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by COPELAND

Enhancing HVAC Energy Efficiency with Door/Window Switch Sensors in Student Housing Accommodations

Overview

Student housing frequently encounters substantial energy inefficiencies driven by the unpredictable and transient behavior of its residents. Doors and windows are often left open while HVAC systems continue to run, leading to unnecessary energy waste, higher utility costs, and increased wear on equipment. These issues create significant challenges for property managers aiming to balance operational budgets and sustainability goals.

At **California State University, Sacramento** (**CSUS**), Verdant's smart energy management solution addressed these challenges by integrating door and window switch sensors with HVAC systems. This technology automatically pauses HVAC operation when doors or windows are open. The success of this integration at CSUS highlights the significant benefits of this approach, providing valuable insights for other student housing facilities facing similar energy challenges.

The Problem:

Wasted Energy from Open Doors and Windows

When doors or windows are left open, HVAC systems work harder to maintain indoor temperatures, resulting in:

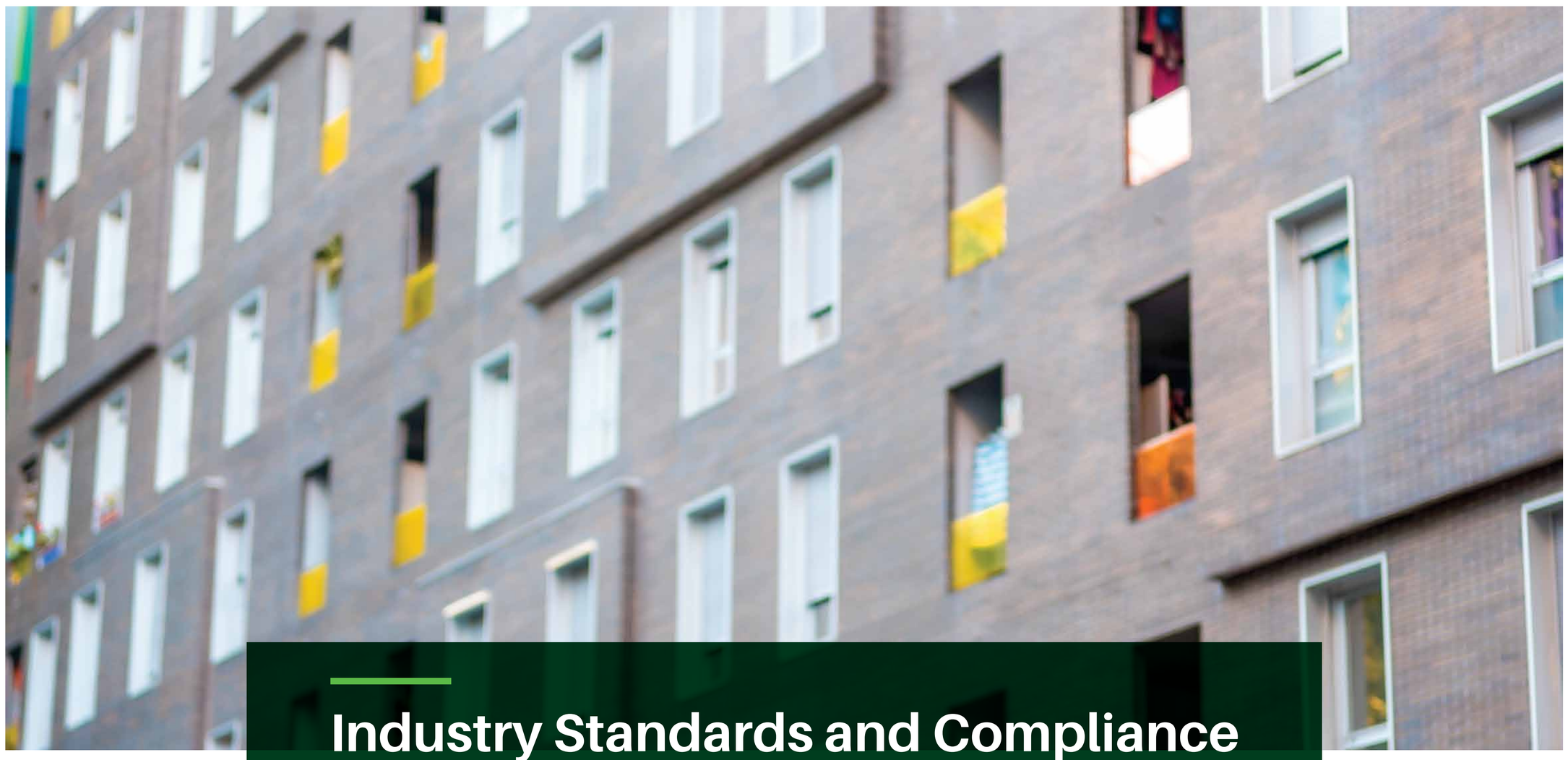
- **Higher energy costs**
- **HVAC equipment strain**
- **Unnecessary energy consumption**

