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Case Study

Technology Company Saves $262K Annually

Modius® OpenData® provided continuous real-time data from data center infrastructure to discover inefficiencies, quantify savings, and justify budgets for energy conservation initiatives.

Company & Data Center Background

This California-based technology company knows the value of a proactive energy efficiency program to keep systems running at peak performance at the lowest possible operating cost. With over 4,000 employees in 60 countries around the world, this enterprise software and services company focuses on managing, analyzing and mobilizing information. The company's products are used in the most data-intensive industries across all systems, networks, and devices.

After completing a comprehensive energy audit, the company discovered that their data center N+1 cooling capacity was at risk based on the center's rapid growth. The company's management took action to optimize existing power and cooling resources and free up capacity to support more equipment in the existing space.

With the help of local utility company incentives and accurate monitoring of data center infrastructure using OpenData, this technology company is saving nearly 2.3 million kW of energy per year and has regained cooling capacity to meet current growth demands.

Cap Costs
$710,000

Utility Incentive
$130,000
(18% of Capital Cost)

CapEx Cost Savings
$1.35M

OpEx Cost Savings
$262,000/Year

Energy Savings
2.3M kW/Year

Simple Payback
2.2 Years

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Data Center at-a-Glance

- 16,000 Square-Feet, 440 Racks, 100 Cabinets
- Utility power via a dedicated 2,500kVA transformer 13kV/480VAC 3-phase to two redundant 500kVA uninterruptible power supplies (UPS)
- 2 x 1000kVA generators, 1 x 800kVA generator
- Three dedicated chillers: one centrifugal and two air-cooled screw chillers

Project Drivers

- N+1 cooling at risk due to brisk growth
- Extend existing power and cooling resources
- Reduce risk of mechanical cooling failure
- Reduce mechanical system stress
- Improve efficiency of power & cooling resources

Implemented Solutions

- Installed N+1 monitoring using OpenData
- Installed high-efficiency chiller & cooling tower
- Installed lighting controls
- Optimized chiller staging & cooling load management
- Installed variable frequency drives on CRAH units
- Sealed raised floor and optimized tile placement
- Installed partial (33%) air-side economizer with heat recovery

OpenData real-time monitoring allowed raising the chilled water temperature from 43°F to 52°F, which saved at least 15% of the chiller energy. The room temperature was also raised from 69°F to 74°F.

Assessment Process

The company had a strong track record of proactive energy efficiency efforts. To address the problem of dwindling cooling resources, management conducted an energy audit of its data center cooling system to determine best options for meeting increasing power demand and identify projects that could qualify for energy incentives from the local utility company. Utility incentives were a strong driver for the company's energy efficiency efforts as they helped make the projects more economically viable.

The cooling system utilized an N+1 monitoring scheme where one active component is always provided. The operational philosophy was to increase efficiencies instead of adding additional power and cooling capacity in part by utilizing this robust monitoring system.

Utility engineers studied the various energy consuming systems in the data center, installed recorders, and examined trend data. The company developed capital projects to enhance the system opportunities identified and coupled them with the incentive application from the utility for consideration by their management.

The company used data collected from the local utility's monitoring system to establish proof of concept and fine-tune the proposed energy reduction measures. The data from this monitoring system convinced the utility to provide incentives for the projects. Altogether, the energy audits identified cooling, air management, and lighting upgrades that qualified for utility incentives of $130,000, resulting in a simple payback of 2.2 years. Over several budget cycles, the company implemented the recommendations from the study as well as additional solutions that did not quite fit any of the incentive criteria.

Monitoring Capabilities

The company had two monitoring systems in an N+1 configuration: one traditional building automation system and the OpenData DCIM solution from Modius. Continuous monitoring and measurement are key components to the operational successes, including verifying ongoing system modifications. The OpenData system provides accurate, comprehensive, near real-time monitoring data for the data center, including all generators, switch gear, uninterruptible power supplies (UPS), power distribution units (PDU), computer room air handler (CRAH) units, and wireless sensors. The data is used to discover IT and facilities inefficiencies, quantify savings opportunities, justify budgets, and measure savings.

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Energy-Saving Measures

The table numbers below represent actual measured figures after projects were implemented at the company.

Nearly one-fifth of the capital cost was paid by utility incentives, reducing the effective payback period.

	Energy Savings (kW/Year)	Cost Savings ($/Year)	Capital Costs ($)	Simple Payback (years)
Cooling Plant				
Install High-Efficiency Load-Base Chiller	476,000	$54,000	$510,000	8.4
Implement Custom Control Program	75,000	$9,000	$6000	0.7
Air Management				
Install Variable Frequency Drives (VFD) on 20 CRAHs	866,000	$99,000	$123,000	0.8
Install Partial Air-Side Economizer	313,000	$36,000	$53,000	0.8
Seal Raised Floor	150,000	$17,000	$0	0
Relocate Perforated Tiles	112,000	$13,000	$0	0
Add Heat Recovery on Air-Side Economizer	65,000	$7,000	$1,000	0.1
Lighting				
Control Lights with 30-Minute Enabled Zones	238,000	$27,000	$17,000	0.6
	2,295,000	**$262,000**	**$710,000** ($130K Rebate)	**2.2** (with Rebates)

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Solutions Implemented

The company determined that the following eight energy saving measures were practical based on estimated implementation costs and payback periods.

Cooling Plant

- Installed a high-efficiency base-load chiller and cooling tower with variable frequency drive (VFD) fans and temperature/humidity (enthalpy) controls.
- Implemented controls to optimize chiller loading for various chiller run scenarios, as each chiller has different efficiency curves.

Air Management

- Installed VFDs on all 20 CRAH units and created four zones for pressure feedback control. Reduced fan power by 83% to remove the same heat.
- Installed enthalpy air-side economizer with air ducted into the space. Economizer also serves as emergency cooling system. Added heat recovery to the economizer to heat other spaces.
- Sealed raised floor penetrations, cable ways, conduits, equipment stands, and ramp skirts; sealed unused cut-outs inside the CRAH units to stop most bypass air.
- Relocated perforated tiles where needed or replaced with solid tiles since "closed" adjustable tiles leak about 35 cubic feet per minute.
- Adjusted tile dampers to match rack airflow requirements. Installed flow diverters on the discharge side of racks with the highest airflow or temperature, reducing impact on the next lineup's intake temperatures (back-to-front line up arrangement).

Lighting

- Eliminated unnecessary lighting by using the building management system to control lights from local switches with a 30-minute countdown.

Assessment Results Confirmed by the OpenData Real-time Data Collection Capabilities

After implementing the energy-saving measures, the company's data center managers used OpenData's real-time data collection and analytic capabilities to confirm the accuracy of the savings estimates provided by the local utility. Comparing measurements taken in the original assessment with results after implementation of the projects, the company found that the projects the company yielded the expected energy savings.

Baselining the current state of your data center is a first step to identify potential energy savings and reduce environmental emissions. OpenData provides an accurate baseline of energy use and the ability to accurately measure projected and actual results from implementing specific energy saving projects. Using the utility's assessment tools, the company estimated power usage effectiveness (PUE) of 1.35 for a data center infrastructure efficiency (DCiE) of 74%, using OpenData, the actual measured PUE is 1.41 (DCiE of 71%).

The company also uses OpenData's infrastructure monitoring capabilities to improve Mean time to Detect (MTTD) and Mean time to Repair (MTTR) metrics in the data center.

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