

# Palomar Medical Center, Escondido, California

## Chilled-Water Reset Strategy and Implementation of Variable-Frequency Drives for Condenser Water Pumps



Estimated Annual Utility Cost Savings:

**\$376,377**

Total Utility Incentive Rebate:

**\$241,979**

Energy Savings:

**2,712,384 kWh**

**478.3 kW**

Project Implementation Costs:

**\$470,000**

Project Simple Payback:

**0.6 year**



## SUMMARY

Palomar Medical Center, which opened in July 2012, was designed as a highly energy-efficient facility that far exceeded Title 24 standards and was originally planned for LEED certification. Willdan has worked with Palomar Health since 2011 as their energy consultant, providing recommendations for energy efficiency in their portfolio of properties. Willdan began a review of Palomar Medical Center in June 2013, once hospital operations were stabilized and building systems fully commissioned. Based on a review of Palomar Medical Center's trend data and interviews with their facility staff, Willdan identified 2,712,384 kWh and 93,581 therm savings. In total, the projects identified by Willdan will save the facility \$376,377 annually.

## GOALS AND CHALLENGES

Palomar Medical Center is a highly sophisticated facility with the latest building management system (BMS) and equipment. The hospital's goal was to identify energy efficiency measures to optimize the operation of their new central plant and other energy-dependent hospital systems in a building that was only one year old.

## SOLUTIONS AND OUTCOME

### eQuest Modeling Sets the Course for Energy Savings

Willdan created a simplified building energy model for the entire property using eQuest, establishing the total building electrical use at approximately 23,158,232 kWh per year. The facility's utility bill for 12 months documented actual electric usage of 25,129,010 kWh per year—showing that the energy model was calibrated within 8 percent of the meter data.

Energy efficiency measures were modeled using the base case (i.e., existing equipment) as the starting point, and, where appropriate, the measure analysis used each previous measure as the baseline in order to account for interactive effects. Willdan's approach

ensured that energy savings from individual measures were not "double-counted"—in accordance with industry best practices.

Modeling demonstrated the relative uses of electric energy within the building and identified that HVAC space cooling accounted for 19 percent of the total medical center electric energy use, while HVAC fans accounted for another 13 percent.

**RESULT: Willdan's approach—to target measures for HVAC systems—had a significant impact on reducing the medical center's overall energy usage.**



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### Aligning System Performance with Building Performance and Environmental Considerations

During the site audit, Willdan discovered that Palomar Medical Center's chilled-water supply temperature (CHWST) for CH-2 and CH-3 was sub-optimally reset between 42°F to 45°F for the entire trend period. We recommended the implementation of a CHWST reset strategy that resulted in the largest single-measure energy savings delivered to the project—531,240 kWh in annual average savings. After careful analysis, our engineers recommended that the CHWST setpoint be allowed to vary, based on actual chiller demand. For example, on hot days, the chilled water may be supplied at a temperature of 42°F. However, on milder days, a chilled-water temperature of 48°F could be sufficient to meet the lower cooling loads. The measure provides energy savings by reducing the chillers' compressor energy during part-load conditions (night time, winter months, and milder temperatures). Raising the chilled-water temperature allows the valves to open more fully, allowing more chilled-water flow through the coils. In addition, energy savings can be achieved by improving chilled-water temperature control and improving performance monitoring and tracking.

Willdan's recommendation to install variable-frequency drives (VFD) on condenser water pumps also resulted in significant savings of 204,272 kWh. Three condenser-water pumps served the existing condenser-water

system, constantly running at full speed with their respective cooling towers, regardless of the cooling load. Willdan recommended installing VFDs on the condenser-water pumps, which enable the condenser-water flow rate and pump speed to be controlled depending upon the condenser-water return temperature. When the temperature differential between supply and return drops below design, indicating that excessive flow is being provided to the chillers, the pump VFD will slow down and deliver less condenser water to the chillers.

#### Results:

- 2,712,384 kWh annual savings
- 478.3 kW of peak demand savings
- Annual cost savings of \$376,377
- Project cost \$470,000
- Payback period of 0.6 year

#### About Palomar Medical Center

Palomar Medical Center is an 11-story, 360-bed facility and part of Palomar Health, one of the largest public hospital districts in California. Opened in August 2012, the hospital has been dubbed the "hospital of the future" for its forward-thinking design and sustainability features—including a 1.5-acre green roof. The facility is fully air conditioned 24 hours per day, and is served by a 40,000-sq.-ft. central plant.