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The Impacts of Gas Intrusion and Geothermal Heating on Crude Oil Stockpiled in the U.S. Strategic Petroleum Reserve

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Abstract—In 1992, the Strategic Petroleum Reserve (SPR) began investigating the impacts of two natural phenomena on the drawdown and distribution of stockpiled crude oil. One phenomenon is geothermal heating of the crude oil due to the natural temperature gradient of the Earth. This heating of the oil increases its true vapor pressure which could adversely impact the level of atmospheric emissions at delivery. The second phenomenon is intrusion of natural gases from the domal salt into the stored crude oil. Natural gas commonly occurs in domal salt of the Gulf Coast region and has been the subject of considerable study by the U.S. Bureau of Mines and others. While intrusion rates are small, the gas that has built up during the 16 years since storage in the SPR began has resulted in an increase in the oil's vapor pressure. Salting out of atmospheric gases from the water used to leach caverns could be contributing to the increased vapor pressure observed. This increase in vapor pressure could result in atmospheric emissions that exceed environmental and safe operational limits during drawdown. Studies to determine the extent and magnitude of geothermal heating and gas intrusion are nearly complete. The quality of the crude oil is unaffected, except for an increase in vapor pressure caused by the elevated temperature and the presence of gases. With cooling and gas removal, applying existing technology, the crude oil can be transported and refined without presenting environmental or safety problems.

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