The Solution:

Verdant's Door/Window Switch Sensors

Integrating door and window switch sensors with HVAC systems offers an automated energy management solution for student housing. These sensors detect open doors or windows and pause HVAC operation until they are closed, providing the following benefits:

- **Smart HVAC control and centralized management**
- **Portfolio-level monitoring, alerts, and configurations**
- **Access runtime data and reports through an online portal**

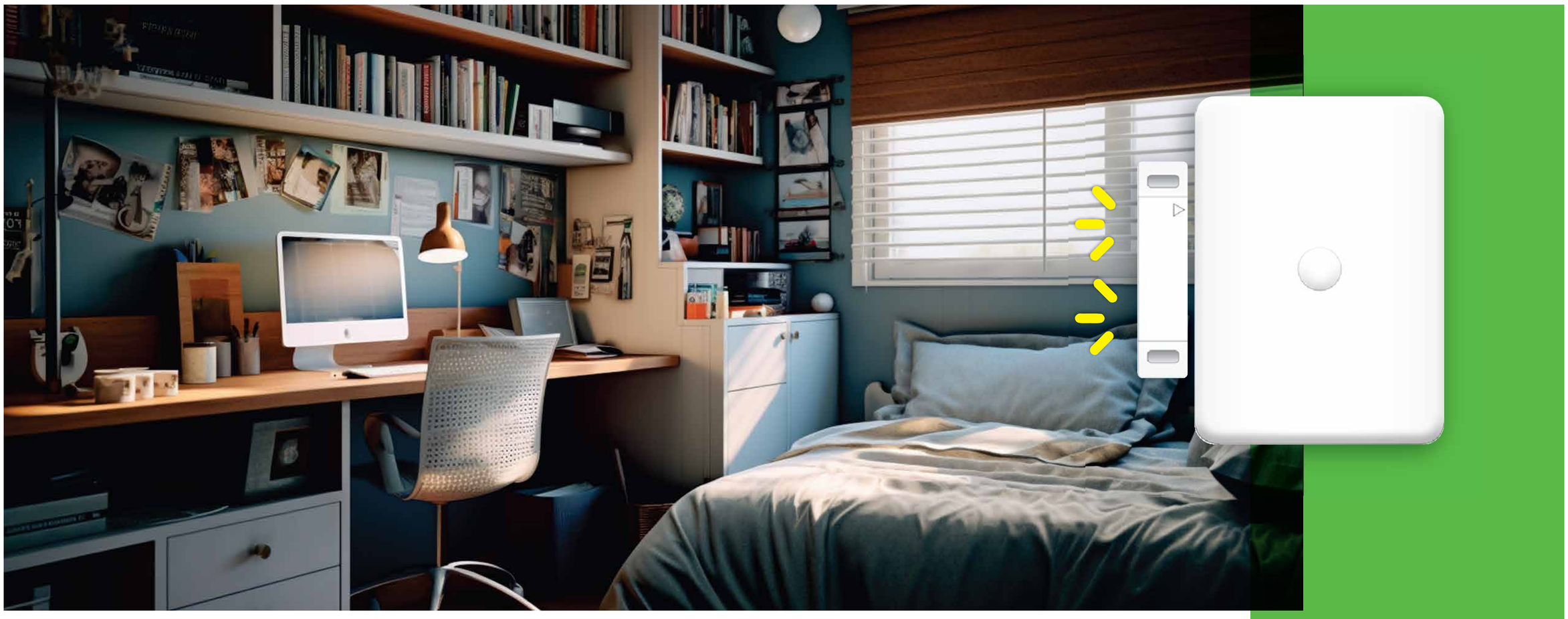


Industry Standards and Compliance

Ensuring compliance with industry standards is essential for maximizing efficiency. Door and window sensors are crucial in achieving these standards, offering significant value to property owners.

