Business Insight Report

Client: EcoSmart Solutions (for a large REIT)

Project: Smart Energy Dilemma – Race for Energy Efficiency

Executive Summary

- Hog and Fox sites have the highest total energy consumption across the REIT.
- Education buildings contribute the most to overall energy usage, far ahead of other building types.
- Wide variation in energy use across sites and building types, with significant outliers.
- Immediate focus should be on high-consuming sites and education-use buildings to meet the 20% reduction target.

Objective

Identify areas of major energy inefficiency across the company's 1600+ buildings to reduce total energy consumption by 20% in two years.

Data Overview

- Daily and hourly energy meter readings across North America and Europe (2016–2017).
- Building metadata includes site, primary usage type (e.g., education, office, public), and energy readings.
- Missing values and inconsistencies were cleaned during preprocessing.
- Rolling averages (24-hour) and group summaries were generated for better trend visualization.

Key Findings

Site-Level Insights

- Hog is the site with the highest total energy usage (~450M+), followed by Fox and Rat.
- Moose site has very few buildings but the highest average energy use per building (an outlier).
- Rat has the largest number of buildings but relatively lower average energy use per building.

Usage-Type Insights

- Education buildings dominate energy usage, accounting for the largest share by a wide margin.
- Office buildings are also high consumers but spread across many buildings.

Energy Efficiency Observations

- Some buildings show consistent high usage throughout the years without obvious seasonal reductions.
- Significant outliers detected (seen in boxplots) — some buildings consume 5–10x the typical median energy for their site/usage type.
- Certain sites (e.g., Eagle, Bear) have more stable and lower variance in energy use compared to others.

Business Implications

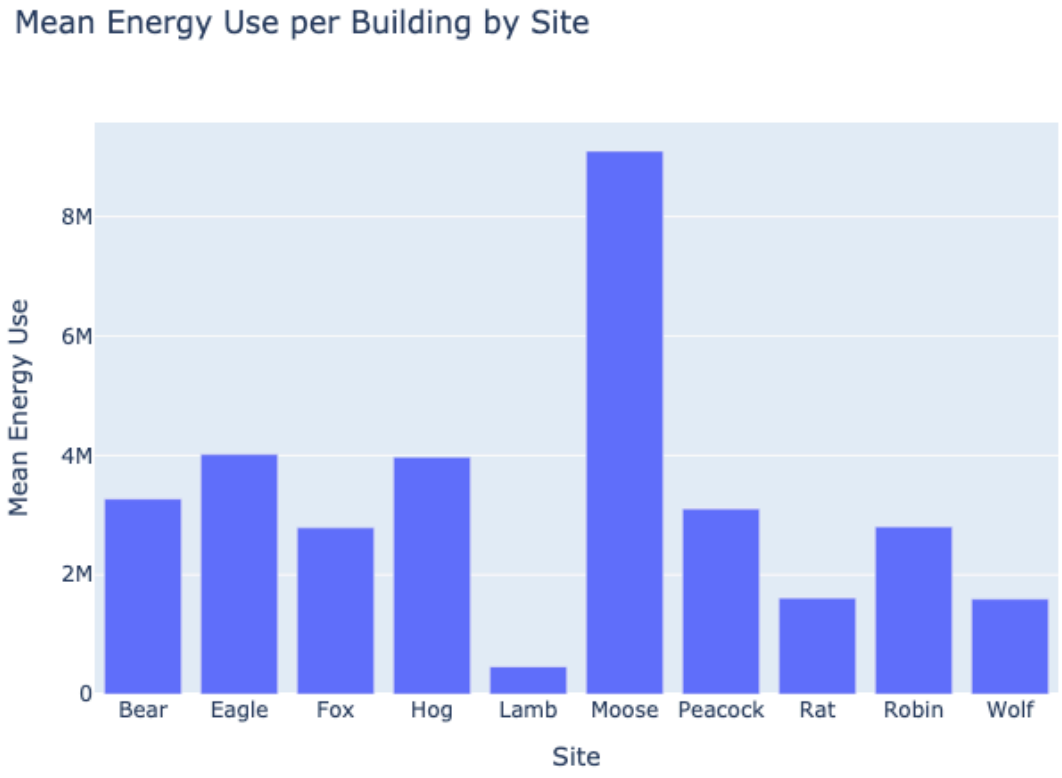
- High Energy Usage Concentration: A small number of sites (Hog, Fox, Rat) and building types (education, office) account for a majority of energy consumption.
- Opportunity: Focusing energy-saving measures on just the top-consuming buildings can deliver disproportionate impact toward the 20% reduction goal.
- Risk: Outliers may skew averages; some sites/buildings may need individualized strategies (not one-size-fits-all).

Recommendations

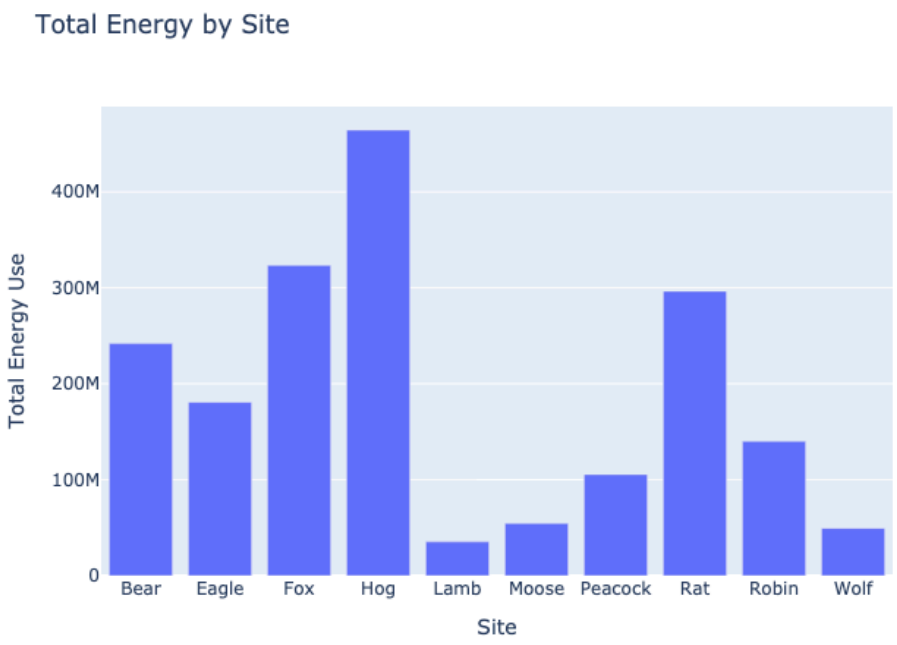
- Prioritize top sites: Audit and optimize energy usage at Hog, Fox, and Rat sites first.
- Target education buildings: Focus on energy retrofits and operational changes in education facilities.
- Investigate outliers: Buildings far above median usage (seen in boxplots) should be immediately flagged for deep dive analysis.
- Implement real-time monitoring: Introduce IoT-based smart meters on top sites to identify ongoing waste dynamically.
- Seasonal tuning: Adjust building heating/cooling systems proactively based on seasonal usage patterns observed.

