

**Helvar**



WHITEPAPER

# **FUTURE-PROOF LIGHTING CONTROL**

How hybrid lighting control  
**brings new opportunities**



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## How hybrid lighting control brings **new opportunities**

As the global population approaches 10 billion by 2060, the demand for new buildings is growing, but keeping up with this demand is challenging. A key strategy to address this is renovating existing buildings and transforming them into smart buildings, which enhances their efficiency for living, working, and leisure.

Advanced lighting control systems play a critical role in these smart buildings by delivering energy-efficient, human-centric environments while integrating with other building technologies for enhanced functionality. These systems also provide valuable insights into building usage, helping to optimise performance over time. However, as projects become more complex, it's essential to design systems that are not only smart but also adaptable for future changes – a lesson we've learned from the recent shifts in working culture and building utilisation. As a result, hybrid lighting systems, which combine wired and wireless technologies, are becoming crucial in smart buildings, offering not only environmental benefits but also significantly improved flexibility.

This guide aims to educate on the opportunities that hybrid systems offer for smart building design. It provides insights for those planning to integrate efficient, data-driven, and adaptable lighting systems into smart buildings, contributing to a more sustainable built environment.





# 01

## The case for hybrid lighting control



Simply put, hybrid lighting controls systems harness the best of both wired and wireless lighting controls technologies into a single system. Data and control messages can flow seamlessly between the wired and wireless parts of the system, resulting in a range of benefits.

It's worth noting that all hybrid systems combine wired and wireless components to some extent, but the specific configuration and set-up can vary dramatically based on the building or space that they are deployed within. There are configurations which introduce, for example, wireless wall panels to wired installations while other configurations allow adding wired devices to wireless solutions.

However, this guide will focus discussion on the merging of wired with wireless systems.

## Wired connectivity

When deciding which system is best for a specific application, it's important to consider various factors and general guidance. Wired systems, where all hardwired controls, all wires, and every circuit lead back to a centralised location, are less prone to interference from external factors and physical obstructions. This makes the lighting and controls essentially hardwired into layout of the building and offers trusted connectivity.

This is crucial for projects where consistent and dependable lighting performance is essential. New build projects can be planned with wired systems during the initial design phase which keeps the extra wiring cost to minimum. For example, DALI cabling to luminaires runs typically within the mains cables.

Systems can be installed to accommodate future expansion or modifications within the building's design as use evolves. In a commercial setting, that means a smarter, more connected lighting system that's capable of evolving over time.







## Wireless flexibility

Wireless lighting control systems bring significant advantages to renovations and built-to-suit projects. Their installation and setup is swift and reduces disruption to existing infrastructure, which lowers initial investment compared to wired systems, especially in retrofits.

The modularity of the system allows for expansion or reconfiguration as the project or tenant needs change. This scalability is particularly valuable in spaces with dynamic layouts or frequent changes.

Wireless systems are highly flexible in that sense; they can be adjusted to accommodate new partitions, office arrangements, or changing functional needs within a defined space in a cost-effective manner.

## Hybrid - the ideal choice

While both wired and wireless systems offer distinct advantages, **the ideal choice often lies in a hybrid approach.**

Wired systems excel in logically complicated projects with a focus on reliability and stability. In contrast, wireless systems excel for projects requiring faster installation, scalability, and adaptability to dynamic layouts.

However, the decision doesn't solely depend on the technology itself. It's crucial to consider the building's usage and potential for change over its lifespan. Buildings with frequent reconfiguration or uncertain future needs can benefit significantly from the additional flexibility offered by a hybrid system.

