



• August 15-18, 2010 • Dallas, Texas •
• Dallas Convention Center •



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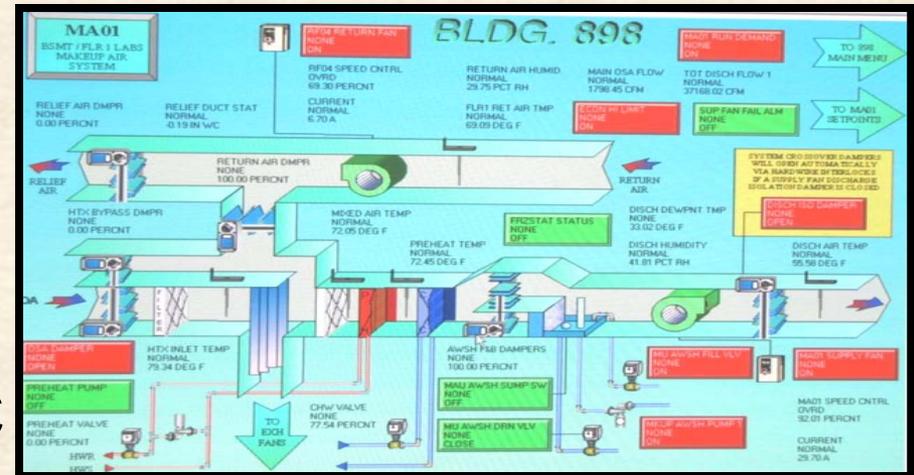
Sandia National Laboratories In-House Retrocommissioning

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Facilities Controls System Team Leader

Building Automated Control (BAC)

Facilities Controls System (FCS)

- Siemens System 600
- 180,000 data points
- 80% of GSF: 98 facilities
- Monitors & controls HVAC
- In-house commissioning, programming, maintenance



Retro-Cx: Overview

April 2006



- **New construction: 822,781 SF in past 3 yrs**
- **No resources for in-house Retro-Cx**
- **In-house staff supported 3rd-party contractor**





Retro-Cx Pilots

Existing Buildings (EBs)

1. Technology Support Center Office & Light Lab

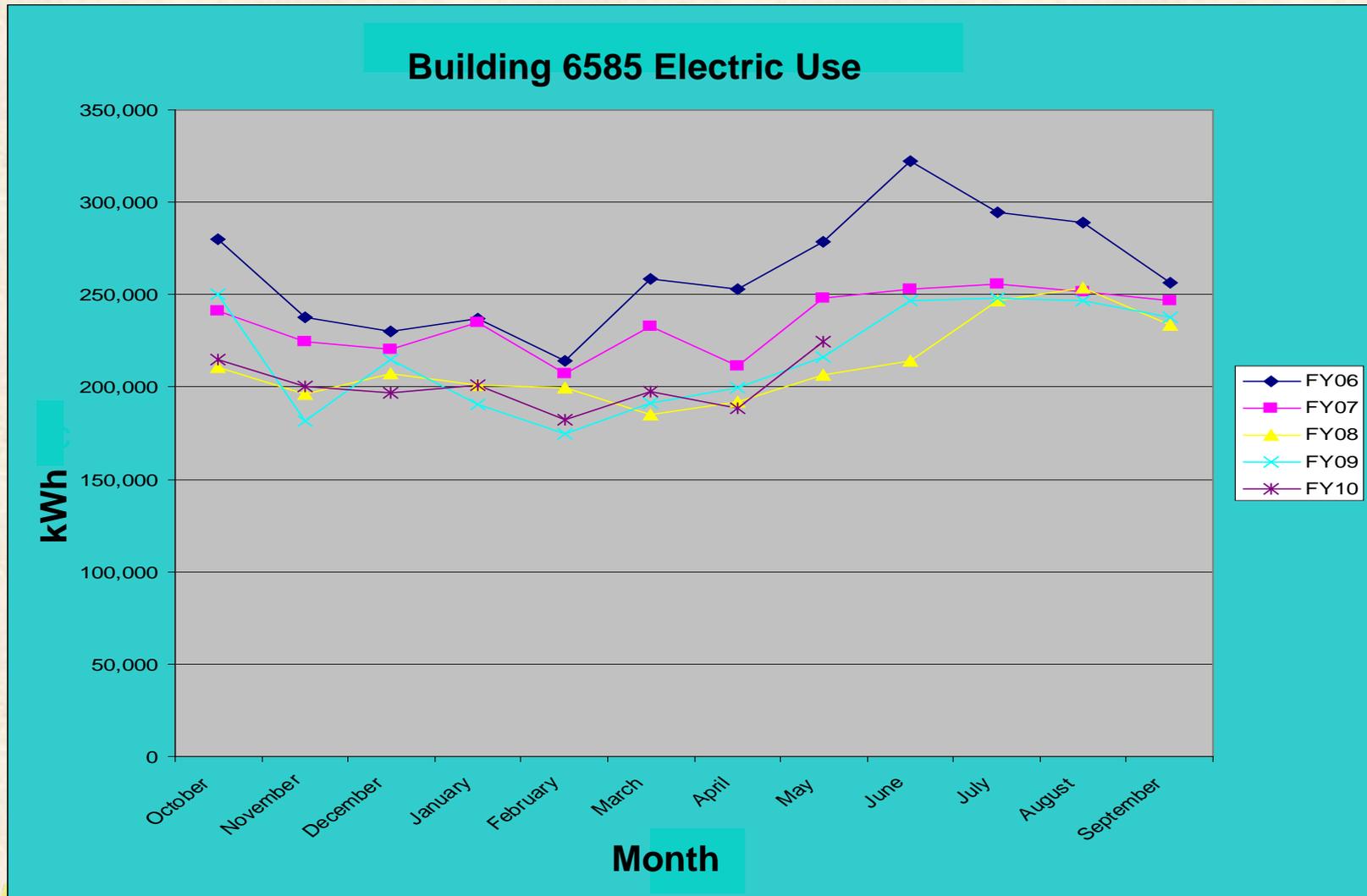
- Operational problems
- Change in functionality