Graphs

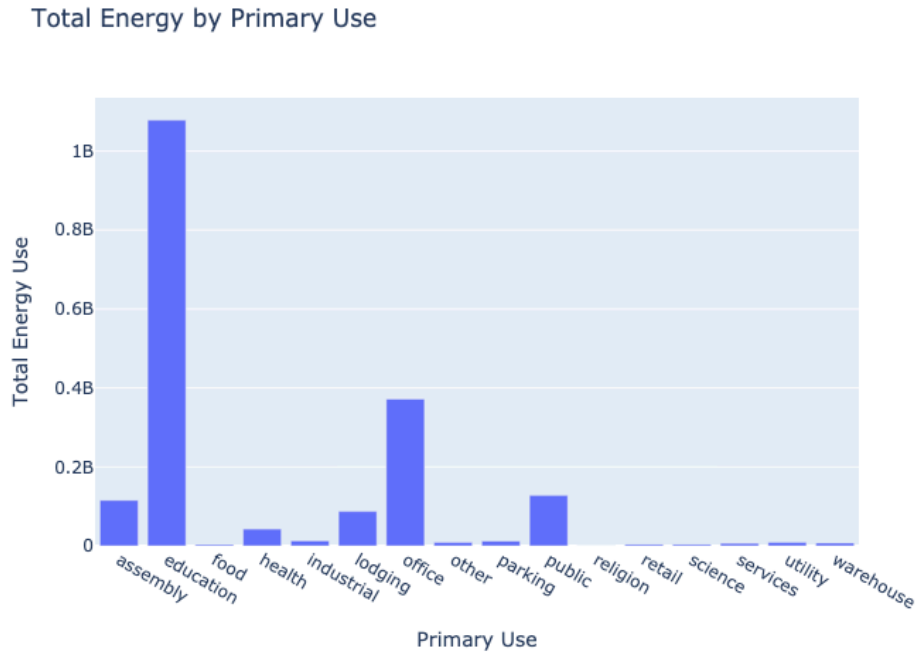
Mean Energy Use Over Time for Major Buildings



