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TITLE: Central Utah Thrust Belt Discoveries – A Tale of Two Hydrocarbon Charges

AUTHORS (FIRST NAME, LAST NAME): David A. Wavrek[1], Daniel D. Schelling[2], Rossella Sbarra[3], John Vrona[4], Keith Johnson[4]

INSTITUTIONS (ALL): 1. Petroleum Systems International, Inc., Salt Lake City, UT, United States.
2. Structural Geology International, LLC, Salt Lake City, UT, United States.
3. Oolithica Geoscience Limited, Gloucestershire, United Kingdom.
4. Wolverine Gas & Oil Corp., Grand Rapids, MI, United States.

ABSTRACT BODY: Wolverine's Central Utah thrust belt discoveries to date provide dramatic contrast in their hydrocarbon column characteristics, particularly in terms of GOR. The 2004 Covenant field discovery produces a gas-stripped oil (GOR is effectively nil), whereas the 2008 Providence field discovery contains gas-rich liquids (GOR for Navajo1 is 6600 SCF/STB vs. 4805 for Navajo2). While the hydrocarbons in both fields are correlated to Mississippian source rock that generated liquids during sedimentary loading, the differences are attributed to 1.) differential thermal stress during the hydrocarbon generation process and 2.) variation in the secondary alteration processes that acted on the reservoired hydrocarbons. It is also noted that the major inorganic gas dilutants are generated from mechanisms independent of that which is responsible for the hydrocarbons.

The Covenant field hydrocarbon charge generated from the Mississippian source rocks in the Valley Mountain / Aurora thrust plate (90-100Ma) at 0.9-1.0 VReq (vitrinite reflectance equivalence). Using the palinspastic reconstructions, a lateral migration vector of up to 25 miles is established. As the current Covenant field configuration was not established at the time of the primary migration, a paleotrap was necessary in the vicinity of the Federal Unit for the accumulation of originally gas saturated liquid hydrocarbons. Subsequent structural deformation to form the current trap geometry (70-80Ma) resulted in hydrocarbon remigration from the paleotrap and concurrent oil-water interaction stripped volatiles from liquid phase in both thrust plates at Covenant field. In contrast, the current hydrocarbon charge at Providence field is from a more proximal source rock facies (Salina plate) and occurred at a later time (70-80Ma), which is coincident with the structural development of this field. The lateral migration vectors for the Providence field are within the same magnitude as Covenant, but the Navajo1 hydrocarbons were generated at 1.1-1.2 VReq and Navajo2 at 1.2-1.3 VReq as a consequence of the charging event in context of structural evolution. The differential thermal stress accounts for molecular and isotopic variation in the volatile and liquid fractions. This study demonstrates the complexity of the petroleum system in the Central Utah thrust belt, as well as the necessity of integrating geochemistry and structural analysis to achieve exploration success.

KEYWORDS: Central Utah Thrust Belt, Covenant field, Providence field, Petroleum Systems.

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