Balancing Costs and Guest Satisfaction with Integrated Energy Management Systems in Hotels

Executive summary

Hotels are in the business of guest satisfaction and hospitality. And guest satisfaction isn't only about delivering a friendly experience – it directly impacts a hotel's reputation and occupancy rate. Studies show that issues with guest rooms represent 42% of all hotel complaints[1] and decrease loyalty by more than 11%.
On the other hand, if a hotel can increase its review scores by just one point on a five-point scale, it can raise its price by 11.2% and still maintain the same occupancy or market share.[2] Guest satisfaction thus has a direct impact on revenue.

Hoteliers have a strong incentive to maintain a constant ideal environment in all guest rooms so that guests won't find their accommodations uncomfortably hot, cold, humid, dry or stuffy. But of course, this would lead to considerable energy wasted in unoccupied rooms.

The solution: a fully integrated guest room energy management system that maximizes energy efficiency while delivering an exceptional guest experience.
In this white paper, we will describe such a solution that natively integrates Somfy Curtain and blind control, Danfoss guest room devices and ASSA ABLOY security access platforms with the Schneider Electric occupancy-based guest room energy management system – the **Connectivity Ecosystem**.

by

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Introduction: What makes a great hotel room?

Hotel guests expect an environment that feels like home – or even better. In the perfect room, every detail has been attended to and every element contributes to an exceptional, personalized guest visit. Guests want an engaging ambience combined with comfort, convenience, control, security and connectivity: a frictionless digital experience.

Delighting your guests is about more than just comfort, it's the entire experience – the ability to control the room (from temperature and lighting, to curtains and room scenes), create varied ambiences, and request services from a personal device or in-room tablet. Now more than ever, it is also about reducing physical touchpoints to minimize contact with germs by providing guests with safer contactless and automated alternatives to interacting with amenities.

Hotels must keep pace with the demand for this kind of automation, which requires energy. Guest room energy consumption accounts for between 40 and 80% of energy use within the hospitality industry. According to industry data, the typical high-end guest room uses 50 to 70kW of energy per day, and a luxury room often more than 80kW of energy per day. While this number varies depending on the type of hotel, location, and other factors, hotel operators spend a significant portion of their operating budget on guest room energy.

Industry data also shows that guests remain outside of their rooms for long durations. On average, guests spend less than eight hours per day in their rooms. When unoccupied, guest rooms are often left with the heating, ventilation, and air conditioning (HVAC) and lights on. When energy usage parameters are not adjusted during these periods of significant "away" time, considerable amounts of energy are wasted.

> Studies show that hotels can spend roughly $2,296 (approximately €2,060) per available room each year on energy – **this represents 6 percent of all operating costs**[3]. Guest room management solutions can help you significantly reduce those costs.

Solution: Integrated energy management systems

Hoteliers must reduce room energy use without sacrificing guest comfort. The solution is a fully integrated system that aggregates data from building management systems (BMS), guest room management systems (GRMS), property management systems (PMS) and access management systems (AMS), helping you to:

- Gain full visibility, functionality, and control of guest rooms
- Drive further energy and operational efficiency
- Ensure guest safety while providing seamless room environment access

When evaluating an integrated energy management system for your hotel, it's critical to look for systems that can offer these benefits:

Exceptional guest satisfaction

- Personalized guest experience
- Improved loyalty & review scores
- Improved revenue
- Enhanced guest peace-of-mind

Significant energy savings

- HVAC energy savings of 25%-44% through occupancy detection and temperature standby
- Deep setback for unrented rooms
- Setback for rented, unoccupied rooms

Proactive maintenance

- Fewer complaints
- Improved operational efficiency

Occupancy-based energy management

Guest room energy management systems can deliver efficiency and comfort when guests are in the room – and when they're not. These systems utilize sensors and controls to adjust heat, ventilation and air conditioning (HVAC), lighting, and other environmental factors in rooms, based on whether or not the room is occupied. An **advanced, occupancy-based guest room energy management system** can provide multiple benefits:

1. **Ability to go into setback mode when room is unoccupied** – Rented but unoccupied rooms can automatically be put into setback mode, adjusting temperatures and turning off all but essential power to save energy costs.

