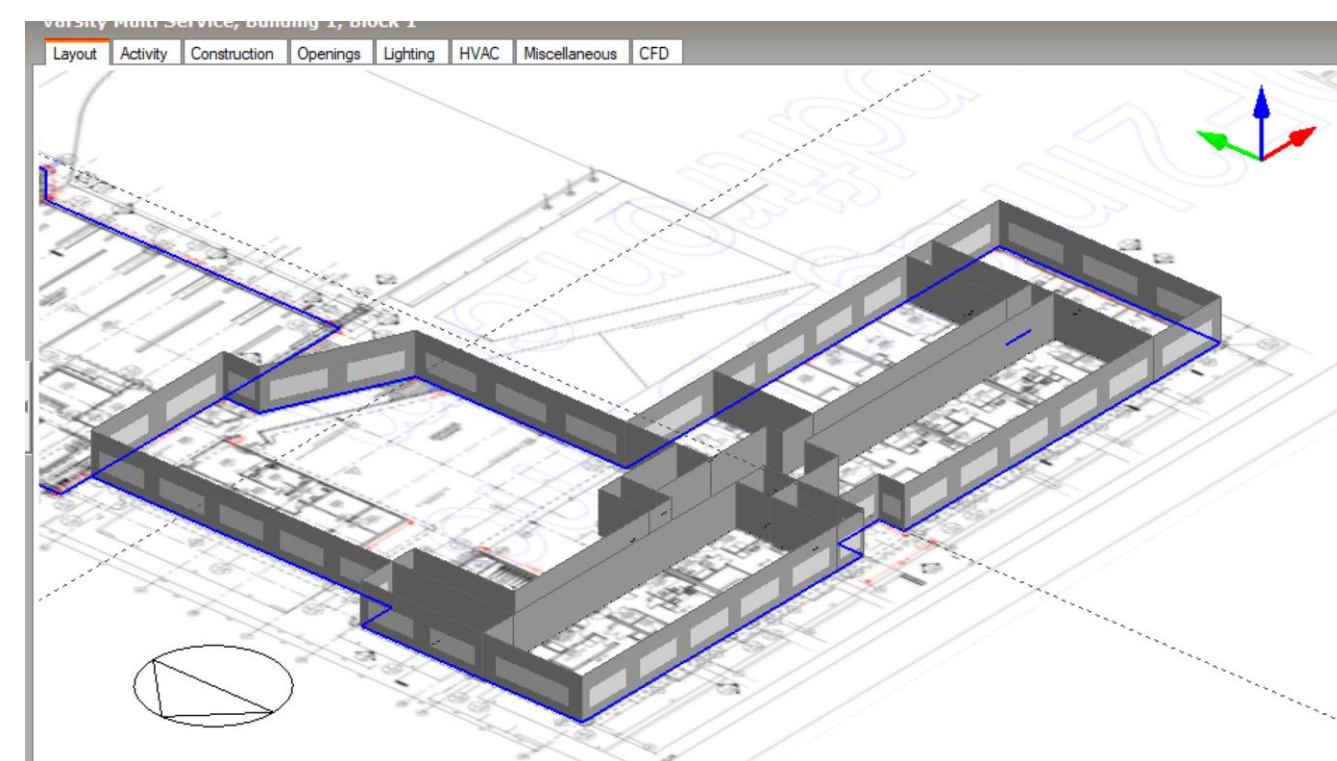


Net Zero Buildings – Project #11

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Introduction

- With the growing commitment of City of Calgary to reduce city wide emissions to 60% below 2005 levels by 2030 and achieve an overall Net Zero GHG emissions by 2050, The City of Calgary engineering team has proposed this project to assess alternate options for the Varsity Multi-use facility that is currently being constructed. The Varsity Multi-use will include a fire station, childcare facilities, and affordable housing units.
- The current varsity fire station that has reached its end-of-life cycle after 50 years of serving the community