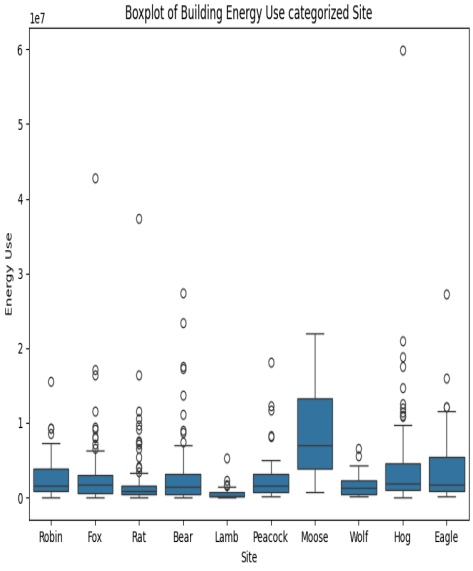
Total Energy by Site

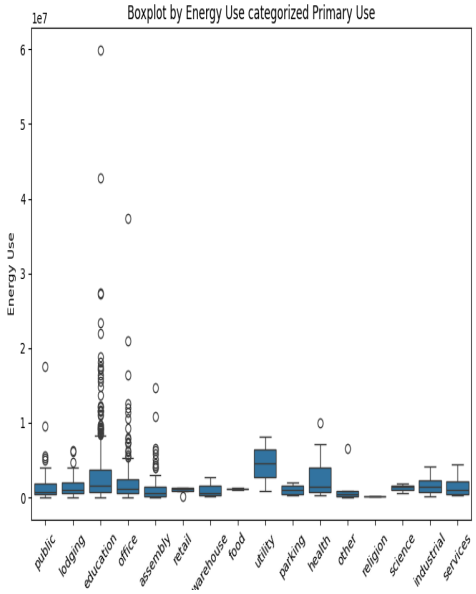


Total Energy by Primary Use

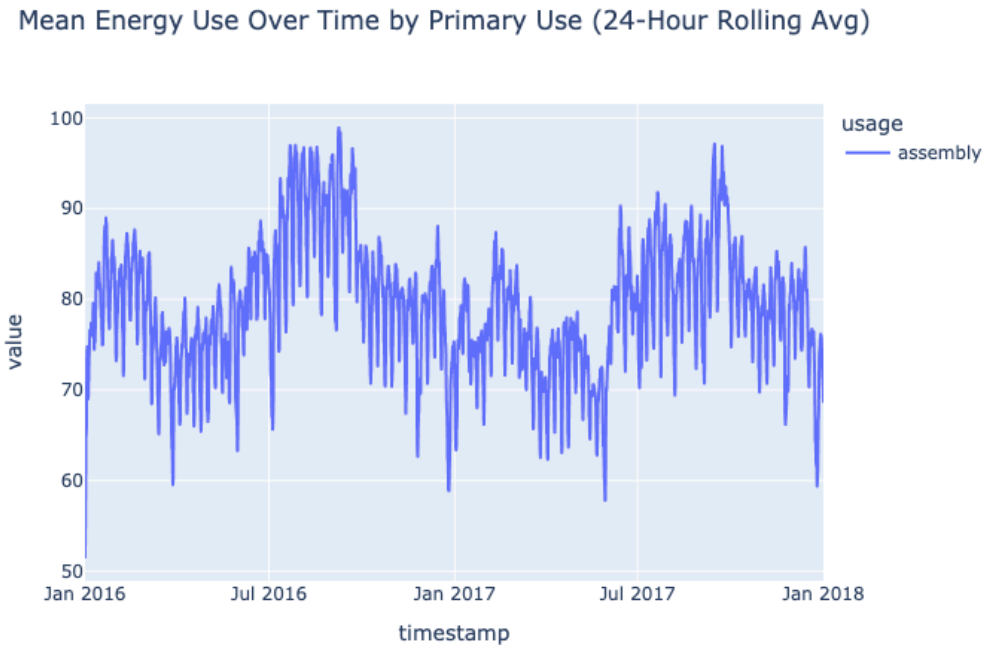


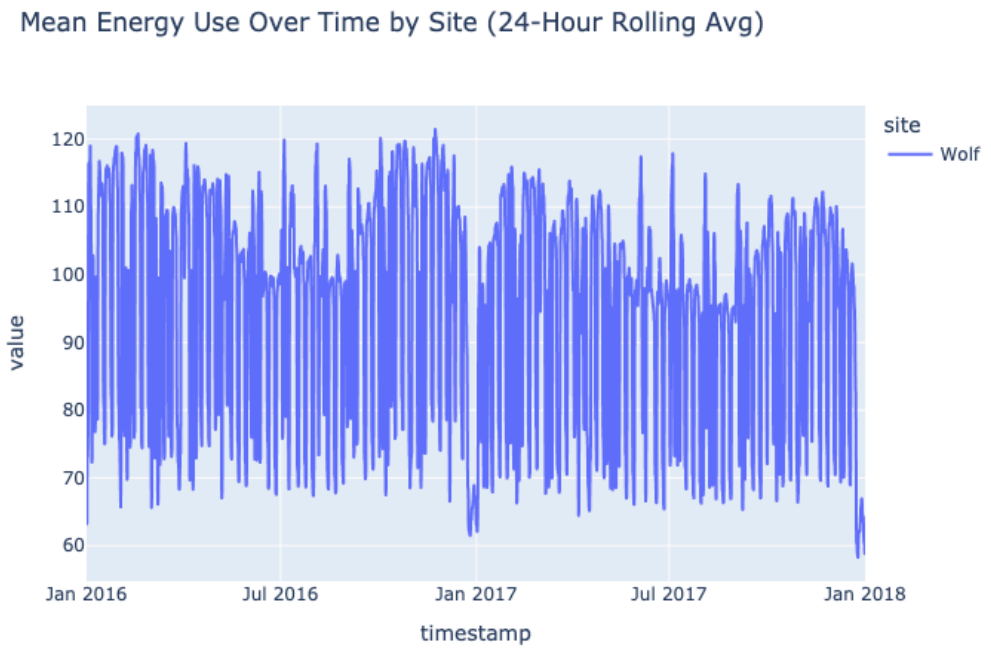
Boxplots showing Energy Use Variations

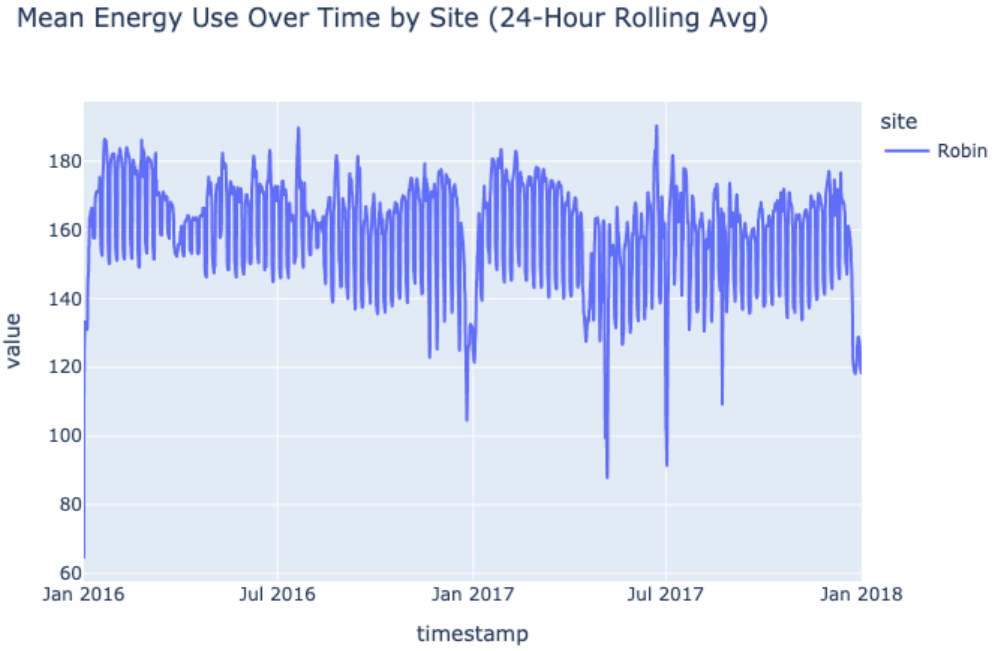


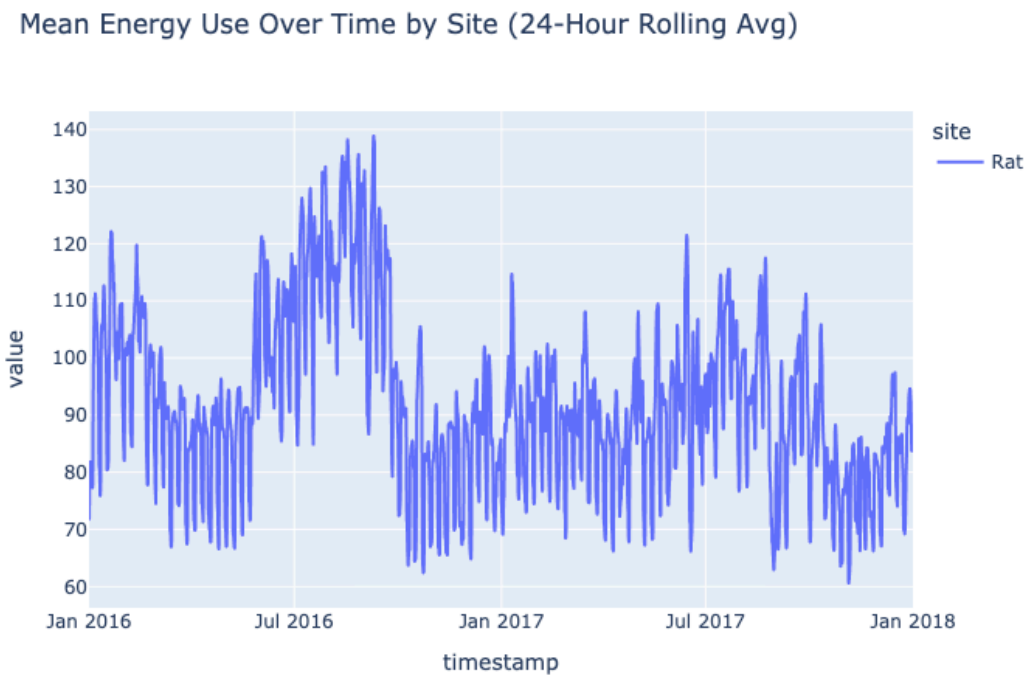