2. **Deep setback mode for unrented rooms** – A hotel can automatically switch unrented rooms to deep setback or, in some cases, temporarily shut down rooms, wings, or entire floors to eliminate unnecessary expense. Deep setback permits increased energy efficiency by reducing the setpoint in heating and cooling seasons, and shutting off lighting and non-essential power.

3. **Improved guest experience for increased revenue** – As discussed earlier, guest satisfaction is always the number one priority and directly affects hotel profitability. Advanced guest room management systems improve the guest experience by signalling for preventive maintenance before the guest complains, pre-cooling or pre-heating rooms to the "occupied" setpoint before the guest enters the room, and enabling remote troubleshooting and adjustments to the room's settings.

4. **Decreased maintenance costs** – Instead of handling hotel maintenance in a reactive mode when equipment breaks or guests complain, integrated technology enables maintenance staff to be proactive. Problems often can be resolved remotely. Breakdowns can be prevented by recognizing performance problems and taking early action – at a lower cost than making emergency repairs and with less guest disruption.

5. **Enhanced security** – The system can alert hotel staff if a room is occupied during unrented periods. This safeguards company property inside a room and assures management that only authorized personnel are permitted to enter when the room is vacant. Further enhancing overall property security is the ability for the system to transmit alerts to staff if an individual is attempting to use a keycard to gain access on multiple doors or if a door has been left ajar.

Figure 1: Hotel guest room operating sequence

Room conditions adjust automatically using presence detectors and door status data that determine when guests are away and when they return.
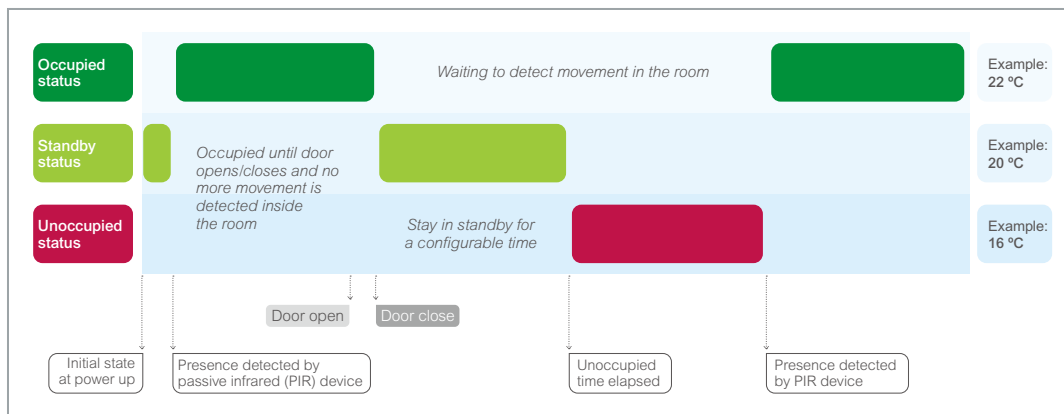
THE SUSTAINABILITY IMPERATIVE

Hotels are also facing increasing pressure to meet sustainability goals and model climate stewardship to shareholders and guests. In fact, **95% of business travellers expect hotels to undertake green initiatives and 70% of B2B customers** – those booking events and conferences – communicate their Corporate Social Responsibility (CSR) requirements during the RFP process[4]. Occupancy-based energy management helps hotels demonstrate their commitment to these efforts.

Case study: The Connectivity Ecosystem by Schneider Electric, Somfy, Danfoss and ASSA ABLOY

Schneider Electric, Danfoss, Somfy and ASSA ABLOY have joined forces to develop a Connectivity Ecosystem that mutually addresses the common challenges of bringing connectivity to maturity and delivering superior value to occupants. Our joint solution is designed to provide deep energy savings and a differentiated experience for guests with upscale amenities and advanced personalized control. The Connectivity Ecosystem seamlessly integrates Schneider Electric building management and guest room management systems with hotel property management systems for occupancy-based energy management, improved operational efficiency, and an enhanced guest experience.

