

36 kW Solar Installation • D.T. Locke Ranch • Firebaugh, California

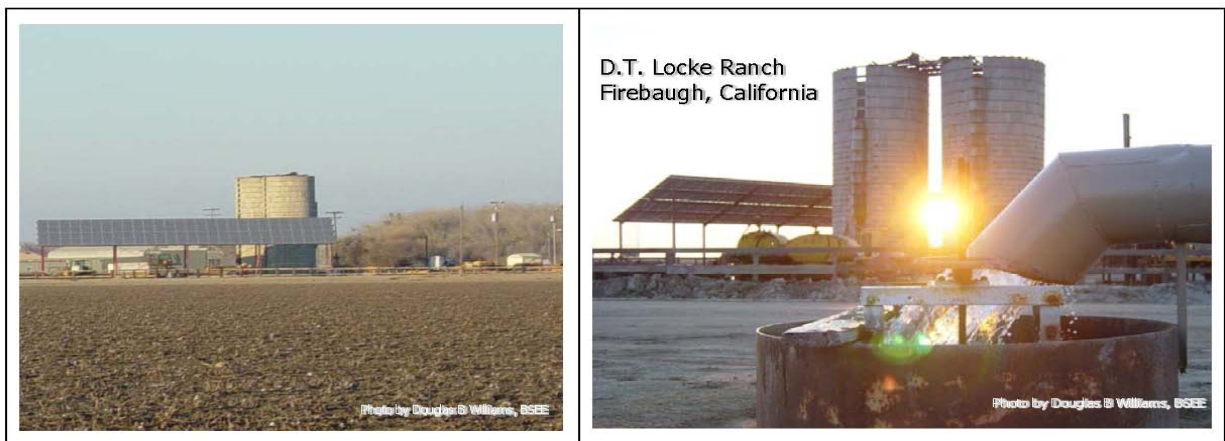
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Project Summary

In 2002 the Locke family of Firebaugh, California was approached by World Water & Power Corporation about the advantages of installing a proprietary Aqua Max System to power a 50-hp irrigation pump using solar power in connection with an existing PG&E intertie. At that time the local Firebaugh-Mendota rural farming area was plagued by frequent power outages from power pole accidents, low voltage conditions and a difficult rural operating environment for electrical equipment. Power outages occurred approximately 4 to 6 times per year for durations as long as 24 hours.

Power outage conditions were particularly onerous if they occurred during the peak irrigation season from April to September. Gary and Mari Martin, co-owners and farm managers requested World Water & Power to develop a complete quote for a solar grid-tied system that had the capability of operating the irrigation pump independently if a power outage occurred.

World Water responded with an innovative 36 kW array that provided approximately 60% of the annual electrical power requirements for the 50-hp irrigation pump, the nearby farm shop, and residence. A number of challenging engineering impediments (detailed below) were overcome; the system was synchronized in August 2003 and has been successfully operating since.



Project Objectives

The major objective of the project was to develop a solar grid-tied system that would provide a fail-safe backup to the irrigation pump during periods of utility outages especially during the extended irrigation season in the central San Joaquin Valley. Secondary objectives were to

