Net Zero Buildings – Project #11

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Goal and Scope

- **Problem Statement:**
  Generate Net-Zero carbon design alternatives for the Varsity Multi-use building by performing energy and emissions analysis and simulation.

- **What is Net Zero?**
  The sum of the greenhouse gas emissions from the building operations is zero. (Total CO2e emissions - Total CO2e offsets = 0)

- **Scope:**
  - The System boundary is the energy use of the building and the related emissions
  - Consider Emissions from Electricity Generation
  - Neglect emissions from upstream natural gas
  - Neglect embedded emissions

Results

Comparison of Designs based on Emissions

- Baseline Change
- Geometry Redesign
- Rooftop & BIPVs
- GSHP DOAS Boiler Backup
- Lighting
- VRF HP V2
- Zone Packaged HP
- Air HP Doas & FCU Replacement
- Air HP Doas Replacement
- Electrification

Discussion

- Alternatives analyzed:
  - High efficiency lighting
  - Envelope materials
  - HVAC Equipment
  - ONSite Solar Power Generation
  - Geometry change

Conclusions

- Emission Focused Design:
  The recommendation for a reduced emissions focused design is to implement the geometry change of the building, generate power on location using both rooftop PV’s and BIPVS and implement a ground source heat pump.

Methods and Materials

The Energy Modelling software used was DesignBuilder, this software was chosen based upon the versatility of the software along with group members having experience using DesignBuilder before starting the project. The first half of the year was spent generating, calibrating and verifying a baseline model that accurately represented the current design of the building.

Once the Baseline model was completed, the group generated alternative designs and quantified the benefits and drawbacks of these alternatives relative to the baseline model.

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