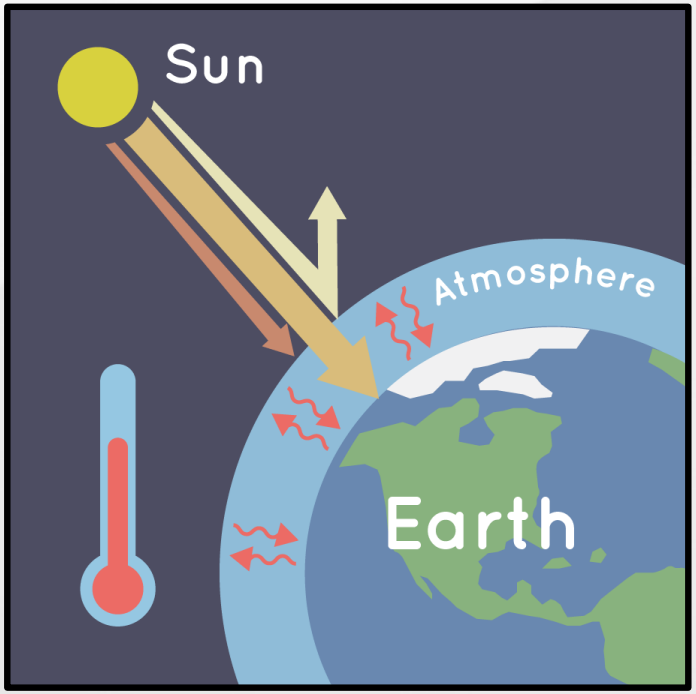
Grand Rapids Green Revolving Fund

Fall 2025 | ENGR 333

Brayden Meyer, Jude Veldboom, Ethan Bosscher, Dafna Heule, Ava Tatko

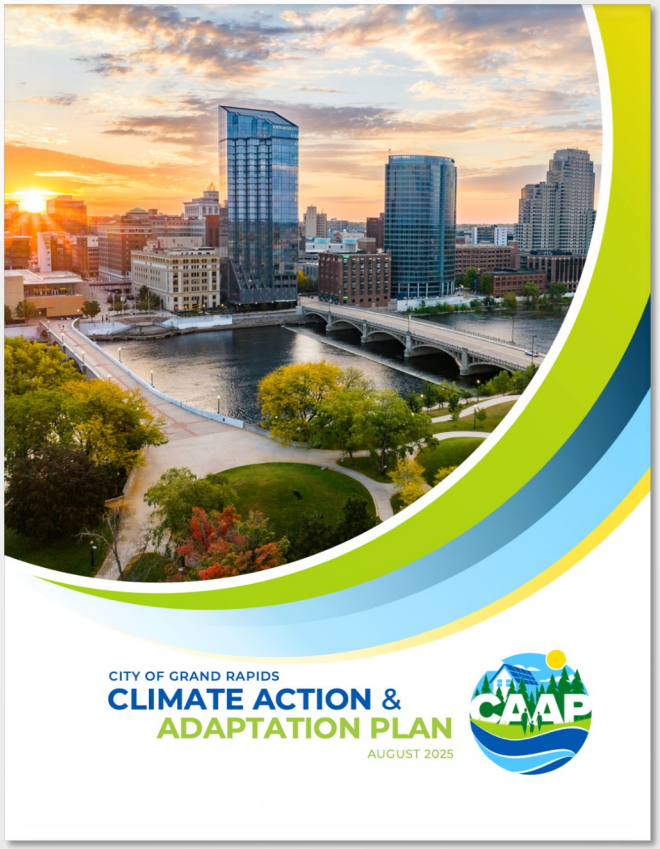
Introduction

Why is CO_2 reduction important?



Introduction

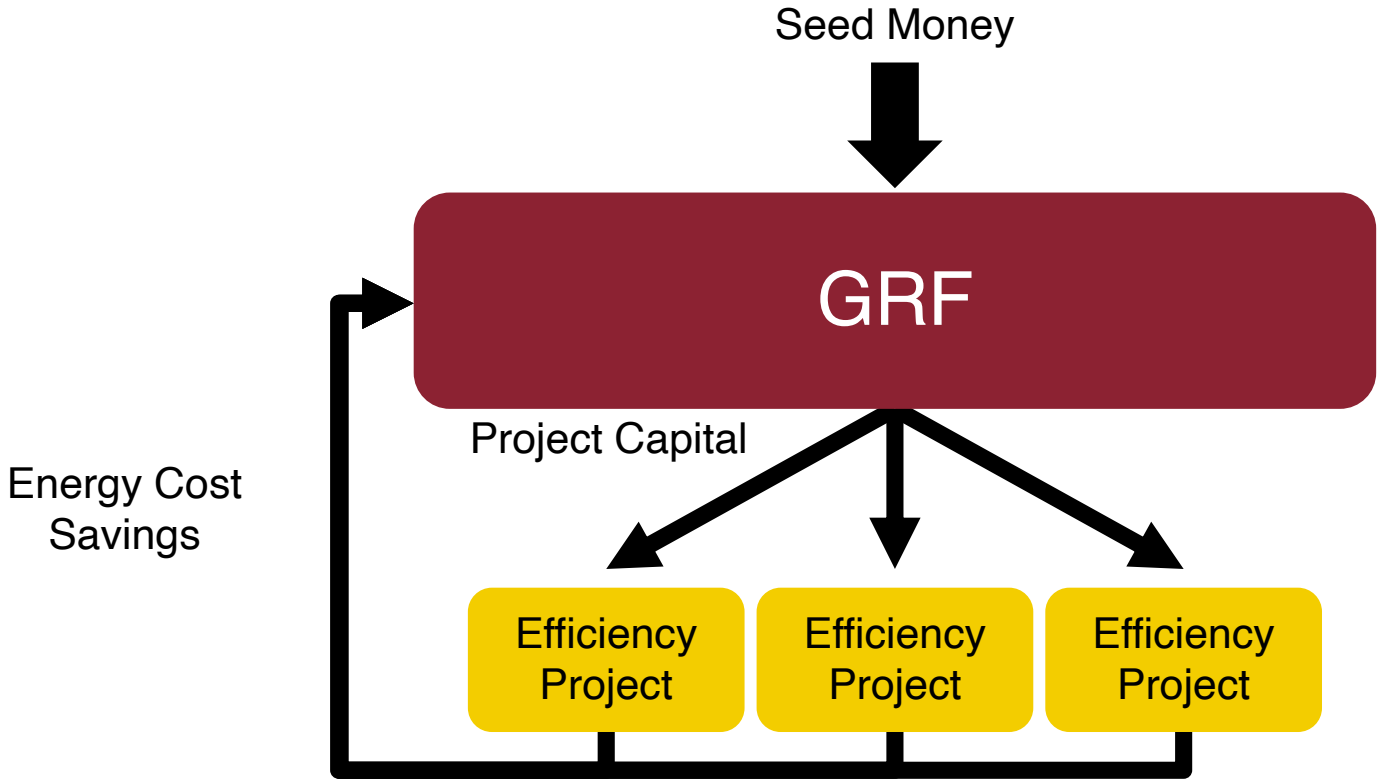
What would it take for the City of Grand Rapids to establish and operate a GRF?

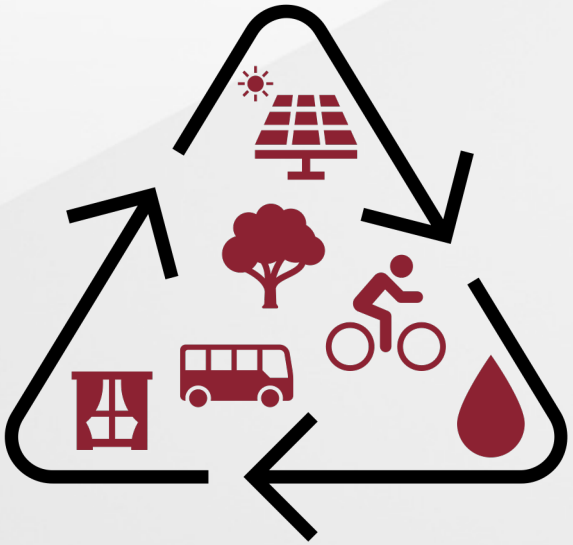


Grand Rapids CAAP (2025)


Calvin
UNIVERSITY
1876

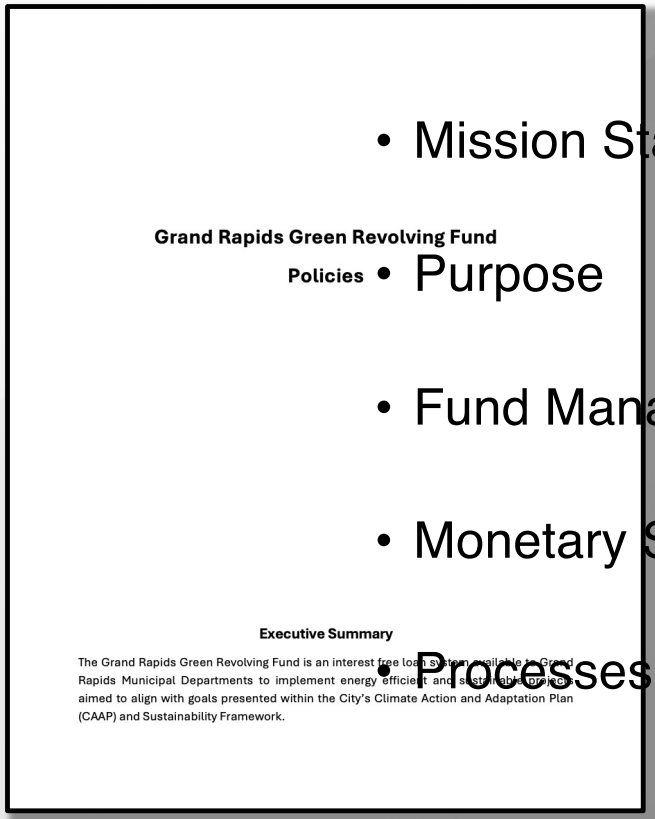
Green Revolving Funds





Policy Team

Develops Green Revolving Fund rules and regulations for governing internal and external GRGRF activities



- Mission Statement
- Purpose
- Fund Management
- Monetary Structure
- Processes and Operations

Mission Statement

The mission of the GRGRF is to assist the City of Grand Rapids

to achieve greenhouse gas emissions reduction goals

in a *cost-effective, resilient,* and transparent manner

via improving the energy efficiency and sustainability of

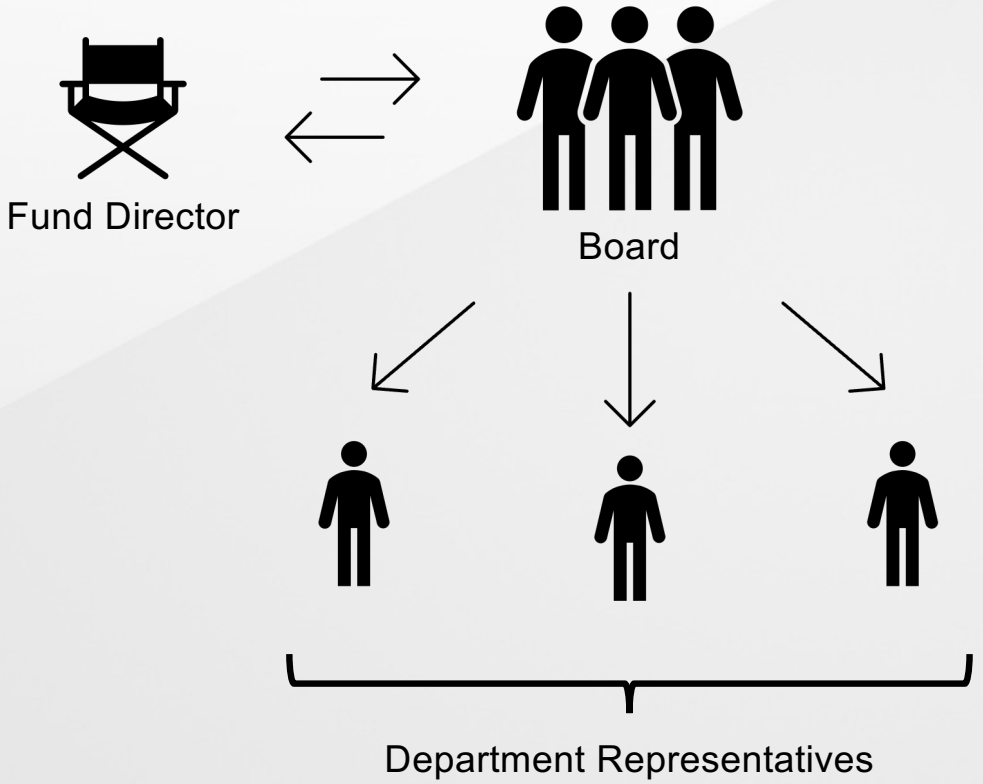
municipal facilities.

