

State of Montana Data Center Finds Sustainability and Innovation through CPI Passive Cooling® Solutions

Founded on an adventurous spirit led by wagon wheels and optimism, Montana is filled with self-sufficient trailblazers who are willing to explore unknown territories. This is especially true in the capitol of Helena, where IT professionals, engineers and architects teamed up as true pioneers to design a secure and sustainable data center that would support all of the state's governmental operations.



Trading in the wagon wheels of their ancestors for revolutionary new KyotoCooling® wheels and Passive Cooling® Solutions by Chatsworth Products (CPI), the State of Montana rolled into a new era of energy savings and security. This journey to become a model for green data centers across the nation has now reached a reality that few could ever dream of matching—a “cooling-only” power usage effectiveness (PUE) of less than 1.1.

Challenge

Originally built in 1946, the building that housed Montana's old data center was well overdue for retirement. Governor Brian Schweitzer saw that need during a building tour shortly after his inauguration and soon made it his personal initiative to build a new, state-of-the-art data center that would ensure reliability and sustainability for many years to come. In 2008 he further supported this idea by adopting the “20 by 10” initiative, which challenged state-owned buildings to decrease energy consumption by 20 percent before the end of 2010.

“The ‘20 by 10’ initiative challenged us to design something highly efficient,” said Joe Triem, Planning Manager, State of Montana Architecture & Engineering Division. “Existing buildings were decreasing energy consumption



Rows of F-Series TeraFrame® Cabinets with Vertical Exhaust Ducts help the State of Montana maintain a PUE of less than 1.1 by keeping hot exhaust air isolated in the cabinet and separate from the room.

Summary

How the State of Montana's new data center used CPI Passive Cooling® and KyotoCooling® to become a sustainability pioneer that regularly reports a PUE of less than 1.1.

Challenge

To design a reliable, self-sufficient, secure and economical data center that used innovative cooling techniques capable of reducing energy usage by 20 percent.

Customer Profile

The State Information Technology Services Division (SITSD) ensures that the State of Montana's information technology infrastructure is reliable, secure, cost-effective and meets the business requirements of state agencies and citizens.

Solution

Deployed a highly-efficient cooling strategy that included CPI's F-Series TeraFrame® Cabinet System with Vertical Exhaust Duct, CPI Passive Cooling® and KyotoCooling®. Security capabilities were also updated through the use of customized software upgrades within CPI's networked Electronic Locking System.

Industry

Government

“ Every dollar that comes into the state, including taxpayer money, comes into this data center. In the State of Montana we are really dependent on information technology to get things done. ”

Mike Boyer, Enterprise System Project Manager,
State Information Technology Services Division (SITSD)

by 20 percent, while new buildings were adding to the overall building load. We took that as a challenge to make sure that we had a building that was at least 20 percent more efficient than current code, and in this case, significantly more than that.”

As the primary data center for all of Montana’s government agencies, this new facility also needed to meet critical security and reliability expectations. That meant protecting identities and financial information regarding everything from Medicaid Management Information Systems and eligibility determination to accounting, paying the bills and yes, even taxes.

“Every dollar that the state pays—for any benefit and service—runs through the State of Montana’s data center,” said Mike Boyer, Enterprise System Project Manager, State Information Technology Services Division (SITSD). “And every dollar that comes into the state, including taxpayer money,

comes into this data center. In the State of Montana we are really dependent on information technology to get things done.”

Developing a Plan

“After the governor took a tour here shortly after his inauguration, to paraphrase what he said, ‘Great, now I have something else to worry about at night,’” said Boyer.

The governor and state legislators teamed up in 2007 to ease concerns about the out-of-date facility by approving the funding for two new data centers, a primary and a back-up. While Montana’s back-up data center was located at a different site and outfitted with traditional cooling methods, the primary data center was set to usher in new era of security, reliability and sustainability.

Montana’s SITSD worked with area architecture firms and engineers to define an ideal energy conservation strategy, but there was still at least one possibility that hadn’t been explored. That changed in April 2008 when Mike Krings, Project SME, IT Facilities, State of Montana Data Center (SMDC), happened upon a webinar presented by Ian Seaton, Global Technology Manager for CPI. While defining the energy saving opportunities available through CPI’s Passive Cooling, Seaton briefly mentioned how those benefits could be maximized with a new technology called KyotoCooling.

