

California Energy Commission Agricultural Peak Load Reduction Program

For Water Agencies

Administered by the Irrigation Training and Research Center



Case Study

North Kern WSD

Site

The North Kern Water Storage District (NKWSD) is located just north of Bakersfield in Kern County and encompasses nearly 60,000 acres. The district receives water from the Kern River as well as groundwater pumping to supply its users.

Opportunity

The energy emergency caused projected energy rates across the board to increase. The district's large reliance on groundwater exudes nearly 10 megawatts (MW) of load on the power grid during the peak water use season.

Solution

The district proposed and designed three projects that have curtailed over 9.9 MW of peak load as part of the California Energy Commission Agricultural Peak Load Reduction Program (APLRP) for water agencies administered by the Irrigation Training and Research Center (ITRC). The first project included the construction and use of storage reservoirs to supply water to users during the peak period, allowing groundwater pumps to be turned off. During the off-peak period groundwater wells were used to refill the storage reservoirs. Turning pumps on and off every day can cause significant stress on the well casing and pump therefore, some of the district's groundwater wells had to be rehabilitated. The major rehabilitation task was lining the wells to prevent casing failure.



Figure 1. Gravity in – gravity out reservoir constructed to store water for use during the peak period



IRRIGATION TRAINING AND RESEARCH
CENTER
California Polytechnic State University
San Luis Obispo, CA
(805) 756-2434



When the wells were pulled, damaged casing and column pipe was also replaced. Timers were installed on each well control panel in the program to automatically shut the well off during the peak period.

The second project also included equipping wells with clock timers rehabilitation of the wells, as well as modifications to the pump discharges to reduce the impact of operation to the landowners, modification to a siphon, pumping bays, and weirs to increase the storage capacity of regulating reservoirs, thereby reducing the peak period electrical demand. Additionally, seventeen telemetry sites were installed to monitor water levels in canals and reservoirs and provide data via radio to the district office computer.



Figure 2. Clock timer used to automatically shut a groundwater well off before 12pm and turn it back on after 6pm every weekday during the peak season.

The third project was an expansion of the previous two. NKWSD included all remaining wells that were not in the previous projects, rehabilitating the wells and installing clock timers. The district also expanded an existing reservoir and modified a pumping bay to supply water during the peak period when the additional wells were turned off. Telemetry was installed on five additional sites to provide district operators with real time data on water levels in canals and reservoirs.



Figure 3. Water supply from a new reservoir supplying water to a canal during the on-peak period when the groundwater pumps are off.

The first project was fully operational during the 2001 peak season (June-September) curtailing 5.135 MW of peak load (Monday-Friday, 12pm-6pm). The second project was completed prior to the 2003 peak season and curtailed an additional 3.284 MW of peak load. The final project was completed prior to the 2004 peak irrigation season curtailing a final 1.517 MW of peak load.



IRRIGATION TRAINING AND RESEARCH
CENTER
California Polytechnic State University
San Luis Obispo, CA
(805) 756-2434



Benefits

- The State of California has benefited from the curtailment of nearly 9.5 MW from the electricity grid during the summer peak period.
- NKWSD and its water users benefit from reduced power costs associated with on-peak pumping. The district estimates it has saved its water users \$20-30 per acre-foot of received water.
- With the installation of regulating reservoirs and telemetry, the district benefits not only for load shifting but also for overall irrigation distribution system operation. With regulating reservoirs and real-time data from key sites within the irrigation system, the district is able to provide more flexibility to water users. For example, before the load shifting projects at the on-farm level, the irrigation system could not handle farmers shutting off during the peak period without spilling the excess water. Now a number of water users that have the capability only operate their irrigation system 18 hours per day.

Summary Category	Results
Total Cost	\$2,656,766
Total Grant	\$1,535,355
Kilowatts (KW) Curtailed	9,936
Grant \$ per kW Curtailed	\$154.52

Further Information

- **California Energy Commission**
Ricardo Amon
(916) 654-4019
Ramon@energy.state.ca.us
- **Irrigation Training and Research Center**
California Polytechnic State University
San Luis Obispo, CA 93407
Dr. Charles Burt
(805) 756-2379, cburt@calpoly.edu
Dan Howes
(805) 756-2347, djhowes@calpoly.edu
www.itrc.org



IRRIGATION TRAINING AND RESEARCH
CENTER
California Polytechnic State University
San Luis Obispo, CA
(805) 756-2434

This information was developed under the California Energy Commission Agricultural Peak Load Reduction Program. It does not necessarily represent the views of the Energy Commission, its employees, or the State of California. The Commission, the State of California, Cal Poly, ITRC, their employees, contractors, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights.