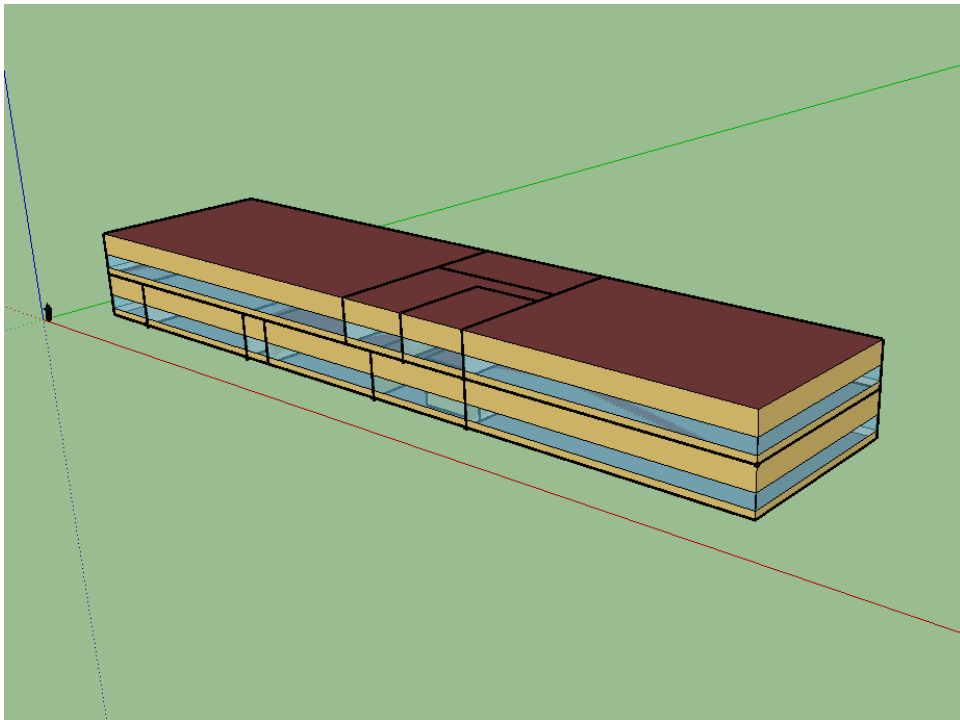


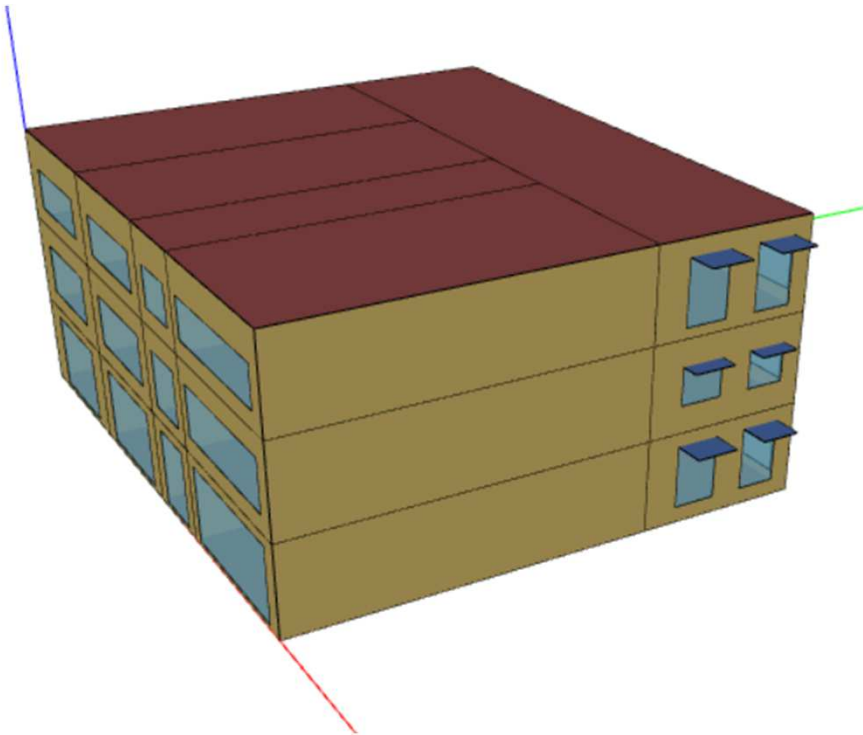
# ARC 523 – Group Presentation

Sophiat Alaran, Seungmin Lee



Categories	Details
Building type	Office
Number of floors	2
Building size	275 ft × 65 ft
Building height	30.4 ft
Window-to-Wall-Ratio(WWR)	33% <sup>1)</sup>
Location/ Weather	Columbia, South Carolina, USA Warm and humid

