

The case for using extended reach drilling to develop California OCS reserves from onshore locations

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1. Background

The Minerals Management Service (MMS) estimates that discovered and undiscovered conventionally recoverable oil and gas resources of the Pacific OCS Region range from **14 to 19 billion BOE**. In the California OCS Santa Maria and Santa Barbara-Ventura Basins, **24 offshore fields** with reserves of **1.3 billion BOE** have been discovered but are undeveloped because of the 1982 Federal moratorium on offshore drilling. The high-side potential, including prospects in state waters, may reach **3.4 billion BOE**. Very long horizontal offsets with extended reach drilling (ERD) from onshore locations may now provide an economically and environmentally acceptable alternative to offshore platforms to develop some of these reserves. Horizontal reaches of ERDs are approaching seven miles. Assuming ERD wells can develop reserves within 7 miles of the California coast, the potential exists to develop between **500 and 1000 MMBOE** from onshore sites. Potential adverse effects of onshore development operations on marine biology and habitats would be mainly associated with marine seismic surveys for pre-development planning. The economic benefits to California of environmentally responsible development operations would include increased employment opportunities, an increased tax base and a windfall of royalty payments from federal lands. *In spite of significant regulatory and technical hurdles to overcome, the use of ERD to develop the offshore resources of the United States should be considered in the formulation of a rational, knowledge-based energy policy.*

2. Pacific OCS resources

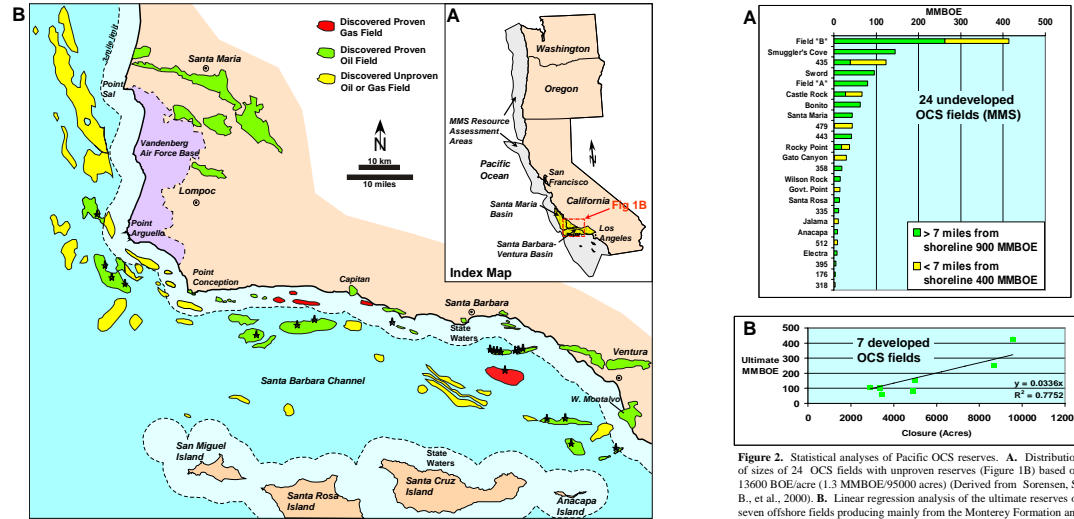


Figure 1. A. Pacific OCS Index Map (After Dunkel, C. A., 1999). MMS estimates of the discovered and undiscovered, conventionally recoverable oil and gas resources of the Pacific OCS range from 14-19 billion BOE, of which over 1.3 billion BOE have been produced since production began in 1968. **B.** Proven and unproven oil and gas fields in the Santa Maria and Santa Barbara-Ventura basins of the California OCS (After Sorensen, S. B., 2000). Twenty-four OCS fields (yellow areas in federal waters) have been discovered but remain undeveloped because of federal and state offshore drilling restrictions. Limited published data indicate that at least five prospects entirely in state waters remain unevaluated (yellow areas in state waters) (Reed, J. L., 2000). The total reserve potential of all undeveloped fields and prospects may range from 1.5-3.4 billion BOE.

5. Conclusions

- ERD technology has the potential to develop one-third of the undeveloped petroleum reserves that lie offshore California (500 million to 1 billion BOE).
- Potential adverse effects of onshore development operations on marine biology and habitats would be nil or short-lived and minimal, mainly associated with marine surveys for pre-development planning.
- The economic benefits to California of environmentally responsible development operations would be huge and would include increased employment opportunities, an increased tax base and a windfall of royalty payments from Federal lands.
- A rational, knowledge-based national energy policy should provide for enabling legislation to develop offshore U.S. oil and gas reserves from onshore drill sites.

References

Anon. "Extended-Reach Drilling in Deepwater at Platform Heritage", MMS Ocean Service, March/April, 2004, 1(2), p. 10.
 Bjorklund, T., "Drilling advances warrant new look at leasing of Pacific OCS," Oil & Gas Journal, Aug. 7, 2006, p. 20-24.
 DOGGR, "Annual Report of the State Oil and Gas Supervisor, California Department of Conservation", Pub. No. PR06, Sacramento, 2006, p. 73.
 Dunkel, C. A., "Oil and Gas Resources in the Pacific Outer Continental," OCS Report MMS 2001-014, 2001.
 Dunkel, C. A., and Piper, K. A. (eds.), "1995 National Assessment of United States Oil and Gas Resources: Assessment of the Pacific Outer Continental Shelf Region," OCS Report MMS 97-0019, 1997.
 Miller, K., "Project Expands," SantaMariaTimes.com, 11/13/2005.
 Plains Exploration & Production Co. presentation at the Howard West 33rd Energy Conference, 4/04/2005.
 Reed, J. L., MMS Pacific Region Update, http://www.mms.gov/mmsab/Archives/policy-committees/Meetings/Fall00/Reed.PPT#259,2,Slide 2, October 26, 2000.
 Robertson, N., ERD Industry data, www.kantechology.com/projects/case_studies.asp, 2006.
 Sorensen, S. B., et al., "Estimated Oil and Gas Reserves Pacific Outer Continental Shelf," OCS Report MMS 2000-063, 2000.

