



AEE SoCal Chapter Meeting

“JPL Building 301 How Over 15% Reduction in Energy Use Was Achieved”

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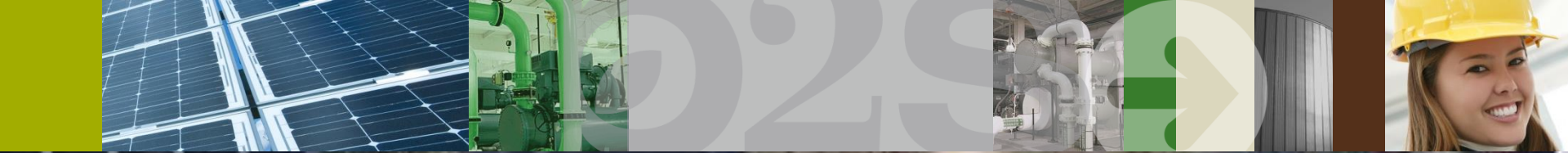
December 5, 2013





What are Common Obstacles In Achieving Energy Reductions?

- Saying That Everything That Could Be Done Has
- No Feedback How Systems Are Operating
- Decoupling Comfort Complaints With Performance
- No Standards for Change of Use Within the Building
- Operating or Changing Set Points Manually
- Designing or Operating By Rules of Thumb





Building 301

- Project Formulation Building
- 170,000 Square Foot 4 Story Building
- (2) 250 Ton Chillers
- *(2) 80,000 CFM 100-HP AHU's that are interconnected*
- *(2) 30-HP AHU Return Fans*
- *33 Fan Coil Units for High Load or Critical Areas*
- *Mixed Use building Offices, Labs, & Data Rooms*
- *Server Racks Everywhere Mixed In*



Project #1 Chiller Replacement (2009)

- Electrical Consumption was over 3.7 Million kWh
- Served from a Central Cooling Tower (B315) with Primary-Secondary-Tertiary Constant Flow CW Pumping
- CHW was Primary Constant Flow
- Originally project was to add a Pony Chiller
- Convinced Honeywell & JPL to meter performance and instead replace the chillers.



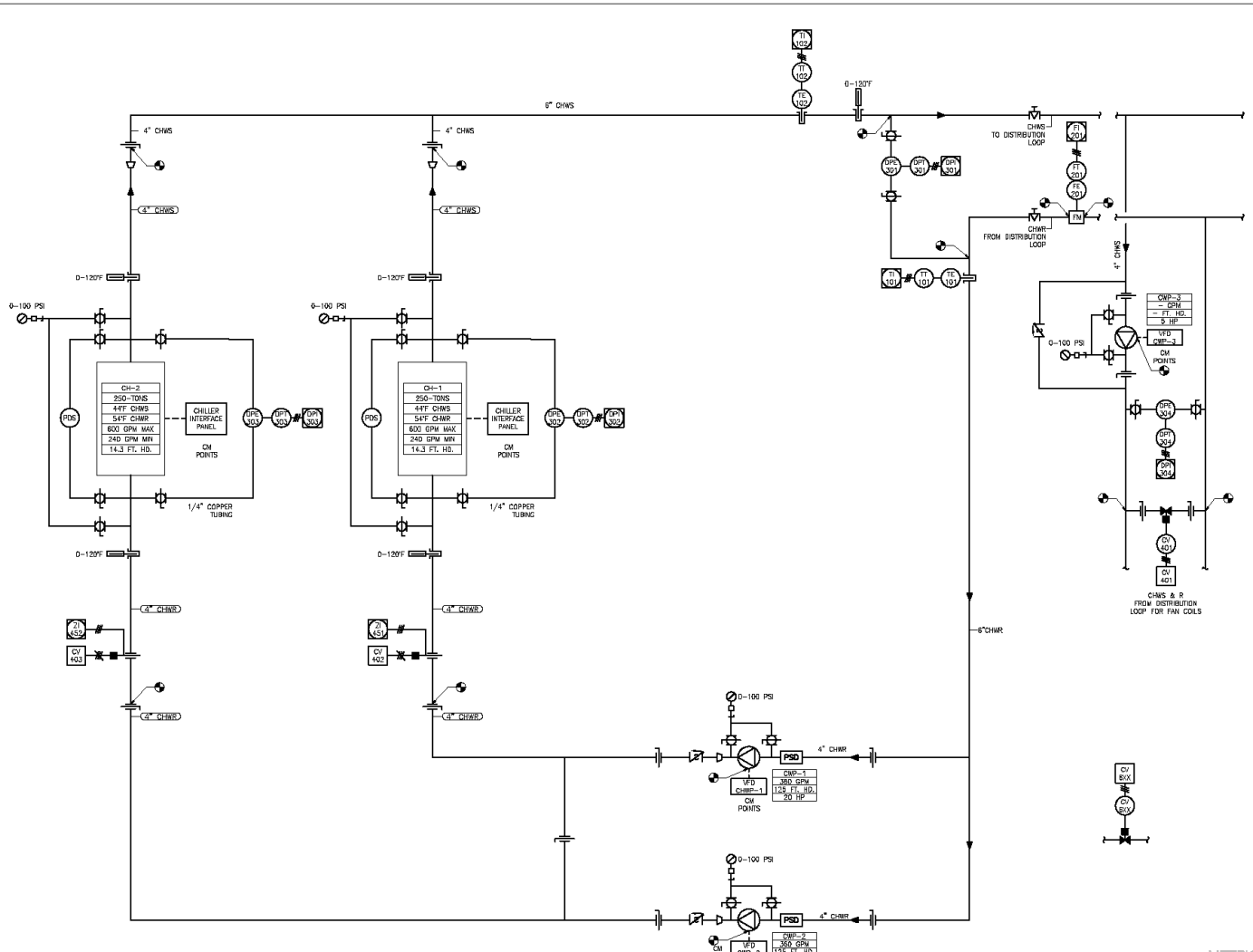
Project #1 Chiller Replacement (2009)