- **ASHRAE 90.1**: Aligns with provisions for automatic controls to reduce HVAC operation when outdoor air infiltrates via open doors/windows.
- **LEED Certification**: Supports criteria for energy performance optimization under LEED Building Operations and Maintenance standards.

What are Door/Window Switches?



Door/window switches are sensor-based devices that detect whether a door or window is open or closed. They typically use magnetic contacts or mechanical triggers. When a door or window opens or closes, the switch changes its state and sends a signal to connected systems.

How They Work:

- Detection: The sensor detects when the door or window is open or closed.
- HVAC Adjustment: The system automatically disables or reduces HVAC operation when the door or window is open for a specified duration.
- Resumption: HVAC resumes normal operation once the door or window is closed.

Automated HVAC Control:

- Switch/Sensor Open: HVAC operation is temporarily paused or set back to prevent energy loss.
- Switch/Sensor Closed: Normal HVAC operation resumes.

Seamless Integration:

- Door switches communicate with thermostats or building management systems, triggering actions in real time without manual intervention.

Energy Efficiency:

- Prevents unnecessary heating or cooling when doors or windows are left open, especially in rooms with external-facing doors like student housing units.

Success Story:
Case Study of CSUS

About CSUS

California State University, Sacramento (CSUS) is a public university located in California's state capital. Known for its vibrant campus and innovative approach, Sacramento State combines academic excellence with a strong commitment to sustainability.

The university's student housing facilities, which house thousands of students, present unique challenges in energy management. With a focus on improving efficiency, CSUS sought out smart solutions to enhance comfort and reduce energy waste across its housing units.

The Challenges

Student housing at CSUS faced several energy efficiency challenges due to inconsistent resident behavior:

- **Energy Waste:** HVAC systems continued running while doors and windows were left open, leading to unnecessary energy consumption.
- **Rising Operational Costs:** The constant energy waste resulted in inflated utility bills.
- **Strained Equipment:** HVAC systems worked harder to compensate for temperature loss, leading to premature wear and higher maintenance costs.
- **Inconsistent Behavior:** The transient nature of student living made manual energy management unreliable and inefficient.

The Solution

Smart door/window switches were integrated with the HVAC system as part of Verdant's energy management solution to address these challenges.

Door/Window Switch Integration:

- Sensors were installed on doors and windows in student rooms to detect when they were open or closed.

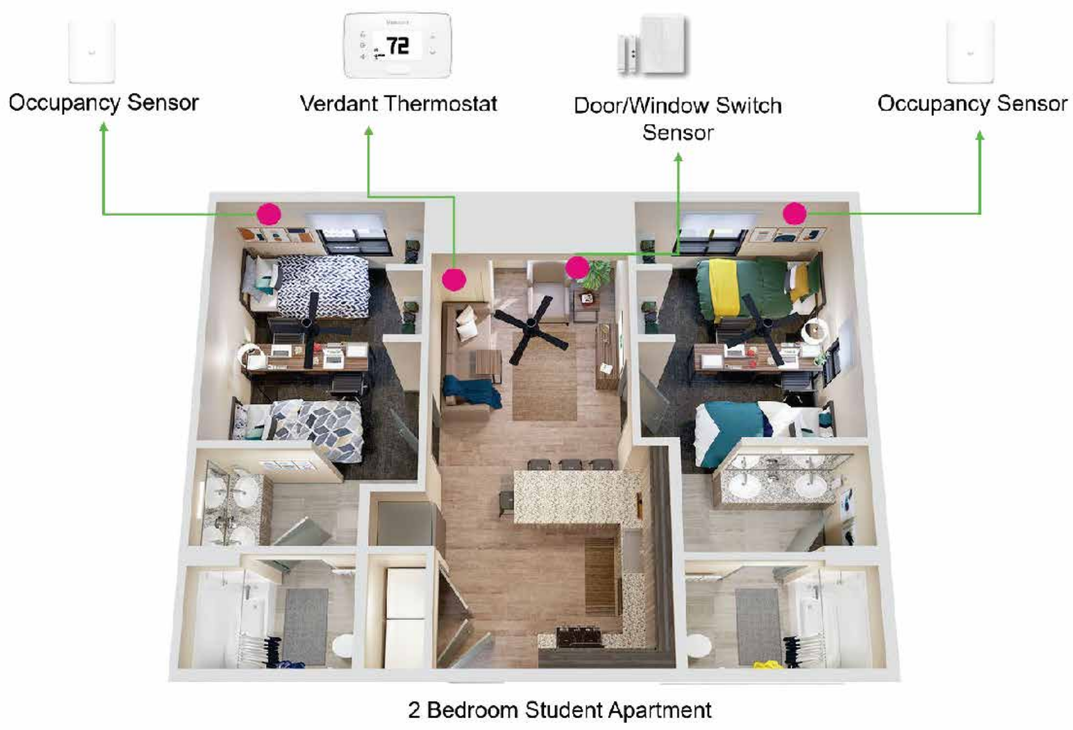
Smart HVAC Control:

