U.S. DEPARTMENT OF ENERGY

STATE ENERGY PROGRAM STELLAR PROJECTS

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

Feds Pitch In, Test Load Reduction in California

Marines at Camp Pendleton show President Bush how simple measures, high technology combine for big savings.

With California electricity providers stretched to their limits last winter and spring, the California Energy Commission (CEC) wanted to test its new Automated Emergency Response System in the event of an electricity supply emergency. The system is designed to communicate with 1,000 city, county, and special districts in the event of an imminent (Stage 2 or Stage 3) emergency. CEC also wanted to see what federal and state facilities managers might contribute in conservation and energy efficiency measures. California has a large number of state and federal facilities, and their combined electricity demand is significant.

President Bush congratulates Camp Pendleton Marines for successfully reducing electricity use in summer 2001.

The U.S. Department of Energy (DOE) offered to coordinate the federal agencies participating in the voluntary CEC test to see how much they could reduce electricity demand between 11 a.m. to 12:30 p.m. on May 24. Altogether, the test involved than 190 people from 115 facilities working for 20 different federal agencies.

Test Results

Although official results from the California Energy Commission (CEC) were inconclusive, both the grid operator for the state and federal facilities managers learned some important lessons.

CEC's communications systems worked well, but the load reductions were difficult to quantify for several reasons. For instance, federal, state, and county managers were each given different time blocks for the test, but there was considerable overlap.

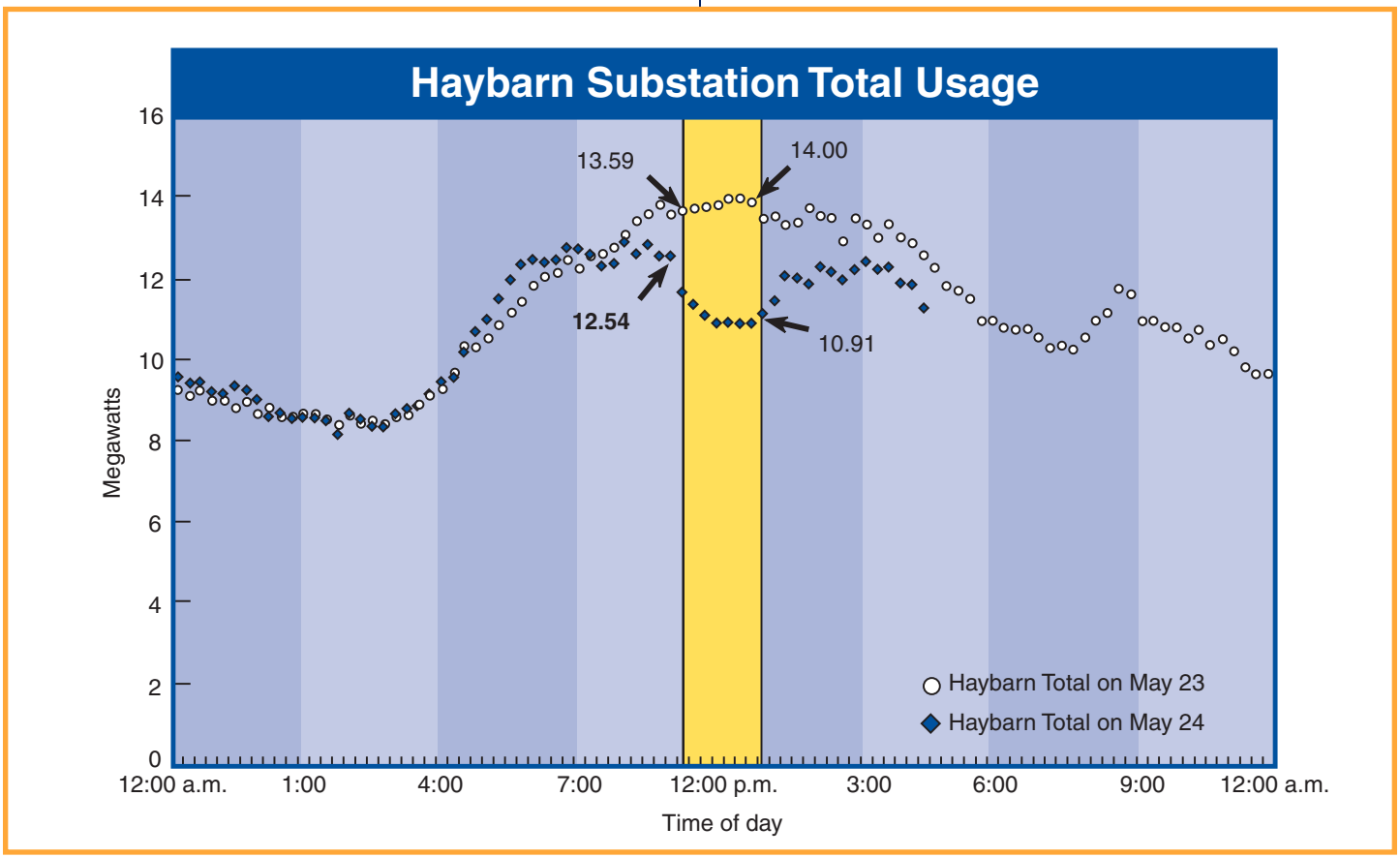
DOE gathered data to determine the contribution of participating federal facilities. Some agencies had no way to accurately document their savings. At Marine Corps Base Camp Pendleton, for example, there were excellent data of savings for the part of the base served by one electrical substation equipped with a data collection system (see graph below), but no such data documenting savings from the rest of the base.