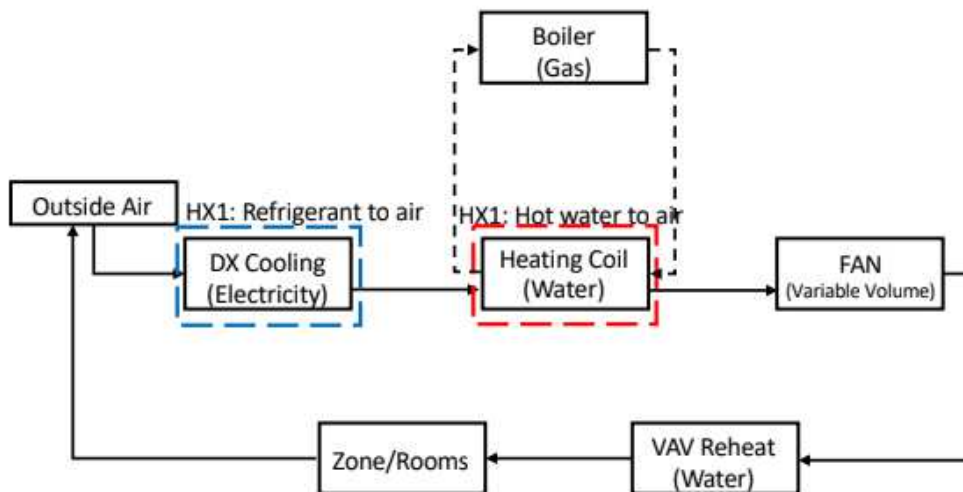
1) 2003 CBECS Data and PNNL's CBECS Study 2007



Categories	Details
Building Type	Office
Number of Floors	3
Building Size	111ft x 104ft
Building Height	32.5ft
Window to wall Ratio	40%
Weather	Raleigh, North Carolina, USA. Warm and Humid

## System-3

### Packaged DX Rooftop VAV with Reheat



- This system uses electricity for cooling and gas for heating.

#### Advantages

- Boilers that use gas generally have a higher thermal efficiency than heating systems that use electricity.

