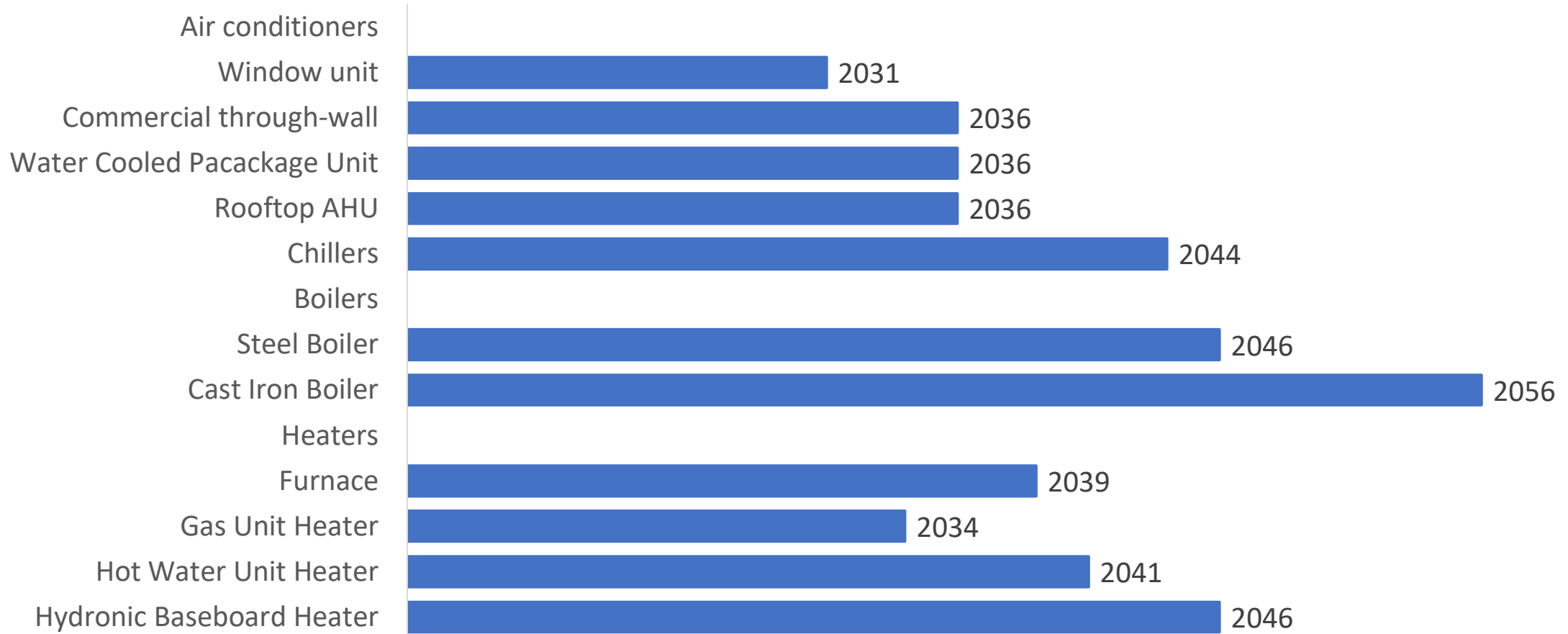


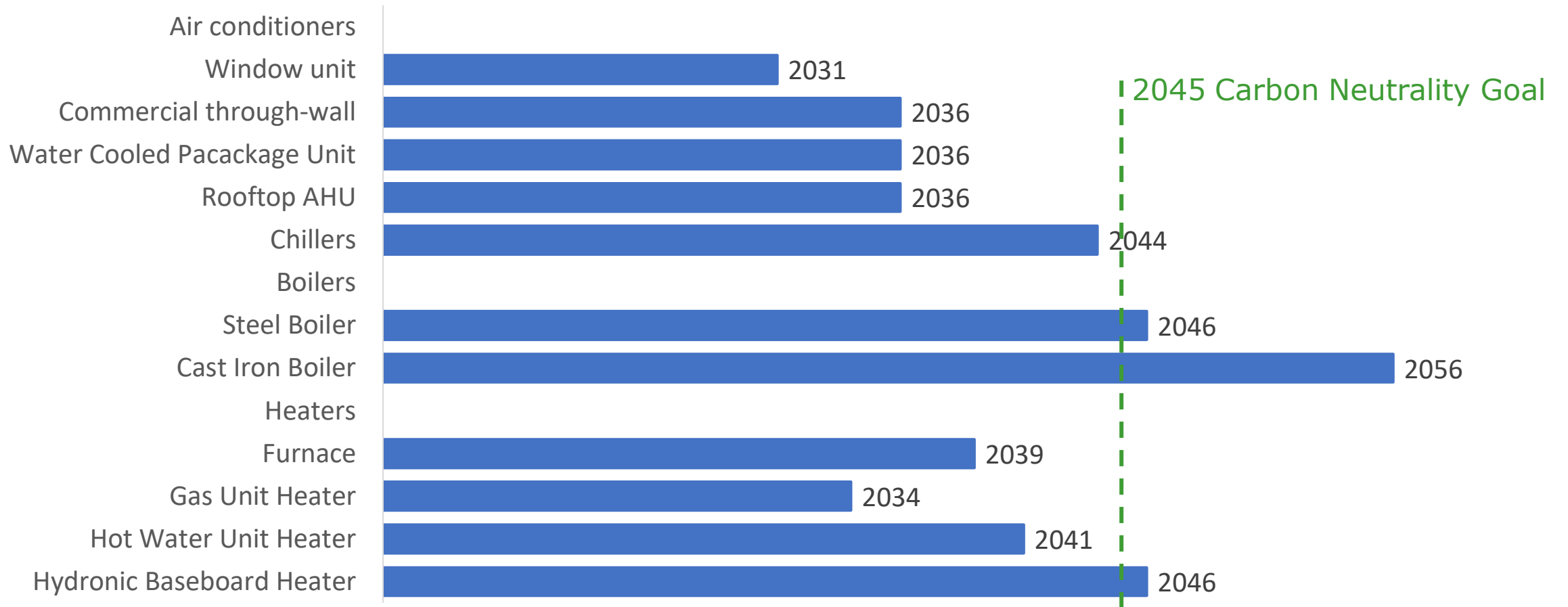
Good News! - If You Act Today, This is Still Easy

Expected Burnout Date of Equipment Installed in 2021 (ASHRAE)



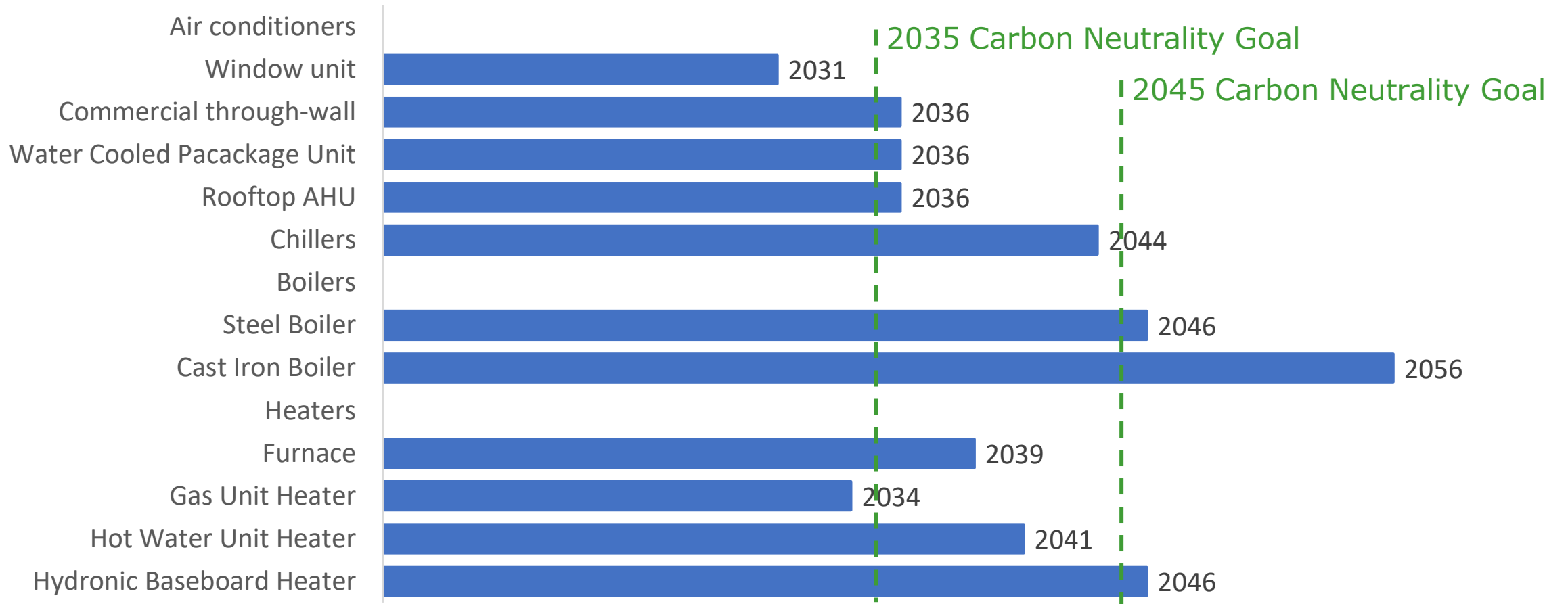
Good News! - If You Act Today, This is Still Easy

