

## CASE STUDY

# Juniper Networks Pushes the Boundaries of Networked Energy Efficiency

Collaboration with PG&E helps redefine energy efficiency for high tech enterprises

Headquartered in Sunnyvale, California, Juniper Networks' technologies power the world's largest and most demanding networks, including the top 100 service providers and 99 of the Fortune Global 100 companies, as well as hundreds of government agencies and higher education organizations throughout the world.

Juniper has worked closely with Pacific Gas and Electric Company (PG&E) for nearly a decade to increase its energy efficiency, decrease its carbon footprint, and take demand off the power grid. The collaboration began in 2006, when Juniper's facilities management team contacted PG&E for help in making energy-efficiency upgrades to their Sunnyvale facilities. These retrofits led to a history of progressively sophisticated design improvements. One of the key areas was Juniper's Sunnyvale research and development (R&D) labs. Since 2006, Juniper has implemented a wide array of energy-efficient designs and best practices that have resulted in significant energy and operational savings, and over \$1,985,469 in PG&E rebates.

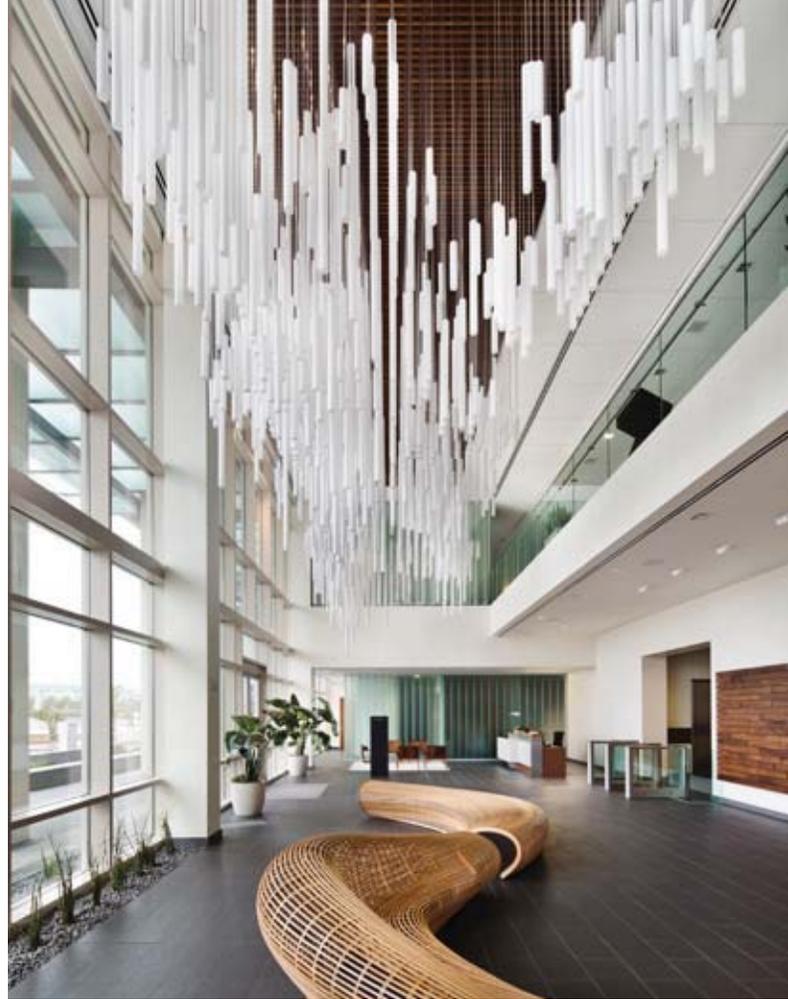
Over this same period of time, Juniper began to use its R&D labs as a proxy to explore how to make its own technologies operate more efficiently by looking at both the hardware and the underlying enterprise network infrastructure. This led to a multitude of innovative approaches, including remote access labs and server virtualization, which further reduced its labs' energy usage. But the best was yet to come.



## Building the Best

When it came to designing and building its new 635,000 sq. ft. corporate campus in Sunnyvale, Juniper took all the past learnings from its collaboration with PG&E and applied everything to the first two buildings. These buildings (which comprise Juniper's Executive Briefing Center, Proof of Concept (POC) labs, R&D Engineering labs, R&D Workplace, a cafeteria and general office space) show what can be done when state-of-the-art, energy-efficiency measures and a state-of-the-art enterprise network are integrated from the ground up. Literally everything is connected so that every performance aspect can be monitored and optimized.

John Lucas, Juniper's Vice-President of Global Real Estate and Workplace Services, explained, "We wanted to demonstrate how a fully integrated network can vastly improve the performance and economics of the work environment, while also giving our employees and customers the place to do their best work." Both buildings have earned LEED certification from the U.S. Green Building Council. Building A (which houses the Executive Briefing Center and over 400 racks of energy-intensive servers) received Gold certification, while Building B (home to the 200 server-rack-equipped POC Lab, plus other energy-intensive labs with an additional 400 server racks) was awarded Platinum status, the council's greenest level.



A dramatic LED lighting sculpture, symbolizing the ability of Juniper Networks' technology to connect the world, greets visitors in the main lobby of Building A's Executive Briefing Center.

