Duke Building Energy Use Report

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Introduction:

To help Duke reduce its energy footprint and achieve carbon neutrality by 2024, the team processed and analyzed troves of utility consumption data and then created practical monthly energy use reports for each school at Duke. Campus buildings use chilled water, electricity, steam/ hot water as energy resources, and the reports created show historical usage trends and provide energy benchmarks for comparison and practical recommendations for energy savings.

Objectives:

- Make a cleaned up database
- Create a Benchmark
- Create Energy Reports
- Transparency to the building managers
- Prepping for Bass Connection

Data:

2008 – 2019 Campus Building Energy use and cost history

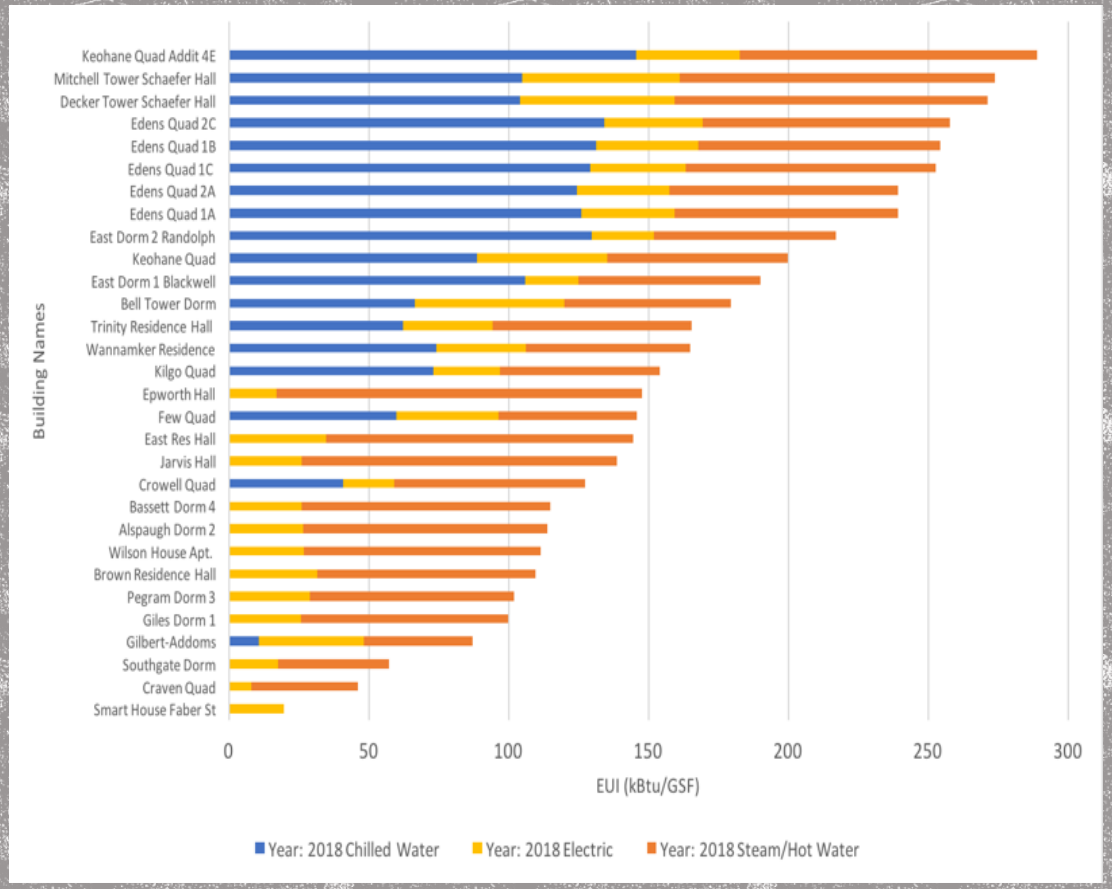
Building Square Footage By Room Use

Wi-Fi Connection

ArcGIS map for energy Use

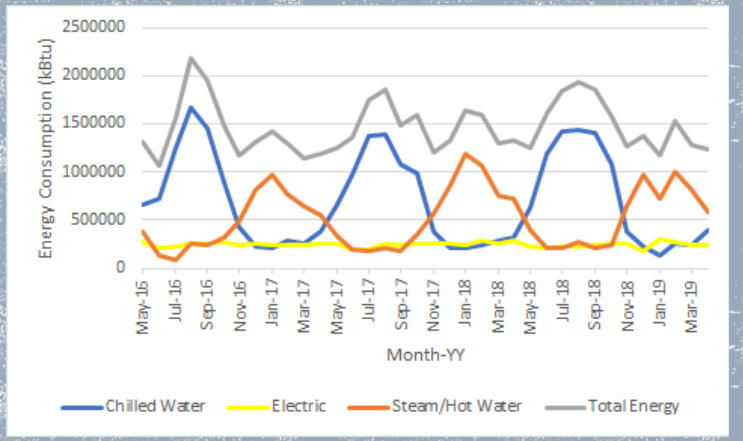
2018 Housing EUI Comparison

After merging and cleaning the data, the team converted all utility data to a common unit of British Thermal Units and divided by gross square footage (GSF) to calculate the Energy Unit Intensity (EUI) for each building. The following bar graph compares the EUI of the dorms on campus:



