A second look at water use for in situ shale oil production

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A previous Oil Shale Symposium presentation looked at estimates and uncertainties regarding water use for in situ production of shale oil using data from Shell's Plan of Operations for a test of its In-situ Conversion Process (ICP). Early data suggested the possibility that large volumes of water would need to be circulated to ensure that certain hazardous compounds that might be left behind in the retorting process were adequately removed before the Freeze Wall was allowed to thaw, and groundwater to flow through the block. In addition, the use of a retort area taken from the Shell test plan, rather than from expected dimensions of an in-situ retort significantly increased the heat lost to the perimeter of the block, requiring further water use for steam condensation at a power plant providing electricity to heat the block. These resulted in very high remediation water use volumes in the results presented. Values of greater than 10 barrels of water consumed per barrel of oil produced were presented as low in probability but plausible. The focus of the presentation was on presenting legitimate uncertainty from a lay person's perspective at an early stage of development. As such, they represented a valuable starting point for discussion, but not a likely endpoint for real production. Subsequent discussions with Shell strongly indicated these volumes could be substantially reduced, based on their more recent experimental results. New calculations using a more realistic retort block that parallels the block modeled by Adam Brandt to estimate carbon and energy balances give substantially different results. The projections indicate that industry estimates of water consumption in the range of 1-3 bbls of water per bbl of oil produced are reasonable for such an in-situ process, and that higher estimates are relatively unlikely. Reclamation water and power plant water are reduced in significance, but remain important. The prior results have been widely cited in public debate over oil shale production and in Government documents, which stated this work was funded by the COSTAR consortium. Early stages of the previous work were supported by a DOE grant on water resource issues to W. Zhou at Colorado School of Mines in which the author participated.