



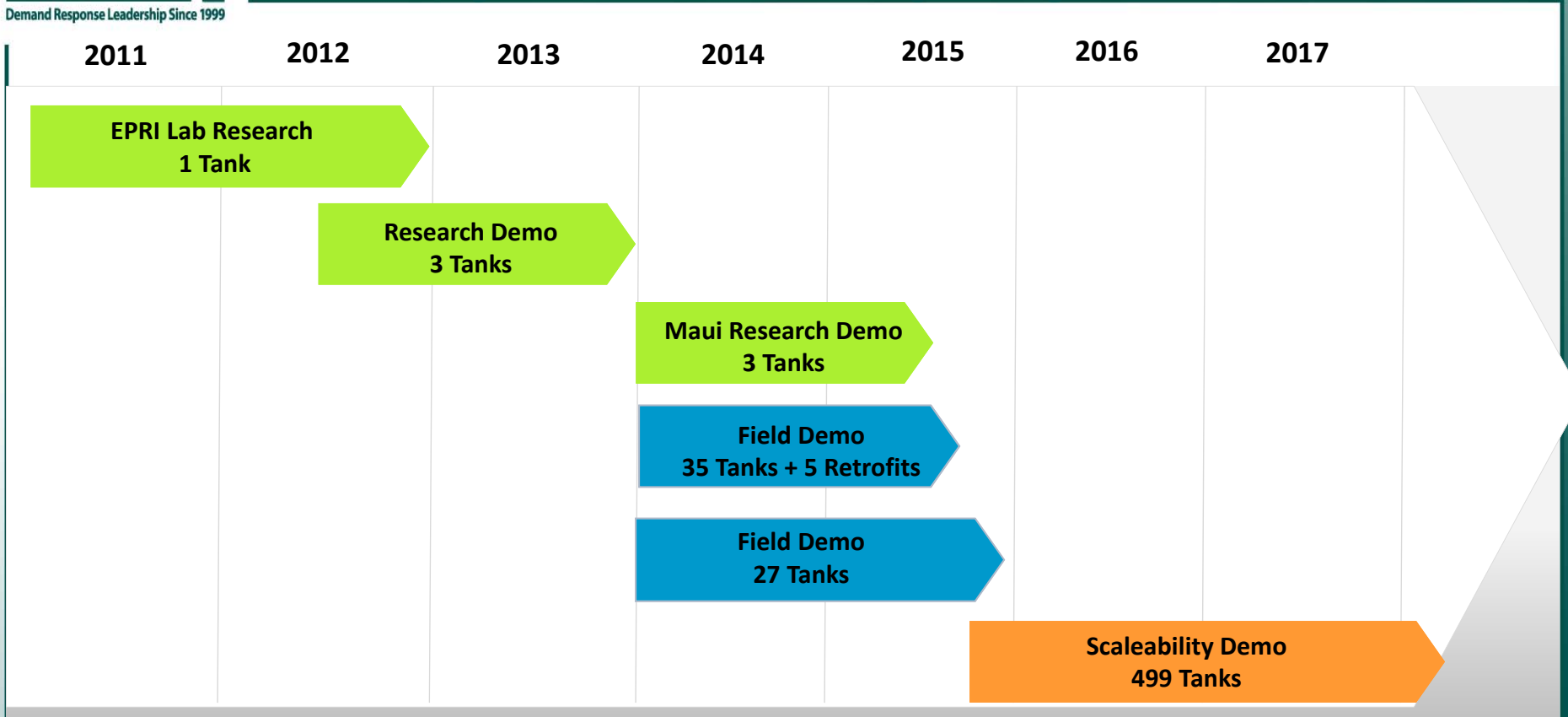
# Grid Interactive Water Heater Project in Hawaii

PLMA Conference  
Cambridge, MA

November 13, 2017

- GIWH Deployment Timeline
- Phase III
  - Project Installation
  - Objectives
  - Test Signals: PJM and HECO RR
  - HECO RR Test Results
- Summary