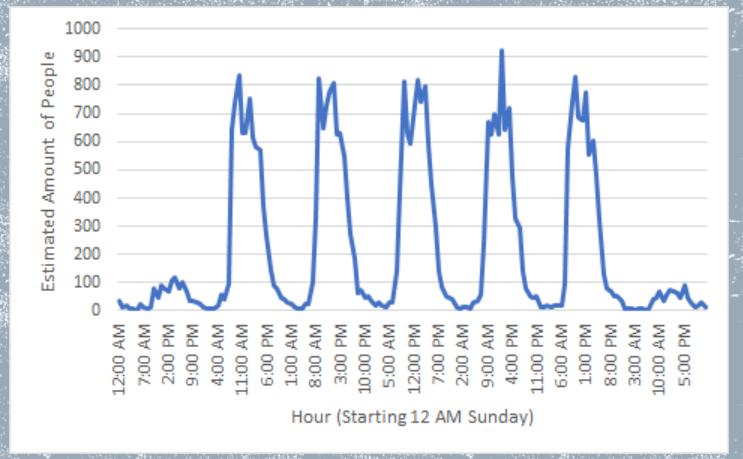
Kilgo 36-Month Energy Consumption

It is important for facility managers around campus to understand past energy consumption trends. The following line graph shows the Kilgo Quad consumption for the last 36 months broken down by utility:

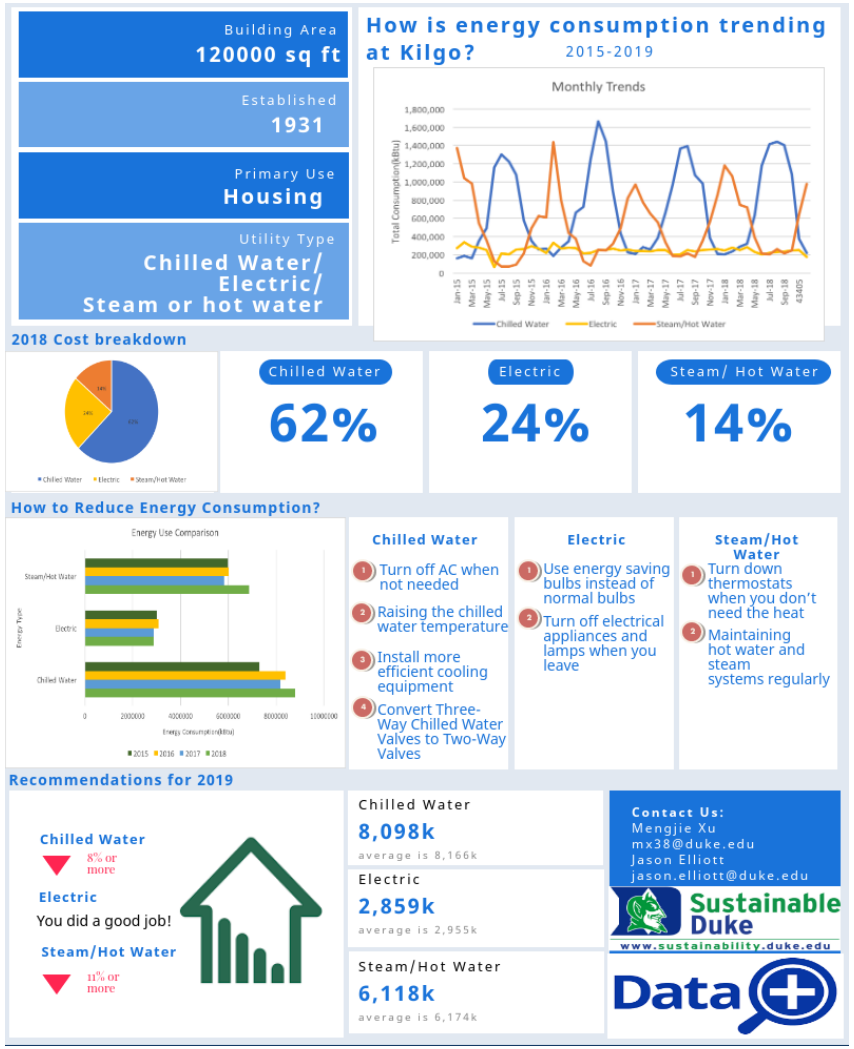


Gross Hall Estimated Occupancy

Besides utility data, the team also explored square footage data which specifies the exact breakdown of the multiple buildings on campus as well as Wi-Fi connections data in order to estimate building occupancy.



Final Report (Kilgo Quad as Example)



Conclusion

After several discussions between the team and faculty advisers, we came to the conclusion that it would be better to create reports for clusters of buildings (e.g. Sanford Buildings, Divinity Buildings, Pratt Buildings, Nicholas Buildings, Dorms, etc.). These reports visualize the data for the cluster in a simple way while avoiding complicated terminology. These reports will create better transparency not only for the experts, but also for the general public that occupy the building daily.

Future Plans

- Work will be picked up by Bass Connections
- Explore other data (e.g. weather data)
- Create a model (Using building occupancy, weather data, etc.)
- Create reports for all buildings