# ZNE Technical Assistance Program

## *Richmond Public Works*

DNV GL

09/26/2017

BAY AREA Regional Energy Network

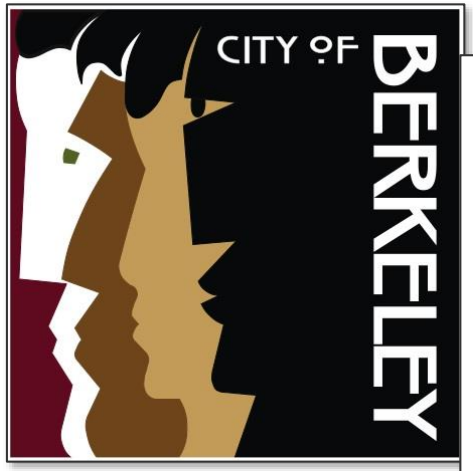
# Agenda

- Program Overview
- Richmond Public Services Overview
- Deep Dive on Richmond
- Lessons Learned
- Questions

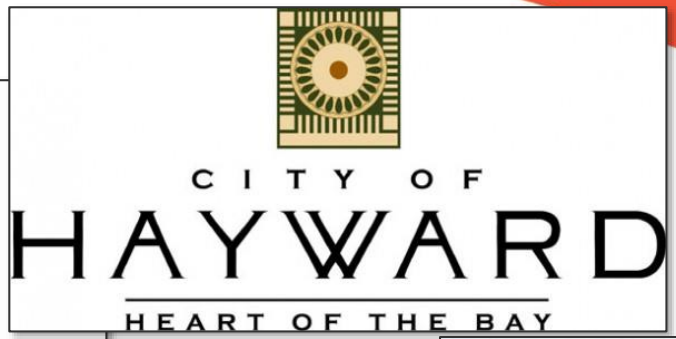



BAY AREA Regional Energy Network

# ZNE Technical Assistance Program



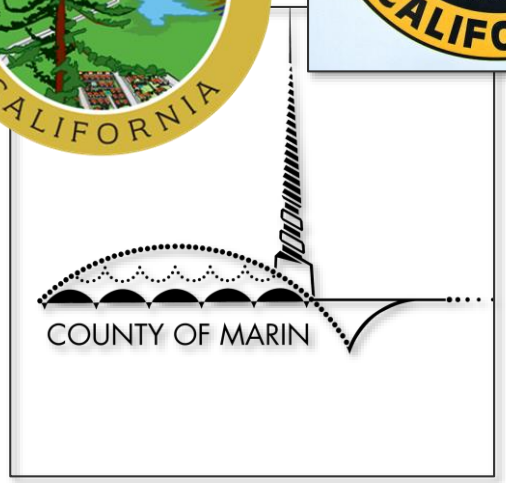




