TRI-COUNTY
REGIONAL ENERGY NETWORK
SAN LUIS OBISPO • SANTA BARBARA • VENTURA

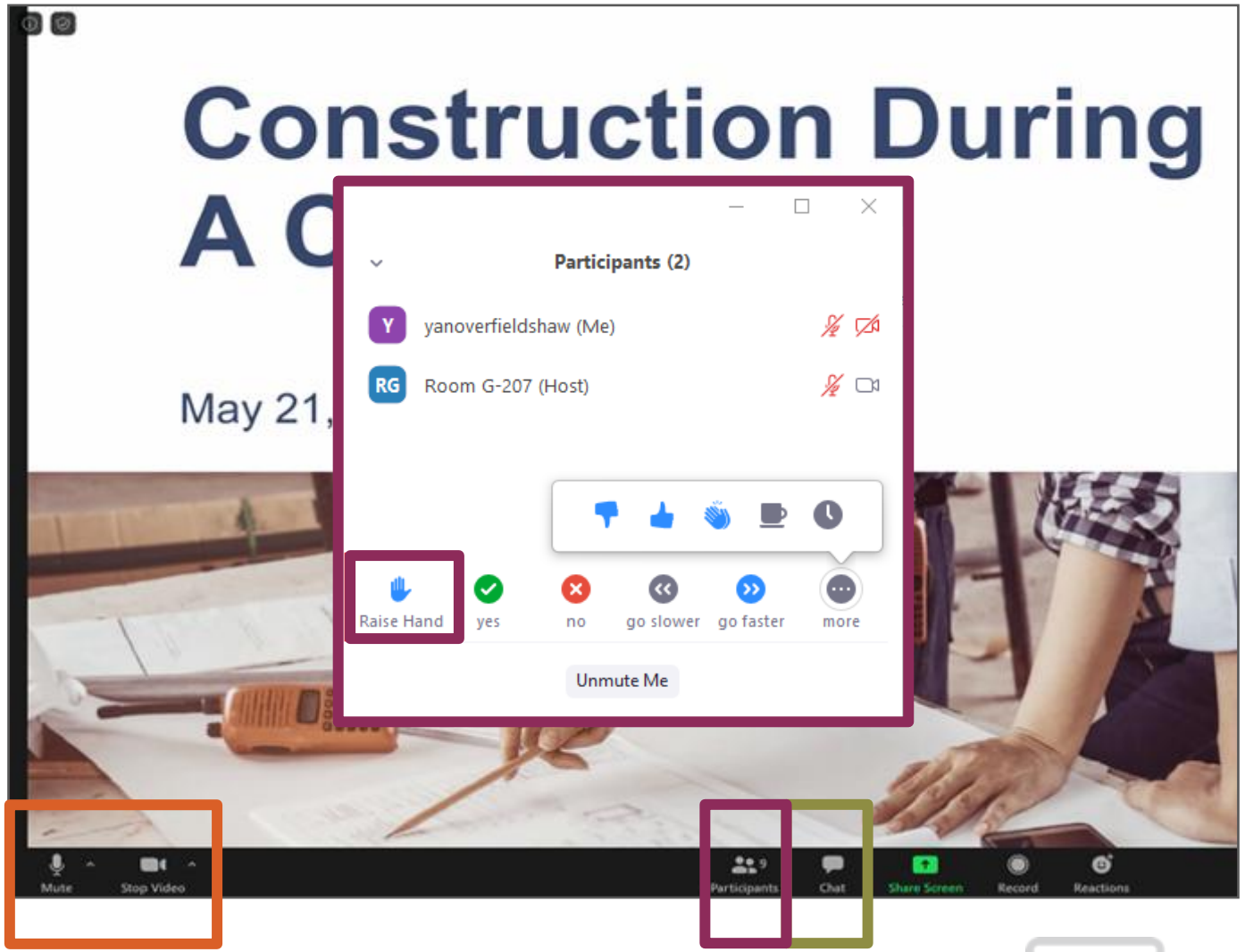
Optimizing Heat Pump Zoning for Maximum Comfort and Efficiency

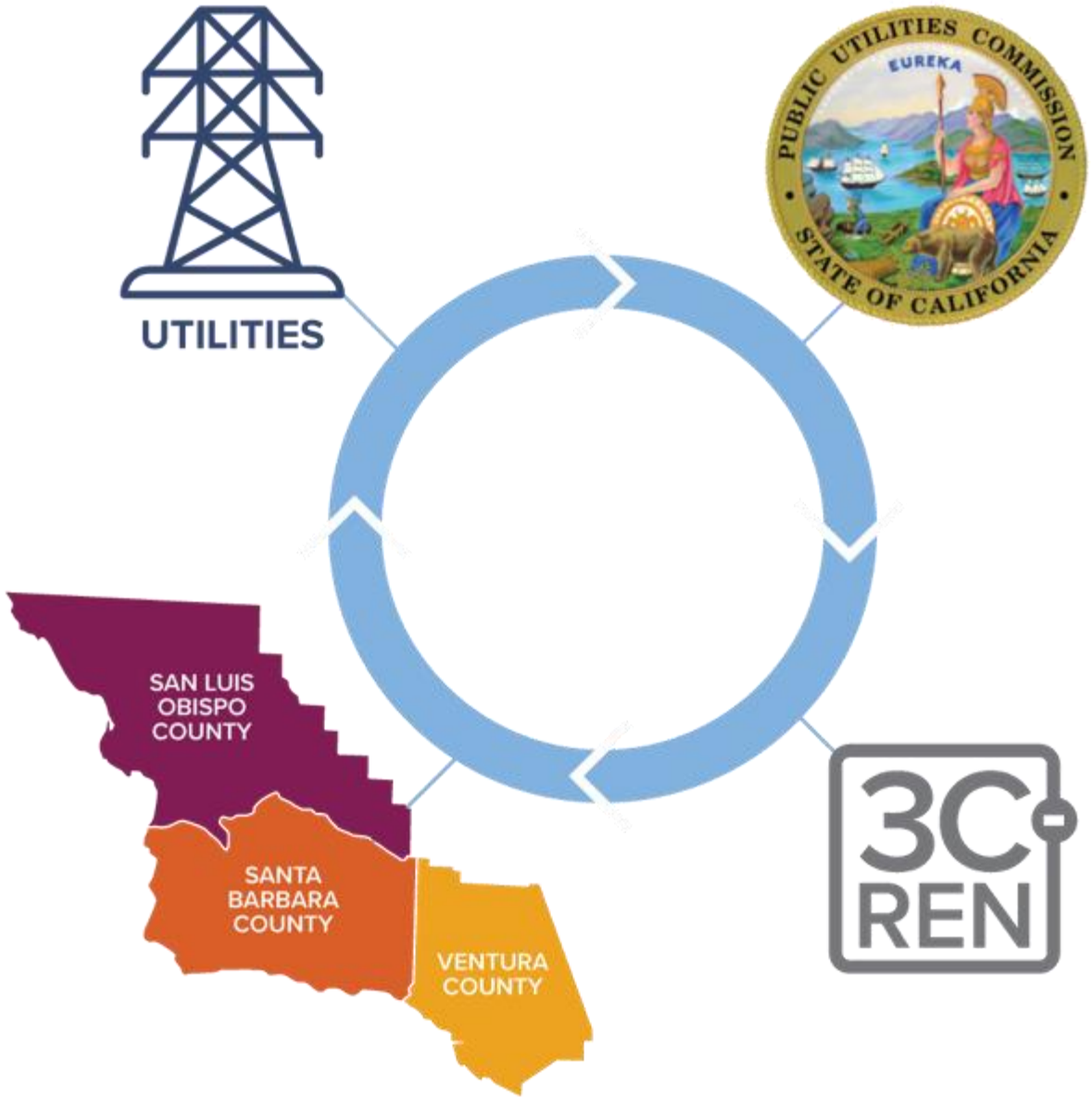
Larry Waters – Electrify My Home

June 17, 2025

Zoom Orientation

- Add an **introduction** in the chat.
  Be sure **full name** is displayed.
- Did you call in? Please **share** first and last name with us.
- Please **mute** upon joining
- Use the "**Chat**“ to share questions or comments
- Under "**Participant**" select "**Raise Hand**" to share a question or comment verbally
- Session may be **recorded** and posted to 3C-REN's on-demand page
- Slides/recording are **shared** after most events





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region

Our Services

Incentives

HOME ENERGY SAVINGS

3c-ren.org/for-residents
3c-ren.org/multifamily

COMMERCIAL ENERGY SAVINGS

3c-ren.org/commercial

Contractors can enroll at
3c-ren.org/contractors

Training

BUILDING PERFORMANCE TRAINING

3c-ren.org/events
3c-ren.org/building

ENERGY CODE CONNECT

3c-ren.org/code

View past trainings at
3c-ren.org/on-demand

Technical Assistance

AGRICULTURE ENERGY SOLUTIONS

3c-ren.org/agriculture

ENERGY ASSURANCE SERVICES

3c-ren.org/assurance

3C REN

3C-REN Achievements

4,000+

Individuals Attended Training

1,374

Energy-Saving Projects Completed

334

Title 24/CalGreen Questions Answered

$155M

Secured for investment in the tri-county region through 2028

Data from 2019-2023 for three programs

Who's This Dude?

- 1982 (UTI), with these tools

- Certs along the way

- 2015 – only heat pumps

- 2020, founded Electrify My Home

Larry Waters
President, Electrify My Home

Agenda

- Introductions
- Introduction – Why Zoning?
- Ducted Zoning Tips
- Ductless Multizone Overview & Case Study
- Multizone Ducted Case Study
- Fully Communicating Ducted HP Case Study

Electrify My Home's 3C-REN Webinars

- **3/11/25:** Nail the Sale: Getting Past Heat Pump Objections
- **4/8/25:** Panel Detectives – Electrical Panel Assessments for Heat Pump Installers
- **5/6/25:** Electrification Products for the Central Coast Climate
- **6/17/25:** Optimizing Heat Pump Zoning for Maximum Comfort and Efficiency
- **7/31/25:** More Than One Brand In The Hand: Application Specific HPWH Design
- **8/28/25:** Retaining Profit – Minimizing Call Backs on Heat Pump Projects

ELECTRIFY MY HOME

Electrify My Home – Electrification Pioneers

Our Mission:

*To provide the **most efficient** cost-effective electrification solutions to California homeowners, to practice **good stewardship** of the electrical panel, and to **train and influence** other contractors to do the same.*

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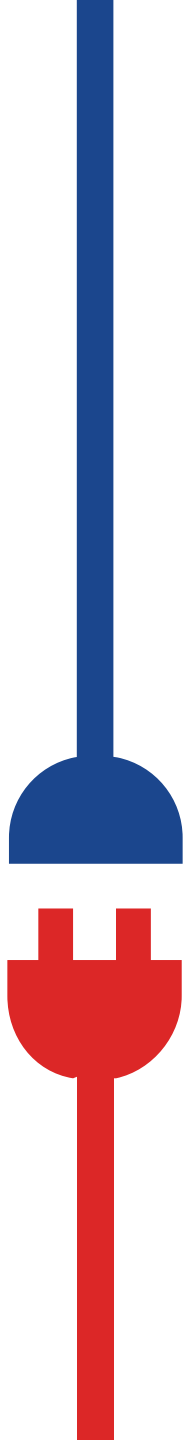
Introduction

Why Zoning?