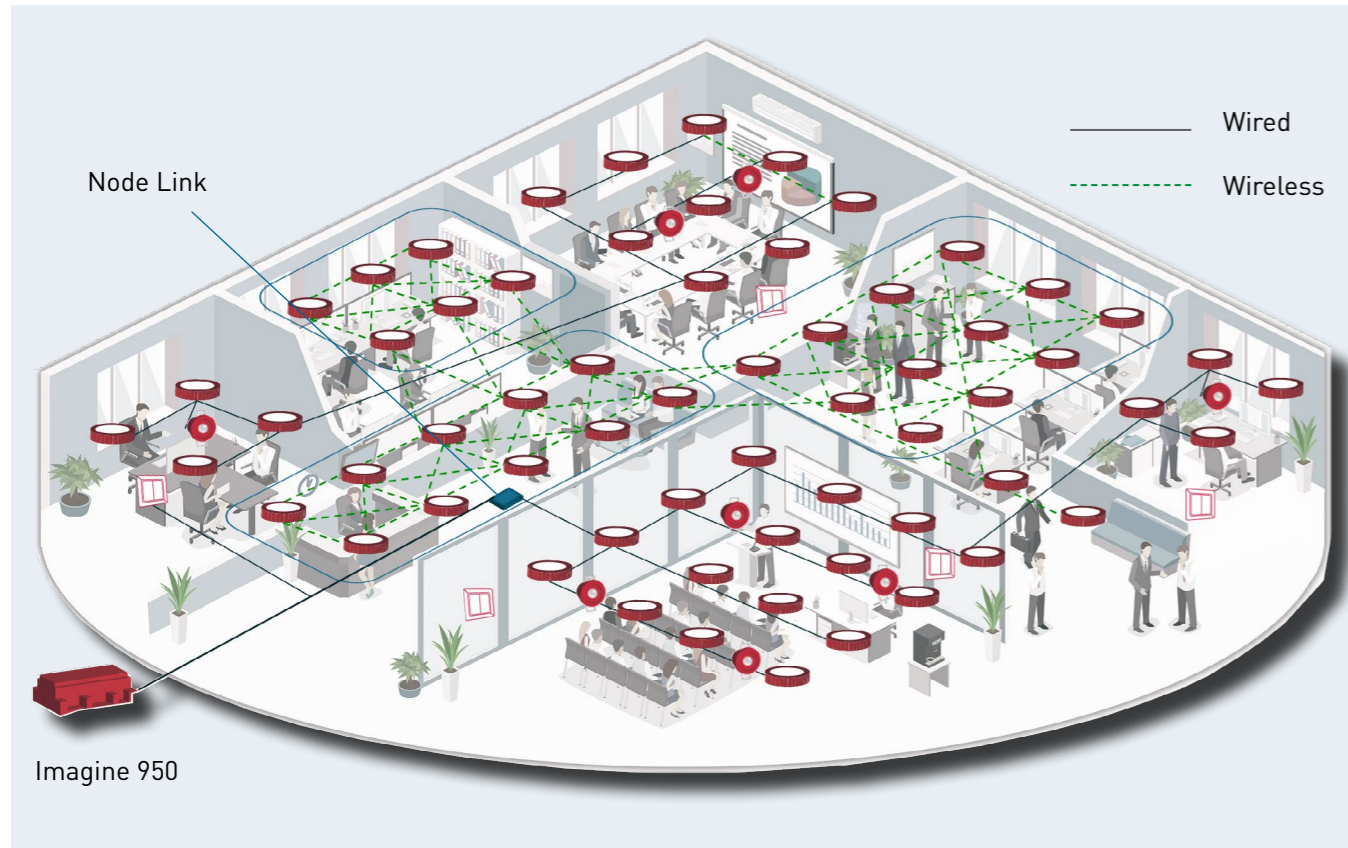
One of the key benefits of hybrid lighting control solutions is that they enable specifiers, facility managers and owners to make decisions that reduce life-cycle expenses of the building. The modular architecture allows them to potentially use existing infrastructure decreasing the upfront capital required. Wireless components can simply be added or relocated, allowing the system to expand in tandem with the building's needs - ideal for large-scale office complexes that may require future adjustments or adaption to evolving building requirements and legislations.





# 01

## Hybrid floorplan example



**Hybrid Floorplan example with wireless Helvar ActiveAhead and wired Helvar Imagine systems.**

The system for each space has been selected based on the space requirements to offer the most sustainable, user friendly and flexible solution. ActiveAhead and Imagine areas are connected using Node Link to achieve a seamless user experience. In this example different areas follow the same schedules and manual override user interfaces.

See the terminology section for further information on wired, wireless and hybrid solutions.



**Demonstrating the value**  
that hybrid systems bring





According to the International Energy Agency (IEA) in 2018, commercial buildings accounted for about 25% of total global electricity consumption (IEA, 2018).

When it comes to lighting systems, the average percentage of energy consumption in commercial buildings is estimated to be between 25-40% of the overall energy consumption, depending on the type of building, the lighting technology used, and the level of energy efficiency (Department of Energy, 2015).

Specifying the best fit lighting control system starts with **the design considerations:**

1. What kind of user experience should the system deliver?
2. What are the wellbeing and sustainability requirements?
3. How does the system scale and support future needs?
4. How much will the system cost, now and in the future?