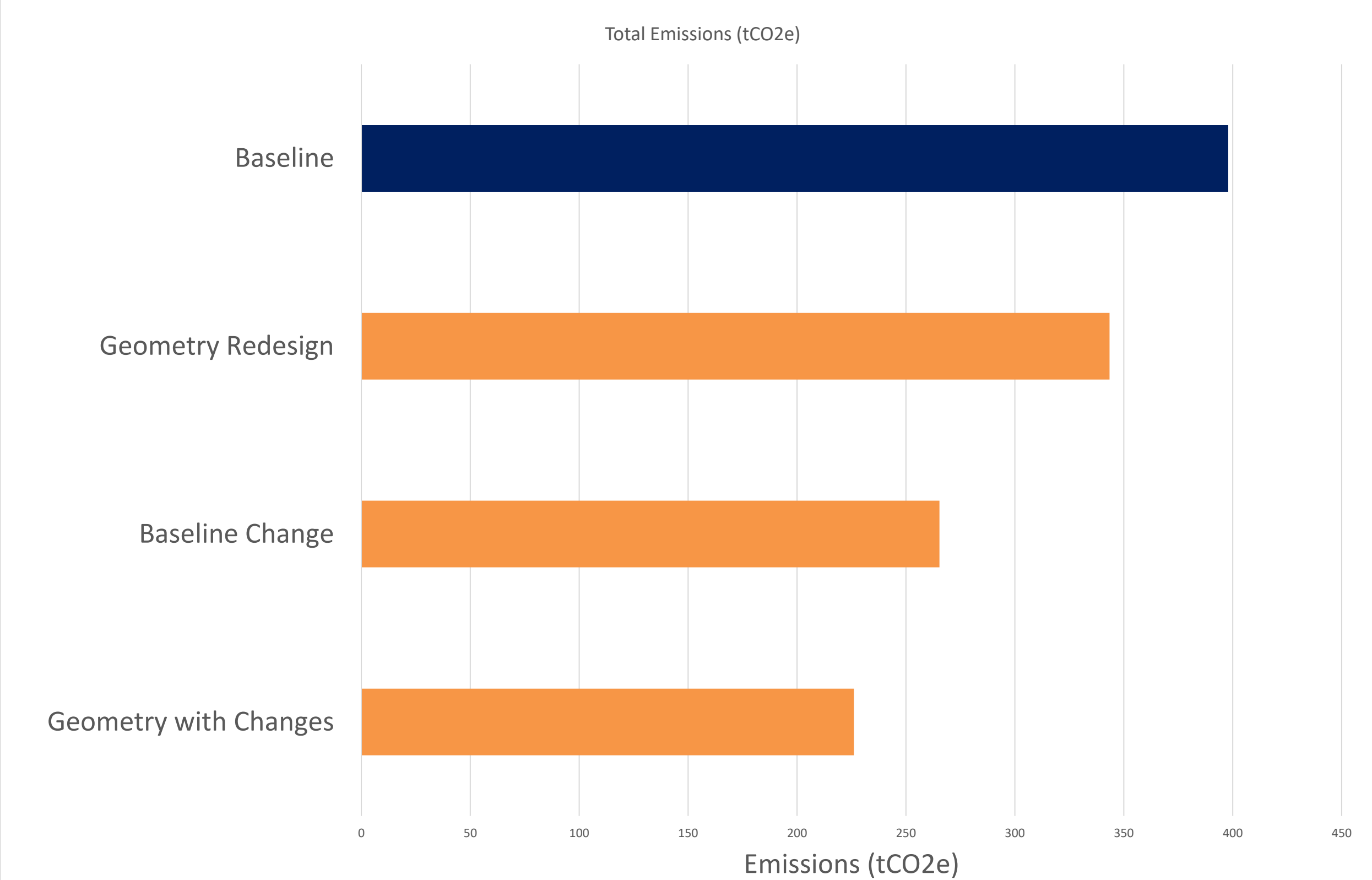


Goal and Scope

- 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



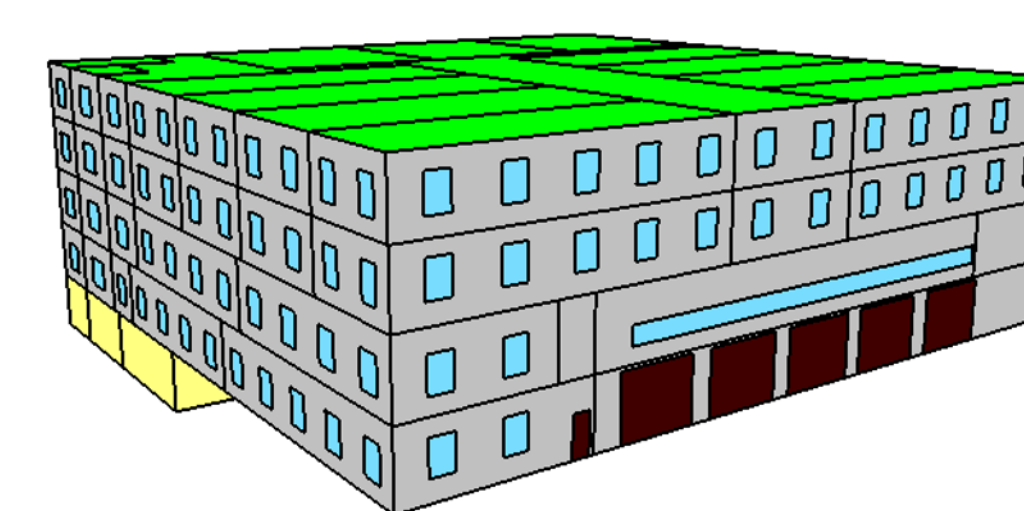
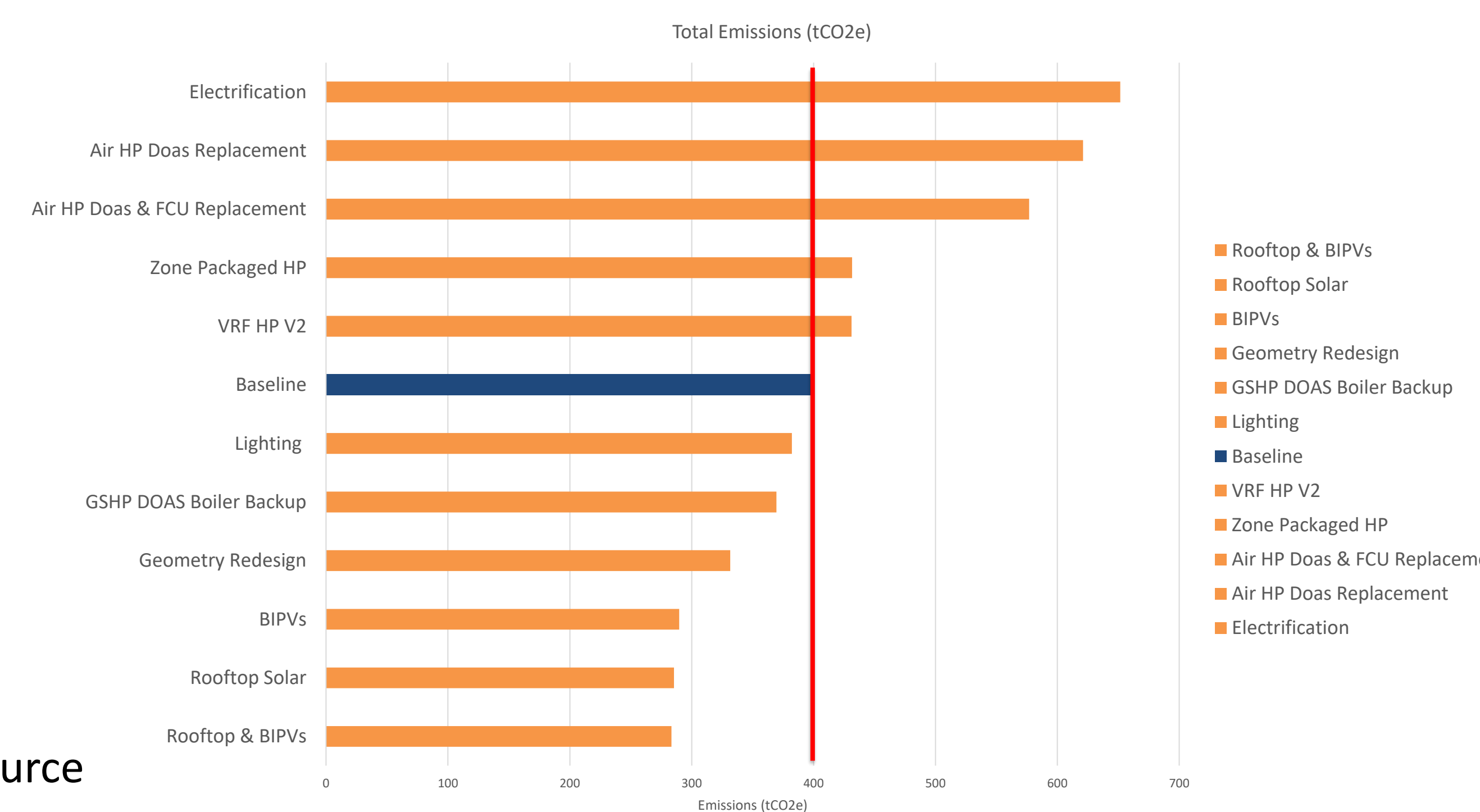
Discussion