# Utility GIWH Deployments



**Phase I – Research Demonstration**  
7 units  
BPA BRD



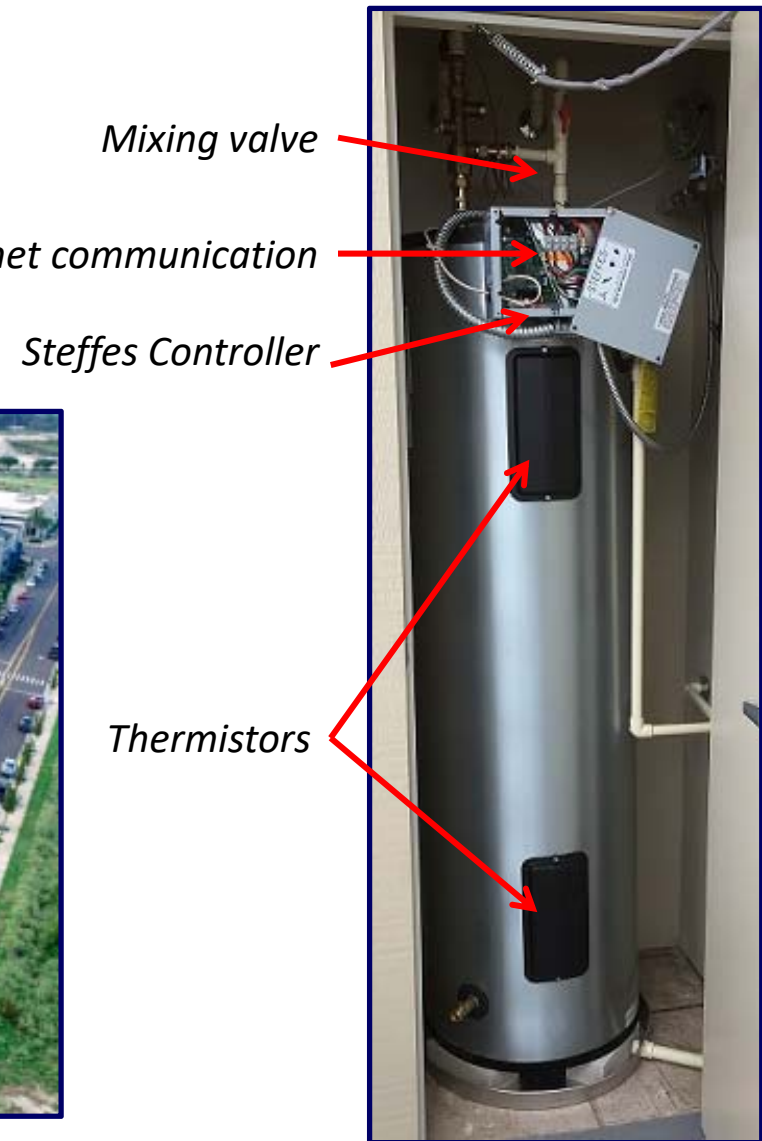
**Phase II – Field Demonstration**  
67 units  
PJM Reg-D  
Hawaiian Electric Load Shift