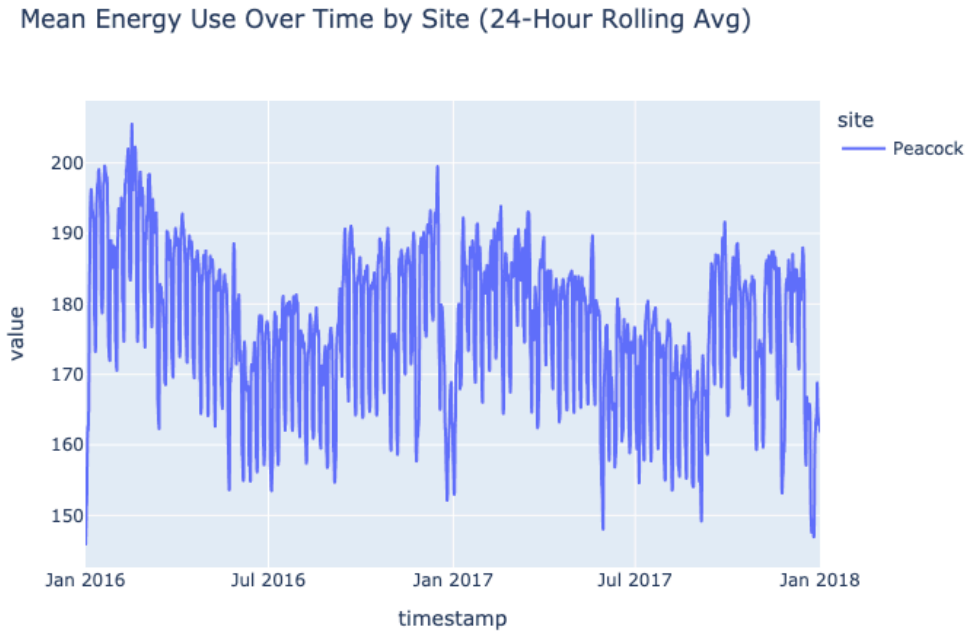
Mean Energy Use Per Building Analysis

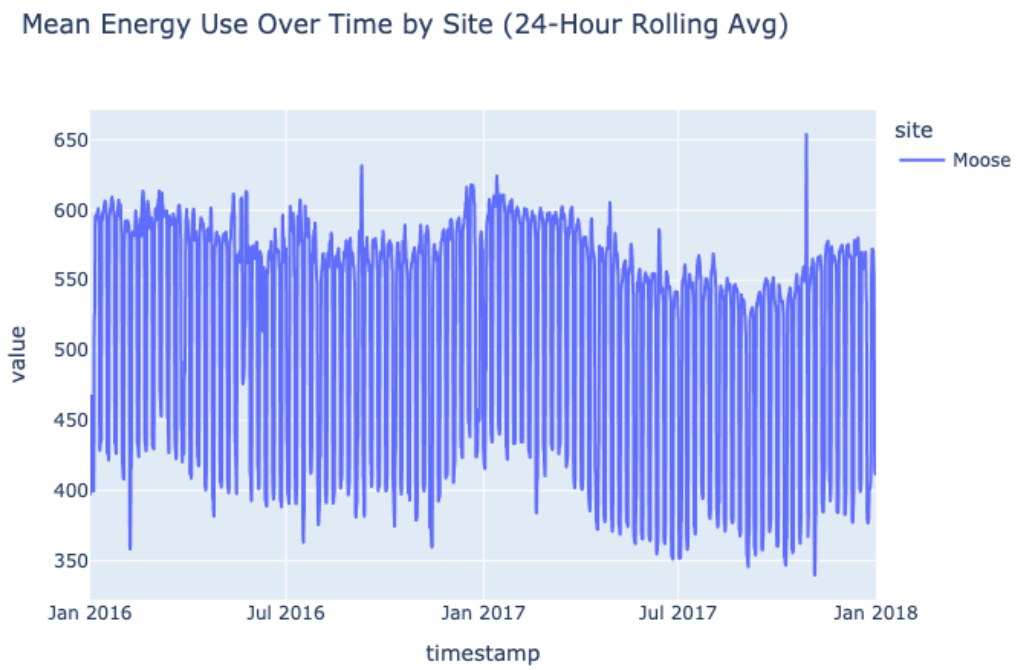


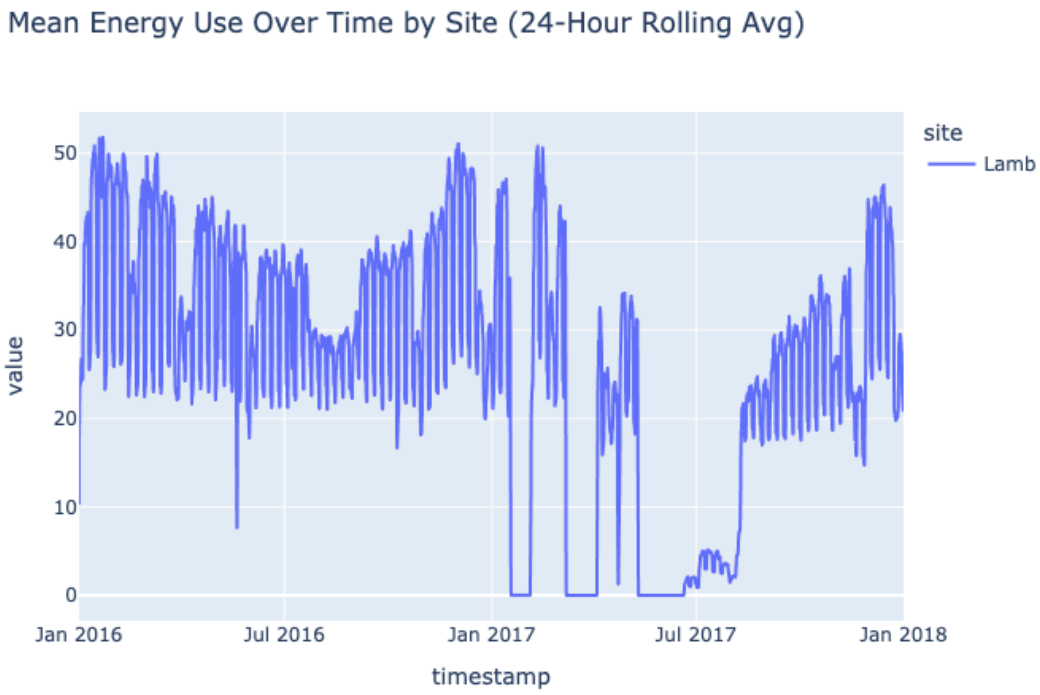

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Wolf
value
120
110
100
90
80
70
60
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp

