



U.S. DEPARTMENT
of **ENERGY**

Federal Energy
Management Program

How Data Analytics Has Informed Decision-Making

T03-S02, August 5th, 2025

FEMP Summer CAMP (Courses Aligned with Mission Priorities)



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Agenda

- Session Learning Objectives
- Energy Portfolio Management
- Using Data Analytics to Inform Building Operations
- Conclusion and Q&A

Session Learning Outcomes

1. Recognize case studies that demonstrate energy modeling.
2. Identify tools, software, and data analytics programs that can be used to inform data-driven decision-making.
3. Recognize best practices for a range of project scales to match impact.
4. Identify in which situations each tool should be applied.



John Elliott

Chief Sustainability Officer

Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory

Physical Campus

- 3,800 FTE employees and 4,000 affiliates
- 202-acre main site
- 2.2M sf built space
- 95 buildings with widespread but aged metering and building automation
- 5 national user facilities



Making Data Actionable

Requires a data ecosystem that provides data integration and storage, an environment in which applications can perform queries, analysis, and visualization - plus a business process to make use of the analytics

Business Process

**Applications for Analysis and
Visualization**

Data Storage

Data Integration

LBL Building Data Ecosystem

Monthly Meter Reads

- Utility bill data
- Manual meter reads

100s of utility meters

Off-the-shelf reporting environment



Interval Meter Data

- Electricity meter data warehouse
- Meters integrated to building automation
- Meters integrated to radio network

