# Strategies for Success with Connected Lighting Systems

**Pacific Northwest**
NATIONAL LABORATORY

Success with lighting controls depends on establishing clearly defined objectives and taking a disciplined approach to design and implementation. This practical guide describes four common use cases for lighting controls and outlines the implementation process, from planning through maintenance. These recommended best practices reflect the experience of practitioners and serve to reduce complexity and the likelihood of problems when installing and using lighting controls.

## Common Use Cases

### 1. Building and Code Compliance

This use case represents the minimum requirement for most projects and is generally the least costly.

SYSTEM CAPABILITIES INCLUDE:

| Switches & dimmers | Programmable clock | Presence detection | Daylight detection |
|---|---|---|---|

Although it's a least-cost approach, code compliance alone may not satisfy key organizational objectives. System capabilities generally include manual switches and dimmers; dimming drivers; sensors that detect unoccupied spaces and signal lights to turn off; sensors that detect light and signal lights to dim when daylight is present; and programmable clocks for interior and exterior lighting.

### 2. Enhanced Lighting Performance

This use case aims at improving workforce productivity, wellness, and facility appeal.

SYSTEM CAPABILITIES INCLUDE:

| Programmable scene control | AV screen controls | Shade control | Tunable white |
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Enhanced lighting performance aims at improving workforce productivity, wellness, and facility appeal. System capabilities generally include convenient keypad controls for multiple settings in conference and training spaces; AV controls for screens, lights and blinds; and luminaires that provide tunable white with manual or automated settings.

### 3. Enhanced Energy Conservation

This use case supports both aggressive cost reduction and zero carbon goals.

SYSTEM CAPABILITIES INCLUDE:

| Energy reporting | System status feedback | HVAC integration | Grid interaction |
|---|---|---|---|

Enhanced energy conservation supports both aggressive operating cost reduction and zero carbon goals. System capabilities generally include energy reporting and system optimization to suggest improved operations; interaction of HVAC systems through a building management system; and grid interaction through demand response signaling.

### 4. Enhanced Facility Productivity

This use case includes increased spatial and asset efficiency, retail performance, safety and security, and engagement.

SYSTEM CAPABILITIES INCLUDE:

| Data sharing and analysis | Indoor positioning | Asset tracking | Occupant counting |
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Enhanced facility productivity includes optimized management of facility spaces and assets, retail performance, safety and security, and occupant engagement. Indoor positioning, asset tracking, people counting and other advanced sensors, combined with application-specific analytics, enable a lighting control system to provide benefits beyond lighting and energy.

# Disciplined Approach to Design and Implementation of Connected Lighting Systems

## Project Planning

**1** **Focus on your organization's core requirements.**
Extensive options add cost and complexity, and they tend to be eliminated by value engineering. Document the key requirements in a controls narrative.

**2** **Plan early for lighting controls.**
Early planning keeps design options open, limits risks, and allows for constructive value engineering. For complex renovation projects, consider an isolated area where new equipment and suppliers can be tested with limited exposure.

**3** **Engage trusted partners.**
Experience in controls, a track record of success, and familiarity with your organization improve decisions and execution. Retain services throughout the process; the higher cost is easily recovered.

**4** **Assemble an internal project team.**
Information technology and maintenance personnel are particularly useful in planning and anticipating problems.

## Design and Construction

**5** **Carefully review the controls narrative for consistency with your objectives.**
The narrative, typically written by a lighting design consultant, engineer, or other technically knowledgeable member of the project team, explains the basic intent and operation of the control system. A good narrative is the foundation of a good system.

**6** **Communicate throughout the project.**
Assure that the project team stays abreast as the system design evolves into system capabilities, a Sequence of Operations (SoO), and detailed specifications. Resolving gaps and contradictions in the documentation saves considerable difficulty and cost later.

**7** **Avoid systems that mix components from different manufacturers.**
Systems with mixed or customized components are more prone to problems and difficult to maintain.

## Installation and Set Up

**8** **Apply "single-point" responsibility for complex controls systems.**
Capabilities, such as tunable white and HVAC integration, often benefit if sourced from a single manufacturer or corporate parent. A system integrator may be a necessity with complex applications.

## Ongoing Operation

**9** **Require intuitive wall controls so occupants can easily operate them.**
Single-function pushbuttons and clear labels help occupants. Labels should be large enough to be easily read. Familiar symbols work better than words in most cases.

**10** **Provide for practical system maintenance.**
Lighting controls need regular attention from experienced technical staff; system upgrades often go awry unless carefully monitored. Limit enhancements to core requirements.

**U.S. DEPARTMENT OF ENERGY**