Getting to Zero Net Energy

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Achieve zero by 2021





Zero Net Energy

Zero Waste to Landfill



Healthy Buildings Happy People



Zero Carbon



Water Balanced



Green Data Science



Transit First

Resilient Natural Systems & Wildlife

Eco-Eats & Shops

The flight path to a net zero campus



Balancing the energy load to zero





Start small

- 8,155 gsf
- \$6 million
- Net Zero Design

and study

- High performance envelope
- Cool roof materials
- Maximize daylight
- Dynamic glazing
- High efficiency HVAC system
- Optimize performance (BMS)
- Generate on-site energy
- Measure & verify design assumptions





Design Challenges

Unique Characteristics

- Functions
 - Airside/landside security
 - •First responders
 - Operations Center
 - VIP reception
 - Training center
- 24hr schedule (3 shifts)
- •Air quality concerns

High Performance Features

- Daylighting / Solar Tubes / Perimeter Glazing
- Advanced Lighting and Controls
- Variable Refrigerant Flow (VRF) Heating and Cooling System
- LEED Gold
- Photovoltaic Array
- Zero Net Energy



Modeled vs Actual Energy

88,916 kWh Modeled Consumption

183,163 kWh Actual Consumption (2015)

2.06 X Greater Consumption Than Modeled

Why is actual performance different than expected?

Energy Consumption System



San Francisco

International Airport

SFO

Occupancy vs Energy Use



San Francisco

International

Airport

SFO



ZNE Verification - Sensors





Plug Load



Occupancy



Plug Load



Utilization Analysis



Occupancy Of AOF Rooms By Time Of Day As Measured By Occupancy Sensors

Time of Day

Program lighting and HVAC schedules to better reflect actual use patterns in order to optimize energy consumption.



Plug Load Assessment





Lessons Learned

Energy Modeling

Energy Disaggregation and Management

Occupant Engagement and Training