Building Automation Data

- JCI/ALC sensors and actuators
- Barrington sensors and actuators

~45,000 data streams

Analytics platform development environment

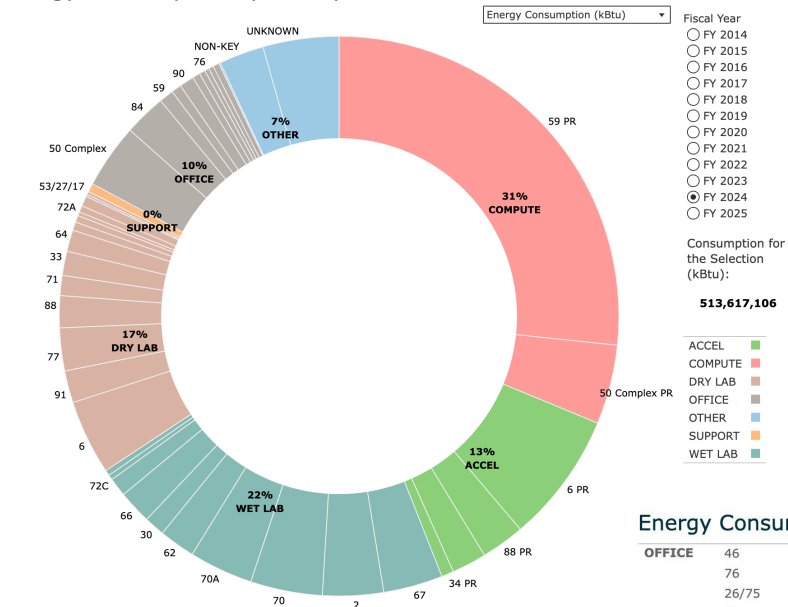


Other Data Sources

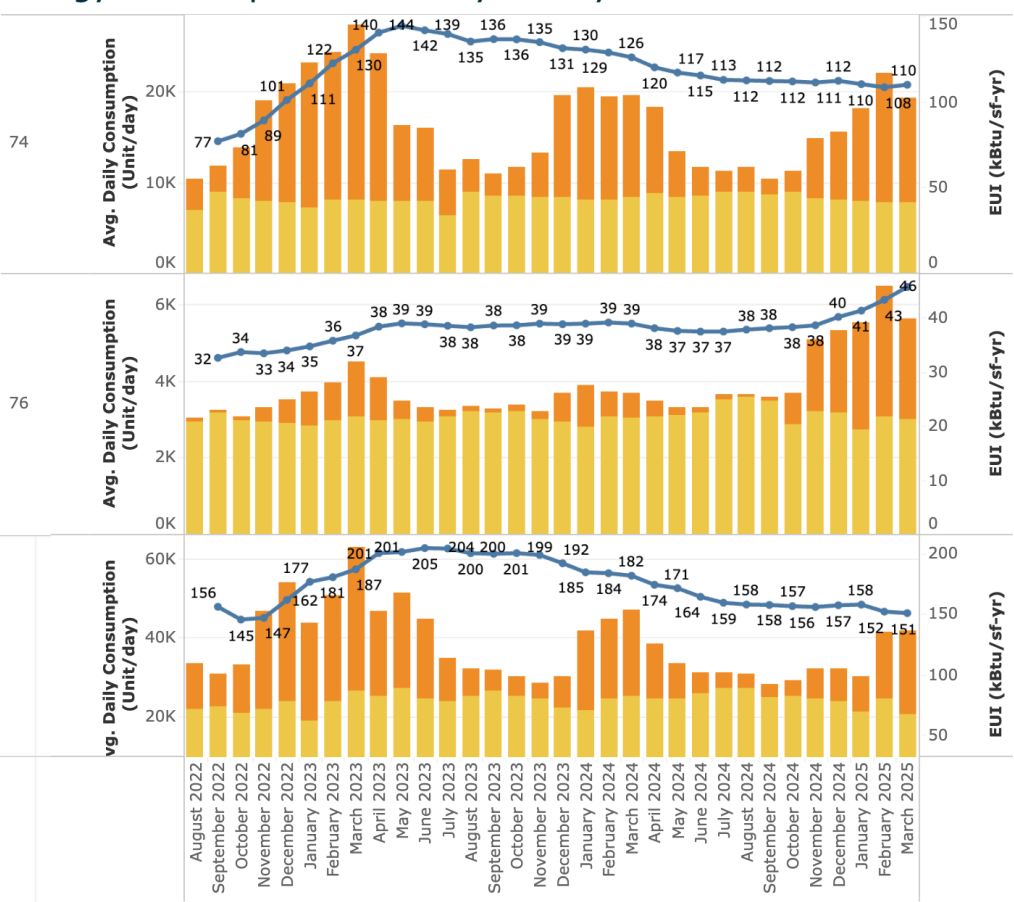
- Weather
- Work ticket data
- IP Address data