**Phase III – Scalability Demonstration**  
499 units  
Hawaiian Electric RR

# Phase III: Installation

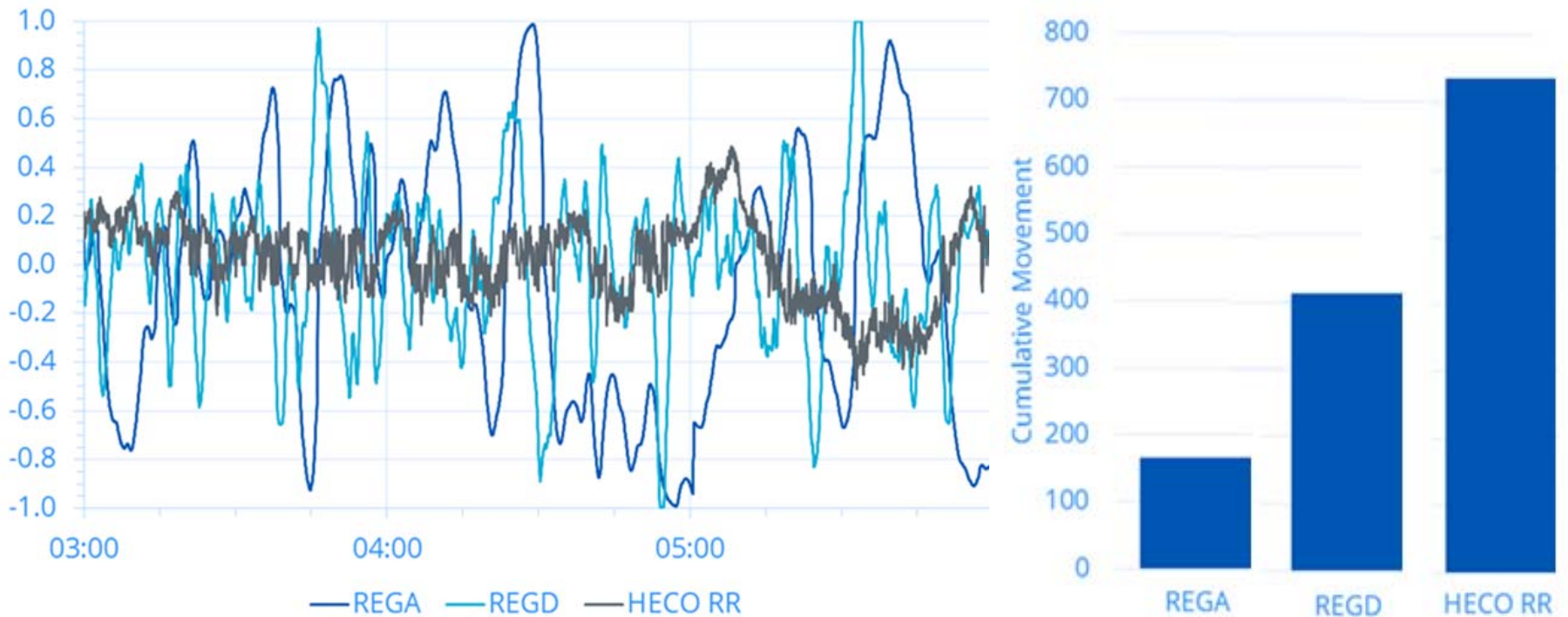
- 499 units
- 14 buildings
- Aug 2016 – Feb 2017