Expected Burnout Date of Equipment Installed in 2021 (ASHRAE)



If You Act Today, This is Still Easy

Expected Burnout Date of Equipment Installed in 2021 (ASHRAE)

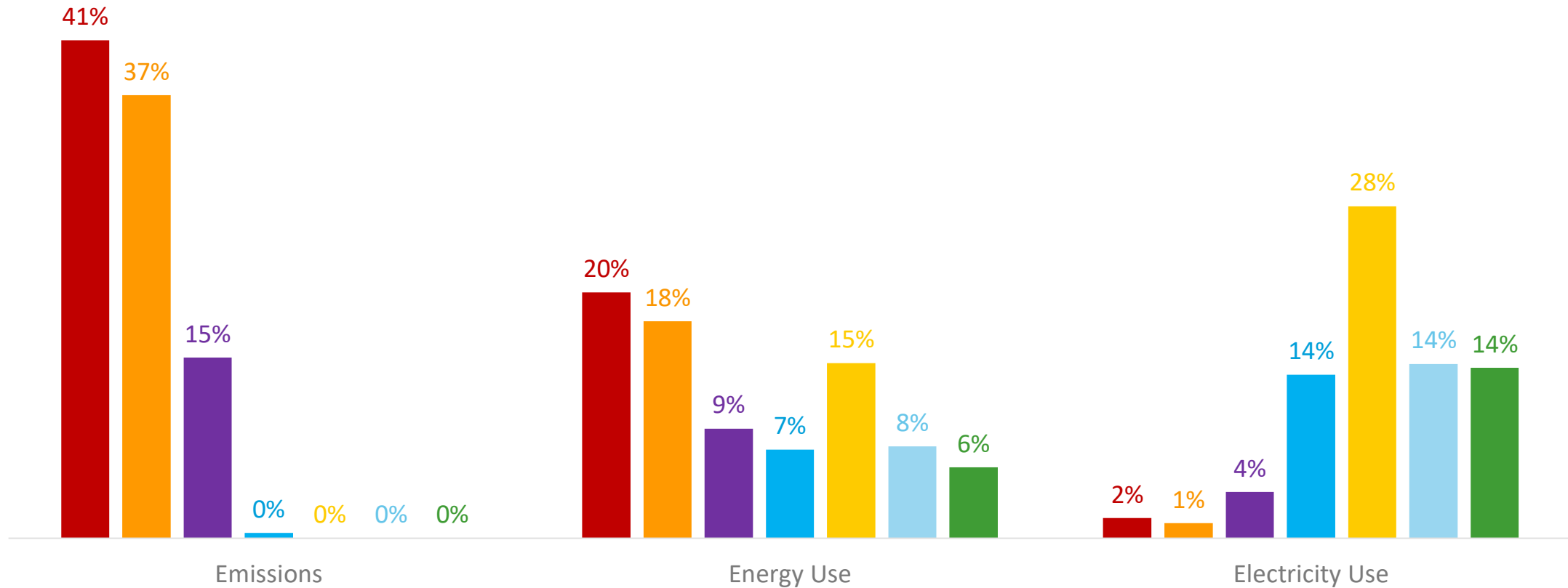


WHY?

Overview of Effective Electrification

Annual Energy Use as a Percentage of Total Palo Alto Building Energy Use

■ Space Heating ■ Water Heating ■ Cooking ■ Cooling ■ Lighting ■ Refrigeration ■ Plug Loads