2. Processing & Environmental Technology Lab (PETL)

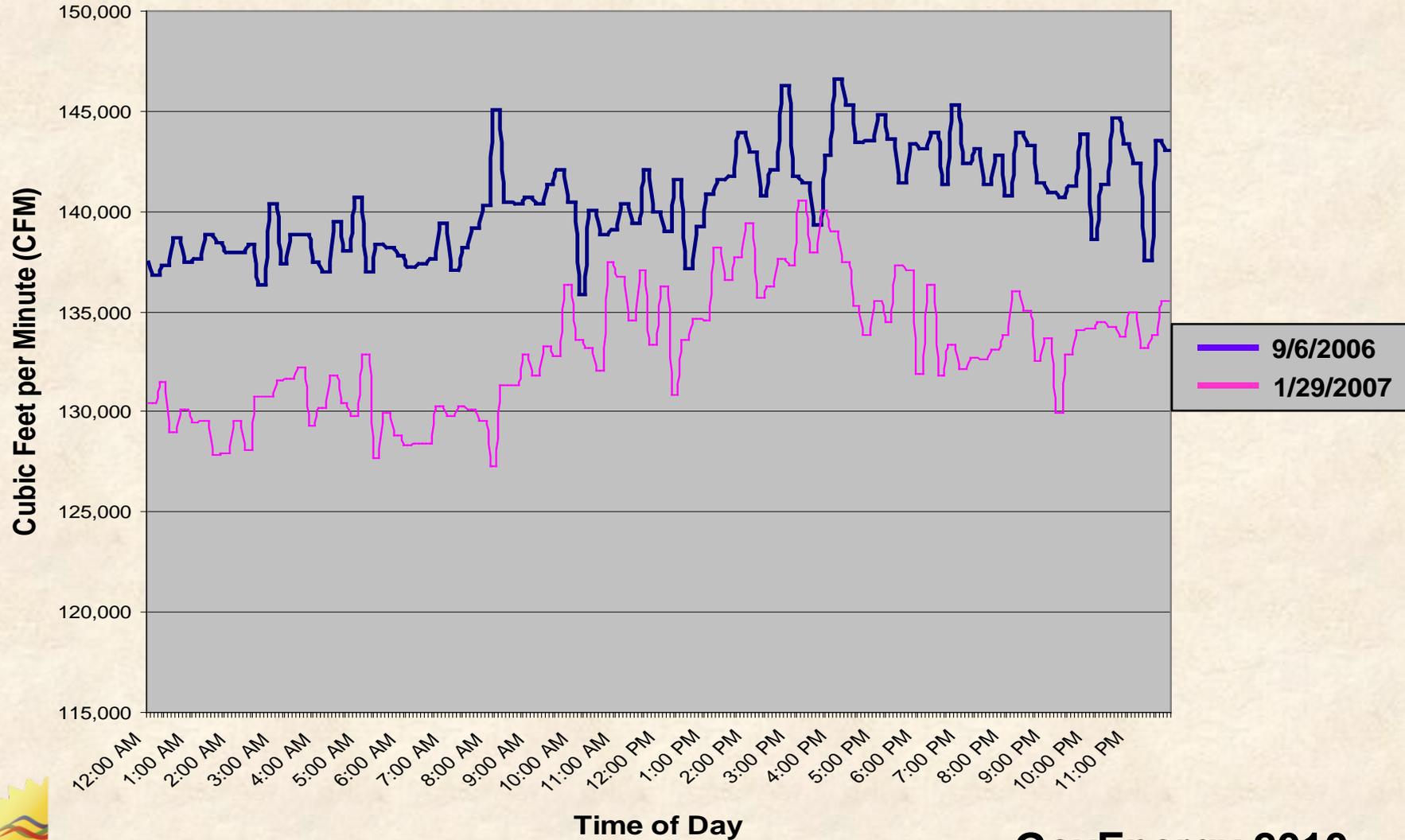
- High airflows
- Exhaust system



Technology Support Center

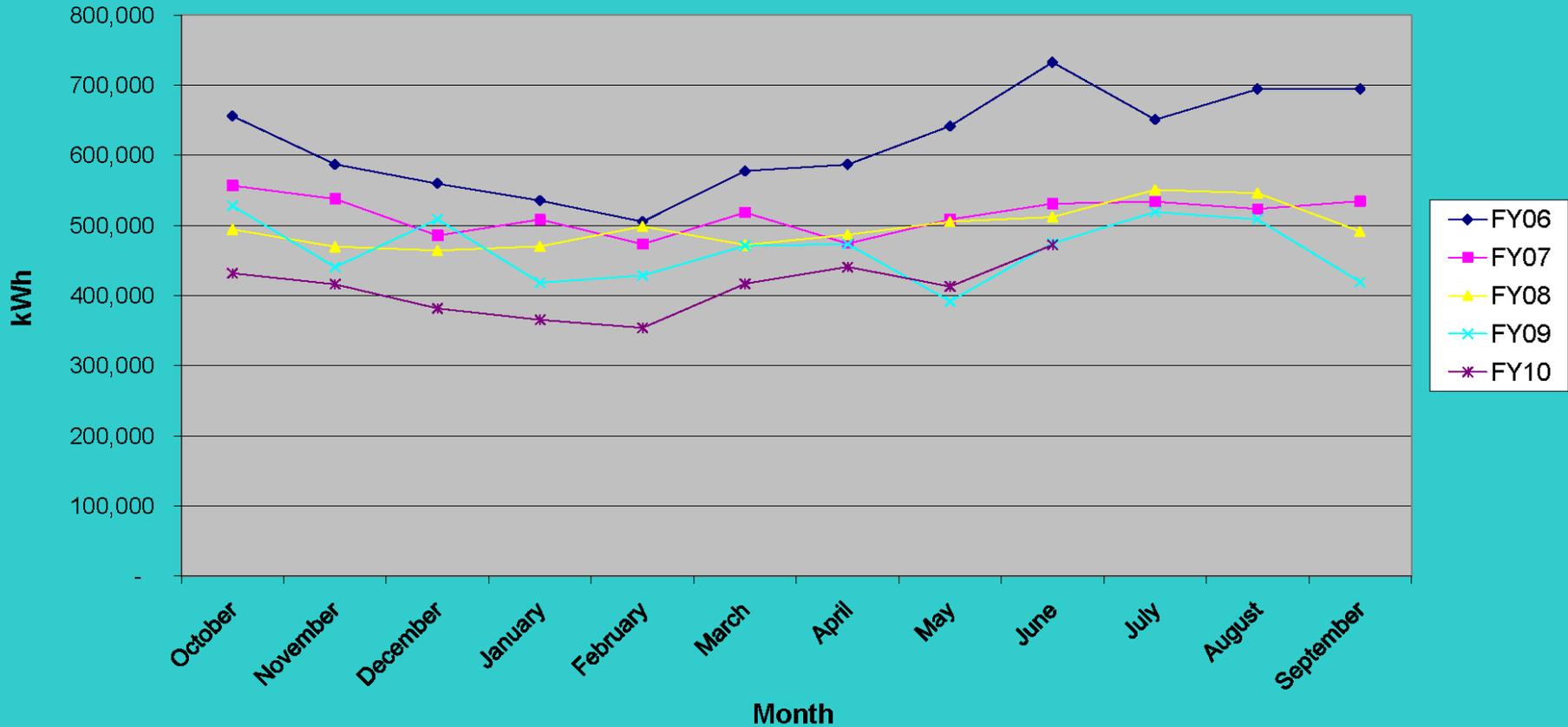


PETL: Exhaust CFM



PETL: Electric Use

Building 701 Electric Use



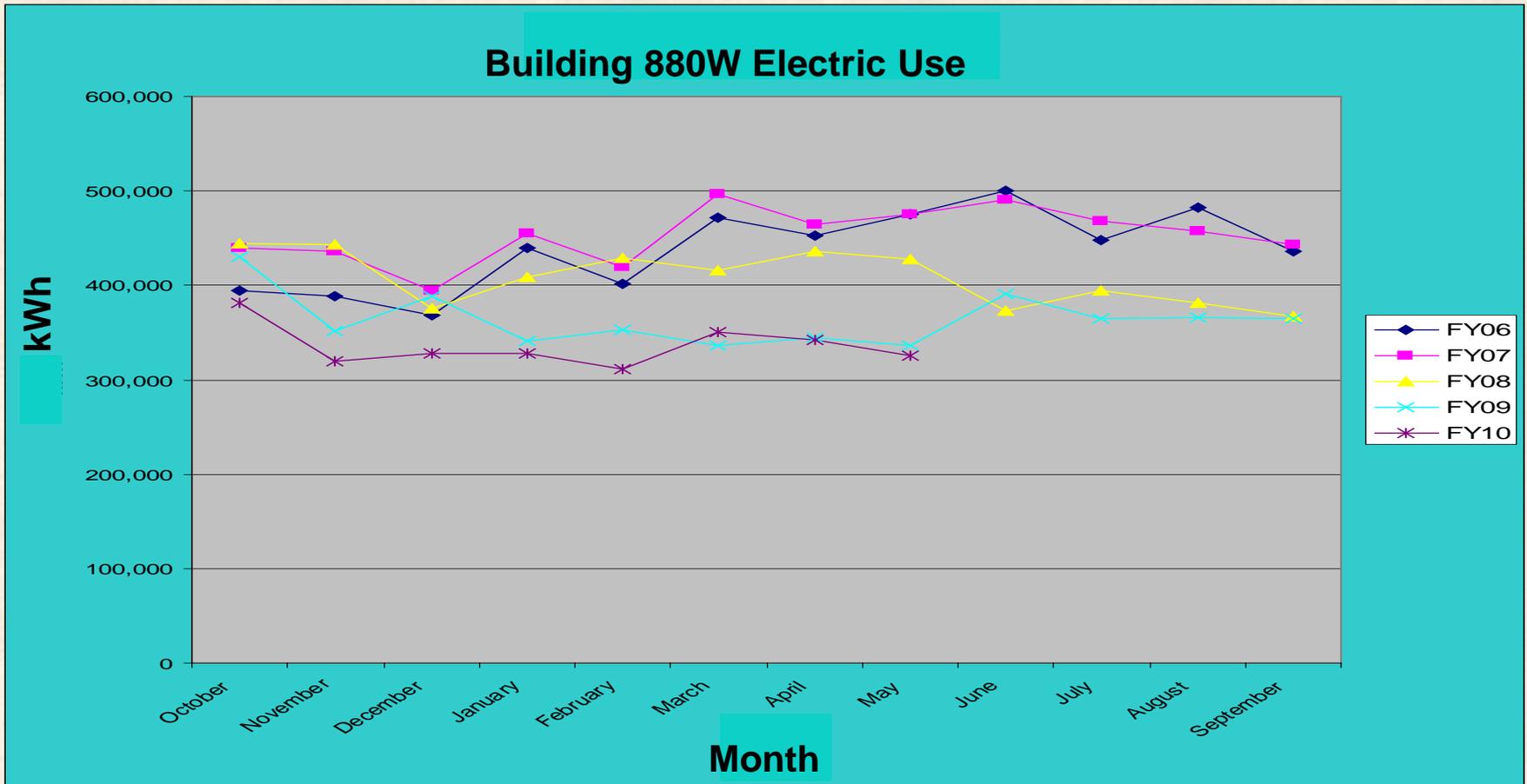
Building 880

Conditions

- 1953 – Built as warehouse space
- 1965 – Converted to office space: 153,530 GSF
- HVAC
 - Office fans operate 24/7
 - Economizer fans
1-8 nonoperational



Building 880 Retro-Cx Results



Building 750 LEED EB

Conditions

- 14,683 SF
- Single-storey office space
- Portfolio Manager Score: 78

• HVAC

- FCS controls all HVAC except 2 units
- 2 primary circulation pumps
- 2 direct exchange (DX) cooling units
- Gas-fired boiler
- 2 air-handlers (AHs)
- Fans have variable frequency drives (VFDs)
 - Roof unit & ceiling fan coil serve CPU room
 - 37 VAV boxes for supply air