By asking the right questions about the system during the design phase and thinking about what the user needs, it can help frame how you specify a system.

We believe there are four concepts any specifier should consider when choosing a lighting control system and, in this section, we will discuss each of them in detail.





## User experience (UX) and wellbeing

Studies have shown that effective lighting can significantly impact mood, focus, and even productivity. To deliver the best possible user experience and enhance occupant wellbeing, it's important to consider each type of space separately and adjust lighting control strategies accordingly.

For example, in a large university campus, there are numerous different buildings with lecture halls, study spaces, libraries, office spaces, corridors, etc. all serving different purposes and having different requirements to achieve a positive user experience.

In areas such as lecture halls, wired systems provide reliable control and advanced features like colour temperature adjustment, pre-set lighting scenes and local integrations; all of which are essential to support focus and facilitate a good learning experience.

On the other hand, the needs of study spaces are very different to those of lecture halls, and a wireless solution may fit better due to its greater adaptability and flexibility for future needs.



Consequently, it is the combination of wired and wireless systems that allows the creation of specialised environments that optimise functionality, user experience, and energy efficiency. For lighting professionals looking to specify lighting controls, a hybrid system translates into designing buildings that prioritise people, not just functionality.



## Adaptability and scalability

Hybrid systems are inherently adaptable and offer strong flexibility by blending wired and wireless technologies. Wireless components can be easily added or relocated without extensive rewiring, thus allowing the system to grow and develop in parallel with the occupants' needs. This modular architecture is especially useful for large-scale office buildings if future additions or modifications are under consideration.

Hybrid systems allow for the strategic allocation of lighting across a building. In open office areas or conference rooms where flexibility is key, wireless components can be prioritised for easy reconfiguration. Wired functionality remains in place for critical areas like emergency exits or server rooms, ensuring reliable operation.

**This strategy reduces the initial investment costs while maintaining the system's flexibility to respond to future tenant needs.**

Ultimately a hybrid system reduces long-term expenses associated with expensive redesign or rewiring, while also improving occupant satisfaction with a space that adapts to their needs.

### Did you know?

**1. SCALABILITY:** the ability to increase or decrease the system's size without compromising performance. A scalable system can efficiently manage a single room or a building.

**2. ADAPTABILITY:** the system's ability to adjust to different conditions and requirements. An adaptable lighting control system can change its operation based on occupancy, daylight availability, user preferences, etc. based on the current scenario.

**3. FLEXIBILITY:** denotes the ease with which the system can meet changing space and user needs. A flexible system can support various types of usage needs over time.

**4. EXPANDABILITY:** the system's capacity to add more components or features over time. An expandable lighting control system allows for easy inclusion of more luminaires, sensors, or features and integrations as the need arises.





## Long-term cost-saving, life-cycle and sustainability

While the initial investment might be a consideration, hybrid lighting control systems provide significant long-term financial and environmental benefits. Where traditional lighting systems, whether wired or wireless, often face challenges when it comes to cost-effectiveness and adaptability, hybrid systems address these issues through their innovative modularity.

In a truly hybrid system, the link between both systems allows leverage of existing wired infrastructure, eliminating the need for expensive rewiring during expansion. Wireless sensors and controllers can be easily added, significantly reducing both the complexity and cost of system expansions. Wireless controls embedded into a hybrid solution enables you to design 'beyond fit for purpose' – for better wellbeing, sustainability, scalability and adaptability.

This strategy allows specifiers and contractors to utilise the existing wired infrastructure, lowering upfront costs. A hybrid solution's scalability is particularly valuable for spaces with potential need for future growth, adjustments or adaption to evolving building requirements.

Such a system can also integrate future advancements in wireless technology, lowering life-cycle costs and protecting the initial investment.

By centralising control into one top-level system rather than maintaining separate systems, hybrid solutions simplify monitoring and reporting, providing a comprehensive overview that enhances flexibility in system development towards goals like increased energy efficiency or improved wellbeing. This unified approach also facilitates compliance with important legislation and directives such as the **CSRD** and **EPBD**, streamlining sustainability efforts and regulatory adherence.

In essence, hybrid systems offer the best of both worlds: the flexibility of wireless technology and the reliability of wired, all while reducing costs and ensuring a future-proof lighting infrastructure. Thus, building owners and operators can reduce energy consumption, lower operational costs, and minimise their environmental impact.





## The growing importance of hybrid lighting control

# 03



Looking ahead, the future of lighting control technology lies in even greater integration, automation, and flexibility of the systems to deliver an improved experience.