- When a door or window was open, the sensor communicated with the thermostat to pause HVAC operation, automatically resuming once the door or window was closed.

Centralized Management:

- Verdant's platform allowed facility managers to monitor the system, track energy use, and receive alerts in real time, making management more efficient and proactive.

By automating energy use and eliminating manual intervention, this integration significantly reduced energy waste and operating costs while improving the comfort of students.



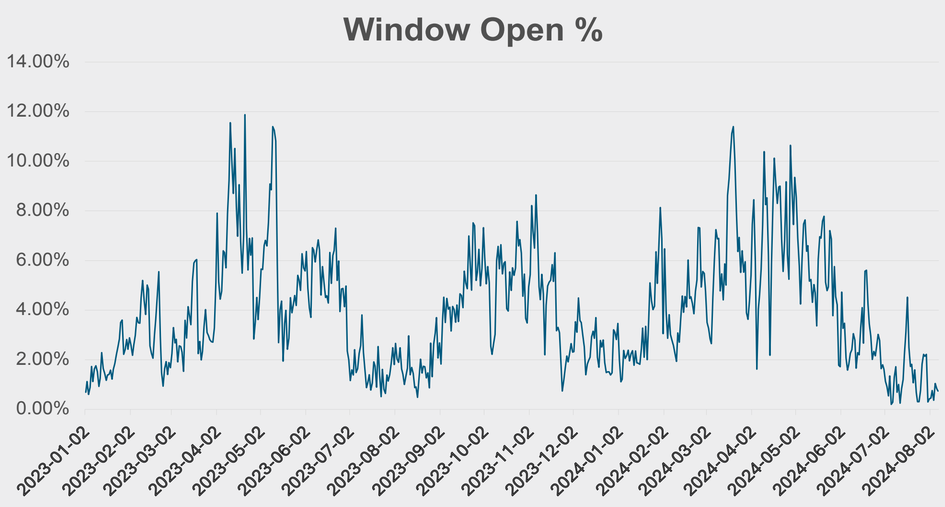
2 Bedroom Student Apartment

CSUS Implementation: Highlights

While implementing these technologies can pose challenges like upfront costs and compatibility with legacy HVAC systems, Verdant offers seamless integration to overcome these obstacles.