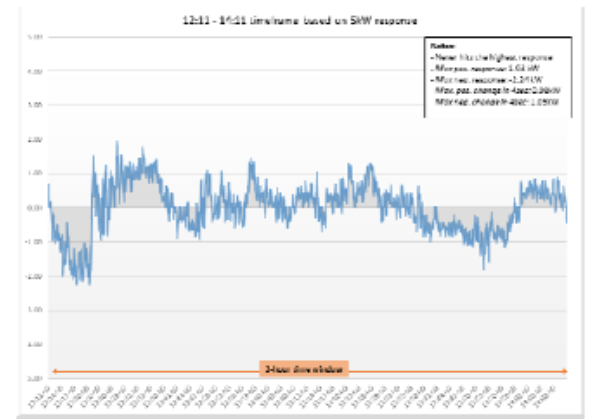
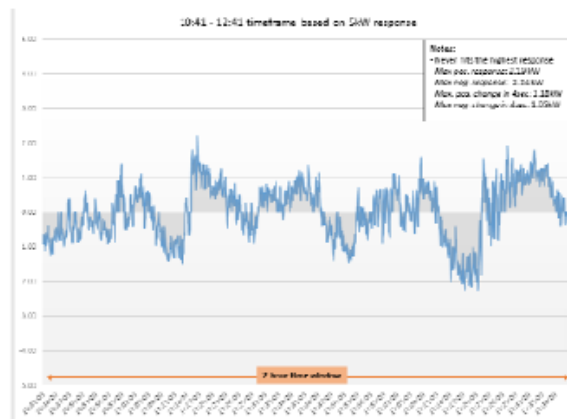
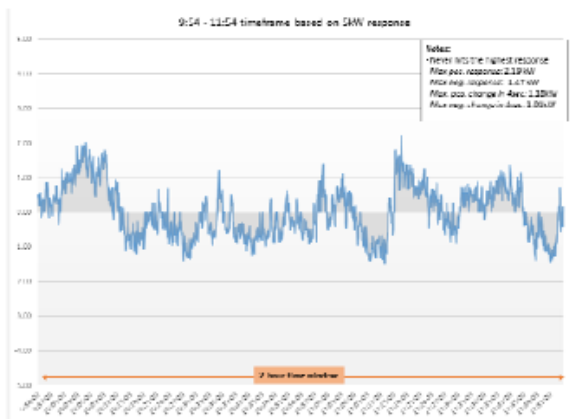
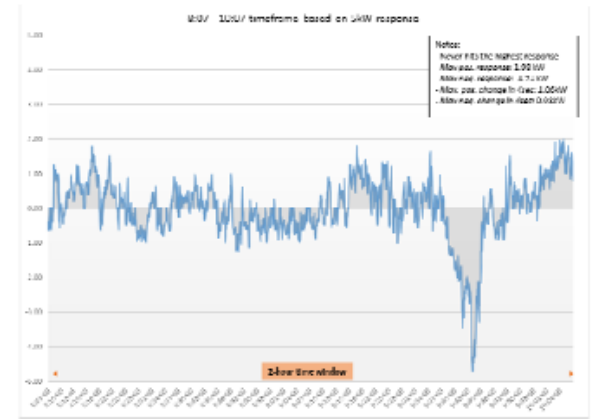
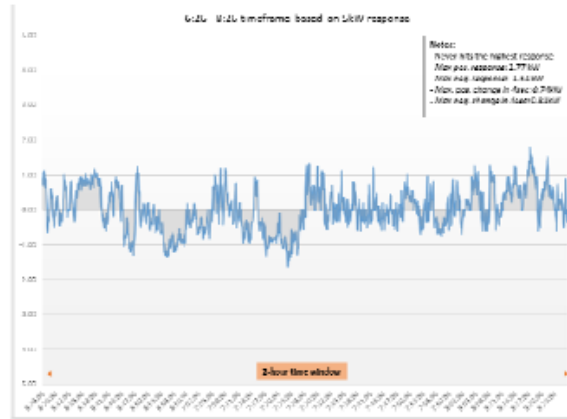
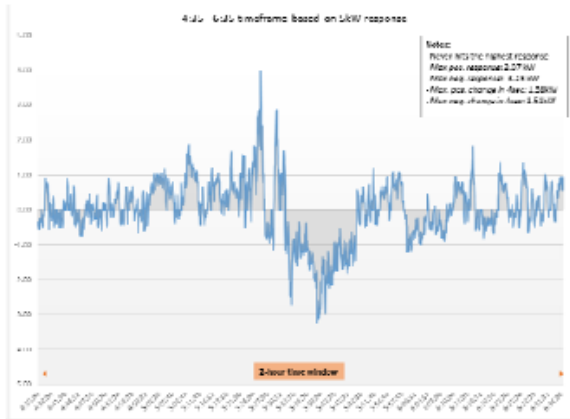
# Phase III Objectives

- Test the capability of the GIWH to perform against different regulation signals
  - PJM Reg-D used for baselining performance
  - Hawaiian Electric Regulating Reserve (HECO RR) is a raw Automatic Generation Control (AGC)
- Determine the aggregated MW capacity of the 499 deployment
- Evaluate any customer impact
  - Water temperature
  - Bill impact