Purpose

Blue Projects

Green Projects

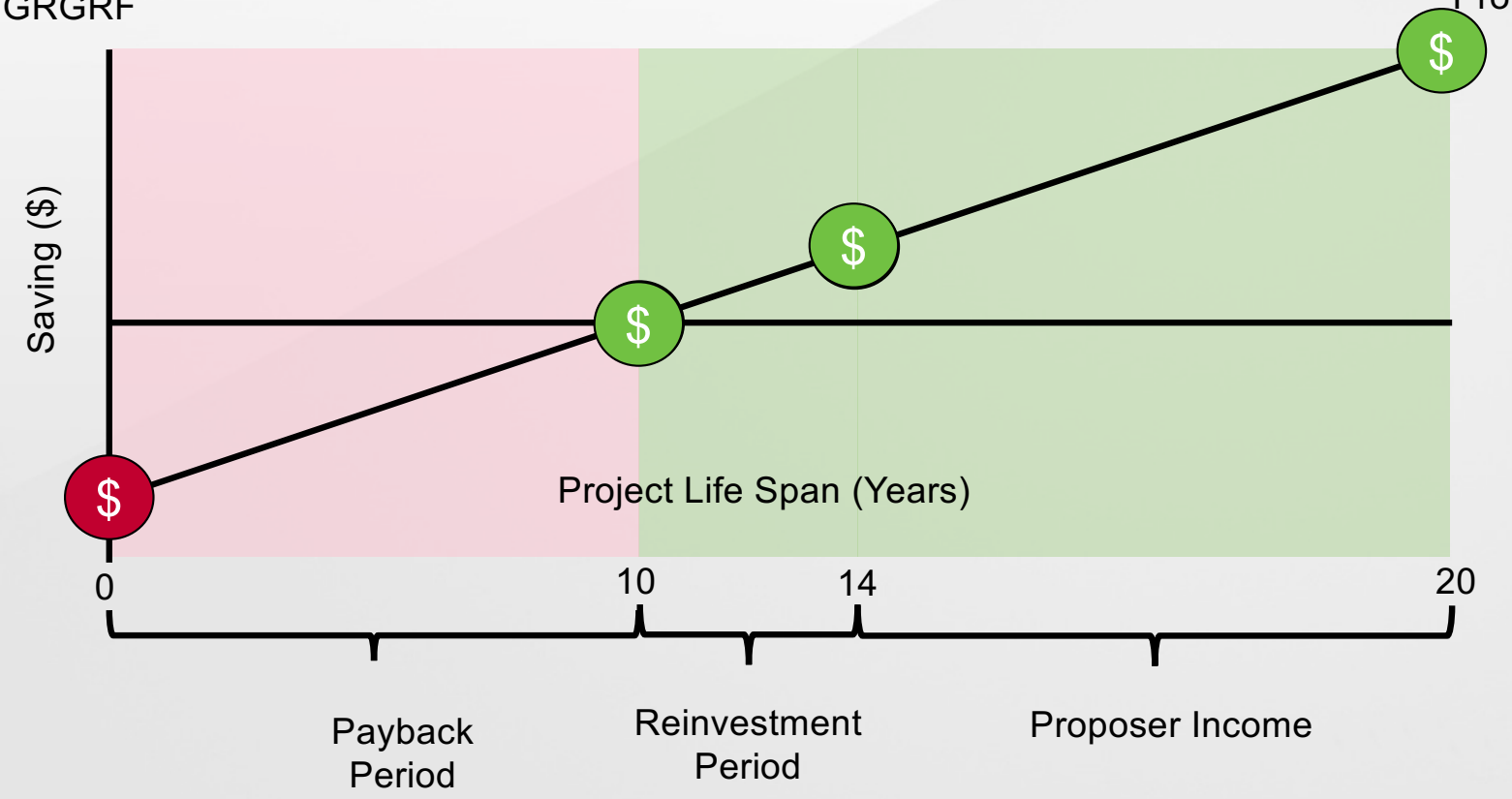
Fund Management

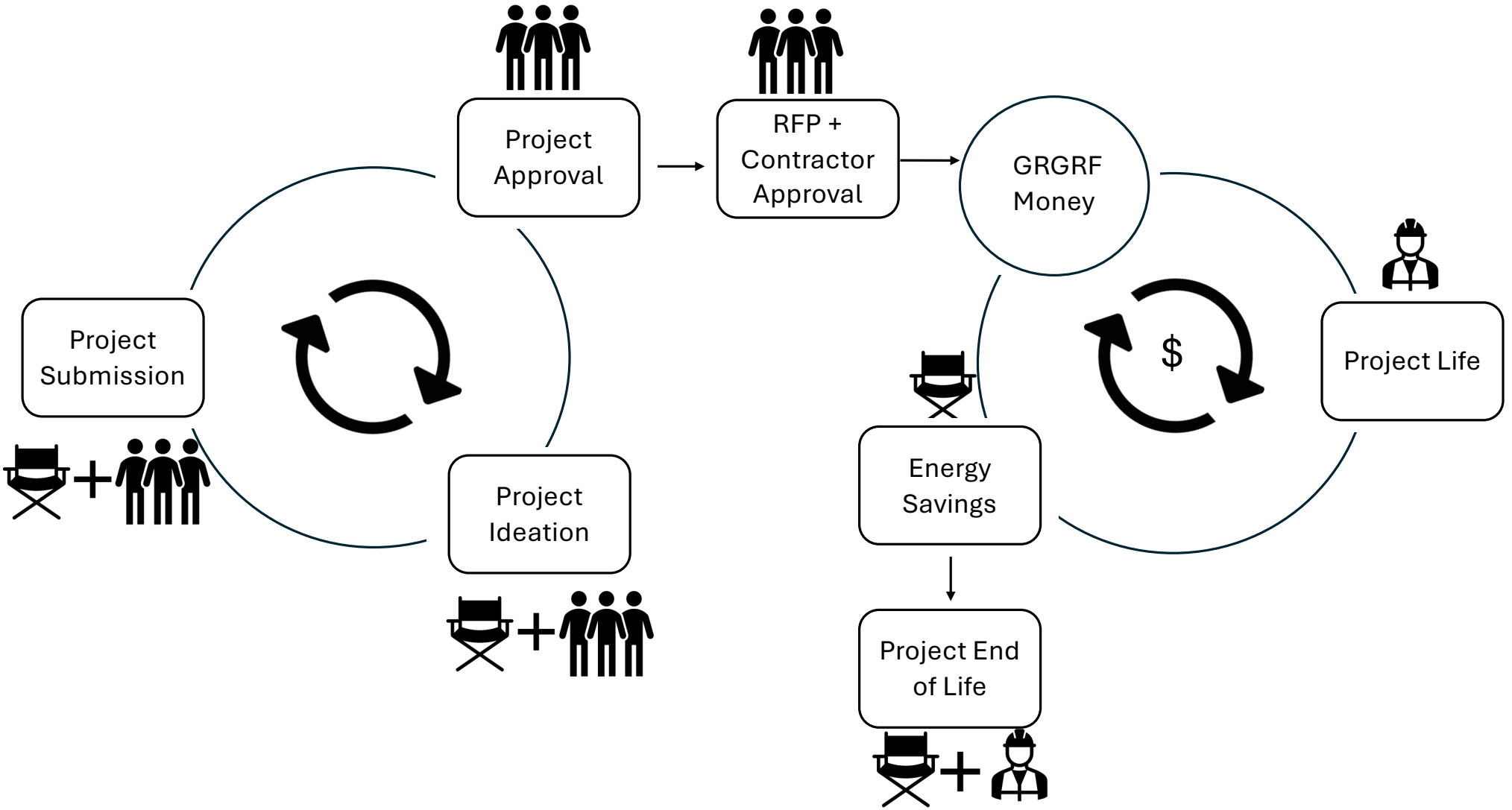


Monetary Structure

GRGRF

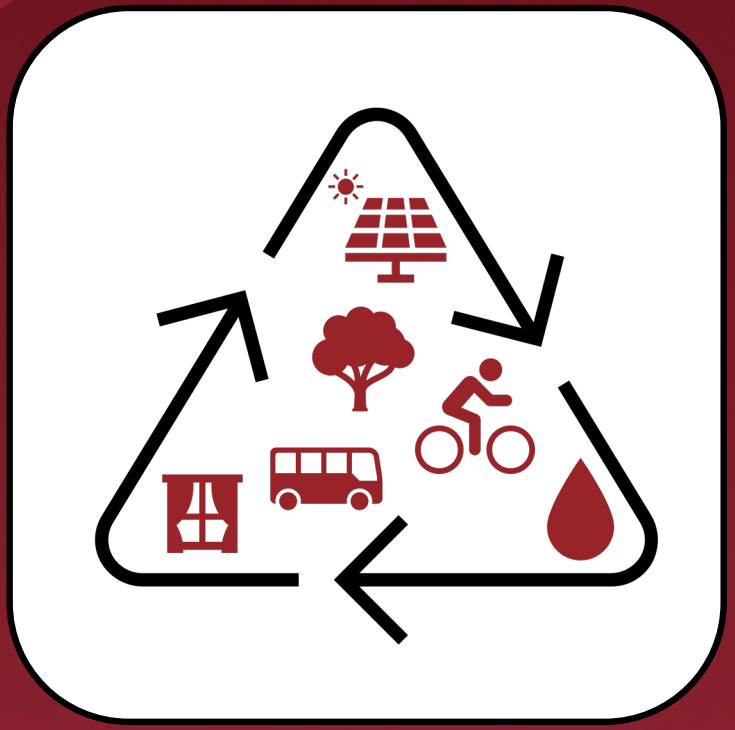
Proposer

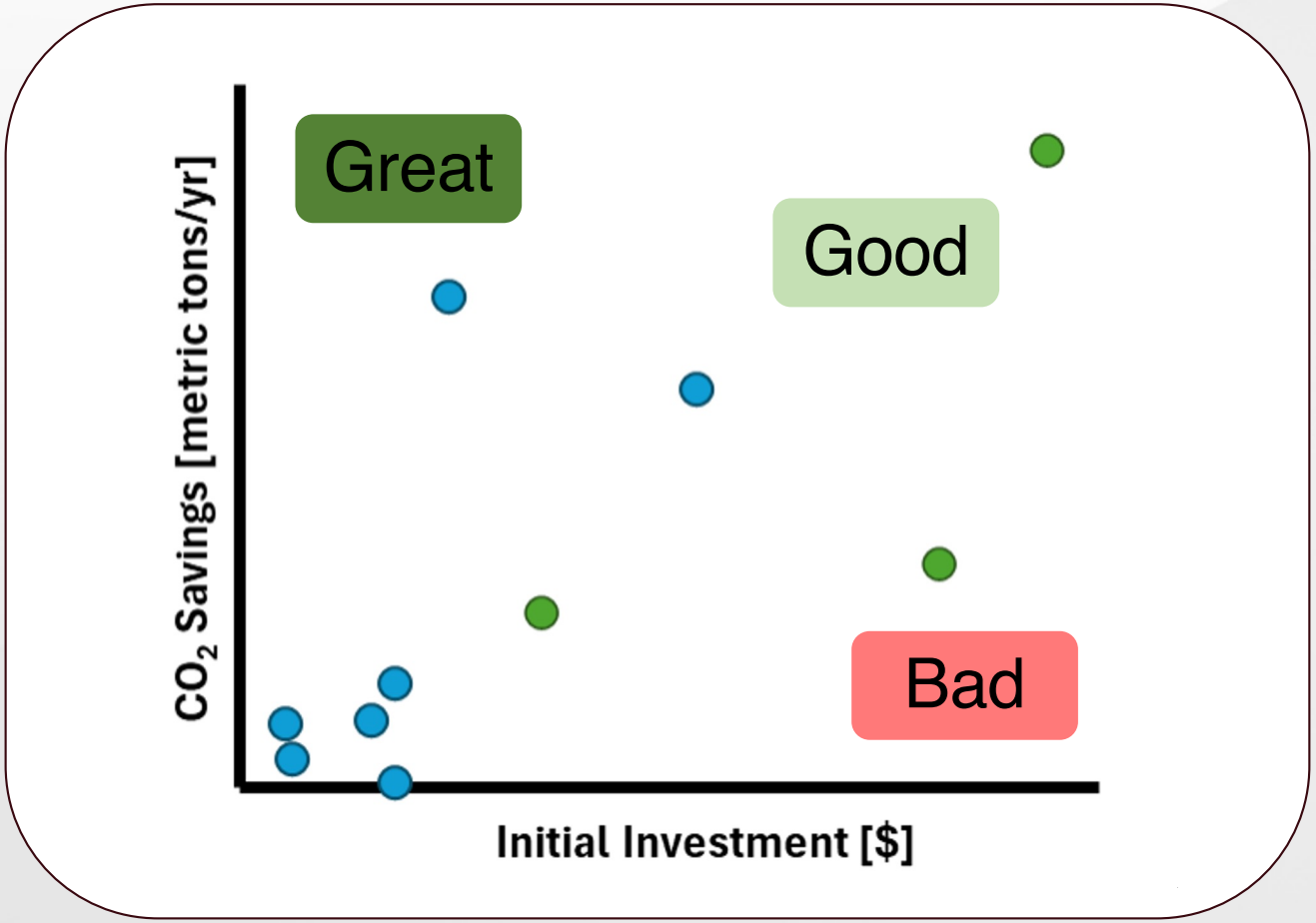



Project Submission
Project Ideation
Project Approval
RFP + Contractor Approval
GRGRF Money
$
Project Life
Energy Savings
Project End of Life

Project Team

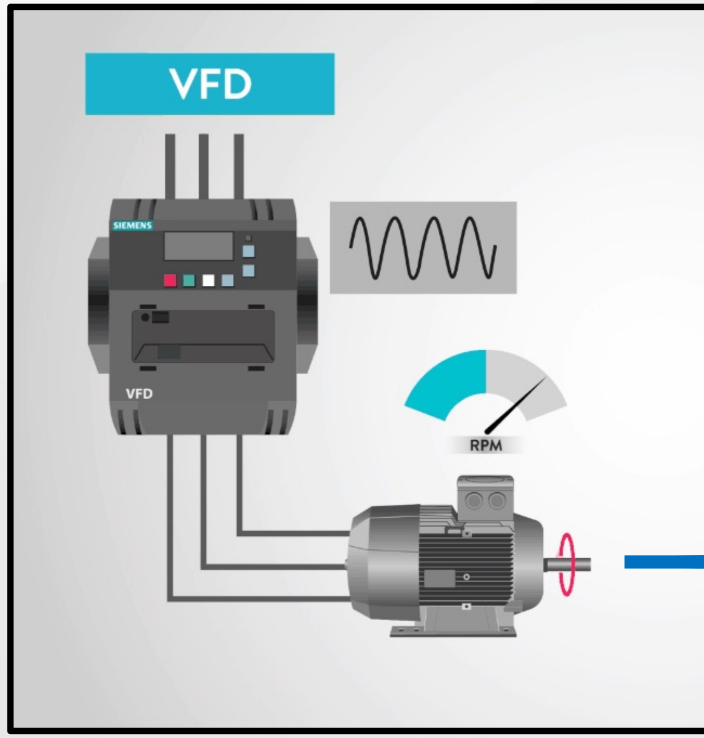
Develops and analyzes energy efficiency projects for GRGRF activities



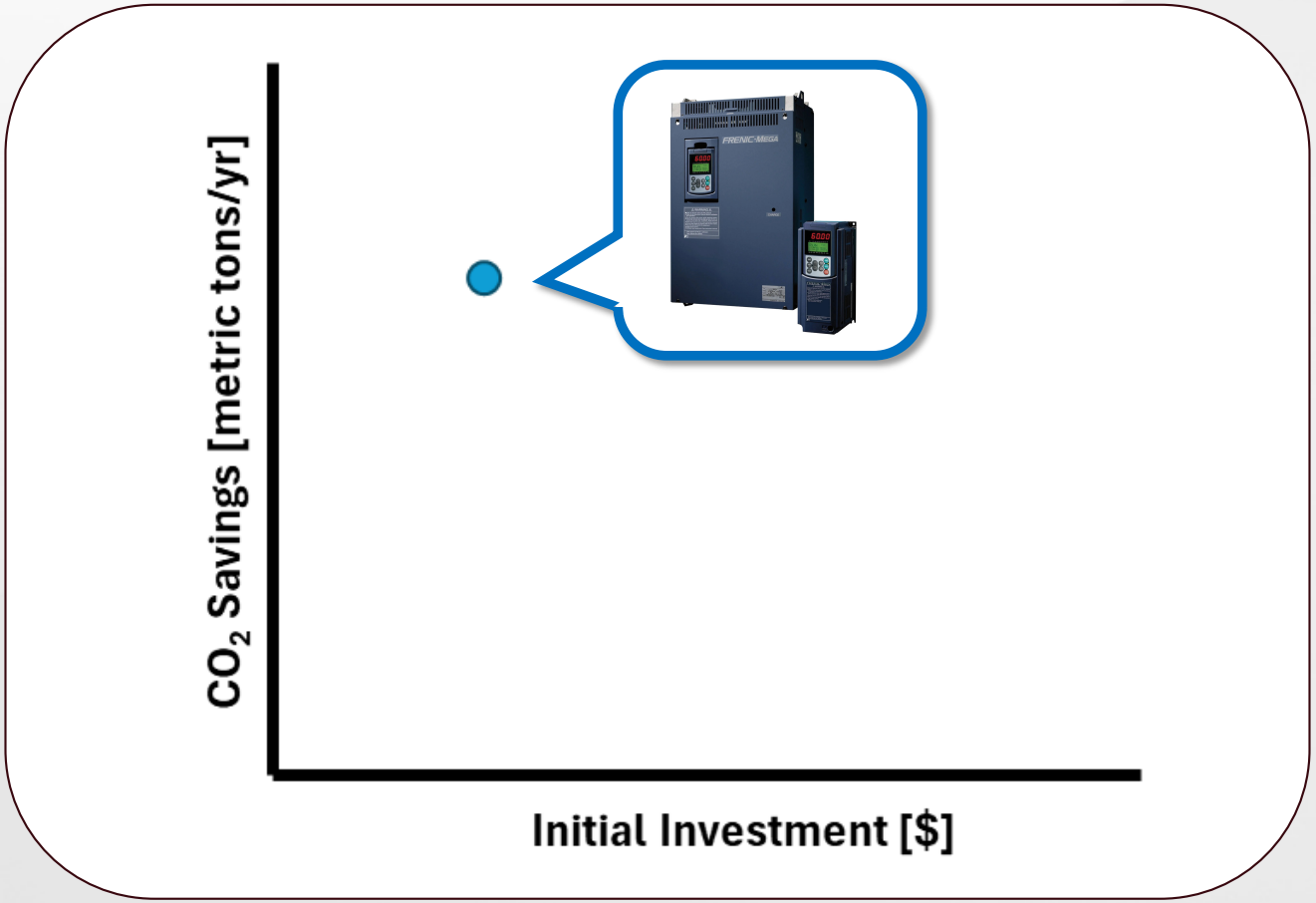

Great
Good
Bad
CO_2 Savings [metric tons/yr]
Initial Investment [$]