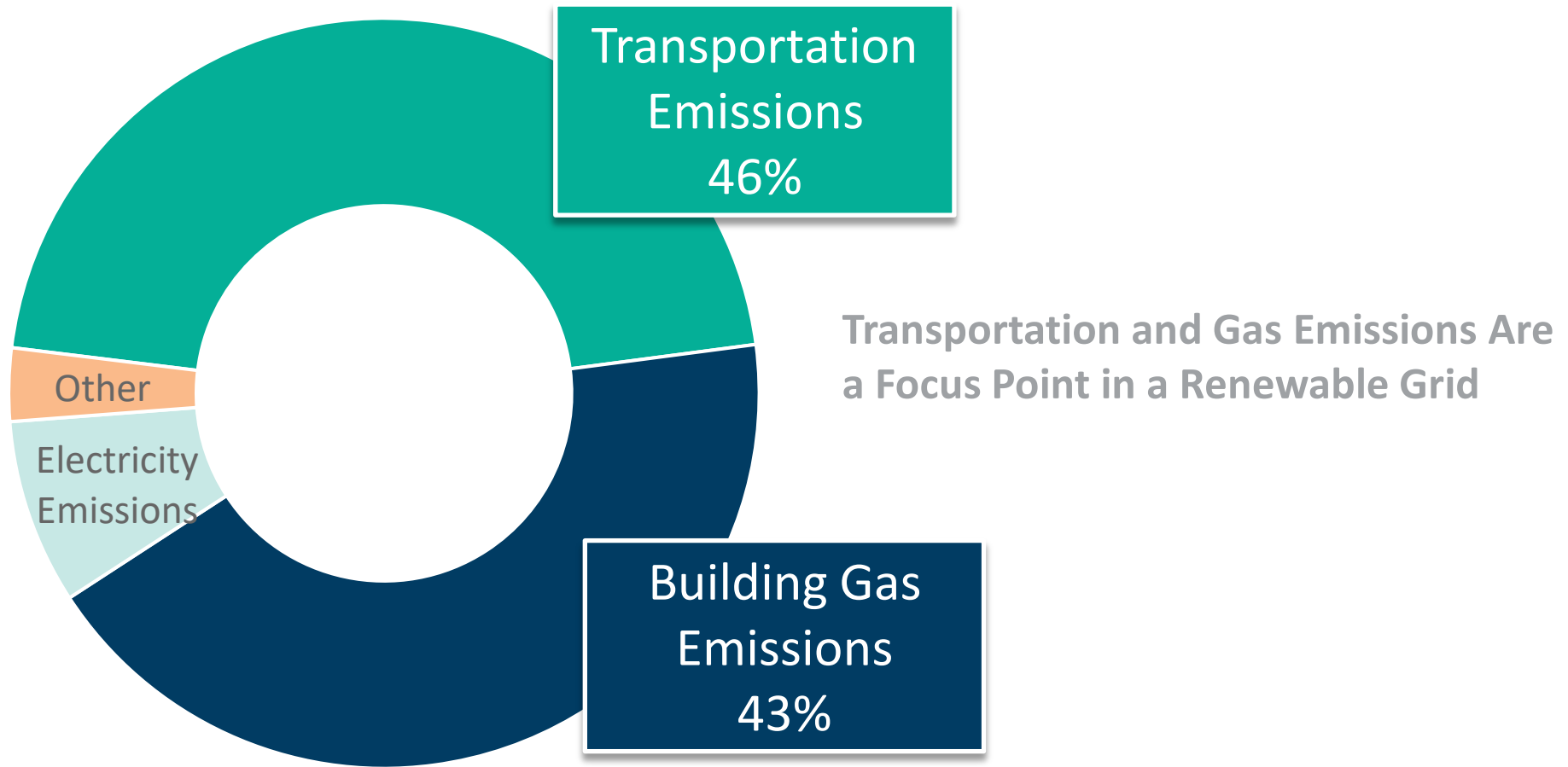


Overview of Effective Electrification



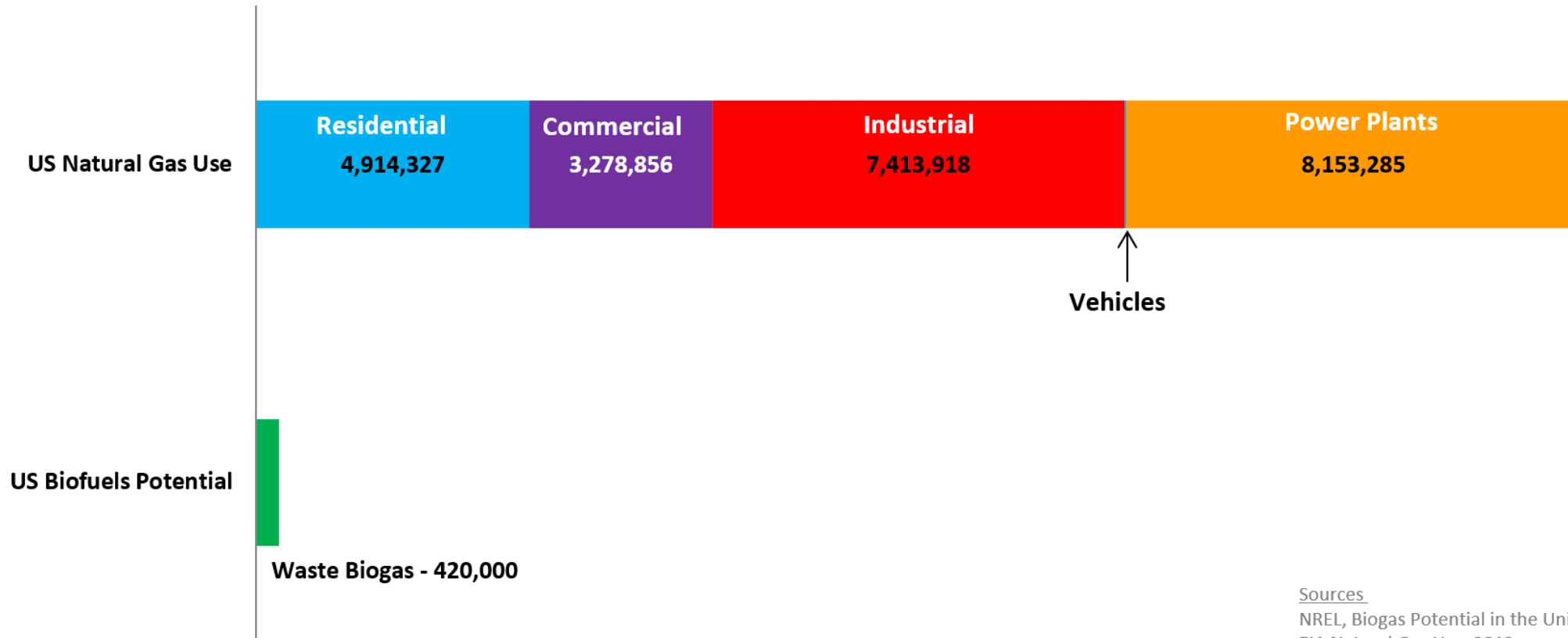
The Triple Bottom Line

Planet - The Emissions Story



Planet - The Emissions Story

Annual Natural Gas Consumption, United States (mmcf)