- 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.

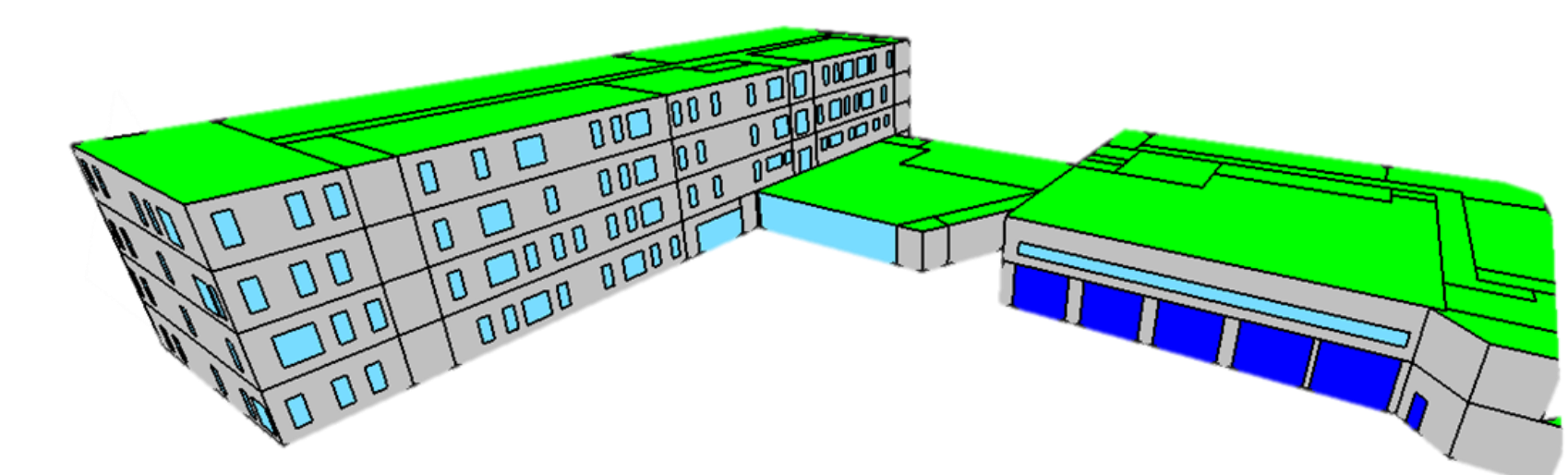
Energy Type	Total Energy Consumption (MWh)	Difference from Baseline (MWh)	Total Emissions (tCO2e)	Difference from Baseline (tCO2e)
Electricity	748	-23	254	92
Natural Gas	241	759	42	41
Total	-	-	296	205



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.



City of Calgary's Website



Our Website



Scan us for more info on the Varsity Multi Use Facility!

Acknowledgements:

Thank you to our Project Sponsors, Tyler young and Grace Suri from the City of Calgary. For entrusting in us with your project

Thank you to our Faculty Advisor, Dr. Sean McCoy for providing us with incredibly valuable feedback throughout the year.