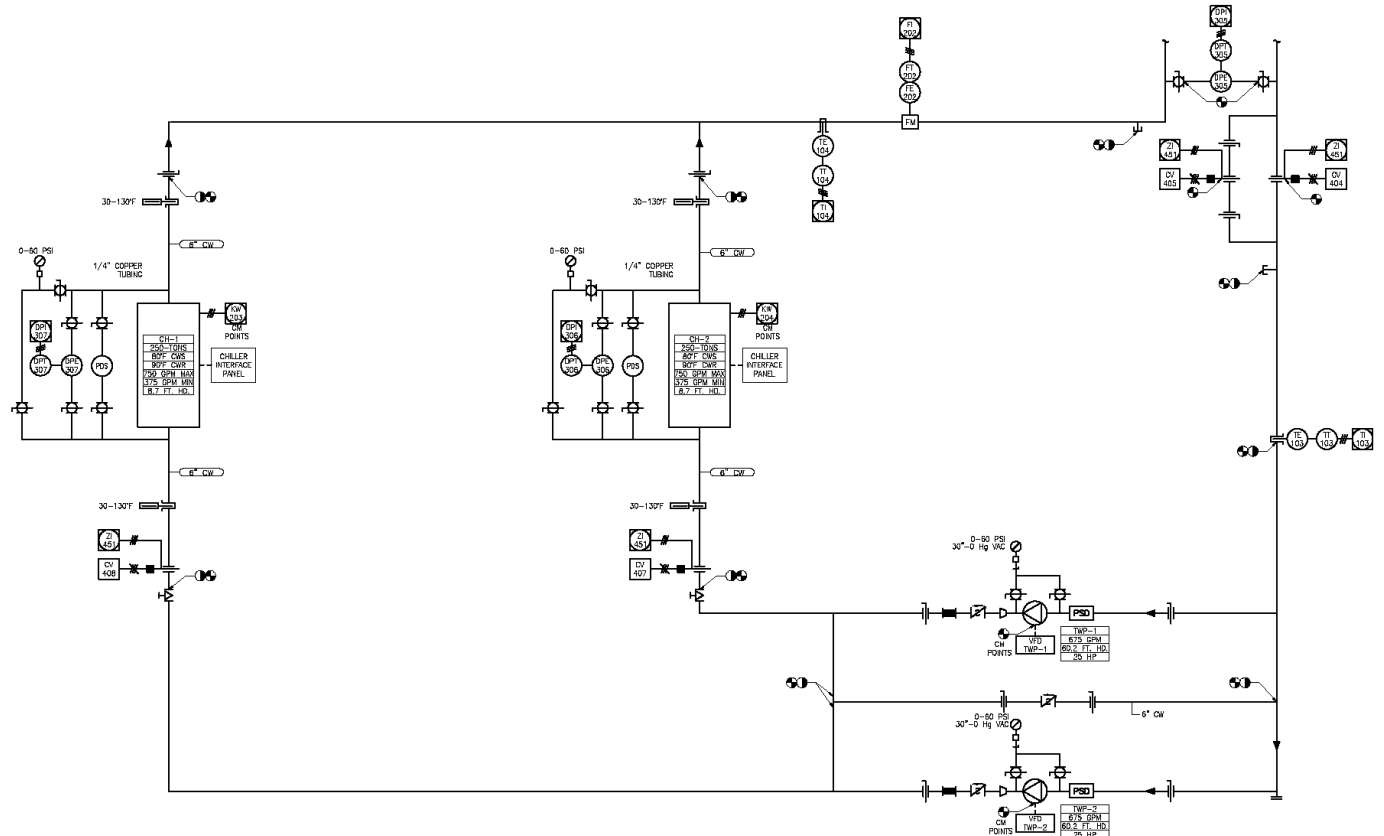
Project #1 Chiller Replacement (2009)

