

A Renewed Focus on Utah's Helium Potential

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Abstract

Utah has significant and largely untapped helium gas resources. Global demand for helium is outstripping production and helium prices will be high and demand strong for the foreseeable future. This transition creates opportunity for focused exploration and production of helium in eastern Utah and the Four Corners region of the Colorado Plateau. Helium occurrences in Utah have been influenced by a combination of mantle and crustal processes. Like a petroleum system, an effective helium system is governed by predictable processes that control generation, migration, and entrapment. Old (Paleozoic) sedimentary rock and fractured Precambrian basement are potential helium source rocks. Helium migration initiates with the alpha decay of U and Th from mineral grains. Recrystallization and diffusion concentrate helium into pore and groundwater over millions of years. Migrating gases sweep helium and nitrogen from old pore water. Recrystallization of acidic gases into solid minerals over long migration distances helps to concentrate helium and nitrogen in the gas phase. Thus, the longer the migration distance and duration the more nitrogen- and helium-rich the gas. Helium-rich gas migrates through carrier beds and can become trapped beneath impermeable seals like other natural gases. Helium-rich gas in Utah is not limited to areas of proven oil and gas production or reservoir rock of a particular age or type. Due to significant helium dilution by methane generation, helium is not typically found in basin centers where most hydrocarbons are produced. In general, Paleozoic rocks typically will have had more time to generate and collect more helium than younger rocks, but this relationship is based on the older (Paleozoic) helium- and nitrogen-rich groundwater that fills the pore spaces rather than the age of the rock itself. Thus, understanding the hydrodynamics of a prospective helium play is critical. In east-central Utah, significantly high

helium gas concentrations have been found in Triassic- Jurassic reservoirs along hydrodynamically complex basin-uplift transition areas and on the margins of proven petroleum fields. Helium-rich gas streams in southeastern Utah have been documented in Devonian-Mississippian reservoirs below thick cycles of hydrocarbon-rich shale, salt, and anhydrite of the Pennsylvanian Paradox Formation. Over 400 wells drilled in Utah have been tested and analyzed for helium with ranges from trace amounts up to 7.31%, with the highest helium concentrations in Jurassic sandstone reservoirs on the crest of the Harley Dome structure in east-central Utah. With several high-helium gas plays and natural gas wells with associated helium concentrations above the historic 0.30% economic threshold, Utah deserves the consideration of those interested in exploring for and producing helium.