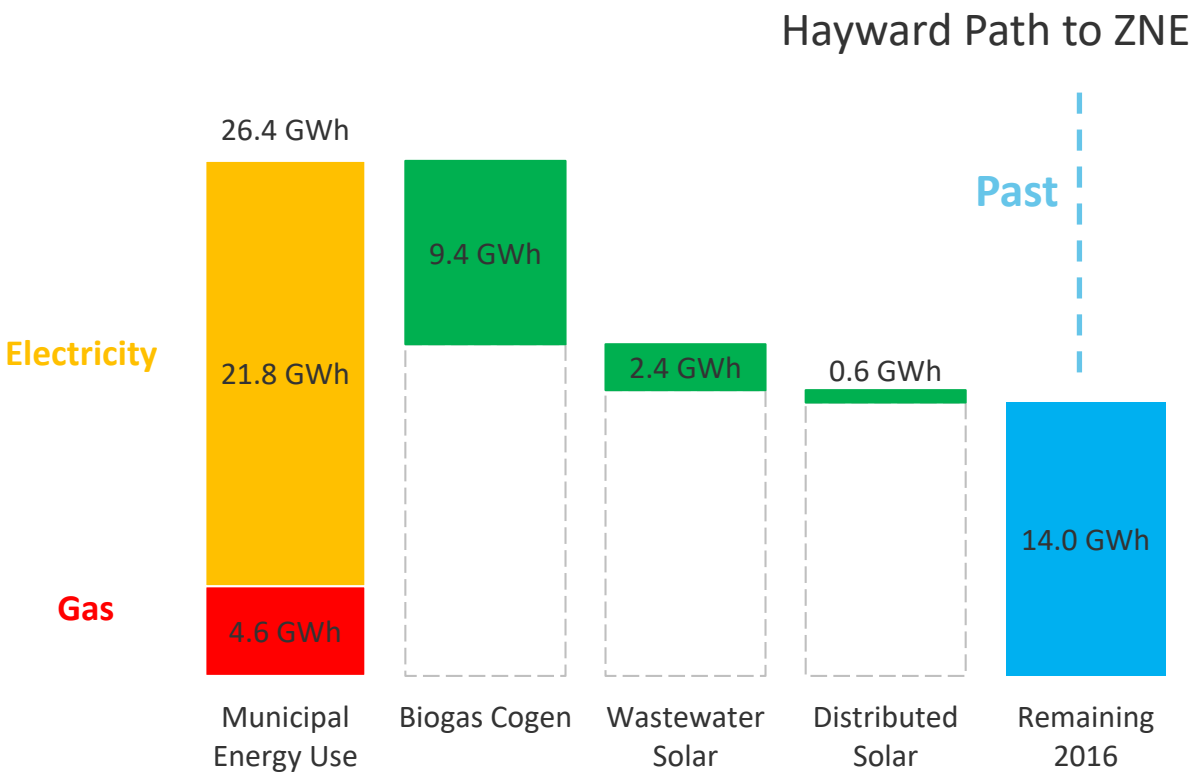






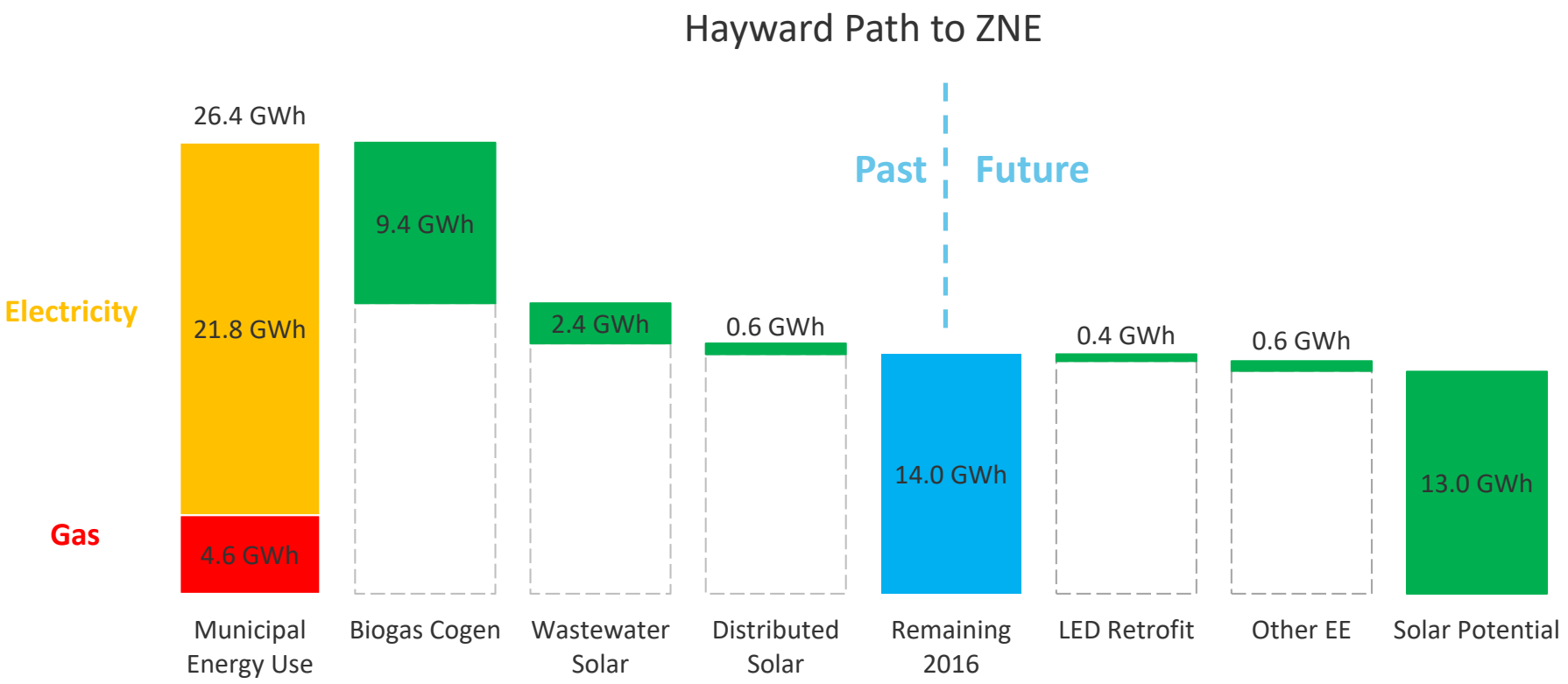



# ZNE Technical Assistance Program




Portfolio Analysis – City of Hayward

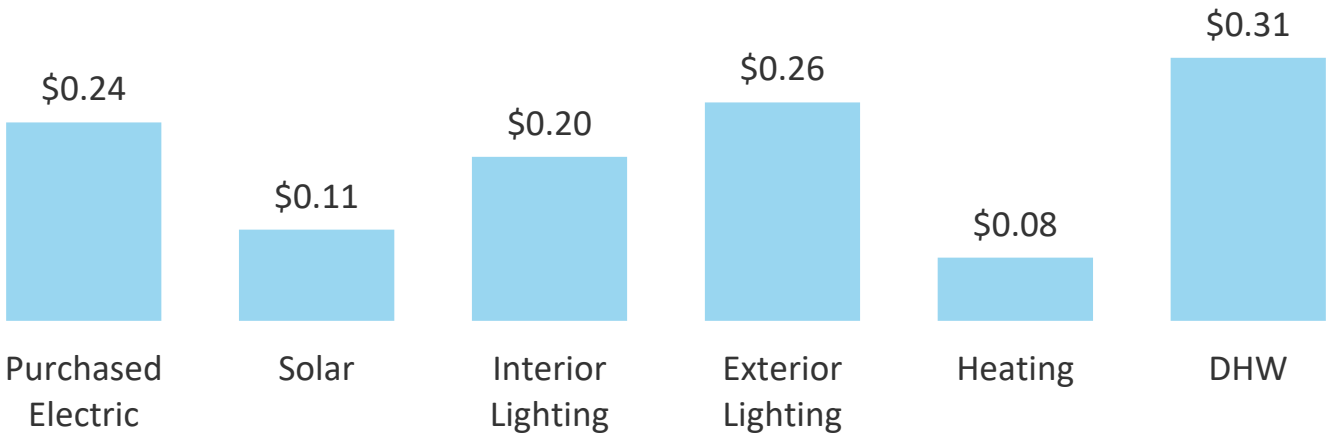
# ZNE Technical Assistance Program




Portfolio Analysis – City of Hayward

# ZNE Technical Assistance Program

## Levelized Cost of Energy

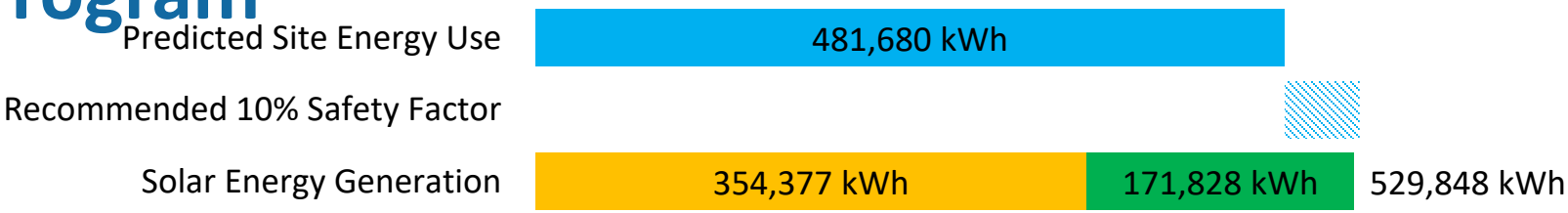



**Payback Analysis**

| | Annual Energy Use (kWh) | Savings (kWh) | Savings % | Savings $/yr | Capital Cost | Payback (years) |
|---|---|---|---|---|---|---|
| Interior Lighting | 3,981 | 5,971 | 60% | $1,411 | $17,500 | 12.4 |
| Exterior Lighting | 8,304 | 8,304 | 50% | $1,963 | $2,160 | 1.1 |
| Heating | 28,885 | 6,138 | 18% | $1,451 | $6,000 | 4.1 |
| DHW | 174 | 98 | 36% | $23 | $400 | 17.2 |
| **Total** | **54,615** | **20,511** | **27%** | **$4,848** | **$26,060** | **5.4** |