Why People Like The Idea of Zoning

- Perceived improved comfort
- Perceived energy efficiency
- Perceived energy savings
- Perceived solutions at reasonable price

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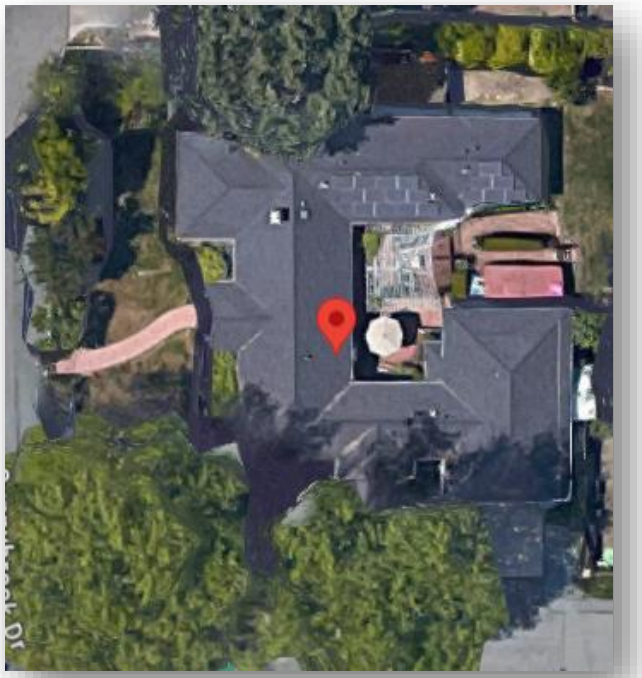
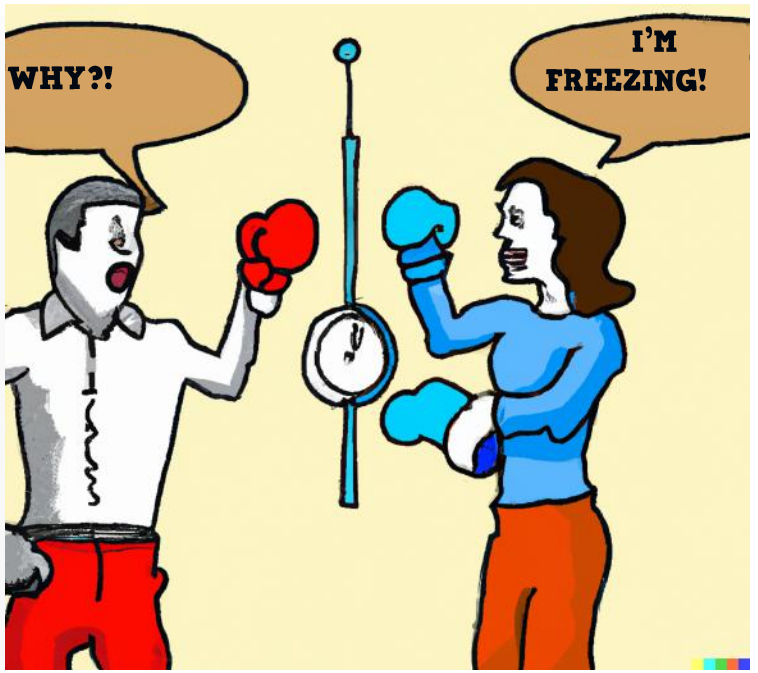
Common Reasons for Zoning

- Major climate differences in home
- Unique architecture
- Sections of home seldom used
- Domestic temperature battles





Types of Heat Pump Zoning

- **Multizone heat pumps**

- **Multiple dedicated systems**

- **Variable refrigerant** heat pumps

- **Traditional zoning** with control board and automated dampers in ducts

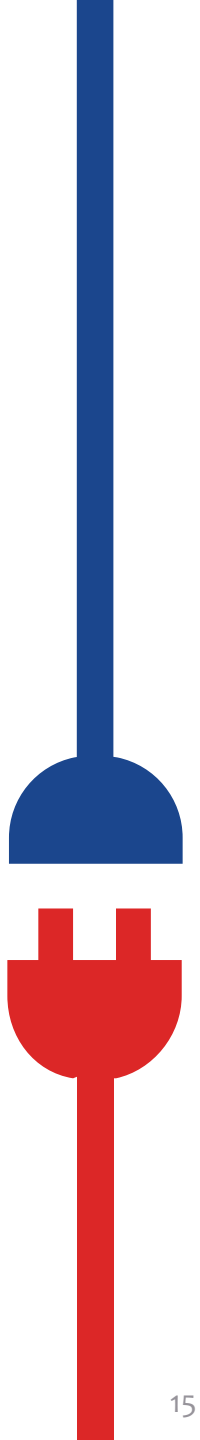
“Smart” Vents?

- Customers are finding these online
- They pair to sensors & damper down vents to restrict airflow to rooms
- Poor strategy for performance
- Can cause noise
- Increase static pressure, adding stress to the unit
- Rob system of necessary flow to maintain proper operation

An AI-generated smart vent mockup

Ducted Zoning

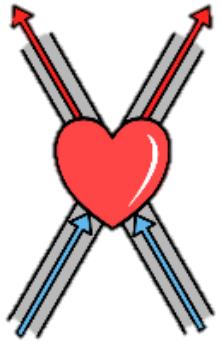
A few things to be mindful of!

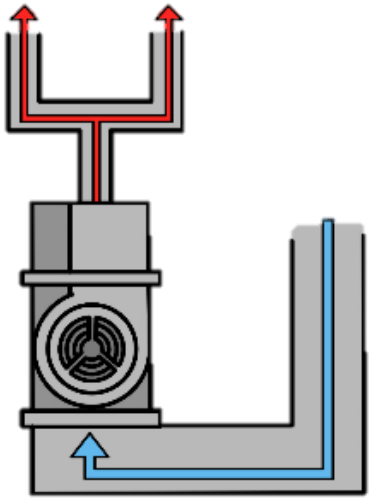


A Must-Know For Ducted Zoning: Static Pressure (aka Duct Pressure)

- Resistance to airflow
- Comparable to blood pressure
- Affects delivered airflow, system performance, efficiency, noise, equipment strain
- Caused by: undersized ducts, dirty filters or coils, blocked registers, long or restrictive duct runs
- Must be kept in check for ducted zoning to work properly

Source: Nate Adams





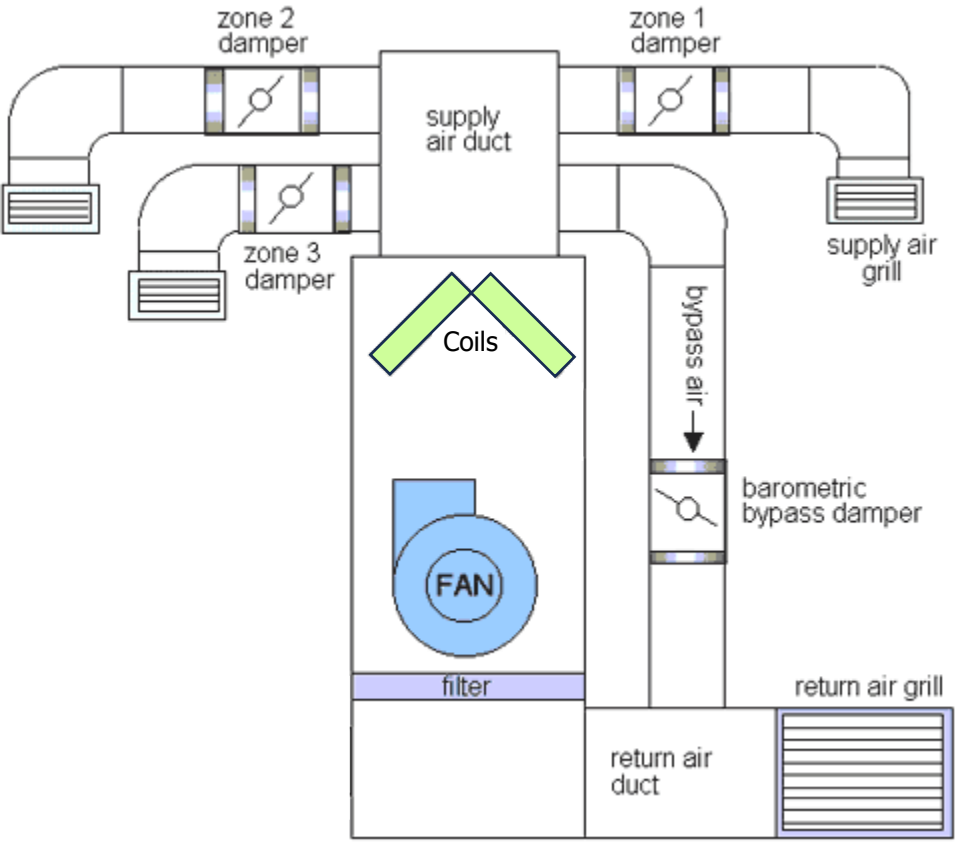
Zoning Doesn’t Fix Poor Ducts

- Particularly on single stage equipment, designing a duct system to work with zoning is challenging.
- Dry climate requires more airflow
  - Dampering = restricting airflow
  - Restricting airflow = high static

Examples of Poor Ductwork

High static pressure, lower delivered airflow/capacity

Compensating For High Static
Return Bypass = Not the Right Solution



- The old way – install a bypass from supply to return to relieve static and lower noise
- Result – lower coil temp (cooling), short cycling (heating), lower velocity, lower delivered capacity & efficiency

Does Traditional Zoning Save Energy?

Study Author(s)	Energy Use Compared to Not Zoned		Notes
	Heating	Cooling	
Kenney & Barbour			
	148% ↑		5°F set up/down in each zone part of the day with basement
	76% ↓	71% ↓	5°F set up/down in each zone part of the day without basement
Oppenheim (from Kenney & Barbour)			
		135% ↑	No temperature set up
Oppenheim/Carrier			
		121% ↑	No temperature set up
		84% ↓	10°F temperature set up in every zone part of the day
Oppenheim/ASHRAE			
	107% ↑		Central with no modulation and 8-hour 12°F setback, zoned with modulating furnace and two additional setback periods on bedroom zones
	88% ↓		Central with no modulation and 8-hour 12°F setback, zoned with modulating furnace and 22 hours of setback on bedroom zones
Leslie & Kazmer			
	112% ↑		With basement conditioned
	99% ↔		No basement, zoning set back 12°F in the bedroom zone for 10 hours a day
Heflin & Keller			
	118% ↑	113% ↑	41% bypass
Temple			
		106% ↑	No bypass, no setback

Figure 1. Energy Consumption Zoned vs. Central System

↑ indicates increase in energy use; ↓ indicates decrease, ↔ indicates no change.

- *Sometimes, but not always*

" In four of seven heating cases in heating and four of six cooling cases, the energy consumption increased with the zoning configuration."
Proctor Engineering, 2011

Traditional Zoning Challenges With Heat Pumps

- Single/Dual stage HPs – similar challenges as ACs
- Pressure/refrigerant sensing inverters – possibly less problematic depending on air handler's ability to adapt
- Communicating inverters – 1,000s of points of communication; duct zoning not built into algorithms
- Use MFR specific components

Ductless Zoning

Must be done carefully

Ductless Solution – How Does It Work

Multi-Zone Systems: Ductless

Advantages

- Flexibility for multi-room solutions
- Houses with a separate climate zones
- Branch boxes reduce line set lengths
- Less outdoor space needed

Disadvantages

- More refrigerant
- More chance for leaks
- Capacity penalty
- Less efficient
- No redundancy
- More difficult to repair
- More complicated installation

Case Study – Ductless Multizone Example

- 1200 sqft house
- 3 bedrooms
- 4 zone multizone setup…3 ton system (vs 1.5 ton ducted)
  - 2x 6kbtu wall-mounts (bedrooms)
  - 1x 9kbtu wall-mount (main bedroom)
  - 1x 15kbtu wall-mount (living room/kitchen)
- Modulation: min 11,700 Btu/h (vs 5,400 on 1.5 ton ducted)
  - What does this mean for smallest zone running at one time?
- 16 refrigerant connections, 4 condensate connections, possible condensate pumps & drywall work

Quilt – A Step In The Right Direction For Multizone

- 25 SEER2 | 14.5 EER2 | 12 HSPF2
- 20,500 BTU/h Max Heat, **2500 BTU/h Min Heat**
- 19,700 BTU/h Max Cool, **2,000 BTU/h Min Cool**

Contact Us For an Intro!

