year.”

In this article, at first we reviewed the history of the CO_2-EWR and addressed its current status in China. Then, we put forth a new generation of the CO_2-EWR with emphasizing the collaborative solutions between carbon emission reductions and subsurface energy storage or renewable energy cycle [2]. Furthermore, we figured out the key challenging problems such as water-CCUS nexus when integrating the CO_2-EWR with the coal chemical industry in the Junggar Basin, Xinjiang, China [3-5]. Finally, we addressed some crucial problems and strategic consideration of the CO_2-EWR in China with focuses on its technical bottleneck, relative advantage, early opportunities, environmental synergies and other related issues. This research is not only very useful for the current development of CCUS in the relative “cold season” but also beneficial for the energy security and clean production in China.

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