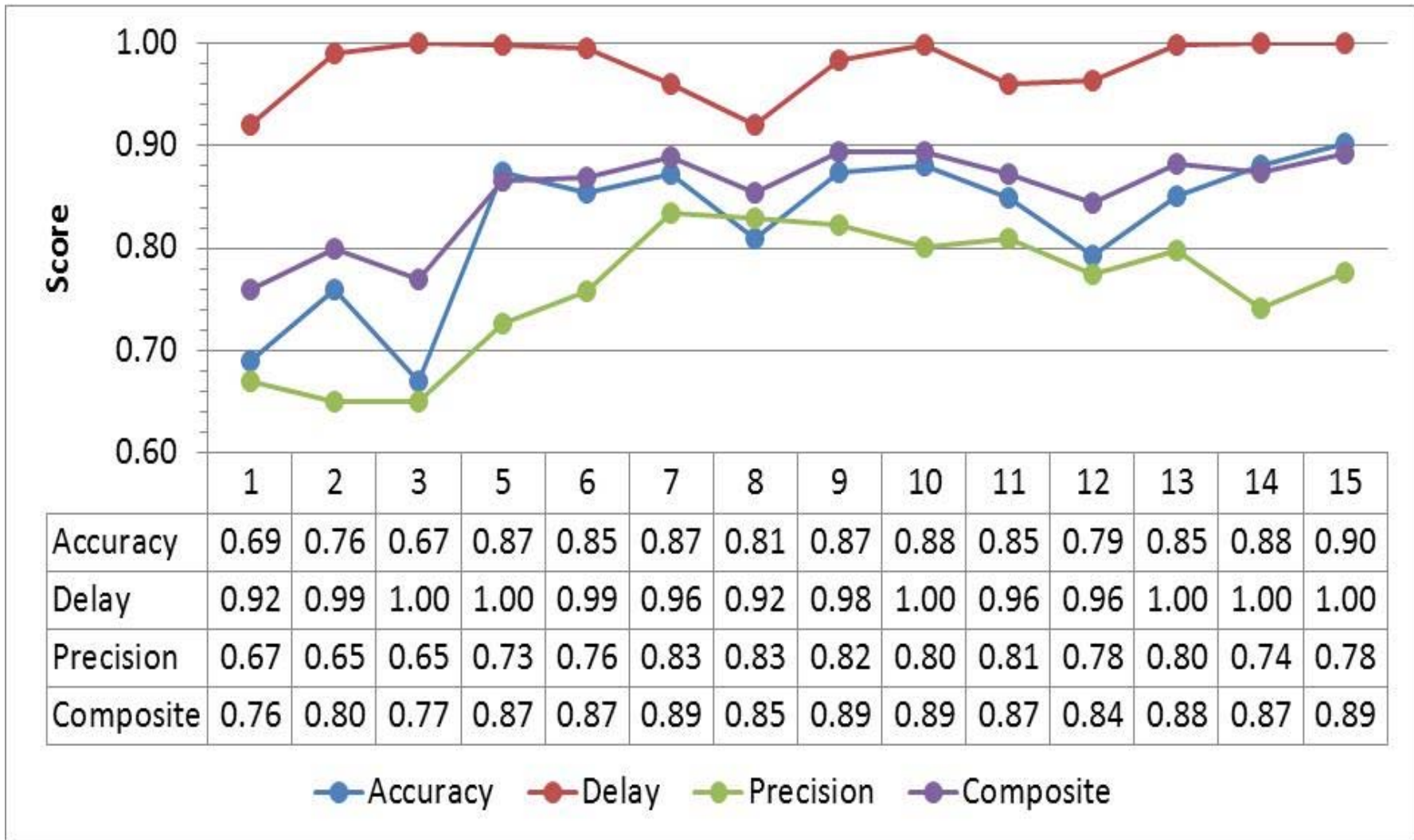
**HECO RR signal has significantly more mileage than the PJM signals**