Multizone Ducted Case Study

36 kBtu Multi-Zone Unit Serving 3 Ducted Air Handlers

- Customer was not satisfied
- Erratic temperatures
- Part of house was less efficient and required more runtime
- System can only modulate down so far
- When a lower output than the minimum BTUs refrigerant will be sent to other zones
- System waived all night

Monitoring Results (Pre)

	T(°F) : Sensor #003 spare bedroom front	T(°F) : Sensor #005 spare bedroom back	T(°F) : Sensor #006 master bedroom	T(°F) : Sensor #008 kitchen counter	T(°F) : Sensor #009 dining room table	T(°F) : Sensor #010 spare bedroom return air
min	62.50	63.00	67.60	65.60	66.10	66.40
max	69.10	72.20	71.80	71.90	71.50	72.10
diff	6.60	9.20	4.20	6.30	5.40	5.70

No data found for sensor ID 22F0022C, Sensor #004 main unit return air

The Solution:
Three Systems 1x 18k Unit + 2x 9k Units

- A hard and expensive lesson
- Downside modulation now 3100 kBtu/h instead of 11,000
- Each zone gets exactly what it needs
- True comfort finally achieved

Before (36K Multi-Zone) | After (1x 18k Unit + 2x 9k Units)

Photos of work performed by A-1 Guaranteed Heating & Air Inc. Vallejo California

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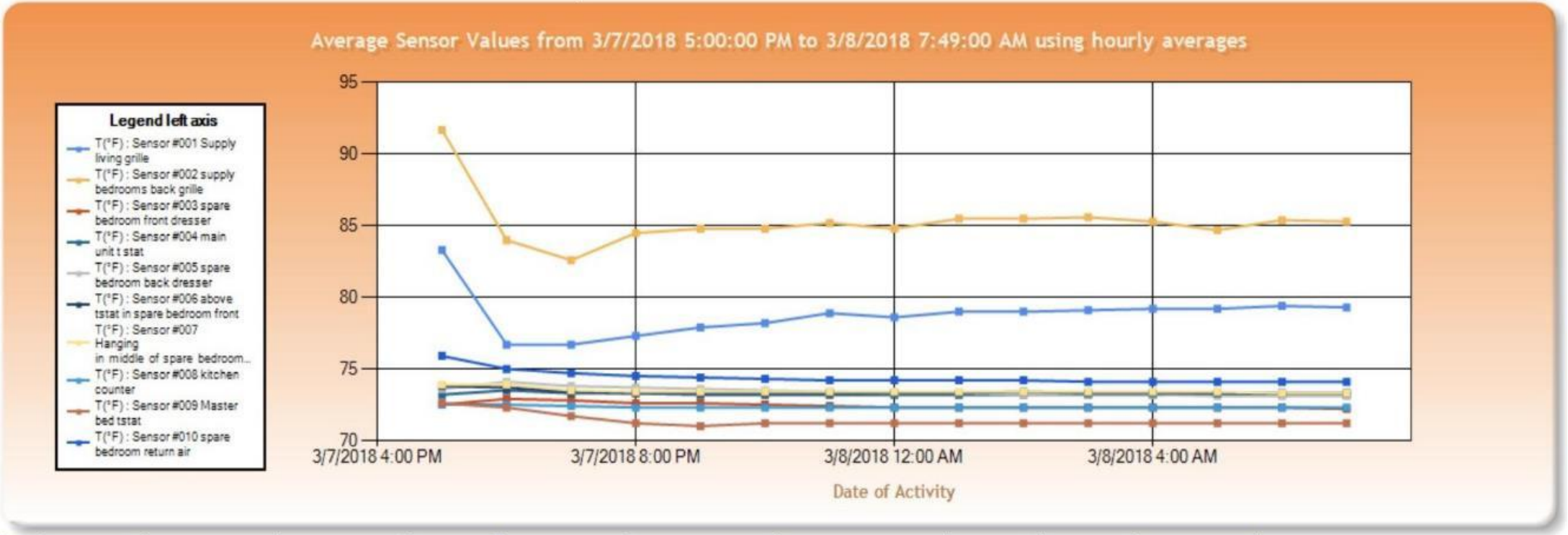
Monitoring Results (Post)



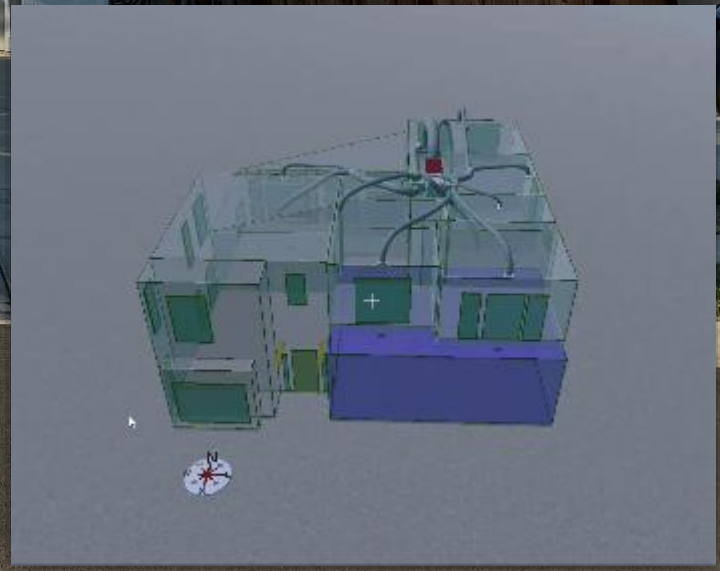
	T(°F) : Sensor #001 Supply living grille	T(°F) : Sensor #002 supply bedrooms back grille	T(°F) : Sensor #003 spare bedroom front dresser	T(°F) : Sensor #004 main unit t stat	T(°F) : Sensor #005 spare bedroom back dresser	T(°F) : Sensor #006 above tstat in spare bedroom front	T(°F) : Sensor #007 Hanging in middle of spare bedroom front	T(°F) : Sensor #008 kitchen counter	T(°F) : Sensor #009 Master bed tstat	T(°F) : Sensor #010 spare bedroom return air
min	76.70	82.60	72.20	73.20	73.10	73.30	73.30	72.30	71.00	74.10
max	83.30	91.70	72.90	73.50	74.10	73.80	73.90	72.50	72.60	75.90
diff	6.60	9.10	0.70	0.30	1.00	0.50	0.60	0.20	1.60	1.80

From Our Experience: Biggest Zoning Takeaways

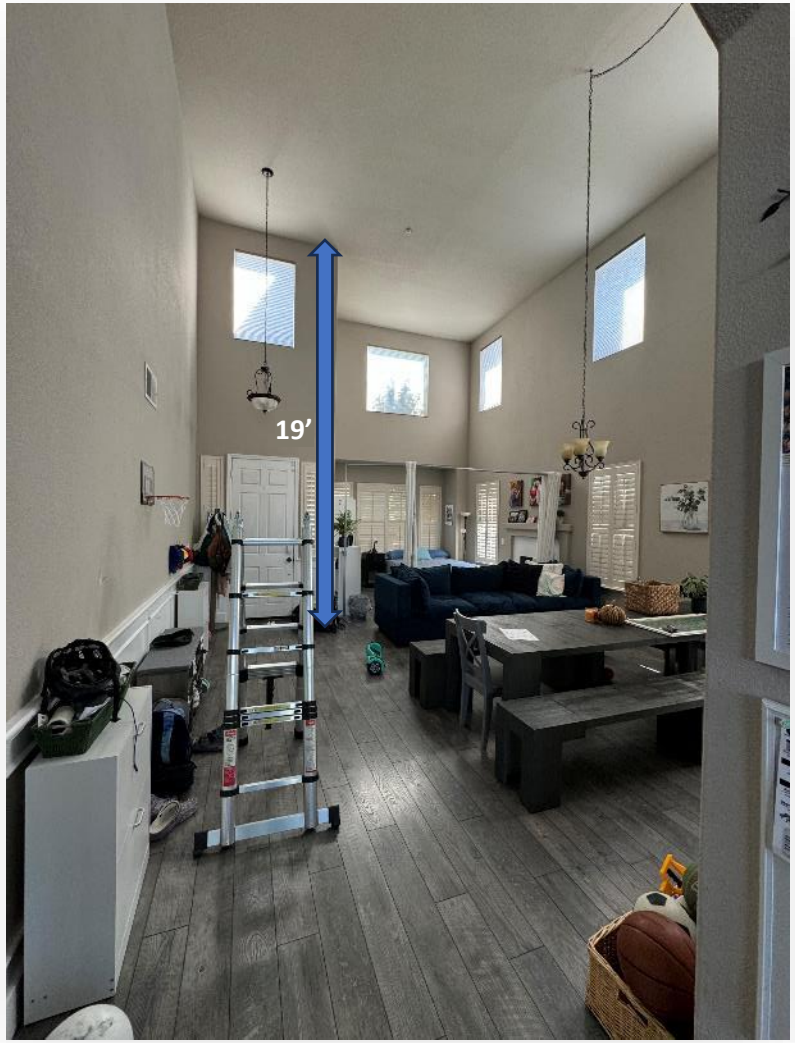
- For most common residential applications, it's best to zone with dedicated units (1 outdoor, 1 indoor)
- We like 1 ducted system for majority of house and dedicated wall-mount for challenging room(s)
- Multizone results are better with limited air handlers or situations where multiple will be run at the same time
- Avoid multiple ducted air handlers on one multizone when possible (fans run continuously)

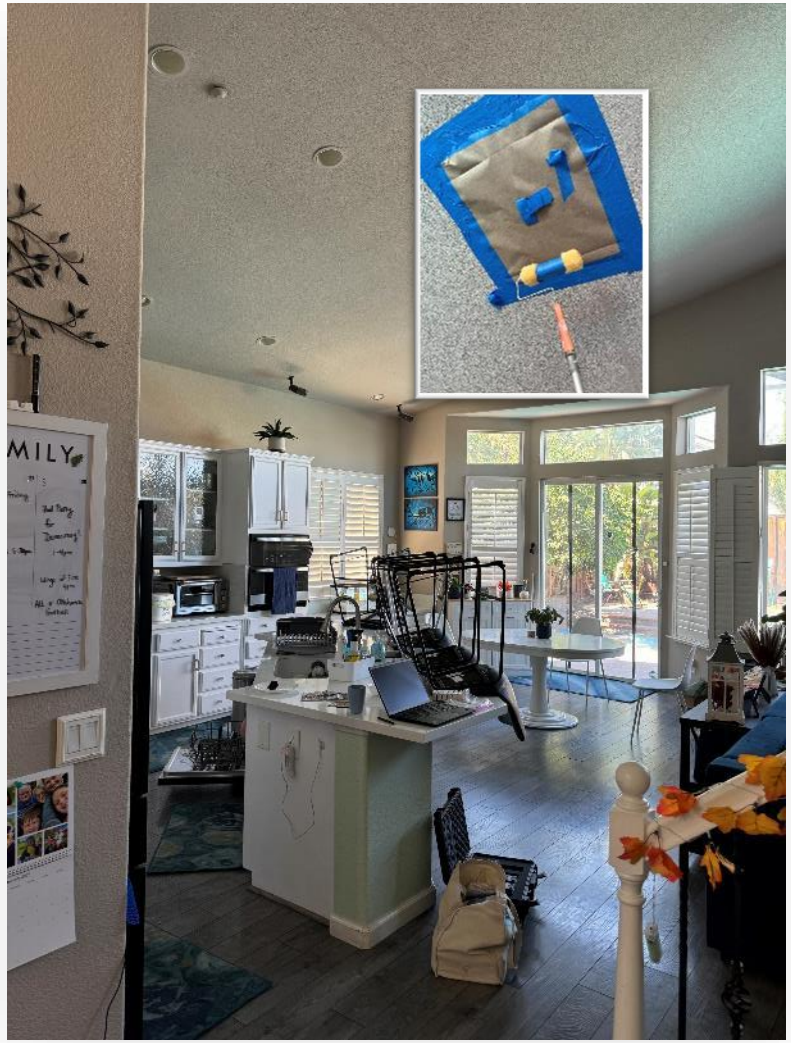
Fully Communicating Ducted Heat Pump Case Study