Here's why hybrid lighting control will continue to grow in importance:

- **User experience and wellbeing:** Hybrid systems can offer a unified user experience, promoting occupant comfort, focus, and productivity. This translates to a human-centric lighting design that enhances occupant wellbeing.
- **Adaptability and scalability:** A hybrid approach offers a superior combined system capable of greater flexibility compared to standalone wired or wireless solutions. This allows for cost-effective modifications as building needs evolve, whether expanding a system or reconfiguring control zones.
- **Future-proofing technology:** The modular design of hybrid systems allows for seamless integration of future advancements in wireless technology, protecting the initial investment in the core wired infrastructure.
- **Sustainability:** Hybrid systems contribute to energy efficiency by combining features like self-learning and advanced integrations, which are traditionally not accessible in standalone wired and wireless systems. This translates to a reduced environmental impact for the building.
- **Reduced life-cycle costs:** Leveraging existing wired infrastructure reduces upfront costs during installation. Wireless components can be added later without extensive rewiring, further reducing long-term expenses associated with overhauls or redesigns.





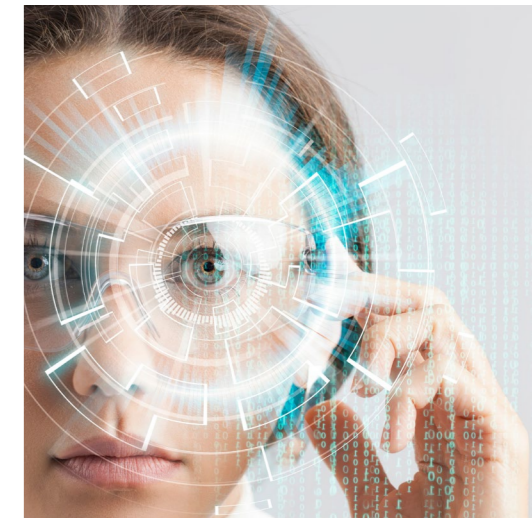
# 04

## What is the future of hybrid?



Hybrid lighting is moving towards greater sustainability and human-centred design using technology as the driving force - the future of hybrid lighting will increase the level of automation in the building to provide improved environments that adapt to the way we use the building.

The hybrid systems of tomorrow will help us create a higher standard in human-centric lighting, enhance occupant wellbeing through light and deliver a more effective blend of automation, user control, and data-driven insights, to increase the buildings' comfort and efficiency.



### Some scenarios for the future of hybrid lighting:

**1. Advanced Integration and Interconnectivity:** Future hybrid lighting systems will integrate deeply with smart building technologies, providing personalised lighting that adapts to both occupancy and occupants' emotional and health states using biometric data, thus enhancing wellbeing and productivity. Moreover, these systems will connect with broader building management systems, including HVAC and security, to boost energy efficiency, environmental control, and security, ensuring greater comfort and safety for occupants.

**2. Utilisation of New Sensing Technologies:** The hybrid approach allows for easy integration of new technologies into existing infrastructures with more exact data by combining climate, air quality, acoustics and space usage data from environmental sensors. As sensing technologies advance, they can be incorporated without complete overhauls, making upgrades less disruptive and more cost-effective.

**3. Circular Economy:** The importance of longer lifetime by reusing existing materials and cables grows in importance to reduce carbon footprint. Old lighting products will get a new life by changing parts on the products. Existing cables are reused and wireless products allow seamless extensions of the systems.



# Terminology

## What is a wired solution?

Wired lighting control systems involve a network where all lighting fixtures and control devices are physically connected through electrical wiring. This robust setup ensures that signals and commands are transmitted via these wires, leading to a highly reliable and stable system for many commercial and industrial applications, ensuring efficient and dependable lighting management.