Figure 2: The Connectivity Ecosystem
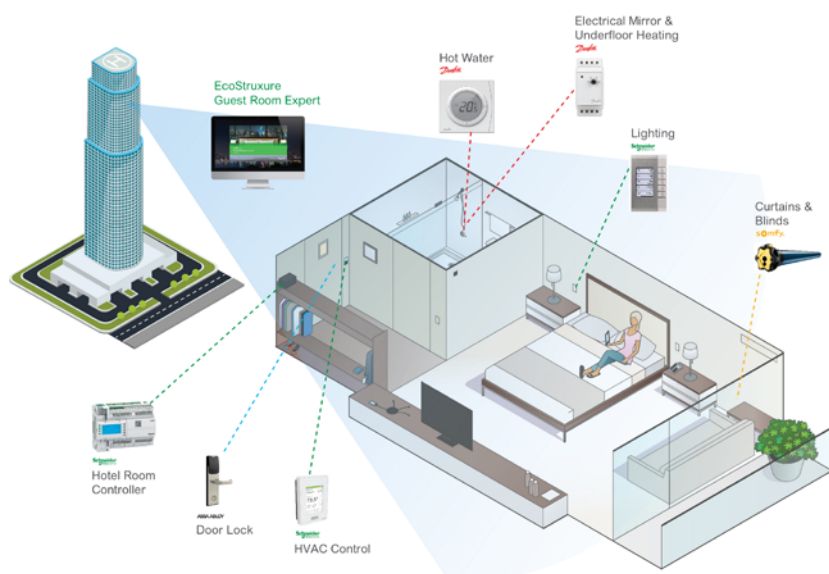
The Connectivity Ecosystem delivers guest room level integration of all applications and devices through the guest room management system:

- Schneider Electric Hotel Room Controllers, HVAC Control, Lighting Control, DND/MUR/Bell, Switches, Dimmers, Sockets, Bedside Panels, and Sensors

- Somfy Curtain & Blind Control

- Danfoss Bathroom Mirror Heating, Electrical Underfloor Heating and Domestic Hot Water solution

- ASSA ABLOY hotel security technology, including access management systems and electronic VingCard door locks equipped with Mobile Access to provide digital key room entry and the ability to bypass the front desk

Schneider Electric: The foundation for guest room management

Schneider Electric has integrated its building management systems (BMS) and guest room management systems (GRMS) with various property management systems (PMS) in the hotel industry using EcoStruxure™ and other products.

Schneider Electric's EcoStruxure™ Building Operation extracts specific critical information from the PMS, allowing operators to monitor and control all critical information about the guest rooms in their hotel from a single user interface – EcoStruxure™ Guest Room Expert, Schneider Electric's guest room management system. Operators can see occupancy and DND/MUR status, troubleshoot problems remotely, and automate energy use based on occupancy.

Key features include:

- Check-in/check-out notification enabling automated deep setback temperature mode for unrented rooms
- Welcome and Restore scenes (lighting, temperature, curtain settings)
- Data automatically sent from PMS to the guest's TV, thermostat, and in-room tablet (preferred language, temperature, and unit of measure)
- Personalized, promotional messages that can be sent to rooms

The solution uses a combination of presence detectors and door status data to automatically detect whenever a room is unoccupied, adjusting room conditions while guests are away and quickly restoring those settings as soon as they return. The solution drives greater hotel efficiency and savings, while still maintaining the highest levels of comfort and personal control for guests when they occupy their rooms.

EcoStruxure™ Building Operation

Building Operation is user-friendly building management software for optimized building performance. Built upon open standards and end-to-end cybersecurity, it integrates and facilitates data exchange from the HRC, Guest Room Expert, PMS, door lock, and other third-party systems to improve staff productivity, reduce guest complaints, and enable superior operational efficiency and guest room functionality.

EcoStruxure Guest Room Expert

Guest Room Expert receives data from the BMS, PMS, and HRC, providing centralized visibility and control to both individual guest rooms and the entire network of rooms.