Building 750

LEED EB

Initial Findings & Fixes

- **Uneven interior temperatures**

- Electric space heaters
- No baseboard heating
- Exterior offices cooler than interior
- Cold outside, zones stayed within DOE range (68 –78)



- **AH issues**

- AH1 duct static: reduced from 1.85” to 0.8”
- AH1 linkage to damper blade: repaired
- AH2 did not shut off: reprogrammed



Building 750 LEED EB

More Energy-Saving Fixes

- FCS reprogrammed
- Lighting occupancy sensors
- Smart strips
- Occupant participation

Results

- 25% reduced energy use
- Portfolio Manager score: 86

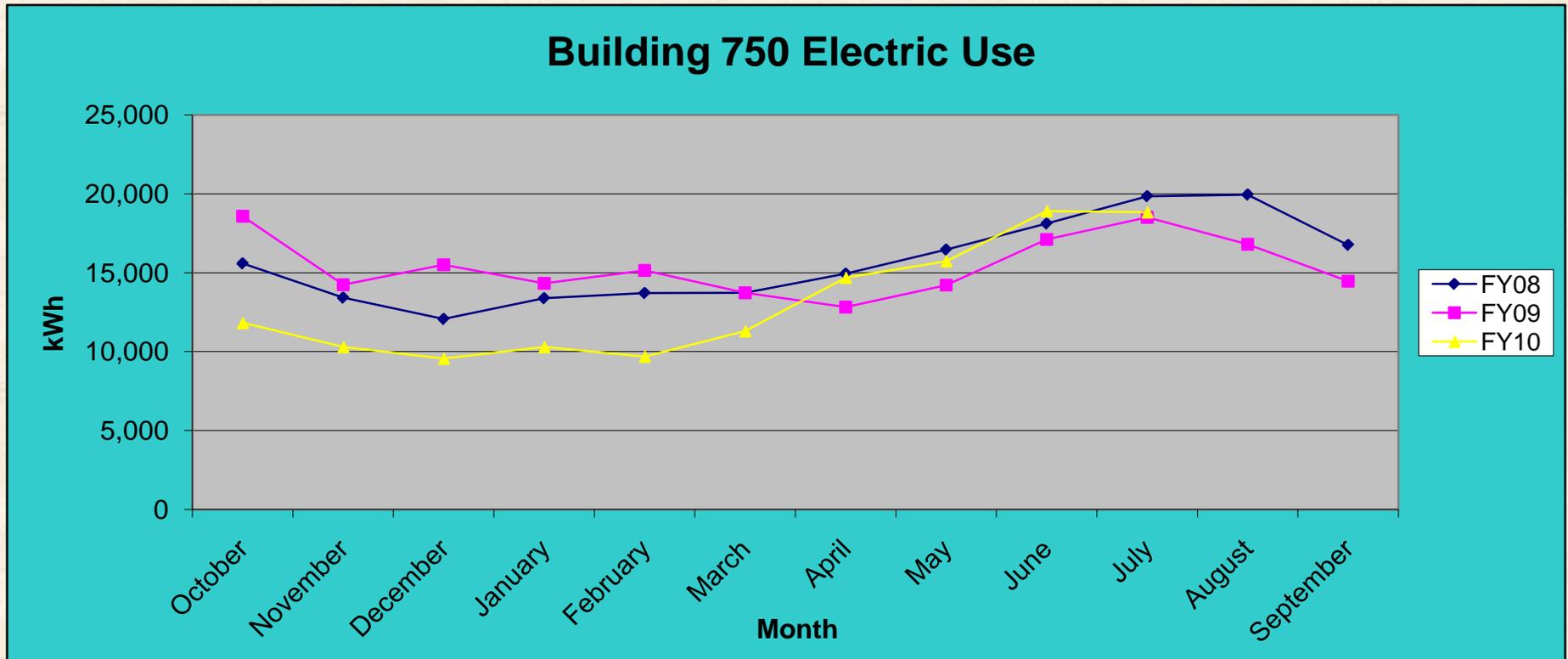
Significant!



Building 750 LEED EB

Oct 2009 – Jul 2010

What happened?



Answer to “*What Happened?*”

1. VAV box 007 damper actuator failed

- Zone ran hot
- Fan VFD static set point at “Max”
- Discharge air set point at “Min”

2. Both AH set points manually overridden

3. Outside mixed-air linkage improperly repaired

4. Building occupancy changed



Retro-CX - Summary

Successes

- Reduced energy consumption
- Improved comfort levels
- Achieved positive ROI

Lessons Learned

- Submetering
- Continuous monitoring
- Adequate resources
- Qualified personnel – in-house, if available