SHOWCASE PROJECT: LOS ANGELES DEPARTMENT OF WATER AND POWER (LADWP): JOHN FERRARO BUILDING

SOLUTION OVERVIEW

Constructed in 1965, the John Ferraro Building (JFB) is an iconic office building that houses the Los Angeles Department of Water and Power (LADWP). In 2014, LADWP committed to obtaining LEED Existing Buildings: Operations and Maintenance (EBOM) certification for the building by its 50th anniversary date in June 2015. This cross-functional effort leveraged energy and water efficiency improvements completed over the years, including lighting retrofits, green plumbing and toilet retrofits, fan system upgrades, and the installation of an energy efficient chiller.

The building was originally designed with unique, experimental features. For example, the lighting system also heated the building, resulting in a high density of lighting fixtures. The HVAC system includes distribution along the exterior window area at floor level and return air integrated with the lighting fixtures. A reflecting pond surrounds the building and is integrated with the cooling towers. The building upgrades for LEED certification were designed to achieve improved energy performance while still preserving the historic nature of the building.

SECTOR TYPE

Local Government, Utility

LOCATION

Los Angeles, California

PROJECT SIZE

890,000 Sq. Ft.

FINANCIAL OVERVIEW

$2.3 Million

SOLUTIONS

LADWP's Facilities Operating and Maintenance (O&M) personnel worked closely with the Energy Efficiency (EE) Engineering group to identify and analyze a suite of energy efficiency measures for the building. Eight measures were selected for implementation. These included fan system retrocommissioning and upgrades, lighting upgrades and controls, duty cycle changes for selected equipment, and chiller replacement. Most measures were implemented throughout 2014 and completed in the first quarter of 2015.

- **Fan System Variable Frequency Drive and Static Pressure Control**

Control strategies were designed and implemented to allow the major fan systems to slow down via variable frequency drives during occupied hours by utilizing the static pressure demand as a set point. Estimates show 6.9 GWh and 590 kW demand savings through the full duration of the project from 2008-2015, with a 1-year payback after utility incentives.

- **Fan System Economizer Damper Control**

LADWP O&M replaced all rusted and inoperable outside air dampers and actuators. The introduction of outside air into the building air distribution system, when the outside air meets adequate conditions, drastically reduces the load on the building mechanical cooling system. These measures are estimated to save approximately 774,000 kWh annually with a 4-month payback after utility incentives.

- **6th Floor Lighting Upgrade**

LADWP EE Engineering designed a lighting retrofit for one floor of the building to reduce lighting power consumption and incorporate a lighting control system. They replaced 410 T8 32-watt lamps with 234 newer LED T8-compatible tubes rated at only 18 watts, resulting in a 42 percent reduction in parts count and over 40 percent in energy savings. Lighting controls were installed that enable the facility operations personnel to interface with individual luminaires from their workstations. These measures are estimated to save approximately 33,541 kWh annually with a 15-year payback after utility incentives. Since this was a pilot project, future costs are expected to be reduced if applied to the rest of the building.

- **Lighting Schedule Change, Half-Hour Daily Reduction**

LADWP O&M has reduced the lighting schedule for all indoor areas by 30 minutes. This resulted in approximately 6,110 kWh of energy savings, with a 6-month payback after utility incentives (accounting for staff time).

- **Daylight Harvesting Controls**

Programming was implemented in existing building automation systems (BAS) and lighting circuitry to use daylight to offset the amount of electric lighting needed to properly light all private perimeter offices. When sufficient daylight is available, controls reduce lighting power by at least 50 percent in the perimeter areas. These measures are estimated to save approximately 195,570 kWh annually and net a 70 kW demand reduction. After utility incentives, this measure has an almost immediate payback.

- **Duty Cycling Pond Pumps**

Reduced the operating schedule of two 50-horsepower pond circulating pumps that push water through the filtration and chemical systems from 24 hours/day to 12 hours/day for a 50 percent reduction in power usage. Monitoring indicates 262,800 kWh of annual energy savings. After utility

incentives, this measure pays back almost immediately.

- **Water Heater Duty Cycling**

Installed controls to allow the BAS to reduce the operating schedule for the electric water heaters for domestic water from 24 hours/day to 12 hours/day during occupied hours. These controls are estimated to save approximately 372,150 kWh annually with an almost immediate payback after utility incentives.

- **Replace Aging Chiller with Frictionless Compressor Based Chiller**

JFB's C-3 double bundle heat recovery chiller was first put in service in the mid-1960s when the building opened. It received a major overhaul in 1995, but in 2012 the chiller had a refrigerant tube rupture within the main barrel, which forced the chiller to be shut down and put out of service. This major failure has left the building with effectively no redundancy in heating and cooling during high peak loads.

Based on analysis of chiller efficiency and power curves, LADWP EE Engineering and O&M selected a new chiller that incorporates multiple oil-free, magnetic bearing, centrifugal compressor technology in its design. This allows for built-in redundancy, low load capacity control, and energy efficient operation.

EE Engineering estimates 2,872,110 kWh of annual energy savings and an increase in coincident peak demand by 165kW resulting from the chiller replacement. The demand increase is due to the new chiller's greater demand at full load. This is a trade-off for its greater efficiencies in partial load, where it operates the majority of the time. After utility incentives, the total cost of the measure is estimated to pay back within 3.2 years.

While these measures and associated savings are impressive on their own, they were also accomplished while adding nearly 1,000 employees. Thus, energy use per capita was actually reduced 42 percent from baseline (2009) to performance year (2016).

OTHER BENEFITS

In 2015, the John Ferraro Building retrofits resulted in the achievement of LEED Gold: Operations & Maintenance (EBOM) via the LEED Dynamic Plaque (now known as Arc).

The JFB project also included numerous plumbing retrofits. All fixtures in the building now have the following flow rates:

- **Water Closet Flushometers**: 1.28 gpf
- **Waterless Urinals**: 0 gpf (with some water required for cleaning)
- **Urinals**: 0.125 gpf
- **Lavatory Sink Faucets**: 0.5 gpm
- **Showerheads**: 1.5 gpm

The success of the JFB project relied on management commitment, employee engagement, and energy analytics. Close collaboration between the Facilities Operating and Maintenance group and the Energy Efficiency Engineering group enabled rapid analysis and deployment. The LADWP Green Team was instrumental in engaging staff, in turn enabling successful project implementation.

Annual Energy Use
(Source EUI)

Baseline(2009)
507 kBtu/sq. ft.

Actual(2016)
319 kBtu/sq. ft.

Energy Savings
37%

Annual Energy Cost

Baseline(2009)
$4,738,000

Actual(2016)
$2,993,000

Cost Savings
$1,745,000