Small VFDs


FRENIC-MEGA
60.00
60.00


VFD
SIEMENS
VFD
RPM

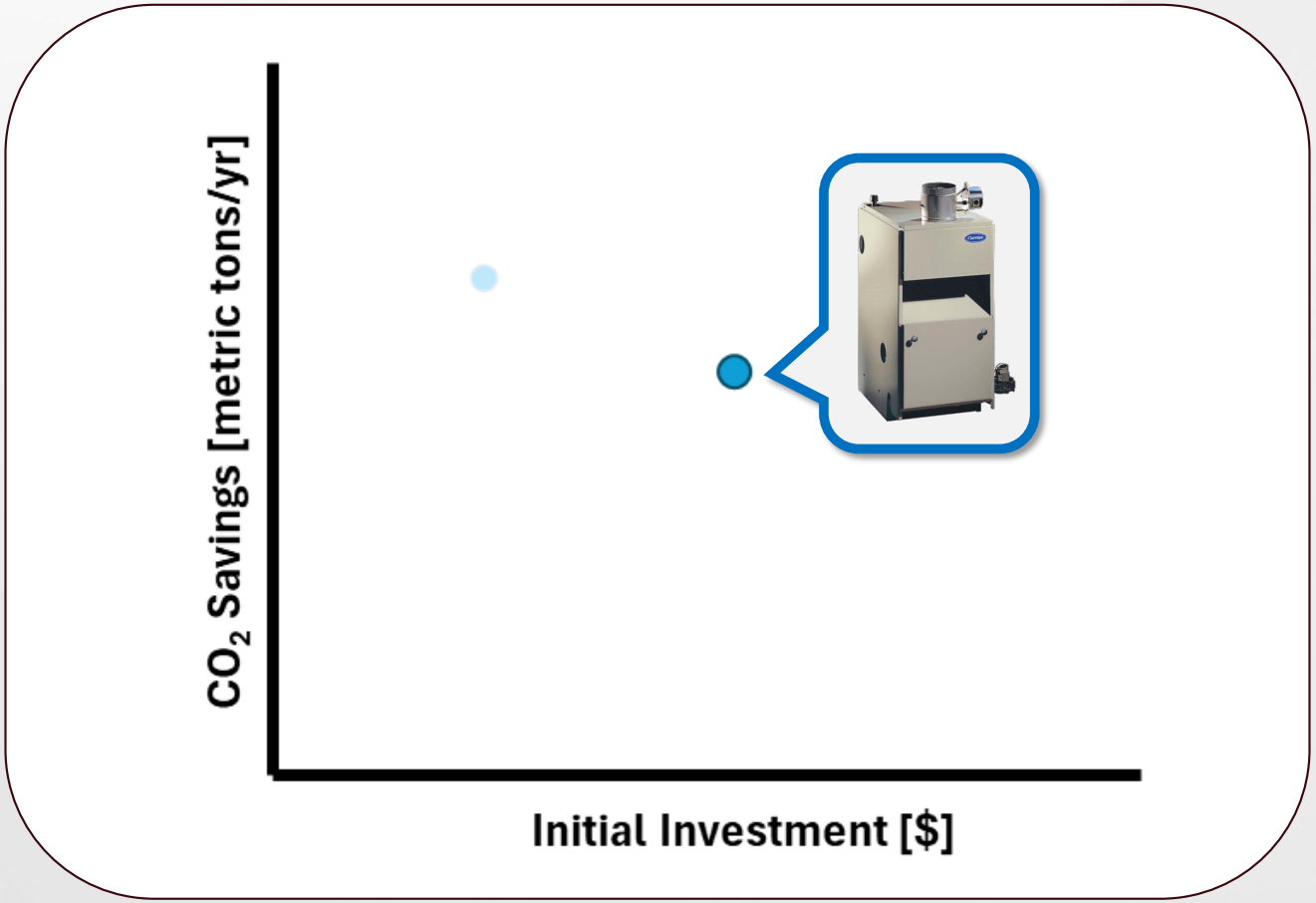
Small VFDs



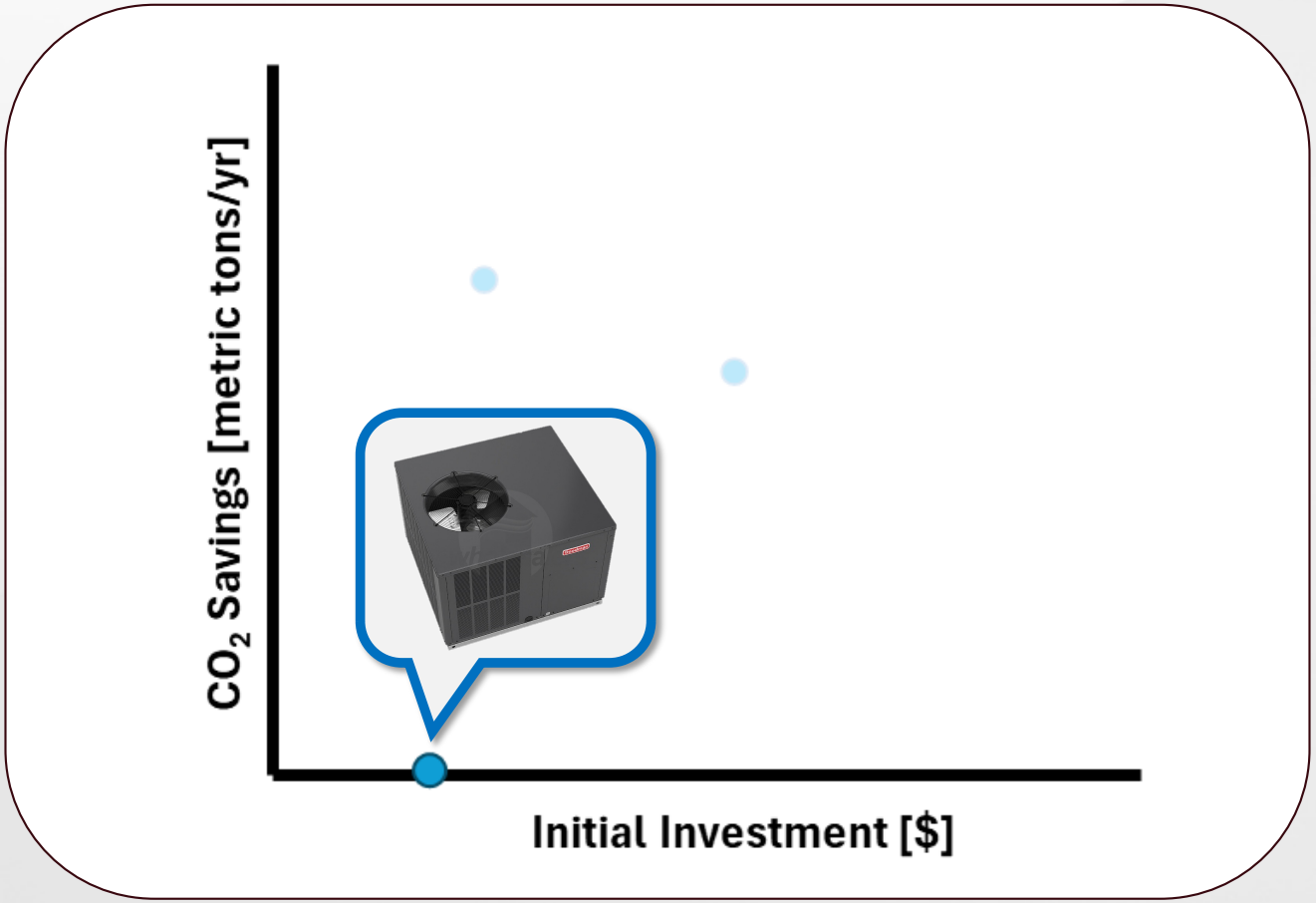
Energy Star Improvements


ENERGY STAR
ENERGY STAR-RATED
MAXIMIZE ENERGY SAVINGS WITH THIS
ENERGY STAR DRYER

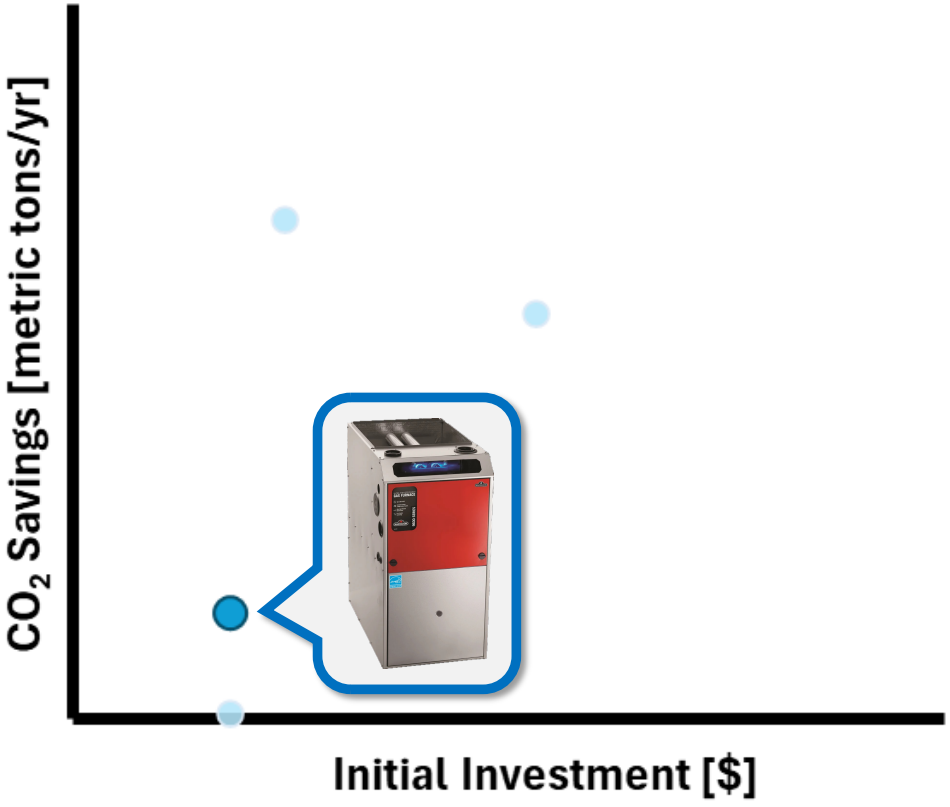
Energy Star Improvements



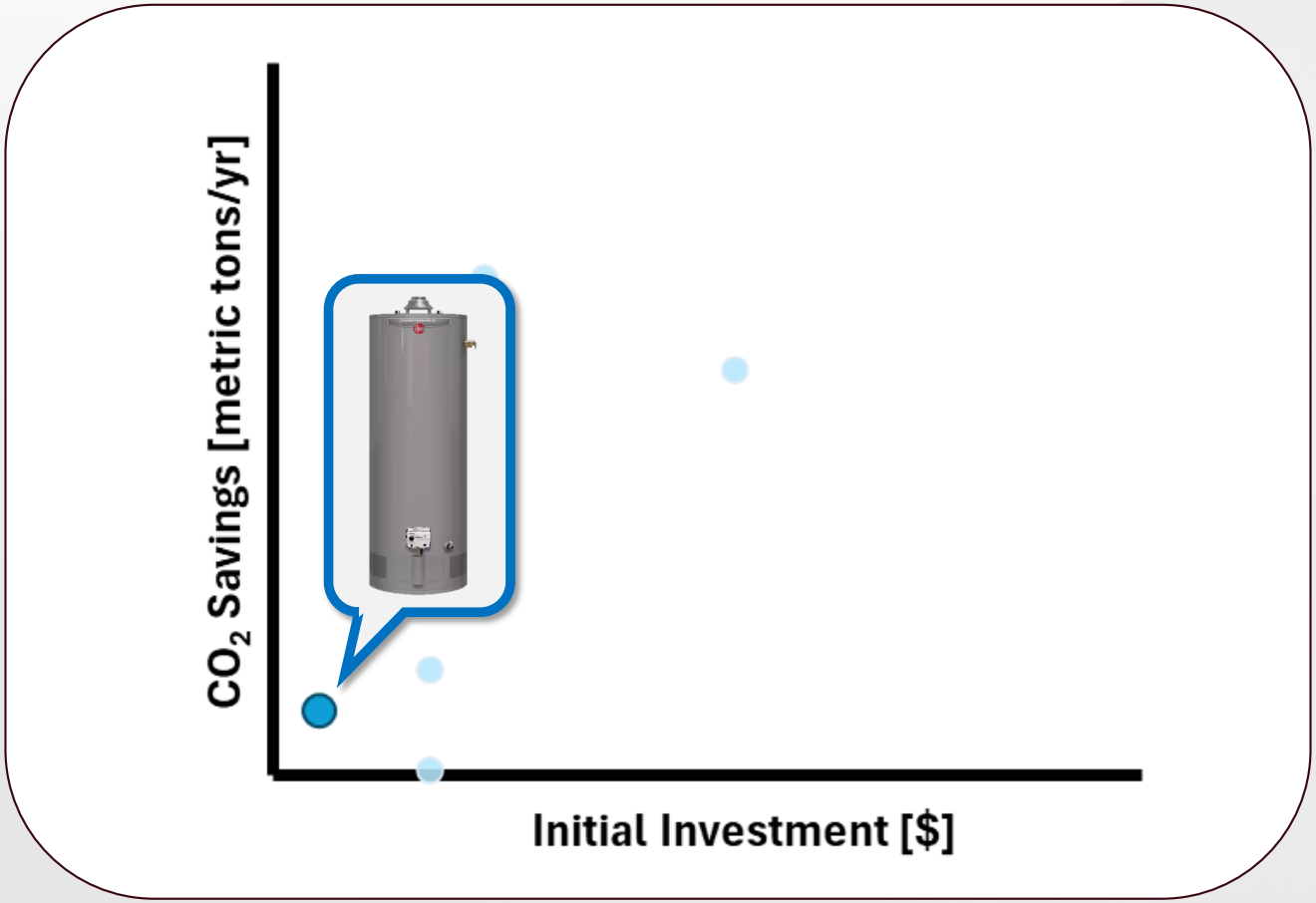
Energy Star Improvements



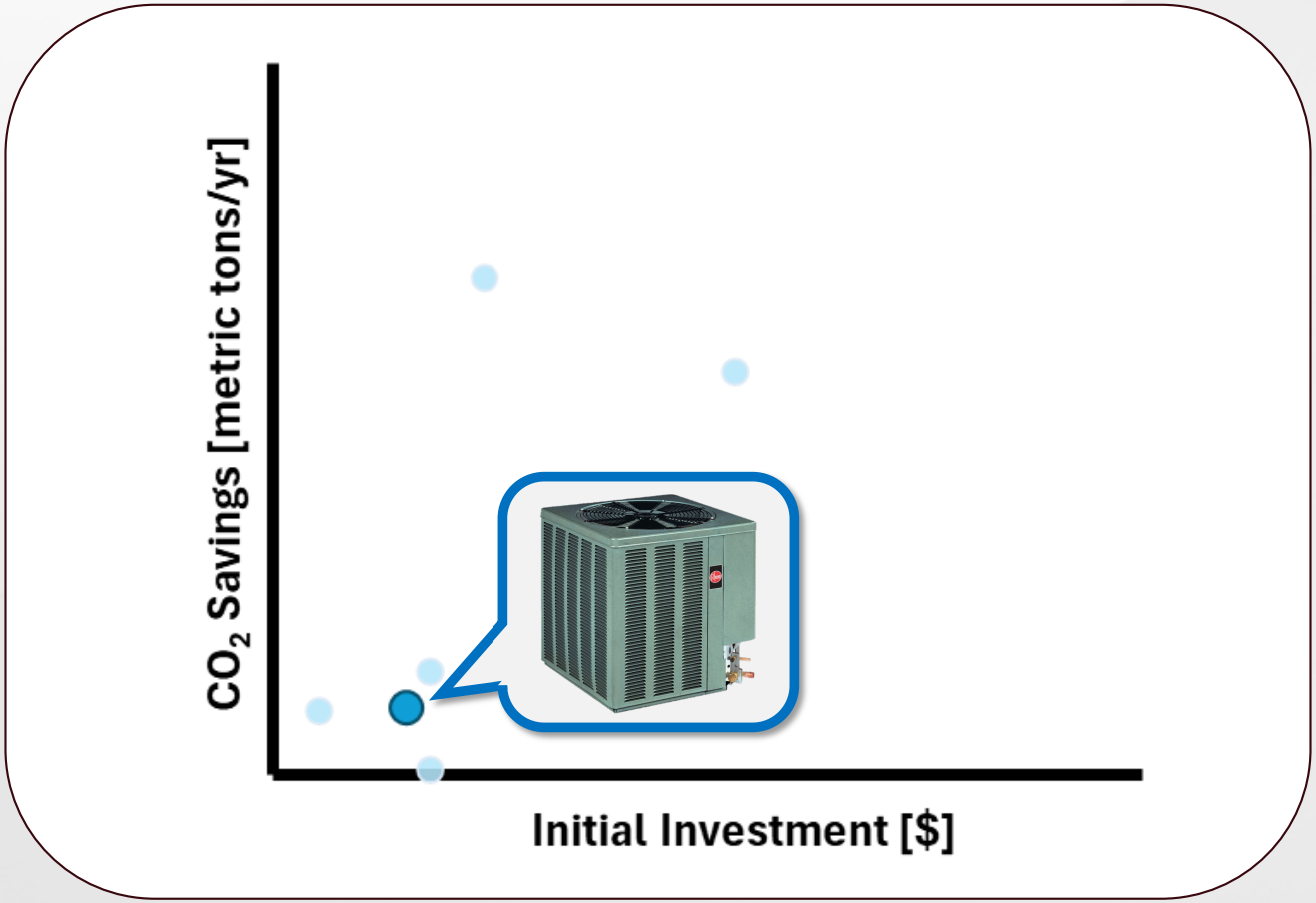
Energy Star Improvements



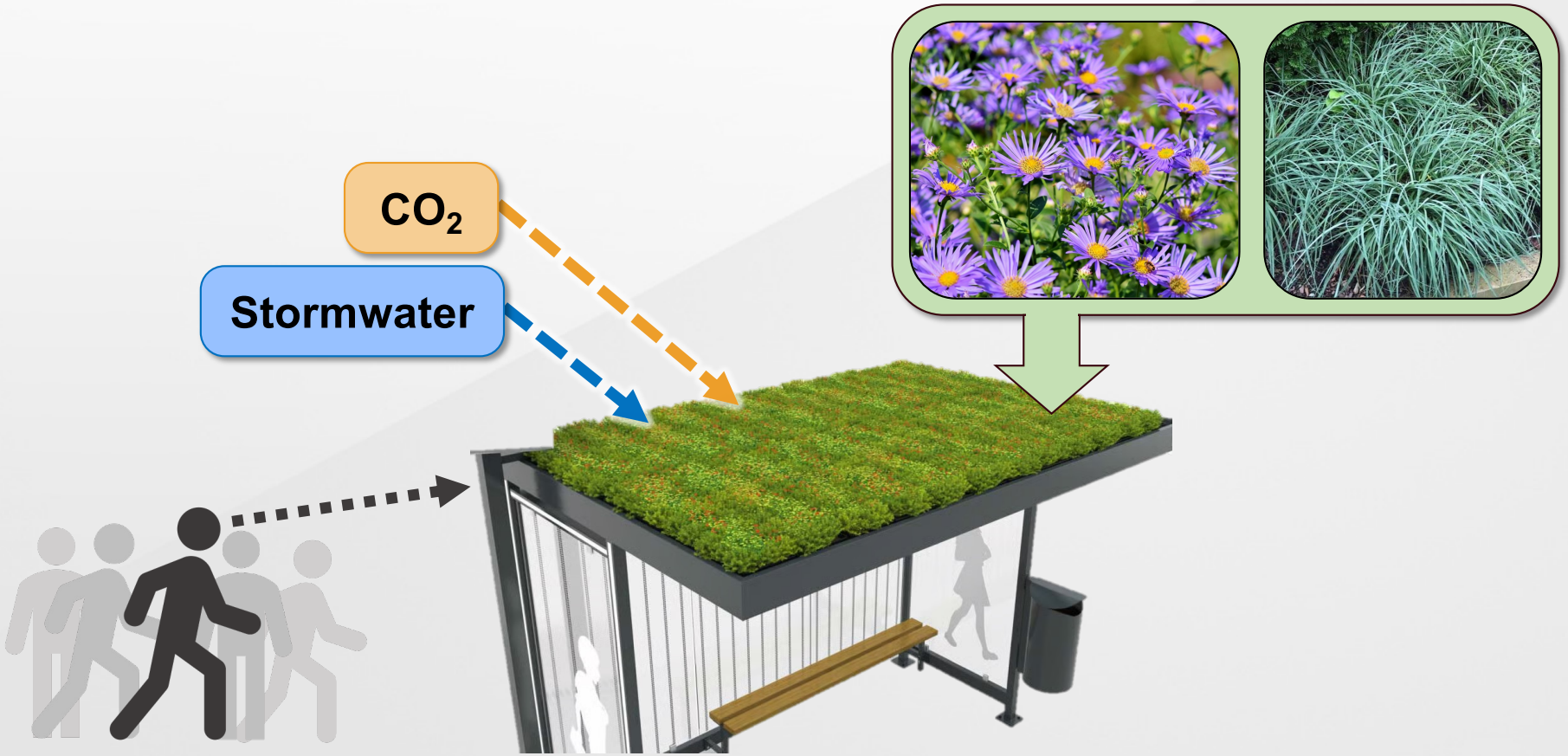