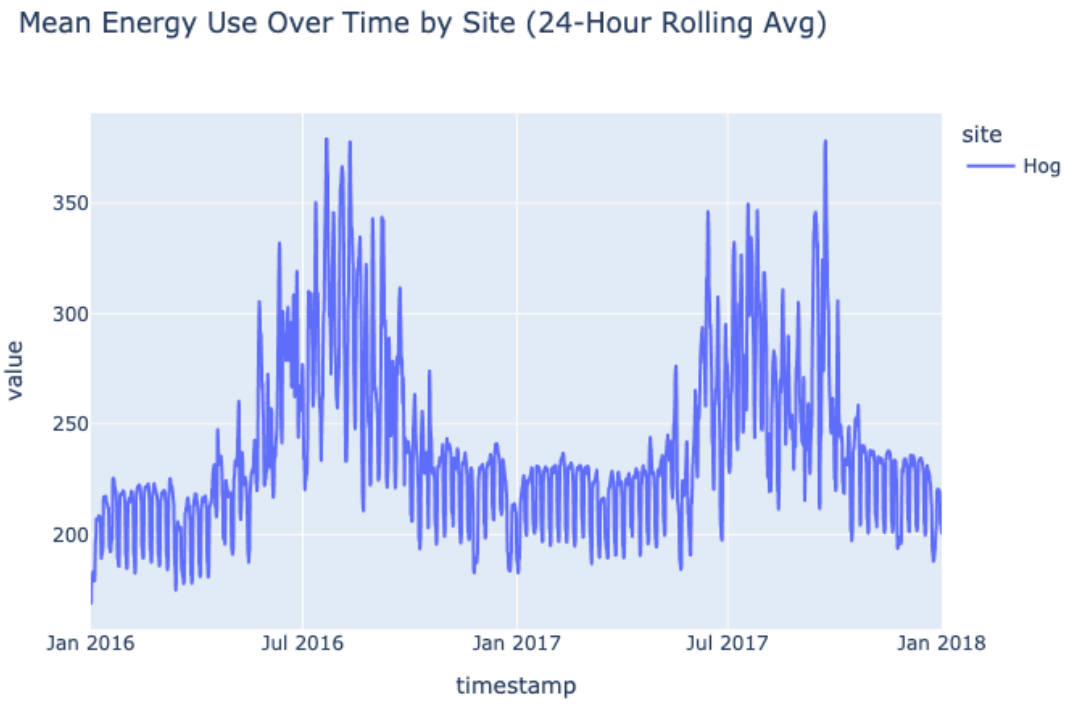

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Robin
value
180
160
140
120
100
80
60
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp

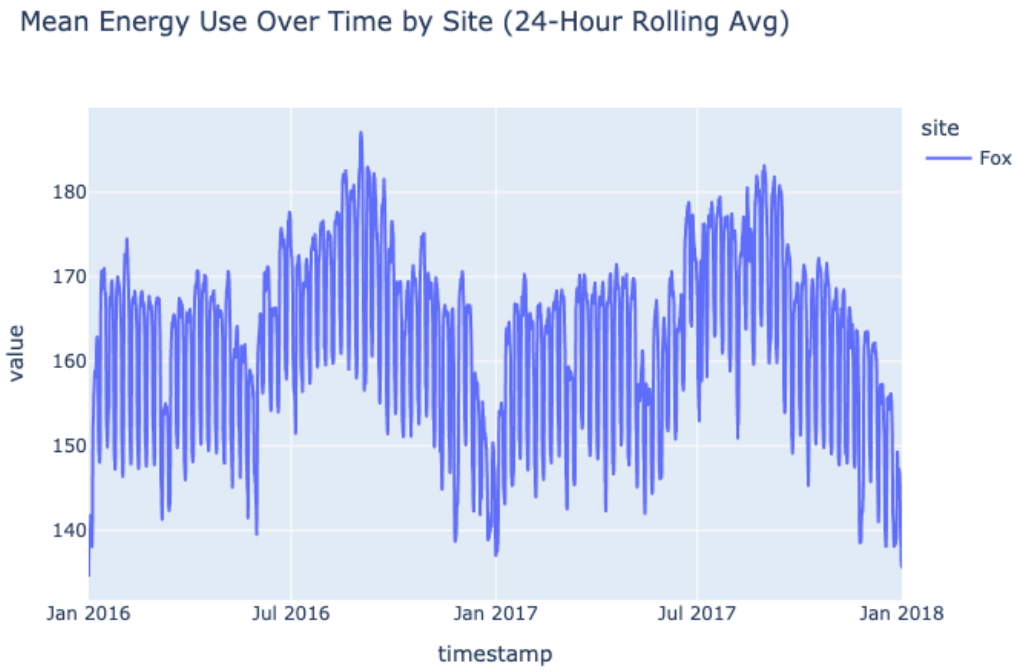

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Rat
value
timestamp
140
130
120
110
100
90
80
70
60
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018

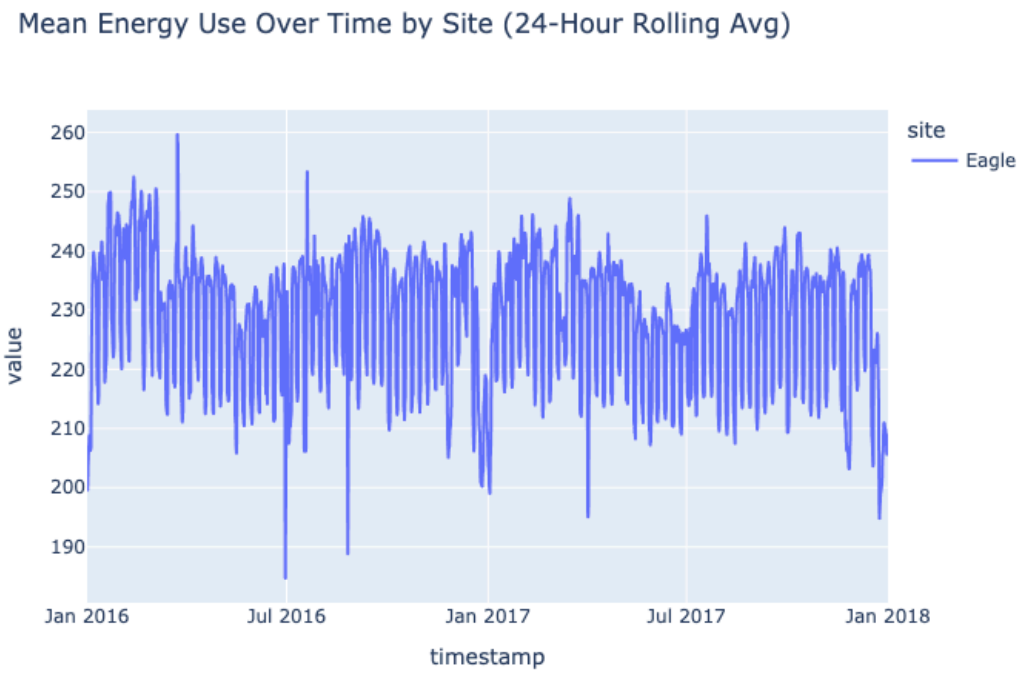

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Peacock
value
timestamp
200
190
180
170
160
150
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018