- Brentwood, CA
- 3,161 sqft | 4BR, 3.5 BA
- Major Comfort Issues



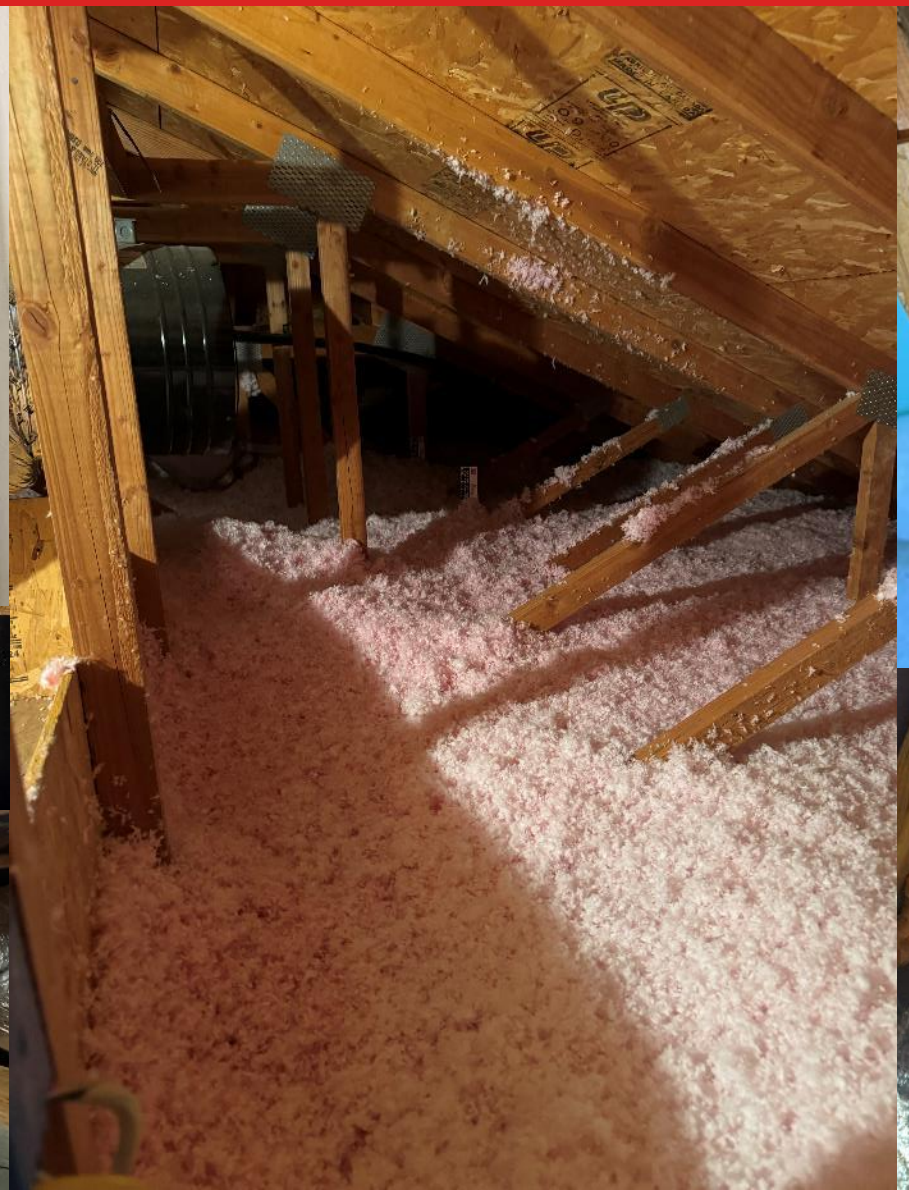
High Ceilings



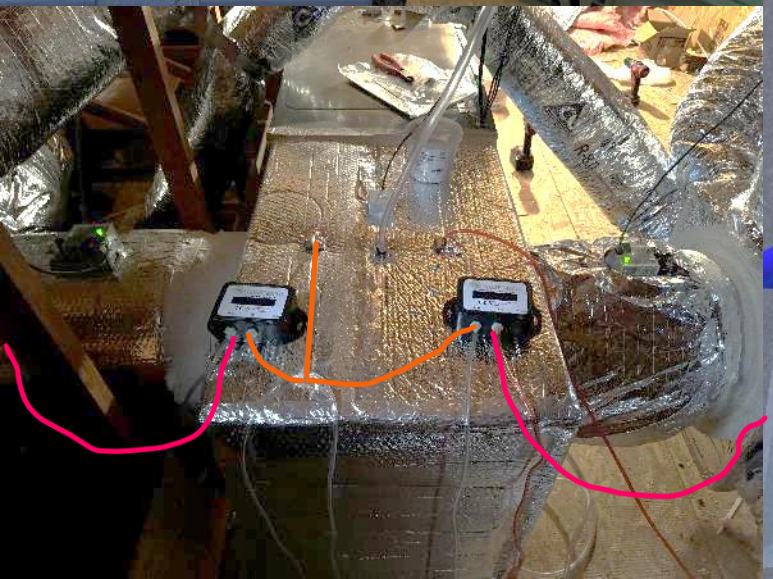


Existing Equipment

Our Scope



Monitoring Setup



Misc temp loggers ambient & registers. HOBO & Omnisense

Damper 1, static differential. Omnisense.

Indoor & Outdoor Unit Power. HOBO.

Damper 2, static differential. Omnisense.

TESP. TEC DG 1000

FlexDuctTool Help

Jonathon Stewart Show

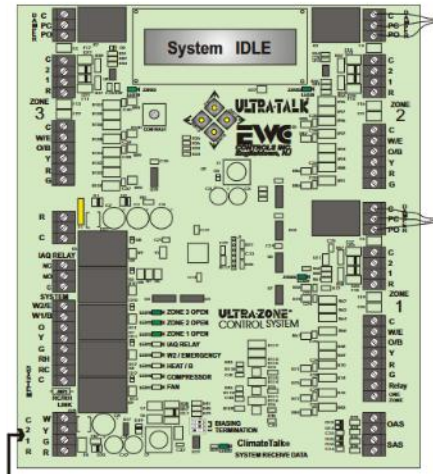
Monitoring Goals

- Does equipment meet its claims?
  1. Is total static kept under user setpoint (0.5”H_2O)?
  2. Does non-calling zone open when approaching static max?
  3. Is system modulating correctly with zoning?
  4. Are reasonable comfort levels achieved?

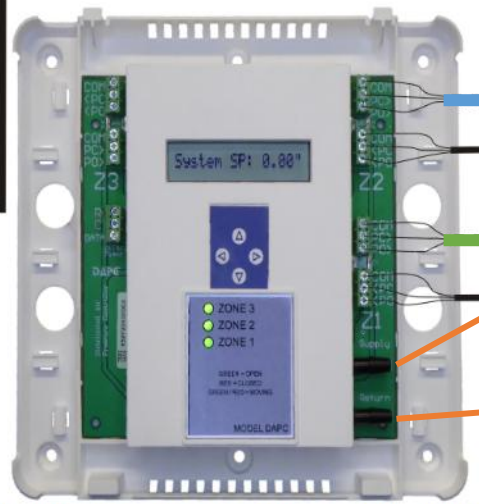
IMPORTANT NOTE – based on these goals, the case study results demonstrate a field assessment, not a recommendation of any products or validation of their outcomes.

EWC: Daikin FIT Zone Control System

- **EWC UT-3000** Communicating Control Board
- **EWC Distributed Air Pressure Controller (DAPC)** Bypass eliminator