Energy Star Improvements



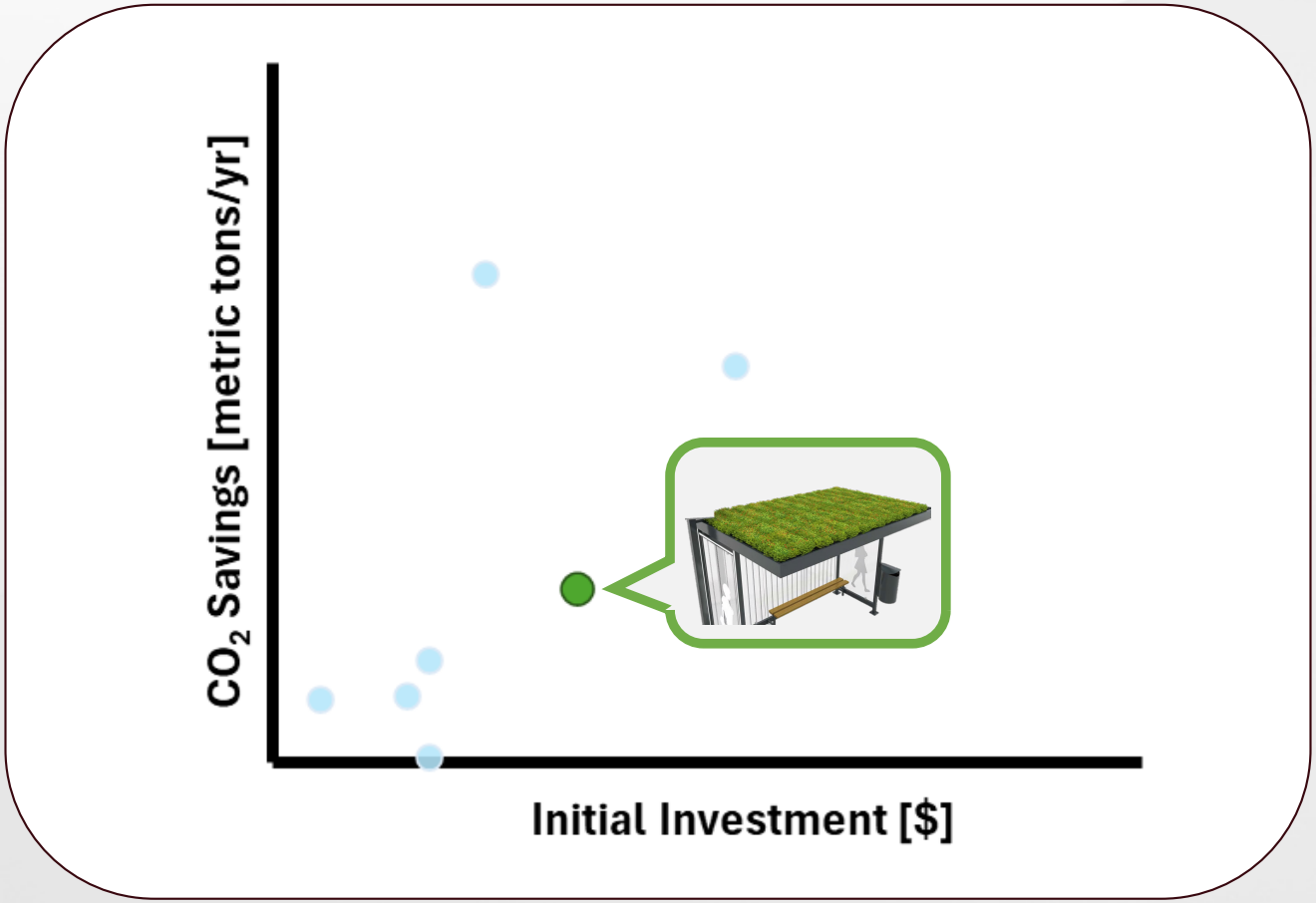
Energy Star Improvements



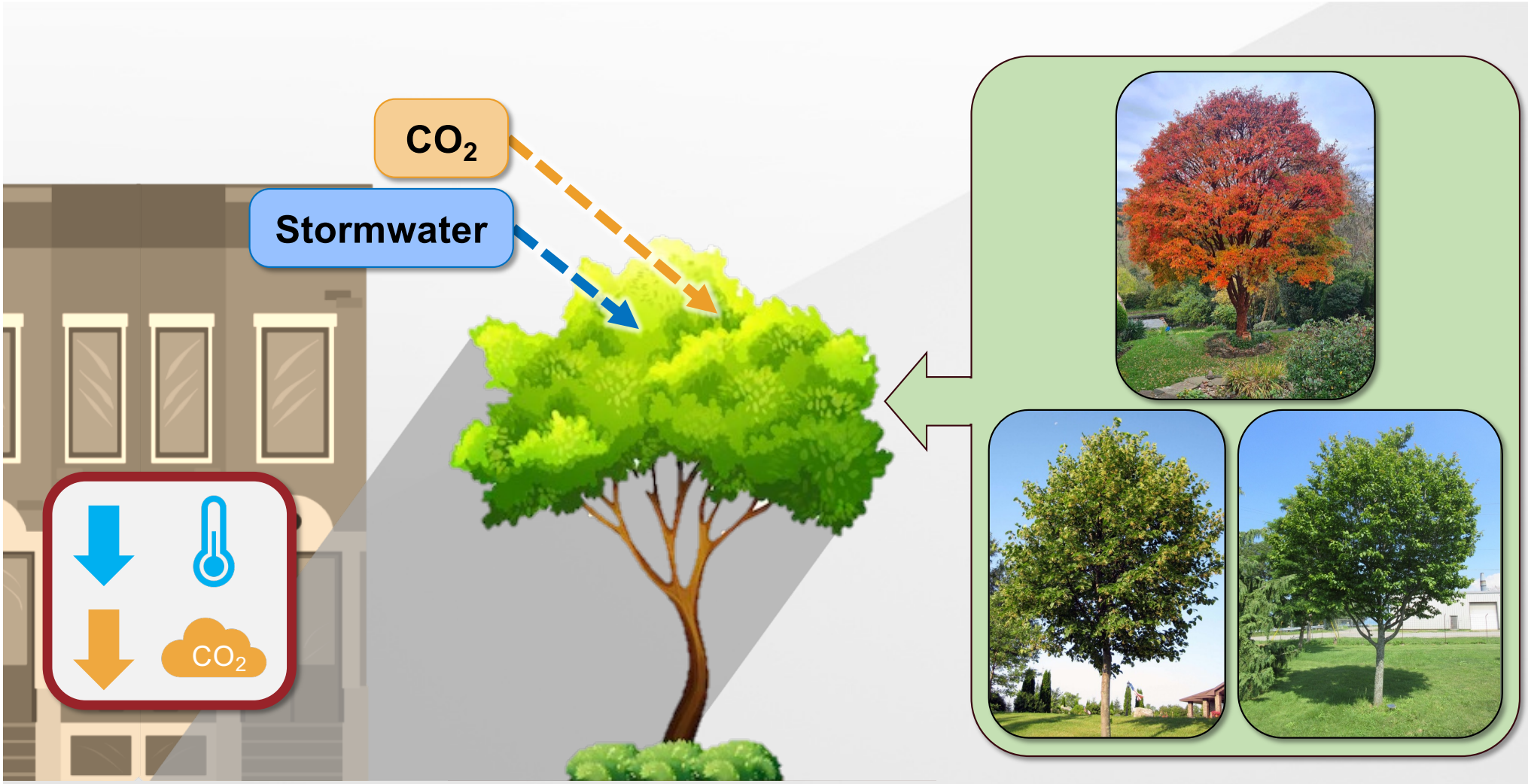
Green Roof Bus Stops


CO_2
Stormwater

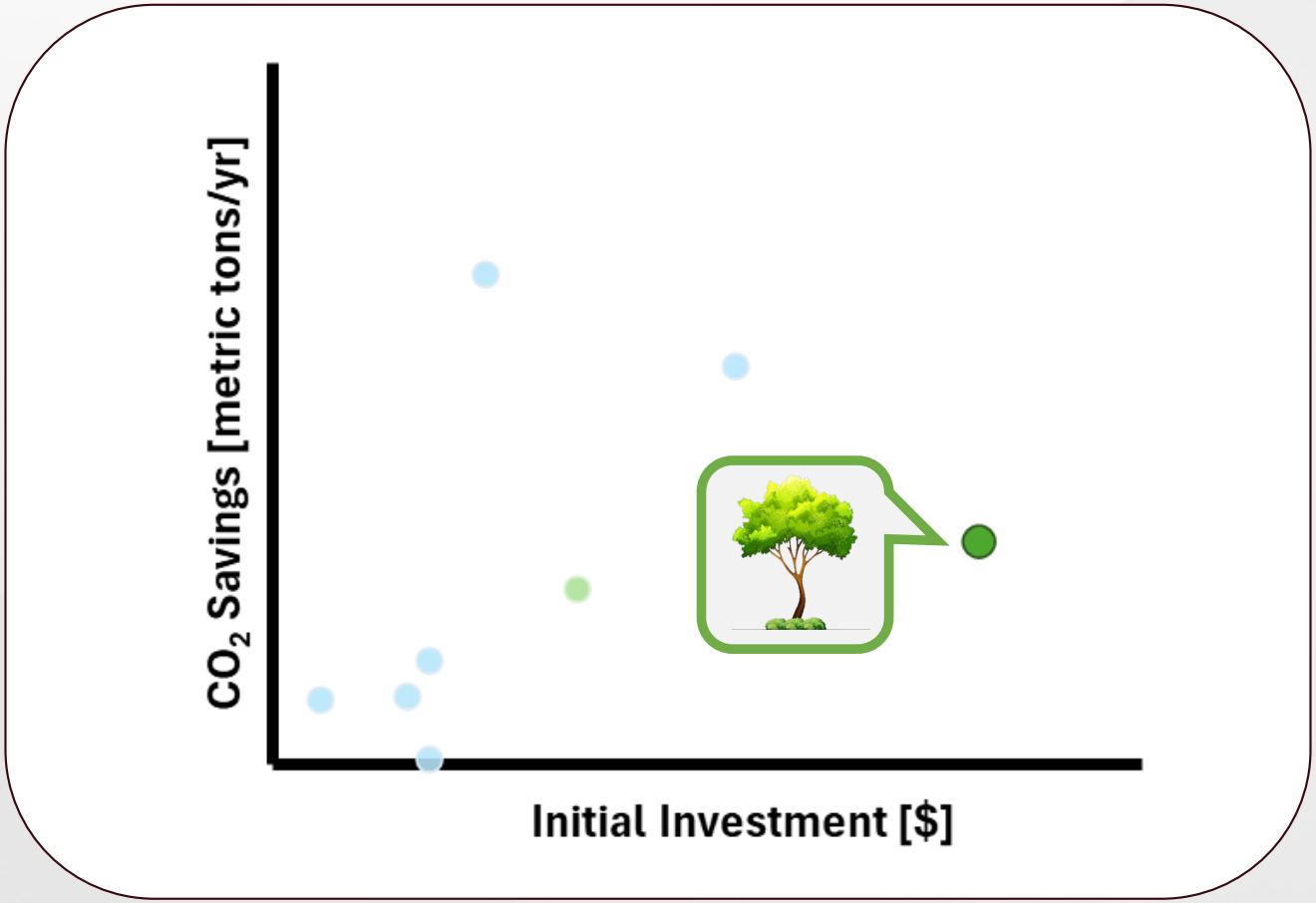
Green Roof Bus Stops



Trees


CO_2
Stormwater
CO_2

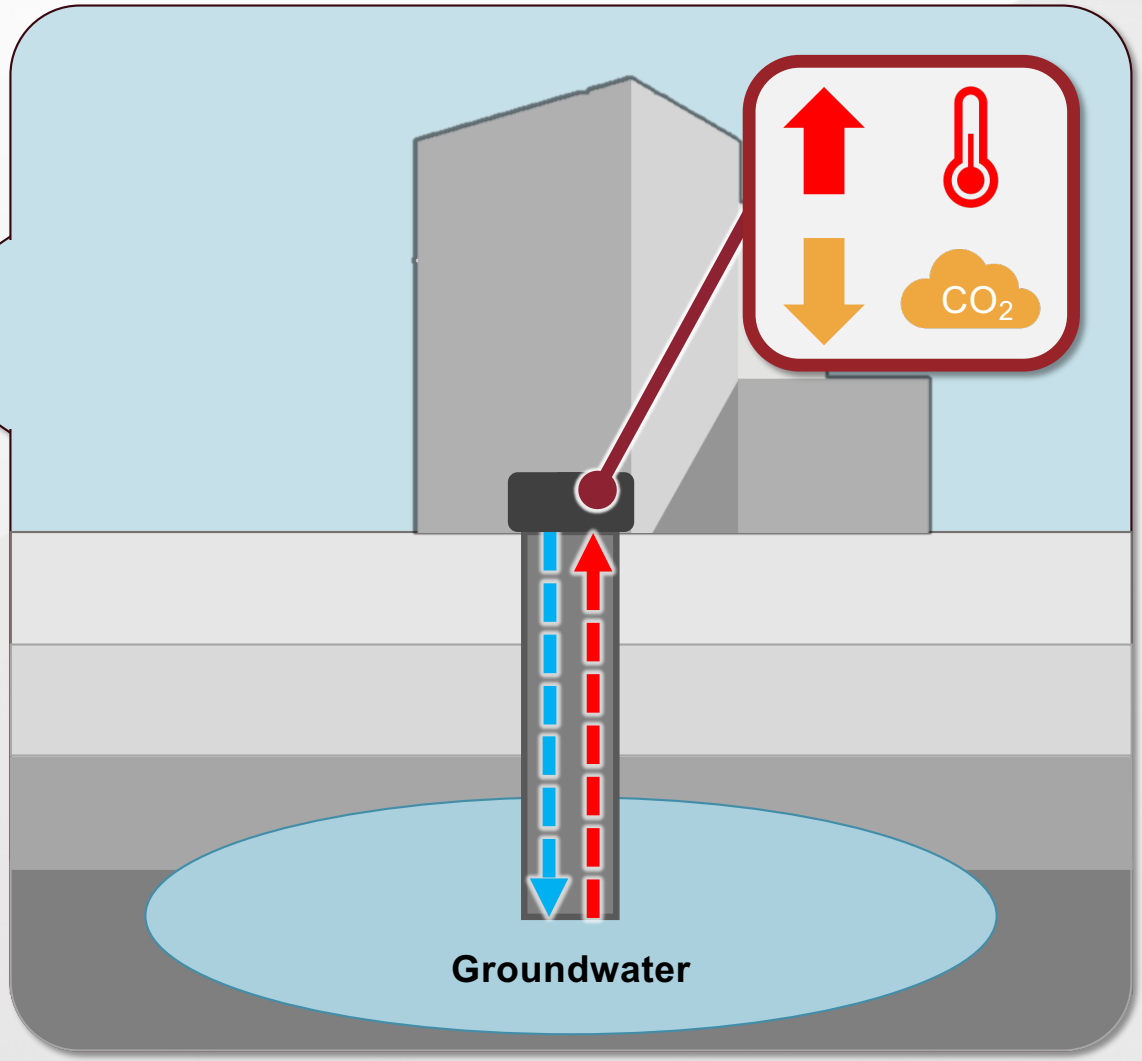
Trees



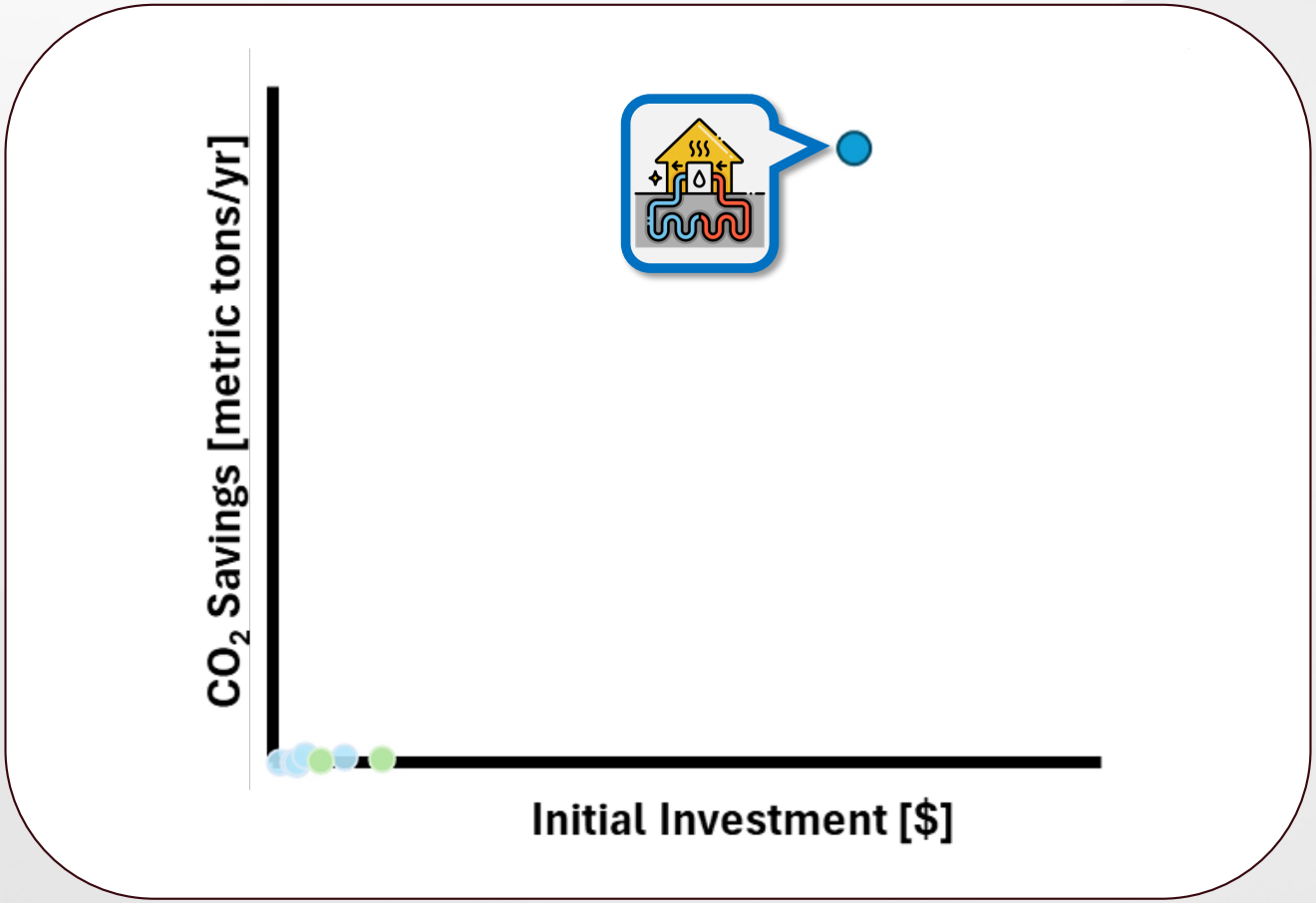
Geothermal Heating

GR Water Resource Recovery Facility

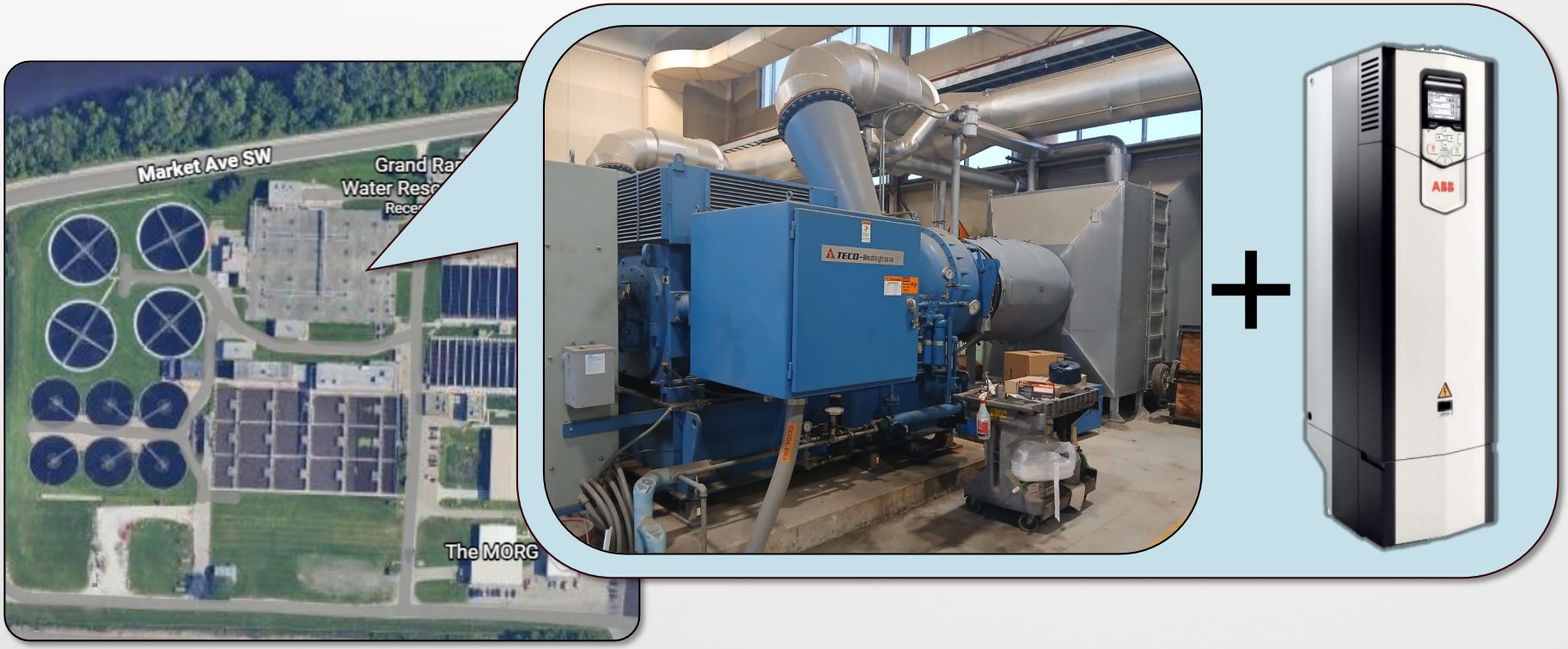

Market Ave SW
Market Ave
Grand Rapids
Water Resource...