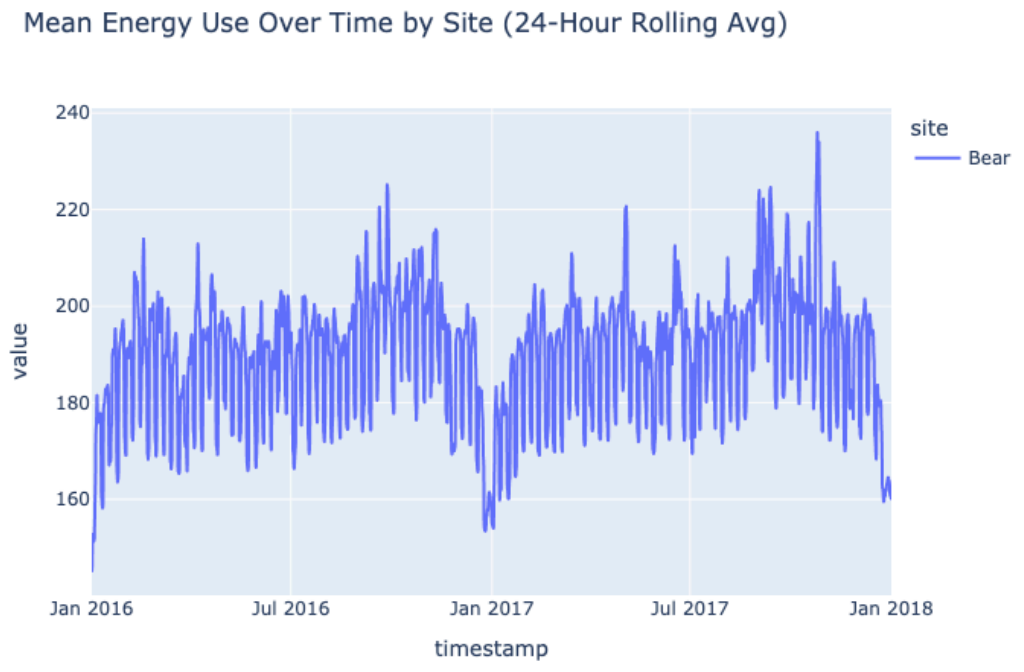

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Moose
650
600
550
500
450
400
350
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp


Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Lamb
50
40
30
20
10
0
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp

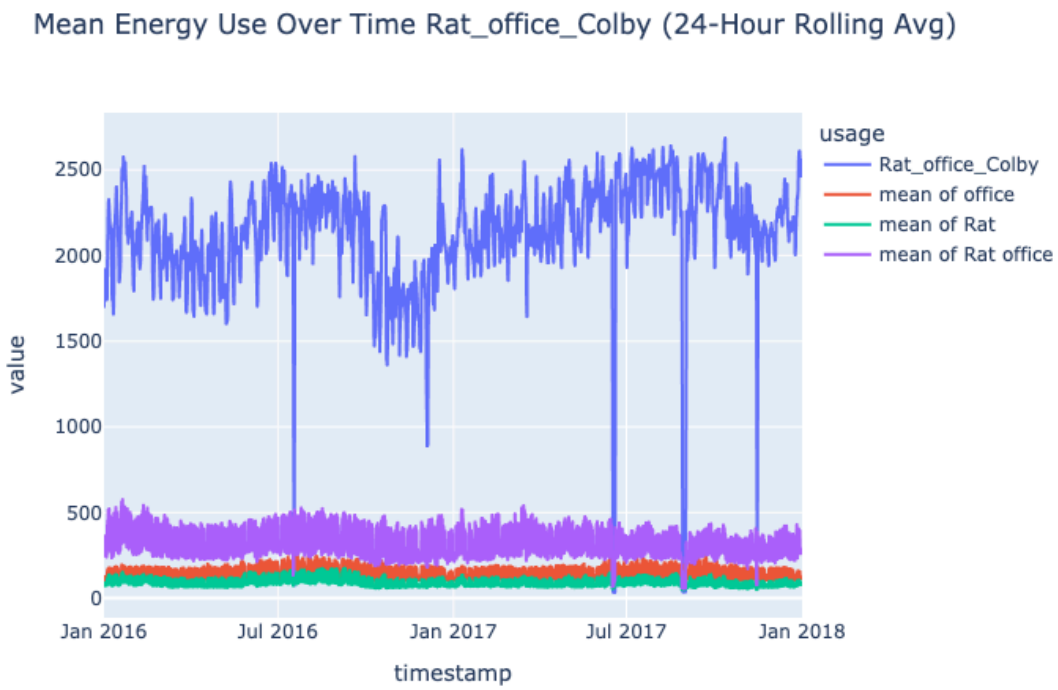

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Hog
350
300
250
200
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp


Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Fox
180
170
160
150
140
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp

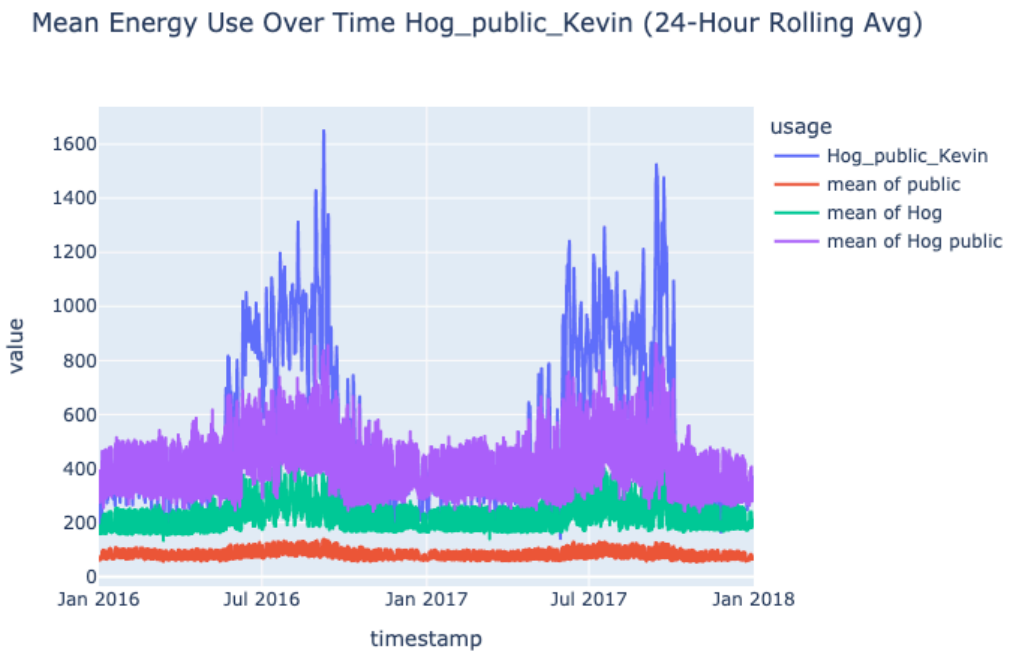

Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Eagle
260
250
240
230
220
210
200
190
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp


Mean Energy Use Over Time by Site (24-Hour Rolling Avg)
site
Bear
240
220
200
180
160
value
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
timestamp