- (2) McQuay (Daikin) 250 Ton WMC's
- VFD's Added to CHW & Condenser Water Pumps
- CHW Converted to Primary Variable Flow
- The Decoupler was Removed from the CW
- CW was converted to Variable Flow Secondary Boosted
- All Operating Setpoints are Reset by Demand or Relation
- Project resulted in over 700,000 kWh in Savings
- CW of other buildings were Converted to Constant Flow Secondary Boosted By Maintenance Staff For Even More Savings to the Lab Not Claimed by this Project.



 Honeywell Building Solutions - 853 4 Opticsville Blvd, Suite 300 La Jolla, CA 92033 Tel: (858) 410-4866	 P2S ENGINEERING 10000 La Jolla Village Drive, Suite 100 San Diego, CA 92121 Tel: (619) 451-1000		REVISIONS DATE: 12/07/09 DESCRIPTION: RECORD DRAWING	G 7/19/09 - 100% DESIGN SUBMITTAL BY: [initials] DATE: [initials] SA: [initials]	[initials] [initials] [initials] [initials] [initials] [initials] [initials] [initials] [initials] [initials]
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301 MI-010-A05/00
 RECORD DRAWING



Honeywell Honeywell Building Solutions - SIS 6 Corporation Drive, Suite 300 La Plata, CA 90023 Tel: (805) 410-4882	P2S ENGINEERING 155 Gateway Dr., Suite 200 San Jose, CA 95128 Tel: (408) 434-8888		REVISIONS 01/12/20 RECORD DRAWING	O 2/14/20 100% DESIGN SUBMITTAL	J1 CM BUILDING 301 CHILLER REPLACEMENT P&ID (CONDENSER WATER)
			12/27/20 RECORD DRAWING	NO SCALE M803	301M-010-A06/03