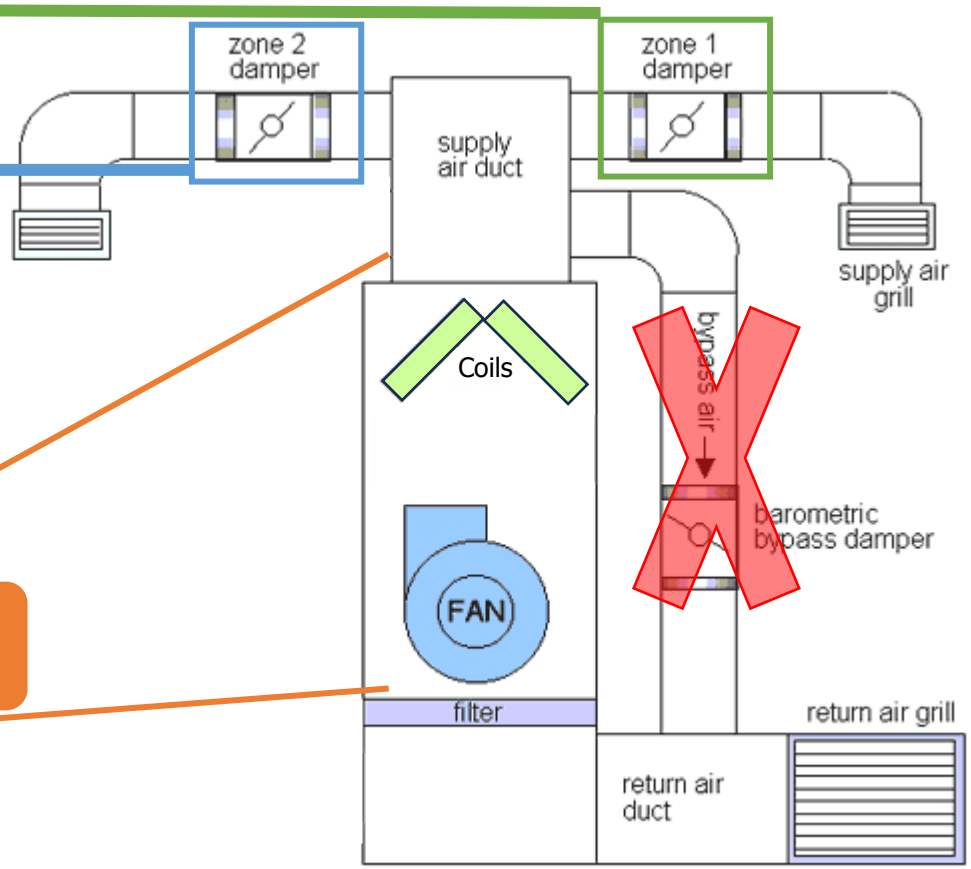
→ *To FIT HVAC system*



OTHER LOW VOLTAGE WIRING IS NOT SHOWN FOR CLARITY

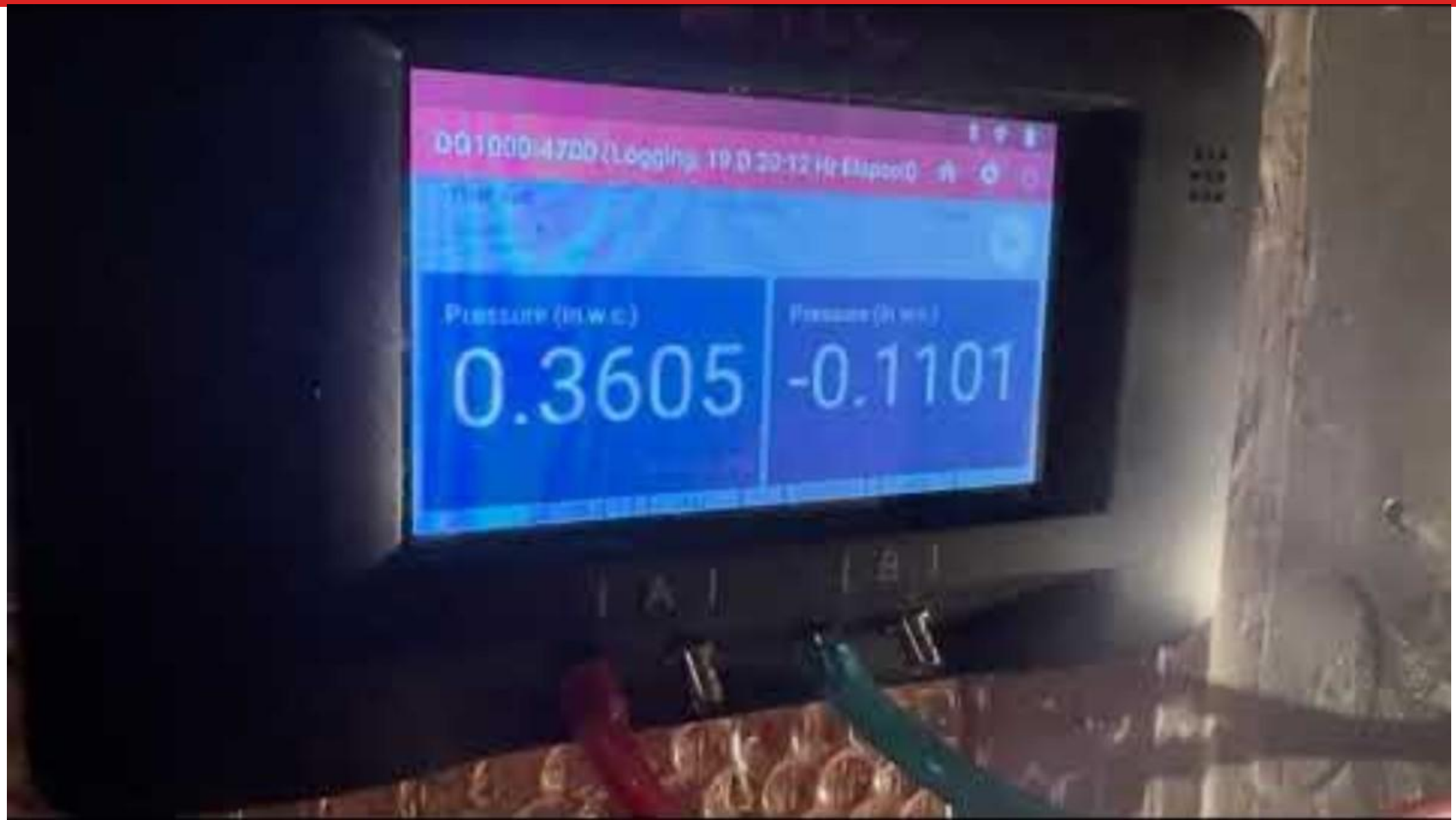
14

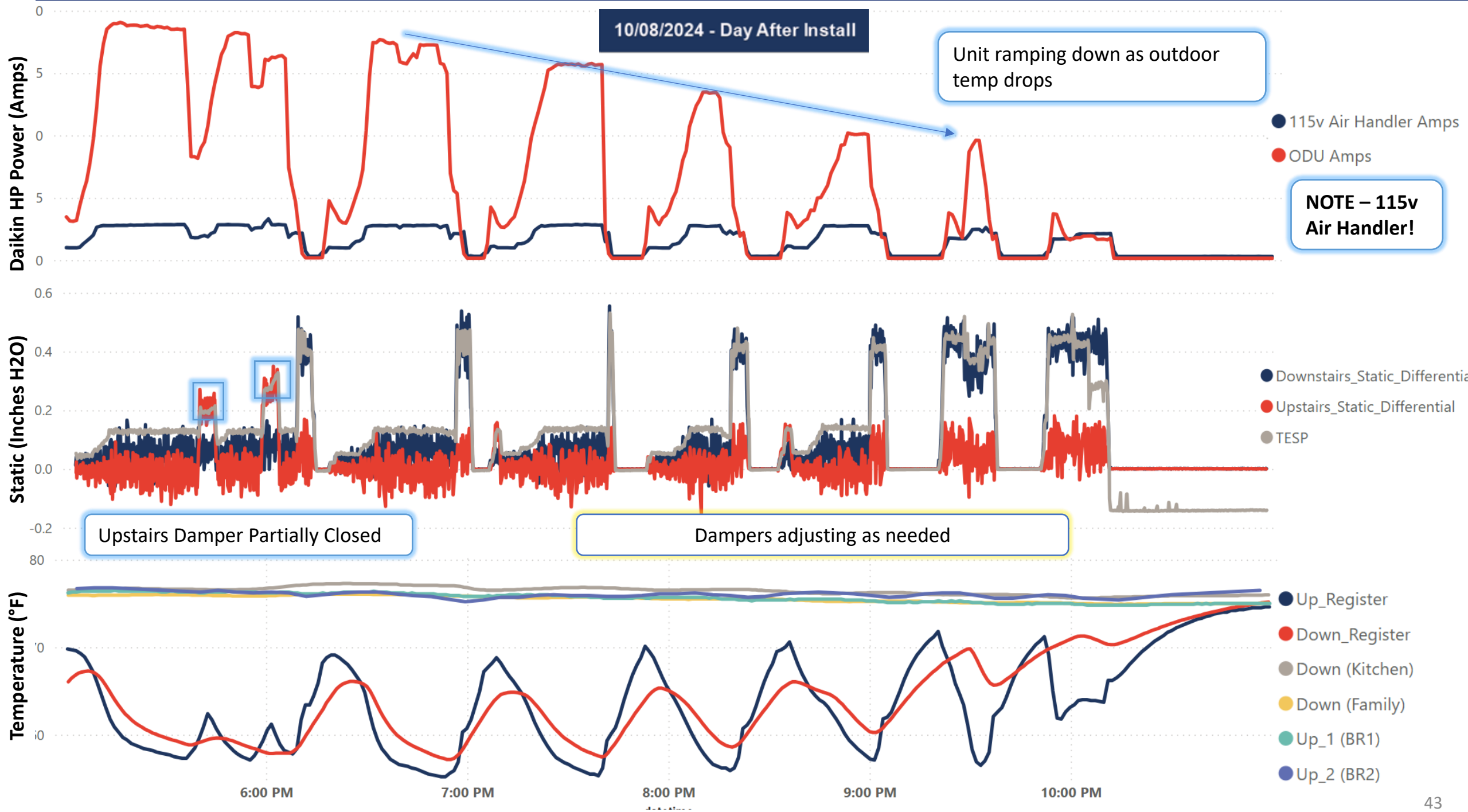
Static Sensing to Return & Supply

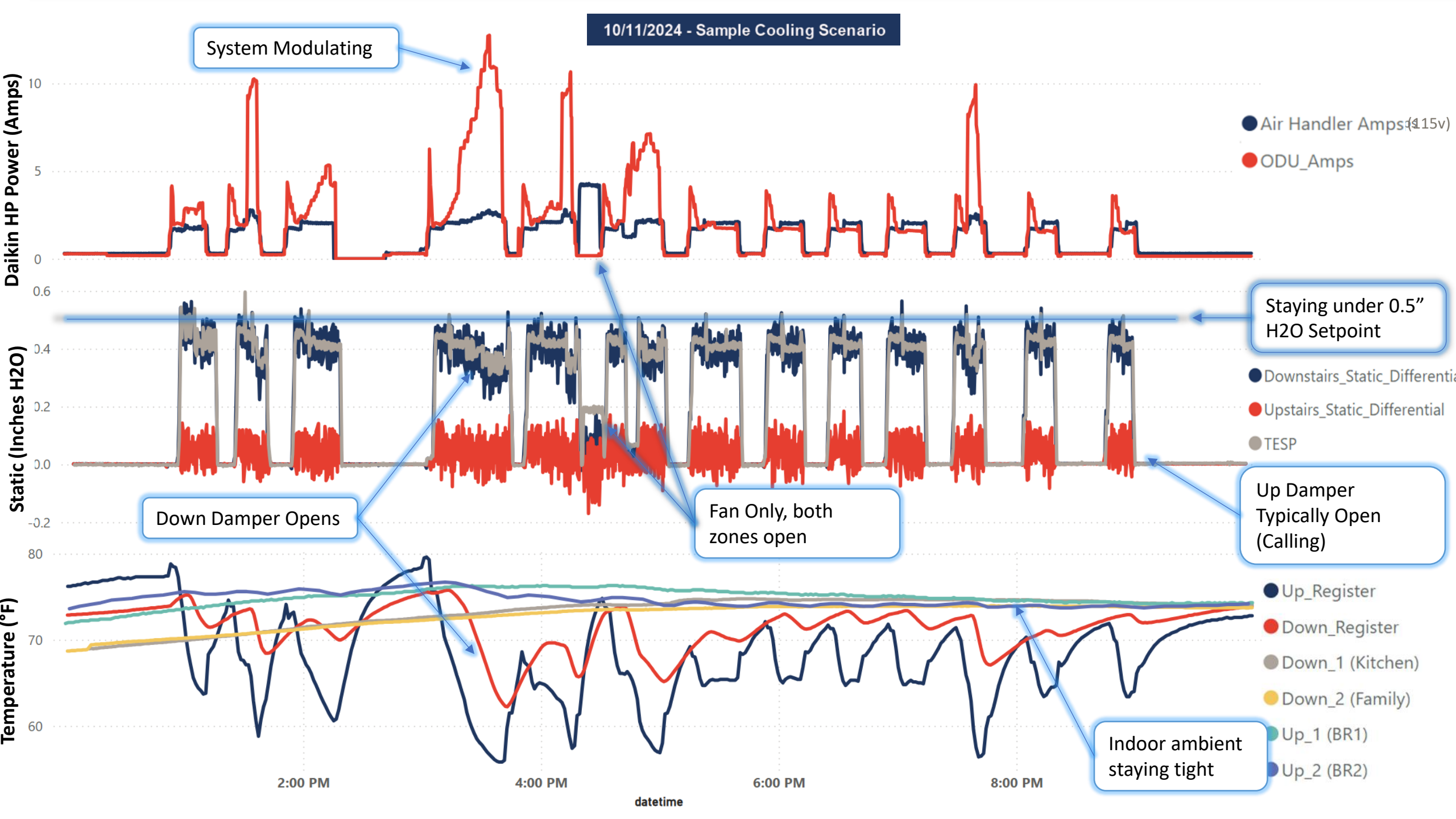


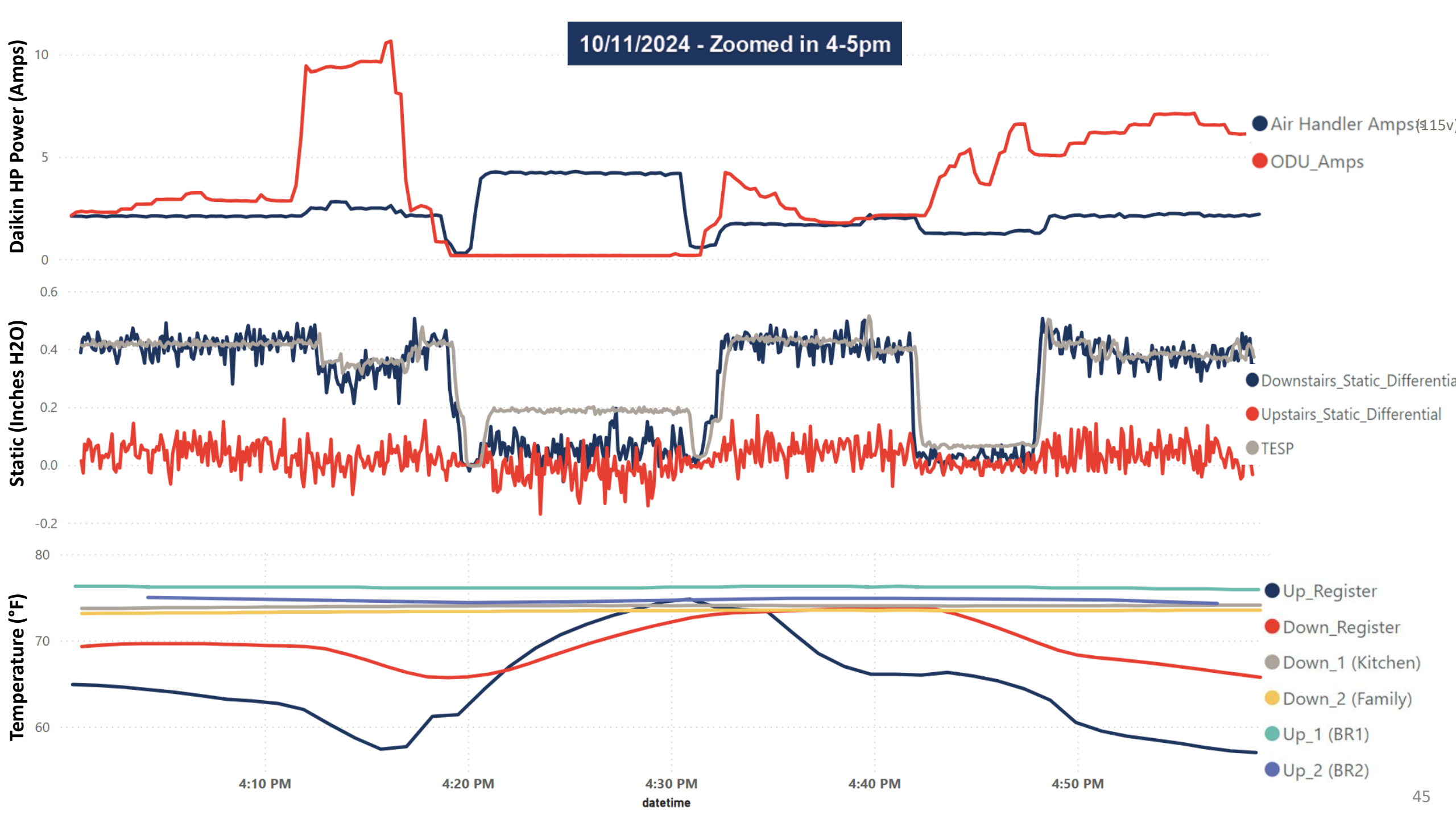
Zoning Equipment In Action

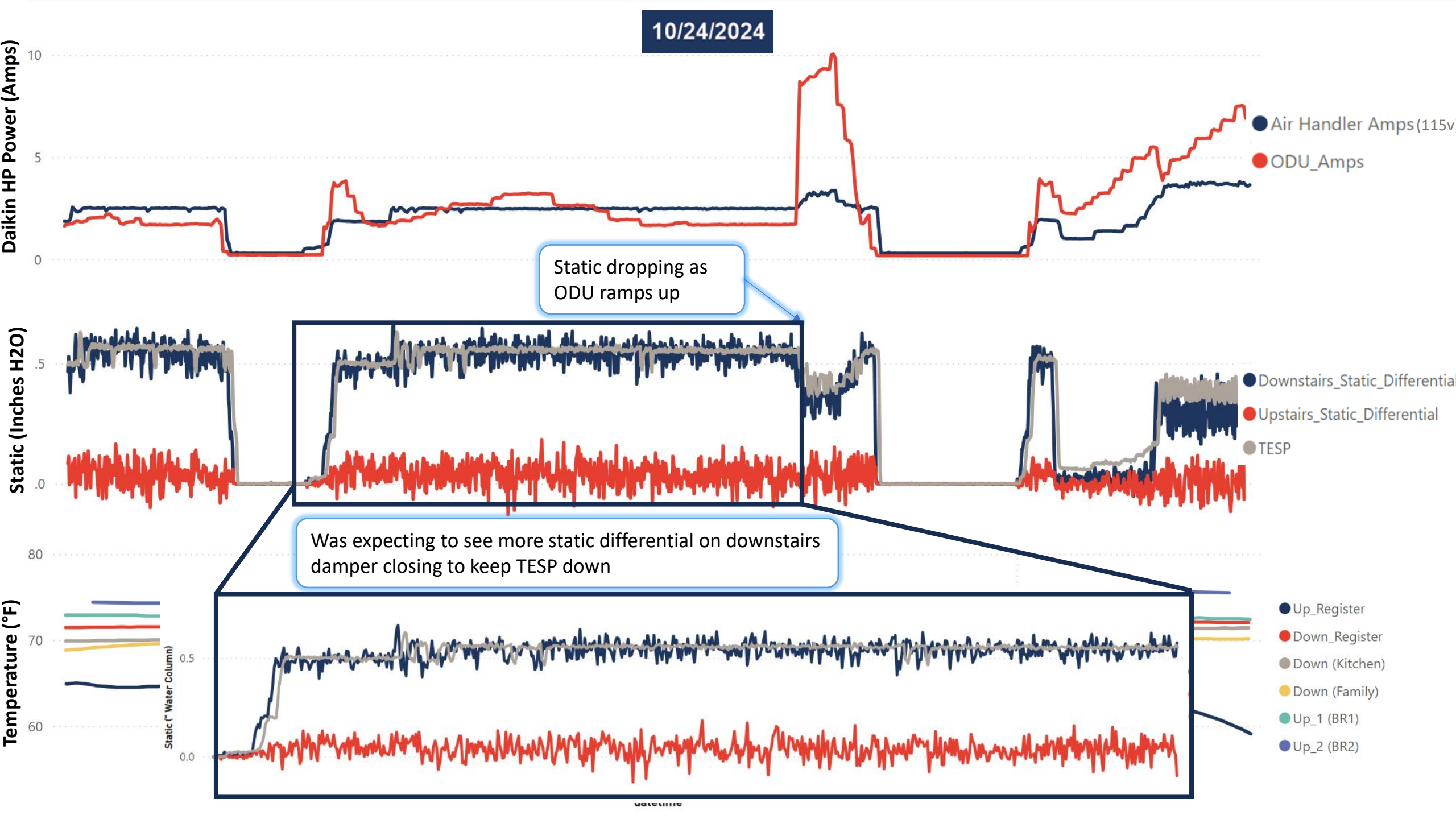
Controller keeping Total External Static below 0.5” H2O