Viewing Annual and Monthly Data for Planning

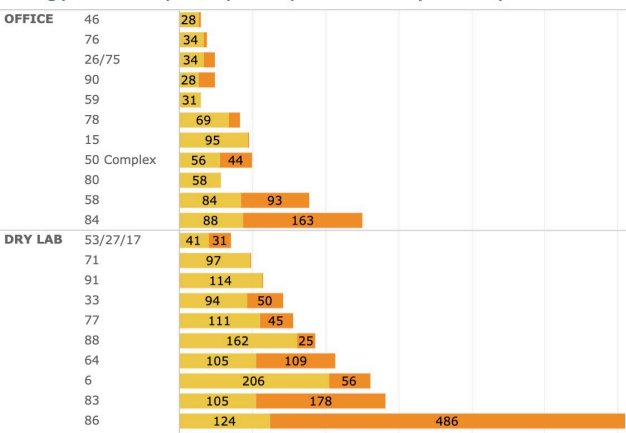
Energy Consumption by Facility



Energy Consumption Trends by Facility

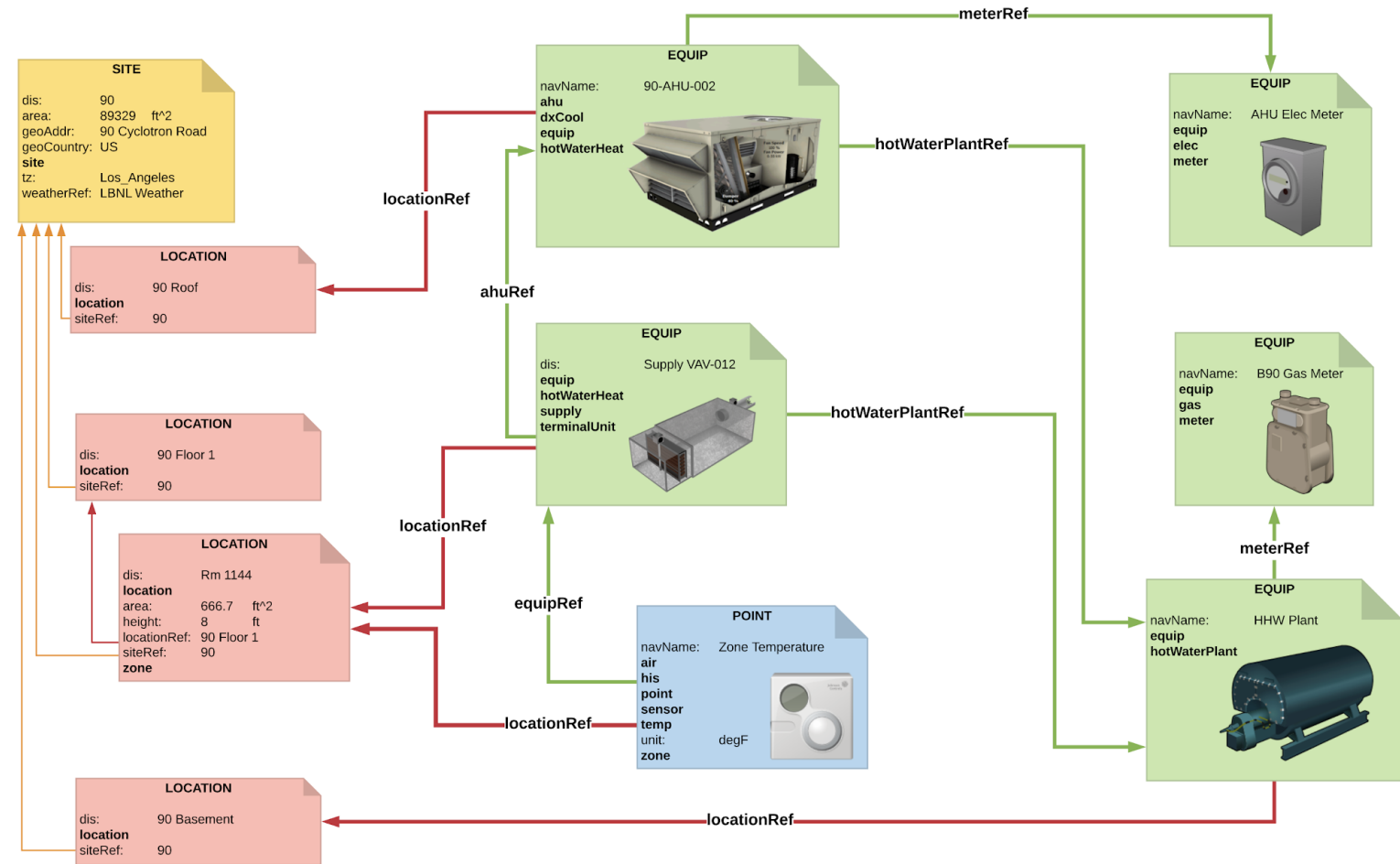