RECORD DRAWING



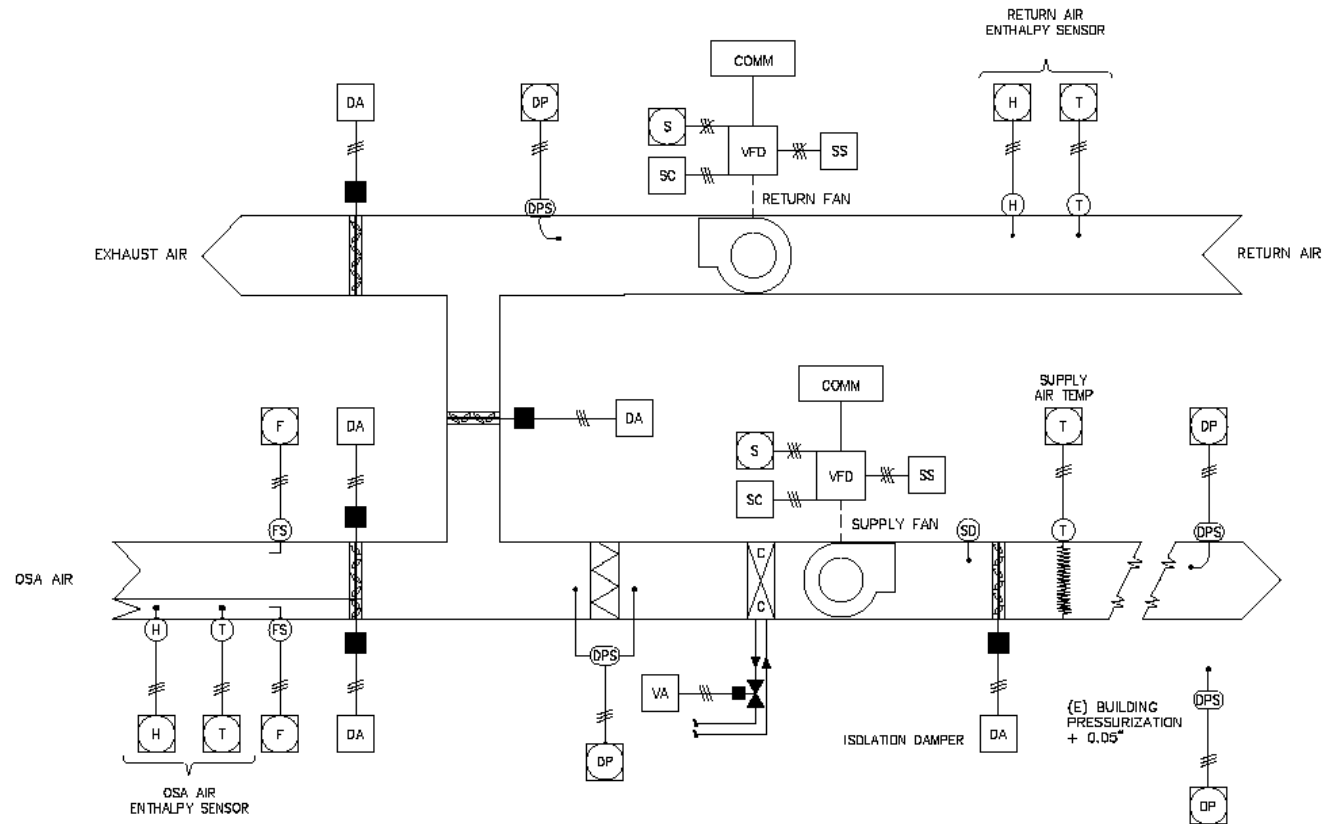
Project #2 Hybrid VAV & Controls Upgrade (2012)

- New study of energy projects on lab performed 2010-2011
- Found Rule of thumb sequences with the AHU and zones
- Enthalpy Economizer not operating correctly
- Chiller Plant operated 24-7 due to critical fan coil loads
- One AHU Ran 24-7 due to server additions
- During winter chiller plant cycles on/off even with a flywheel mode multiple times