Deep Energy Retrofits – Berkeley Live Oak Recreation Center

# ZNE Technical Assistance Program

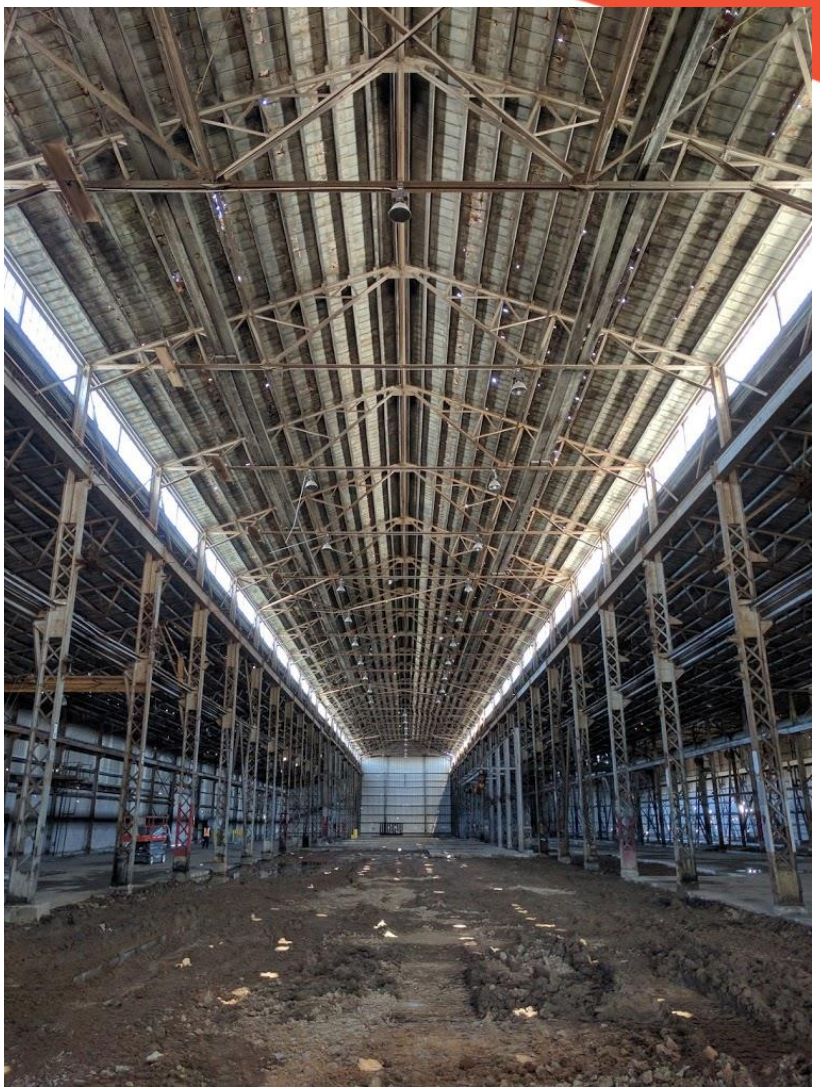




New Construction – Dublin Police Station

# Richmond Project Overview

- Opportunity to consolidate PW and parks facilities
- Existing Green Building Ordinance of LEED Silver
- City Manager requested a cost benefit life cycle analysis to explore ZNE



# Project Benefit #1

- Activate a former steel processing and distribution center
  - Opened in 1949
  - Closed in 1989