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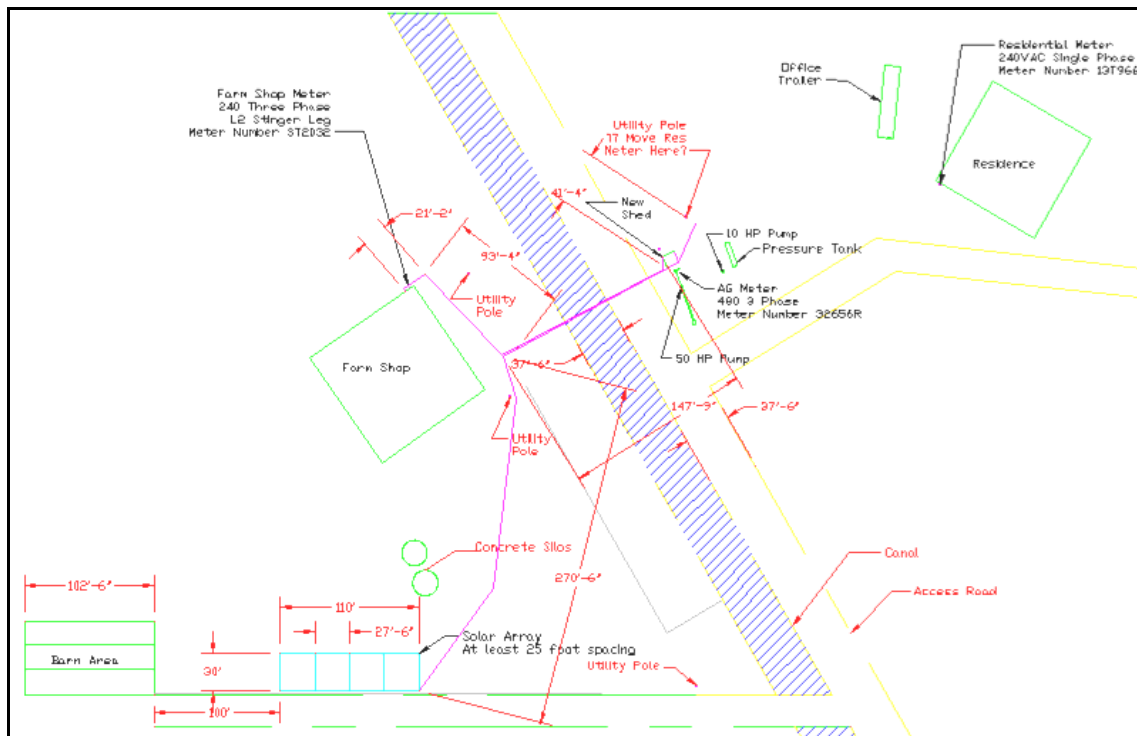
independently produce Green-e electrical power, tie together ancillary requirements (farm shop, residence), and reduce the carbon footprint of a visionary family farming operation. All project objectives were met and exceeded with the specified system.

Permitting Environment

Primary permitting for the Locke solar array was through the Fresno County Public Works and Planning Department. Permitting conditions were relatively straightforward.

Major Construction Details

The construction of the D.T. Locke 36 kW solar array required innovative solutions to overcome some difficult engineering challenges. Proper siting and orientation of the solar array panels required the construction of a large steel shed-type framework (38' X 108') with a minimum height of 14 feet. The array structure was engineered to serve as a shaded parking area for farm personnel, tractors and other expensive farm equipment. The second major challenge to overcome was the long DC electrical run from the elevated solar array framework under the Central California Irrigation District CCID canal to the enclosed electrical equipment structure. Several utility power poles had to be relocated to accommodate the installation. Lastly, construction under the CCID canal had to be accomplished during a narrow time window after winter rains and before the irrigation season began in April effectively curtailing construction until after the end of the season in October. Fortunately, with careful planning and nimble execution, the necessary work was accomplished without any serious construction impediments - a major accomplishment.



Utility Interconnect Details

The Locke Ranch is in the PG&E service area. Utility connections were relatively straightforward except for a 60-day delay synchronizing the array to the grid.

Financial Arrangements and Incentives

The 2003 installed cost of the 36 kW solar system with the array support structure, long run to equipment enclosure including tunneling under an irrigation canal, equipment structure and all electrical switch gear was \$295,000 or \$8.19/watt.



California Energy Commission direct financial incentives were provided at \$4.50/watt (2002) or \$147,500. A California Franchise Tax Board tax credit of 15% of the cost paid or \$44,500 was available. A federal Internal Revenue Service tax credit of 10% of the costs paid or \$29,500 was also available. The payoff period based on energy saved was estimated to be 6 ½ years which was completed in the fall of 2009.

Impediments

Major impediments on the Locke Ranch installation were the construction challenges, detailed above which were overcome with good engineering, design, construction techniques, and the final PG&E solar system interconnection with the grid. Interconnection details were eventually overcome but caused a 90-day delay in full system synchronization.

System Performance vs. Specifications

The Locke Ranch system was designed as a 36 kW array and has performed up to specification in each of the seven years since synchronization generating approximately 48,000 kWh annually. The only time system performance has been reduced was between array cleanings which normally occurs twice per year. Ranch conditions are quite dusty at times with field road truck and tractor traffic by the array. This resulted in fugitive dust emissions on the panels that washed off with winter rains. Regular cleanings are essential to maintain performance.

Quote

“An excellent system that has exceeded all our expectations. I would build it again in a minute.”

Gary Martin

D.T. Locke Ranch Owner/Manager

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