Hotel Room Controller (HRC)

The HRC manages multiple lighting circuits, curtains, room scenes (including Welcome, Restore, and Maid), DND/MUR, HVAC, bedside panel, and tablet applications in the guest room. It aggregates data from all subsystems and devices in the room and sends it to the Guest Room Expert and the PMS. This gives Hotel Operators visibility and control of all rooms to drive energy efficiency, and to troubleshoot maintenance issues.

SE8000 Series Room Controller

The SE8000 provides occupancy-based HVAC control. It determines occupancy, humidity, CO_2, and other room parameters from various sensors to reduce energy consumption during unoccupied periods. Integration with the PMS allows the hotel operator to:

- Send welcome messages on arrival
- Set guests' preferred language, temperature, and other settings
- Send targeted commercial messages to rooms

Somfy: Curtain and blind control

Somfy manufactures strong, quiet motors with electronic and app controls for interior and exterior window coverings. Somfy motorization systems are easily integrated with security, HVAC, and lighting systems, providing total home or building automation.

The curtain and blind control solutions incorporated into the Connectivity Ecosystem create energy savings while maintaining thermal and visual comfort. They also reduce manual operations and thus maintenance costs in guest rooms – and extend the life of motorized equipment by allowing them to run smoothly.

Moreover, these solutions from Somfy increase the hotel's customer appeal with an enhanced room experience. Instead of drawing the curtains or blinds manually, guests can use either a wall-mounted switch, a bedside integrated control panel, or a remote control device, a smartphone or a tablet, depending on the chosen configuration. Hotels can even set up a voice control system so guests can go to bed and say "Good night Alexa!" and everything in the room sets to night mode – all lights are turned off, curtains and blinds closed automatically, television switched off, etc.

- Energy savings – During unoccupied and unrented times, curtains are automatically closed to mitigate solar heat gain and loss, which reduces demand on the heating and cooling systems, as well as energy consumption from artificial lighting. The system also responds automatically to the weather outside and works together with lighting and HVAC to maintain optimal indoor conditions.

- Reduced operational expenses by protecting furnishing and carpets – Automated curtain control helps protect the furnishings from UV damage in equatorial and tropical climates, where a high UV index contributes to sun damage (fading and discoloration) of the floor coverings and furnishings. Less daily touch by hand can also reduce wear and tear on the blinds and curtains. This means that rooms last longer, reducing operational expense by increasing the lifespan of the furnishings. Hotels can also see improvements in operational cost as a result of housekeeping staff spending less time adjusting the blinds and curtains room by room.

- Enhanced guest experiences – Hotels can use automated curtain and blind control to orchestrate a variety of creative and memorable experiences for guests. These could include a welcome scenario where the blinds respond to the room's door lock system when the guest first enters the room, or a morning scenario to let the sunshine in at the guest's desired wake-up time, or a movie scenario to integrate with entertainment facilities for ideal viewing conditions. The Somfy solutions also maintain a quiet room environment through motorization and accessories that guarantee an industry-leading level of silent running.

Danfoss: Bathroom electrical underfloor heating, mirror heating, and domestic hot water solutions

Danfoss specializes in a range of automated, energy-efficient industrial technologies that help promote a more sustainable world by creating healthier and more comfortable climates in our buildings and homes.

The heating solutions used in the Connectivity Ecosystem provide underfloor heating and mirror heating and ensure reliable supply of domestic hot water for hotel guests throughout the day and night.

- Enhanced guest experience and satisfaction – Increased comfort in the bathroom via warm floor, mist-free mirrors and instant hot water.
- Maximize energy savings without compromising customer comfort and health by means of pre-programmed plans, rental and occupancy status management, and easy integration of all components into a single facility management system.

- Saving water and suppressing Legionella – Electric heat tracing systems along the entire pipe system keep water at the required temperature for disinfection to suppress Legionella bacteria and ensure instant supply of Legionella-free domestic hot water.

ASSA ABLOY: Access management systems, electronic door locks and Mobile Access technology for hotels

By adding ASSA ABLOY's solutions for hospitality to the Connectivity Ecosystem, hoteliers and guests can benefit from superior guest experiences and operational performance while maximizing security and personal safety for little to no additional cost.