- Zoned for live/work space OR municipal corporation yard

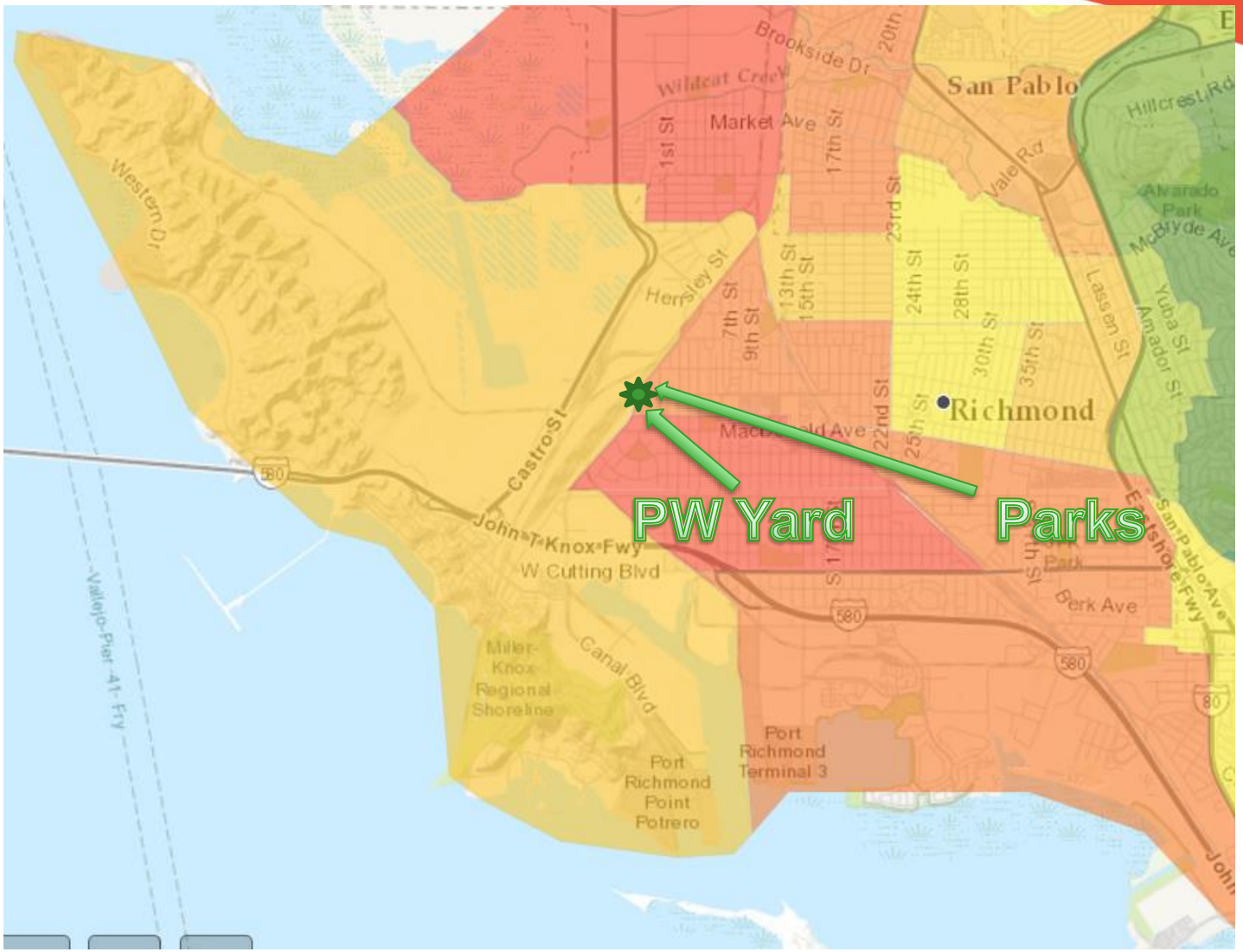
# Project Benefit #2

## Return Park's Corporation yard to the City's heritage Nicholl Park

