

EMERGING TECHNOLOGIES



**ENERGY ↔ WATER
CONNECTION**



Load Monitoring System

For the past 26 years, the California Energy Commission (CEC) has been the state's primary energy policy and planning agency. In its continuing effort to promote energy efficiency, the commission provides grant and loan money for the development of new energy conservation technology.

In 1995, the Arvin-Edison Water Storage District (AEWSD) received a loan from the CEC to develop a program with variable frequency drives. The AEWSD used part of the loan to initiate a "Load Monitoring System." Both programs were intended to improve the management and conservation of energy within the district.

AEWSD pays (1/01) about \$3 million a year for power at a rate of \$0.03 per KW-hr. Each year the AEWSD has a contract rate of delivery (CRD) of 30 MW with the Western Area Power Authority (WAPA). If the district approaches the maximum power usage, the district calls WAPA to see if excess energy is available. If the energy is available, AEWSD purchases the amount needed at ten times the base rate.

If the energy is not available, however, the district must dedicate a sufficient load to cover the overage to PG&E for an entire year at PG&E's current rates. In the past thirty years, AEWSD has surpassed the CRD three or four times, and each time WAPA happened to have excess energy. In January of 2005, the district's WAPA contract will change significantly and increase the district's need for near real-time load information. In planning for this substantial change, the AEWSD recognized the need for an accurate system to monitor energy use; therefore, the district decided to implement a "Load Monitoring System."

Design

The "Load Monitoring System" is an information management and decision support system that monitors energy use in the district. There are three components to the system:

1. Quad IV Meters are located at each pumping plant (load center) and monitor the total load (KW) of all the pumps at that location. Each meter collects data every five minutes and stores it. Each

Quad IV is equipped with a phone modem. There are about 50 pumping plants and load centers.

2. AEWSD uses a special Pacific Bell service termed “Centrex” service. Centrex allows calls made to the pumping plants to be treated as if they were calls made between extensions inside an office – at a much lower rate than for a measured business line account. The phone lines coming into the office are managed by Pacific Bell as 3 Centrex “units”. Each Centrex collects and manages data from about 16 pumping plants.
3. An office computer calls and receives the data from each Quad IV meter once every 15 minutes. The software used to manage the communications and Siemens Quad IV meter data inquiry is Stark NA EAPLUS. This software acts as a somewhat seamless interface with a database such as Centura-Gupta SQL, Oracle, or Microsoft SQL. A graph similar to the one in Figure 1 is updated every fifteen minutes on the office computer. The graph shows an accumulated demand for the entire district.

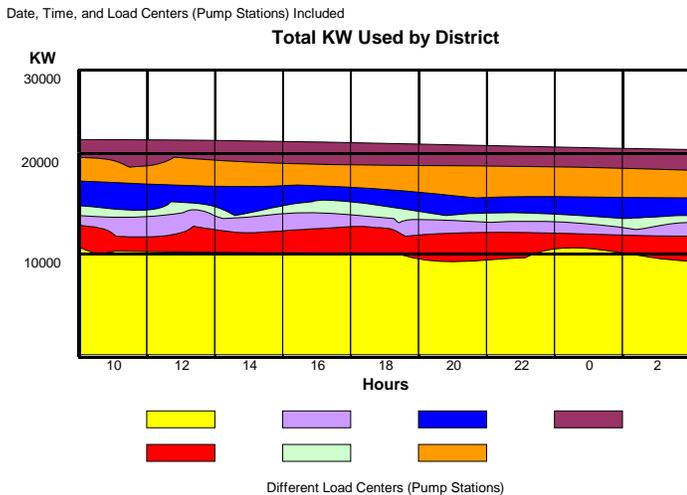


Figure 1. Software graph (hypothetical)

To warn the district that it is approaching its CRD, an alarm may be enabled in the office software. The system is designed only to support the decision-making by district personnel; it does not automatically shut down any pumps if the CRD is approached.

Cost

Installation and start-up for the system was \$50,000. In addition to start-up costs, the district pays a fee to PG&E for meter readings at a rate of \$2,500 a month.

Necessity for AEWSD

Without the system, there is a very real possibility that the CRD may be exceeded at some time. In summer of 2000 the “Load Monitoring System” was temporarily shut down, and the AEWSD spent \$102,000 when it exceeded the CRD only once.

When it is maintained properly, the “Load Monitoring System” saves the district a large amount of money because the system may be used to avoid exceeding the CRD.

Initial Start-up Challenges

The Arvin-Edison Water Storage District is one of the first irrigation districts to initiate a near real-time load management system. There were some initial difficulties with hardware and software compatibility, new configurations of the Quad IV, and issues with corruption of the regular monthly data readings by Pacific Gas and Electric Co. due to the monitoring by AEWSD. Those issues have been cleared up, and hardware and software today (2001) are performing much more consistently than when AEWSD started this program.

Other Configuration Options

Some of the AEWSD system functions could be incorporated into a standard SCADA (Supervisory Control and Data Acquisition) system. SCADA systems interrogate remote units, and then archive and display data. For example, it may be possible to interrogate the Quad IV meters with software residing in an RTU (Remote Terminal Unit) that is at each load center for other purposes such as for controlling Variable Speed Drive controllers.

It is possible to completely bypass the Quad IV meters and use another device to measure the KW load at a pumping plant. A separate meter would eliminate the need to stay compatible with the utility interrogation procedures and hardware. In either case, the central office computer would then monitor that information as well as other RTU information in a real-time manner.

Benefits

The system:

- Calls the meters and pulls in raw data
- Performs calculations to determine KW demand
- Organizes data in a form for viewing and displaying
- Enables trending estimates by hour, day, and year
- Sounds an alarm when the CRD is approached
- Provides near real-time data that assists with detecting unexpected pump shutdowns and other problems.

If You Are Interested

Other districts can benefit from the learning experiences of AEWS.

If you are interested in a load monitoring system, the hardware and software are available. The Quad IV meters are expensive, but PG&E has an abundant amount of them throughout the state that could possibly be available to districts interested in interrogating meters. Siemens sells both the meters and the software that are compatible with Quad IVs used by PG&E.

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