#### Disadvantages

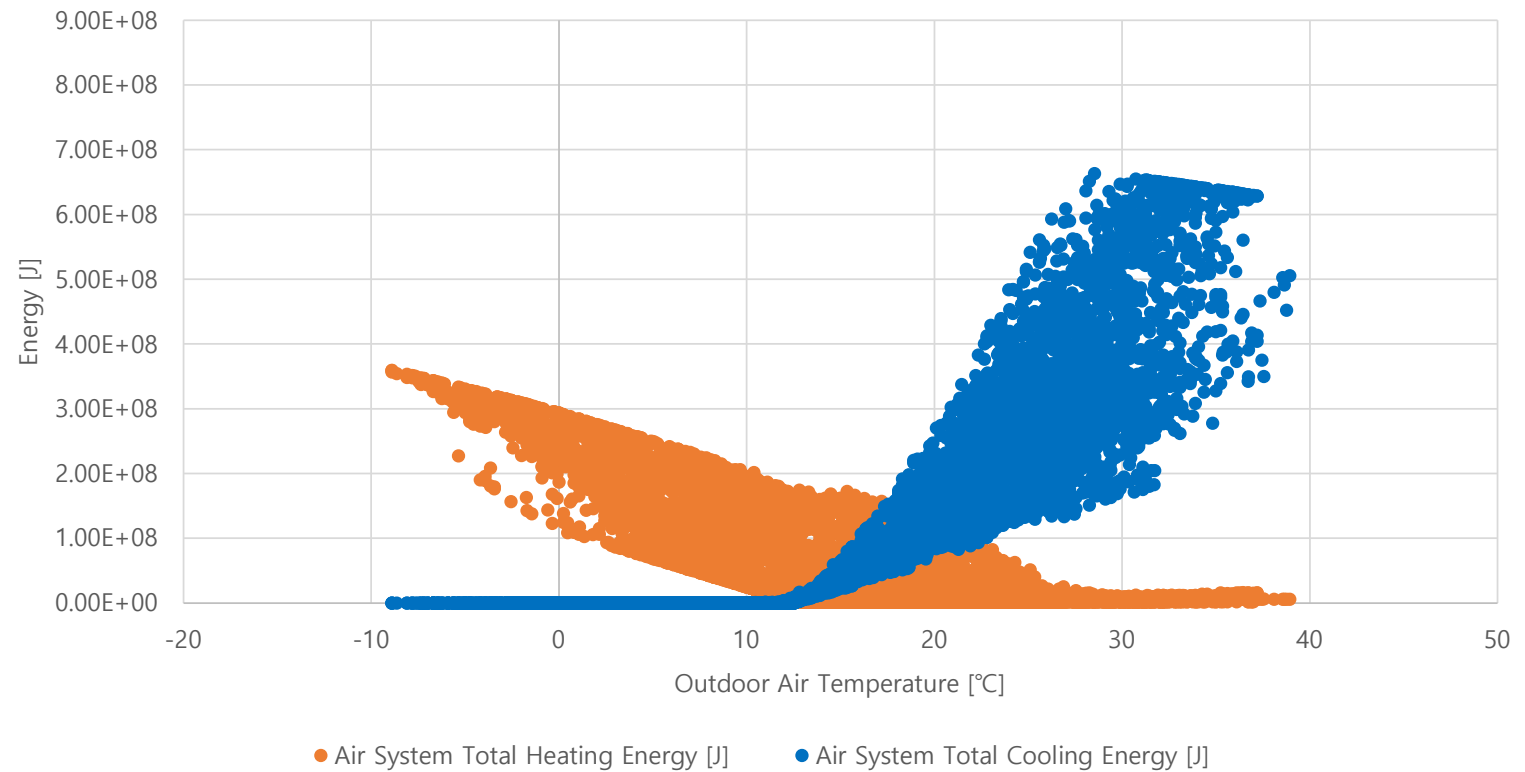
- Using electricity for cooling and gas for heating means depending on two different energy sources, which can increase the complexity in management and supply.