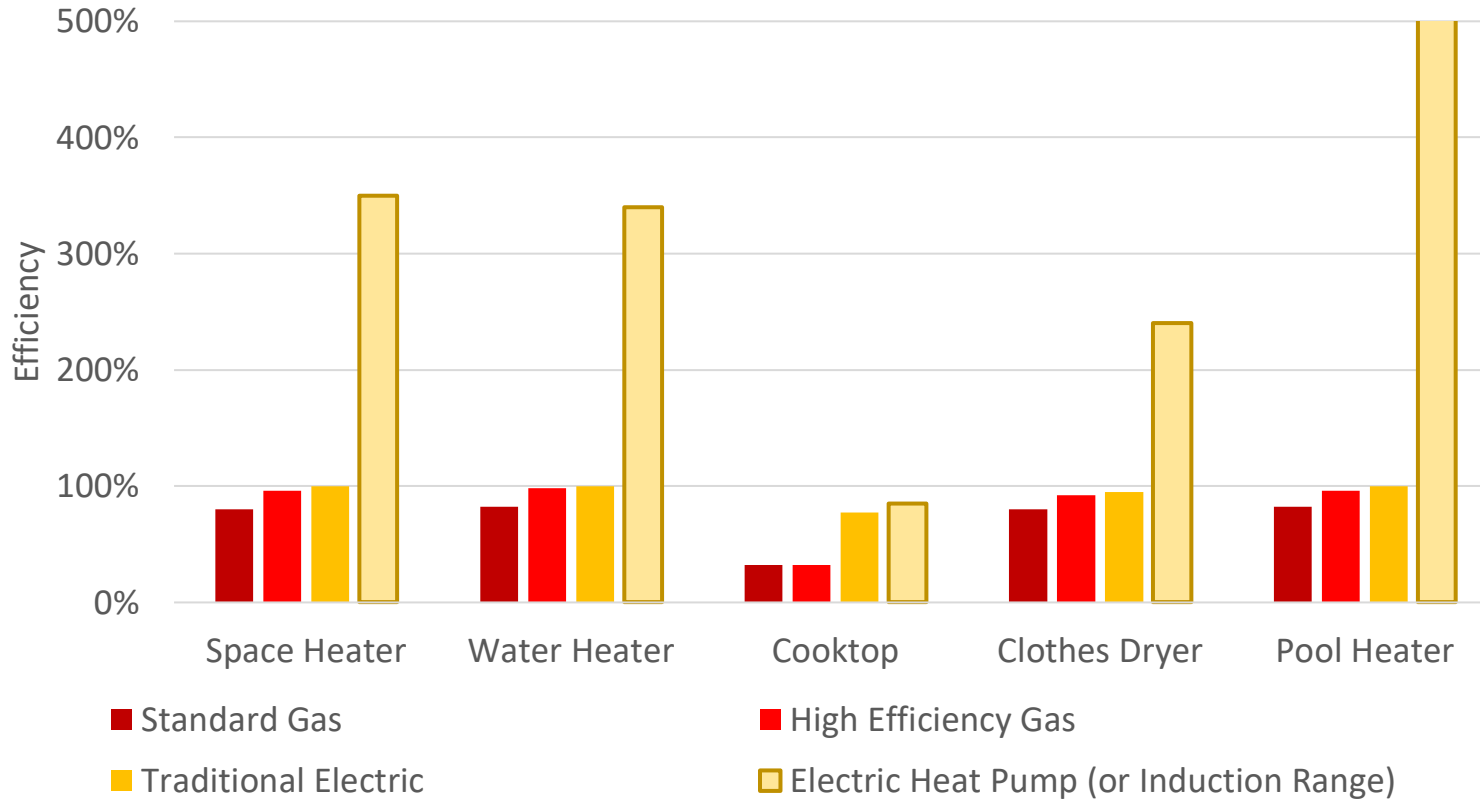


Sources

NREL, Biogas Potential in the United States
EIA Natural Gas Use, 2013

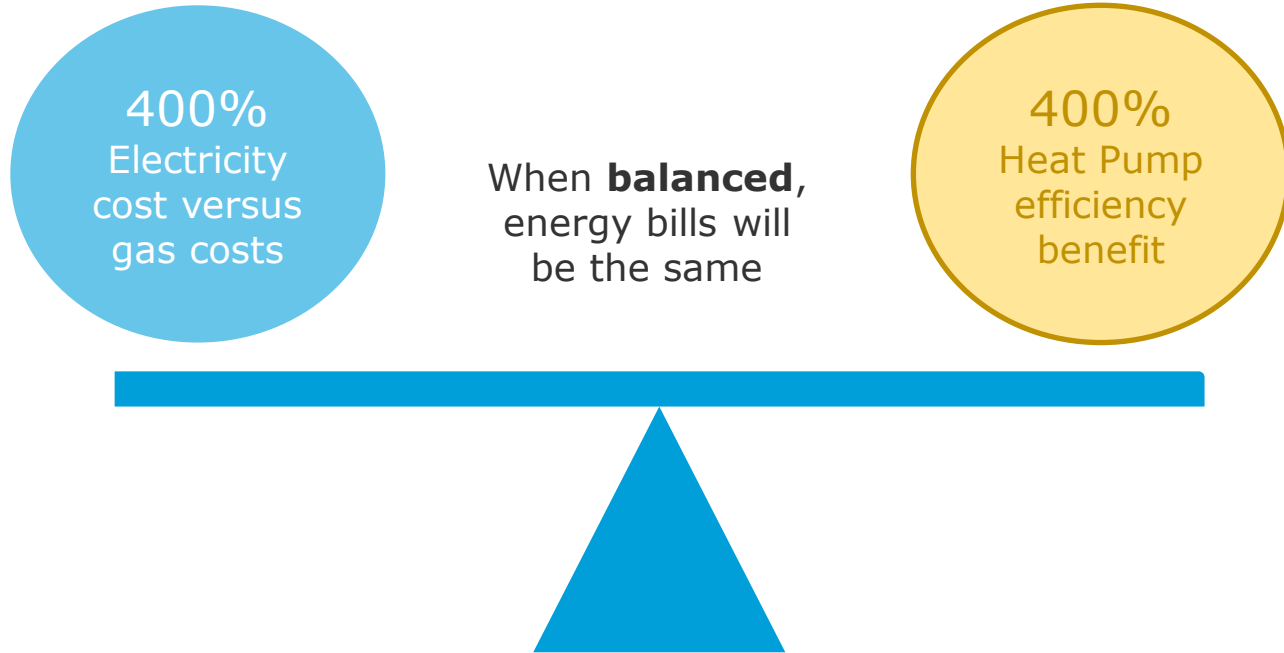
Profit - The Energy Cost Story

Electrification *is* Efficiency

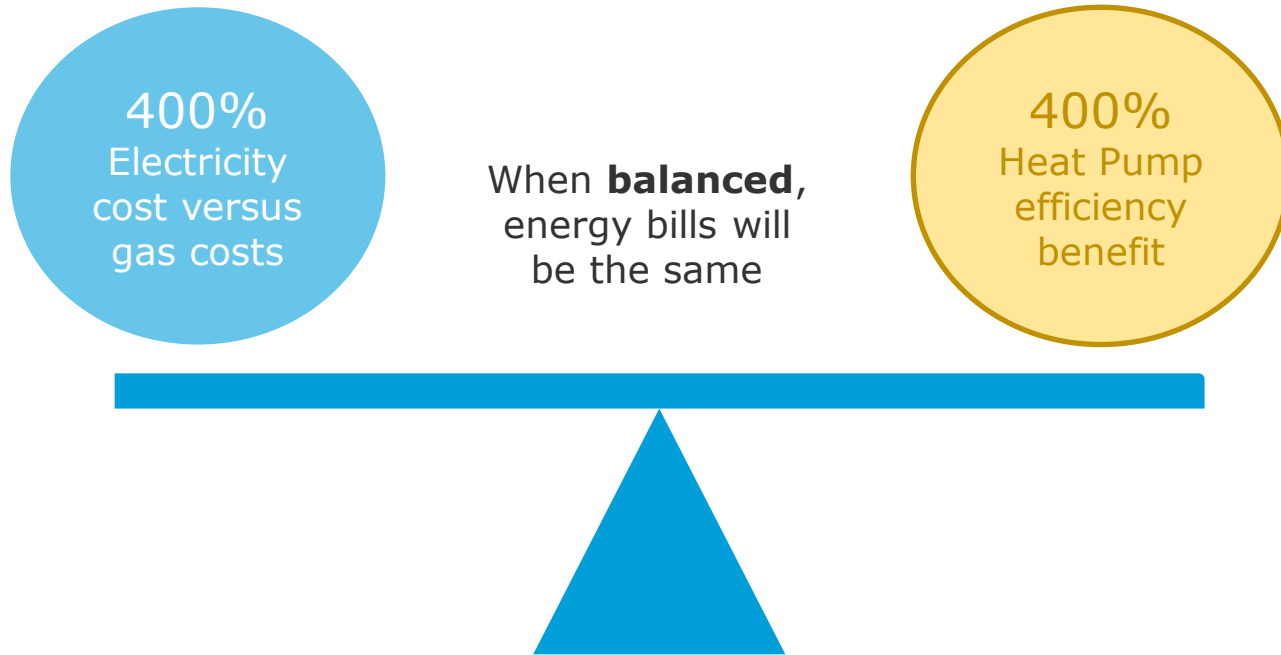


Heat Pumps are Typically Four Times More Efficient Than Gas Appliances

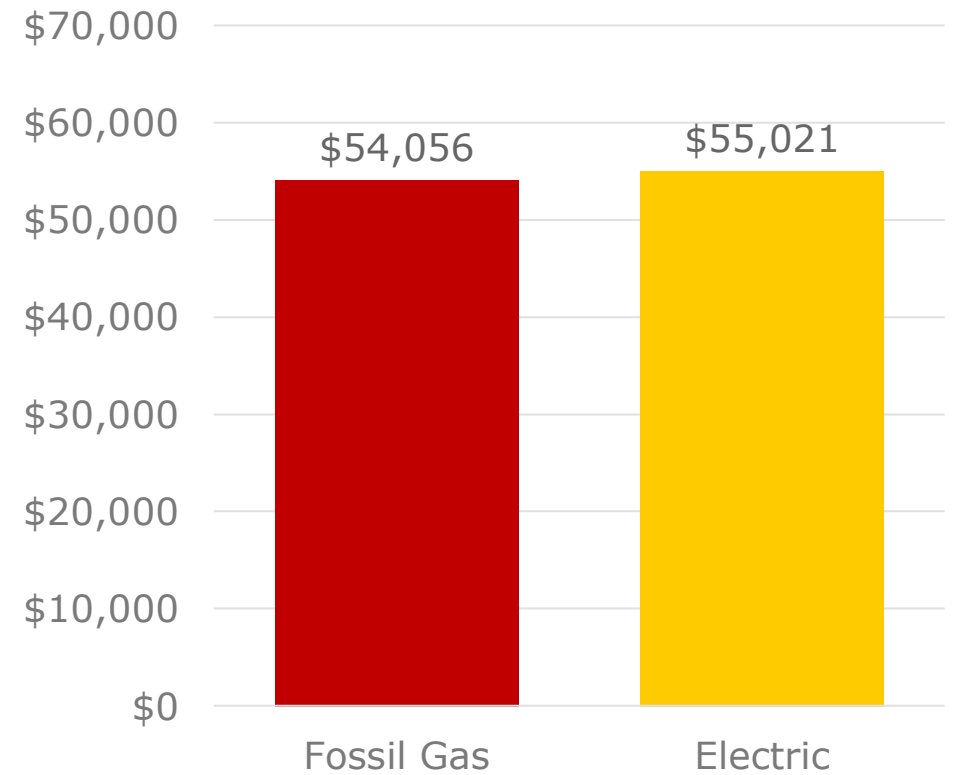
Profit - The Energy Cost Story



Profit - The Energy Cost Story



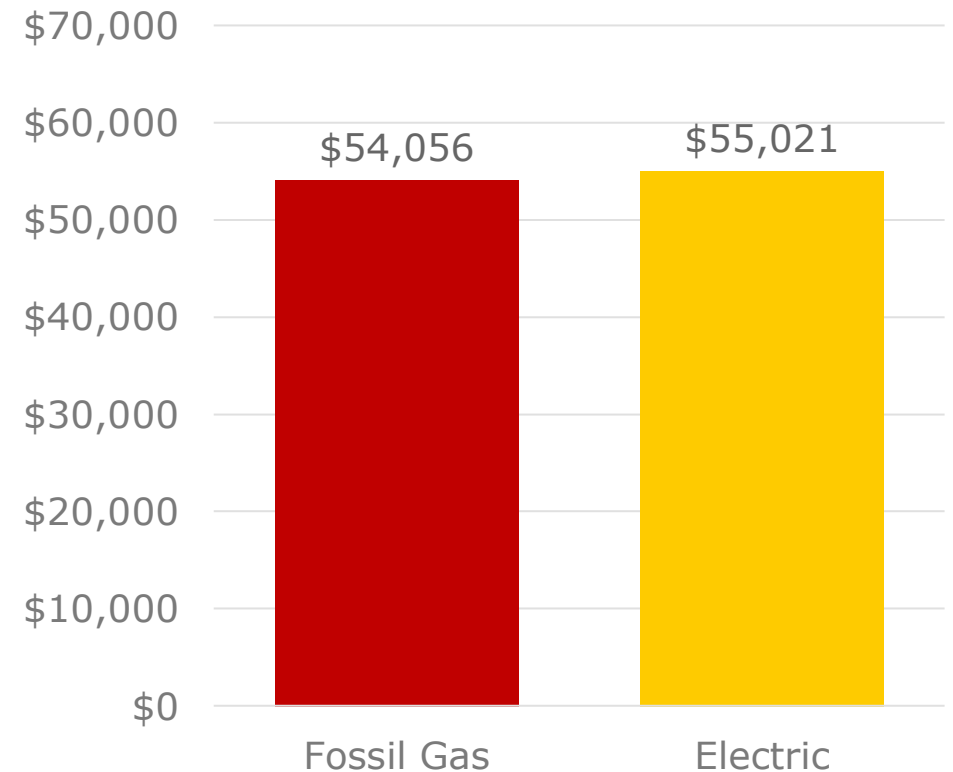
Annual Energy Cost Comparison
- Municipal Building



Profit - The Energy Cost Story

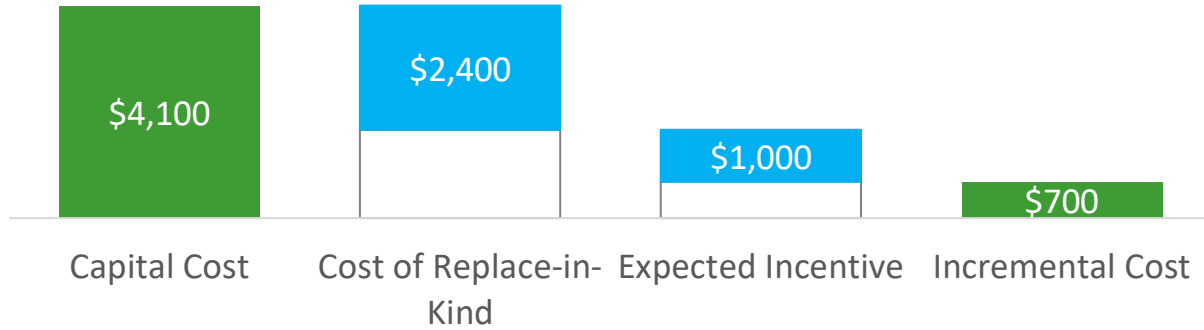
- Typical on-bill difference of +/- 3% for BayREN municipal buildings
- Adding solar results in bill savings that is unattainable with gas

