

SHOWCASE PROJECT: PENN STATE: COMPUTER BUILDING UPGRADES

SOLUTION OVERVIEW

Built in 1964 and located on the main campus of Penn State University, the Computer Building is a two-story computer facility and data center with a partial penthouse and basement. It is a mixed-use facility supporting both enterprise and research needs. Virtual migrations and network resources have been consolidated in the building, which also houses the campus collocation facility. All high-performance computing has been relocated to another facility.

The building is a concrete structure with brick facades and a flat built-up roof. The structure had a large addition built to its south facade in 1971 and a recent addition to its west facade in 2008. The second floor houses office space and a new generator room in the west addition. The first floor includes offices in the original section, a large server room in the 1971 addition, and generator equipment in the 2008 section. Most of the office space was remodeled during the 2008 renovation and addition. The penthouse contains mechanical space.

SECTOR TYPE

Education

LOCATION

State College, Pennsylvania

PROJECT SIZE

65,000 Square Feet

FINANCIAL OVERVIEW

\$600,000

SOLUTIONS

The Computer Building was selected for energy upgrades due to the known potential savings within the facility. Prior to the energy project, the facility's EUI of 671 was the fourth highest on campus. Once a thorough energy audit was completed on seven buildings, the Computer Building project was specifically targeted because of its projected payback period of just 5.1 years. Due to conservative energy savings assumptions related to the CRAC isolation dampers, air flow management, and the removal of equipment in the facility, the project realized a 3.8-year payback post construction.

The following energy conservation measures were implemented at the Computer Building:

Savings Measure	Cost	Projected Annual Energy Savings	Notes
5 CHW Valve Replacement's with Pressure Independent Control Valves (PICVs)	\$12,600	\$7,200	Installation of 5 Belimo pressure independent control valves allows for a steady heat transfer rate. It guarantee's ?T to be 12 degrees. Realizing annual energy savings of 56,660 kWh and 16,113 ton hr of chilled water.
5 CRAC Installations	Wrapped into larger scope, cannot extrapolate	\$8,594	Installation of backdraft dampers on the computer room air condition (CRAC) units. These units provide backup cooling should the primary air handling units (AHUs) fail. Since the units are typically not in use, it provided a path for the raised floor supply plenum air to short circuit to the return air ceiling plenum. Realizing annual energy savings of 133,241 kWh.
ESS Program Update	Wrapped into controls bid, cannot extrapolate	\$7,394	Programmed an Energy Saver System (ESS) mode into the existing uninterruptable power supply (UPS) 5 and 6 to save electricity. Yielding annual energy savings of 114,632 kWh.
Cold Aisle Containment	\$196,000	\$86,648	Air flow mgmt. Installation of a ridged paneling and door system to isolate hot aisles from cold aisles, which prevents airflow recirculation in the data hall. Realizing annual energy savings of 1,343,386 kWh.
Enable economizing on RTU's (Cooling UPS room)	\$2,100	\$3,800	It was discovered that the existing roof top units (RTU) were capable of having air economizers, which were never enabled. The project enabled air-side economizers on the RTUs. Updating the RTUs is resulting in annual energy savings of 58,915 kWh.
Battery Room Overcooling	Wrapped in with larger scope, cannot extrapolate	\$2,254	Installation of 2 large VAV boxes, hydrogen sensors, controls and branch ducts to serve the battery room zone. Originally this zone was constant volume fed by AHU's conditioning the server room that ran 24/7, resulting in the battery room being historically overcooled. Annual energy savings are 34,940 kWh.
Decommissioning of Humidifiers	\$100	\$934	Decommissioned two steam humidifiers that were not needed for the application. Estimated annual energy savings are 76

			MMBtu of steam and 50 kGal of water
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OTHER BENEFITS

With the Computer Building projecting a short payback period of just 5.1 years, Penn State's team decided to incorporate energy saving measures in four other buildings under the same project for a combined total projected payback of 5.7 years. The four other buildings were the Buckhout Building, Davey Laboratory, Ritenour Building and the Althouse Laboratory. These buildings have mixed uses and consist of high-use laboratories, research space, office space and general classrooms. Many of the ECM's implemented on the project also reduce operating and maintenance costs and enhance comfort within the facilities.

Annual Energy Use

(Source EUI)

Baseline(2016)



Actual(2018)



Energy Savings

20%

Annual Energy Cost

Baseline(2016)



Actual(2018)



Cost Savings

\$214,000



Computer Building Facade



Cold Aisle



CRAC Backdraft Damper



Chilled Water Analysis