# A graph for HVAC System 3 - Seungmin

ARC 523

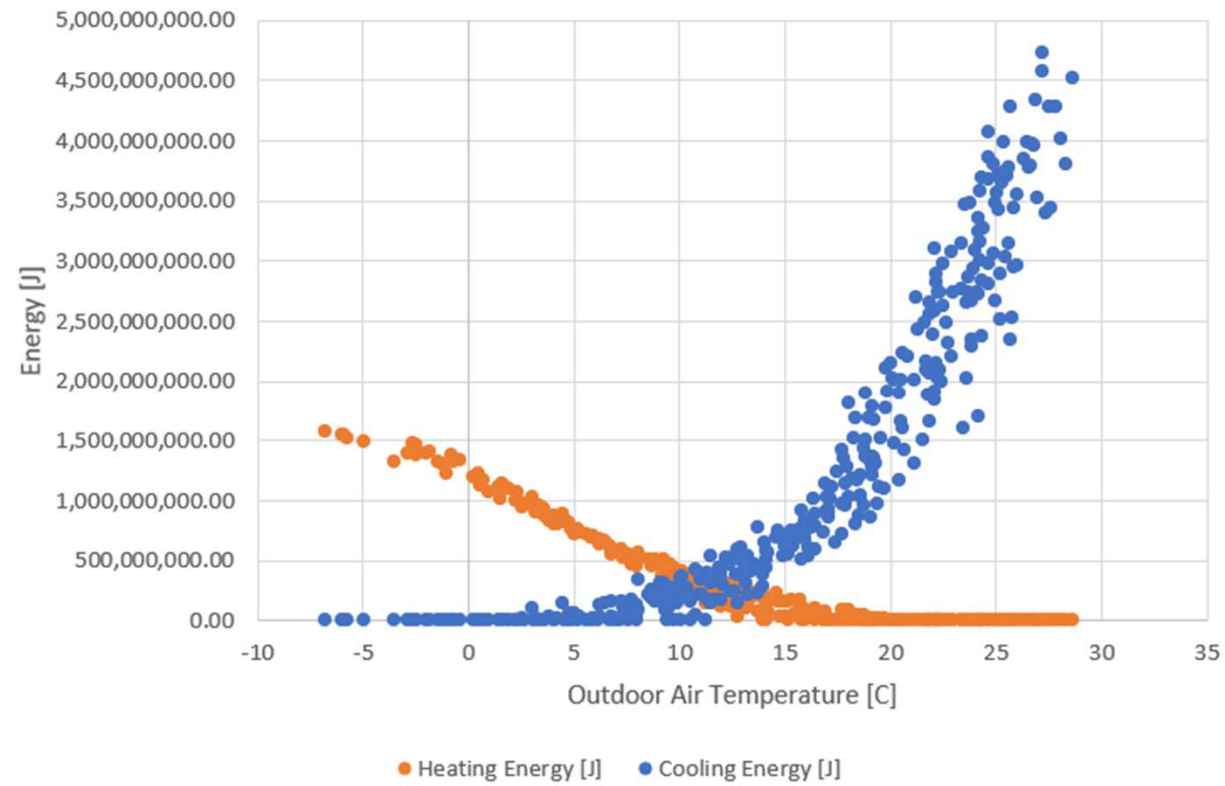
## Output Variables for System 3

- Air System Total Heating Energy
- Air System Total Cooling Energy

