

Lucasfilm

DOE Assessment Evaluates Energy Performance of Film and Entertainment Company Data Center

Company and Data Center Background

Lucasfilm Ltd., the production company responsible for award-winning movies such as “Star Wars” and “Indiana Jones,” has been at the forefront of technology since its inception in 1971. Today, the company is setting new standards for sustainability through its headquarters building, the Letterman Digital Arts Center, which is located at the Presidio of San Francisco National Park in California. The 23-acre center houses several divisions of Lucasfilm—one of the largest computer networks in the entertainment industry.

In 2007, the company participated in a U.S. Department of Energy (DOE) Industrial Technologies Program energy assessment to examine the energy performance of its data center. The assessment was conducted through Save Energy Now, a national initiative to drive a 25% reduction in industrial energy intensity in 10 years.

Populated with high-end servers, the Lucasfilm data center is critical to delivering large volumes of data and high-resolution images to the desktops of visual effects artists, game developers, and motion picture directors. While the company had already incorporated many best practices prior to the assessment, Lucasfilm looked to DOE to identify new ways to save energy and improve efficiency by focusing on the most energy-intensive features of the data center.

Assessment Process

After a walk-through of the facility, Lucasfilm and the DOE assessment team determined a list of efficiency measures to be examined. Energy use data was identified and subsequently collected over several weeks through a combined effort that involved: examining electric bills; gathering data from an existing building management system; logging electric values from uninterruptible power supply (UPS) and power distribution unit (PDU) devices; and field measurements by the DOE team.

The Lucasfilm data center performance was also benchmarked using information collected from other data centers that DOE has evaluated. The team identified 15 ways the company could save energy, which were narrowed down to seven measures that were deemed practical based on estimated implementation costs and payback periods.

| | |
|----------------------|----------------------|
| Cost Savings | \$343,000 |
| Energy Savings | 3,109,200 kWh |
| Implementation Costs | \$429,500 |
| Payback | 1.2 Years |

Data Center At-a-Glance

- 13,500-square-feet
- Houses a render farm (cluster of computers that work around the clock to process digital images), file servers, and storage systems
- More than 4,300 AMD processors
- Utilizes standard constant speed computer room air conditioners
- Cooled by a central chilled water plant serving all the Lucasfilm buildings
- Receives back-up power through UPS systems
- Minimal use of outside air for cooling

Project Drivers

- Improve data center energy efficiency.
- Identify short-term cost and energy savings opportunities.
- Meet sustainability goals to preserve and enhance the Presidio National Historic Landmark District.
- Develop data center assessment protocols and tools that can be applied industry-wide.

Recommended Solutions

- Remove redundant UPS systems
- Turn servers off during downtime
- Stage chillers to maintain high load factor
- Operate UPS in switched by-pass mode
- Improve air flow
- Implement water-side economizer
- Install lighting controls



Assessment Recommendations

The following seven measures were identified during the Lucasfilm data center assessment and deemed practical based on estimated implementation costs and payback periods.

| Measure | kWh/year | Cost Savings/year | Capital Cost (\$) | Simple Payback (years) |
|---|------------------|-------------------|-------------------|------------------------|
| Remove redundant rack mounted UPS | 109,500 | \$12,000 | \$0 | immediate |
| Turn servers off during downtime/power management | 273,800 | \$30,000 | \$10,000 | 0.3 |
| Stage chillers to maintain high load factor | 92,800 | \$10,000 | \$4,000 | 0.4 |
| Operate UPS in switched by-pass mode | 887,300 | \$98,000 | \$100,000 | 1.0 |
| Improve airflow | 806,700 | \$89,000 | \$113,000 | 1.3 |
| Implement water-side economizer | 928,600 | \$103,000 | \$200,000 | 1.9 |
| Install lighting controls | 10,500 | \$1,000 | \$2,500 | 2.1 |
| Total for all measures | 3,109,200 | \$343,000 | \$429,500 | 1.2 |

Remove redundant rack mounted UPS systems that impose an additional energy burden, take up rack space, and are useful only if the main UPS system fails to provide backup during a power outage.

Turn servers off in between major movie projects when computation loads are significantly reduced.

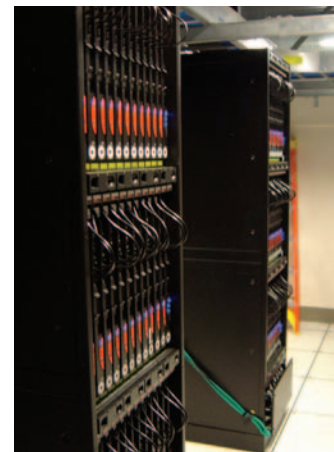
Stage chillers to maintain high load factor by programming the control system to delay staging additional chillers (during periods of increasing load) until the chillers running at the time reach a higher load factor. This will help ensure that the chillers operate at the highest efficiency possible.

Operate UPS in switched by-pass mode to avoid the conversion losses of going from AC to DC and back to AC. Reconfigure the UPS with an automatically switched by-pass to save energy.

Improve air flow by isolating hot and cold air flow within the center, enabling the cooling system to work more efficiently.

Implement water-side economizer to capture water produced by cooling towers during periods of low wetbulb temperature (often at night), eliminating a portion of the load from the chillers and potential points of failure inherent in chilled water systems.

Install lighting controls to save both the electricity consumed by lights, which are left on even when the data center is unoccupied, and the HVAC required to offset the heat produced by the lights.



Since the Lucasfilm data center had areas with racks of high-heat intensity servers, the DOE assessment team recommended better isolation of cold and hot air streams.

Save Energy Now in Your Data Center

Visit the Save Energy Now Data Centers Web site to:

- Learn more about the National Data Center Energy Efficiency Information Program
- Sign up for e-mail updates
- Download the Data Center Energy Profiler (DC Pro) online software tool designed to help companies quickly diagnose how energy is being used by their data centers and ways to save energy and money.

www.eere.energy.gov/datacenters

Public-Private Partnership

The U.S. Department of Energy's (DOE) Industrial Technologies Program cosponsored the assessment at Lucasfilm to assist in development of industry assessment protocols and tools. Through the Save Energy Now initiative, DOE promotes data center energy efficiency assessments that will lead to improvements in data center efficiency, reliability, and global competitiveness, while reducing environmental impact.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

For additional information, please contact:
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