



## Location Background

### Energy Technology

#### Enhanced Oil Recovery Technology:

Chevron uses enhanced oil recovery methods to extract heavy oil found in Kern River, which was once considered unfeasible to recover. Beginning in the 1960s, Chevron began using steam flooding, a method by which steam is injected into a reservoir to heat the oil and reduce its viscosity, allowing it to be pumped out of the ground. With the help of steam flooding, Chevron's overall recovery rate at the Kern River Field is 53 percent and in some parts 70 percent.

Chevron also uses carbon dioxide (CO<sub>2</sub>) injection to improve the flow rate of the oil. During this process, CO<sub>2</sub> is injected into the reservoir, causing it to expand and thus pushing additional oil to a production wellbore. CO<sub>2</sub> dissolves in the oil and lowers its viscosity.

The 3-D visualization facility at Chevron's Kern River oil field also enables the extraction of heavy oil. The technology in this facility translates data from seismic surveys into a 3-D model that shows the sub-surface structure of an oil field. The 3-D model is projected onto a large panoramic screen that allows Chevron's team to determine the most efficient and cost effective method to inject steam that will loosen the oil deposits that are more difficult to reach.

Kern River's 3-D visualization facility helps determine where to drill horizontal wells, which produce over 10 times more than typical vertical wells. The facility also allows older steam injection wells, to be converted to production wells because oil in those areas is now thermally viable to pump out.

To help further improve production, Chevron uses the i-field Steam System Optimizer, which allows engineers to analyze accurate information about steam floods and thermal conditions below ground, thus assisting management of heat use.

#### Efficient Technology:

California's first large cogeneration facility, with the generating capacity of 300 megawatts, is located at Kern River Field. This facility is a joint-venture partnership between Chevron and Edison Mission Energy and provides natural gas to generate electric power for Southern California Edison and steam for Chevron's enhanced oil recovery methods.

In order to adhere to new requirements of air emissions permit and licensing revisions in 2007, Chevron worked in conjunction with General Electric to install industry-leading combustion control technology at the facility.

In addition to several steam generation plants, Kern River's two large cogeneration plants produce the majority of steam at the field. Each plant has modified jet engines that produce approximately 250,000 barrels of steam every day. The facilities also produce more than 300 megawatts of electricity that power about 9,000 oil pumps at the field and homes and businesses in the area.

Chevron treats wastewater produced from the field in facilities. The treated wastewater is then used to irrigate crops in the San Joaquin Valley.

### History

In May 1899, a father and son team used shovels and hand-augers to dig a single 45-foot-deep well at the Means Ranch, seven miles northeast of Bakersfield. This became the first of more than 16,000 wells in the Kern River Oil Field. On June 2, 1899, the Elwood brothers discovered oil on Means Ranch, as reported in *The Daily Californian*, and so began the oil boom that transformed Kern County.

By 1901, Kern River Field was producing 12,000 barrels a day. By 1904, Kern River produced 17 million barrels of oil – nearly as much as the entire state of Texas and a record for the field. However, in 1910 Kern River entered a period of maturity, with gradual production declines occurring over the next 50 years, in part due to the decrease in demand and the Great Depression.

In the 1940's and 50's the Kern River Field was restored to full production in support of World War II and the Korean War. However, in the absence of war, the demand for Kern River Crude subsided. In 1962, steam injection tests began. By



1966, the Kern River Field produced 19.5 million barrels of oil, more than 53,000 barrels per day, eclipsing a record that had been set in 1903. Between 1966 and 1988, oil production at Kern River topped the 1966 record each year.

The Kern River Field now consists of one large pool and two smaller pools, the Vedder and Jewett, discovered in 1981 and 1985, respectively.