Energy Consumption per Square Foot by Facility



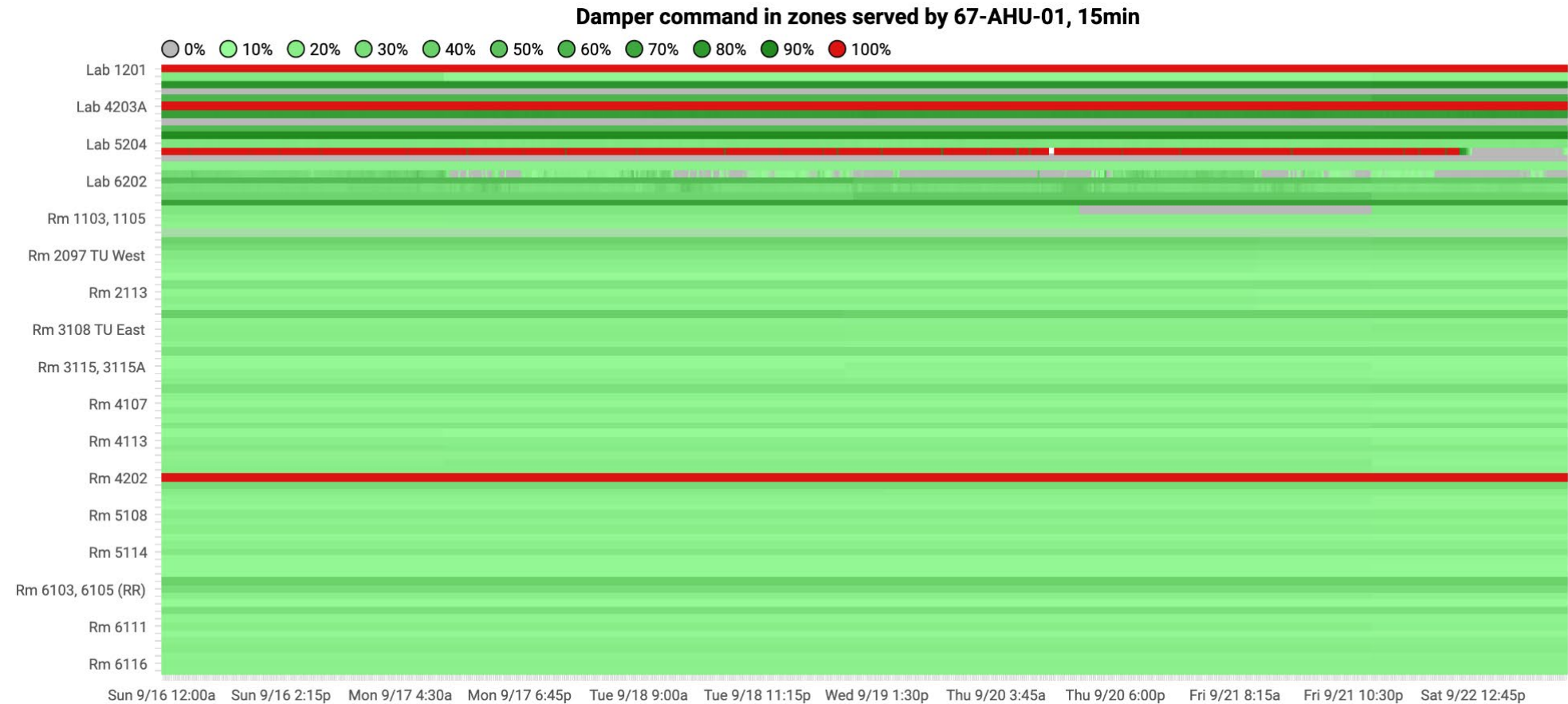
Organizing and Tagging Data

- Data is organized using a metadata tagging standard based on Project Haystack
- Allows analytic approaches to scale