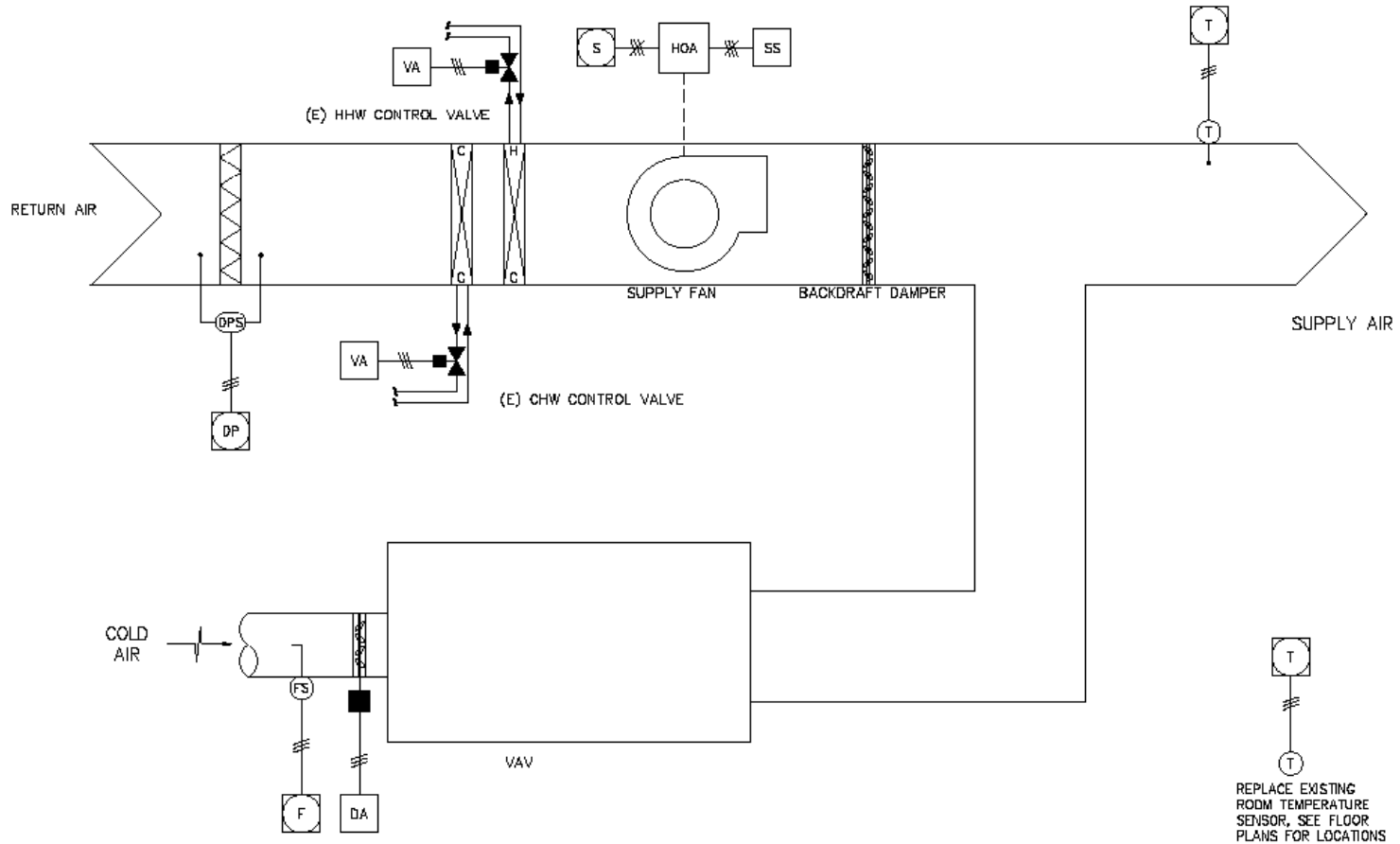
Project #2 Hybrid VAV & Controls Upgrade (2012)

- System/Sequence Operates based on Demand
- Winter AHU operates 24-7 with Economizer for all loads
- Chiller plant cycles less in winter, on 10, off 40 minutes.
- Summer Time only Fan Coils operate at night....
- Until an unknown server with out a fan coil was found.
- Spaces cooler, was operating at 78 deg F, now 74 deg F
- Less Complaints
- Still more savings available
- VAV Reheat Coils Plugged, Reheat Valves Leak by
- Isolation dampers on AHU do not close off
- On track for about 800,000 kWh Savings



