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## **Predicting Source Rock Quality Using GR Wireline Response and $U_{\text{maa}}$ vs. $\rho_{\text{maa}}$ Crossplots in the Lewis Shale, Green River Basin, Wyoming**

Jenny LaGesse, SPE, Chevron; Neil Hurley\*, SPE, Colorado School of Mines

\*Current address: Schlumberger

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### **Abstract**

Evaluating source-rock quality using wireline logs is a practical and economic tool for reservoir characterization. Wireline data of the Lewis Shale in the Green River Basin, Wyoming was analyzed to determine if source-rock quality indicators could be found. Gamma-ray tool response to uranium was found to be a good predictor of total organic carbon (TOC) values. The viability of using  $U_{\text{maa}}$  vs.  $\rho_{\text{maa}}$  crossplots as a method to evaluate source-rock quality is less certain, as TOC signatures are overwhelmed by host-rock mineralogy.

### **Introduction**

Source-rock characterization is an essential tool for oil and gas exploration and wireline logs are a practical and reliable method to evaluate source-rock quality. The Lewis Shale turbidite sandstones are an emerging tight-gas resource within the Green River Basin of Wyoming. Analysis of the Lewis Shale has shown it to be an effective source rock with a TOC between 0.45-2.5% (Meissner 1978, Pyles 2000, Rigoris 2005). This study uses available wireline logs and TOC data in the CSM Strat Test 61 well (Goolsby 2007) to determine if source-rock quality indicators can be found by analyzing a GR-TOC relationship suggested by Rigoris (2005) and Pasternack (2007). Also, this study evaluates the use of  $\rho_{\text{maa}}$  (apparent matrix density) and  $U_{\text{maa}}$  (apparent volumetric matrix photoelectric index) plots as source-rock indicators.

### **Theory**

#### Geologic Setting

The study area is in the Washakie Basin within the Green River Basin of southwest Wyoming (Fig. 1). The Green River Basin is an elongate foreland basin part of the Cretaceous interior seaway, and was present