Recently viewed
The MORG


CO_2
Groundwater

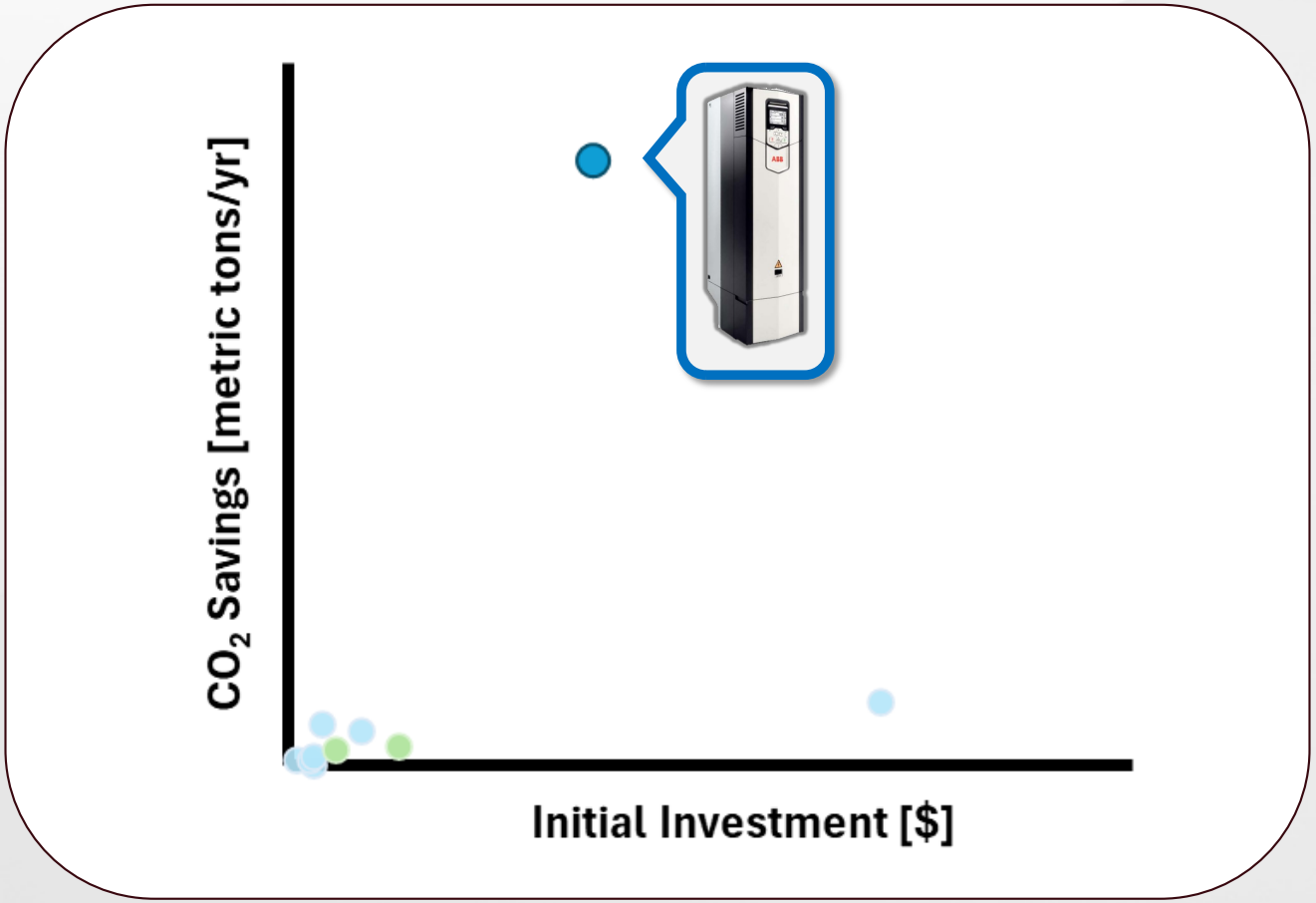
Geothermal Heating



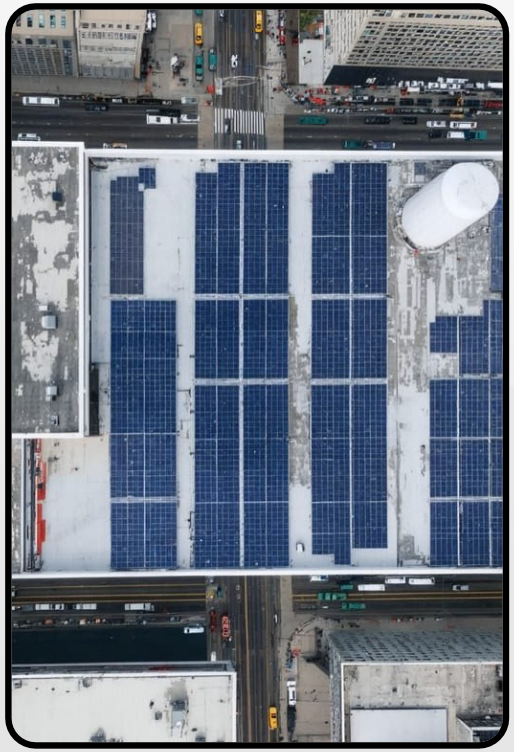
Large VFDs


Market Ave SW
The MORG
TECO-Westinghouse
ABB

Large VFDs



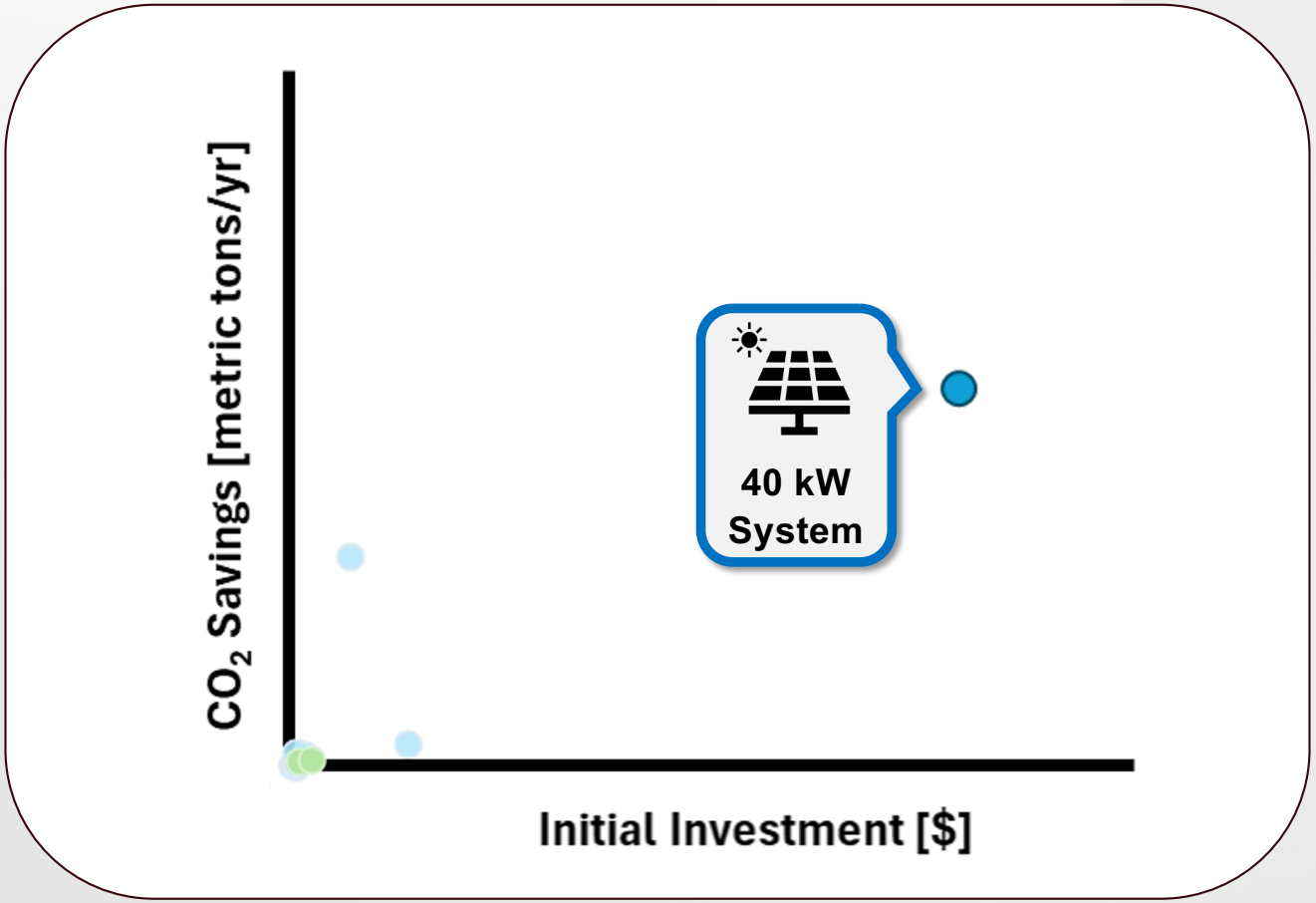
Solar Panel Systems



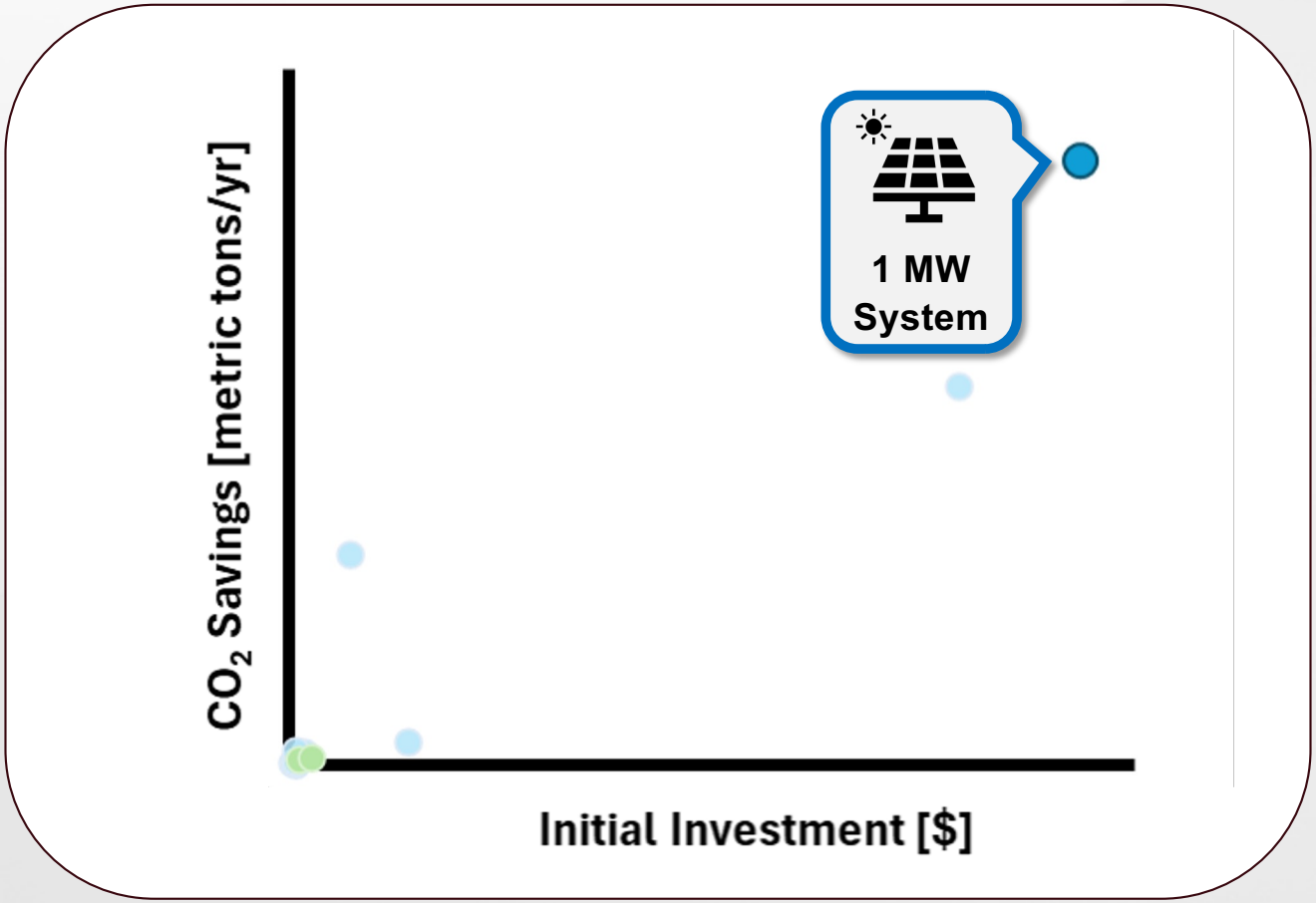
Examples

40 kW system	1000 kW system
• $80,000	• $2,000,000
• 2300 sq. ft (8 parking spots)	• 57,500 sq. ft (1 football field)
• 53,000 kWh/yr	• 1,333,000 kWh/yr
• 22 Tons CO_2/yr	• 544 Tons CO_2/yr

