

Advanced Exploration Technology and Concepts— Key to Future U.S. Gulf of Mexico Deep Shelf Oil and Gas

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ABSTRACT

For more than 60 years, the offshore U.S. Gulf of Mexico has been the “R&D Lab” for the world petroleum industry. Powered by continual development of new geologic depositional and structural models, and seismic data acquisition and processing techniques, along with innovations in drilling and completion technologies, the offshore Gulf of Mexico has repeatedly yielded new plays with world class oil and gas resources, assuring its permanent place as one of the global super basins for petroleum production.

Over the last 20 years, drilling and regional geological studies supported by extensive 3D seismic data have proven that most salt bodies in the Gulf of Mexico are part of extensive allochthonous salt sheets that have translated more horizontally than vertically throughout the subsurface shelf and slope. Much of what the mobilized salt has covered are thick, untested sedimentary sections containing reservoir quality sand bodies and highly effective sealing shales, with petroleum liquids preservation assisted by the heat transfer properties of the embedded salt bodies. The industry has confirmed that advanced seismic imaging technologies, such as broad-frequency reverse time migration, have significantly clarified subsalt and side-salt imaging such that potential traps and even hydrocarbon indicators are far better defined, thereby enhancing future wildcat drilling success. Economics are extremely robust, benefitting from short production cycle times, advances in drilling and production technologies, access to well-established infrastructure and reasonable lease bonus costs.

Today, explorers are focusing these technologies and concepts intently on the deep Miocene shelf, where new large oil discoveries will be made. Recent deepwater Miocene subsalt discoveries were built upon the initial pioneering success in the 1990s, e.g., Mahogany, Conger, Hickory, and Tanzanite fields. Gone are the days when drilling stopped at the first sign of salt, as in the first 40 years of the Gulf of Mexico exploration. Now, the deep Miocene section under the present-day shelf holds significant petroleum potential for substantial thicknesses of subsalt sedimentary section.

For explorers like us that have spent over 35 years exploring the offshore Gulf of Mexico, we have always known the Gulf of Mexico to be a world class exploration province with perpetual potential. Those who have spoken of it as the “dead sea” likely underestimated the industry’s barrels of oil equivalent yet to be discovered, enabled by the continuous advances in technologies and geological concepts that the industry always has, and will continue, to develop in its “R & D Lab.”