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Petroleum Resource Assessment Methodologies and Petroleum Systems Modeling

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Abstract

Petroleum resource assessments are used to quantify discovered and undiscovered ('yet-to-find') petroleum that is technically and economically recoverable within a certain time frame, typically 30 years. The importance and economic impact of these assessments is enormous, especially in the light of globally dwindling resources. Resource assessments are however made using a range of methods, none of which can be described as being scientifically rigorous, especially in applications in frontier areas or areas with sparse data.

Petroleum resource assessment methods can be subdivided into those that are applicable vs. those that are not applicable in frontier areas with only limited or no data. Methods that require detailed production data and therefore cannot be used in frontier areas include material balance, historical performance and reservoir simulation methods. Those that can be used in frontier areas include analogies, volumetric, delphi and Petroleum Systems Modeling methods. The latter is already recognized by leading assessment agencies such as the USGS as providing the most rigorous approach. According to the USGS, "Petroleum Systems Modeling incorporates the geoscience data required for resource assessments in ways that strengthen the assessment process" and "quantitatively extend the 'total petroleum systems' (TPS) that is employed in USGS resource assessments".

Petroleum systems modeling can require more effort to compile and structure the data, however it provides clearly superior results as they are based on all of the available G&G data, conceptual models can be used if no data is available, uncertainties can be included in the analysis, all of the controlling parameters are coupled and geologic processes and time are included in the assessment. They offer the only resource assessment workflow which is documentable, logical, repeatable, quantitative and consistent within the constraints of the available data.

In this presentation, the authors use both conceptual and real applications to illustrate how petroleum systems modeling is applied to petroleum resource assessments and what the benefits of the methodology are.