Solar Panel Systems

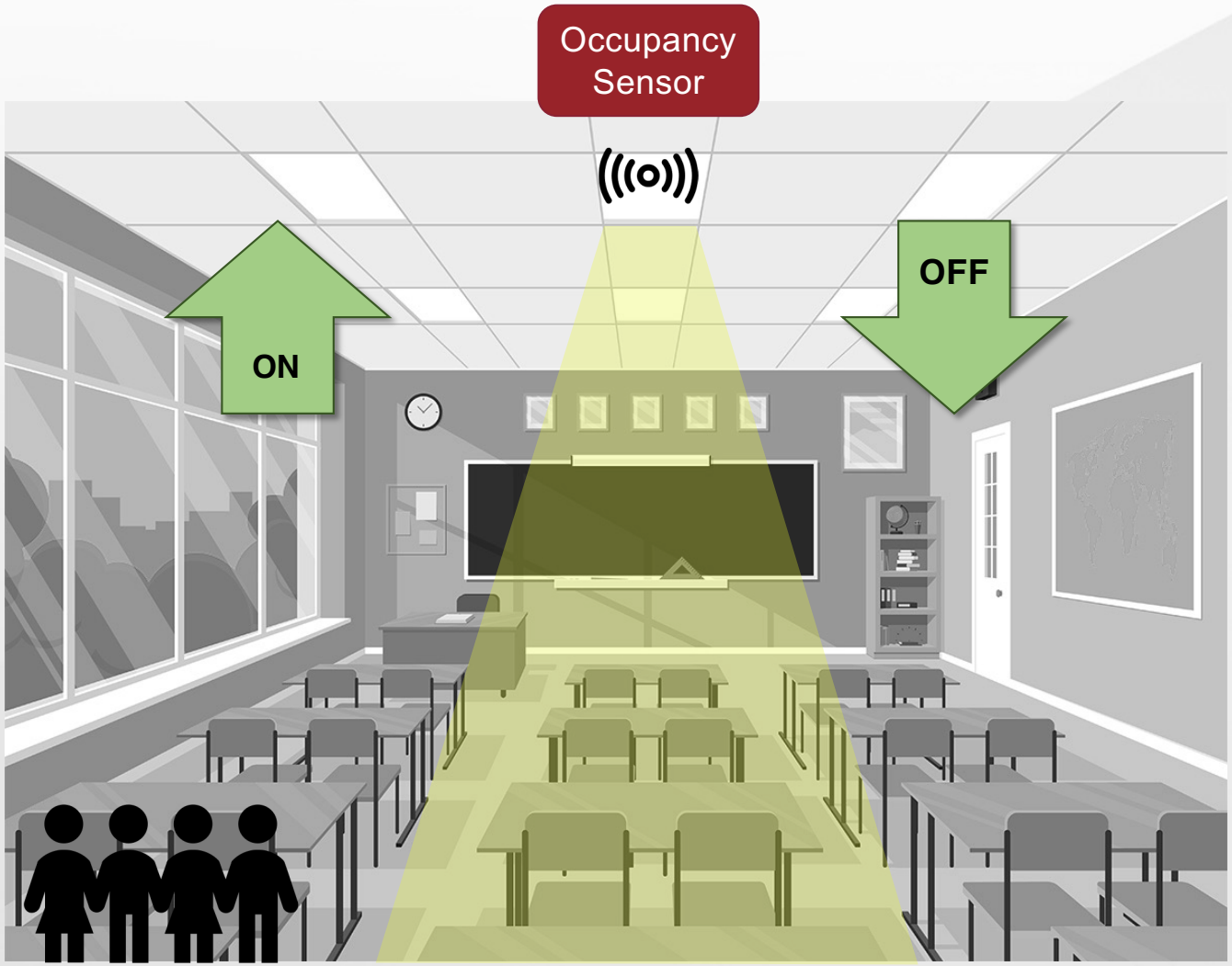


Solar Panel Systems

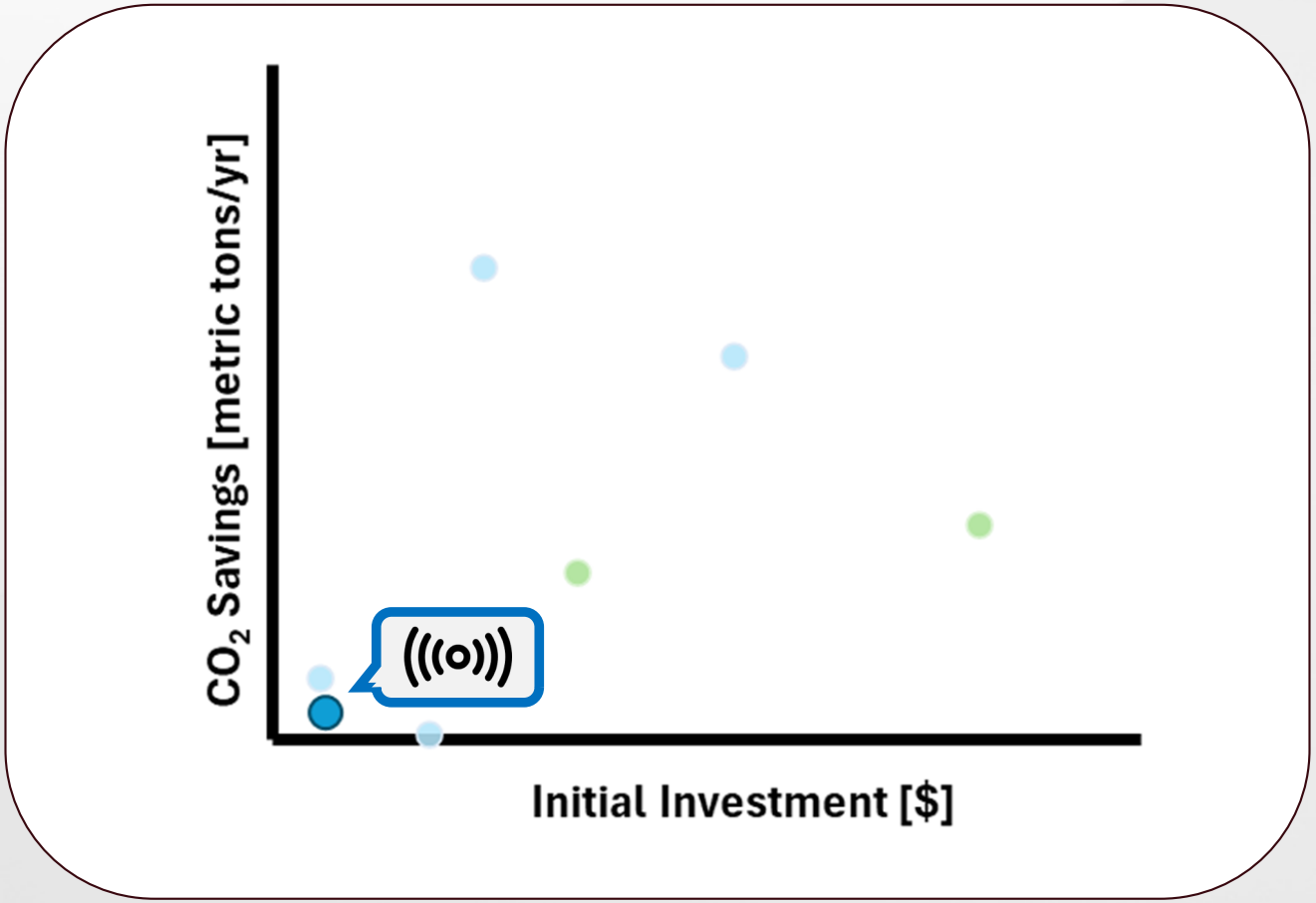



CA FROST
ENVIRONMENTAL SCIENCE
MIDDLE/HIGH SCHOOL
1417
A

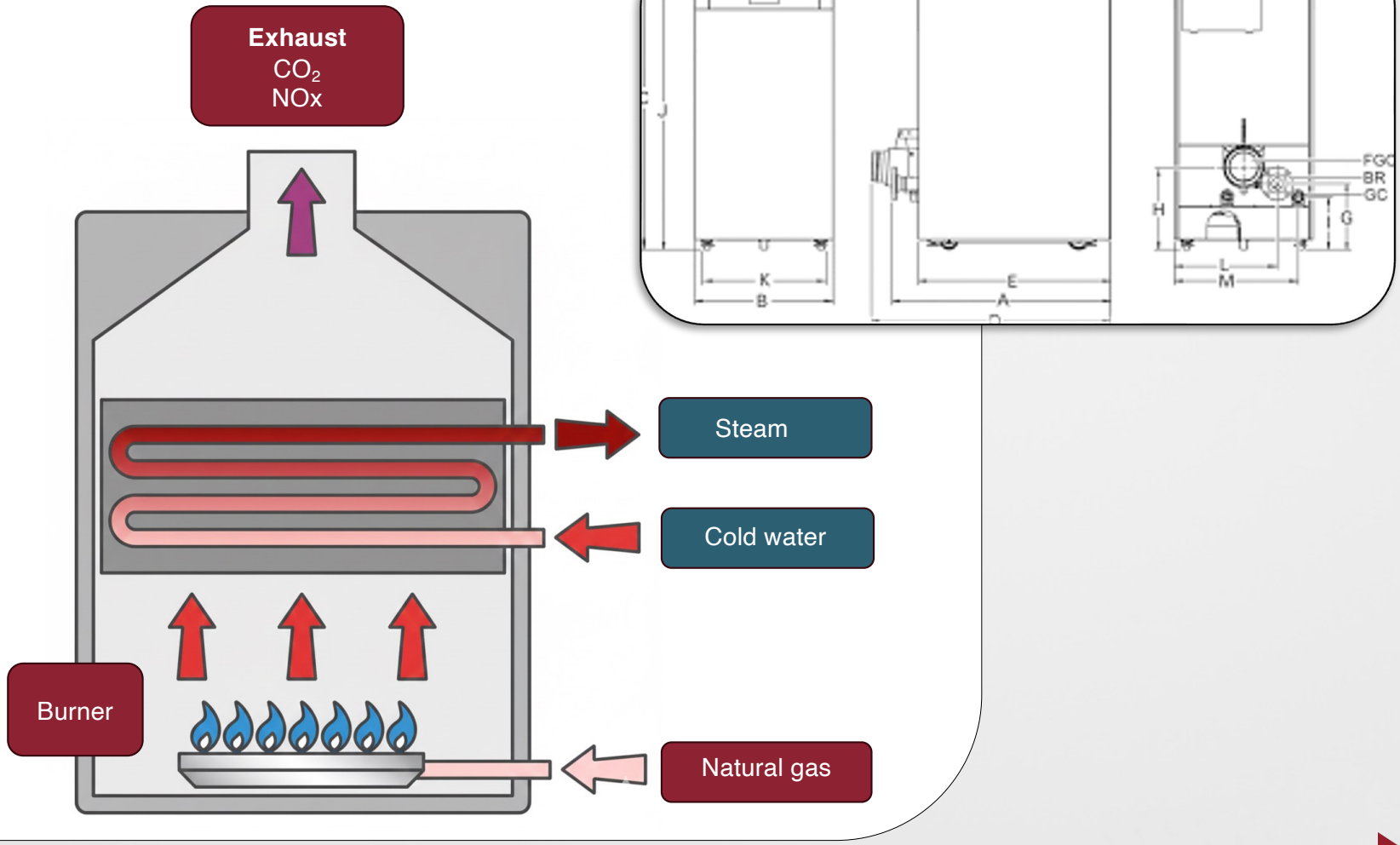
Automatic Lighting Controls


Occupancy Sensor
ON
OFF

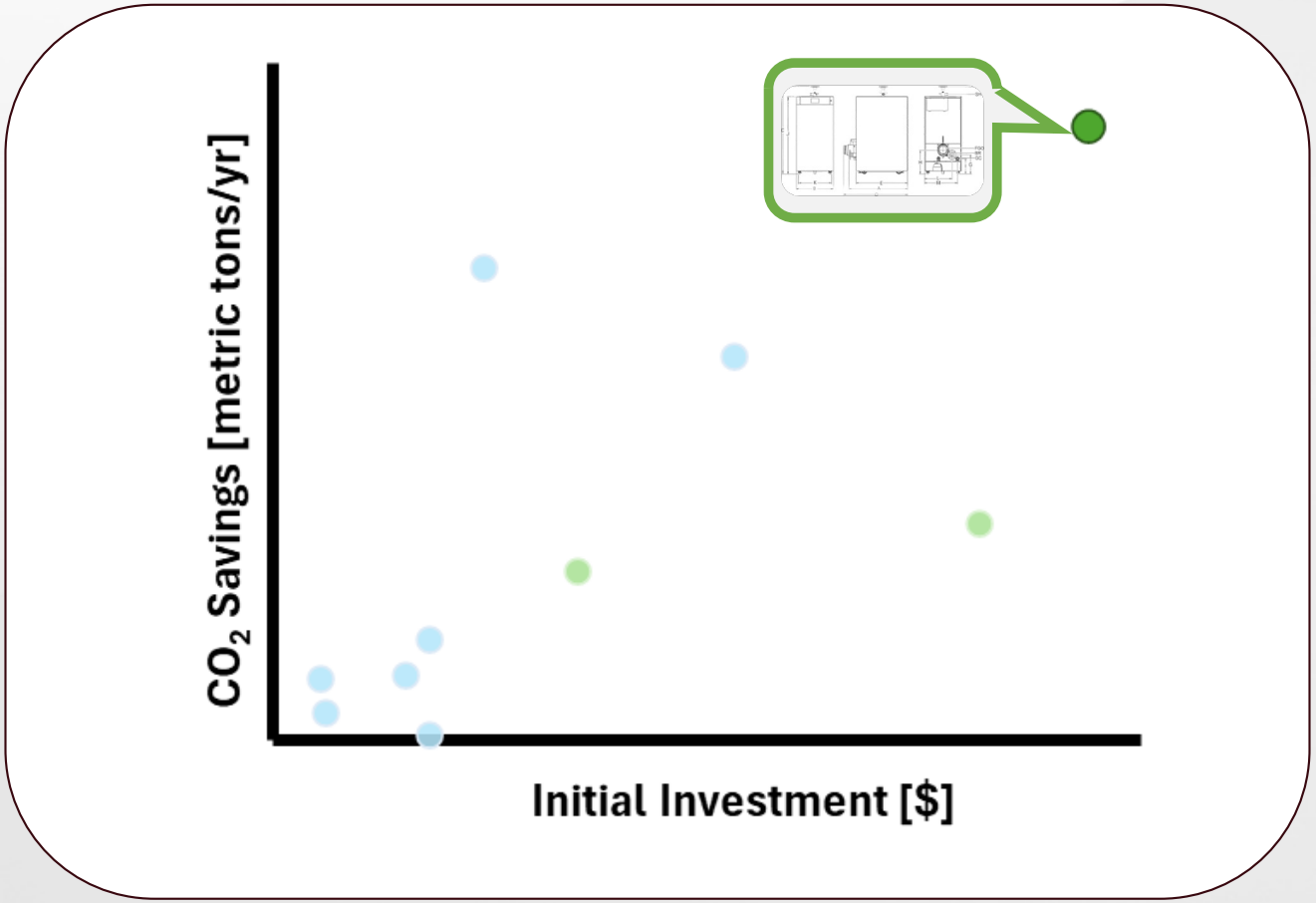
Automatic Lighting Controls



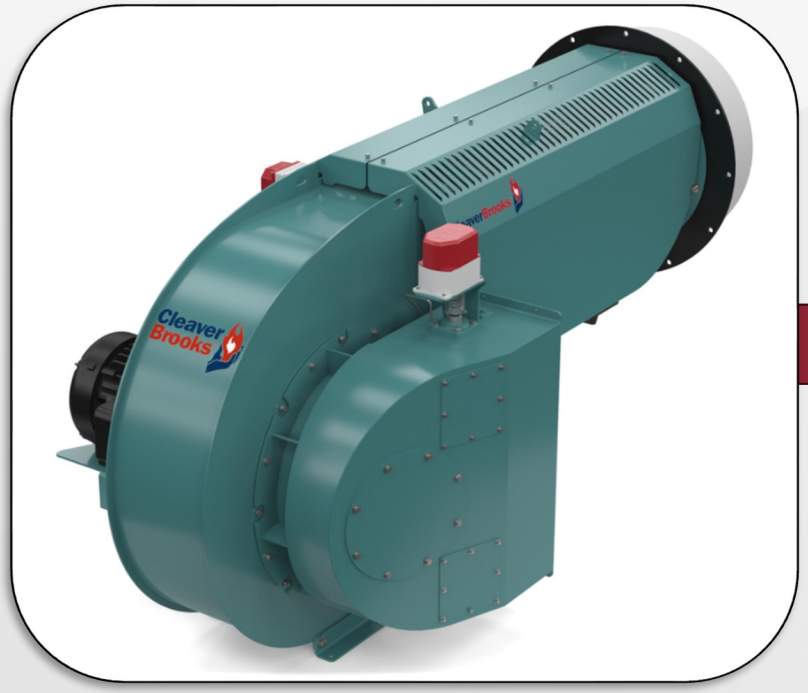
Boiler Replacement


Exhaust
CO_2
NOx
Steam
Cold water
Natural gas
Burner
J
K
B
E
A
H
G
L
M
FGC
BR
GC