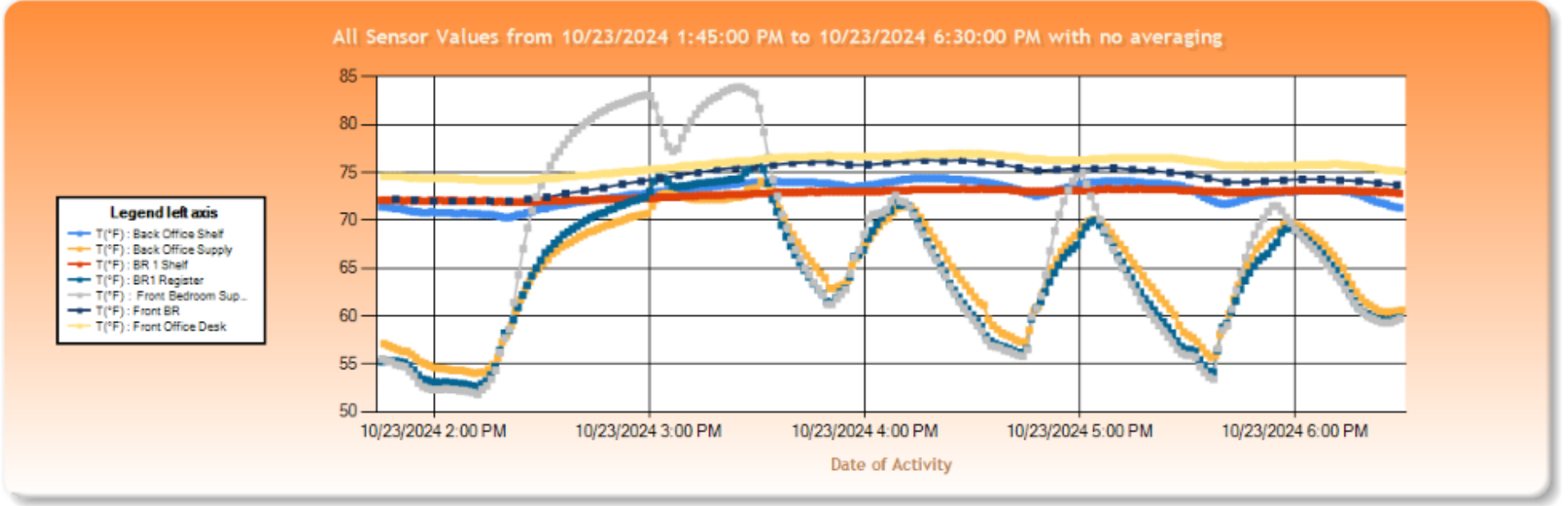



10/08/2024 - Day After Install
Unit ramping down as outdoor temp drops
Daikin HP Power (Amps)
115v Air Handler Amps
ODU Amps
NOTE – 115v Air Handler!
Static (Inches H2O)
Downstairs_Static_Differentia
Upstairs_Static_Differential
TESP
Upstairs Damper Partially Closed
Dampers adjusting as needed
Temperature (°F)
Up_Register
Down_Register
Down (Kitchen)
Down (Family)
Up_1 (BR1)
Up_2 (BR2)
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM

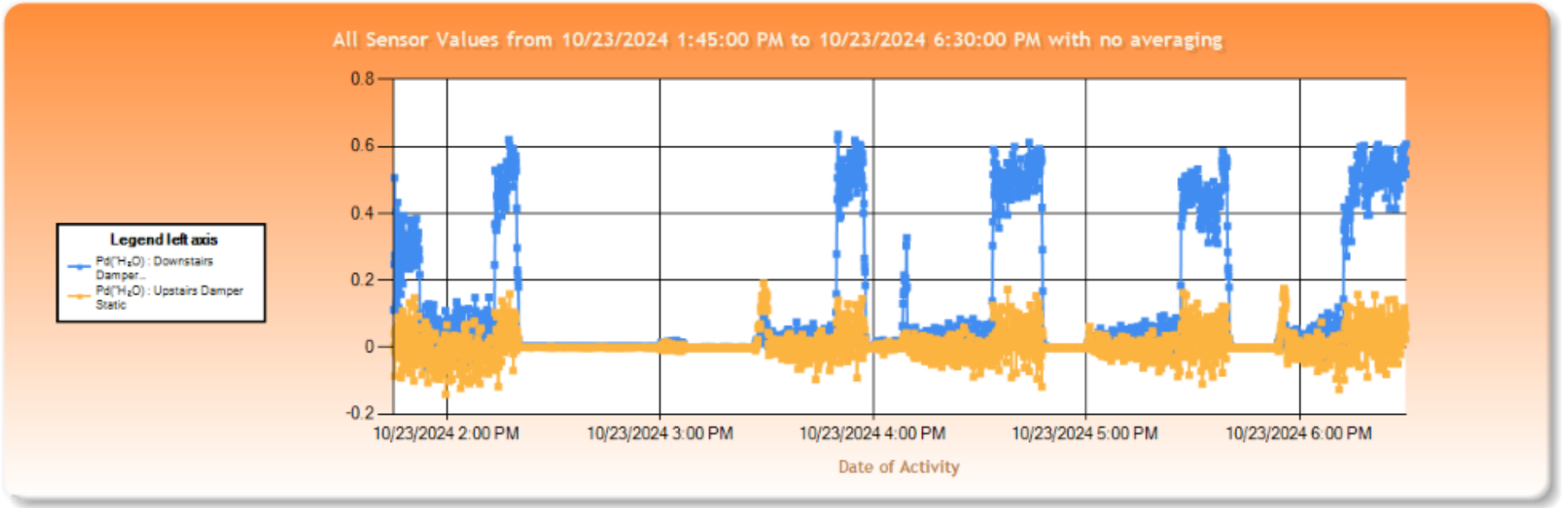

10/11/2024 - Sample Cooling Scenario
System Modulating
Daikin HP Power (Amps)
10
5
0
Air Handler Amps (115v)
ODU_Amps
Staying under 0.5" H2O Setpoint
Static (Inches H2O)
0.6
0.4
0.2
0.0
-0.2
Downstairs_Static_Differentia
Upstairs_Static_Differential
TESP
Down Damper Opens
Fan Only, both zones open
Up Damper Typically Open (Calling)
Temperature (°F)
80
70
60
Up_Register
Down_Register
Down_1 (Kitchen)
Down_2 (Family)
Up_1 (BR1)
Up_2 (BR2)
Indoor ambient staying tight
2:00 PM
4:00 PM
6:00 PM
8:00 PM
datetime

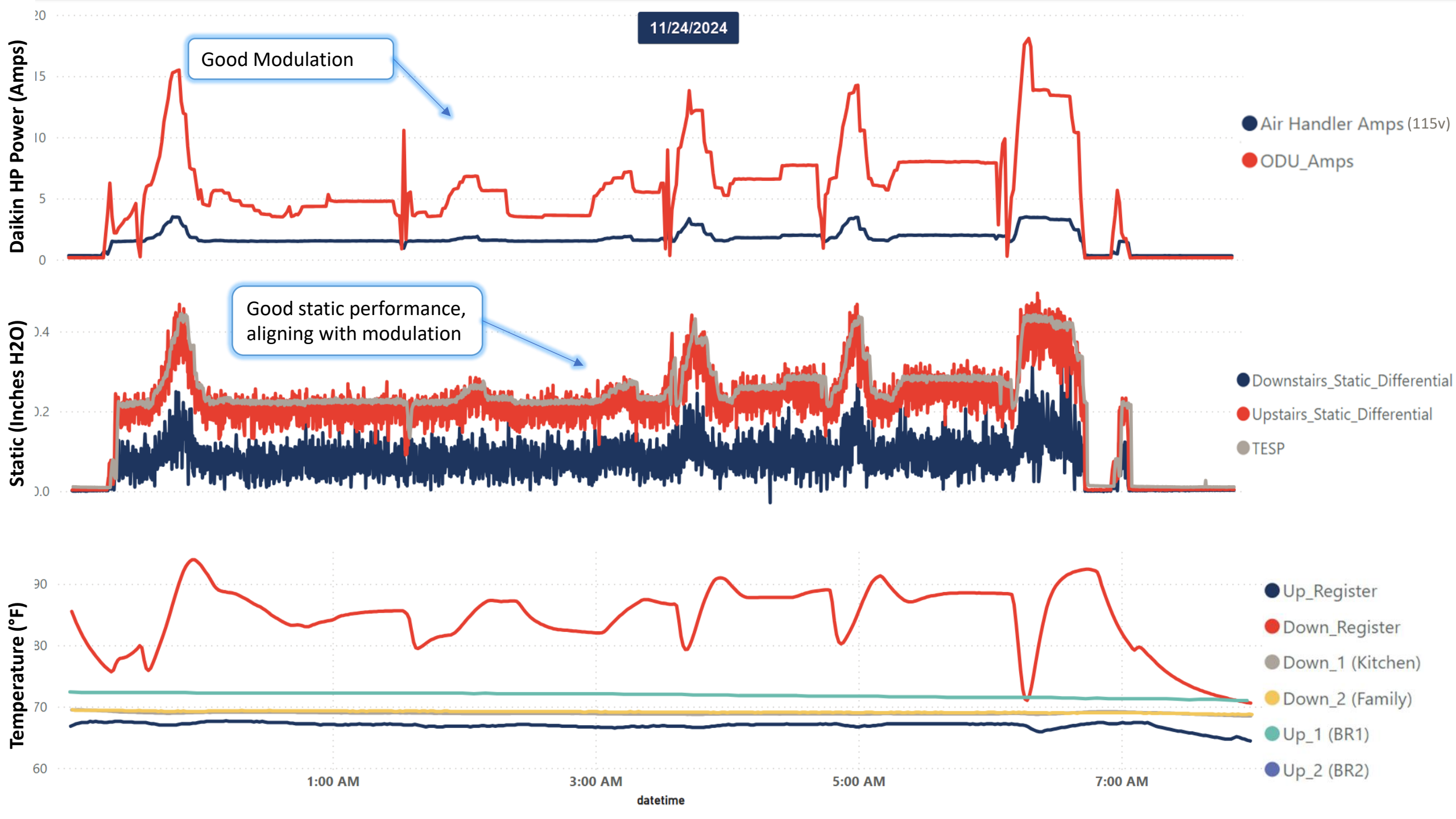

10/11/2024 - Zoomed in 4-5pm
Daikin HP Power (Amps)
10
5
0
Air Handler Amps{115v}
ODU_Amps
Static (Inches H2O)
0.6
0.4
0.2
0.0
-0.2
Downstairs_Static_Differentia
Upstairs_Static_Differential
TESP
Temperature (°F)
80
70
60
Up_Register
Down_Register
Down_1 (Kitchen)
Down_2 (Family)
Up_1 (BR1)
Up_2 (BR2)
4:10 PM
4:20 PM
4:30 PM
4:40 PM
4:50 PM
datetime