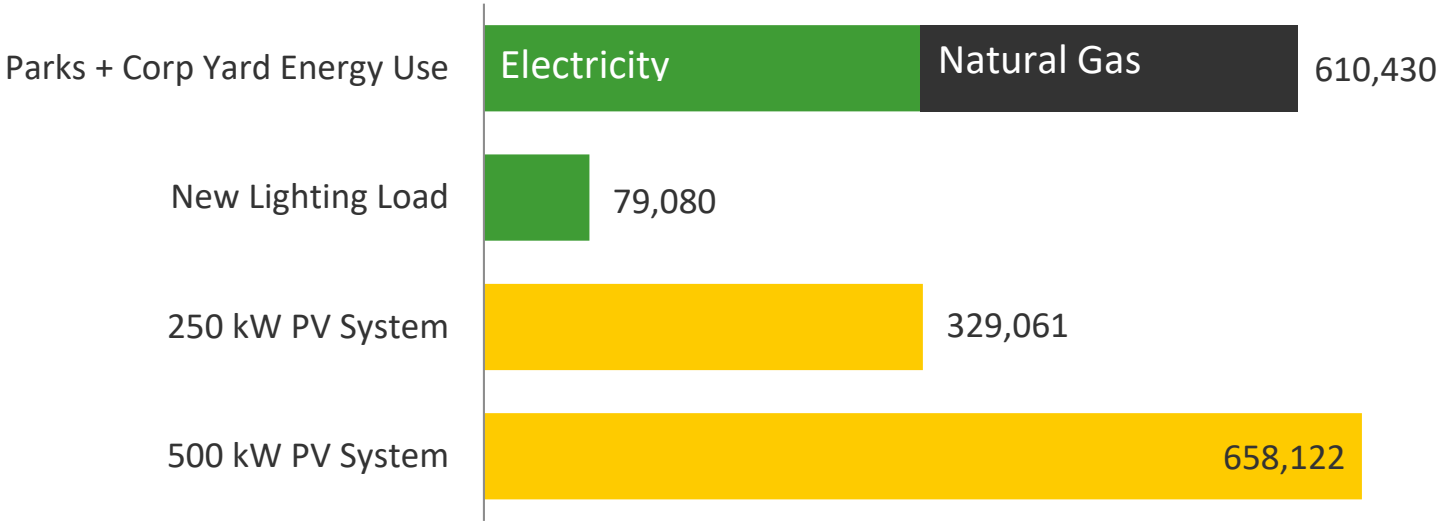
# Project Benefit #3

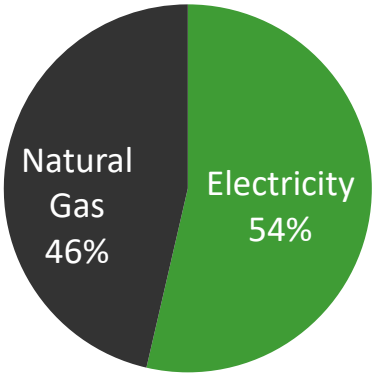
## Provide opportunities to redevelop Public Works yard into housing adjacent to Richmond Greenway