Juniper brought PG&E in early, during the building's blueprint stage, to maximize opportunities for PG&E's integrated program incentives, including technical assistance and self-generation. In this case, building plans were about 30 percent complete. Collaboration at this stage enabled PG&E to be part of the process and influence the design without interrupting it. A dedicated PG&E team, including an energy solutions manager, several technical leads, a project manager, and an account representative, helped to identify the best measures to reduce energy consumption and maximize Juniper's rebates.

Two key PG&E programs—Savings By Design and Customized New Construction—were also used to inform this design process. Savings By Design offers incentives to customers who exceed California's Title 24 standards in building high-performance, non residential buildings. Customized New Construction offers incentives to improve the energy efficiency of facilities where Title 24 standards don't apply.

As Mike Szeredy, Senior Facilities Project Manager, noted, "PG&E was our energy-efficiency 'North Star'. We used their experts throughout the process to make sure the additional monies we spent upfront on more energy-efficient design and technologies would pencil out with shorter ROIs, because of the energy savings and the rebates."

Video conference rooms use Juniper media applications and specially outfitted iPads to improve the video conferencing experience and limit the need for travel.



## Making Networked Energy Efficiency Possible

The resulting buildings are a striking combination of eco-friendly materials and energy-efficient systems. Chief among the systems benefiting from design expertise and a clean sheet of paper are the heating, venting and air conditioning system.

For example, airside economizers have been located on the side of Building A near the server labs to provide more efficient cooling and reduce chiller cycles. Water-cooled chillers have been installed to offer superior cooling for both office spaces and the heat-intensive server labs. Forced-draft condensing boilers have been sized for 1/3 and 2/3 of the load for improved low-load efficiency. Solar water heaters have been deployed to handle the domestic hot water needs of the cafeteria, rest rooms, and on-site showers. Lastly, most of the motors, fans and pumps have been equipped with variable frequency drives (VFDs) to ensure maximum efficiency under partial-load conditions.

Lighting systems also received a great deal of attention. Daylight-sensing controls have been installed to optimize the harvesting of sunlight. Occupancy sensors are placed in virtually all spaces, so lights shut off automatically when people aren't present. Office spaces are equipped with LED task lighting. Windows added to the stairwells further maximize the use of daylight and minimize maintenance. Even the dramatic lighting sculpture in Building A's lobby is highly energy efficient, consisting of 1,081 LED tube lights that visitors can interact with to illustrate how the world is one big network.



Energy-intensive server labs feature many energy conservation measures. Here in-row, water-chilled fan coils and overhead supply air ducts minimize the mixing of hot and cold air to reduce the lab's overall cooling load.

To fully grasp the design of these buildings, they must be seen at the micro level to appreciate the deep integration of Juniper's own enterprise networking technology. Not only does this networking technology monitor and keep all the buildings' systems running as efficiently as possible, but it also provides a platform for other kinds of energy optimization and conservation.

For example, video conference rooms use Juniper media applications and specially outfitted iPads to improve the video conferencing experience, which limits the need for travel. In addition, these rooms use less energy since the iPads—like most computing tablets—use up to 20 times less energy than desktop PCs. There's also an iPad mounted outside each meeting room that connects directly to Juniper's enterprise server in the cloud, so people can review and schedule meeting rooms digitally, on the spot, eliminating the use of paper.

**“By partnering with PG&E to find innovative ways to boost energy efficiency, Juniper has earned nearly \$2 million in energy-efficiency incentives over the past five years, while saving enough energy to power 850 homes.”**

HELEN BURT, SENIOR VICE PRESIDENT AND CHIEF CUSTOMER OFFICER, PG&E



## Key Green Features

These buildings feature many carbon-reducing measures, including fuel cells, solar panels and solar water heaters, and eco-friendly materials like modular recyclable carpet tiles and non-VOC paints. To learn more about them, as well as Juniper's other conservation efforts, go to [www.juniper.net/sustainability](http://www.juniper.net/sustainability).

Often an overlooked building feature, the stairwells at Juniper Networks' new corporate campus are lined with windows to maximize the use of daylight and minimize lighting maintenance.

## Learn. Earn. Save. Repeat.

In four years, Juniper's building design standards have gone from a concept to a set of buildings that pushes the boundaries of energy efficiency, thanks to the deep integration of Juniper Network's own networking technology. These buildings are projected to save 1,010,792 kWh in the first year alone, reducing Juniper's annual electric bill by \$121,295. This is a successful combination that Juniper wants to share both internally and with the world.

"At Juniper, we believe the network is the single best way to unleash innovation and discovery while improving the economics of any enterprise. We saw these buildings as an opportunity to use our own technology to 'unleash' energy efficiency. And we knew PG&E was the right company to collaborate with to help us," said John Lucas. "We're now taking these best practices and bringing them to our facilities around the globe. For anyone who's involved in integrating energy efficiency, it would be worth your time to visit us here in Sunnyvale to see these networked energy-efficiency solutions for yourself."

### NEXT STEPS

To learn how PG&E can help your business reduce energy consumption and costs, contact your PG&E Account Representative or call our Business Customer Service Center at 1-800-468-4743. More information is available at [www.pge.com/hightech](http://www.pge.com/hightech).

To tour Juniper Networks' corporate campus, call 1-408-936-5395.