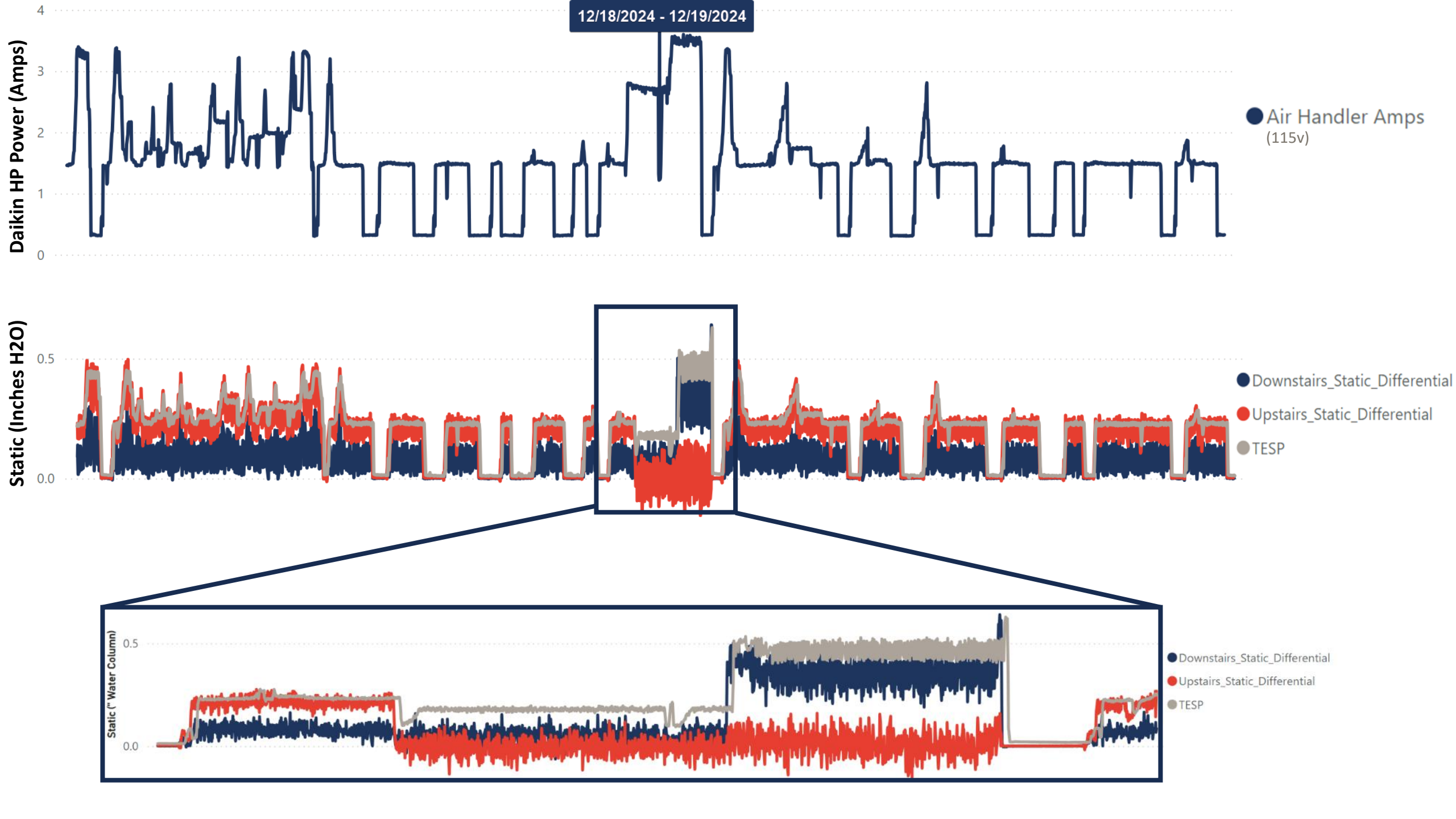

10/24/2024
Daikin HP Power (Amps)
10
5
0
Air Handler Amps (115v
ODU_Amps
Static dropping as ODU ramps up
Static (Inches H2O)
.5
.0
Downstairs_Static_Differential
Upstairs_Static_Differential
TESP
Was expecting to see more static differential on downstairs damper closing to keep TESP down
Temperature (°F)
80
70
60
Static (" Water Column)
0.5
0.0
Up_Register
Down_Register
Down (Kitchen)
Down (Family)
Up_1 (BR1)
Up_2 (BR2)



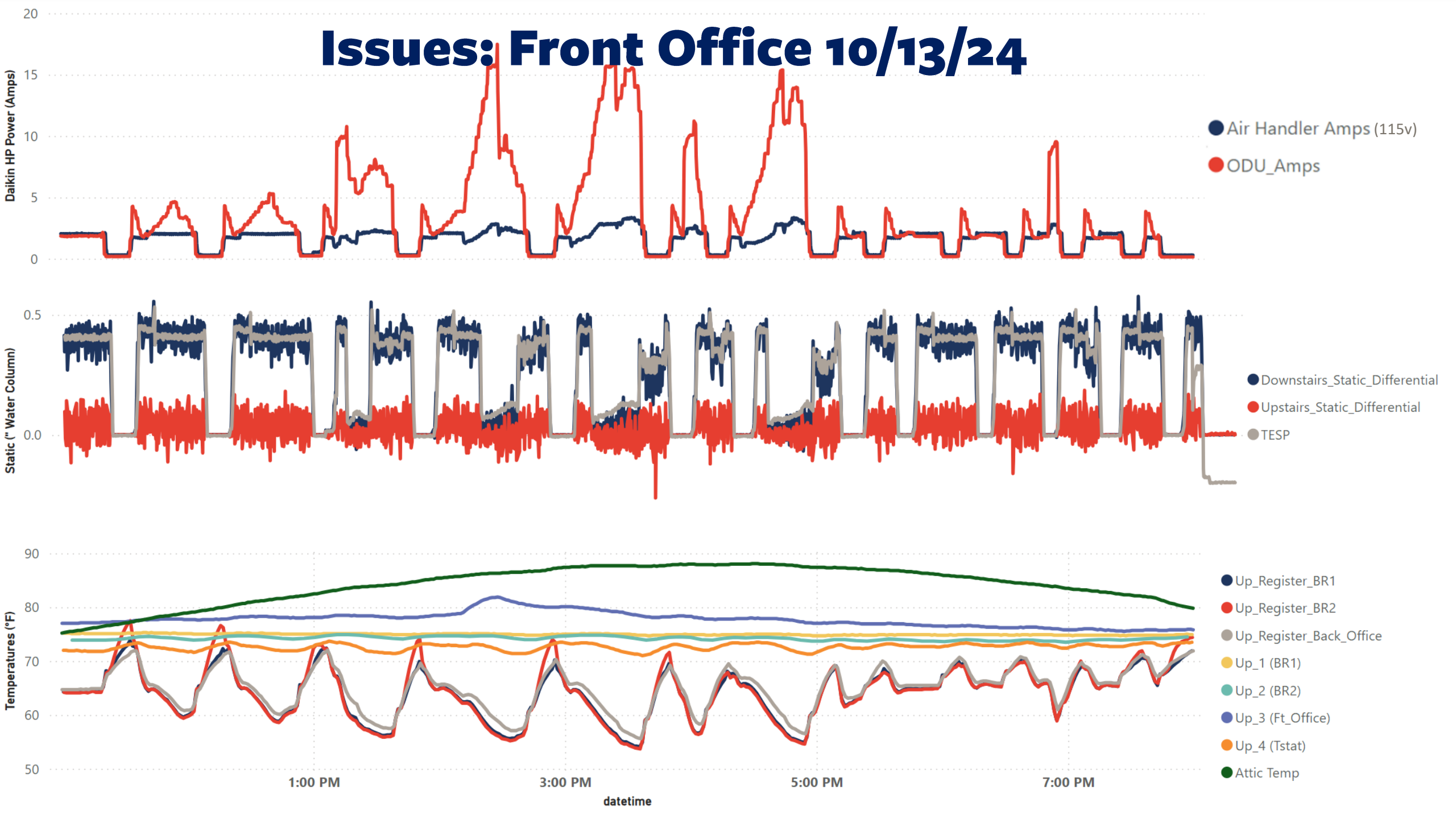
	T(°F) : Back Office Shelf	T(°F) : Back Office Supply	T(°F) : BR 1 Shelf	T(°F) : BR1 Register	T(°F) : Front Bedroom Supply	T(°F) : Front BR	T(°F) : Front Office Desk
min	70.30	54.00	71.90	52.60	51.80	72.00	74.20
max	74.40	74.10	73.30	76.20	83.90	76.30	77.00
diff	4.10	20.10	1.40	23.60	32.10	4.30	2.80



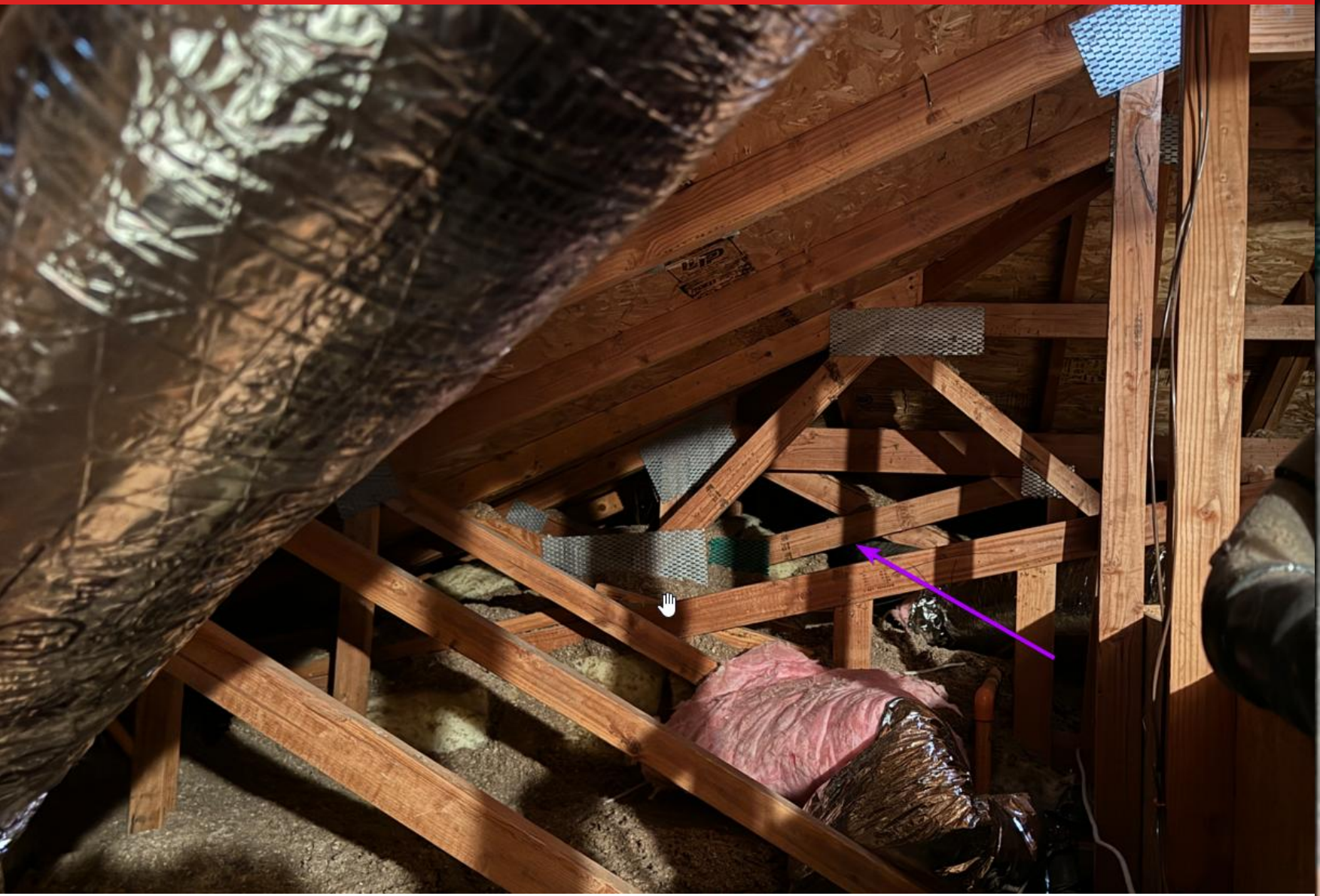

11/24/2024
Good Modulation
Daikin HP Power (Amps)
Air Handler Amps (115v)
ODU_Amps
Good static performance, aligning with modulation
Static (Inches H2O)
Downstairs_Static_Differential
Upstairs_Static_Differential
TESP
Temperature (°F)
Up_Register
Down_Register
Down_1 (Kitchen)
Down_2 (Family)
Up_1 (BR1)
Up_2 (BR2)
1:00 AM
3:00 AM
5:00 AM
7:00 AM
datetime