Annual Energy Cost Comparison
- Municipal Building

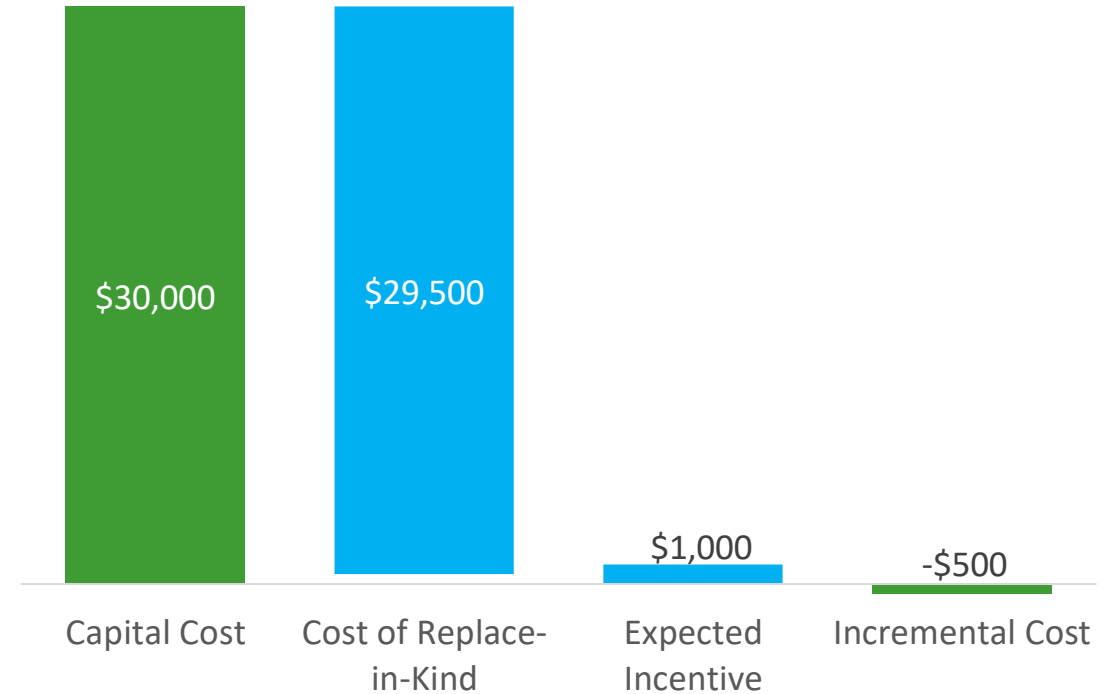


Profit - The Capital Cost Story

Water Heater Replacement



Space Heater Replacement
(If air conditioned)



People

Comfort

Equivalent
Comfort

Safety

Reduced risk of:

- Carbon monoxide poisoning
- Natural gas explosion
- Kitchen fire

Health

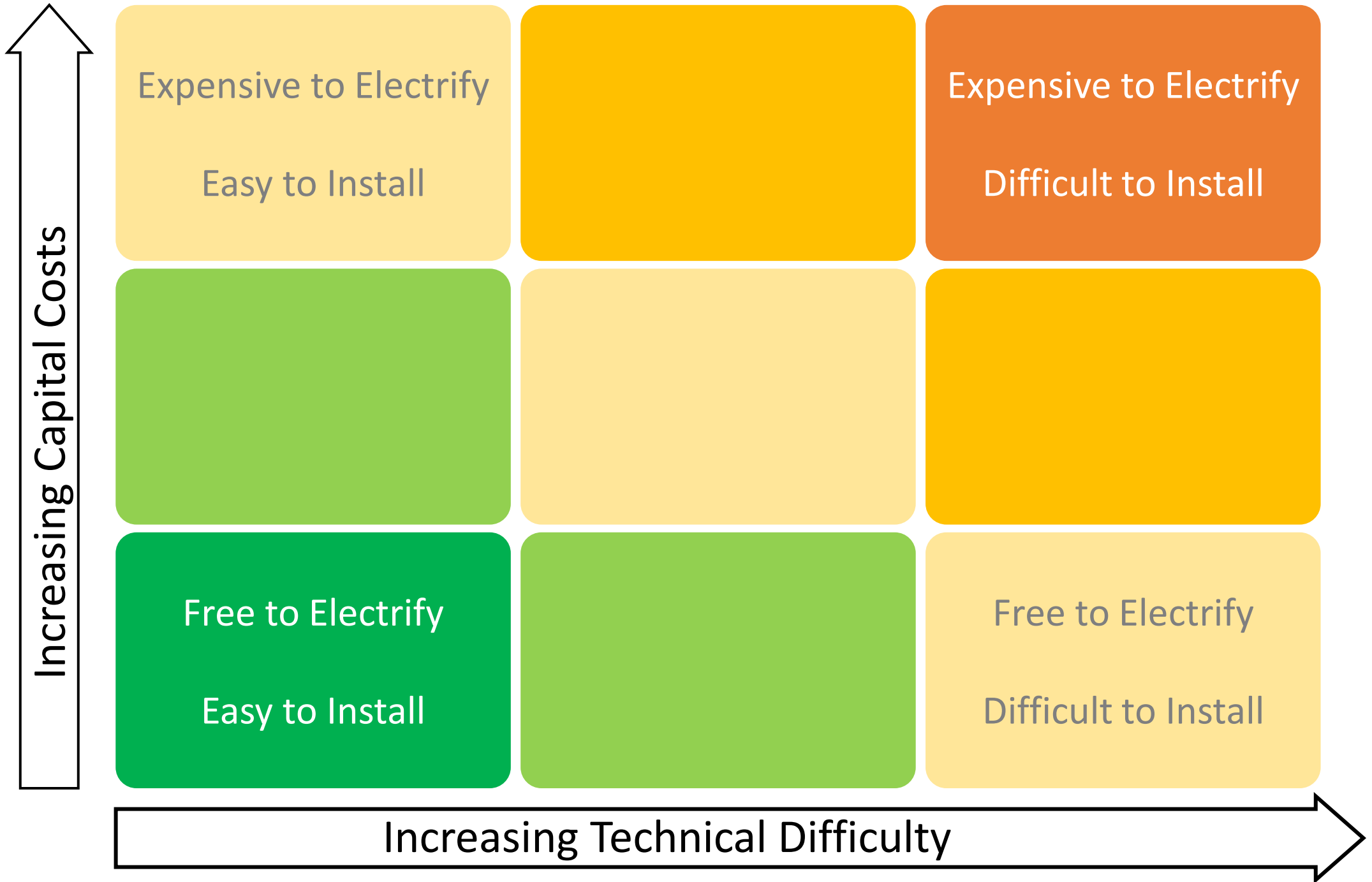
Reduced risk of:

- Asthma

Resilience

Equivalent
resilience
because most
gas appliances
require electricity
to operate

LESSONS LEARNED – THIS CAN BE EASY



Expensive to Electrify
Easy to Install

Expensive to Electrify
Difficult to Install

Free to Electrify
Easy to Install

Free to Electrify
Difficult to Install

Increasing Capital Costs



San Mateo Animal Shelter
Brisbane City Hall
Richmond Public Works

East Palo Alto Govt Building
San Mateo Forensics Lab
Berkeley Live Oak Recreation Center
Portola Valley Town Center



Dublin Police Station
San Carlos Youth Center
Millbrae Community Center
Burlingame Comm. Center
San Mateo HH&S
Oakland (undisclosed)



Increasing Technical Difficulty

Increasing Capital Costs



San Mateo Animal Shelter
Brisbane City Hall

East Palo Alto Govt Building
San Mateo Forensics Lab



Dublin Police Station
San Carlos Youth Center
Millbrae Community Center
Burlingame Comm. Center
San Mateo HH&S
Oakland (undisclosed)
Berkeley Live Oak Recreation Center
Oakland Fire Stations
Richmond Public Works

Portola Valley Town Center



Increasing Technical Difficulty

LESSONS LEARNED – SEIZING OPPORTUNITIES

Framework

1) 2020-2021: Stop the Bleeding – Find all upcoming replacements for the next three years

- Consider adopting an existing municipal building electrification policy
- Look for buildings more than 10 years old
- Seize the the easy opportunities – rooftop packaged units and residential style space and water heaters
- Plan for the hard ones – Work with BayREN or reach out to your local CCA for tech assistance
- Never buy an air conditioner without a reversing valve.

2) 2021-2023: Create a Strategic Plan to Decarbonize – Find all upcoming replacements through 2030

- Arrange buildings by facility and equipment condition
- Inventory all gas-fired equipment, and create a building-by-building retrofit plan
- Hold quarterly cross-departmental planning meetings
- Integrate decarb goals with goals to improve air filtration and add air conditioning for emergencies
- Consider integration with solar

3) 2023-2040: End. Fossil. Fuel. Use.