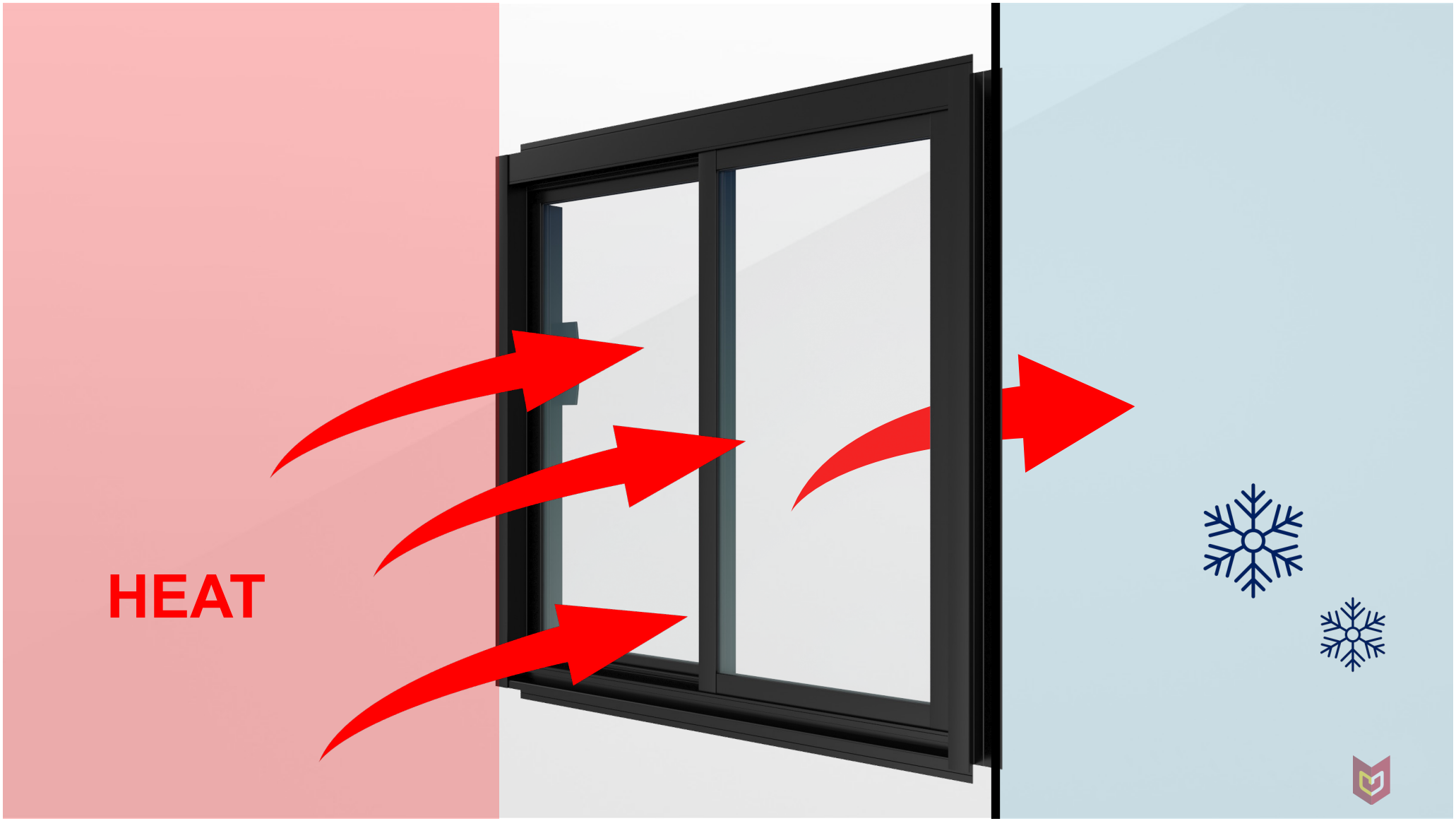
Boiler Replacement



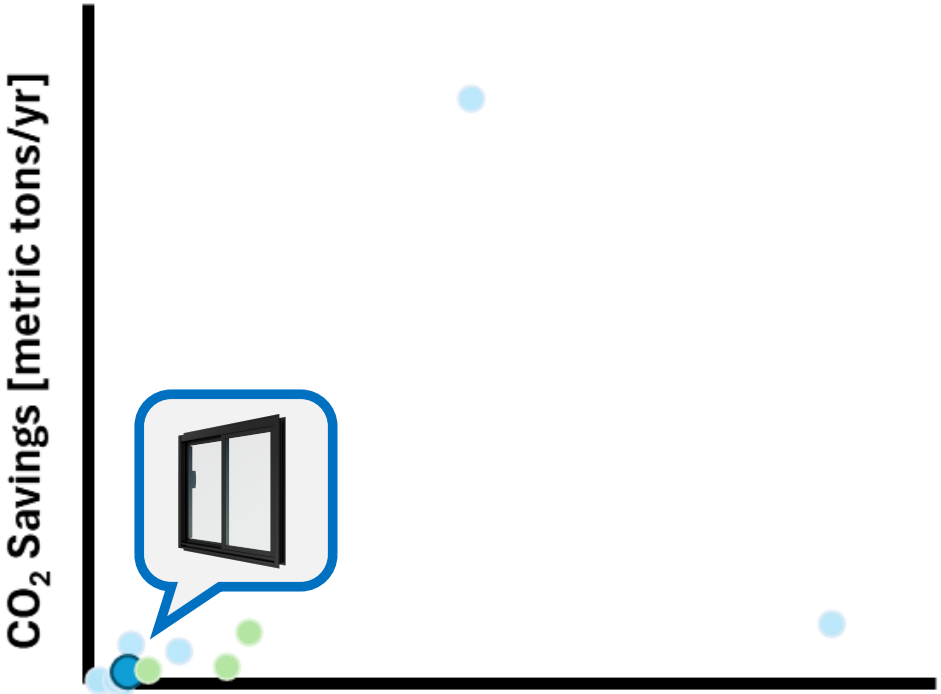
Future Work for Boilers



Windows

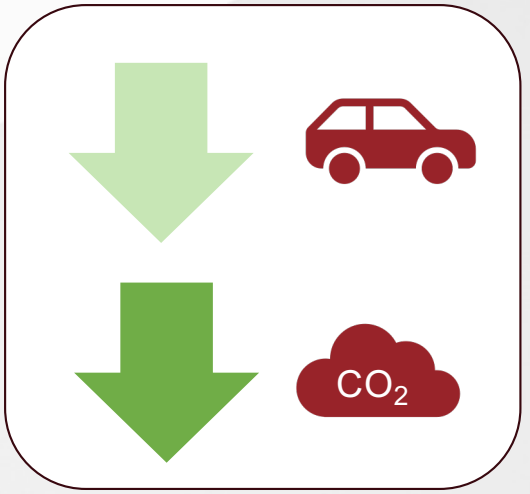

HEAT

Windows



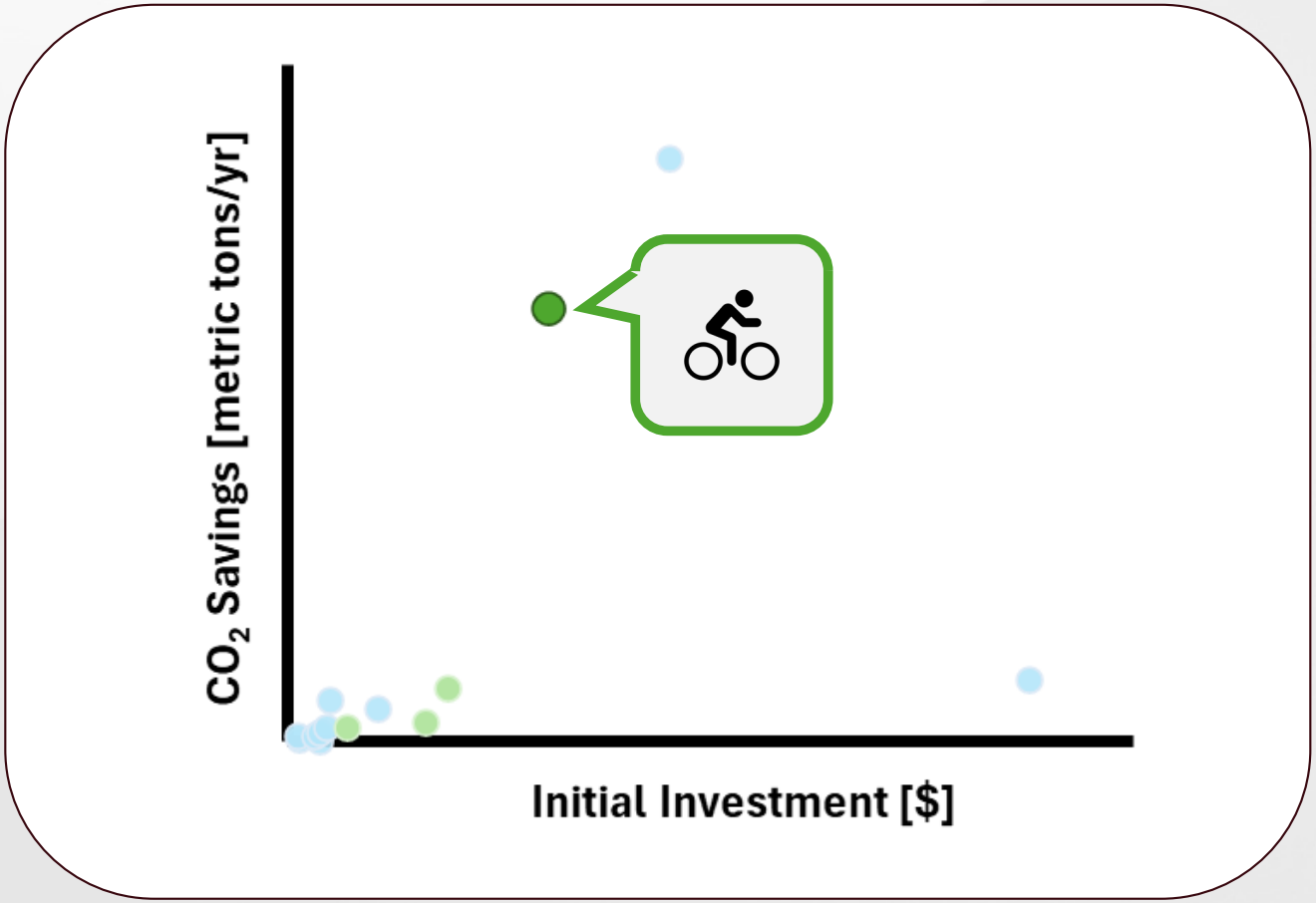
E-bikes


CITY OF GRAND RAPIDS

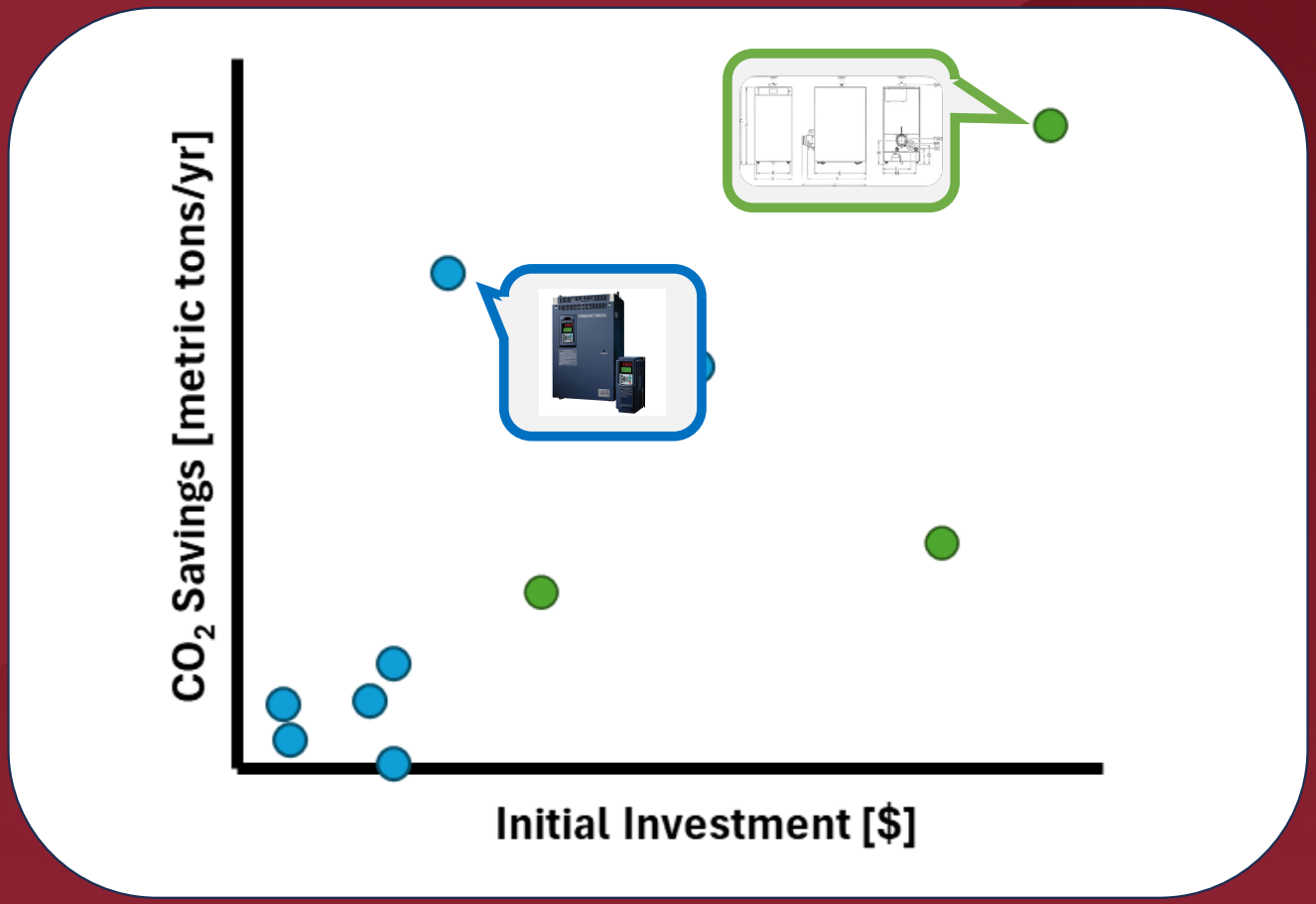

CO_2

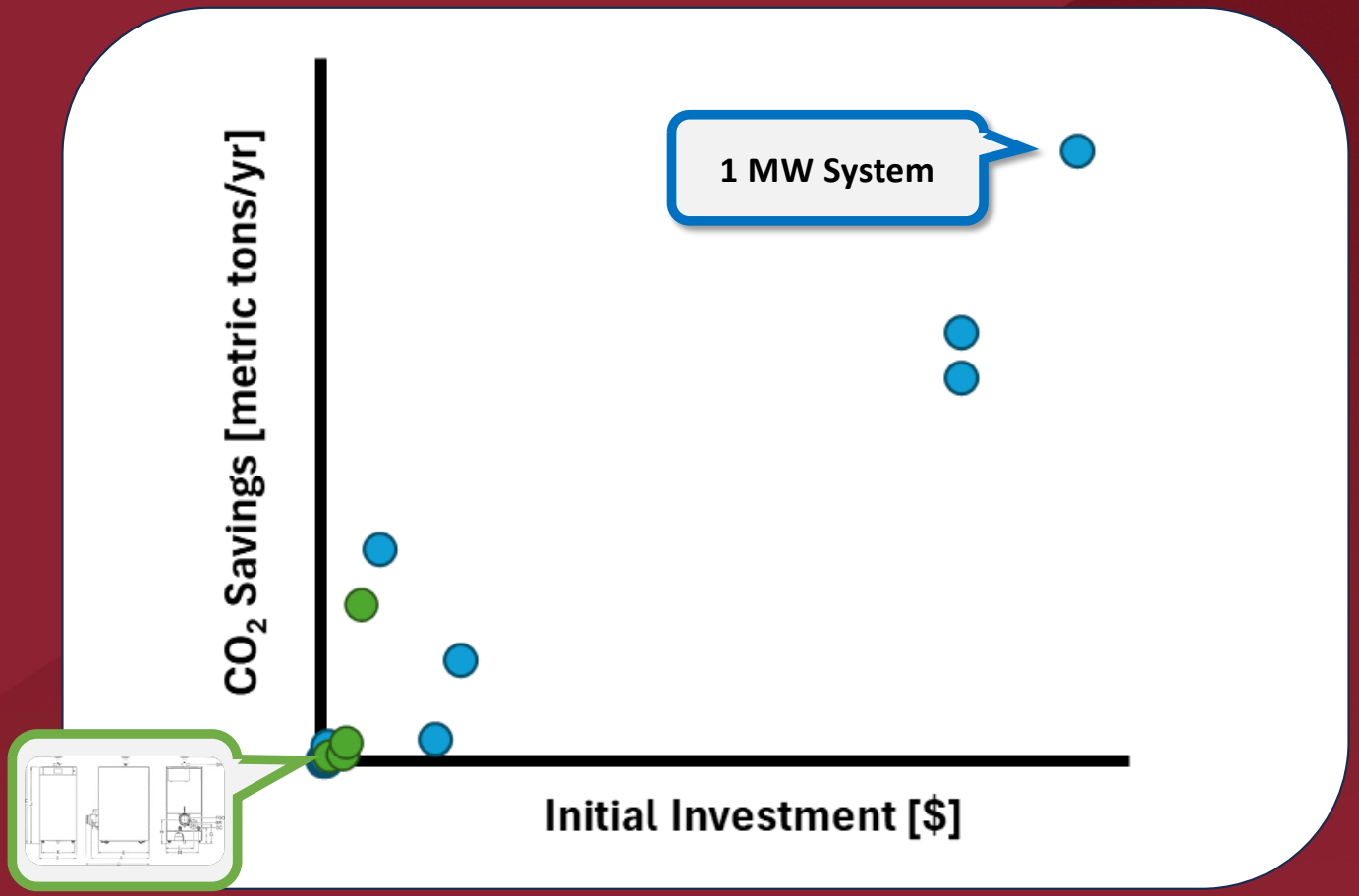
E-Bikes

Rebates



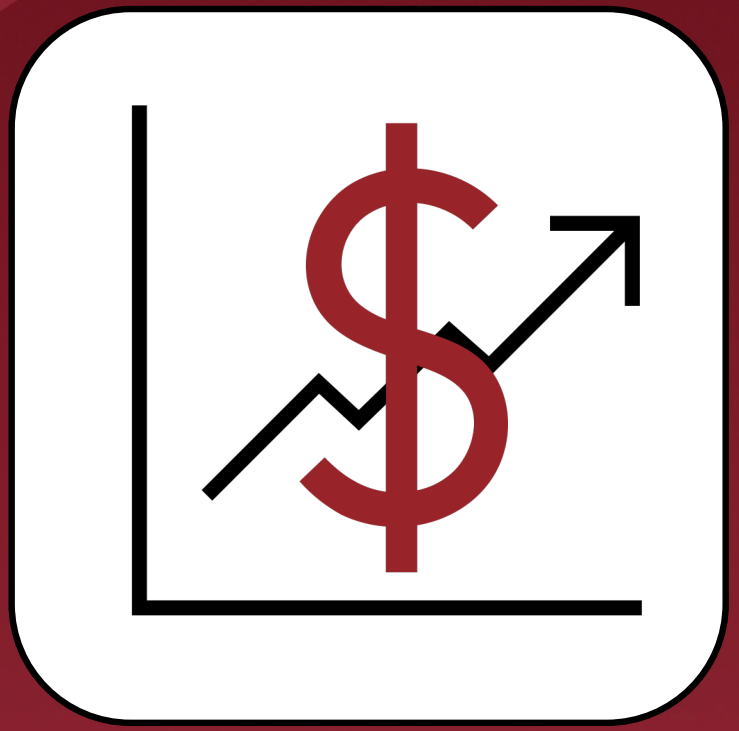
Projects overview


CO_2 Savings [metric tons/yr]
Initial Investment [$]

