Sybase Results

Cost Savings	**$262,000/year**
Energy Savings	**2,295,000 kW/year**
Capital Costs	**$710,000**
Utility Incentive	**$130,000** *(18% of capital cost)*
Data Center Infrastructure Efficiency (DCiE)	**71%**
Simple Payback	**2.2 years**

Database Technology Company Saves $262,000 Annually

DOE DC Pro Tools Provide Accurate Estimates of Energy Savings; Utility Incentives Lead to Quicker Payback

Company and Data Center Background

Energy managers at Sybase, Inc.'s Dublin, California, database technology center know the value of a proactive energy efficiency program to keep systems running efficiently. A major enterprise software and services company that employs 4,000 people in 60 countries around the world, Sybase focuses exclusively on managing, analyzing, and mobilizing information. The company's products are used in the most data-intensive industries across all systems, networks, and devices.

In 2005, Sybase conducted an energy audit that revealed that their data center N+1 cooling capacity was at risk due to the center's rapid growth. The company's energy managers took action to optimize existing power and cooling resources and free up capacity. With the help of local utility company incentives, Sybase is saving nearly 2.3 million kWh of energy per year and has regained cooling capacity to meet growth demands. After the assessment, Sybase applied the U.S. Department of Energy's (DOE) DC Pro software tools and determined that the potential energy savings estimates provided by the tools closely matched the company's realized savings.

Project Drivers

- N+1 cooling at risk due to brisk growth
- Extend existing power and cooling resources to delay infrastructure investments
- Reduce risk of mechanical cooling failure
- Reduce mechanical system stress
- Improve efficiency of Sybase data centers

Assessment Process

Sybase has a strong track record of proactive energy efficiency efforts. In 2005, the company conducted an energy audit of its database technology center cooling system to determine best options for meeting increasing power demand and identify projects that could qualify for energy incentives from Pacific Gas and Electric (PG&E). Utility incentives were a strong driver for Sybase's energy efficiency efforts as they helped make the projects 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.

Data Center At-a-Glance

- 16,000-square-feet, 440 racks, and 100 cabinets
- Utility power via a dedicated 2,500kVA transformer 13kV/480VAC 3 phase to two redundant 500kVA uninterruptible power supply (UPS)
- Two 1,000kVA generators plus one 800kVA generator
- Three dedicated chillers: one centrifugal with tower and two air-cooled screw chillers

PG&E engineers studied the various energy-consuming systems at Sybase, installed recorders, and examined trend data. Sybase developed capital projects to enhance the identified system opportunities and coupled them with the incentive application from the utility for consideration by their management.

Sybase used data collected from their monitoring system to establish proof of concept and fine-tune the proposed energy-reduction measures. The data from their test equipment helped convince PG&E 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, Sybase implemented the recommendations from the study as well as additional solutions that did not quite fit any of the incentive criteria.

Monitoring Capabilities

Sybase has two monitoring systems in an N+1 configuration: one traditional building automation system and one Data Center Information Manager (DCiM™). Continuous monitoring and measurement are a key component to the operational successes, including verifying ongoing system modifications. The DCiM 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 information technology (IT) and facilities inefficiencies, quantify savings opportunities, justify budgets, and measure savings.
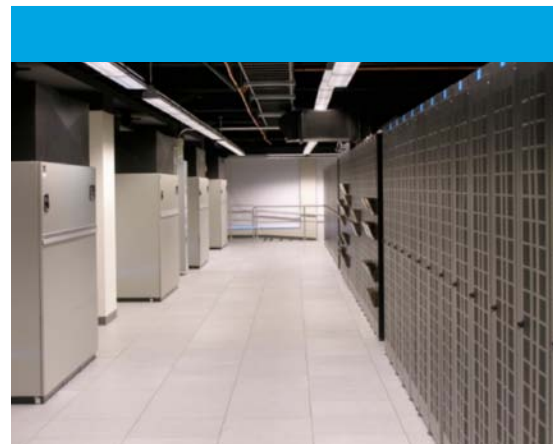
The Sybase data center in Dublin, California, is a physically well-organized and energy-efficient environment. Implemented cooling plant and air management measures at Sybase allowed raising the chilled water temperature from 43°F to 52°F, which saved at least 15% of the chiller energy. The room temperature was also raised from 69°F to 74°F.

Energy-Saving Measures

The table numbers below represent actual measured figures after projects were implemented at Sybase. Nearly one-fifth of the capital cost was paid by utility incentives, reducing the effective payback period.

Measure	Energy Savings (kWh/year)	Cost Savings ($/year)	Capital Cost ($)	Simple Payback (years)
Cooling Plant				
• Install high-efficiency base-load chiller	476,000	$54,000	$510,000 (rebate $54,000)	8.4
• Implement custom control program	75,000	$9,000	$6,000	0.7
Air Management				
• Relocate perforated tiles	112,000	$13,000	$0	0
• Seal raised floor	150,000	$17,000	$0	0
• Install variable frequency drives (VFD) on 20 CRAHs	866,000	$99,000	$123,000 (rebate $52,000)	0.8
• Install partial air-side economizer	313,000	$36,000	$53,000 (rebate $24,000)	0.8
• Add heat recovery to 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
Total for all measures	2,295,000	$262,000	$710,000 (rebate $130,000)	2.2 (with rebates)

Solutions Implemented

Sybase 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 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

- **Relocated perforated tiles** to 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.
- **Sealed raised floor** penetrations, cable ways, conduits, equipment stands, and ramp skirts; sealed unused cut-outs inside the CRAH units to stop most by-pass air.
- **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 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 lineup arrangement).
- **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.
- **Pending key measure**: install blanking panels inside racks.

Lighting

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

Save Energy Now in Your Data Center

Visit the Save Energy Now Data Centers Web site to:

- Download free tools for assessing data center energy use, including:
  - DC Pro Profiling Tool
  - Air-Management Tool
  - Electrical Systems Tool
  - Assessment guidelines, master list of actions, and report template.

- Sign up for e-mail updates.

- Learn more about DOE partnerships and activities focused on reducing data center energy use.

www.eere.energy.gov/datacenters

Assessment Results Confirm Accuracy of DOE DC Pro Tools

After implementing the energy-saving measures, Sybase energy managers applied DOE's DC Pro software tools to confirm the accuracy of the savings estimates provided by the tools. Comparing measurements taken in the 2005 assessment with results after implementation of the projects, Sybase found that the projects yielded the expected energy savings.

- The high-level DC Pro Profiling Tool is a first step to identify potential energy savings and reduce environmental emissions. The tool provides an overview of energy use, savings potential, and a list of specific actions companies can take to realize savings. At Sybase, using the Profiling Tool with current data resulted in an estimated power usage effectiveness (PUE) of 1.35 for a DCiE of 74%. The actual measured PUE is 1.41 (DCiE=71%).

- Using DOE's DC Pro Air-Management Tool with pre-existing conditions resulted in the same recommended measures as Sybase implemented or is planning to implement. The tool also estimated the percentage of energy savings for fans and chillers within a couple of percentage points from the actual measured savings. The data center was over-ventilated by almost 130% prior to the retrofit but has now been reduced to 30%.