



Saving resources with green technology

Dell boosts energy efficiency, cuts carbon emissions and saves water with custom thermal wheel and a highly renewable local power source

Customer profile

Company	Dell
Industry	Technology
Country	United States
Employees	110,000
Website	www.dell.com

Business need

Dell needed a new hosting data center, and it wanted the facility to achieve the best possible power, water and carbon utilization effectiveness (PUE, WUE and CUE).

Solution

Dell designed and built an innovative data center that uses mainly renewable energy, a custom hot-aisle containment design and a unique cooling system powered by one of the world's largest thermal (heat transfer) wheels.

Benefits

- Reduces emissions by using approximately 82 percent¹ renewable electricity made from hydroelectric power
- Minimizes energy consumption by using outside air and a custom thermal-wheel air-handling system
- Cools facility with little water compared to facilities using conventional technology
- Supports disparate cabinet sizes while minimizing energy loss

Solutions at a glance

- Data Center & Cloud Management
- Managed Services

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Thomas Lawrence, Director of Global Facilities Engineering, Dell



Based in Round Rock, Texas, Dell is a privately held, Fortune 100 company that provides enterprise solutions to every size of business including end-user computing, servers, storage, networking, software and IT services. To meet increasing demand for data and equipment hosting, Dell needed an enhanced Tier 3 data center that it could expand to a Tier 4 (fault tolerant) site. Rather than using conventional data center models, Dell wanted to make its new site more environmentally friendly.

“With its low power utilization efficiency and high use of renewable power, Quincy achieves a very low carbon utilization efficiency.”

Thomas Lawrence, Director of Global Facilities Engineering, Dell

As an industry leader, Dell strives to minimize its environmental impact and help serve as a model for a more energy-efficient company that uses fewer natural resources. To help facilitate these objectives, the company has set ambitious environmental goals including reducing its operational greenhouse-gas emissions by 50 percent and reducing water usage in water-stressed areas by 20 percent. Dell also seeks to dramatically improve its data center power utilization effectiveness (PUE), water utilization effectiveness (WUE), and carbon utilization effectiveness (CUE). Consequently, engineers wanted to use renewable energy at its new data center and avoid using water for cooling. Engineers also wanted to find new ways to overcome traditional issues such as energy loss resulting from cooling equipment of various sizes. All solutions had to be cost-effective so that Dell could continue to be competitive.

Uses renewable, low-emission hydroelectric power

Dell evaluated potential sites and for many reasons chose to build its new data center in Quincy, Washington. Most importantly, the site is located in an area that generates the majority of its electricity using renewable and affordable hydropower. Thomas Lawrence, director of global facilities engineering at Dell, says, “We generate

some of our own solar power at our sites in Round Rock, Texas, and Bangalore, India. We knew solar technology could not provide the scale we needed in a data center.”

Creates a custom thermal wheel to minimize energy consumption

By building its data center in Quincy, Dell could reduce its energy usage. “Low humidity and cool weather during much of the year mean we can take advantage of the natural climate to reduce our energy usage,” says Lawrence. “This includes using outdoor air to cool the data center on many days of the year with thermal-wheel (or heat recovery) technology.” The custom thermal-wheel deployment is one of the largest in the U.S. — and, possibly, in the world. In addition, the air-handling units manage all air-related processes, which are typically provided by separate systems. Lawrence explains, “Our thermal-wheel air-handling units manage air cooling, humidification and pressurization — and can even purge the facility of smoke in the unlikely case of a fire.”

Products & Services

Services

Managed Services



Cools facility without water, saving this precious resource

By creating and deploying an innovative heat wheel, Dell minimized its water usage at the Quincy data center. "We designed our thermal-wheel air-handling units to use water only to humidify the air, not to cool it," says Lawrence. "As a result, the water utilization effectiveness, or WUE, of our Quincy data center is low." A typical water-cooled data center of similar capacity would use a great deal of water as part of the cooling process.

Supports disparate cabinet sizes while minimizing energy loss

Engineers also came up with another innovative solution to overcome energy inefficiencies: a custom optimized-containment system (OCS). "Most containment systems require cabinets that are about the same size and width," Lawrence says. "By using our custom thermal wheel and OCS, we could make our hardware sizes agnostic and still preserve the efficiency of our air system." Through its rack-independent support structure, the OCS is not limited to containing only traditional server cabinets. Instead, the OCS can accommodate non-traditional compute form factors such as mainframes and larger storage components that vary in height, width and depth. Additionally, the rack-independent design enables engineers to remove or replace racks without any containment disassembly.

The OCS minimizes energy loss by delivering cool air to the front of cabinets in a cold-aisle configuration and returning the heat extracted from servers from a contained hot aisle. The OCS maximizes the bypass air between the cold and hot aisles, and the thermal wheel continuously cools the hot return air through an indirect thermal exchange with the outside air providing cool supply air to the data center.

Minimizes carbon footprint

Since more equipment is required for an enhanced Tier 3 (and Tier 4-capable) fault-tolerant infrastructure, this type of data center typically consumes greater energy than less redundant, fault-tolerant data centers. However, the custom thermal-wheel air-handling system in conjunction with the OCS uses dramatically less power than a typical data center its size, resulting in reduced carbon emissions. Lawrence says, "With its low power utilization efficiency and high use of renewable power, Quincy achieves a very low carbon utilization efficiency."

Helps the company reach its sustainability goals

By deviating from traditional data center designs with energy-efficient power sources and cooling technologies, Dell has taken a big step toward achieving its 2020 Legacy of Good sustainability goals — and demonstrating to others what's possible. Lawrence says, "At Dell, we have set a goal to source at least 50 percent of our purchased energy from renewable resources by 2020. Our data center in Quincy is helping us achieve that target."

To realize even greater environmental savings, Dell is evaluating its other locations to see how it can reduce its impact on the environment and still deliver cost-effective offerings. For example, in India, Dell is investigating the use of backup power generators that run on fuel cells rather than generators that run on diesel fuel, to reduce the emissions of greenhouse gases and other air pollutants. Lawrence says, "As Dell continues to operate its global locations, we will try innovative ways to increase our power, water and carbon utilization effectiveness — and by doing so, help our customers reduce their emissions related to data-processing activities."

1) Source: Washington State Electric Utility Fuel Mix Disclosure Reports for CY2012.

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