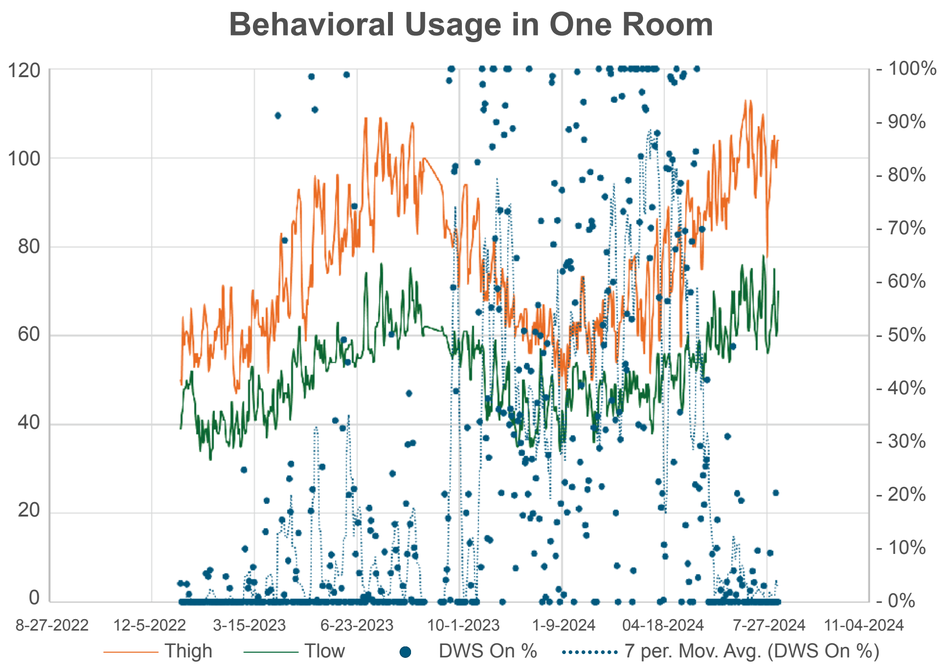
A pilot project at a 150-unit student housing property, running from January 2023 to December 2024, provided valuable insights:

Average Door/Window Open Time:
6% of the total time recorded across 24 months.



Key Findings: Behavioral usage

- 10% of the students kept door/window open for more than 10% of the time
- 4 students kept the window open for more than 15% of the time
- 13% students never opened the door or window



Example of a room where a student left a door or window open for more than 25% of the time.

Left scale: Temperature in Fahrenheit. Right scale: Percentage of door/window open (0% to 100%)."

HIGHLIGHT:
68% of the time, doors or windows were opened while the HVAC system was still running, indicating that students often didn't turn off the thermostats before opening the windows.

RUNTIME REDUCTIONS:

In addition to heating/cooling runtime reduction via **setbacks**, there was an additional reduction of:

3.4%
in cooling runtime
Equivalent to saving **24 hours of cooling** per day across 150 rooms combined

Annual total savings:
8,760 hours of cooling

3.8%
total heating runtime on an annual basis
Equivalent to saving **20 hours a day of heating** for a property of 150 rooms combined

Annual total savings:
7,300 hours of heating

Projected ROI

The upfront cost of integrating door/window sensors with HVAC systems offers a strong return on investment (ROI).

Quick Payback Period: The initial investment in door/window sensors and HVAC integration typically pays for itself within 2-3 years, depending on the size of the property and local energy rates.

Significant Long-Term Savings: Over a 5-year period, properties can expect to save 4-5 times the initial investment.

Future Potential and Scalability

Adaptable Across Property Types

This technology is designed to scale efficiently across various property types, including hotels, multi-dwelling units (MDUs), and commercial offices. Its flexibility ensures it can meet diverse energy management needs while maintaining efficiency and reliability.

Seamless Integration with Smart Systems

The system integrates with advanced tools like occupancy sensors, AI-driven HVAC optimization platforms, and smart building automation technologies, positioning it as a critical component of modern energy management strategies.

By combining scalability with compatibility, this technology equips properties to meet current demands and prepare for the future of smart energy solutions.

Conclusion

Door and window switch sensors provide a powerful solution for improving energy efficiency in student housing. By addressing common challenges like students leaving doors and windows open, these sensors help:

- **Reduce HVAC runtime by up to 50%**, minimizing system strain and operational costs.
- **Lower energy consumption by 10-15%**, translating into substantial annual savings.
- **Cut carbon emissions**, aligning with sustainability goals and certifications like LEED and ENERGY STAR®.
- **Extend HVAC lifespan** by reducing wear and tear on system components.
- **Seamlessly integrate with HVAC systems** and building management systems (BMS) for easy implementation.

As energy costs rise and sustainability becomes increasingly important, adopting smart energy management solutions is both an operational necessity and a strategic advantage.

For student housing properties, the upfront investment in door/window sensors quickly pays off, delivering **strong ROI**, long-term savings, and optimized system performance.

Ready to enhance energy efficiency and reduce costs? Contact us today to integrate Verdant's smart energy solutions into your student housing properties and begin your journey toward a more sustainable future.

Book a Demo: verdant.copeland.com

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