



Multiple computer lab retrofit yields big energy savings

The Opportunity

Our Fortune 500 tech client was looking for energy optimization and efficiency improvements at its large, multiple-build tech campus in the temperate climate of Silicon Valley. Conventional options were considered, but none could provide a high-performance, cost-effective solution for its existing HVAC systems and operations in a way that didn't disrupt data center or computer lab operations. In contrast, CLEAResult's Design Build Solutions team was able to rise to the occasion and meet the challenge. We worked with the client to design and implement a solution that delivered on cost, performance, and uptime requirements.

The Project

We analyzed energy use for the entire tech campus of over 30 separate buildings, identifying ten candidate buildings for central chilled water plant optimization. Using detailed, disaggregated trend data, we determined the cooling system's baseline energy performance and designed a custom retrofit solution bundle to significantly reduce annual electricity consumption, featuring:

- ✓ An integrated water-side economizer, designed by CLEAResult to maximize free cooling hours with seamless, automatic operation (including a 1,000-ton plate and frame heat exchanger)
- ✓ Modifications to the 1,500-ton chiller plant, including adding chilled water and condenser water piping headers to the heat exchanger and adding flow and energy metering
- ✓ Conversion of the primary-secondary pumping design to variable primary using existing pumps and drives
- ✓ A cooling tower sequence of operation (SOO) redesign to optimize free cooling hours
- ✓ A full redesign and reprogram of the chiller plant control sequence
- ✓ Analysis of optimized plant performance trends and real-time display from a BAS front-end energy dashboard
- ✓ Upgraded hardware control for chillers and plant controller for improved reliability and access to data points

Our project analysis and development results were so compelling that funding for 5 of the top 10 candidates was approved. Detailed design development, permitting, installation, commissioning, and post-installation energy dashboard setup were all accomplished on an aggressive, concurrent seven-month schedule.

Project by the numbers

\$1.1M

annual energy cost savings

\$1.2M

utility incentive received

10.5M kWh

annual energy savings

3 Years

simple payback period

0.45 kW/ton

annualized chiller performance

41%

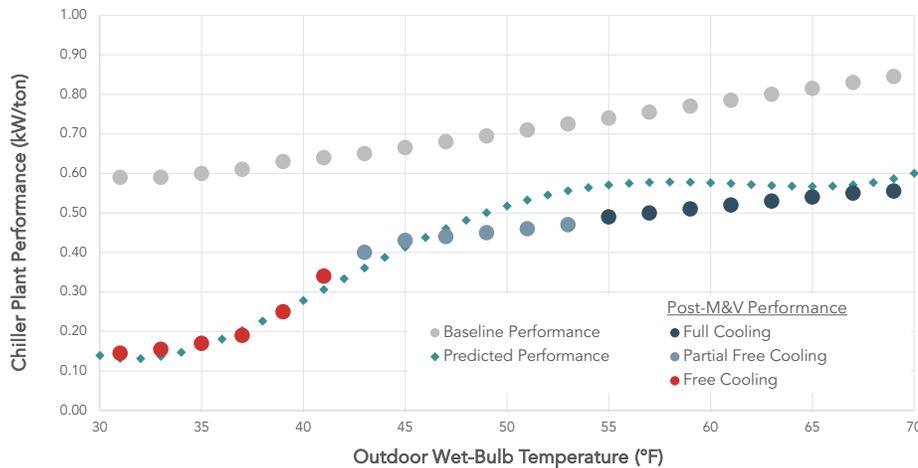
reduction of chiller plant annual energy use



The aggressive solution bundle and project schedule required tight coordination to ensure financial and functional success without central system interruption. Key project elements included:

- ✔ Close observation of equipment orders in order to manage manufacturer and delivery lead times.
- ✔ A hybrid mechanical installation approach that involved a shop-built heat exchanger and interconnected piping skids for all five buildings, along with site-constructed conversion with hot taps and line stops from primary-secondary to variable primary distribution without any interruption to cooling delivery.
- ✔ Coordination of crane lifts for prefabricated skids and heat exchangers.
- ✔ Redesign of cooling tower and heat exchanger control sequence of operation, with pre-functional bench testing during mechanical installation.
- ✔ On the fly repair and maintenance of existing systems, coordinated with the site operations team to allow the existing system to work with and accept the new system components and operating logic.
- ✔ Carefully choreographed switch-over to new system that was 100 percent effective at keeping all systems running

CLEAResult water-side economizer performance Chiller plant (kW/ton) vs. Outdoor wetbulb (°f)



Our enhanced commissioning process delivered better than predicted performance in the 45° - 55° F wet bulb range.

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