- Implementing the latest industry standards in security encryption technology to protect against unauthorized access using VingCard door locks.
- The ability for hotel staff to instantly cancel keycards that are reported lost or suspected of being stolen.
- Providing the option of extending guest stays or reassignment to another guestroom without requiring that guests visit the front desk to be issued with a new key, enhancing convenience, satisfaction and operational efficiency.
- Compatibility with Mobile Access to provide guests with an alternative to visiting the front desk by using their mobile devices to check-in from safe distances. Also able to use their own devices as a secure digital key throughout a hotel in addition to guestrooms, guests using Mobile Access not only experience enhanced convenience but will also welcome the ability to reduce contact with potential surface area risks.

The Connectivity Ecosystem provides different options to integrate with ASSA ABLOY solutions. For VingCard Allure locks, both an Ethernet/IP based server to server and hardwired connection is required.

Integrated for success

Brought together as components of the Connectivity Ecosystem, the preceding solutions from Schneider Electric, Somfy, Danfoss and ASSA ABLOY solutions deliver substantial benefits.

- Easy, out-of-the-box commissioning for all the components
- Fully integrated solutions with tested, validated, documented architectures
- Training provided across the full range of systems and devices

### Native integration drives capital expense savings

The native integration of preconfigured Somfy, Danfoss and ASSA ABLOY devices with the Schneider Electric Hotel Room Controller allows for precise control to maximize energy efficiency without impacting the guest experience. Benefits include:

- The ability to turn energy-using amenities like underfloor heating, mirror heating, and instant hot water off
- Greatly reduced installation and commissioning time
- Greatly reduced programming time, typically 15 minutes per room
- TVDA certified installation and commissioning for peace of mind
- No additional wires required

Integration benefits between Schneider Electric and ASSA ABLOY include:

- Visualisation of critical door alarms and events in the GRMS software. This provides a single alarm interface for maximized security and management simplicity. This added value feature is possible with 'online' and 'offline' VingCard systems. Example event alarms include: low battery alarm, door ajar alarm, wandering intruder, forced entry or door offline alarm.

- Reduced guest disturbance by disabling door bell and room access for staff when the guestroom is set to 'do not disturb' mode when implementing VingCard Allure locks.

- Improved room energy efficiency by changing the A/C mode and temperature depending on staff or guest entry. For example, setting 24C cool/19C heat temperature when staff enter but 21C cool/20C heat for when a guest first enters. (For a guest re-entering – The temperature would revert to their last stored set point)

- Activation of enticing welcome and restore lighting scenes for guests when unlocking guestroom door.

- The possibility of reduced network costs by sharing a common GRMS building network for door access management and alarms.

- A single interior design for all wiring devices and accessories including the door access panel when implementing VingCard Allure locks.

- Synchronised DND, MUR and doorbell signals between VingCard Allure corridor panels and Schneider Electric GRMS.

