**Fault Displacement Hazard Assessment for Critical Offshore Facilities**

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The potential for displacement on Quaternary active faults represents a hazard for both onshore and offshore man-made structures. Fault rupture of the ground surface (or seafloor) can intersect and displace engineered facilities such as foundations, pipelines, dams and roadways, causing severe damage and possibly resulting in total performance failure.

As the development of seafloor oil and gas infrastructure in the geologically active environment of the continental shelf becomes increasingly common, bottom-founded structures in deepwater have become more exposed to fault hazard. In recent years probabilistic fault displacement hazard analysis (PFDHA), developed primarily for evaluating hazard for nuclear facilities, has been applied to offshore facilities with great success. In this approach, the results of the analysis are expressed as the annual recurrence of displacements of a given magnitude. Uncertainty in the input parameters is incorporated into the analysis, reducing the need for a conservative approach to hazard mitigation by avoidance or design.

Performance assessment for developments in geologically active deepwater environments often must include the analysis of potential fault movements that could affect engineered structures. A case study from the deepwater Gulf of Mexico is presented as an example of the methodology and results of a PFDHA performed for seafloor oil and gas development facilities.

A PFDHA was performed for BP's deepwater Atlantis Field Development in the northern Gulf of Mexico. The Atlantis Field is located on the Sigsbee Escarpment of the lower continental slope, in a water depth of approximately 3000 meters. The Sigsbee Escarpment is the geomorphic expression of the seaward limit of allocthonous components of the regional Louanne Salt. Basinward migration of the salt at depth by updip sedimentary loading and gravitational potential of the continental slope causes complex faulting of the overlying sediments.

The data were analyzed to formulate a structural geologic model of the site to evaluate the driving forces of fault activity at the site, and to characterize the fault activity for recency, magnitude and recurrence as direct input into the hazard computation. Results of the Atlantis PFDHA provided the hazard design basis for in-field flowlines and export pipelines for the planned facilities.