

## **Assigning Volumes for Realistic Assessment of Value in Multiple-Lease Prospects**

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The large prospects under evaluation in regions such as the deep water Gulf of Mexico typically extend onto multiple lease blocks or concessions. The value of each lease is a function of the potential hydrocarbon volume within the lease boundary.

Calculating the hydrocarbon volume by lease for a field or a well-defined discovery is straightforward using deterministic methods. But the methods for calculating a representative hydrocarbon volume by lease for an undrilled prospect or a new discovery are not well-established.

If a hydrocarbon accumulation extends onto multiple leases, the volumes cannot be apportioned to the leases based on the mapped area within each lease. An updip lease containing a given productive area may contain a greater hydrocarbon volume than a downdip lease containing the same productive area, due to the thinning of the accumulation as the reservoir top intersects the hydrocarbon-water contact.

Assessment of hydrocarbon volume by lease must consider not only the productive area on each lease, but lateral variations in reservoir thickness, the height of the hydrocarbon column on the lease, and lateral variations in the dip of the reservoir. Assessment of an undrilled prospect or new discovery must consider the uncertainty associated with these factors.

Contact uncertainty may significantly impact the proportion of the accumulation that is assigned to each lease. A deep contact may result in a large percentage of the accumulation being on a downdip lease, while a shallow contact may place little or no hydrocarbons on a downdip lease. A very shallow contact may in effect add risk to a downdip lease if the accumulation does not extend onto the lease.

Proper calculation of lease value must integrate contact uncertainty with a realistic representation of the potential container. Depth-dependent volume methods that vary structural area and reservoir thickness with depth can be used to construct appropriate container models for each lease. Monte Carlo simulations can then integrate contact uncertainty with uncertainty associated with the container model. The results will include the range of volumes, and the associated probabilities, for each lease. Relative value can then be assigned based on the risked volumes.