3. Worldwide extended reach technology

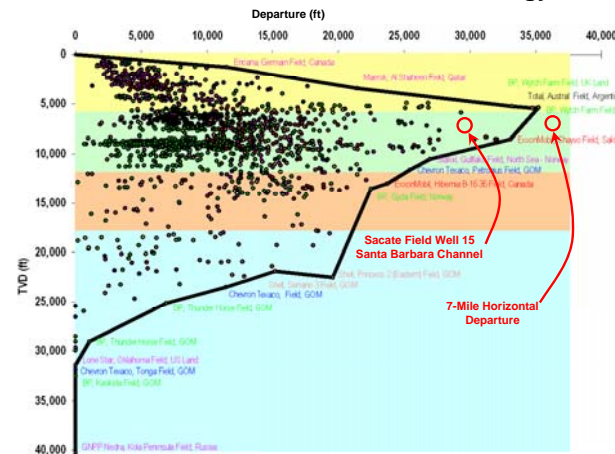


Figure 3. Industry drilling envelope (After Robertson, N. 2006). In 2006 Exxon drilled well Sa-15 in Sacate Field from Platform Heritage in Pescado Field with a departure of 29719 feet and a TVD of 7659 feet, which is the North American record for extended reach drilling and among the top ten wells worldwide (Figure 4.1). A well in BP's Wyth Farm Field in the UK reached within less than 2000 feet of a seven-mile departure.

4.1 Completed ERD project

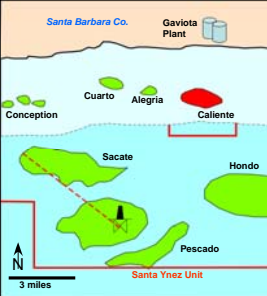


Figure 4.1. Since 1999 ExxonMobil has drilled 15 ERD wells from Platform Heritage into Sacate Field. The 15th well reaches over five and one-half miles from Platform Heritage and is the longest ERD well in North America (The red-dashed line is five and one-half miles long). Sacate Field has produced over 18 MMBO and 15 BCFG. The estimated ultimate recovery is 106 MMBOE (DOGGR, 2006). The environmental benefits of developing Sacate Field using ERD technology are fewer required wells, the elimination of the need for a new platform, reduced noise and visual impacts, reduced air emissions, and reduced impacts to the marine biology and habitats. (After Reed, J. L., 2000)

4. Pacific OCS extended reach drilling

4.2 Proposed ERD project

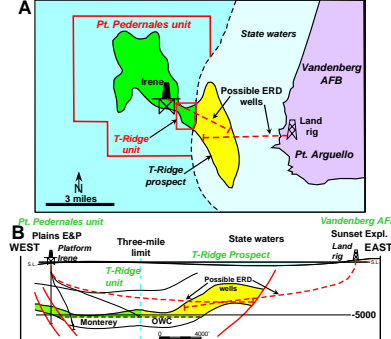


Figure 4.2.A. and **4.2.B.** T-Ridge prospect map and cross section. Plains E&P has announced plans to use ERD from Platform Irene in their Point Pedernales Unit to develop the T-Ridge prospect in state waters and has applied to the State Lands Commission for a lease to carry out the development (Plains, 2005). Sunset Exploration has proposed a competing project to develop the T-Ridge structure using ERD from an onshore site at Vandenberg Air Force Base and has signed a letter of intent to participate in the project with ExxonMobil (Miller, K., 2005). The Sunset plan is a prototype of development that may be feasible in other OCS areas. The horizontal departures of a well to develop fractured Monterey Formation on the T-Ridge structure from either onshore or Platform Irene would be about four miles. Based on 3000 acres of closure, the potential of the T-Ridge prospect may range from 40-100 MMBOE (cf. Figures 2 and 4.3).

4.3 Possible ERD projects

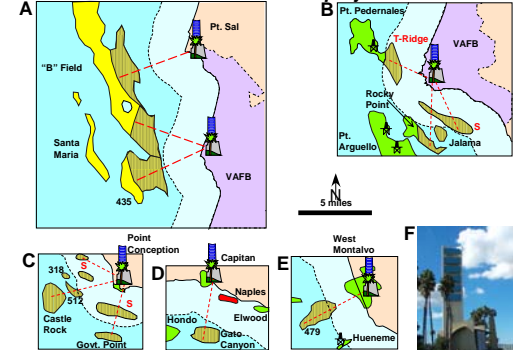


Figure 4.3. Vertical-lined patterns show unproven OCS reserves within seven miles of shoreline and possible reserves in state waters (T-Ridge and S labels). Rig symbols locate six possible onshore drill sites. The total reserve potential of the six onshore drill sites ranges from 500 to 1000 MMBOE. The low-side and high-side recovery factors are 13600 BOE/acre and 33600 BOE/acre (See Figure 2). The reserve potential of each drill site is: A., North Vandenberg Air Force Base, 230-470 MMBOE. B., South Vandenberg Air Force Base, 110-220 MMBOE. C., Pt. Conception, 110-210 MMBOE. D., Capitán, 30-60 MMBOE. E., West Montalvo, 40-90 MMBOE. F., The drilling rig on the man-made Grisso drilling island near Long Beach, California is an example of the use of camouflaging to enhance the visual impact of operations in urban areas. (Modified from photo by J. Jepson, California DOGGR website.)