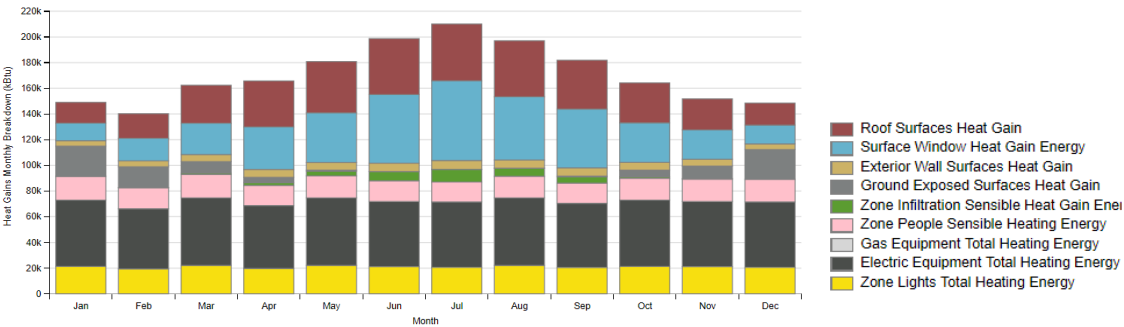


## A graph for HVAC System 3 - Sophiat

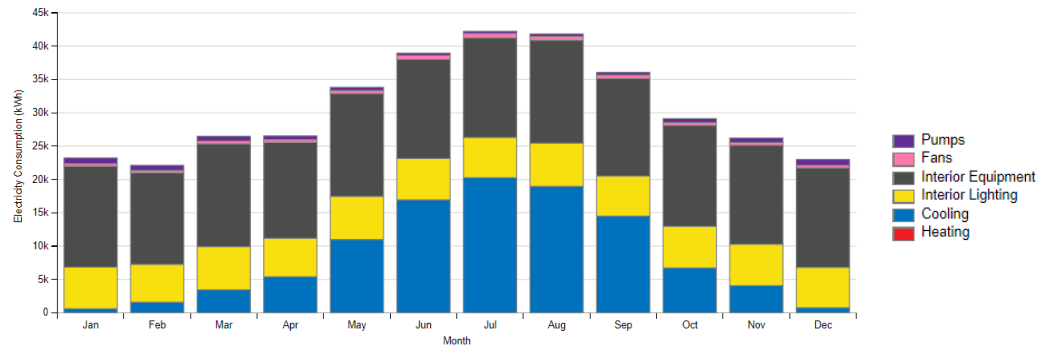
ARC 523



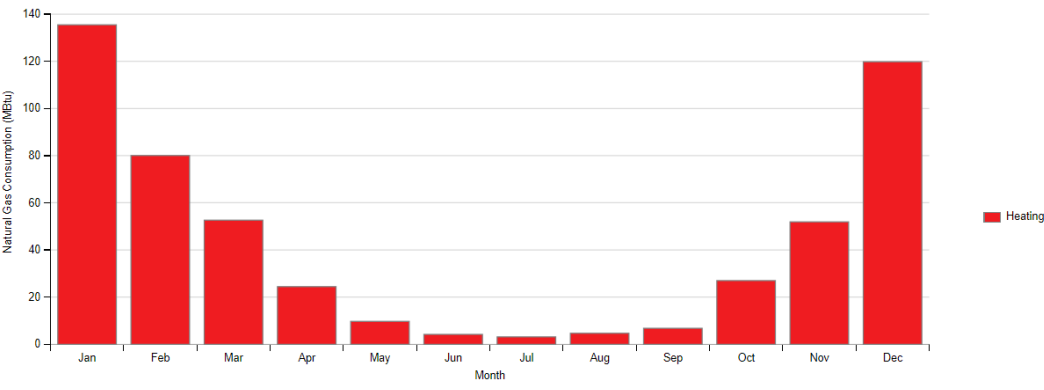
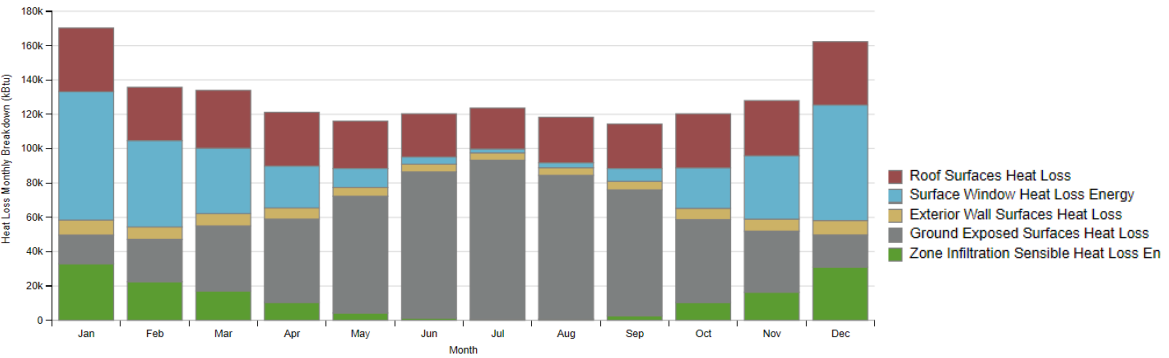
Heat Gains