## What is a wireless solution?

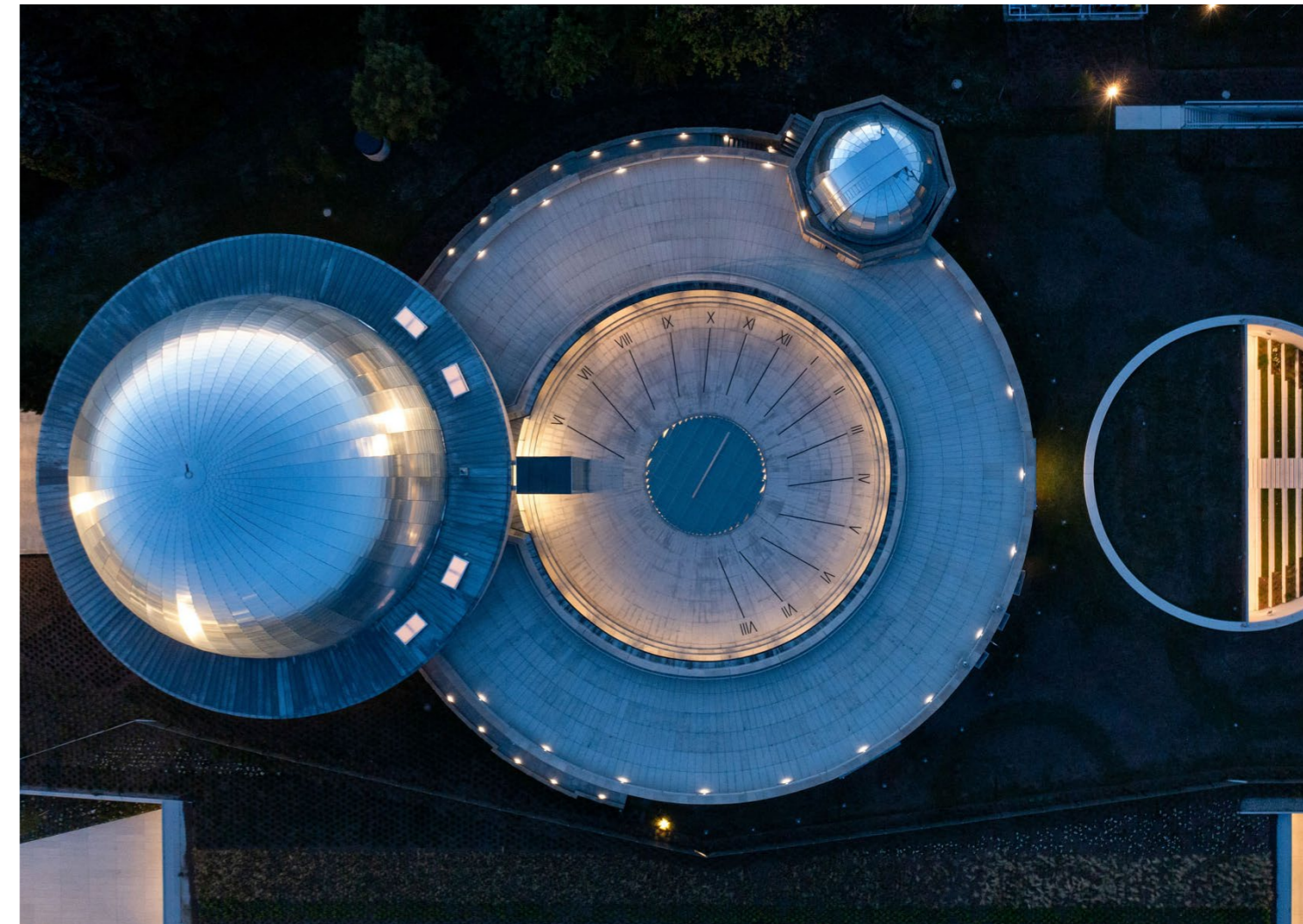
Wireless lighting control systems utilise radio frequency (RF) technology to enable communication between various lighting devices without the need for physical wiring. This type of system is highly adaptable and can be installed with minimal structural impact, making it ideal for both new constructions and retrofit projects.

## What is a hybrid solution?

A hybrid lighting control solution combines both wired and wireless technologies, creating a versatile and efficient system that leverages the strengths of each type. This integration offers enhanced reliability and flexibility, making it ideal for complex building layouts that require both stable and adaptable lighting solutions that can share data and control messages.

Hybrid systems are scalable, allowing for easy adjustments to lighting requirements without extensive modifications, which is beneficial in environments with frequent changes. The design flexibility, ease of installation, and potential for upgrades with minimal disruption are significant advantages, particularly in existing structures.

Hybrid systems are cost-effective in the long run due to reduced maintenance costs and adaptability to changing needs. These systems are especially suitable for mixed environments, providing a balanced solution that meets both permanent and temporary lighting needs.



## APPENDIX

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# Ready to **discover more?**

Contact us today to discuss your specific project requirements and discover how hybrid systems can help you create a smarter, more sustainable, and human-centric building.

We're based in Finland, Sweden and the UK - but we work with Partners all over the world.

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