



## SHOWCASE PROJECT: KING COUNTY AIRPORT TERMINAL DEEP RETROFIT

### SOLUTION OVERVIEW

The King County Airport Terminal project is a deep energy retrofit focused on replacing the mechanical and lighting systems throughout the facility with state-of-the-art efficient technologies. This project highlights how a modern design approach to mechanical and lighting systems can dramatically reduce energy use, and how older and historic buildings can achieve deep energy reductions and exceed advanced energy code requirements.

The Main Terminal is a two-story masonry brick building constructed in 1929, making it one of the oldest airport terminals in the country. There have been several renovations and numerous interior improvements since original construction, including heating system conversions from coal to oil to natural gas, and now electricity.

While Seattle-Tacoma International Airport (Sea-Tac) is the primary hub serving the region, King County International Airport/Boeing Field is one of the country's busiest non-hub airports, averaging 200,000 takeoffs and landings annually.

State grant funding provided \$300,000 toward the project. This support came in the form of a Department of Commerce grant award to King County, and additional energy efficiency incentives of \$129,970 were provided by Seattle City Light, Seattle's publicly-owned electric utility.

### SECTOR TYPE

Local Government

### LOCATION

Seattle, Washington

### PROJECT SIZE

25,000 Square Feet

### FINANCIAL OVERVIEW

\$350,000\*

### SOLUTIONS

The following energy conservation measures were implemented as part of the airport terminal's

deep energy retrofit:

- Variable Refrigerant Flow (VRF) heat pumps and a Dedicated Outdoor Air System (DOAS) replaced existing multi-zone air handler roof top units (RTUs)
- New, high-efficiency heat recovery ventilator installed with up to 90 percent heat recovery
- Interior 32-watt fluorescent tubes were replaced with 15-watt light emitting diode (LED) lamps. The facility was partially fitted with advanced lighting controls to fully optimize energy savings, including daylight and occupancy sensors
- Outdoor airport ramp and parking lot lighting were upgraded to LED technology with night setbacks to 50 percent of full lighting levels.

The VRF system is fully programmable, with controlled zones and set points aligned for occupancy and use. Carbon dioxide sensors are used to control ventilation in conference rooms. Unnecessary plug loads, such as space heaters and fans that were used for occupant comfort with the previous mechanical system, were removed to better balance the building heating and cooling system, and maximize energy savings.

During commissioning of the VRF/DOAS system, blowing air and noise performance issues were identified and resolved. The new system offered more flexibility to respond to occupant needs. The blowing air noise was addressed by reducing fan speeds and offering occupant controls to turn fans off. The building's lobby has a high ceiling but features a large, commercial fan, which has proven an effective solution to maintaining air movement in the large open foyer.

The VRF and DOAS equipment installations were completed in the first quarter of 2017. Special Federal Aviation Administration (FAA) clearance was required for use of a crane to set new rooftop HVAC units and remove the old RTUs.

One unexpected result of the indoor lighting retrofit was a perceived increase in lighting output from the LED lamps, resulting in staff reporting some spaces as over-lit. Consequently, in those zones lamps were dimmed to 75 percent output, improving comfort and enhancing energy savings. Select interior spaces also take advantage of daylight harvesting and occupancy sensors. Exterior parking lot and tarmac lighting is controlled by a microwave-based occupancy sensing system which, at night, dims the parking lot lights and the tarmac lighting when no planes are approaching. The lighting retrofits were completed in the second quarter of 2017.

## **OTHER BENEFITS**

These upgrades will improve traveler comfort and reduce staff time spent on building maintenance. It is expected that the building will earn ENERGY STAR® certification. Additionally, staff education has improved energy reductions. Prior to the retrofit, workers often used personal electrical devices in their workspaces, such as fans, task lights, space heaters, and hot plates. Following this deep energy retrofit, staff have discontinued the use of these personal electrical devices to further reduce energy use and improve energy cost savings.

\*Incremental energy efficiency investment

### Annual Energy Use

(Source EUI)

Baseline(2015)



Actual(2018)



**Energy Savings**

**60%**

### Annual Energy Cost

Baseline(2015)



Actual(2018)



**Cost Savings**

**\$31,000**



King County International Airport Terminal Building



Removal of inefficient RTU



New air-source heat recovery and energy recovery ventilation (ERV) units



Main Terminal Rear



Terminal Interior