Figure 3: Full service guest room architecture
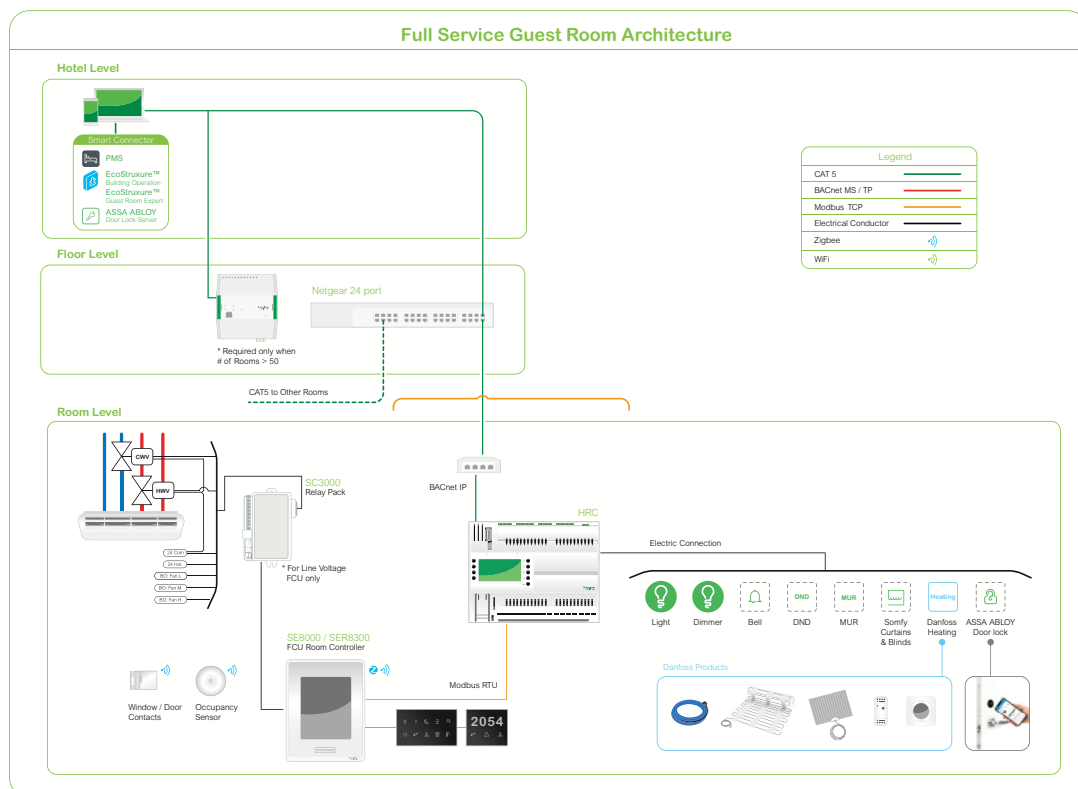
Hotel guest room study: The savings of integrated solutions

The benefits of using the Connectivity Ecosystem with a fully integrated guest room energy management system (compared to a non-connected system) include significant energy savings based on closer control.

When Danfoss and Somfy solutions are integrated into the Schneider Electric Guest Room Management System using the Hotel Room Controller (HRC), further energy savings can be achieved. For this white paper, we made several credible, basic assumptions for a typical hotel property and demonstrated where significant savings can be gained through integrated solutions in specific areas of the guest room space.

Base room assumptions

For this study exercise, we assume a 250-room hotel (1 MWh per day) with an occupancy rate of 75% per year (25% unrented annually, 2190 hours/year). We assume a key card would not be used. We assume a bathroom space of 4m² (0.4kWh per day per room) with a cost of electricity based on 1kW = €0.1. A typical hotel room is in a rented/occupied mode for 10 hours per/day (2,737 hours/year), which means that there are 14 hours per day (3,832 hours/year) when the room is rented/unoccupied, and the HVAC is in setback mode.

Figure 4: Hotel room configuration and occupancy status with Schneider Electric, Danfoss & Somfy Solutions

Room Status	Room Hours	Lighting	Curtains	HVAC	Floor Heating	Heated Mirror	Domestic Hot Water (DHW)
Unrented	25%/Year	OFF	Closed	Deep setback	OFF	OFF	OFF (KW)
	2,190 Hours/Year			16° - 30° C			
Rented/Unoccupied	14 Hours/Day	OFF	Closed	Setback	OFF	OFF	ON
	3,832 Hours/Year			21° C			
Rented/Occupied	10 Hours/Day	ON	Open	Guest set point	ON	ON	ON
	2,737 Hours/Year						

Energy savings with the Connectivity Ecosystem

We conduced internal studies to estimate annual energy savings for an average hotel using Danfoss and Somfy solutions connected with the Schneider Electric HRC. These estimates are summarized below. Detailed calculations for each estimate are available in the appendix.

Snapshot of energy savings with Schneider Electric HRC integration	
Somfy Curtain and Blind Solutions	€1,852
Danfoss Underfloor Heating	€6,850
Danfoss Heated Mirror	€4,106
Danfoss Hot Water System	€12,828
Total estimated savings per year	€25,636

Somfy Solutions + Schneider Electric HRC

For Somfy Curtain and Blind Solutions: WT Motors, RTS Motors and DC Transmitter Connected with HRC

We used the base room assumptions and assumed that HVAC and lights are off during the unrented period (25% of the time, or 2190 hrs/year) with curtains and blinds closed. The energy savings with HVAC control during the unrented period are calculated at €9,125 per year.