Seizing Opportunities – Don't Miss the Easy Ones



Rooftop Packaged Heat Pumps



Residential Scale
Water Heaters

Seizing Opportunities – Planning for the Hard Ones



Lighting and ceiling – aging



Ductwork insulation above



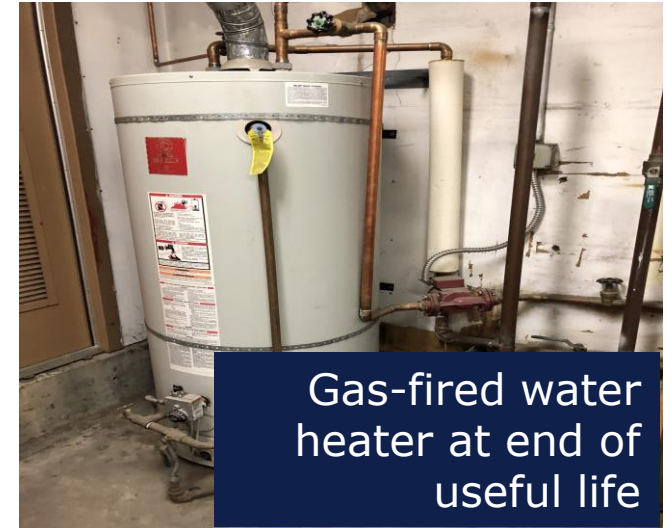
Solar shade structures in



Complex central chilled water



32W T8 fluorescent light



Gas-fired water heater at end of useful life

Planning



Planning



2019-20 CIP FACILITY IMPROVEMENTS SUMMARY – GENERAL FUND		
Project	Location	Amount
Small Projects Countrywide	Countywide	\$150,000
Various Accessibility/Transition Plan Implementation Projects	Countywide	\$1,000,000
Countywide Project Planning Staff Time	Countywide	\$200,000
Lucas Valley Parks Building Replacement	Lucas Valley	\$100,000
Arc Flash Analysis Study	Jail	\$75,000
Add Second Restroom	Hicks Valley	\$100,000
HOJ - Office Space / Tenant Improvements	CC - HOJ	\$1,750,000
Replace 3 of 6 Rooftop AC Units	Jail	\$360,000
Replace Video Monitoring System	Jail	\$200,000
Paint Exterior of Substation	Point Reyes	\$150,000
Replace 120 Batteries and five-year EOF Electrical Maintenance of backup	1600 Los Gamos Drive	\$220,000
HVAC Replacement	3270 Kerner	\$250,000
Reconfigure Electrical and Communication Wiring	Point Reyes	\$75,000
Reconfigure Evidence Process and PPE Room	Marin City	\$120,000
Asphalt Replacement	Civic Center Admin Parking	\$250,000
General Fund Total =		\$5,000,000

Seizing Opportunities – Planning for the Hard Ones

Typical Building Assessment

KANE COUNTY GOVERNMENT Building Condition Assessment

CORDOGANCLARK
ARCHITECTS-ENGINEERS-CONSTRUCTION



Building: **Building A**
Gross SF: 43,486
Date of Visit: 12/11/2014
Year Built: 1941

Facility Function:
Data processing, Treasurer, County Board, Auditor, Purchasing, Tax Office, Forest Preserve, Criminal Justice, Building Department, Veteran's Assistance

Property Components	Area or Type	Life Exp.	Comments	Photo #	Improvement Type	Improv. Cost	Recommended Capital Allocation Year & Amount											
							2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
27	Interior Door Hardware		Mismatched through building		Replace throughout with same keying system	\$25,000								\$25,000				
28	Interior Storefronts	Aluminum	80															
Interior Finishes																		
29	Floor Finish	Carpet (Tiled)	15	Some areas in poor shape	A-11	Replace as needed	\$20,000			\$10,000						\$10,000		
30	Floor Finish	Carpet (Sheet)	15	Some areas in poor shape		Replace as needed	\$20,000			\$10,000						\$10,000		
31	Floor Finish	Vinyl Comp. Tile	10	Some areas in poor shape		Replace as needed	\$5,000				\$2,500						\$2,500	
32	Floor Finish	Ceramic Tile	60	Original to building														
33	Floor Finish	Epoxy	50	Some cracks on 2nd Floor	A-12	Fill cracks	\$200		\$200									
34	Ceiling Finish	Gypsum Board	30	Some areas in poor shape		Replace as needed	\$2,000				\$2,000							
35	Ceiling Finish	Spline	25	Some areas in poor shape	A-13	Replace as needed	\$1,000				\$1,000							
36	Ceiling Finish	ACT	25	Some areas in poor shape	A-14	Replace as needed	\$1,000		\$500									
37	Wall Finish	Wood Panel	20															
38	Wall Finish	Paint	10	Some areas in poor shape, some cracking	A-15 A-16	Repaint as needed, install control joints	\$4,000				\$2,000							\$2,000
39	Wall Finish	Ceramic Tile	40	Original to building. Has been painted over in most areas														
40	Wall Finish	Stone at main entry on interior face or ext wall		Staining from water running down from condensation of windows above	A-17	Clean, address condensation issue at interior face of glass	\$1,000		\$1,000									
Plumbing																		
41	Plumbing Fixtures	Water Closet	30	Replace in-kind		Corrective Maintenance	\$5,000							\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
42	Plumbing Fixtures	Lavatories	30	Replace in-kind		Corrective Maintenance	\$5,000							\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
43	Plumbing Fixtures	Urinals	30	Replace in-kind		Corrective Maintenance	\$3,000							\$1,000	\$1,000	\$1,000		
44	Plumbing Fixtures	Flush Valves	12	Replace in-kind		Corrective Maintenance	\$8,000			\$2,000		\$3,000				\$3,000		
45	Plumbing Fixtures	Faucets	10	Replace in-kind		Corrective Maintenance	\$3,500	\$500		\$500		\$500		\$500	\$500	\$500	\$500	\$500
46	Domestic Water Distribution	Piping	30	Repair domestic water leaks		Condition-Based Maintenance	\$10,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
47	Electric Water Heater	Room 315	10	Replace in-kind	A-18	Condition-Based Maintenance	\$1,000		\$1,000									
48	Electric Water Heater	1st Fir Men's	10	Replace in-kind	A-19	Condition-Based Maintenance	\$1,000											\$1,000
49	Water Heater	1st Fir Boiler Room	10	Replace in-kind		Condition-Based Maintenance	\$1,000		\$1,000									
HVAC																		
50	Condensing Unit-1	Roof	20	Replaced in 2010														
51	Condensing Unit-2	Grade	20	Replaced in 2010														
52	Condensing Unit-3	Grade	20	Replaced in 2010														



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Seizing Opportunities – Planning for the Hard Ones