“He (Seaton) just got to talking about the Kyoto wheel and I got enough information to be dangerous,” said Krings. “A group of us were dealing with HVAC and looking for ways to do ‘free cooling’ and this Kyoto wheel stuck out to me. We passed the information on to the HVAC team and it piqued curiosity.”



The new State of Montana data center sits among “Big Sky Country” as a model for efficient cooling strategies that take advantage of airflow containment and “free cooling.”

“ We felt that it was our responsibility as a governmental agency to lead by example and push the envelope. We have done that here. ”

Joe Triem, Planning Manager,
State of Montana Architecture & Engineering Division



The KyotoCooling® wheel is installed at the State of Montana data center, making it the first in the US to deploy this emerging technology.

Innovative Cooling Solutions

Finding an innovative and low-cost cooling solution was a top-level priority for Montana's data center from the start. Beyond meeting the government's initiative of reducing energy consumption in its buildings by 20 percent, this was a chance to break new ground and set an example for other government buildings to follow.

"We felt that it was our responsibility as a governmental agency to lead by example and push the envelope," said Triem. "We have done that here."

Exploring possibilities that reached beyond standard base cases and scenarios, Montana's data center design team did their due diligence on the varying energy costs, savings and lifecycles of proven cooling solutions, as well as new ideas like KyotoCooling. With this information in hand the design team called upon Montana's State Buildings Energy Conservation Program (SBCEP) for additional funds. By financing energy improvement projects for state owned buildings the SBCEP chooses projects to fund and then invests the savings from those projects into future energy upgrades.

"The program gives you the money and you pay the utility company their part," said Triem. "Then the savings from the difference of your old bill would go back to the energy program. In other words, the energy program is bonding us to go to these more efficient systems and that's why it's very important to know how efficient the system is and how much net savings you will have in a typical year."

With funds locked in place for a state-of-the art, highly sustainable data center, the State of Montana revisited the notion of KyotoCooling. By abandoning compressors for an air-to-air heat exchanging cooling system known as the Kyoto wheel, KyotoCooling offered a revolutionary, fault-tolerant cooling solution capable of reducing the cooling energy budget to less than 10 percent of the IT load.

Senior staff member with the Uptime Institute and international data center consultant Dr. Bob Sullivan, widely known as "Dr.Bob," explains: "There are two isolated circulation paths, rather than an intake and exhaust path. The computer room is configured with an isolated hot aisle and the hot air is circulated. The heat is absorbed by the honeycomb wheel as it slowly rotates into a chamber, carrying the computer room heat load with it."



Dr. Bob Sullivan, a senior staff member with the Uptime Institute, played a key role in bringing KyotoCooling® to the State of Montana.

This approach allows the isolated heat energy to dissipate outside as the wheel rotates into a stream of cooler air. By using Montana's naturally cool air to regulate the data center's temperature, this "free cooling" approach would lead to huge cost savings by eliminating energy usage associated with compressors and traditional cooling methods.

As the potential savings from this system continued to grow, so did the possibility that Montana's data center would become the first in the US to deploy a KyotoCooling system. The only piece that remained was defining an airflow containment solution that would keep the heated air produced by high density servers completely isolated from the room being cooled. Not only was

“ You could solely use KyotoCooling in the data center, but if you don’t use CPI Passive Cooling as well, you’re missing 95% of the boat. ”

Mike Boyer, Enterprise System Project Manager,
State Information Technology Services Division (SITSD)

this proven to maximize the benefits of KyotoCooling, it would be a complete reversal of cooling practices in Montana’s legacy data center.

“The air handlers were maintained at 45°F (7.2°C), just above freezing, to maintain a temperature in the old data center close enough to get chilled air to some of the blade centers,” said Krings. “A couple of the servers were constantly giving alerts that they were over 80°F (26.7°C) ambient temperature.”

Searching for an airflow containment solution that would erase those kinds of inefficiencies and maximize energy savings potential, Krings called upon the man that had introduced him to KyotoCooling in the first place—CPI’s Ian Seaton. As an expert on CPI’s Passive Cooling Solutions, Seaton explained how Vertical Exhaust Ducts could integrate with KyotoCooling to provide superior equipment cooling performance and reduce data center cooling energy costs.