The difficulty for CEC, the California Independent System Operator (CA-ISO), and utilities everywhere is how to reduce peak load on a day when the electrical system is strained to its maximum. In California, peak demand usually occurs on hot afternoons when air conditioners around the state are cranking to keep Californians cool. On these days, electric power companies will have every available power generator working or on standby reserve. Power distributors will also purchase as much power as they can from out of state to meet the demand.

If demand increases to the point that it outstrips generating capacity, voltage decreases along the power lines in response. But it can only decrease so far before safety equipment will trip open, causing a local blackout. (CA-ISO has a pre-arranged system of "rolling blackouts" that exempt critical facilities from power disruptions in such an event.)

With all this in mind, DOE is helping federal agencies investigate to what extent additional conservation and energy efficiency measures can contribute to reducing electricity load on a day of peak power demand. In June, the Federal Energy Management Program initiated an effort they call ALERT—Assessment of Energy and Load Reduction Techniques. ALERT teams have conducted assessments at 25 federal sites in California to identify short-term strategies to reduce electricity use.

Several important questions need to be answered before the public or a power distribution company



Camp Pendleton measured a 1.6 MW reduction in load on May 24 compared with the load from the previous day at one substation serving about half the base.

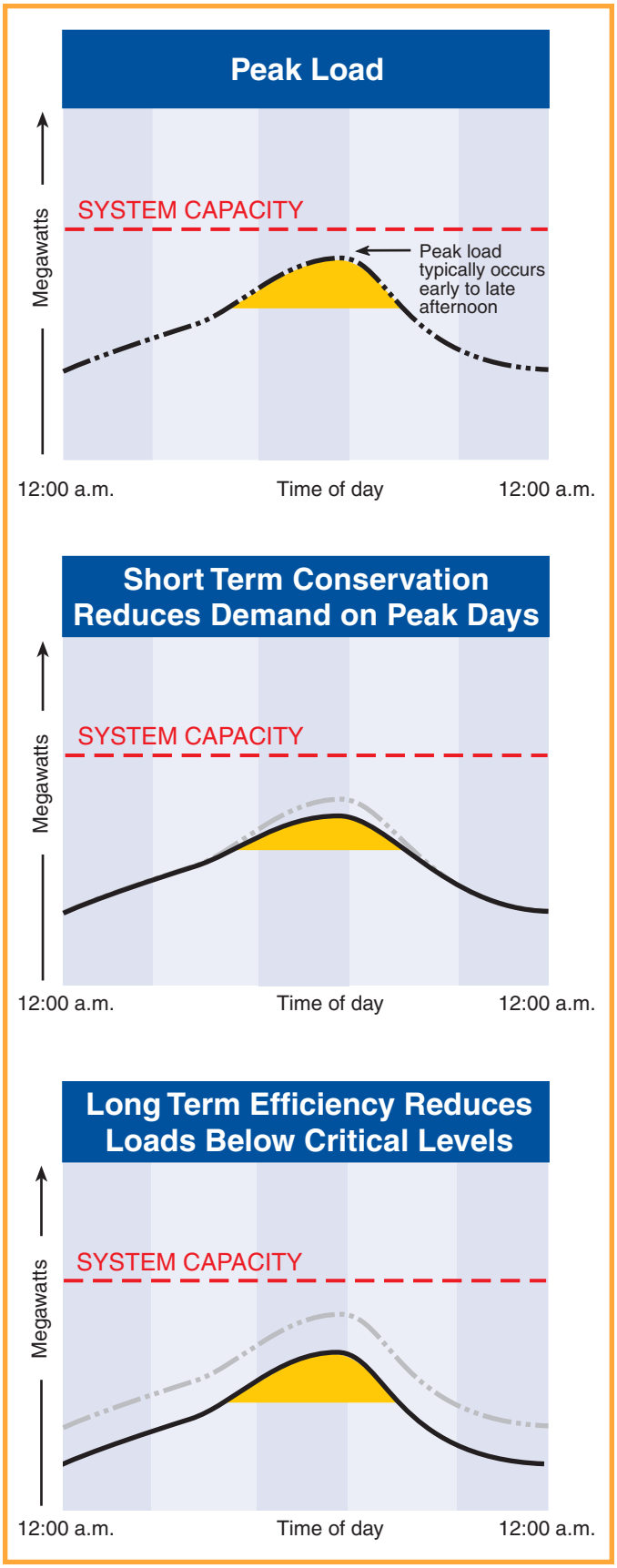
will be willing to depend on such measures. First, are short-term conservation measures as reliable as power generation for reducing load on days of peak demand? After all, lives are at stake, and our entire lifestyle depends on a reliable electricity supply. Second, can such measures be called upon quickly? The modern electric power system responds almost instantaneously to balance supply and demand over a wide geographic area. Third, can medium- or long-term efficiency measures reduce overall electricity demand to the point that the system is not strained in the first place? The U.S. electric power system is a modern technological marvel, and its day-to-day operation is extremely complicated.