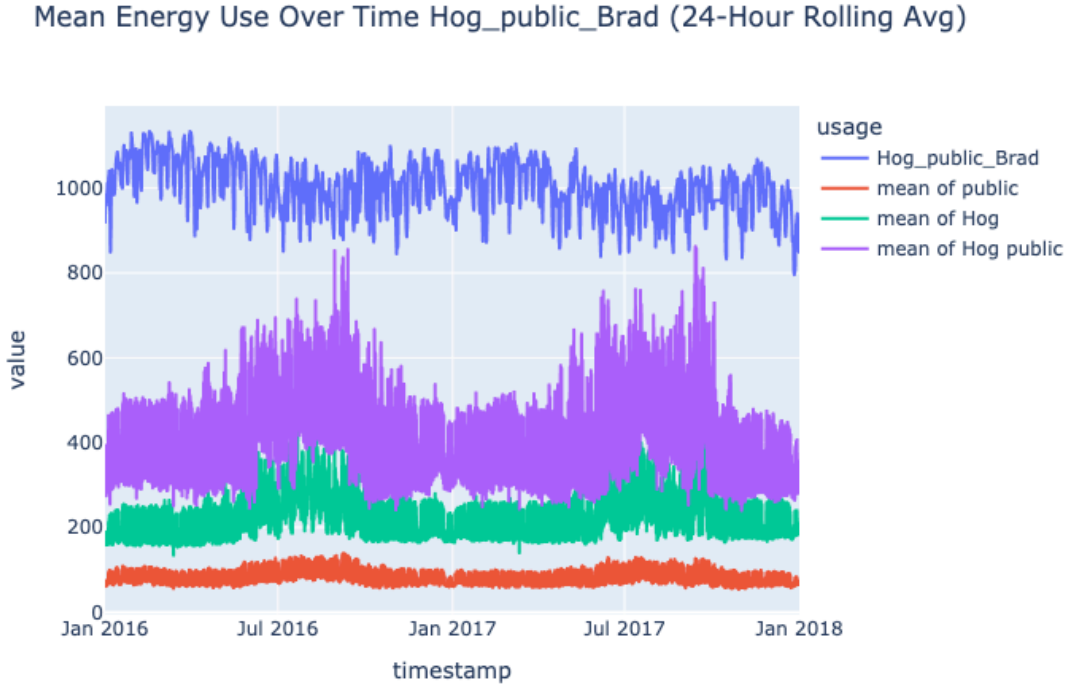
Mean Energy Use – Rat Office



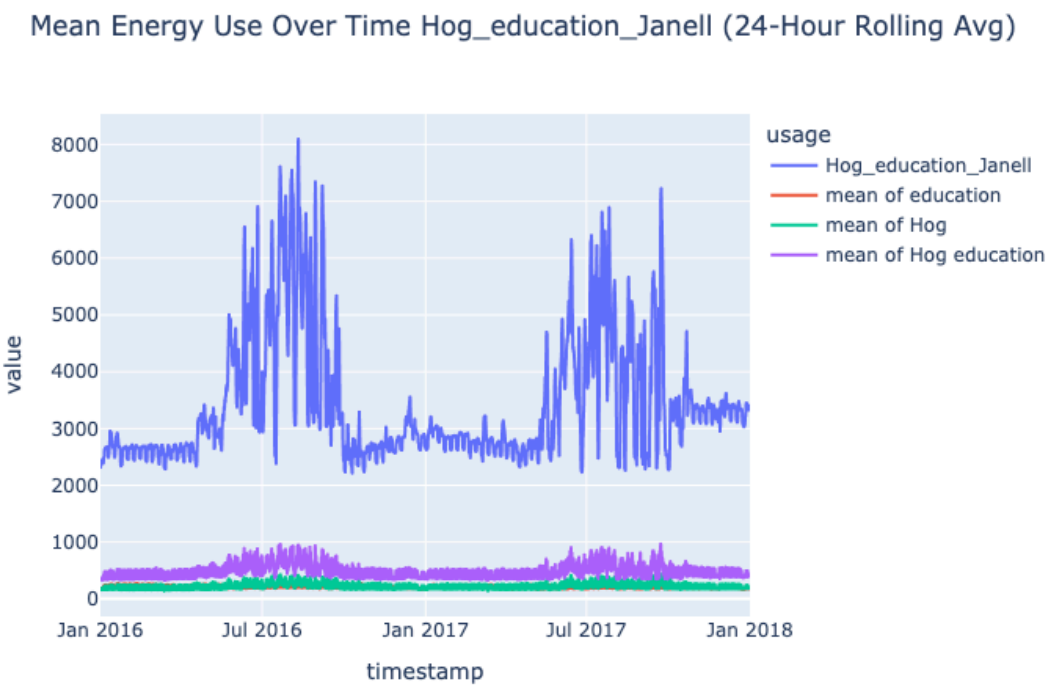
Mean Energy Use – Hog_Public_Kevin



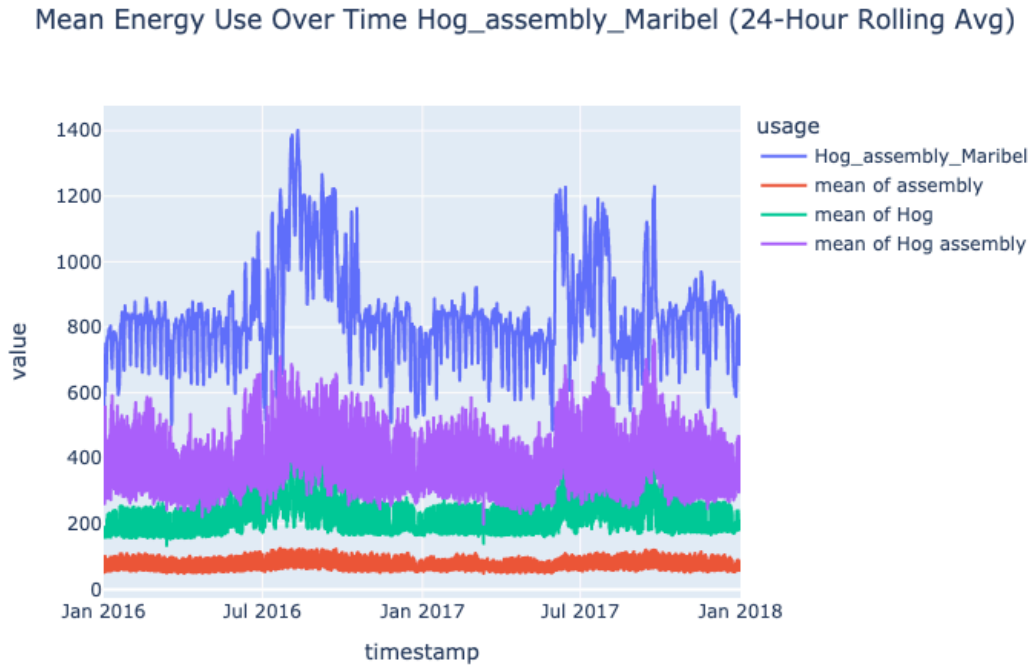
Mean Energy Use – Hog_Public_Brad



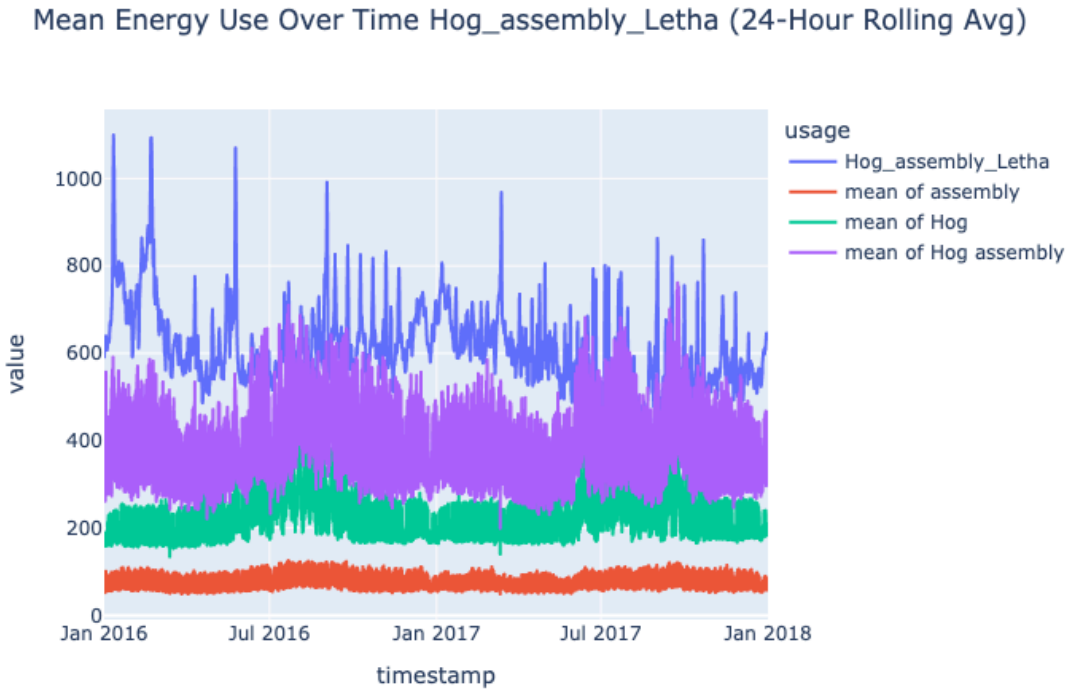
Mean Energy Use – Hog_education_Janell



