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ENERGY EFFICIENCY & RENEWABLE ENERGY

Power over Ethernet (PoE) Technologies in Offices

Scaling Up the Next Generation of Building Efficiency Packages

Saint Paul Port Authority turns to Power over Ethernet (PoE) to power and control its lighting and office needs.

In October 2021, the Saint Paul Port Authority (SPPA) relocated their offices to Treasure Island Center located in downtown Saint Paul, Minnesota. The offices were designed to be LEED Gold certified and achieve the highest Fitwel certification. The build-out consists of 8,400 sq. ft. of office space, with eleven private offices and seven workstations along with an open collaboration space, two focus rooms, and two conference rooms. The SPPA offices use the Igor Nexos IoT platform to operate, manage, and power the PoE systems Four PoE technologies were implemented in the SPPA offices:

- **Office Lighting** - The 71 PoE luminaires in the offices include overhead linear suspended fixtures, cylindrical pendants, sconces, undercabinet lighting, and decorative lighting, including LED image projectors and have a total maximum power input of 2,836 Watts. The lights were networked controlled with the system integrated with wall switches, occupancy sensors, and photosensors.
- **Office Plug Load Control** – Minnesota Energy Code requires that 50% of the AC outlets in the office spaces must be controlled by occupancy sensor or by time control. The Igor nodes control the outlets using a PoE-powered relay to switch the outlets on and off depending on occupancy or schedules.
- **AV Display Management –** The display monitors in the Reception Area, Great Room, and meeting rooms are managed and operated using PoE touchscreen AV system controllers.
- **VAV Controller** – The controllers of the variable volume air handling units in the office are powered by low voltage DC electricity from the PoE network.

The PoE devices are powered by Transition Networks PoE++ network switches, supplying up to 90 Watts per port or a total of up to 1,640 Watts PoE output per switch. With four switches, the maximum total output would be 8,200 Watts.

PoE lights in the SPPA Great Room.

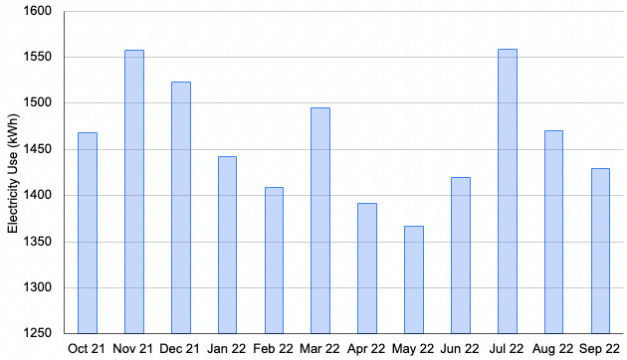
"The Saint Paul Port Authority has undertaken the goal to become sustainable and the ability to reduce our energy consumption with the latest PoE technology has been both rewarding in achieving that sustainable goal, as well as saving us real operating dollars."

— Monte Hilleman, Senior Vice President, Sustainable Development for the Saint Paul Port Authority

PoE lights in the SPPA Reception area.

Energy Use

A submeter was connected to the electrical panel of the offices to monitor the energy use of the offices' lighting system, plug loads, server room, and air handling units (VAV boxes). The below graph shows the monthly electric use of the Port Authority over the twelve months from October 2021 to September 2022.



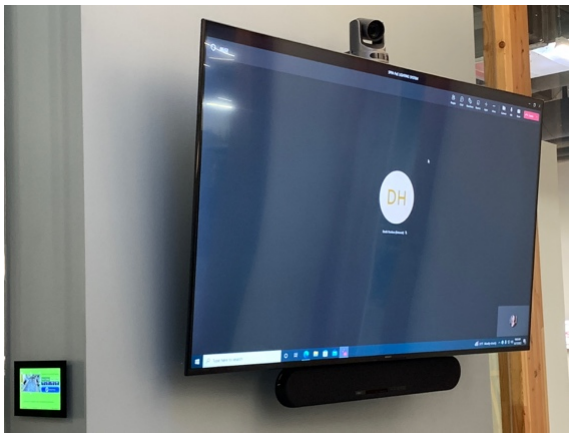
The average monthly electric use is 1,461 kWh which represents about 1% of the monthly electric utility bill of the entire building.

ENERGY STAR Portfolio Manager allows tenant spaces within a larger property to be benchmarked. Portfolio Manager calculated the weather-normalized source EUI from October 2021 to September 2022 to be 19.9 kBtu/ft^2 which is 82.9% lower than the median. The weather-normalized site EUI of the office's electric use is 7.1 kBtu/ft^2.

ENERGY STAR Portfolio Manager Results	
Gross Floor Area (ft^2)	8,400
Site Energy Use (kBtu)	59.7
Source EUI (kBtu/ft^2)	19.9
Site EUI (kBtu/ft^2)	7.1
Total GHG Emissions Intensity (kgCO$_2$/ft^2)	0.9

Tips and Best Practices

- The majority of savings of the networked PoE luminaires compared to unnetworked LED lights comes from the ability for individual light level customization (brightness and color temperature) and luminaire level controls.
- The networked PoE systems can be scheduled to be powered on or off through the PoE system management software of via integrated occupancy and daylighting sensors. PoE controlled circuits also allow for scheduled power or sensor control to minimize phantom loads.
- Network switch management software allows for real time port level energy monitoring of the network switch (and the PoE devices connected to each port). IT staff can perform this using SNMP. Power from the power distribution unit (PDU) to the PoE network switches can also be possible depending on the type of PDU.
- 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 AV touchscreen controller and display monitor in the SPPA Great Room.

"Our PoE project has been a success in that the end-users who are our coworkers see it as seamless, and adaptable as lighting needs change."

— Monte Hilleman, Senior Vice President, Sustainable Development for the Saint Paul Port Authority