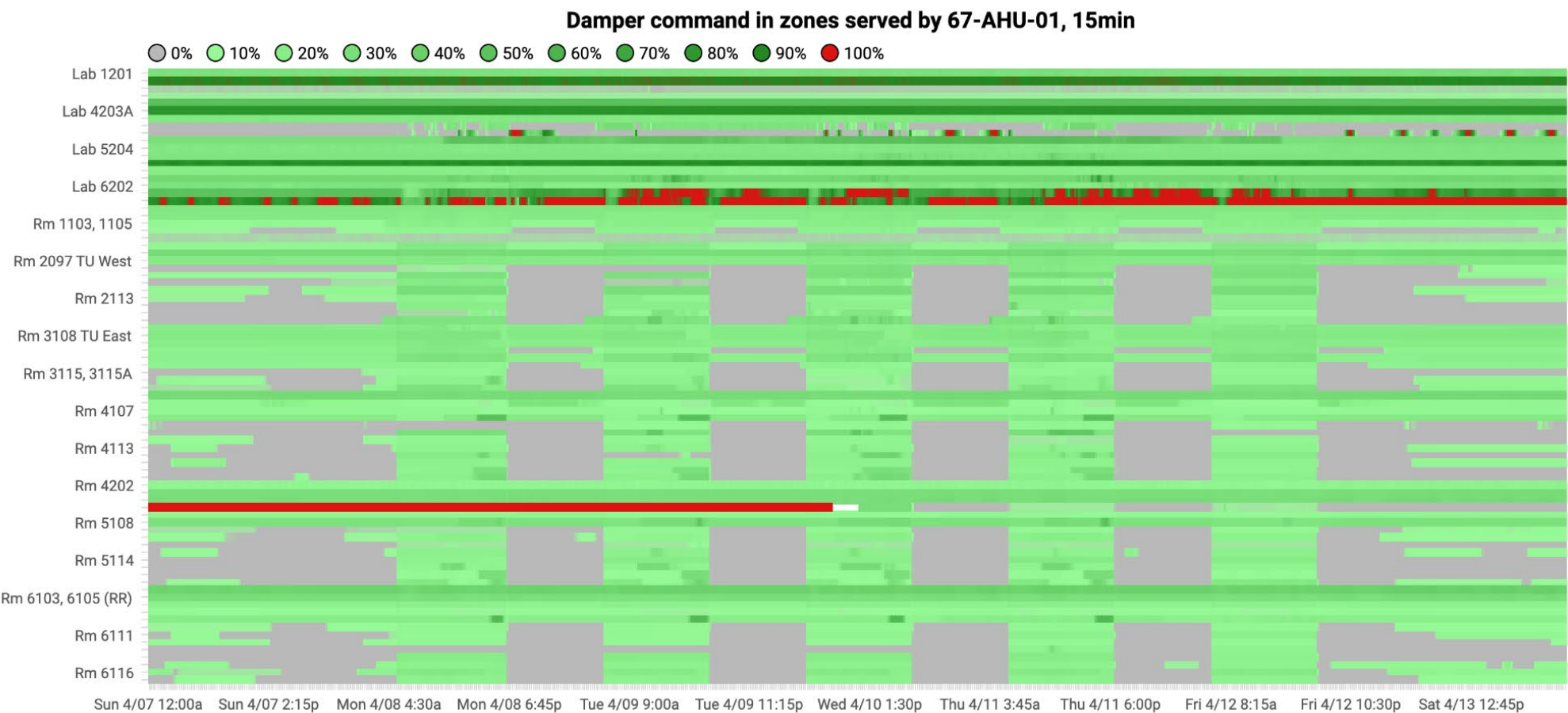
Visualizing System-Level Patterns

VAV damper commands pre commissioning

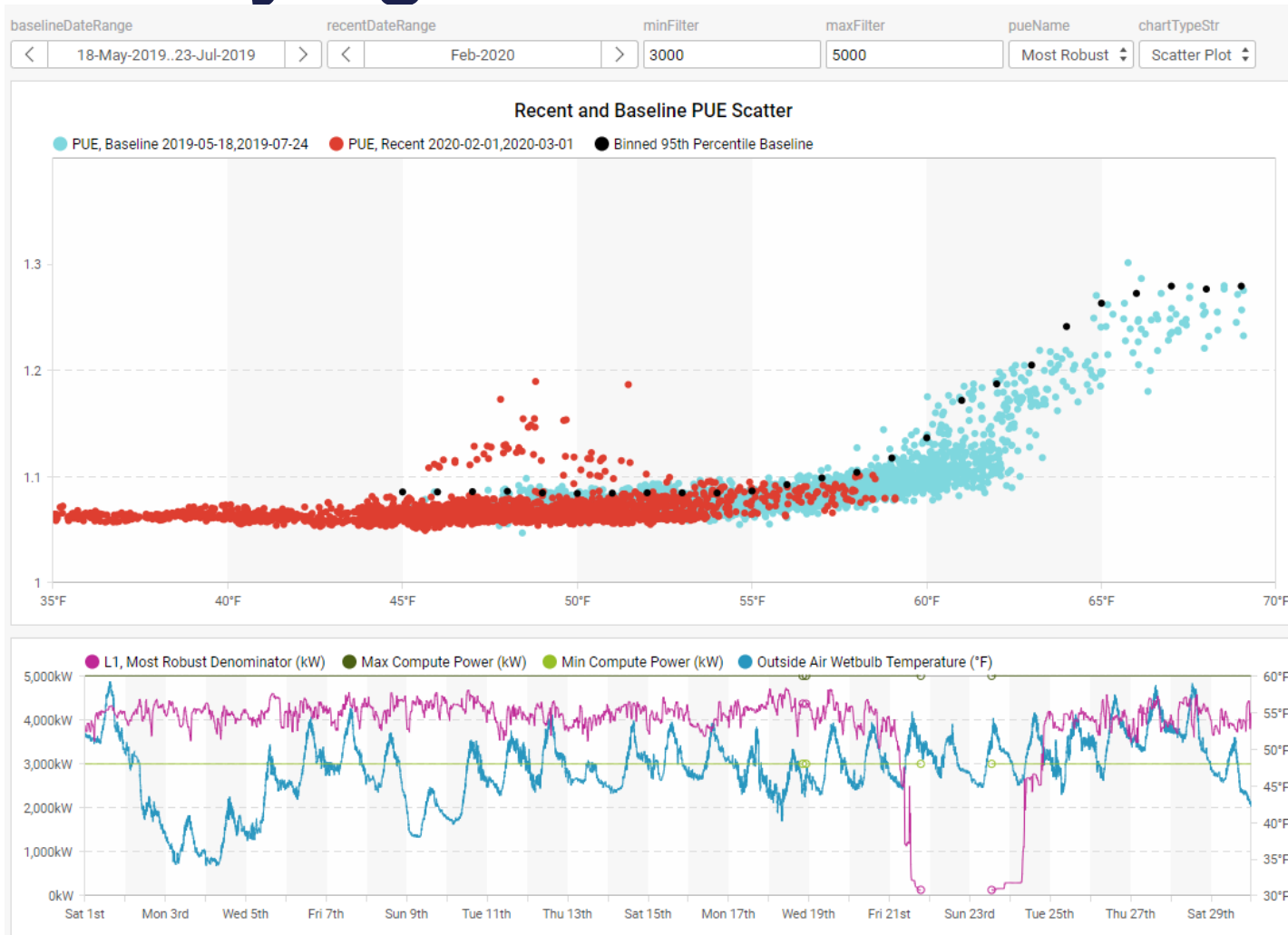


Visualizing System-Level Patterns

VAV damper commands post commissioning



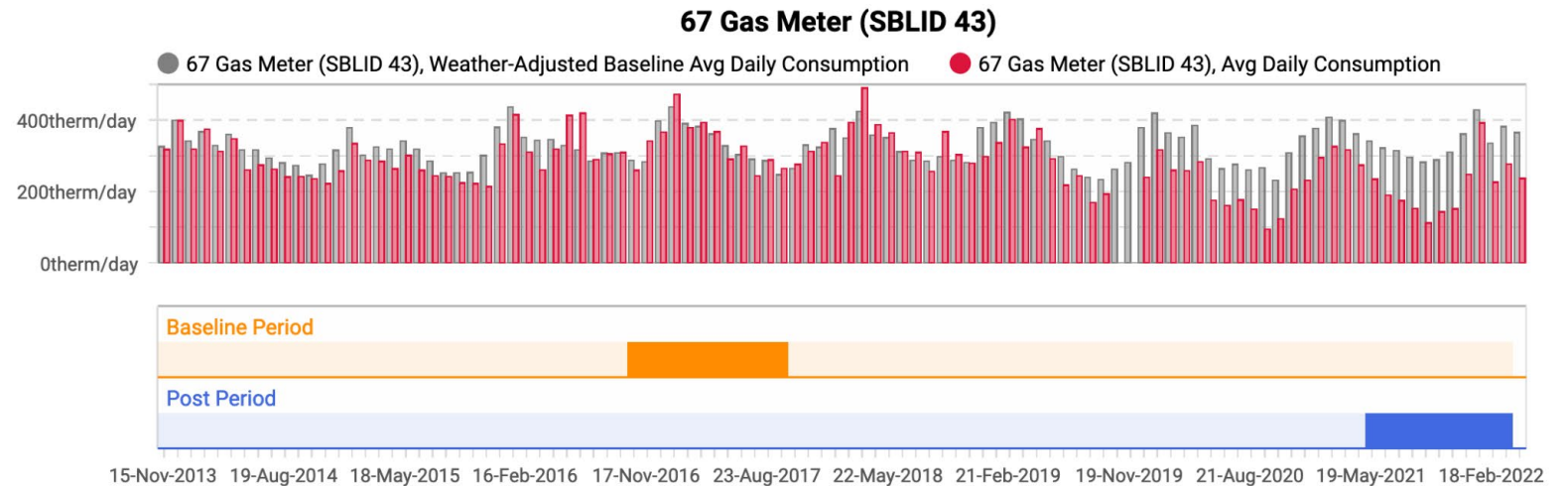
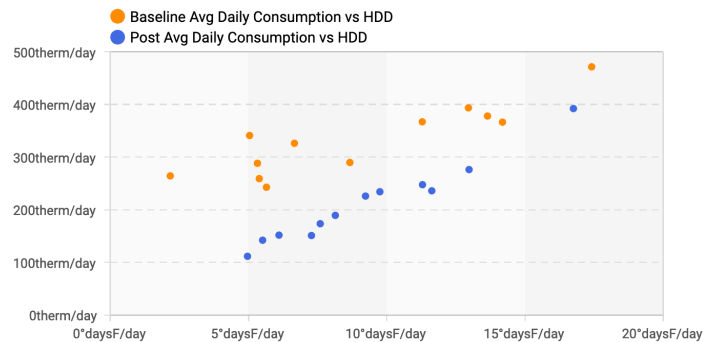
Identifying Diversion from Baseline Performance



- Tracking Power Utilization Effectiveness
- Operational charts indicating any loss of energy or water performance when consumption is outside a binned 95th percentile of baseline

Identifying Diversion from Modeled Performance

Regression models are used to calculate savings, estimate consumption when a meter is dysfunctional, and for anomaly detection.



Monthly metering data is automatically flagged for review when consumption deviates substantially from a weather-normalized baseline.

Facility	SBLID	Read date	Estimated	Measured consumption	Predicted consumption	Error	Percent error	Percent difference
006	4	24-Mar-2022		1,465,972kWh	873,848kWh	592,123kWh	67.76%	67.76%
023	9	24-Mar-2022		11,400kWh	7,927kWh	3,473kWh	43.81%	43.81%
023	9	24-Mar-2022		46.35therm	31.83therm	14.52therm	45.64%	45.64%
047	18	24-Mar-2022		742therm	533therm	210therm	39.33%	39.33%