Typical Building Assessment

KANE COUNTY GOVERNMENT
Building Condition Assessment

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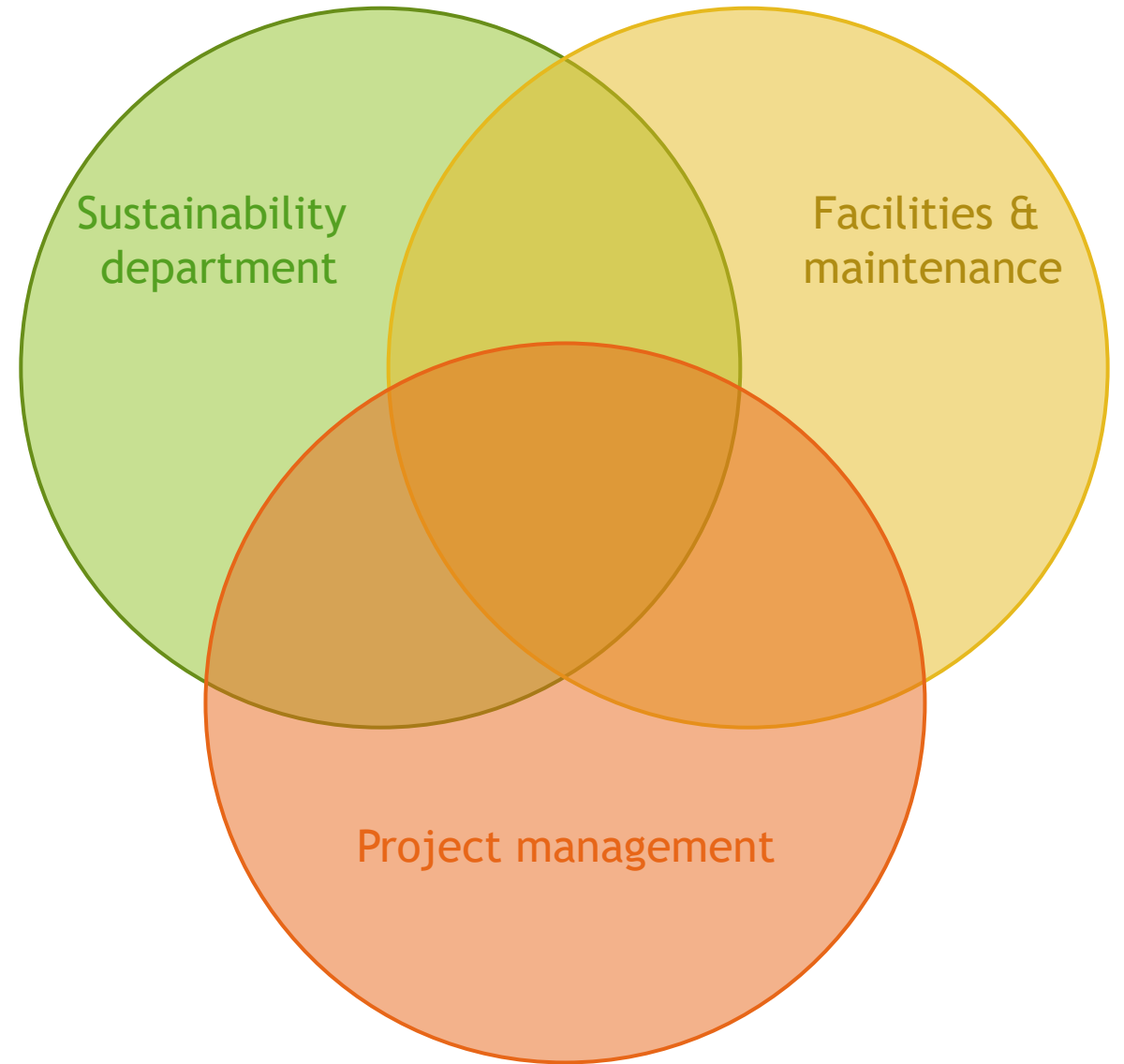
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							2015	2016	2017	2018	2019	2020	2021	2022	2023	2024				
46 Domestic Water Distribution	Piping	30	Repair domestic water leaks		Condition-Based Maintenance	\$10,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
47 Electric Water Heater	Room 315	10	Replace in-kind	A-18	Condition-Based Maintenance	\$1,000		\$1,000												
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HVAC																			
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46 Domestic Water Distribution	Piping	30	Repair domestic water leaks		Condition-Based Maintenance	\$10,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000			
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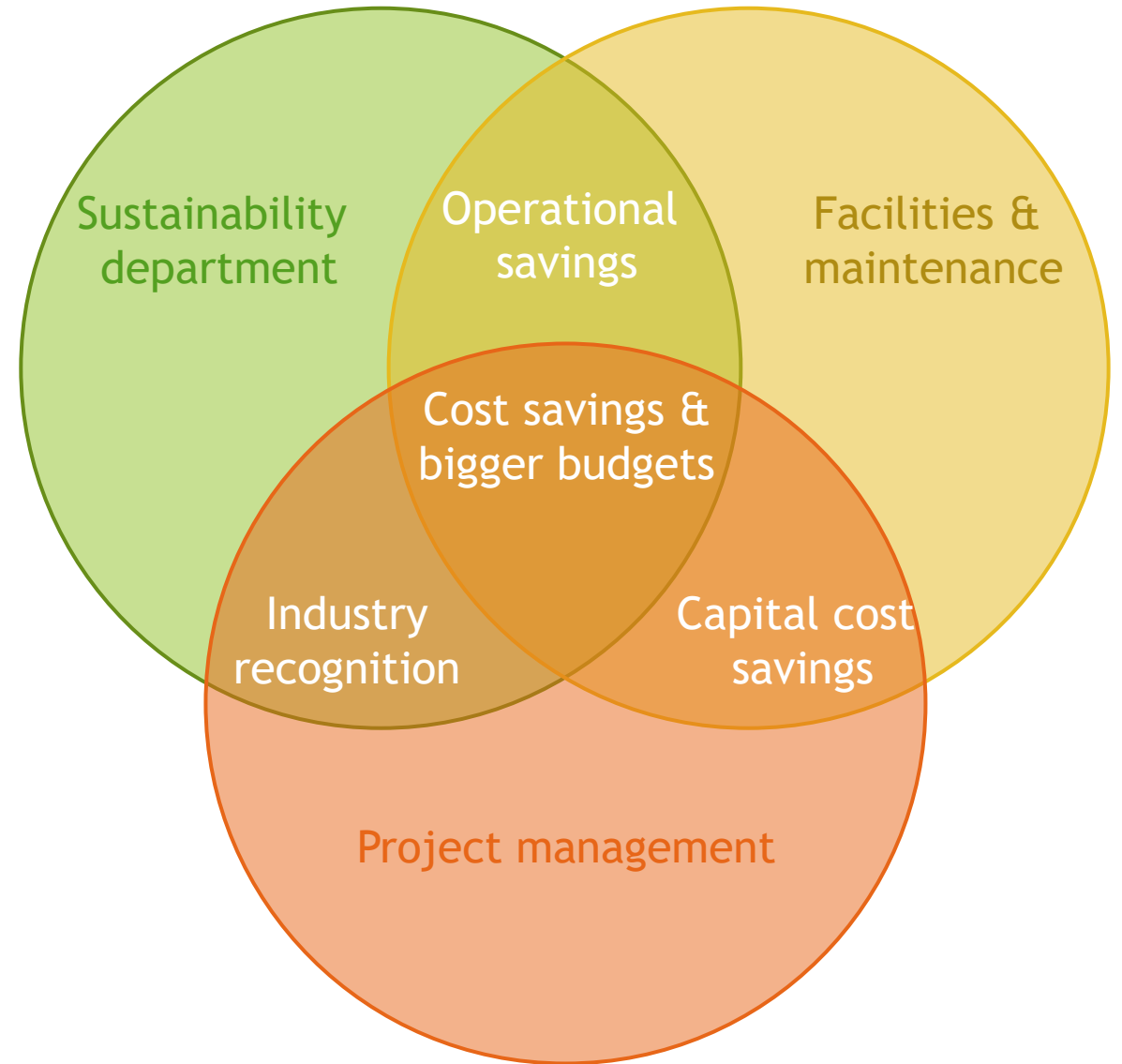


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Cross Departmental Collaboration



Cross Departmental Collaboration



What Should the Policy Look Like?



Municipal Green Building Policy

Effective Date: December 5, 2017

I. PURPOSE

The Board of Supervisors is committed to environmental, economic, and social stewardship through sustainable building practices for County buildings. The implementation of this Municipal Green Building policy is expected to yield cost savings to County taxpayers through reduced operating costs, to provide a healthy work environment for County employees and visitors to County buildings, to contribute to the realization of the Board of Supervisors' stated goal of protecting, conserving, and enhancing the region's environmental resources, and to support sustainable buildings for San Mateo County.

The current County Sustainable Building policy, enacted in 2001 and updated in 2014, encourages the construction of LEED® Certified buildings. This policy revision elevates the County's standards for sustainable building practices beyond LEED® Certification. Specifically, the policy establishes ambitious energy efficiency targets and sets out to achieve Zero Net Energy for new building construction in order to advance the County's sustainability goals and reduce greenhouse gas emissions.

II. DEFINITIONS

County-owned Building

Any building owned by the County of San Mateo, including County-owned buildings or portions thereof that the County leases to non-County entities.

Financial Feasibility

Financial Feasibility is defined as a return on investment (ROI) of greater than 5% over the anticipated lifetime of the energy efficiency or renewable energy generation asset vs. purchasing grid energy.

LEED® Rating System

LEED® stands for Leadership in Energy and Environmental Design, and is a voluntary, consensus-based, market-driven green building rating system developed by the US Green Building Council. It is based on existing, proven technology and evaluates environmental performance from a "whole building" perspective. LEED® is a certifying system designed for rating building projects, such as new and existing commercial, institutional, and multi-family residential buildings. Generally, LEED® addresses six main categories: Location and Transportation, Materials and Resources, Water Efficiency, Energy and

NEWS RELEASE, SUSTAINABILITY

CITY OF HAYWARD ADOPTS ZERO NET ENERGY GOAL

December 21, 2016



City facilities get greener! The Hayward City Council unanimously approved a Resolution establishing a Zero Net Energy Goal for municipal facilities in the City of Hayward. By 2025, the City will strive to achieve Zero Net Energy (ZNE) for its portfolio of facilities.

To meet this goal:

More City facilities will produce and/or use renewable energy produced on-site.

More City facilities will produce as much energy on-site as they consume over the course of a year, therefore 'zeroing-out' their consumption.

Some City facilities, which currently generate excess renewable energy, will offset electricity and natural gas use at other buildings.

City facilities which currently produce renewable energy include the Water Pollution Control Facility, Animal Shelter, Utilities Center, and the Corporation Yard.

This Resolution brings Hayward closer to its greenhouse gas (GHG) reduction goals. Hayward's goal is to reduce its municipal GHG emissions 20% below 2005 levels by 2020. This new goal also strengthens the Council's existing commitment to Zero Net Energy, which is for all new and significantly retrofitted municipal facilities that begin design after January 1, 2017 to be ZNE.

GREEN BUILDING

California Universities Are Transitioning to All-Electric Buildings

The University of California system and Stanford University are making all-electric buildings the default in new construction.

JUSTIN GERDES

SEPTEMBER 24, 2018



California's universities are getting serious about all-electric buildings.

What Should the Policy Look Like?