AHU-1 CONTROL DIAGRAM

MISC
NO SCALE

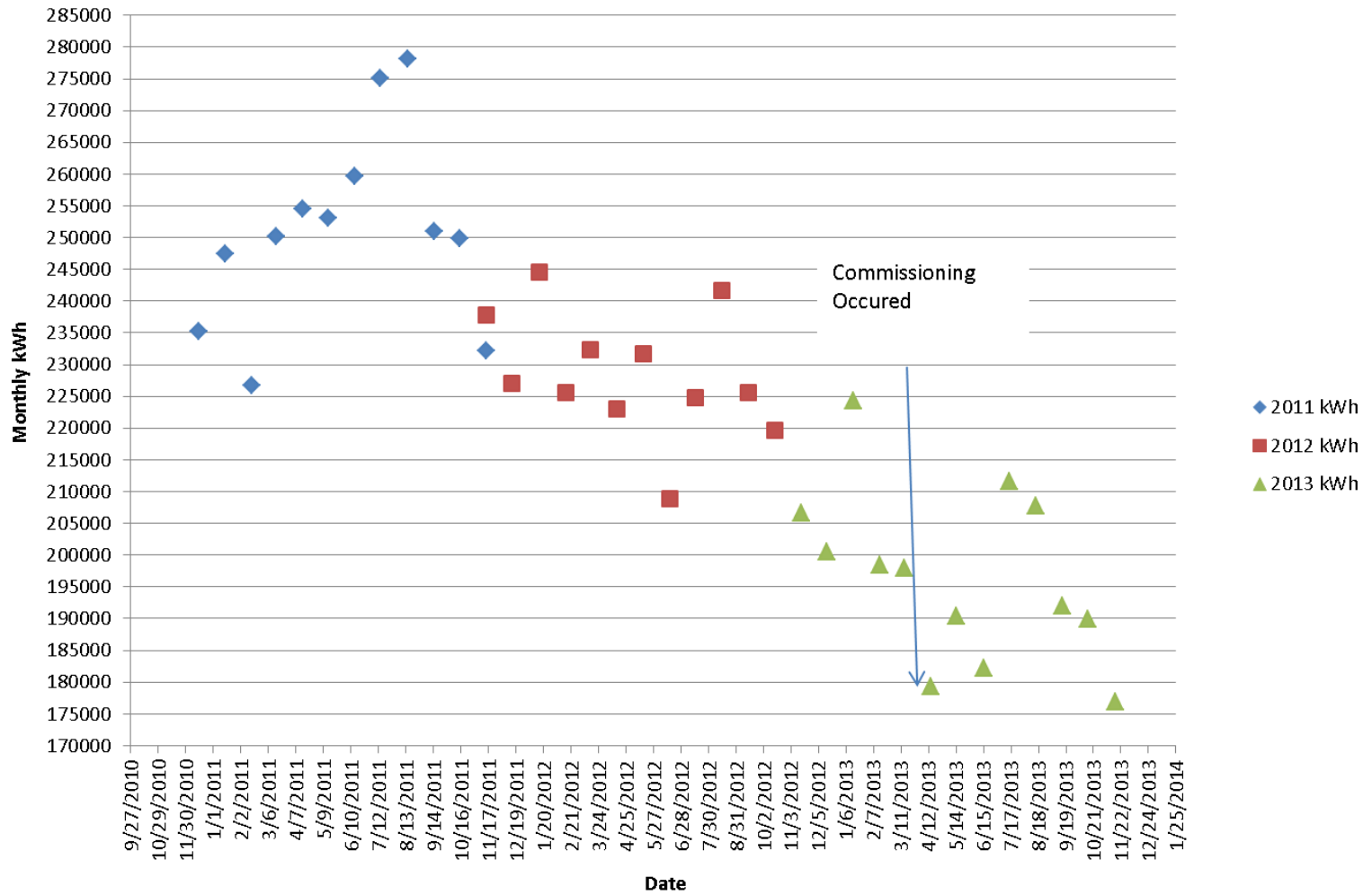


FAN COIL / VAV BOX HYBRID CONTROL DIAGRAM

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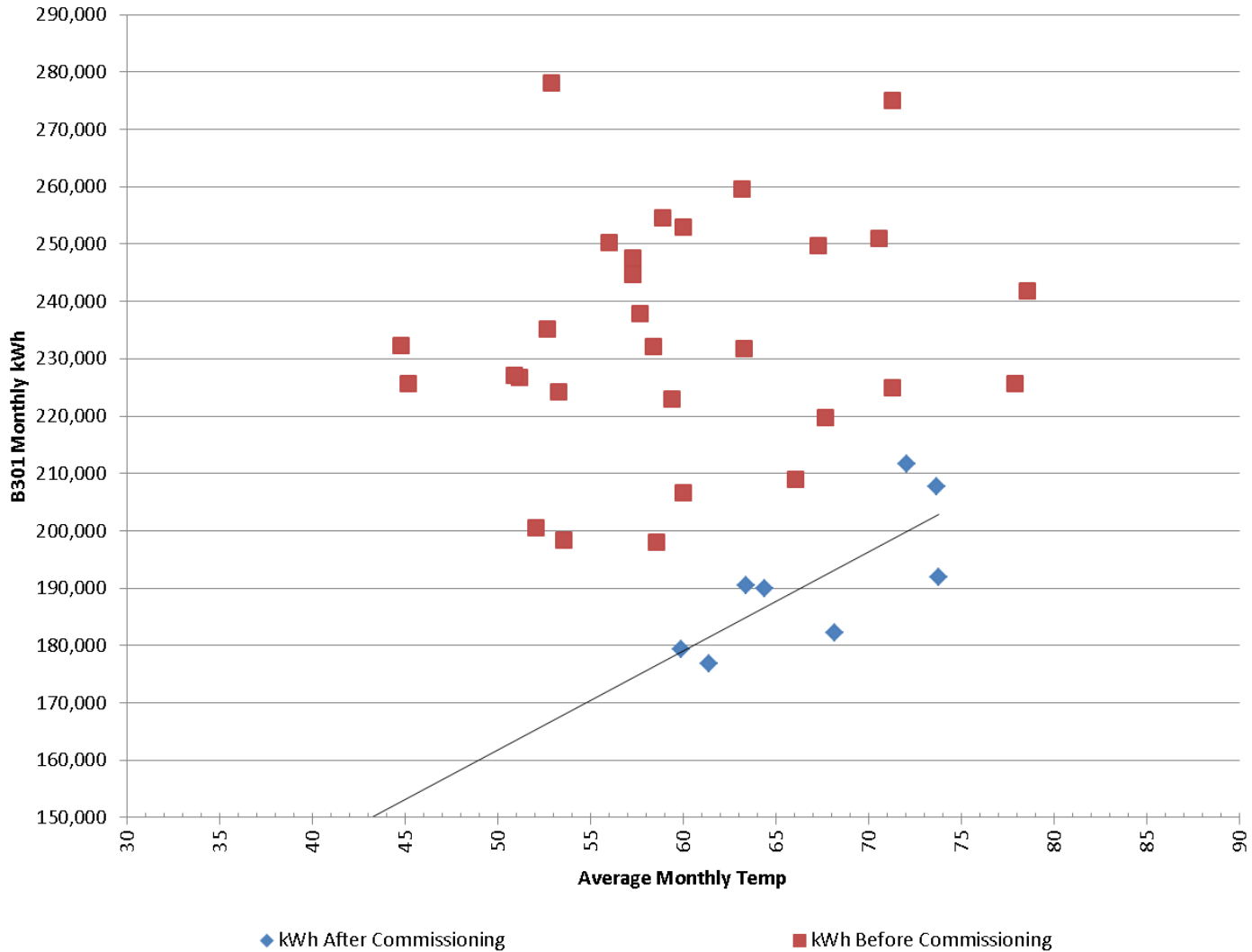


Building 301 Monthly kWh





B301 Monthly Average Temp Vs kWh





How to Serve Critical Spaces Efficiently

- IDF –Intermediate Distribution Frame (Typ. 0.5 to 2 Tons)
- BDF – Building Distribution Frame (2 to 10 Tons)
- MDF – Main Distribution Frame (5 to ? Tons)
- Typically IDF's are served by Mini Spilts and VRF Systems
- Typically BDF's are served by Ceiling Computer Rm Units
- Typically MDF's are served by Floor Standing CRU's

- Why?



How to Serve Critical Spaces Efficiently

- In the past controls were not accurate (8 bit A to D)
- 256 points of resolution vs. 4096 today
- Use hybrid solution for small to medium rooms
- Use dedicated AHU's for Larger Rooms
 - Less internal DP
 - Hot Water Reheat
 - VFD Efficient Fans
 - Quieter spaces, more room inside the data room
 - Just as reliable
- Use External Adiabatic Humidifiers



Thank You!

Q & A



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