

Deep-Water Exploration and Production: Global Update Highlights a Major Transformation in the Last Decade

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ABSTRACT

In the past decade, resources from deep-water giant discoveries more than doubled, from 35 bboe to >74 bboe, driven by a series of play-openers, the largest including Lula (Brazil), Prosperidade (Mozambique), Jubilee (Ghana), Tamar/Leviathan (Israel), Liza (Guyana), Tortue (Mauritania) and Zohr (Egypt). We contrast recent deep-water E&P trends with those published in 2007, focusing on giant discoveries (>500 mmboe) in >500m WD. We apply a robust and consistent classification to capture the critical geological aspects of the major discoveries. This reveals the most prolific geological habitats, common genetic themes, and predictive concepts that can drive future deep-water success. In 2007 oil comprised 60% of the total deep-water resources, primarily from passive margins with Cenozoic turbidite reservoirs. The last decade saw a dramatic shift in the hydrocarbon mix: whereas total oil resources from giants rose by 43%, total gas resources more than tripled, driven by large discoveries and high success rates in E. Mediterranean and E. Africa. Greater variation in geologic setting is evident: 1) basin setting and trapping style, as exploration moved beyond the deep-water extensions of productive deltas, 2) geological age of successful plays (greater pre-Cenozoic contribution), and 3) depo-environment (e.g., carbonates in Brazil, aeolian in GoM). While simple extension of proven deep-water plays produced a steady growth in resources (e.g., Cretaceous turbidites), a more abrupt jump came from previously under-explored settings. For instance, Cretaceous carbonate buildups found below younger deep-marine basins account for 40% of post-2007 resources, vs. 5% in 2007. Is there any reason future giants in <500m WD should vary significantly vs. deep-water giants? The earlier work demonstrated that deep-water discoveries as a whole contrasted sharply with shallower water, most notably in reservoir and trap style. We demonstrate this was a consequence of the first 20 years of deep-water exploration focusing on downdip extensions of productive deltas along Neogene passive margins. As exploration in <500m WD wasn't historically restricted to that setting, we apply the same systematic approach to recent shallow water giants to document their key characteristics vs. deep-water giants. This reveals several key differences and a few similarities, suggesting that certain themes remain under-explored, with important implications for deep-water exploration in the next 10 years.