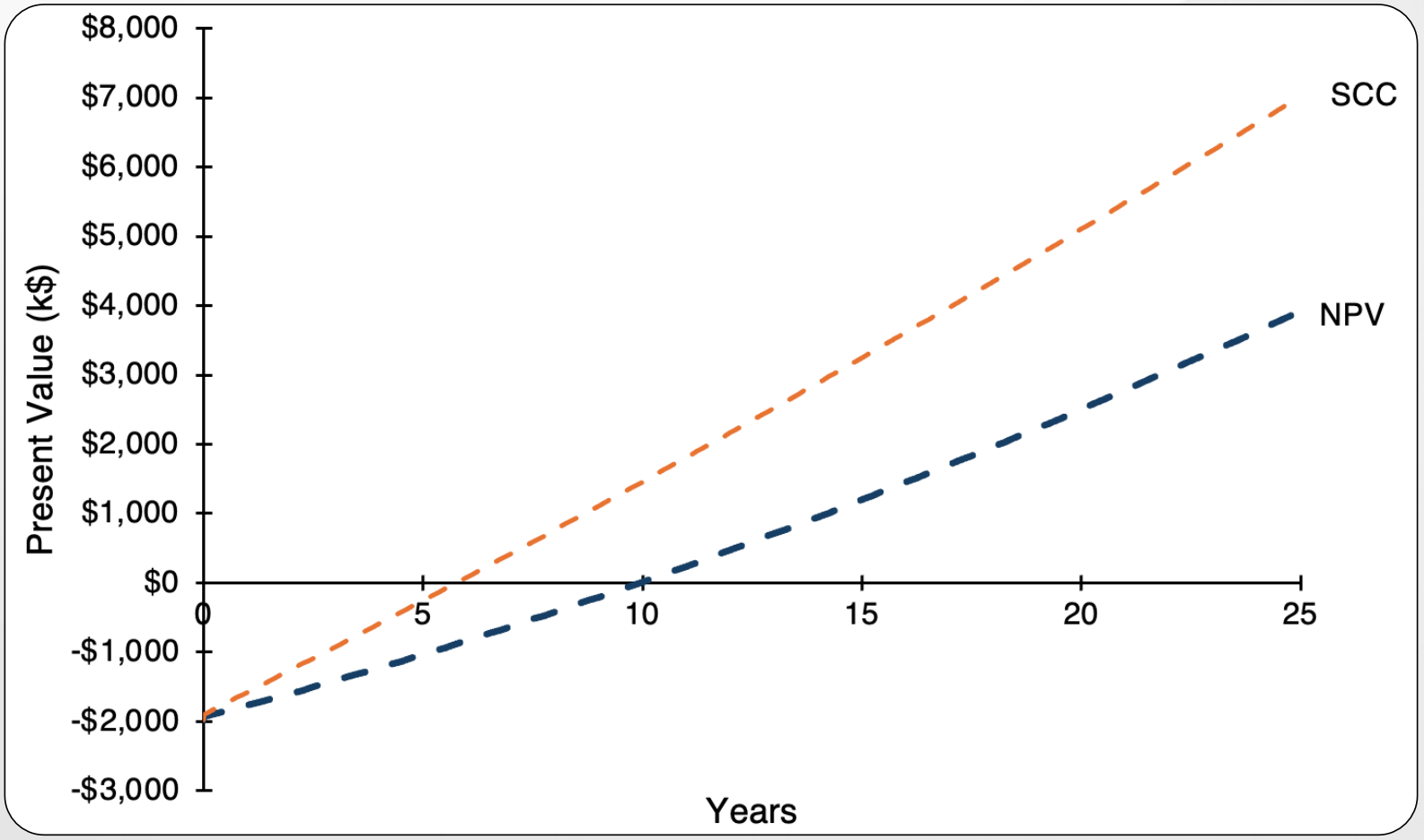

1 MW System
CO_2 Savings [metric tons/yr]
Initial Investment [$]

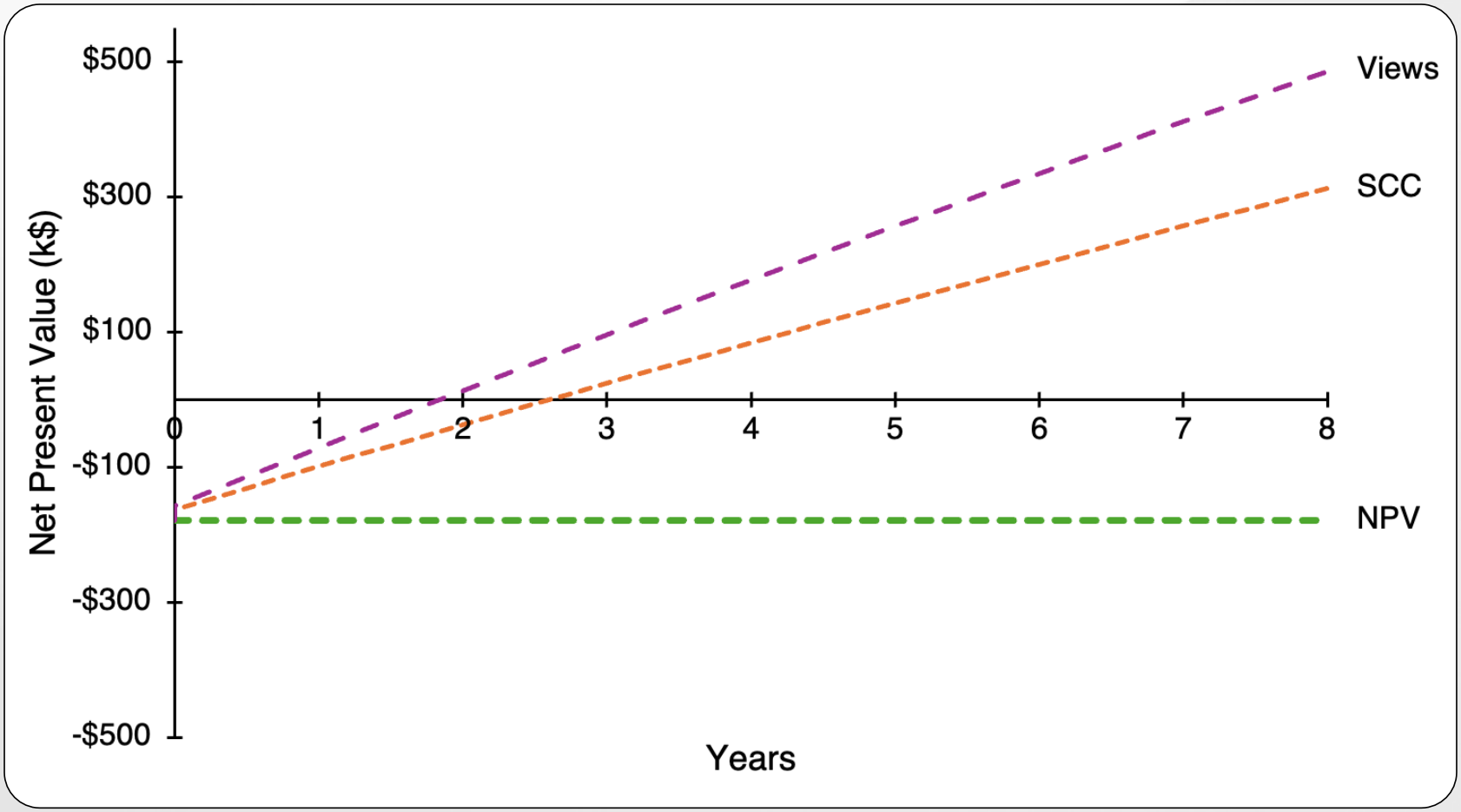
Financial Team

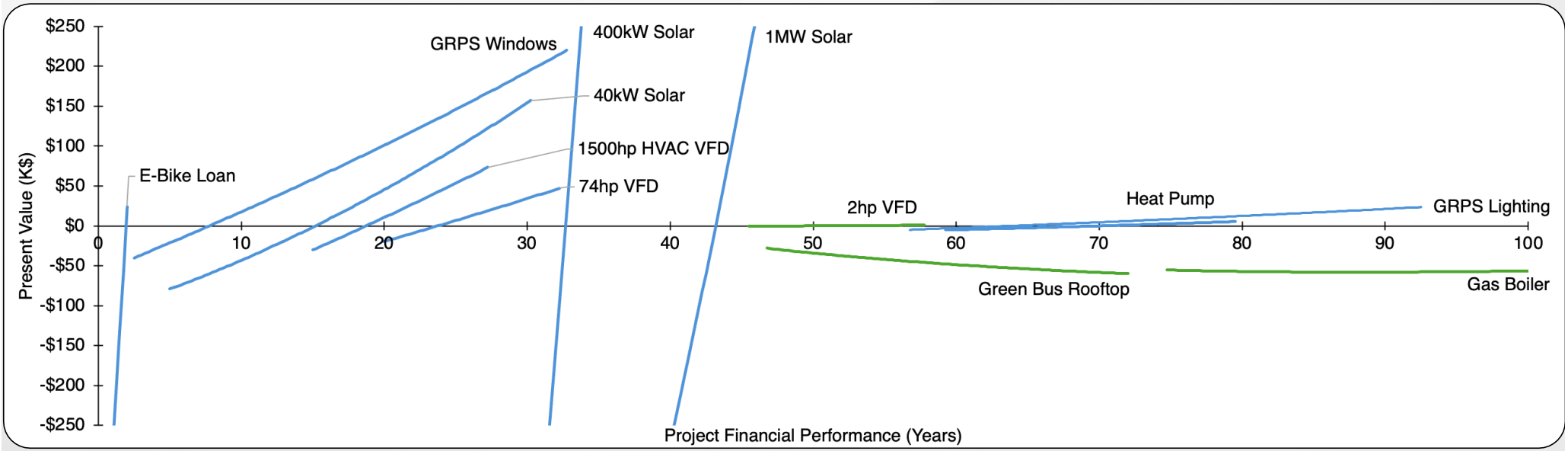
Provides financial analysis of the GRGRF, including cashflow projections



Example Project			
		Savings Metrics	Total
Project Implementation		Cost Savings ($)	$1,197,129
Installation Cost ($)	-$200,000	Energy Savings (kWh)	1,696,800
Maintenance Cost ($ / quarter)	-$1,000	CO2 Savings (Metric tons)	693
End of Life Cost ($)	-$3,000	Natural Gas Savings (MCF)	10100
Project Length (years)	25	Gasoline Savings (Gallons)	101000
Inflation (Elec) (%)	0.05	Water Savings (Gallons)	101000
Inflation (Natural Gas) (%)	0.02	Views	5000000
Inflation (Water) (%)	0.02	CO2 Cost Savings ($)	$200,880
Inflation (Gasoline) (%)	0.0346		
Cost of money (1/yr)	0.04		
Quartly Interest Rate (%)	0.0099		
Rebate ($)	$1,000		
Net Present Value ($)	$428,558		
NPV Fund ($)	$84,441		


$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
-$1,000
-$2,000
-$3,000
Present Value (k$)
0
5
10
15
20
25
Years
SCC
NPV


$500
$300
$100
-$100
-$300
-$500
Net Present Value (k$)
0
1
2
3
4
5
6
7
8
Years
Views
SCC
NPV


$250
$200
$150
$100
$50
$0
-$50
-$100
-$150
-$200
-$250
Present Value (K$)
0
10
20
30
40
50
60
70
80
90
100
GRPS Windows
400kW Solar
1MW Solar
40kW Solar
1500hp HVAC VFD
E-Bike Loan
74hp VFD
2hp VFD
Heat Pump
GRPS Lighting
Green Bus Rooftop
Gas Boiler
Project Financial Performance (Years)

Overall Fund Cash Flow

Year 1:

80 kW of Solar Panels
3 Window Projects
3 Lighting Projects
1 Gas Boiler
1 E-bike Loan Project

Year 2.75:

120 kW of Solar Panels

Year 5:

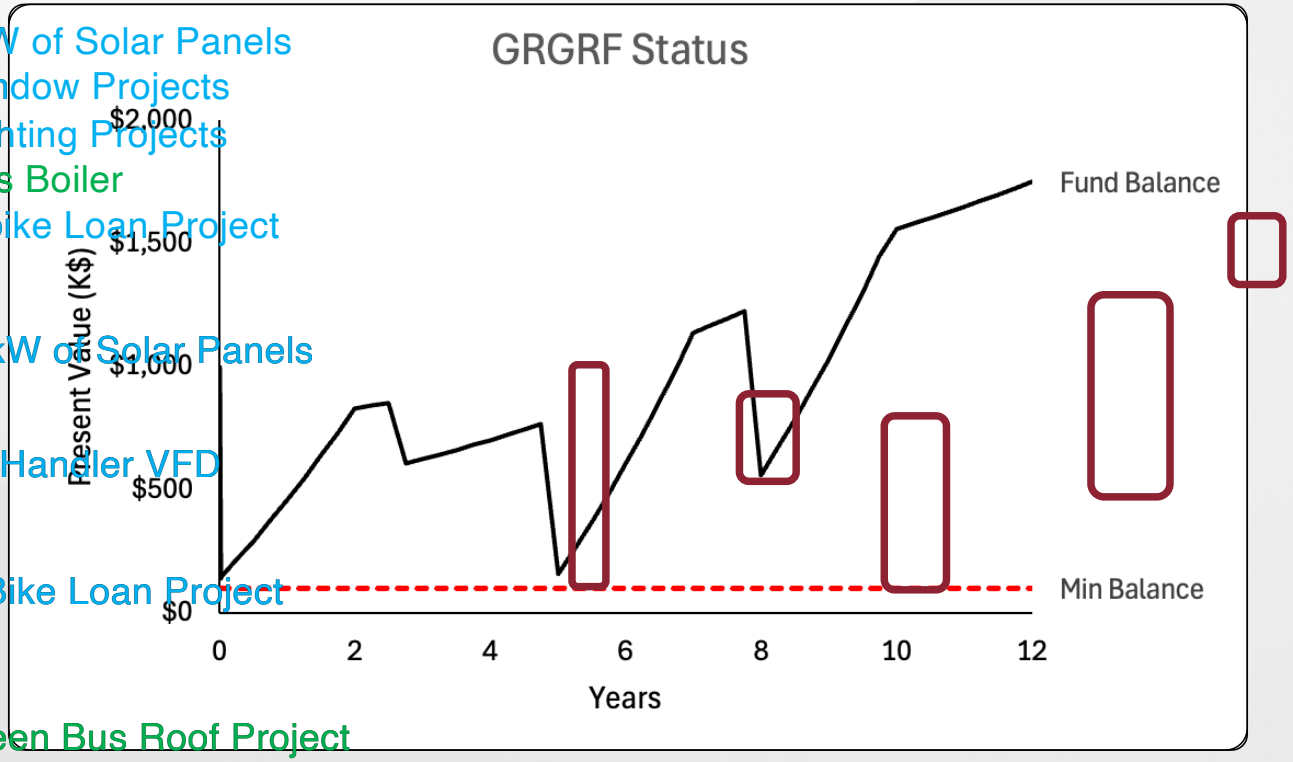
1 Air Handler VFD

Year 8:

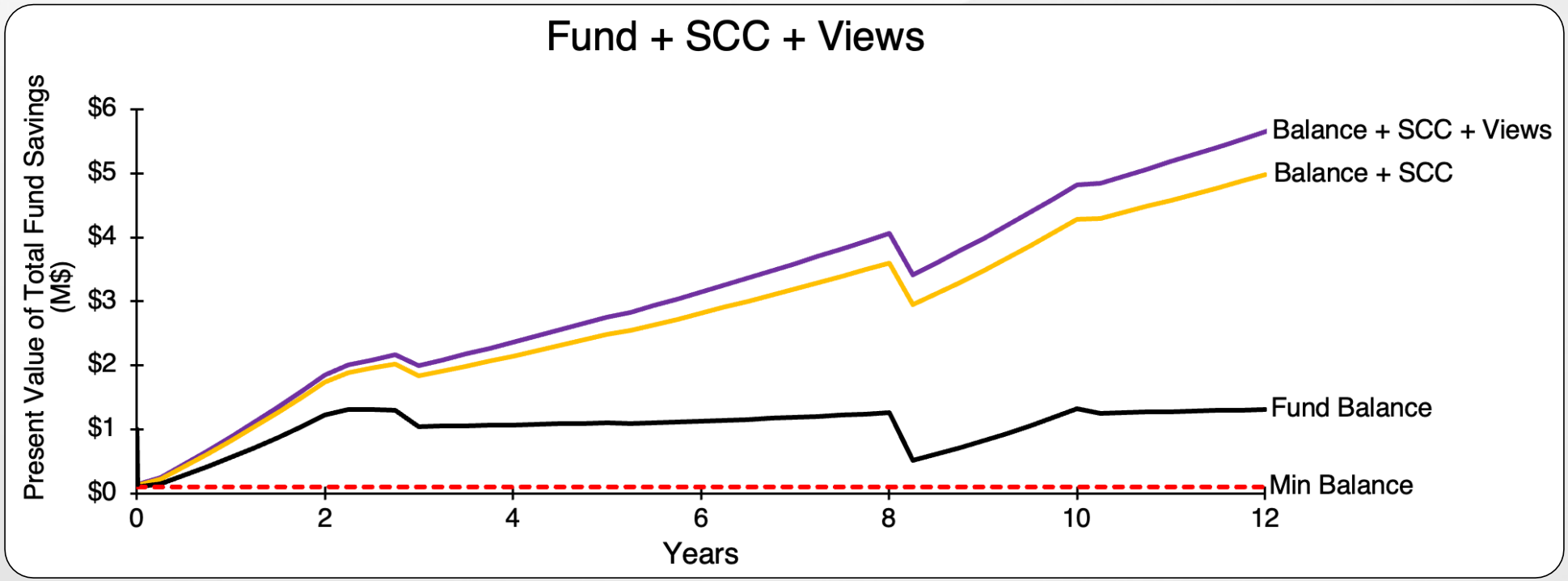
1 E-Bike Loan Project

Year 10:

1 Green Bus Roof Project



Overall Fund Cash Flow



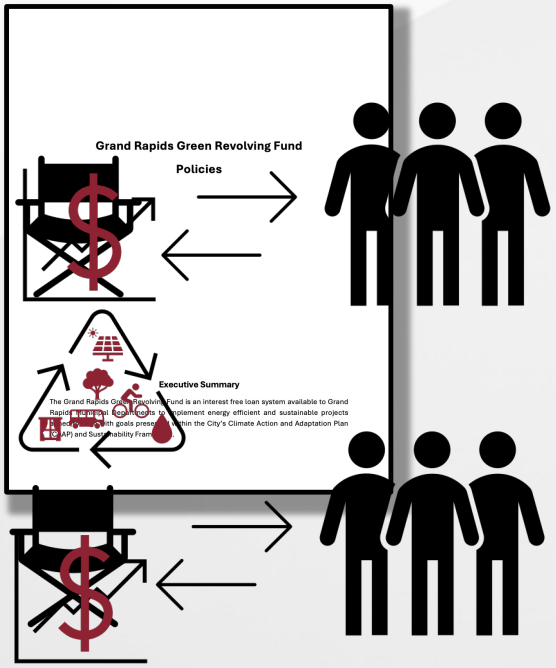
Conclusions and Next Steps

The Overarching Question:

What would it take for the City of Grand Rapids to establish and operate a Green Revolving Fund?

What would it take for the City of Grand Rapids to establish and operate a Green Revolving Fund?

- Policies
- An oversight board
- Seed money
- Project
  - Proposals
  - Feasibility analysis (by the board)
  - Implementation contracts
  - Monitoring
- Reporting by the board
- Cost delivery mechanism



We believe that a GRF is feasible for the City of Grand Rapids to assist meeting CAAP goals

Acknowledgements

Professor Heun, for continual guidance and feedback.

Thank you,
ENGR 333

- Mayor David LaGrand
- Annabelle Wilkinson
- Mike Troupos
- Jonathan Hand
- Brett Hoogewind
- Kevin Greene
- Marc Bennett and Alex Smart at GRPS
- Kelsey Groesbeck and Paul Bootsma at TowerPinkster
- Jason Malone from WRRF
- Darcy Solutions

Thank you

Questions

Appendix

APPENDIX Table of Contents

Class Learnings

Class Learning

Class Learnings

This course felt like a life lesson packaged as an engineering class.

- Get a ballpark answer first, then narrow it down!
- Sometimes a project that doesn't make money can be viable in other ways.
- Interface, interface, interface: Looking back, the most important factor is the frequency of interfacing/meetings between the teams.
- Iteration (in the engineering sense) also applies to finance.
- Normally engineering problems (in classes) have a clear set of givens, one way to find the answer, and it can always be solved. In real life, that's not always the case. I enjoyed getting to define a problem and trying a lot of different ways to get a good answer for each analysis.
- This class has made me more confident in communicating with those who aren't doing the same work I am.

Class Learnings

- Policy-making is incredibly difficult. It is so hard to think of what is necessary and to remember to explicitly write all things that seem obvious. I didn't realize how many iterations we would need to go through for each policy.
- One of the best ways to make progress on a project is by working with others.
- I liked having a class project that had real impact on others. It felt like I was making more of a difference than how I feel when I'm doing homework.
- Aligning priorities across multiple teams takes patience and collaboration.
- Planning to organize information is crucial in a team setting.
- Learning how to motivate others is a necessary skill that both builds confidence in your team members and improves effectiveness.
- I did not expect to need some nontechnical skills, because I neglected to consider that our ideas and work are only as good as we communicate and present to the customer