Water Disposal in the Oil Sands: Challenges and Strategies

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Abstract

Alberta is certainly blessed with plentiful hydrocarbon resources. From conventional oil and gas reservoirs to unconventional tight oil, shale gas and oil sands deposits, these resources have helped fuel our economy and place our country on the world stage. At the centre of this activity is water. Without water, the extraction and processing of these hydrocarbons would not be possible. In the Athabasca Oil Sands of east-central and northeast Alberta, a large portion of our hydrocarbons resources resides in deeply buried deposits, which can only be accessed by in situ technologies. Currently, the prevailing approach employs the injection of high temperature steam to mobilize the bitumen and recover it to surface. Much of the water used to support this process is accessed from groundwater sources that are often brackish or saline. To produce the boiler feed water needed for steam production, this water requires treatment, which inevitably leads to the generation of liquid wastes requiring disposal.

Although many focus on water supply as the challenge for the oil sands, disposal of the liquid wastes generated following the treatment and re-use of the water are now being seen as a possible limiting factor to sustained development. Currently, the majority of liquid wastes are disposed of by injection into deep bedrock formations. This practice is controlled by Alberta's Energy Regulator through an application and approval process, and once approved is restricted to certain injection pressures to ensure cap-rock and formation integrity. In certain areas of the oil sands, the presence of suitable disposal formations is scarce and will certainly present a challenge in the future. In others, the use of certain bedrock intervals is leading to the cumulative build-up of formation pressures that is threatening the sustainability of activities.