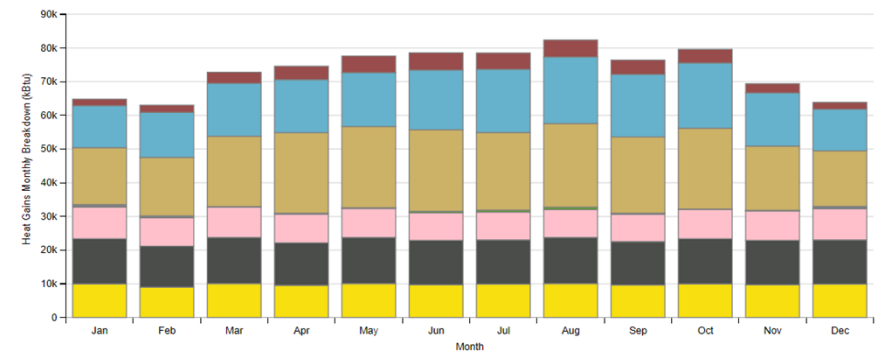
Energy consumption



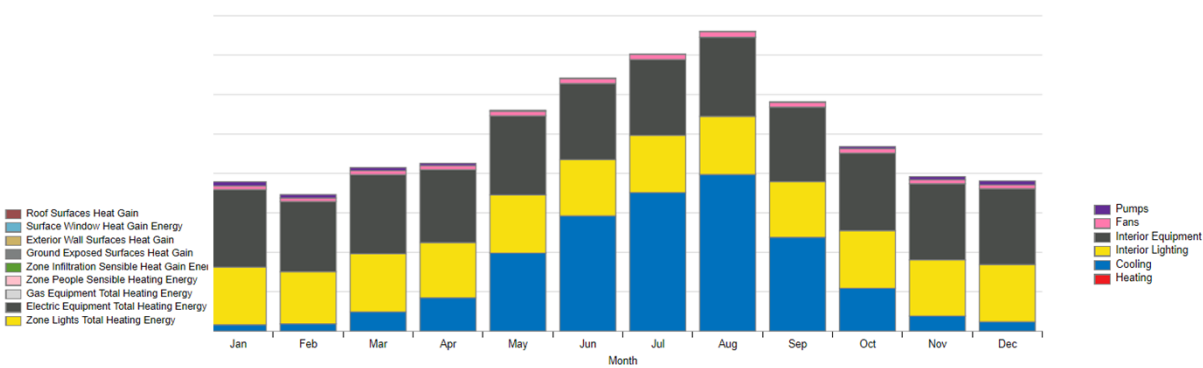
Heat Loss



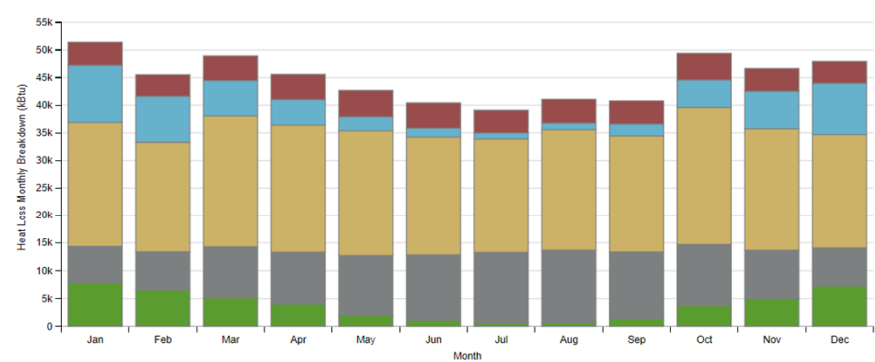
Heat Gain



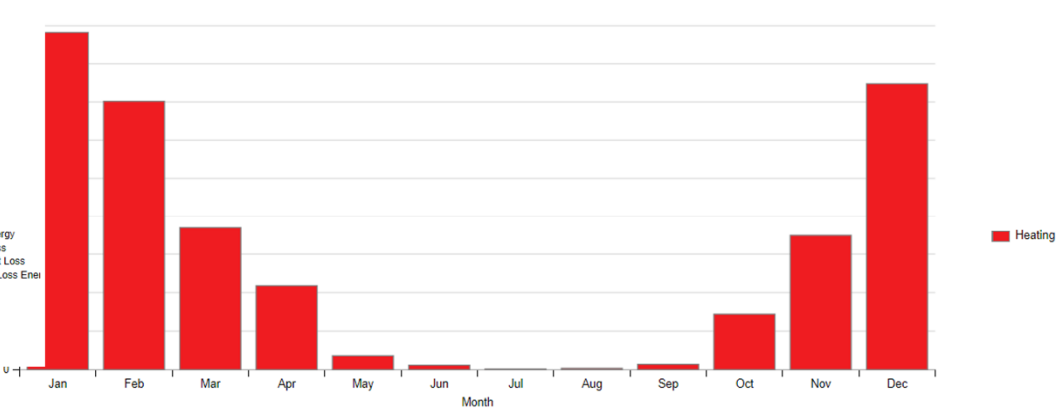
Energy Consumption



Heat Loss



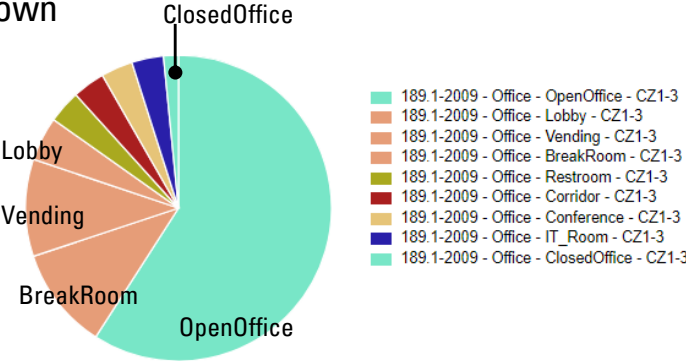
Natural Gas Consumption



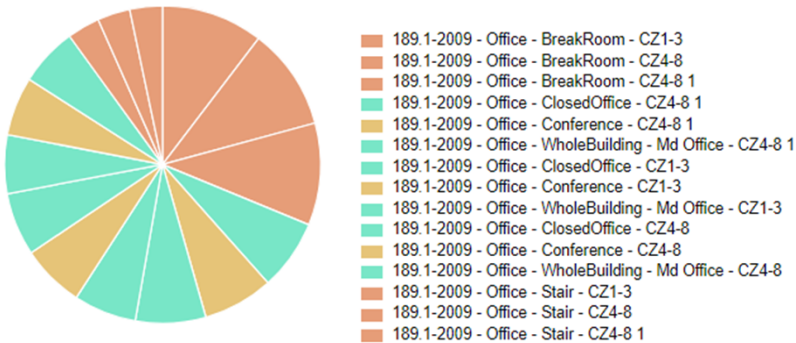


# Significant Differences Between Both Buildings Result

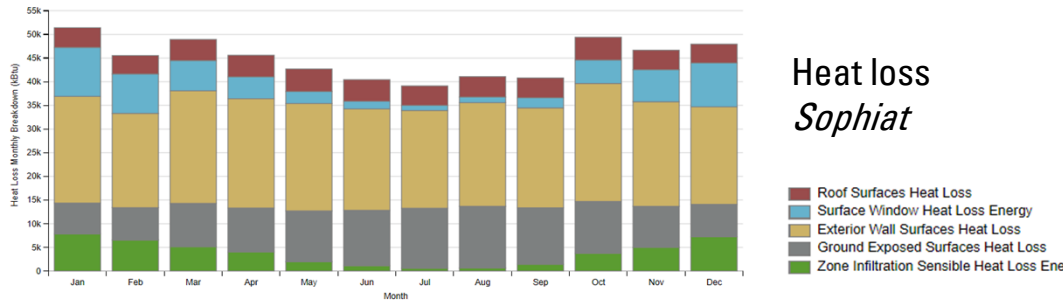
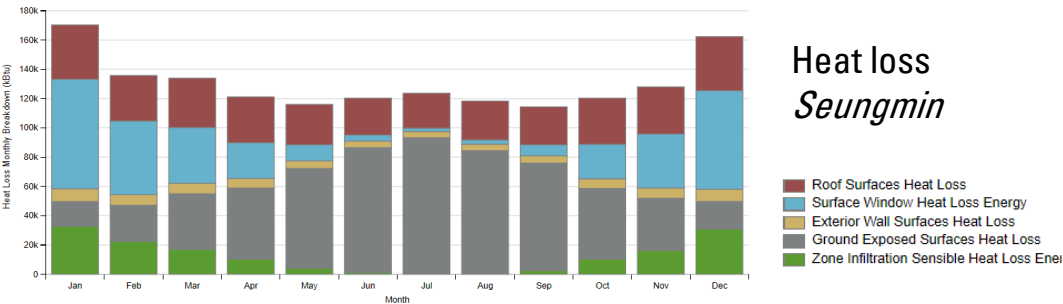
Space type breakdown  
*Seungmin*



Space type breakdown  
*Sophiat*



Variables	Seungmin's Office Building	Sophiat's Office Building
Building Design	Open office floor plan	Closed office floor plan with partitions
Element With Highest Heat Loss	Ground exposed surfaces	Exterior wall surfaces
Zone Infiltration Sensible Heat Loss	Occur Jan – May, Sep – Dec. Absent Jun – Aug.	Occurs all year round



Category	Seungmin	Sophiat	ENERGYSTAR [Office]
<b>Total Source Energy Per Total Building Area [kBtu/ft2]</b>	127.43	130.16	116.4
<b>Total Site Energy Per Total Building Area [kBtu/ft2]</b>	49.80	51.05	52.9

- Seungmin’s building is more efficient than Sophiat’s Building in terms of the Total Source Energy and Total Site Energy value obtained.
- Both buildings are Office type buildings with the same HVAC system and building schedules.
- However, Seungmin’s building is located in Columbia, South Carolina and it is a two-storey building with window to wall ratio of 33% and a total surface area of 17,875ft<sup>2</sup>. Sophiat’s building on the other hand is located in Raleigh, North Carolina and it is a three-storey building with window to wall ratio of 40% and a total surface area of 11,493ft<sup>2</sup>.

- Since the type of fuel and system significantly impact energy usage, it's essential to consider the appropriate combination of systems for a building.
- The components of a building are related to heat gain and heat loss. Therefore, it is necessary to construct an envelope suitable for the climate zone where the building is located.
- Some HVAC system are more efficient in terms usage and maintenance than the other. For example, the Packaged Rooftop Heat Pump System is very energy efficient.