Thanks to HRC control during the rented but unoccupied period (14 hours/day) with curtains closed, lights and HVAC off, additional energy savings of **€1,852 per year** can be achieved.

Danfoss Solutions + Schneider Electric HRC

Danfoss Underfloor Heating: ECtemp 300 and DEVImat 150T

We used the base room assumptions and considered that the underfloor heating is connected to the Schneider Electric HRC. With HRC control and a Danfoss thermostat, it is possible to switch off the floor heating in the bathroom for limited periods during the night of up to 30 minutes within each hour – and up to five times per night – without compromising the guest comfort.

Through controlling the floor heating as described above, an estimated **€6,850 savings per year** can be achieved.

Danfoss Heated Mirror: ECfoil Mirror

We used the base room assumptions and considered that the power consumption of the mirror is 0.05 kWh/day and that the mirror is operationally controlled by the HRC for one hour per day.

The energy savings without control equate to 45,625 kWh per/year. By connecting the heated mirror with the Schneider Electric HRC and controlling the time the mirror is switched on (1 hour/day) a savings of **€4,106 per year** can be achieved.

Danfoss Hot Water System (DHW): ECtemp Next Plus

The benefits of utilizing the domestic hot water system have already been highlighted in this paper, as it relates to instant hot water and improving health and safety by controlling Legionnaires' disease. The risk of Legionella bacteria occurs when the hotel room is not occupied for lengthy periods of time.

We used the base room assumptions and estimated that the water heater consumption would be 240 watts per day and per bathroom installation. Through our calculation, if the HRC is not connected to the domestic hot water system, the energy consumed would be 131,400 kWh per year.

With the Danfoss hot water system connected to the Schneider Electric HRC, it is possible to control the system to meet hotel operational requirements. With the room being unrented for 25% of the time per year, it is possible to have domestic hot water operational for 90 days a year, operating two times per week and averaging 2 hours for each cycle.

Taking this information into consideration, we calculate bathroom energy savings with HRC control at **€12,828 per year**.

Conclusion: The Connectivity Ecosystem meets your energy objectives

- Exceptional guest satisfaction
- Significant energy savings
- Enhanced safety & security
- Proactive maintenance
- Reduced installation and commissioning time
- Compliance with hotel brand standards

A sophisticated, occupancy-based guest room energy management system – like the fully integrated solution developed by Schneider Electric, Somfy, Danfoss and ASSA ABLOY – offers hotel operators the benefits of increased levels of guest satisfaction, energy efficiency, security and operational efficiency.

Based on a 250-room hotel, fully integrated Danfoss and Somfy solutions connected to the Schneider Electric Hotel Room Controller enable **€25,636 in energy savings per year**. This figure does not include basic savings on HVAC and lighting which result from an occupancy-based energy management system. According to Navigant Research, minimizing the runtime of HVAC systems in guest rooms can reduce energy costs from 15% to 20%.[5] Other estimates range from 20% to 50% when HVAC, lighting, and plug loads are controlled.[6]

Appendix: Energy savings data calculations

For Somfy Curtain and Blind Solutions: WT Motors, RTS Motors and DC Transmitter connected with HRC

Somfy Assumptions	Energy Savings
• Hotel rooms: 250 • Room unrented during 25% per year • Curtain/blinds closed 25% of time per day. • Estimate 20% of energy savings when rented/unoccupied (14 hours per day) • Energy consumption per room: 4 kWh/day	Generally HVAC and lighting are OFF during unrented period • Energy savings during the unrented time in 25% of the time = 1,000 x 365 x 0.25 = €9,125 per year Thanks to HRC control during the rented/unoccupied period, curtains are closed, and lights and HVAC are OFF • Energy savings 1,000 kWh x 14 hrs/24 hrs = 583 kWh x €0.1/kWh = €58.33 per day • 58.33 x (365 x 0.75 x 0.58 x 0.2) = **€1,852.40 per year**