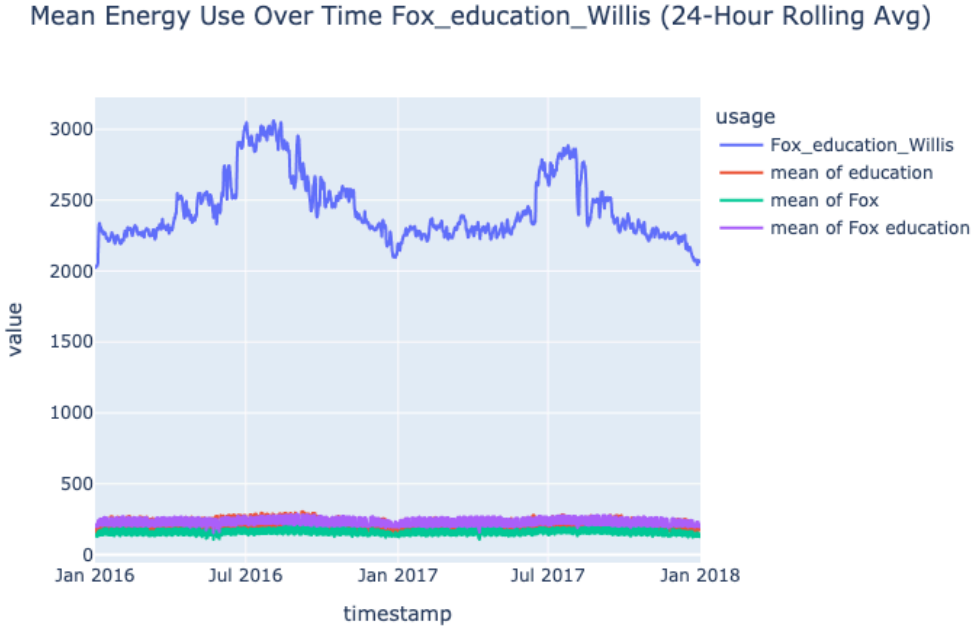
Mean Energy Use – Hog_assembly_Maribel



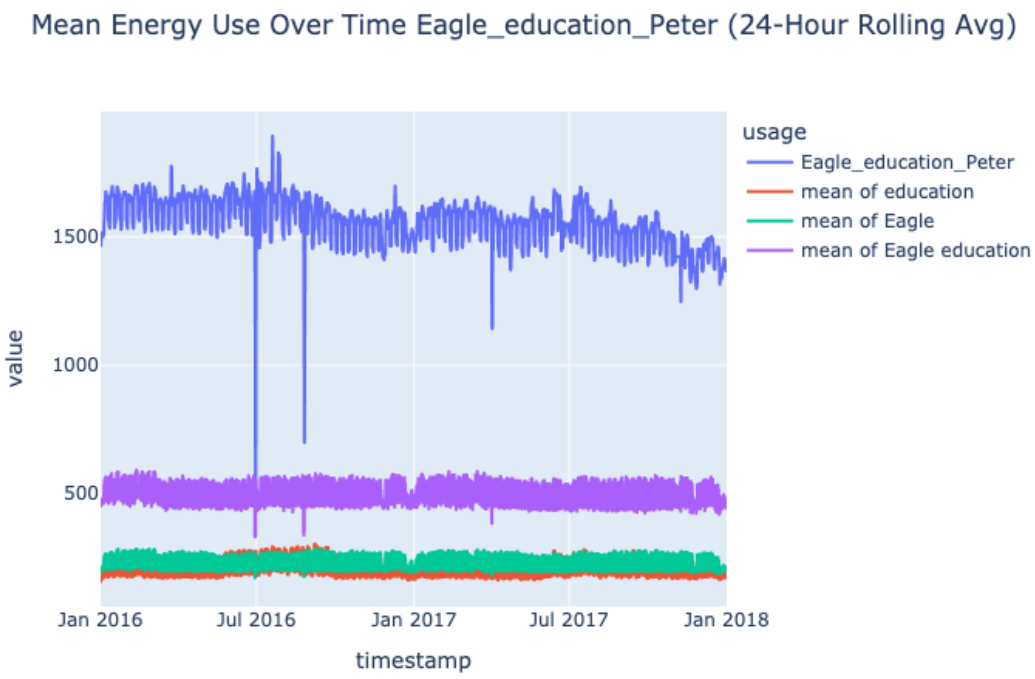
Mean Energy Use – Hog_assembly_Letha



Mean Energy Use – Fox_Education_Wills



Mean Energy Use – Eagle_Education_Peter



Mean Energy Use – Bear_Education_Wilton