Said Seaton, “When I first saw something on KyotoCooling back in 2007, it looked like a solution that essentially depended on maintaining a good separation in the data center between cold and hot air streams. In subsequent conversations with Mees Lodder, former CEO for KyotoCooling, it became obvious that the remarkable economies available from his air-to-air

“ 80% more energy efficient, regarding kilowatt hours and consumption, as compared to other methods. ”

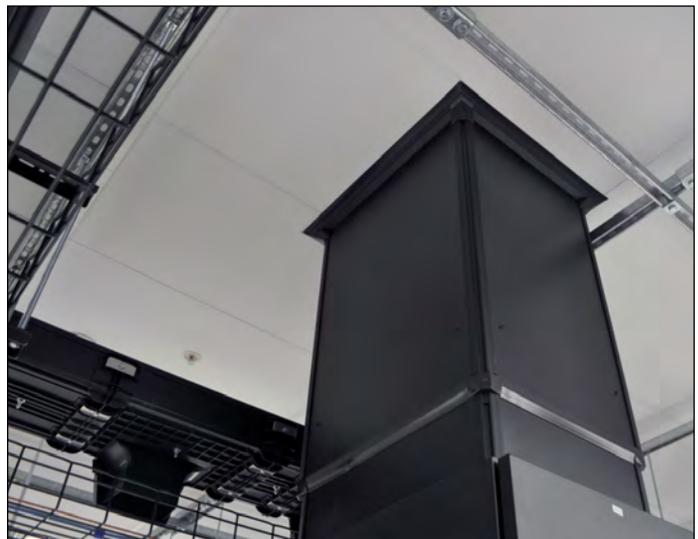
Joe Triem, Planning Manager,
State of Montana Architecture & Engineering Division

heat exchanger would be optimized by the degree of air separation we could provide with our cabinet’s Vertical Exhaust Duct solution. Basically, their solution provides the lowest possible data center cooling costs when the supply air is as high as possible without exceeding specified thresholds and the highest possible temperature differential is delivered across the wheel. CPI containment technology guarantees both of those conditions.”

Utilizing CPI’s F-Series TeraFrame Cabinet System with Vertical Exhaust Duct, the State of Montana data center was able to direct hot air out of the cabinets and into an isolated return path above the drop ceiling. Known as CPI Passive Cooling, this sustainable approach to data center cooling creates a total separation of hot return air from cool supply air inside the computer room through the use of a Vertical Exhaust Duct, which directs hot air into the overhead plenum without the use of fans or additional energy.

“You could solely use KyotoCooling in the data center, but if you don’t use CPI Passive Cooling as well, you’re missing 95 percent of the boat,” said Boyer. “You could do conventional cooling but you wouldn’t be taking advantage of our environmental situation—which KyotoCooling does.”

Triem also concluded that by using KyotoCooling, Montana’s data center would be “80 percent more energy efficient, regarding kilowatt hours and consumption, as compared to other methods.”



The Vertical Exhaust Duct on CPI’s F-Series TeraFrame Cabinet extends to the ceiling, ensuring that heated exhaust air from the servers is passively directed into the plenum space and isolated from the room.



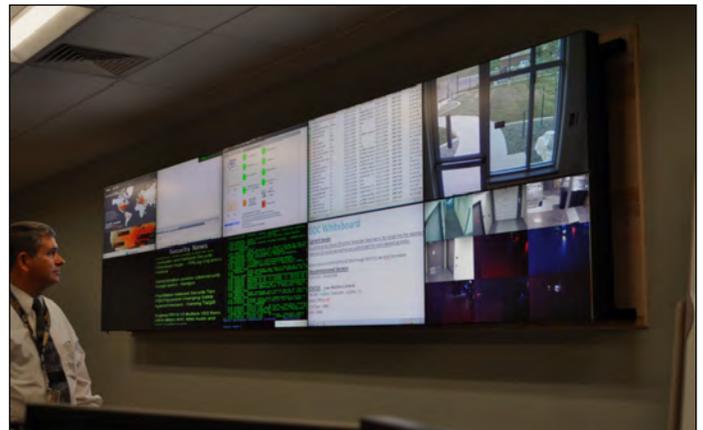
Flexible Security Updates

Although this new data center centralized IT operations for the State of Montana, it also created a unique security issue most commonly associated with colocation facilities. Numerous individuals representing approximately 150 governmental departments would all be hosted within the same data center, with each person performing different duties and needing varying cabinet access levels. This meant some individuals would need to be assigned access to specific cabinets or groups of cabinets within their departments, while others would need full access to all cabinets.

