Beyond Hydrocarbons - What Else Can Be Found within and Below Utah's Oil and Gas Fields

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Abstract

Throughout Utah's extensive history of oil and gas exploration, numerous other valuable commodities have been overlooked or considered a nuisance by the petroleum industry. The Paradox Basin of southeastern Utah boasts a rich history of petroleum and potash exploration and production. During the 1920s, explorationists targeting large surface anticlines in search of oil and gas encountered a thick section of bedded evaporites and black shales in the Pennsylvanian Paradox Formation. Further drillhole and coring programs revealed a significant potash resource in the Paradox Formation on the Cane Creek anticline. Initially, potash extraction relied on underground room-and-pillar mining methods until 1970 when in situ solution mining emerged as a more economically viable and safer alternative. In addition to the currently exploited resources, Utah harbors other known potash deposits that were serendipitously investigated and defined by oil and gas exploration efforts. Estimates place potash resources of the Paradox Basin at approximately 2 billion tons at a grade of nearly 19% potassium chloride. In the deep subsurface of the Paradox Basin, thick evaporite layers contain enriched groundwater brines. Wells drilled for oil and gas in the basin have also encountered supersaturated lithium-rich brines in Pennsylvanian, Mississippian, and Devonian reservoirs. Analyses from oil and gas wells indicate lithium concentrations of up to 240 parts per million. Earlier analyses also suggest commercial potential for extracting magnesium, potassium, bromine, boron, and other minerals from the brines, particularly in the central part of the basin. A recent resource assessment in the area identified an in-place indicated and inferred 287,000 tons of lithium carbonate equivalent and a recoverable indicated and inferred 205,000 tons of lithium carbonate equivalent. Global demand for helium is surpassing current production levels, creating opportunities for focused exploration and production efforts. Utah's helium resource potential is concentrated within the Colorado Plateau in the eastern part of the state. Analyses of gas stream data from oil and gas wells reveal economically viable helium reserves spanning Devonian- through Jurassic-age reservoirs. The highest concentration of helium, exceeding 7% He, was encountered in the Jurassic Entrada Sandstone on the crest of the Harley Dome structure in east-central Utah. Helium discovery traces back to 1924 during oil and gas exploration along the Woodside anticline, leading to its designation as Federal Helium Reserve #1 via executive order. Subsequently, Harley Dome received the designation of Federal Helium Reserve #2 in 1932. Both federal designations have been removed and oil and gas explorers in the area continue to find economic concentrations of helium in their gas stream.