Fault Detection with Prioritization

Site	Rule	Target	Duration	Mon 7th	Tue 8th	Wed 9th	Thu 10th	Fri 11th	Sat 12th	Energy ▼
33	> ① AHU CHW Valve Leaks By	33-AHU-1	> 11.66day							42,416kBTU
91	> ① AHU CHW Valve Leaks By	91-AHU-1	> 1.46day							22,768kBTU
06	> ① AHU CHW Valve Leaks By	06-AHU-19	> 2.46day							20,488kBTU
66	> ① AHU CHW Valve Leaks By	66-AHU-4 (East)	> 1.53day							18,212kBTU
77	> ① AHU CHW Valve Leaks By	77-AHU-8	> 1.7day							16,844kBTU
77	> ① AHU HHW Valve Leaks By	77-AHU-5	> 4.42day							7,910kBTU
77	> ① AHU CHW Valve Leaks By	77-AHU-13	> 6.06day							3,670kBTU
77	> ① AHU CHW Valve Leaks By	77-AHU-10	> 1.17hr							2,600kBTU
33	> ① AHU HHW Valve Leaks By	33-AHU-3	> 30min							2,382kBTU
77A	> ① AHU HHW Valve Leaks By	77A-AHU-04	> 12.67hr							1,474kBTU
70	> ① AHU HHW Valve Leaks By	70-AHU-25	> 2.34day							1,104kBTU
64	> ① AHU HHW Valve Leaks By	64-AHU-31	> 30min							726kBTU
06	> ① AHU HHW Valve Leaks By	06-AHU-18	> 18.5hr							658kBTU
64	> ① AHU CHW Valve Leaks By	64-AHU-28	> 2.76day							386kBTU
66	> ① AHU CHW Valve Leaks By	66-AHU-2	> 2.67hr							122kBTU
59	> ① AHU CHW Valve Leaks By	59-AHU-01	> 56.77min							84kBTU
59	> ① AHU CHW Valve Leaks By	59-AHU-19 (Upper Twin...	> 3.03hr							82kBTU
59	> ① AHU CHW Valve Leaks By	59-AHU-11 (Lower Twin...	> 33min							66kBTU
59	> ① AHU CHW Valve Leaks By	59-AHU-20 (Upper Twin...	> 6.33hr							64kBTU
59	> ① AHU CHW Valve Leaks By	59-AHU-18 (Lower Twin...	> 2.25hr							40kBTU
64	> ① AHU HHW Valve Leaks By	64-AHU-30	> 17.33hr							18kBTU

Using AI for Work Order Equipment Summaries

What recent work has been performed on Building 33 AHU003?

Based on the work orders provided, here's the recent work performed on 33 AHU003:

Summary: The unit has had recurring issues with the HHW valve leak-by, with repairs completed in June 2025 but the problem potentially returning by July 2025. Regular preventive maintenance has been performed, and various sensor calibration issues have been addressed.

Most Recent Work

July 2025 Work Order W0450841 - Currently in progress as of July 17, 2025

- **Issue:** Potential recurrence of HHW (heating hot water) valve leak-by problem
- **Status:** Work assignment marked complete by craft person, but work order still waiting for craft supervisor
- **Problem:** Supply air temperature measuring 7°F higher than mixed air temperature with both HHW and CHW valves closed
- **Recommendations:** Field verification of HHW valve leakage and SAT sensor accuracy check

June 2025 Work Work Order W0445006 - Completed June 25, 2025

- **Issue:** Leaky HHW valve causing 6°F temperature differential
- **Resolution:**
 - Actuator adjustments made to ensure complete valve closure
 - Sensor calibration performed (SAT offset +2.9°, MAT offset -0.4°)
 - Problem appeared resolved at completion

April 2025 Work Work Order W0434178/W0434179 - Semi-annual preventive maintenance completed July 2025

- **Work performed:** Pre-filter changes, drain pan cleaning, condensate trap clearing, compartment vacuuming, linkage tightening

Questions?



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1. Log in to <https://edu.wbdg.org/> using your WBDG credentials
 - The assessment and evaluation will be made available to attendees at 8:00am ET on Monday, August 11th
 - The assessment and evaluation will close on September 22nd
2. In the list of trainings you attended, click on the Visit link by the course you wish to complete
 - If the course you're looking for is not listed, click on My Account in the top right menu
 - If you still can't find your course, contact the WBDG support team to check your eligibility
3. Complete the assessment with a score of 80% or above
4. Upon passing the assessment, click the Post-Evaluation Survey button
5. Complete and submit the evaluation
6. Click Download Your Certificate to generate your certificate of completion, which can be downloaded for your records

Questions or issues? Contact WBDG Support at wbdg@nibs.org.



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