Elk Hills Field: The Oil and Gas Property Sale of the Century

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In late 1995 President Clinton authorized the sale of the Federal Government's controlling interest in the billion barrel Elk Hills Naval Petroleum Reserve (NPR#1), located near Tupman, California. The two year sale process, including independent reserve evaluation, sales presentations, equity redetermination, and bid evaluation, has drawn to a close. Bids that initiate the next phase of the process were due on October 1, 1997.

Elk Hills: Sale of the Century

The Elk Hills sale is occurring at a time of significant change within the California oil and gas production community. In the Gulf Coast the focus of the major oil companies has been a shift in operations from the onshore and inner continental shelf to the deeper waters of the Gulf Coast. In California the opposite trend has dominated. The recent merger of CalResources (the former Shell-Western) with Mobil-California into AERA, the recent Texaco purchase of the largest independent in California (Monterey Resources), the continued consolidation of producing assets, the increased production and refining of heavy oil, the large consumer demand for clean-burning natural gas, the shift of Alaskan light crude off the West Coast market, the future addition of a new multi-crude pipeline from the San Joaquin Valley to Los Angeles area refineries, and the deregulation of the California electric market, have all combined to allow the future Elk Hills owner(s) to be pivotal players in many potentially profitable future financial interactions within the California energy market.

The trend of increasing acquisition costs for producing properties could continue to record highs with this transaction. In several ways the sale will be a landmark event in the oil and gas history of California. Virtually every major oil company and large independent made some effort to evaluate and bid on portions of the property. Selection of the high bidders has the potential of altering the future California oil and gas production environment even more than the changes of the past several years.

The Story of the Elk Hill Petroleum Reserve

Elk Hills field is one of the ten largest producing oil and gas properties in the Lower 48, the largest natural gas reserve in California, and the largest natural gas liquids producer in the state. The field produces only light oil and gas from a variety of lithologies in structurally and stratigraphically complex stacked reservoirs. Although production in this "mature" field has been steadily declining over the past decade, production has been enhanced by the application of newer technologies and improved reservoir management.

The Federal Government will benefit from the fortuitous timing of the sale as potential high bidders in California are consolidating their own operations and aggressively acquiring independents. In addition, consolidated production operations that have a high net cash flow like Elk Hills are currently being valued at high prices.

The Elk Hills field is located in the southwestern San Joaquin basin, approximately 20 miles southwest of Bakersfield, California, and less than 15 miles from the surface trace of the San Andreas strike-slip fault system. The field was discovered in the early 1900s, at about the same time as nearby future giant and elephant fields such as Buena Vista, Belridge, McKittrick, and Midway-Sunset. In the 1920s the bulk of the field operations were converted into a Naval Petroleum Reserve by the Federal Government to ensure a steady supply of energy for the oil-fired boilers of the U.S. Navy. Since then the field has been jointly owned by the Federal Government (first the Navy, and now the Department of Energy), and Chevron USA. As a Naval Petroleum Reserve, the field has only really been produced during the two World Wars, and since the Arab oil embargo of the 1970s. The field operations have been managed by several operators, but current operations are run by Bechtel Petroleum Operations.

The field is centrally located in one of the richest oil and gas basins of the United States and produces from a variety of stacked Pliocene to Miocene reservoir rocks in four primary zones, all of which are productive in nearby fields. These reservoir rocks represent a variety of shallow to deep marine depositional systems impacted by the synsedimentary growth of the nearby structural highs within either a marine or a non-marine setting. Reservoir rocks range from highly porous and permeable shallow marine and turbidite sandstones, to low porosity and permeability siliceous shales and tight sandstones.

Basement Structure

The field area overlies the basement-level transition from coastal Franciscan series rocks, which behave plastically, to Sierran granitic batholithic rocks, which behave rigidly. This transition zone along the eastern edge of the San Joaquin Fold-Thrust Belt results in a complicated and currently unresolved deep structural picture consisting of at least three structures separated by San Andreas-related strike slip fault systems. The deeper structures merge into one large shallow anticline broken by numerous small normal tensional fault systems.