Danfoss Underfloor Heating: ECtemp 300 and DEVImat 150T connected with HRC

Underfloor Heating Assumptions	Energy Savings with Danfoss Underfloor Heating, Connected with Schneider Electric HRC
• Hotel rooms: 250 (1MWh per day) • Keycard not used, thermostat not used • 8,760 hrs/year • Bathroom space: 4m² (0.4 kWh per day per room) • Cost 1kW = €0.1 • Switch off floor heating (5 x 0.5 h per day) = 2.5 hrs/day • Room unoccupied: 3,832 hrs per year • Room unrented 25% of the year = 2190 hrs	• Total energy consumption without control = €36,500 per year • Energy savings = 1,000 x 25% (250 kWh per day) • 250 rooms x 365 days x 0.75 x €0.1 = **€6,850 savings per year** with integrated HRC • Certified TVDA

Danfoss Heated Mirror: ECfoil Mirror not connected vs. connected with HRC

Heated Mirror Assumptions	Energy Savings with Danfoss Heated Mirror
• Hotel rooms: 250 • Keycard not utilised • Power consumption of mirror: 0.05 kWh/day • Room rented average: 10 hrs/day, 365 days/year • 10% of time mirror is ON – operational for 1 hour per day	• Energy consumption without control: 0.05 kWh per day x 10 x 250 x 365 = 45,625 kWh per year • Savings with control: 45,625 kWh x 0.9 = 41,062 kWh per year • €0.1 x 41,062 kWh = **€4,106 savings per year**

Danfoss Hot Water System (DHW): ECtemp Next Plus not connected vs. connected to HRC

DHW Assumptions	Energy Savings with Danfoss Heated Mirror
• Hotel rooms: 250 • Domestic Hot Water = DHW • Heater consumption (DHW) 240 Watt • 10 Watt per meter, 20 meter pipe • System operational 90 days/year, 2 times per week – average 2 hrs for each cycle, 4 hours a week • Energy cost 1kW = €0.1 • Risk of Legionella occurs when the room is not occupied for lengthy periods of time	Danfoss DHW Not Connected to HRC • 25% room unrented (91.25 days/year or 2190 hrs/year) Not controlled 0.24 x 2190 = 525.6 kWh/year for DHW per room • Bathrooms 250 x 525.6 = 131,400 kWh/Year = €0.1 x 131.400kWh = €13,140 per year Danfoss DHW Connected to HRC • 25% room unrented 91.25 days/year or 2190 hrs/year) Hotel operates 4 hours per week in unrented mode • Therefore: 91.25 days / 7 = 13 weeks • 13 weeks x 4 hrs/week = 52 hrs: 52 hrs x 0.24kW = 12.48 kW/day • 250 bathrooms x 12.48 kW/day = 3,120 kW/year = 3,120 kW/year x 0.1 euro = €312 per year • Bathroom savings = €13,140 - 312 = **€12,828** savings per year

References

1. **Disaster Recovery – When Guests Have Big Problems** [*Electronic article*], Jonathan Barsky, HotelExecutive, September 29, 2013.

2. **The Impact of Social Media on Lodging Performance** [*Electronic article*], Chris K. Anderson, PhD, Cornell Hospitality Report, 12(15), 6-11.

3. Hotels: An Overview of Energy Use and Energy Efficiency Opportunities **https://www.energystar.gov/sites/default/files/buildings/tools/SPP%20Sales%20Flyer%20for%20Hospitality%20and%20Hotels.pdf**. Accessed May 9, 2019.

4. **AccorHotels Studies Find Positive Impacts of Corporate Social Responsibility Program** [Electronic article], Editor, ehotelier, July 8, 2015.

5. *Energy Management in the Hospitality Industry*, Navigant Consulting, Inc., 2014.

6. *Wireless Energy Management In Hotels, EnOcean Alliance.* **https://www.enocean-alliance.org/wp-content/uploads/2016/11/Whitepaper__hospitality.pdf**

It works simply together