

About the Project

Denver Water is committed to maximizing energy savings in its buildings and is focused on the potential energy related benefits from integrating advanced lighting systems with HVAC systems.

The 35-acre Denver Water campus is home to nine buildings—seven of which are newly constructed. Completed in late 2019, the certified LEED Platinum Administration building was designed with peak energy efficiency in mind. It includes a networked lighting control system that is building automation and control networks (BACnet)- integrated with the building automation system and shares real-time status of the networked occupancy sensors located in nearly all spaces of the building.

The Administration building was only used under normal operating conditions for a short time before operations and occupancy of the building were adjusted due to the COVID-19 pandemic in March 2020.

Project Goals

The project's driving force was a desire for energy savings. The Denver Water Administration building project represented an opportunity to further the agency's ongoing environmental stewardship mission by achieving the most energy efficient campus possible.

With support from its board, the agency wanted its Administration building to achieve net-zero carbon emissions. A primary goal was to use the new lighting system to implement energy-saving temperature setbacks in unoccupied spaces through integration with the building's HVAC system. This would complement the energy offset already being offered by the building's three solar arrays.



Denver Water Administration Building

PROJECT QUICK FACTS

- ▶ Denver Water is Colorado's oldest and largest water utility. The agency serves 1.5 million customers and is funded by water rates and new tap fees.
- ▶ Denver Water partnered with Xcel Energy and IMEG (design), Ambient Energy (commissioning and rebate assistance), and Mortenson Construction (project management) to deploy Osram Encelium in its Administration building.

KEY STRATEGIES AND OUTCOMES

- ▶ Denver Water employed the following **lighting and integration strategies**:
 - ▶ Advanced lighting controls, integrated with building automation systems
 - ▶ Lighting system occupancy sensors integrated with HVAC controls
- ▶ Advanced lighting and integration strategies led to the following energy savings **outcomes**:
 - ▶ Estimated annual energy savings of 25,000 to 50,000 kWh

Lighting and Integration Strategies

After reviewing lighting management options, the design team and Denver Water selected Osram's Encelium, a lighting management system with **advanced lighting controls**, intuitive dashboard, and intelligent data visualization. **Light sensors** were integrated with the building automation system using BACnet.

This allowed the building, which is mostly radiant heated and cooled with a dedicated outdoor air system, to have different temperature setpoints for occupied vs unoccupied spaces—76° F/85° F for cooling and 70° F/60° F for heating. This occupancy-based setback measure further increases the system efficiency of the district heating and cooling plant serving the Administration building.

The variable air volume (VAV) systems in the building's electrical rooms were not included as part of the integration strategy.

Outcomes

For Denver Water, much of the benefit of its new integrated system has not yet been officially measured due to the timing of operational impact from the COVID-19 pandemic. Shortly after moving into the new building, the agency transitioned to hybrid operations. Building occupancy was decreased and has since remained in flux.

However, based on design documents, efficiency studies, and energy modeling by project partner Integral Group, the integrated strategies are anticipated to result in an additional 2 – 4 percent efficiency compared to non-integrated controls. This would translate to additional savings of 25,000 to 50,000 kWh per year.

“The system upgrades are operating well, and we have very good buy-in from leadership and board members.”

– Adam Hutchinson, Denver Water

From here, the agency is creating a facilities committee to include representatives from operations and maintenance, engineering,

construction and electrical shops, asset management, and sustainability. The group will explore continuous improvement opportunities and a new model for managing maintenance work that does not link directly to processing activities, including for lighting and other systems.

Lessons Learned

One of the challenges that emerged following the project related to an issue with sub-metering. It was a challenging six-month process for Hutchinson and the team to determine how to access the meter data, which provided a couple key takeaways:

- ▶ **INCLUDE KEY STAKEHOLDERS IN INITIAL CONVERSATIONS.** When the project started, the sustainability/energy management roles did not exist; however, their design input at the outset of the project would have been ideal. The agency is building another treatment plant now and Hutchinson is pushing for a useful metering approach up front with the project designers.
- ▶ **INTEGRATE METERING IN THE PROJECT DESIGN.** Metering was part of the project's electrical system setup, with power meters added in at the end. Hutchinson believes it would have been better to fully integrate sub-metering from the start for a more streamlined outcome.

Beyond submetering, the team gained some additional wisdom from reviewing the project and its outcomes:

- ▶ **DEFINE SYSTEM OWNERSHIP UP FRONT.** There has been discussion about who should have ownership over the systems, including whose budget its installation and upkeep should come from, and who will be the administrator. It is best to define all of this before project start.
- ▶ **IMPLEMENT ENTERPRISE ENERGY CONTROLS VIEWING SOFTWARE.** Looking back, the team would like to have an overarching software that would provide a comprehensive view of building energy use across systems. Currently, a separate software system must be used to look at lighting energy use and compare it side by side with HVAC energy use to determine building performance.

About the ILC

The Integrated Lighting Campaign (ILC) is a program designed to help facility owners and managers take advantage of savings opportunities and benefits of advanced lighting controls and of integrating lighting systems with other building or business systems in their facilities. The ILC serves as a resource for relevant research regarding new advanced lighting controls and integrated lighting systems and provides a platform to recognize exemplary projects shared by ILC participants and supporters.



To learn more and join, visit

<https://integratedlightingcampaign.energy.gov>

To learn about Better Buildings Technology Campaigns and join, visit

<https://betterbuildingsolutioncenter.energy.gov/alliance/tech-campaigns>

ILC Organizing Partners

This effort is a collaboration between the DesignLights Consortium® (DLC), Illuminating Engineering Society (IES), the International Facility Management Association (IFMA), interNational Association of Lighting Management Companies (NALMCO), the Lighting Controls Association (LCA), U.S. General Services Administration (GSA), and the U.S. Department of Energy.

