

# Carbon Neutral By 2025: UC Davis Taps Into the Transformative Power of Data

## INDUSTRY FACILITIES

## CHALLENGE

Achieve carbon neutrality by 2025.

## SOLUTION

Use the PI System to collect and integrate real-time data on utility usage, buildings, and central heating/cooling plants.

## BENEFIT

Holistic data is enabling UC Davis not only to reduce annual energy use, but to move to data-informed design of future systems and drive research.

In 2013, UC Davis as part of the University of California system had an ambitious goal: Net zero greenhouse gas emissions from the campus's building and vehicle fleet by 2025. University of California, Davis was the first major university to pledge carbon neutrality, and with more than 1,000 buildings comprising a total of 11.3 million square feet, it's a high bar to clear. In early steps toward carbon neutrality, the university embarked on a few large projects with clear benefits, retrofitting large plants and buildings to operate more efficiently. But when the obvious projects had been tackled, UC Davis turned to the PI System™ to identify opportunities for using data to drive more efficient use of resources.

"Getting to our 2025 goal, we need to go deeper, and that increasingly requires things like user engagement, campus engagement, optimization, and really in the last five years, the use of real-time data," said David Trombly, engineering supervisor at UC Davis. "PI has really expanded and become increasingly integral to our operations and goals."

## Real-Time Data, Real Reductions

UC Davis has been using the PI System to track facility data since 2006. "We started collecting the data a long time ago, and it provided the groundwork and baselines for later efforts," Trombly said.

A program called the Active Commissioning Enterprise now works to identify new energy projects, funded by savings from projects already underway. There are three main components that drive most of the energy use (and carbon emissions) for UC Davis's buildings: steam heat, chilled water, and electricity. In the past, building and plant managers had separate systems for tracking building and plant operations. Energy use and building systems were monitored independently, and before integrating them in a single dashboard, engineers couldn't see clearly how they were impacting each other, missing opportunities for energy savings.

For one project, UC Davis engineers used PI Vision to zero in on the chilled water system that cools campus buildings. A dashboard that tracks delta-T, a measure

of the difference between supply water temperature and return water temperature, and visualizes it along with the flow of chilled water through buildings, helps building and plant operators run the system more efficiently. Another dashboard tracks electricity rates alongside chiller electricity use and chilled water tank storage capacity, allowing plant managers to replenish a 5-million gallon chilled water tank when rates are low and rely on stored water when rates are high. The recently-launched project has yielded the university \$15,000 in savings so far, Trombly said; he expects the campus to save \$150,000 a year from the project.

UC Davis is using real-time data and PI System dashboards to do more efficient scheduling of heating and cooling, with an innovative way of looking at building usage: local wi-fi traffic, which engineers are using as a guide to building occupancy. "We've increasingly used this to basically help us turn down our buildings when they're not occupied," Trombly said. "We have scripts that look at the schedule, and change our control system to turn off when we don't

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PI allows us to make our campus into a living lab that will run more efficiently with everyone’s help, allows training and instruction and research to happen, and ultimately will allow us to reach our sustainability goals.”

— David Trombly, Engineering Supervisor at UC Davis

expect anyone scheduled there.” With PI Notifications, building managers can be alerted if there’s an unexpected spike in Wi-Fi traffic.

### Designing for the Future

When deciding which systems are most efficient, the answers aren’t always obvious. UC Davis has an old steam system that provides most of the heating for the campus, with some significant deferred maintenance costs on the horizon. Would it make more sense from a cost and emissions standpoint to replace boilers, or invest in a whole new system? The key to answering that question was data. By running different scenarios with a wealth of baseline data already in the PI System, campus engineers determined that switching to a lower-temperature hot water system would save the campus money and emissions in the long run. Electricity use will go up, but the campus is looking at an expected 62% reduction in gas use after the switch.

“This project is going to get us a lot of the way we need to go to the goal,” Trombly said. “We’re using our PI System for

improved capacity planning. Gathering all this data and baselining eventually empowers us to design our systems better.”

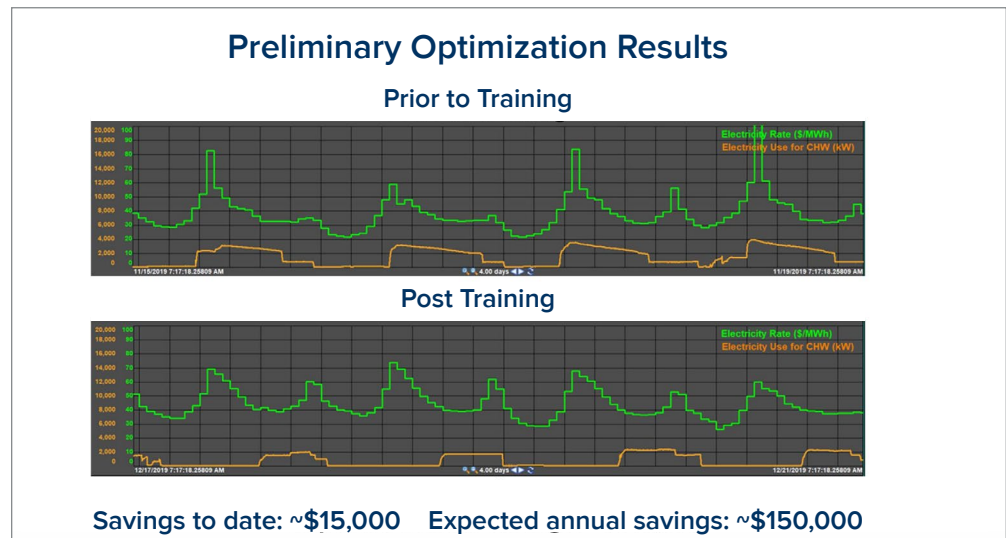
### Bringing in the Community

One of the most exciting benefits of taking a holistic approach to campus data is that it is opening up new opportunities for education, collaboration and research. A dashboard called “Campus Energy Education Dashboard” (CEED) presents real-time building and energy data for all campus users. A tool dubbed “Thermostat”, in a nod to the university’s agricultural focus, provides opportunities to gather thermal feedback from building occupants. UC Davis is using the PI System to provide data for courses and projects, offer internships working with the system, and host a small-building optimization project run by students.

The university’s goals are lofty, but it all starts with a simple step: gather the data.

“What you can’t measure, you can’t manage,” Trombly said.

**For more information about UC Davis and the PI System, watch the full presentation here.**



By visualizing chiller operation alongside fluctuations in energy rates, building operators at UC Davis are able to time energy usage more efficiently.

Trombly, David. “UC Davis Path to Carbon Neutrality Using the OSIsoft PI System.”