



EDGE Building Intelligence Group

## DC-Coupled PV and PoE IoT in Support of Net-Zero Initiatives

IP PoE lighting is a huge step forward in furtherance of net-zero initiatives. The Master Technology Planning Process, adopted by Cisco Systems, supports adoption while minimizing disruption to traditional construction efforts. By replacing traditional AC powered edge devices with Ethernet-tethered DC IoT devices that are powered and controlled by an IP network, traditionally siloed building systems may coexist on a cohesive data-normalized network as distinct VLANs.

### Traditional Building System Siloes

- Traditional building systems use different protocols and cabling systems
- Costly to install and administer
- Disparate teams, networks, software, servers and support
- Each system requiring dedicated power, infrastructure, operation and maintenance
- Multiple networks in the same building to perform the same basic functions = wasted dollars for redundant servers, switches, cable and conduit
- Siloes inhibit or prevent interoperability, data-normalization, flexible, granular control



### Integrated IP Systems

- Simplified Design consolidates cabling and reduces pathways and material cost
- Reduces labor cost
- Universal connectivity and cabling means less costly moves, adds and changes
- Power, control and security on one infrastructure
- Integration permits smart control lower energy consumption by up to 25%
- Improved overall manager and occupant satisfaction
- Increases productivity via improved comfort, air quality, lighting, shading, way management
- AI and HI - Ready



**NO DISRUPTION TO LIGHTING DESIGN:** The very same lights will be used but shipped from the manufacturer without drivers and with the DC leads exposed. We modify existing plan documents and specify IP-based systems and end-points by rewriting the Divisions and overlaying an enhanced design in the architectural sets, such as the Reflective Ceiling Plan. IP-PoE powered and controlled systems support Net-Zero initiatives and superior financial and energy efficiencies in the following ways:

1. **INITIAL COST:** Reducing 1st cost \$2-\$5 per square foot by reducing labor cost, reducing gross material required for wiring by replacing all electric wiring used for lights and building system endpoints with low-voltage Ethernet.
2. **SUPERIOR OPERATING EFFICIENCY:** All PoE powered IoT devices are automatically manageable via the network, eliminating the need for “bolted on” controls.

### Cost Savings with DC & PoE

#### Traditional AC



- Conduit, wire and a back box for each
- Electrician wage rates
- Electrical code
- ~ \$750 per light

#### DC Connected



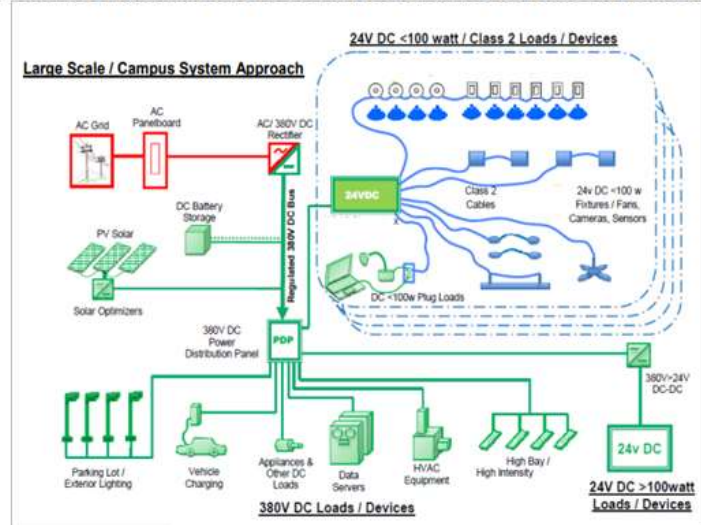
- Safe low-voltage installation with cabling and connectors
- Cabling contractor wage rates
- Established cabling standards
- ~ \$500 per light

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3. **DATA-NORMALIZED BY DESIGN:** All building systems endpoints conform to a uniform open-API data format making data collection, analytics and use-case management less difficult and costly.
4. **ELIMINATE UNNECESSARY ROUND TRIP FROM DC to AC to DC:** For buildings contemplating inclusion of solar and wind for locally sourced power, directly DC coupling the solar/wind systems' DC-battery array to PoE switches would avoid 20-40% inversion and rectifier loss.
5. **UNIFIED SWITCH FABRIC:** PoE lighting establishes a smart and powered switched fabric that extends to an entire property. This permits other building systems to be layered on the same switched fabric on individuated VLANs, avoiding the need for dedicated network backbones for each building system.
6. **REDUCED MATERIAL:** By using low voltage network wiring rather than high voltage AC wiring, using IoT system sensors, like motion sensors, across multiple building systems and designing a unified network, the amount of physical infrastructure and IT equipment would be sharply reduced. Using a DC micro-grid coupled with an IoT PoE network with integrated controls will create the most efficient power distribution and management.

## OPTIMAL ARCHITECTURE for *IN-BUILDING* DC DISTRIBUTION



**ENERGY EFFICIENCY** - New energy conservation and sustainability mandates inform consideration of local Direct Current power-producing photovoltaic and wind alternatives to largely fossil fueled grid power sources. In new construction up to 85% of building system endpoints including lights are likewise DC at their core.

In traditional construction plug loads and light loads are AC-powered. Accordingly, to be usable, locally produced DC power is inverted to AC and then converted back to DC in the LED fixture or other device. The round trip from DC to AC and then back to DC wastes 15%-40% of the locally produced DC power. This waste can be avoided by powering the IoT infrastructure directly with DC power from the solar batteries. This DC power source can be directly coupled to PoE switches and DC distribution hubs.

IoT platforms including PoE lighting with integrated controls support advanced power management for energy conservation. Monitoring and control of elevators, HVAC, and facilities help to ensure that a building meets performance standards and enables building managers to reduce their carbon footprints.