12/18/2024 - 12/19/2024
Daikin HP Power (Amps)
4
3
2
1
0
Air Handler Amps
(115v)
Static (Inches H2O)
0.5
0.0
Downstairs_Static_Differential
Upstairs_Static_Differential
TESP
Static (" Water Column)
0.5
0.0
Downstairs_Static_Differential
Upstairs_Static_Differential
TESP

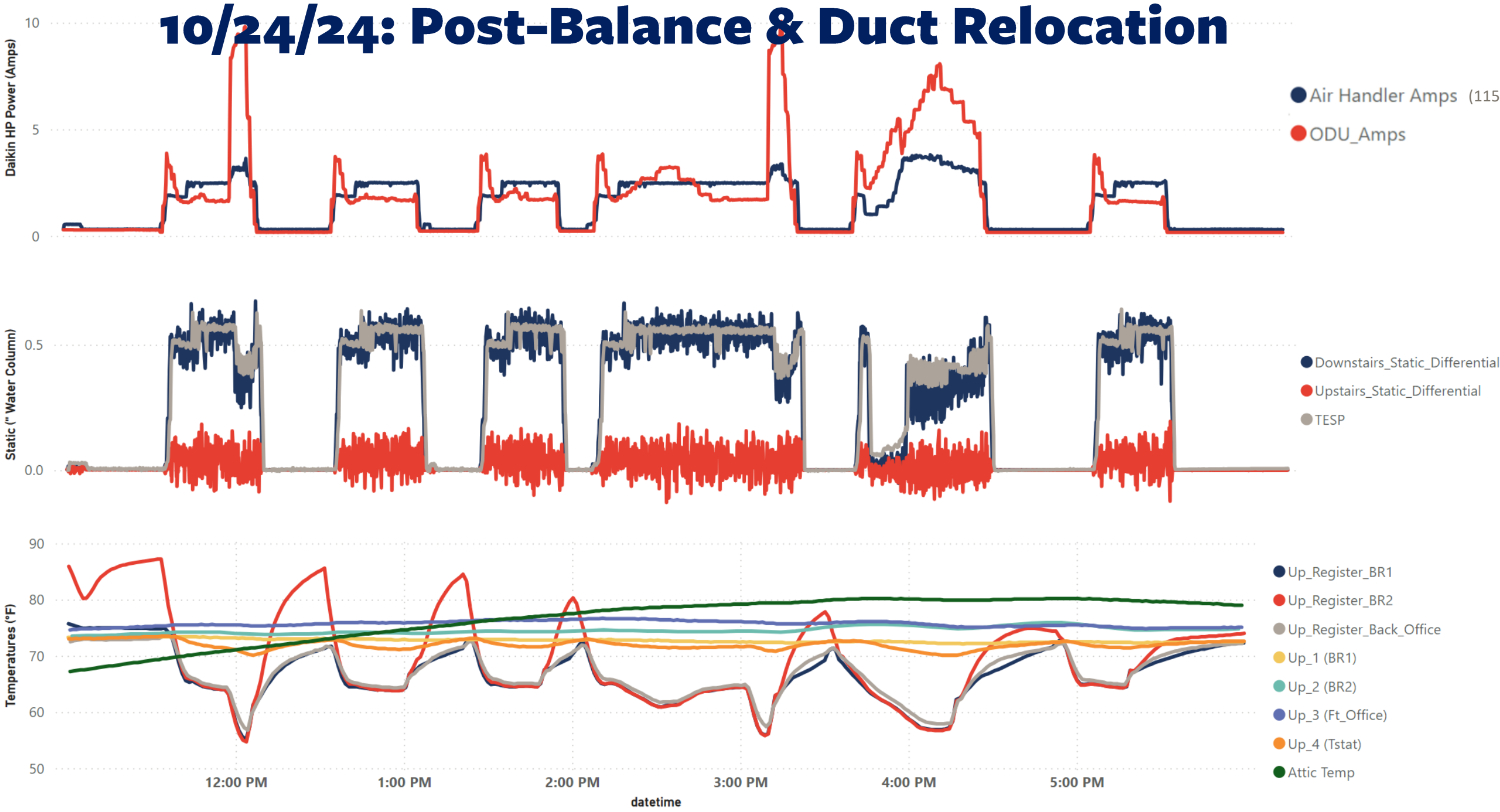
Issues: Front Office 10/13/24



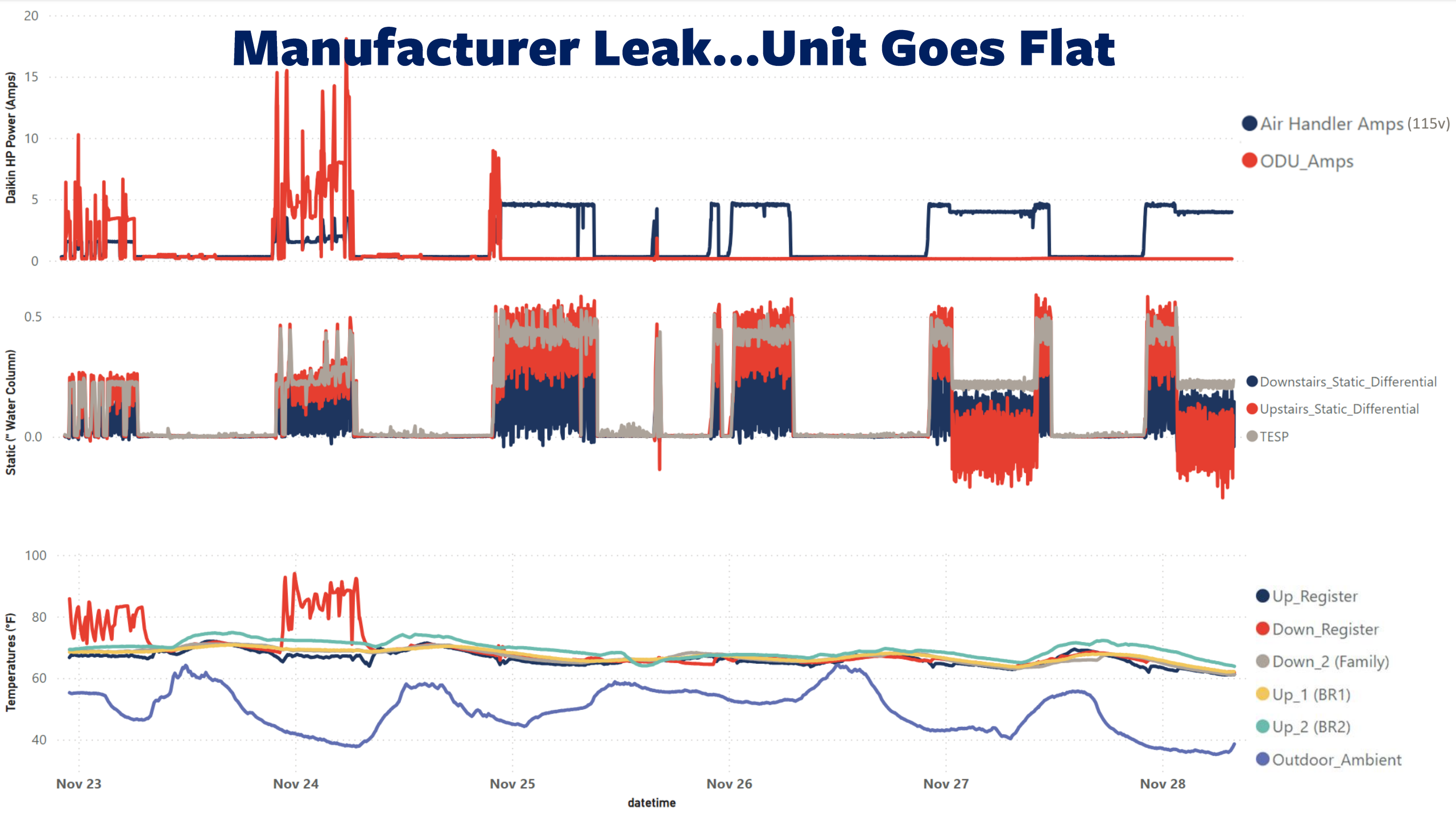
Front Office:
South facing, over garage, & THIS!



10/24/24: Post-Balance & Duct Relocation



Manufacturer Leak...Unit Goes Flat










HEAT PUMP EXPERTS
ELECTRIFY
MY HOME


Questions? Stay in Touch!

Join us 7/31/25: More Than One Brand In The Hand: Application Specific HPWH Design

ELECTRIFY MY HOME

Larry Waters | 707-840-3411 | www.electrifymyhome.com | info@electrifymyhome.com

Closing

Continuing Education Units Available

- Contact julianna@3c-ren.org for AIA LUs and ICC CEUs

Coming to Your Inbox Soon!

- Slides, Recording, & Survey – Please Take It and Help Us Out!

Upcoming Electrify My Home Courses:

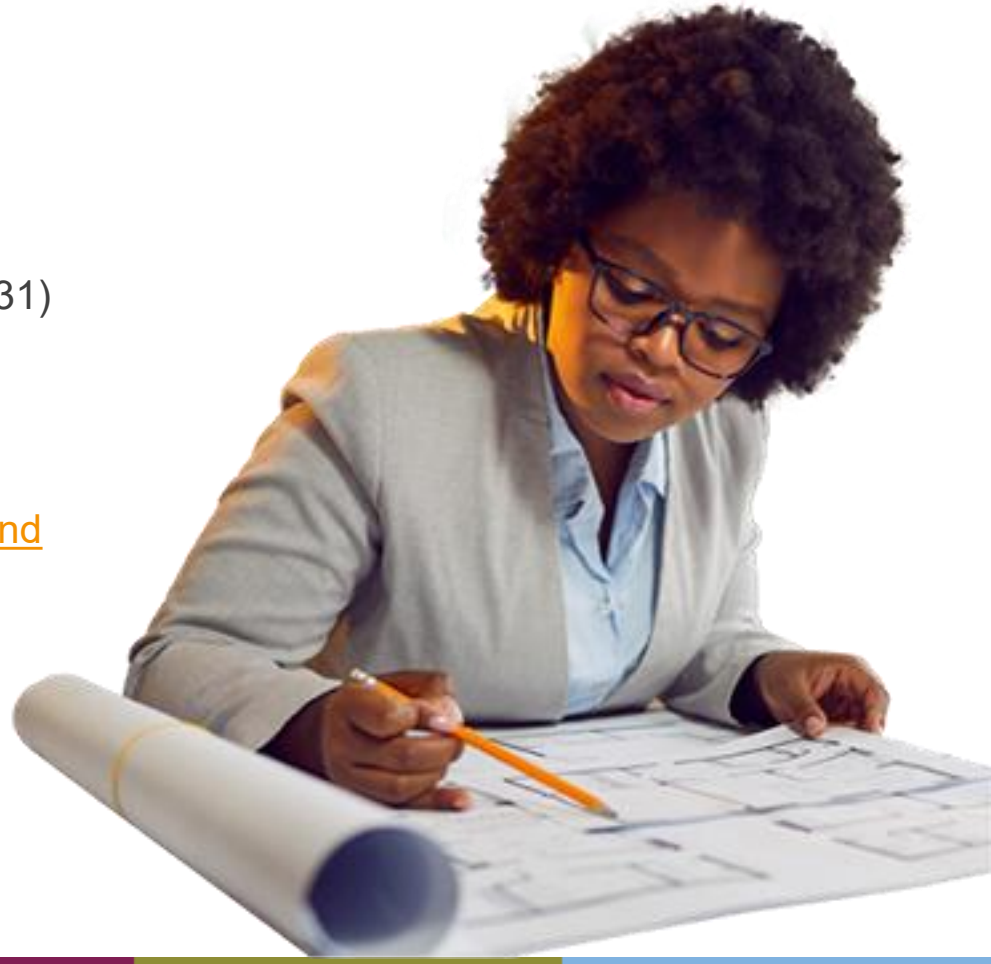
- More Than One Brand In The Hand: Application Specific HPWH Design (7/31)
- Retaining Profit – Minimizing Call Backs on Heat Pump Projects (8/28)

Other Opportunities

- Passive Design/Build Boot Camp with Emu Passive – Hands On Training and Exam (FREE!) – Monday, September 29th to Friday, October 3rd

https://www.3c-ren.org/calendar-of-events-and-trainings/

Any phone numbers who joined? Please share your name!



Thank you!

More info: **3c-ren.org**

Questions: **info@3c-ren.org**

Email updates: **3c-ren.org/newsletter**

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