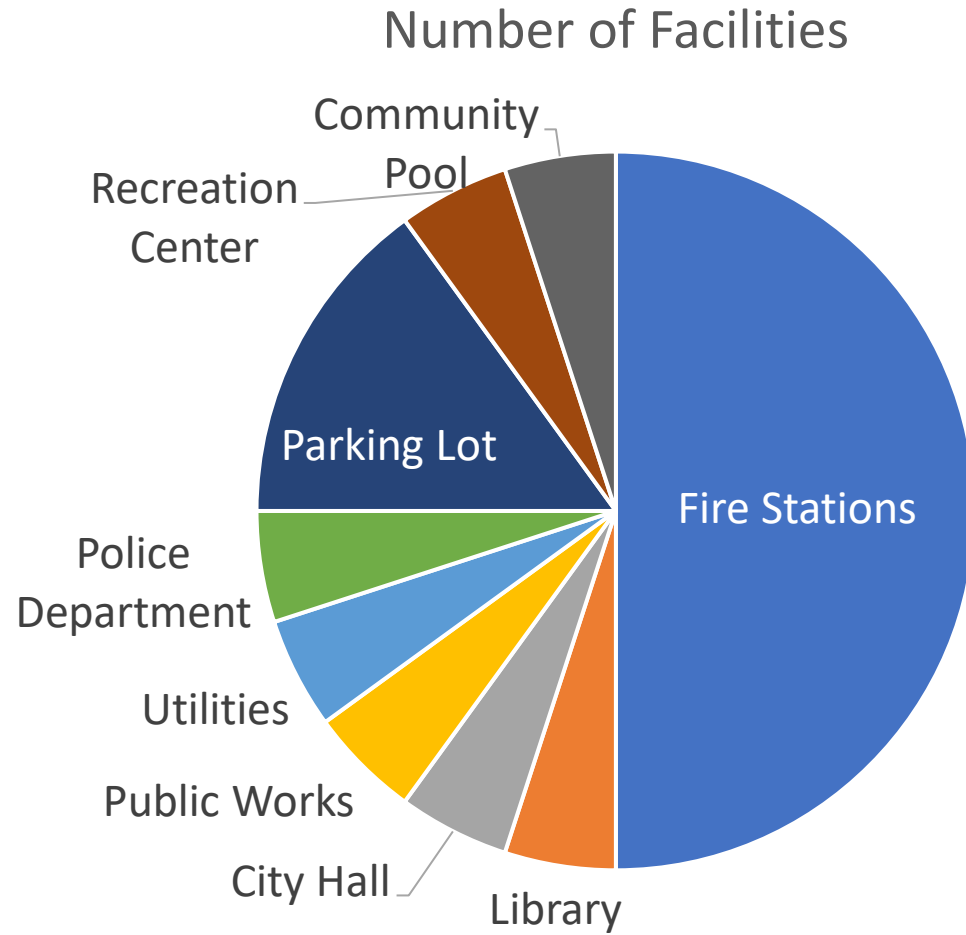
Is it a purchase policy?

Is it a building policy?

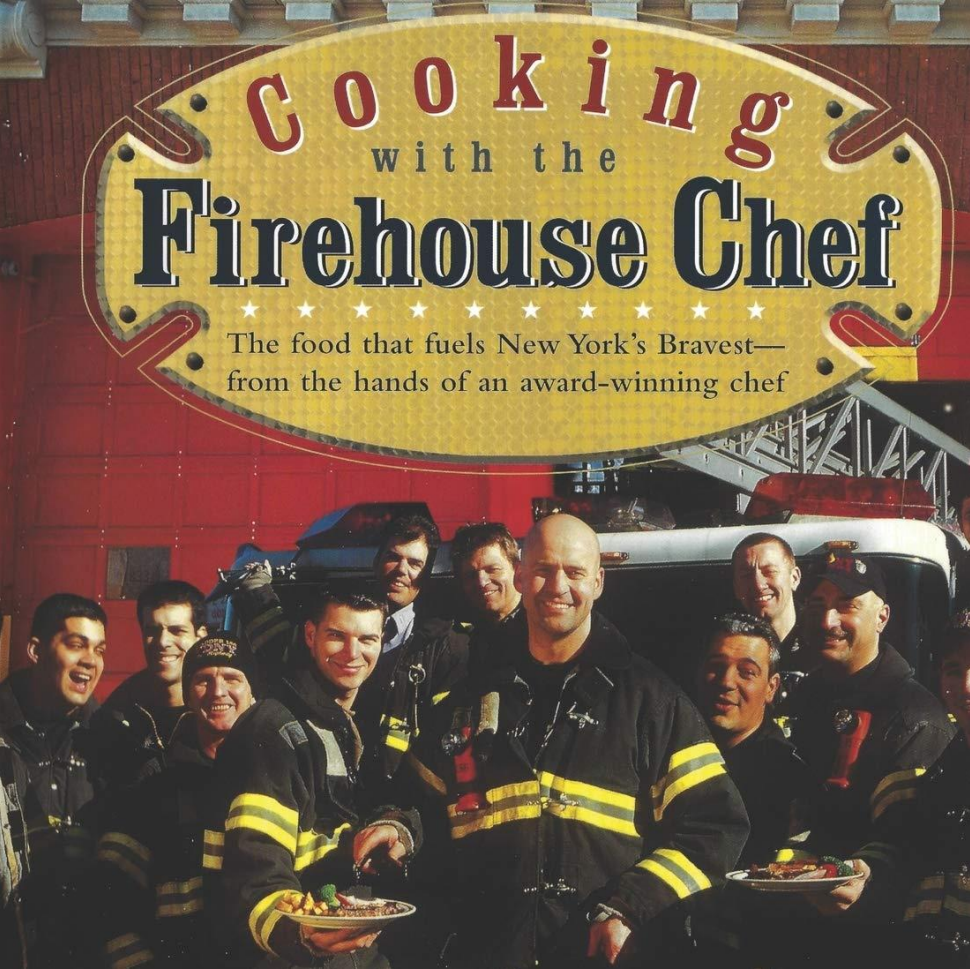
What is it?

LESSONS LEARNED – FIRE STATIONS

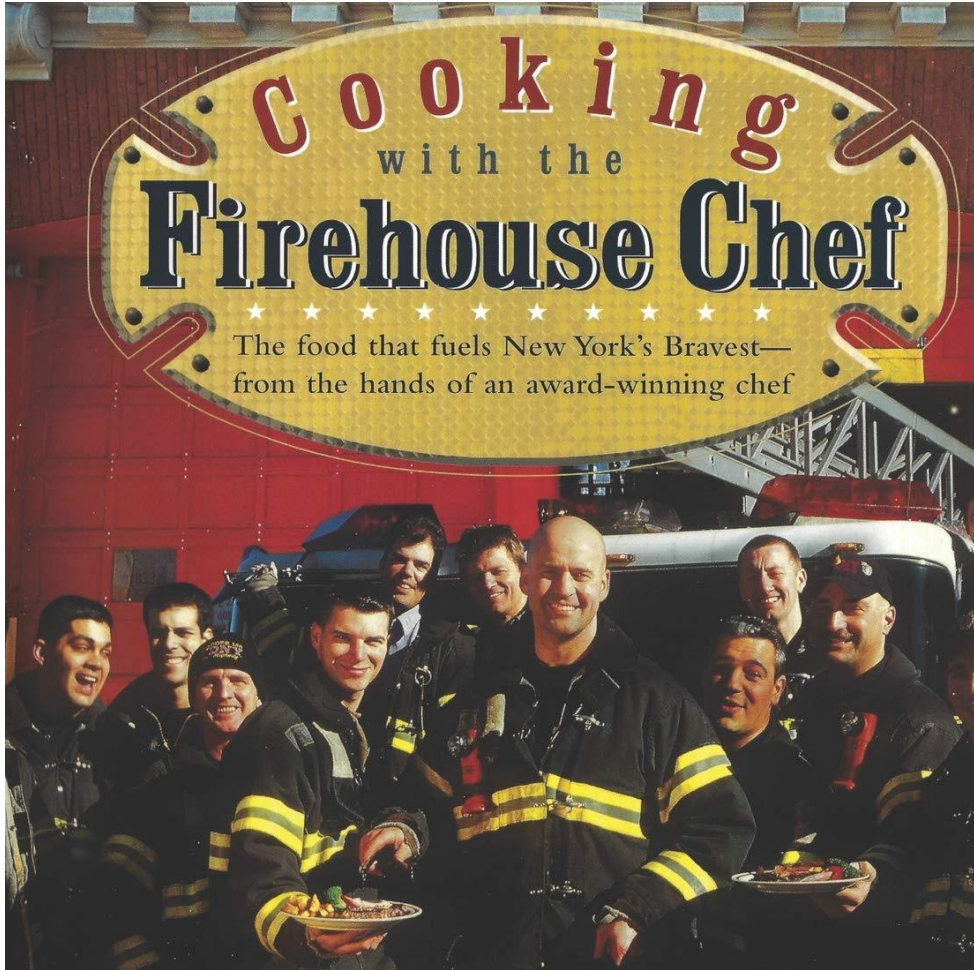
Fire Stations



Fire Stations



Fire Stations



QUESTIONS?

Blake Herrschaft, PE, LEED AP
Director of Building Decarbonization
Blake.Herrschaft@dnvgl.com
619-955-0754