C002

Early Integration of Dynamic Prediction (Engineering) and Geologic Uncertainty in Play Assessment of Continuous Resources - The Fastest Molecules Always Win

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SUMMARY

Well-established techniques for assessing conventional plays have provided a robust foundation for assessing continuous resources. Although the concepts of risk, count, and size remain applicable, continuous resource plays challenge the definitions of what to risk, what to count, and what to size. What to risk is complicated for many continuous resources by large areas that contain sufficient hydrocarbons to be considered a geologic success but cannot be extracted commercially (i.e. at a sufficient rate) utilizing reasonable technology and resource price and therefore present a commercial failure. Although geologic resource-base assessments are essential for defining the global hydrocarbon endowment, without understanding the cost of supply one cannot predict if or when these resources will become available commercially.

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What to count is complicated for many continuous resources because counting wells is more expedient than counting discrete fields or discoveries. As a result, assessment results may be heavily influenced by well spacing. Unfortunately, robust estimates of ultimate well spacing (and therefore well count) and associated information on interference among wells may not become available until late in the life of a play, long after many key business decisions must be made.

What to size is complicated for many continuous resources by the paucity of discrete hydrocarbon pools with clearly defined limits. If counts are based on wells then sizing must also be based on wells, despite difficulty in projecting ultimate well volumes early in the life of a play and substantial variability in performance even among closely spaced wells. Variability on this scale suggests that variability (and perhaps irreducible uncertainty) in engineering practices has a large effect on individual well volumes. Although individual wells can be counted, aggregates of wells must be sized in order to establish the commercial viability of a development program. As the amount of performance data increases through the life of a play, reconciling well results with initial volumetric-based assessments becomes increasingly challenging owing to the volume and ambiguity of data.

One overarching theme is the dynamic aspects of these challenges. Historically, play assessment has been primarily a geoscience function. For continuous resources, engineering considerations are essential in conjunction with geologic evaluations, and assessment processes must integrate the dynamic aspects of production. Integration of engineering and geoscience workflows for play assessment supports dynamic simulation of continuous resources which take into account spatial variation, estimate uncertainty, parameter correlation, and risk dependency. Results can be aggregated to create both resource and commercial assessments using a variety of sensitivities.