## Selected multiple 2-hour duration windows that were energy neutral



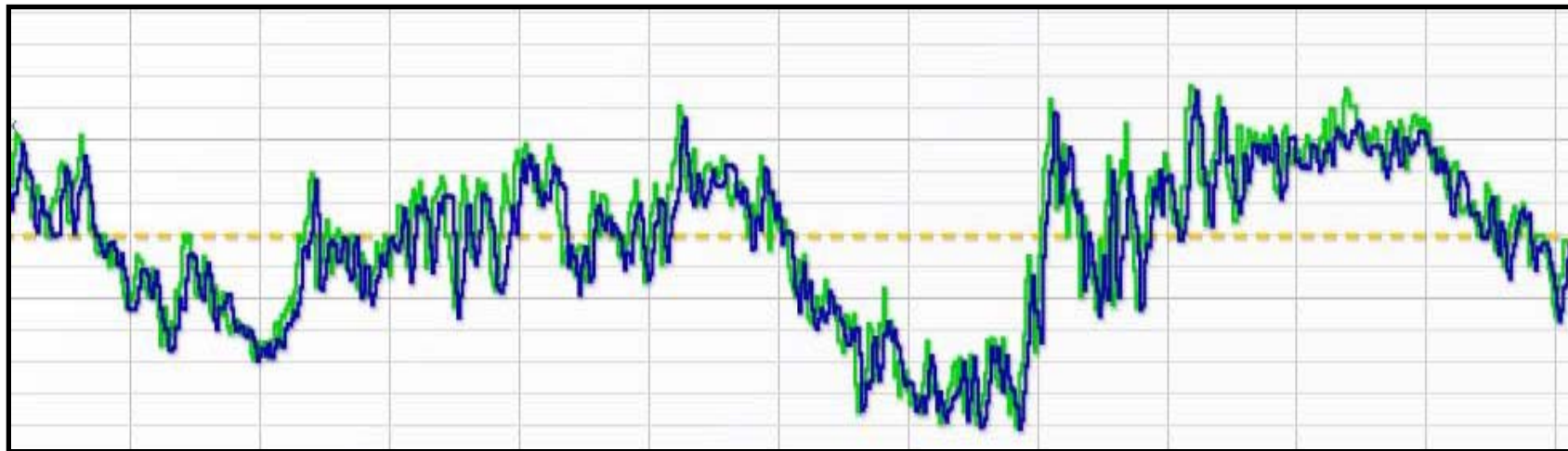
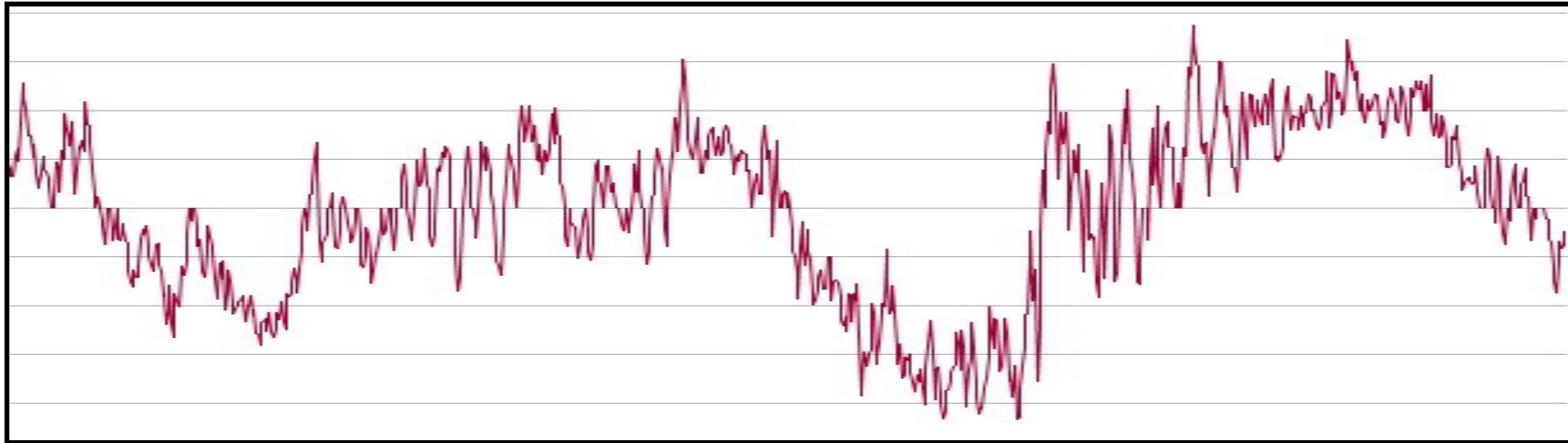
# HECO RR Test Score Results





# HECO RR Test #15

- HECO RR Test Signal
- Steffes Power Requested
- Steffes Fleet Response



## Lessons Learned

- Need to check that all servers in the communication chain are properly synchronized
- There are different methods to scale the HECO RR signal each with pros/cons
- A low accuracy score can impact other scores

## Next Steps

- Continue to resolve some of the communication issues in the building with boosters for the routers
- Continue to test longer duration of the HECO RR signal (up to 24 hours)
- Establish a baseline for uncontrolled GIWH fleet
- Final Report



Thank you!