The State of Montana's new data center had an electronic locking system in place when it was finally completed in December 2010, but soon saw its security needs change as it became increasingly difficult to manage the varying cabinet access allowances and disallowances across each department. Hoping to add flexibility and speed to this process, the State of Montana turned to a customized version of CPI's networked Electronic Locking System. This upgrade supported individual user and group access permissions, event logging, audit trails, centralized administration, proximity card usage and custom group programming.

The State of Montana data center quickly transitioned to an increased level of security and convenience through the CPI Electronic Locking System, which provides network access. CPI's custom hardware and software upgrades, added system administration via HTTP access, a web interface and support for multi-frequency HID proximity card readers. This would allow access to be easily assigned to groups or individual cabinets, and group access can be assigned to specific cabinets. HID proximity card readers

on various cabinet rows also allow users to simultaneously unlock numerous cabinets in a single swipe, allowing immediate access to all the cabinets associated with their clearance protocol.



With all of Montana's government departments housed in the same data center, monitoring internal cabinet access and defending against external threats are a critical component of day-to-day operations.

“We’re running at a 1.08 PUE,” said Boyer. “In the old data center we were almost at 3.”

Mike Boyer, Enterprise System Project Manager,
State Information Technology Services Division (SITSD)

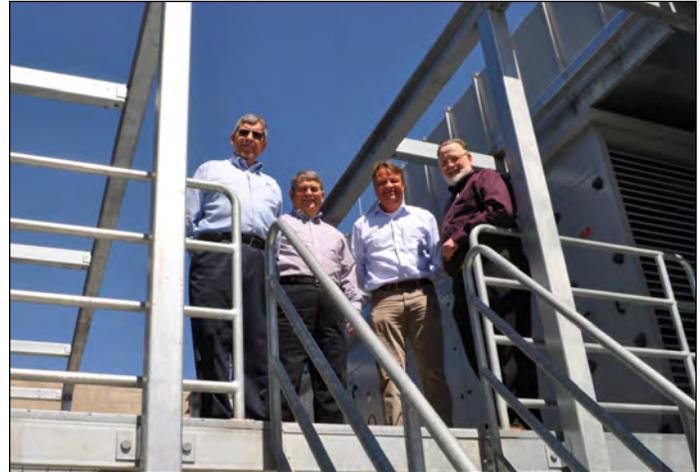
Conclusion

The pioneering spirit Montana was founded upon is still very much alive and well. Not only did the State of Montana make the bold choice of becoming the first US data center to use CPI Passive Cooling and KyotoCooling together, they were able to translate that daring vision of sustainability into huge savings.

"We're running at a 1.08 PUE," said Boyer. "In the old data center we were almost at 3."

Even more significant is the fact that cooling costs account for the largest percentage of a data center's controllable operating expenses. Many data center managers are given marching orders to reduce these costs, but the State of Montana took that need a step further by opting for a fresh approach that offered a greater potential for savings. That transition from potential savings to actual savings eventually sparked inspiration beyond Montana's border, as the Oregon-based colocation data center BendBroadband became the second US data center to deploy a combination of CPI Passive Cooling and KyotoCooling. Completed in 2011, BendBroadband is currently running a PUE of 1.2.

The State of Montana has clearly set a new standard for matching sustainability with innovation. Extending well beyond the original goal of building an energy-efficient, secure and reliable data center, Montana has proven that sustainable cooling solutions are more than just a path toward being the greenest data center. They are the path toward dramatically reduced energy usage and more importantly ... reduced cost. 



Pulled together through a truly collaborative effort, the State of Montana's new data center design was led by, pictured left to right: Dr. Robert "Bob" Sullivan, Mike Boyer, Mees Lodder and Mike Krings.

Read the BendBroadband case study at www.chatsworth.com

About Chatsworth Products

Chatsworth Products (CPI) is a global manufacturer providing voice, data and security products and service solutions that optimize, store and secure technology equipment. CPI Products offer innovation, configurability, quality and value with a breadth of integrated system components, covering virtually all physical layer needs. Unequalled customer service and technical support, as well as a global network of industry-leading distributors, assures customers that CPI is dedicated to delivering products and services designed to meet their needs. Headquartered in the US, CPI operates global offices within the US, Mexico, Canada, China, the Middle East and the United Kingdom. CPI's manufacturing facilities are located in the US, Asia and Europe.

CPI is listed with the General Services Administration (GSA) under Federal Supply Schedule IT 70. Products are also available through GSA Advantage and through Government Wide Acquisition Contracts (GWACs), including GSA Connections and NITAAC-ECS III. (www.chatsworth.com/gov)