Seismic Data and Operations

Although the operational goals of the field have been related to development operations, many vintage 2-D seismic lines, and one recent 3-D seismic survey, are available. The poor quality of data for both

types of seismic data are a reflection of the thick air zones in the shallow section, the ongoing production operations, and the complex structural and stratigraphic framework in all but the shallowest producing horizons. This situation creates an opportunity for a technologically competent operator to better evaluate the shallow and deeper zones for production improvements and exploratory play definition.

Production Data

Elk Hills is a large and extensive operation. The 72 square mile unitized operation has approximately 1,200 active wells producing over 58,000 BOPD, 350 MMcfd of natural gas, and 400 MGal/d of natural gas liquids.

Active production wells range from 1920s vintage vertical wells at a 10- to 20-acre spacing, to recent horizontal infill wells designed to produce from narrow "wedge" oil zones created in steeply dipping reservoirs between existing modern vertical wells at a 10-acre spacing. Wells range from about 3,000 to 11,000 ft in depth, and often contain multiple behind-pipe opportunities.

The reservoirs have been well managed through the interaction of the two owners and the lead operator, but recent production improvements can be related to implementation of newer technologies, increased use of modern reservoir management philosophy, and improved geological analyses and models. Most of the deeper reservoirs are pressure-maintained, either through gas injection or waterflooding projects. The operation has historically been well maintained even by California standards, with extensive amounts of investment made for field facilities and environmental compliance.

Reserve estimates from various sources are comparable in "Proved" categories, but vary in "Unproved" estimates. The complicated lithologies, stratigraphic variability, and microfaults create areas of unswept reserves in most of the reservoirs. Recently completed wells in marginal, mature production zones, have been enhanced significantly through the use of horizontal drilling and frac techniques.

Refineries and Processing Facilities

Each Elk Hills product has a unique niche in the competitive California energy market. Unlike nearby fields with predominantly thermally produced heavy oil, Elk Hills produces a high gravity crude sought by the independents as a diluent for pipeline transportation of their heavy crude to refineries in Los Angeles. The field also has the two largest gas processing facilities in California, and is the largest natural gas liquids producer in the state.

The field contains the largest pressure-maintained reservoirs in the state, with over 2 TCF having been reinjected for improved oil recovery and NGL stripping. Eventual gas cap blowdown will impact the California gas market. Excess electricity output from the modern cogeneration facility is ready for use in the soon to be deregulated California electric market. In addition, emission reduction credits and other value areas are also present.

Operational costs and revenues for Elk Hills field are significantly different from those typically associated with California operations. The preponderance of Cali-fornia long reserve life heavy oil production skews the financial analysis of "comparable" California operations. Elk Hills net cash flow, revenues per employee, and BOE produced per employee are among the highest in California. Production and financial simulation models generate a very positive range of values for the property. The true value will be dependent upon the new owner(s) strategic "fit", evaluation of unproved reserves, anticipated operational cost savings, and long term price scenarios, especially for that of natural gas.

BIOGRAPHIC SECTION

Jonathan G. Kuespert is an oil and gas consultant in Los Angeles, CA. He received his B.S. in geology and B.A. in economics from Duke University in 1981, his M.S. in Petroleum Geology from Stanford University in 1984, and his M.B.A. from the University of California at Los Angeles in 1994. Upon graduation from Stanford he joined Chevron in San Francisco. Over the following nine years he worked as a development geologist, EOR geologist and explorationist in the Sacramento and San Joaquin basins of California, including two years at Elk Hills as the Stevens Zone geologist for Chevron. In 1995 he and Mr. Anand formed Inside Elk Hills LLC, a consulting company which included other independent consultants, to produce a multi-client technical field study for the then unannounced sale of the Federal portion of Elk Hills field. Since completion of the Elk Hills project, he and Mr. Anand, have formed EGOR, a technical and financial consulting firm for full service evaluation of energy, gas and oil resources on the West Coast.

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