

Capturing the Full Range of Uncertainty – an Overview of One Company's Integrated Prospect Assessment Practices

Sykes, Mark A., Steven N. Salzman, Katrina D. Withers, Kenneth C. Hood, and Parke D. Snavelly, ExxonMobil Exploration Co, Houston, TX

Assessment is a process for estimating the likelihood that subsurface features contain hydrocarbons and, if so, the potential range of recoverable hydrocarbon volumes. Assessment can be applied to diverse investment opportunities, including producing fields, undeveloped discoveries, undrilled prospects, and conceptual plays.

ExxonMobil's prospect assessment workflow has been developed and refined over the course of four decades of research and application. While our practices utilize standard statistical techniques, they are grounded in sound geologic interpretation and engineering principles. This approach stresses representation within the numerical model of physical and genetic relationships within, and amongst, reservoir-structural segments. Each prospect segment is characterized by discrete risks and volume uncertainty based on predicted hydrocarbon contacts and estimates of independent rock volume parameters at the segment level.

The overall prospect chance of success, defined relative to a minimum recoverable volume, and volume range are determined by aggregating segment-based risks and volumes. The shape of the resultant curve is not predetermined, but instead is constrained by prospect geology. Geologically defined fluid leak-fill-spill interactions, conformable relationships, and risk and volume dependencies have a crucial and often underappreciated impact on the resulting prospect assessment.

A fundamental principle of ExxonMobil's approach is that assessment should provide robust estimates of the range of possible outcomes. This is achieved through early identification of key uncertainties and incorporation of alternative, viable geological scenarios and their associated probability of occurrence. Such an approach mitigates the danger of anchoring around a single interpretation and restores the focus on accuracy and robustness of the evaluation.