Natural Gas CO_2 Emissions Reduction Project

ENGR 333-A, Calvin University Fall 2022

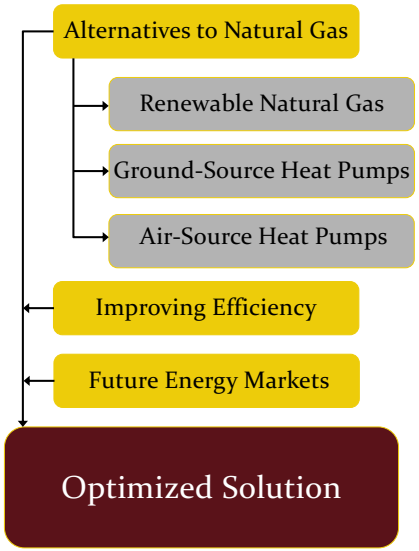
Calvin University 1876

Introduction

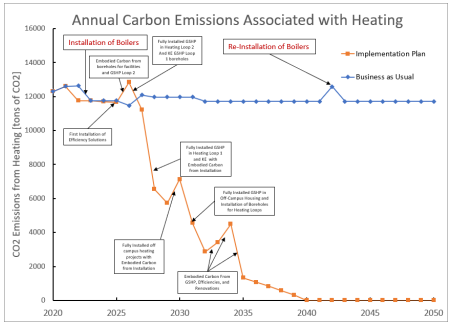
In 2017 President Michael K. Le Roy signed Second Nature's President Climate Commitment. This commitment outlines that Calvin's governing body will ensure Calvin University is a carbon neutral educational institution by 2057. In June of 2022, Calvin University's presidential seat was passed from Dr. Michael K. Le Roy to Dr. Wiebe Boer. In his short time as the president of Calvin University, Dr. Boer has put many projects into motion to help Calvin achieve its goal of becoming carbon neutral by 2057. This past fall Dr. Boer tasked the ENGR 333 class with answering the following question: What would it take to eliminate Calvin's natural gas-related net $CO2$ emissions? Here is a display of our solution.

ENGR 333 Section A Team

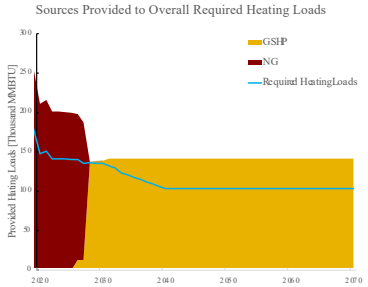
Methods



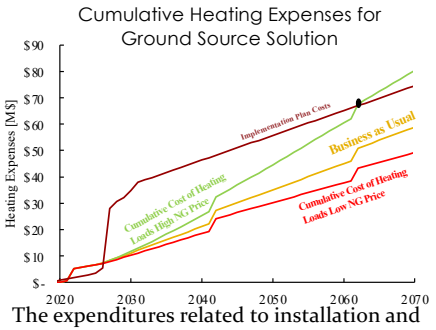
Results



To meet Calvin University's goal of being carbon neutral by 2057, the implementations as seen above allow Calvin to reach neutrality by 2040.



Currently, Calvin University uses more natural gas than is needed due to poor boiler and dormitory efficiencies. With the transition to electrical based heating sources, an improved efficiency from the systems prevents Calvin University from using more natural gas than needed.



The expenditures related to installation and operating and maintenance costs for the implementation plan compared to potential natural gas costs can be seen above.

The ground-source heat pumps will operate on heating loops. This diagram shows the existing loops and loops that will be added through this plan.

Conclusions

After extensive research and optimization, the students in Engineering 333 Section A proposed a solution utilizing ground-source heat pumps and efficiency improvements based on the comparison of effectiveness of sources and the financials related to each source. This team of students believes that this is a successful and financially feasible solution for eliminating Calvin's natural gas-related net CO_2 emissions by 2040 and enables the continued following of the Statement on Sustainability.

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