Power over Ethernet (PoE) Technologies in Offices

Scaling Up the Next Generation of Building Efficiency Packages

Center for Energy Environment adopts PoE technologies.

In 2018, the Center for Energy and Environment performed a renovation of their Administration office area. As part of the renovation, CEE agreed to use the space to demonstrate the use of three Power over Ethernet (PoE) technologies:

- **PoE Lighting** -The renovation consisted of the installation of 17 new cubicles (in adjacent rows consisting of nine and eight cubicles, respectively). For the nine cubicle row, a Signify Ledalite 4' suspended PoE luminaire was installed over each cubicle. The adjacent row of eight cubicles was illuminated by the legacy 2x4 T8 fluorescent suspended lighting system consisting of a row of 13 AC-powered fixtures. Later the T8 lamps were replaced with 4' AC LED replacement lamps.

- **PoE Computer** - In one of the Admin area cubicles, an AC-powered desktop PC workstation with two external monitors was replaced by a ThinLabs Dual Screen PoE All-in-One quad-core computer. The workstation was used primarily for word processing, spreadsheets, business correspondence, and online webinars/training.

- **PoE Thin Client** - In the adjacent Lending Center space, eight 10ZiG PoE-capable thin clients replaced the previously used AC-powered thin clients that were connected to dual external monitors. The 10ZiG thin clients were powered in two modes: (1) using AC adapters supplied by 10ZiG and (2) using PoE connected by Ethernet cable to a PoE+ switch.

The Admin area PoE devices were powered using Cisco Catalyst Digital Series UPoE+ network switches (60W per port) and the Lending Center PoE thin clients were powered with PoE+ network switches (30W per port).

To determine the energy performance of these PoE technologies, their energy usages were compared with the power loads of the AC-powered devices that they replaced.

PoE lights in CEE's Admin office area.

"I like that the lights turn off when the cubicle is not occupied and that we can dim the brightness of the cubicle to that person's preference."
—Judy Thommes, Manager of Operations for the Center for Energy and Environment

ThinLabs Dual Screen PoE All-in-One quad-core computer.

Major Findings

PoE Lighting - The savings from using PoE LED lamps over the T8 fluorescent lamps was over 50%. The PoE luminaires used the same LED lamps (as the replacement LEDs) with the exception that the ballast and driver was replaced by a PoE LED driver. Each PoE luminaire was dimmable with occupancy and photosensors. With the PoE lights, we were able to customize the light level for each cubicle and resulted in about 40% savings.

PoE computer - The PC workstation with two external monitors consumed 16-40 watts with normal activities and 40-95 watts with high activities. The PoE ThinLabs with dual monitors were showing 11% savings under the same activity levels. There was little difference in power draw whether the ThinLabs was powered by line voltage or PoE. The ThinLabs standby load was higher than the PC workstation. However, the loads in standby mode (3-5 watts for PoE and up to 2 watts for PC) are much lower than in active mode.

PoE thin clients - The results showed about 45% saving switching from line voltage thin clients to the POE ones. The 10ZiG thin client could also be powered by line voltage or PoE and the performance of both modes were very similar.

"PoE has given us insight and control into operational areas that have traditionally been outside the domain of IT. This leads to more informed operational decisions and initiatives like energy savings and employee comfort."
—Robert Lysholm III, Systems Engineer for the Center for Energy and Environment

Tips and Best Practices

▶ The majority of savings of PoE luminaires compared to LED lights come from individual light level customization and controls.

▶ An advantage of the PoE mode is that the network switch can be scheduled to turn off power to the thin client during off hours, eliminating the standby power.

▶ Network switch management software allows real time port level energy monitoring (and the PoE devices connected to each network switch port).

▶ Low voltage licensed electrical contractors, who charge lower labor rates, can be used for the cabling of the PoE systems.

▶ PoE projects should have equivalent or cheaper costs than the similar line voltage-specified job. Specify Division 27 - Communications for PoE systems to ensure that the bids are for low-voltage DC-power.

PoE lights in CEE's Admin office area.

Results			
PoE Technology	Lighting (Compared to LED)	Workstation	Thin Client computer
Power Load (per fixture/device)	16 W	8-25 W	5-8 W
Energy Savings (estimated annual)	14 kWh	9 kWh	11 kWh
Energy Use Reduction	40%	11%	44%

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