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MAY 2026

POWER-OVER-ETHERNET (PoE) DC DISTRIBUTION

OPPORTUNITY

What are the benefits of PoE systems?

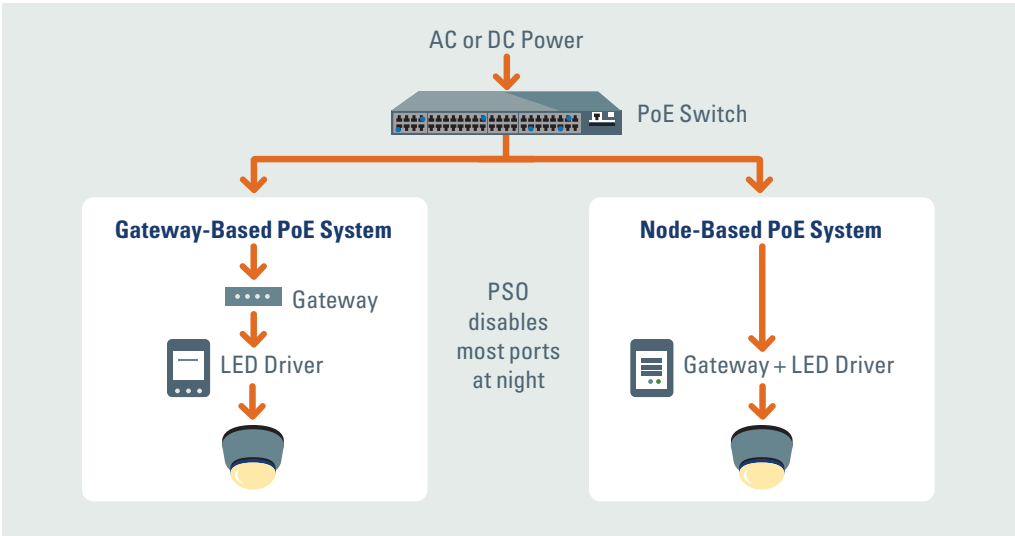
SINGLE CABLE FOR POWER + DATA ENABLES CENTRALIZED CONTROL AND SYSTEM INTEGRATION

DC distribution can reduce system loss[1] and reduce capital costs[2]

TECHNOLOGY

How do PoE DC systems work?

PoE Switch Sends Power and Data Over Ethernet



M&V

Where did Measurement and Verification occur?

LAWRENCE BERKELEY NATIONAL LABORATORY (LBNL) evaluated two PoE LED lighting systems: a gateway-based system at GSA's Workplace Innovation Lab and a node-based system at LBNL's Flexlab.

RESULTS

How did the PoE DC systems perform?

6%
MORE EFFICIENT THAN AC
node-based; Port shut-off (PSO)* critical to limit standby losses[3]

<5%
ERROR FOR ENERGY REPORTING
Sufficient for system and energy management integration[4]

11%
LESS EXPENSIVE
than equivalent AC system. Majority of savings from reduced labor costs[5]

ADD'L
CABLE RUNS
Lower-cost cabling (no conduit), but more runs required due to power limits ~2–8 luminaires per run (typ. 25 W each), depending on system design[6]

*PSO: Most ports off at night; critical sensors on.

System Design Impacts Efficiency

Gateway-based system is more flexible but less efficient

	Efficiency vs. Equivalent AC	System Standby Consumption
Gateway-based without PSO	9% less efficient	210 W
Gateway-based with PSO	4% less efficient	200 W
Node-based with PSO	6% more efficient	135 W
Optimized for lighting only with PSO	18% more efficient	83 W
Optimized for lighting only with PSO and DC input	22% more efficient	Not tested

DEPLOYMENT

Where does M&V recommend deploying PoE DC systems?

NEW BUILDS & MAJOR RENOVATIONS

CONSIDER SMART BUILDINGS OPPORTUNITIES; CONNECTING MULTIPLE IOT DEVICES MAY ADD VALUE TO POE DC DISTRIBUTION

- Use PSO to reduce standby losses.
- Install PoE lighting with clear zoning, entrances, and exits.
- Confirm PoE switch compatibility with the network.
- Explore HVAC control. PoE occupancy data may support HVAC integration, but further evaluation is recommended.

[1]https://www.sciencedirect.com/science/article/abs/pii/S0306261917307419E [2]https://www.sciencedirect.com/science/article/abs/pii/S0306261918312339 [3]Daniel Gerber, Jordan Shackelford, Vegelis Vossos, Luis Fernandes, Performance of Power over Ethernet DC Distribution, LBNL, June 2025, p.5 [4]Ibid, p.6 [5]Ibid, p.7 [6]Ibid, p.8