The California Load Reduction Test did more to raise these questions than to answer them. Federal facilities account for only 2% of California's electricity load of 35,500 MW, so by themselves, they cannot prevent statewide emergencies. DOE estimates total federal curtailment of 70–75 MW during the test, or about 10% of the total federal load. Nevertheless, most participants believe if such a reduction were to take place at a critical time, it would be significant. And the test may have uncovered some techniques for load reduction that can be put to wider use.

Camp Pendleton Combines Efficiency with Conservation

Perhaps the experience of Camp Pendleton typifies the test. Located on 125,000 acres on the shores of the Pacific Ocean north of San Diego, the base is home to approximately 20,000 Marines and 10,000 family and support staff. The base obtains its power from San Diego Gas & Electric Company (SDG&E) through several substations that transform the power to lower voltage for distribution throughout the base.

The base has very modern energy equipment and a facilities staff that understands energy. For example, the staff controls the energy systems in 1,200 of the base's 4,300 buildings with one energy management system. Called "Unity" and managed by Johnson Controls, Inc., this system controls lights, pumps, compressors, and various other energy systems throughout the base. Facilities Manager Lieutenant Colonel Scott Nelson says, "We set the thermostat to 78°F and hours of operation for all those buildings



While short-term conservation measures or emergency curtailments reduce peak load at specific times, long-term investments in energy efficiency reduce the overall demand below critical levels.

with a single setting, thus reducing waste and saving energy." His staff also runs large power equipment, such as pumps for the base's water reservoirs, at night when demand on the SDG&E power system is low.

The base has also engaged in a number of SDG&E-sponsored demand reduction programs recently. Says Col. Nelson, "We spent $22 million over the last five years upgrading facilities with energy efficient systems." This investment has resulted in savings of approximately $4.5 million per year, he says. As a result, Camp Pendleton was able to achieve significant savings compares with other federal facilities that participated in the May 24 Load Reduction Test. For example, Col. Nelson was able to document savings of 1.6 MW for the area served by the Haybarn Substation, which serves about half the base. That same day, SDG&E reported savings from all its commercial customers of 3.7 MW. Col. Nelson concludes, "The Marine Corps contributed in a big way."

A week later, Col. Nelson briefed George W. Bush on the test during the president's brief visit to Camp Pendleton. He explained how the Unity control system worked and how the contribution of individual Marines made a big difference. "Everybody chipped in, "he said, "by turning out lights or turning off their computers when they went to lunch." He said that the most surprising result of the test to him was how big a difference the individual Marine contributions made when added together. In his address to them later that afternoon, President Bush thanked the Marines for doing their part on May 24.

President Bush is reflected on an energy management system at California's Camp Pendleton, where he visited recently to learn about the significant energy savings Marines have achieved at the military base.

Col. Nelson and his staff continue work on long-term efficiency measures. He and his staff are checking light levels in all of the buildings and replacing incandescent lighting with compact fluorescent lights (CFL). Col. Nelson says he recently spent $1 million on CFLs, which last 7 years and draw only 13 watts each. He estimates through energy and maintenance savings, his investment will pay itself back in four months.

DOE continues to investigate whether the lessons learned at Camp Pendleton and other federal facilities during the California Load Reduction Test of May 24 can be repeated on a larger scale to help prevent an electrical emergency in any state.

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