

## **Implementing Smart Grid Auto-Demand Response for Existing Government Buildings in County of Santa Clara**

*Retrofit of pneumatic HVAC system cost 20% of conventional solution, required 95% less time to install, and received PG&E Auto Demand-Response incentive payment*

### **The Challenge**

- The County of Santa Clara wanted to reduce energy costs via participating in PG&E's Auto Demand Response (Auto-DR) program. To do so, its buildings must be able to automatically shed electrical load when a demand event signal was sensed
- Two buildings, each 150,000 sq-ft, were identified as candidates, but they used older pneumatic controls which cannot receive an electronic signal or allow remote temperature control. This made implementing Auto-DR difficult to achieve.
- The cost to retrofit the pneumatic thermostats with Direct Digital Control (DDC) thermostats was estimated to be \$2,000 - \$3,000 per thermostat, and far exceeded the program funds available from PG&E.
- The two buildings were typical of commercial buildings found throughout the US. Many use pneumatic controls which make Auto-DR to challenging to implement.

### **The Solution**

- The County of Santa Clara opted to replace all of its existing thermostats with Cypress EnviroSystems' Wireless Pneumatic Thermostats. The cost of the project was \$175,000, compared with an estimated \$880,000 using conventional technology.
- The implementation was completed in eight days, compared with six months or more using conventional technology. Operations in the building continued as usual during the deployment with none of the disruption of a DDC installation.

### **The Results**

- With the deployment of the Wireless Pneumatic Thermostats, the County of Santa Clara was able to participate in PG&E's Auto-DR program. PG&E, through its Technical Incentive Program, covered the entire cost of the deployment.
- "The wireless thermostat installation was one of the easiest, fastest and most cost effective energy efficiency improvements we have ever made in our buildings," said Jeff Draper, Manager of Building Operations, Santa Clara County.

## **Situation/Background**

Located 60 miles south of San Francisco and encompassing the City of San Jose, the County of Santa Clara is one of the most populous counties in California and also one of the most vibrant. Home to Stanford University, Silicon Valley and major high tech power-house companies including Google, Cisco, and Apple Computer, the County of Santa Clara County is known worldwide for its being at ground zero for technical innovation.

## **Auto-Demand Reduction**

To reduce strain on the electric grid during the hottest days of the year, PG&E (the utility serving Northern California) offers its customers “incentive funding” to participate in its Auto Demand Response (Auto-DR) Program ([www.auto-DR.com](http://www.auto-DR.com)). To qualify for the program, customers must be able to electronically sense a signal sent from the utility and automatically shed a predetermined load during event hours. The shed must be accomplished automatically without requiring any manual intervention. After the shed event is concluded, the building must automatically return to normal levels.

An objective of the program is for the shed to have minimal effect on business continuity. Working with PG&E, the Department of Energy Lawrence Berkeley Labs has developed and tested shed strategies for different types of buildings including industrial facilities, refrigerated warehouses, data centers and big-box retail stores. For office buildings, the shed is usually accomplished by increasing the HVAC temperature set point by a few degrees and reducing lighting. Controlling the temperature on a zone-by-zone basis helps to ensure employees remain comfortable and productive during the shed event.

## **The Challenge Facing the County of Santa Clara**

The County of Santa Clara wanted to deploy Auto-DR throughout its largest facilities. Two of the targeted properties included 333 and 373 Julian Street in San Jose. Originally built in 2000, the buildings were leased by the County to house the departments responsible for child welfare, adoptions, foster placement, elder abuse, and other social services.

An inspection of the buildings revealed that both had been equipped with non-communicating pneumatic thermostats. These devices are unable to accept an electronic signal, and potentially jeopardized the County’s ability to participate in the program.

The County of Santa Clara is not unique. Industry analysts estimate that 70-80% of buildings in the US are similarly equipped with antiquated pneumatic thermostats that are unable to accept an electronic signal.



***Figure I - Leased Buildings Occupied by County of Santa Clara Government***



***Figure II – Existing Pneumatic Thermostat prior to retrofit***

## **The Cypress Envirosystems Solution**

Cypress Envirosystems offers a pneumatic wireless device that can easily replace conventional non communicating pneumatic devices. With the Cypress solution, the thermostat can automatically accept a wireless signal, and change its HVAC set point. Additionally, the Cypress solution can be retrofitted to replace a conventional pneumatic thermostat in about 15 minutes, creating minimal disruption to the building occupants. The cost to replace a pneumatic thermostat using the Cypress solution is about \$500 per thermostat. For the County of Santa Clara, the entire deployment of 350 devices was at a total cost of \$175,000 and took about eight days to complete.

In comparison, costs to retrofit using conventional Direct Digital Control (DDC) thermostats typically run \$2,000 -\$3,000 each. Tenants would need to be vacated during the wall and ceiling work. Asbestos and other harmful materials could be released, creating a significant issue in a building with children and frail seniors present. Also, a DDC system takes much longer to install. For the County of Santa Clara, the installation may have required six months to complete at a cost of potentially \$875,000. In comparison, the Cypress solution required eight days at a cost of \$175,000.



***Figure III – Wireless Pneumatic Thermostat***



## **Other Advantages**

Apart enabling Auto Demand Response, the Cypress solution reduces the expense of ongoing building management. The building manager now has a visibility and control at his fingertips of temperatures throughout his facility. He can automatically calibrate the thermostats, reducing the need for staff to walk around responding to calls and adjusting temperature. Troubleshooting can be performed remotely without the required presence of an employee at the tenant location.

Many customers also achieve 10% reduction or more off their energy bills by improved zone control and occupancy override. These functions provide HVAC comfort to tenants who work irregular hours, without the need to heat or cool an entire building. Most importantly, customers report that tenants are happier, more comfortable, and more likely to remain long-term satisfied building tenants.

Cypress Envirosystems solutions have been widely deployed at companies including Genentech, Freescale and Stanford University.

### **Results of Retrofit with Cypress Envirosystems Wireless Thermostats at the County of Santa Clara**

	<b>Cypress Envirosystems Wireless Pneumatic Thermostats Retrofit</b>	<b>Conventional Direct Digital Control Retrofit</b>
Installed Price	350 x \$500 = \$175,000	350 x \$2,500 = \$875,000
Time Required	8 days	6 months
Disruption to Operations	Minimal	Significant
Potential Exposure to Toxic Substances in Walls	None	Unknown
Paid for by PG&E Auto DR Incentive	100% covered	31% covered

“The wireless thermostat installation took only eight days and was one of the easiest, fastest and most cost effective energy efficiency improvements we have ever made in our buildings,” said Jeff Draper, Manager of Building Operations. “We installed 350 wireless thermostats for a total project cost of \$175,000.”

“Adopting green technology solutions as part of our energy retrofit program, such as these inexpensive programmable wireless thermostats, is not only the best bang for our buck, it will also achieve the best result and help grow local jobs,” stated Supervisor Liz Kniss, President of the County of Santa Clara Board of Supervisors.

“This is the kind of program the Economic Stimulus Package should be funding,” said Vice President of the Board of Supervisors Ken Yeager. “Low cost, easy-to-install retrofits provide the best savings while moving us into the green economy, a benefit to both the public and private sectors.”

*About Cypress Envirosystems:*

*Cypress Envirosystems is a subsidiary of Cypress Semiconductor (NYSE: CY). Its mission is to save energy and improve productivity in older plants and buildings, using state-of-the-art non-invasive and wireless technologies to minimize disruption and cost, delivering payback of 12 months or less. More information is available at: [www.CypressEnvirosystems.com](http://www.CypressEnvirosystems.com) or call (408) 943-2800.*