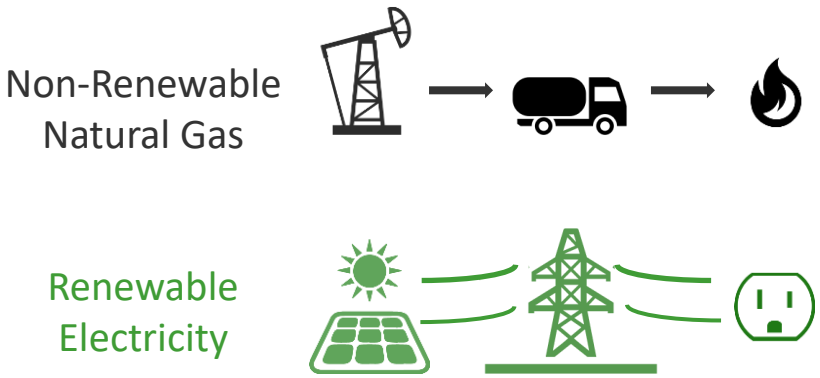
# CalEnviroScreen Context



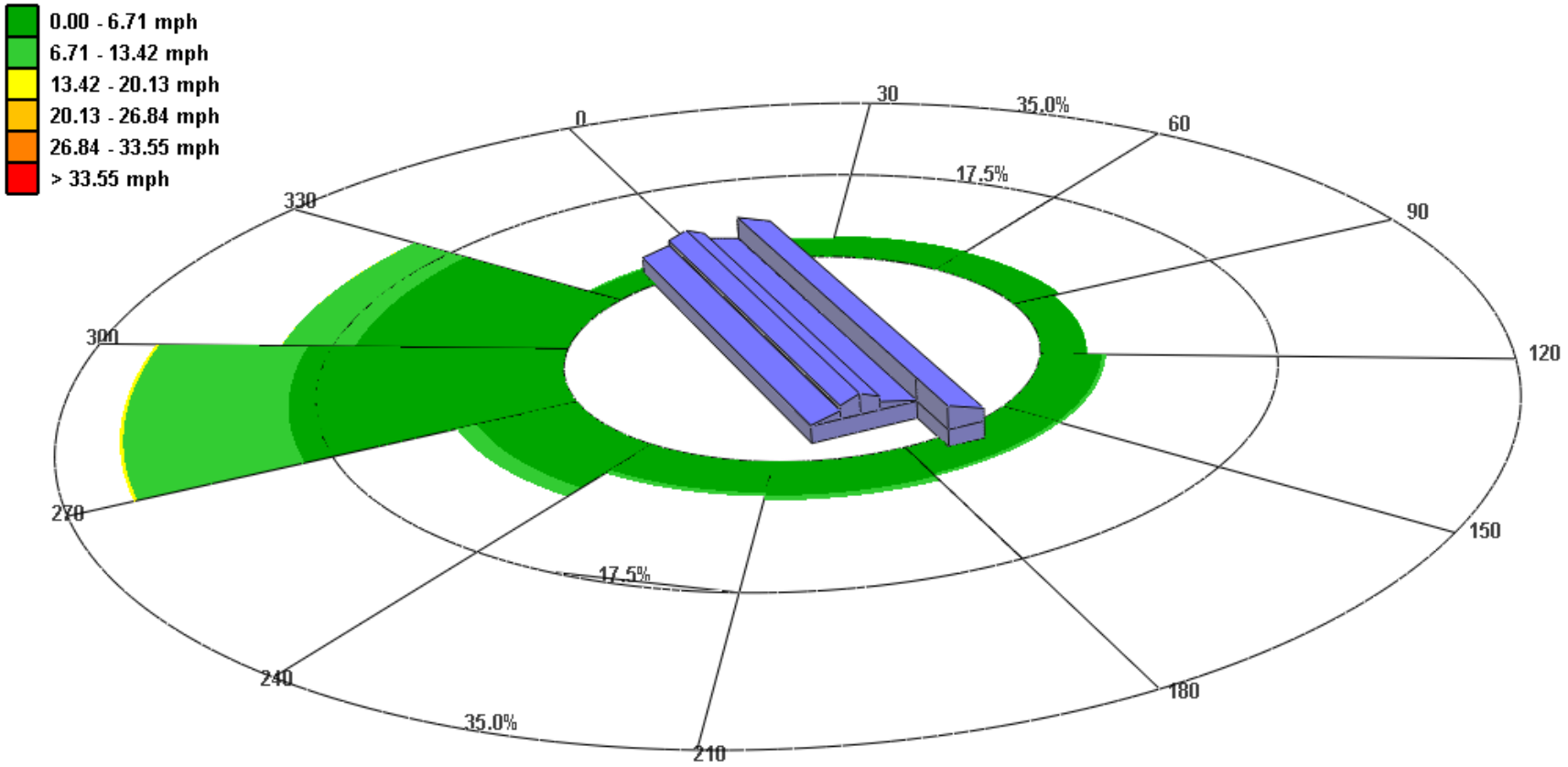
# Preliminary Design



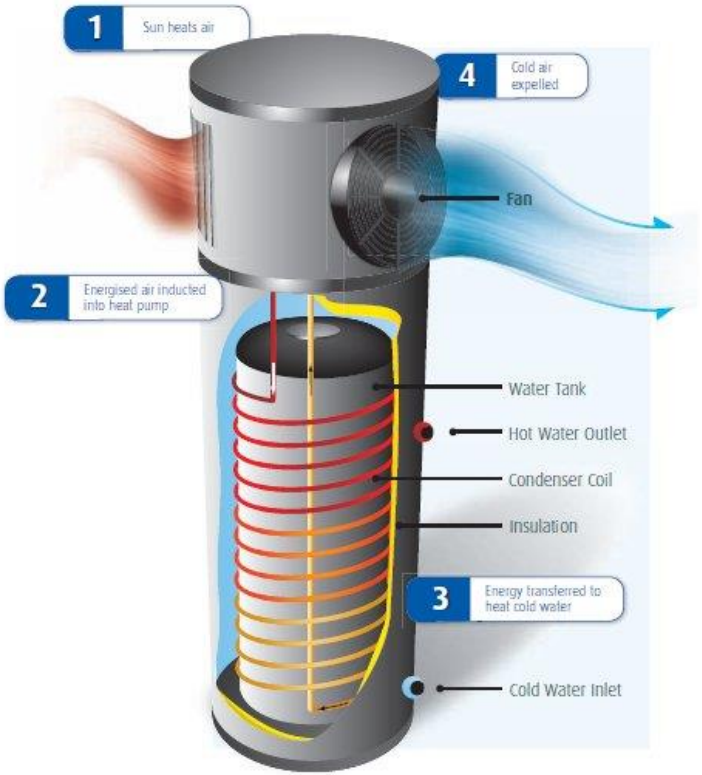
# Energy Simulation



# Energy Efficiency Measures

ENVELOPE | **HOT WATER** | SPACE HEATING

**RECOMMENDATION:**
**HEAT PUMP HOT WATER**



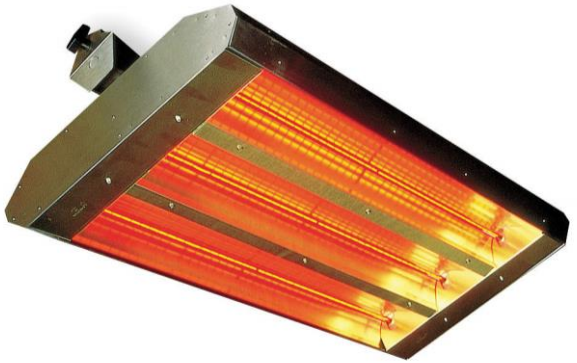
# Heating System Options

ENVELOPE | HOT WATER | **SPACE HEATING**

**RECOMMENDATION:**
**RADIANT HEATING**

**ALTERNATIVE:**
**GAS FURNACE**

**ALTERNATIVE:**
**DUAL PACKS HEAT PUMP**

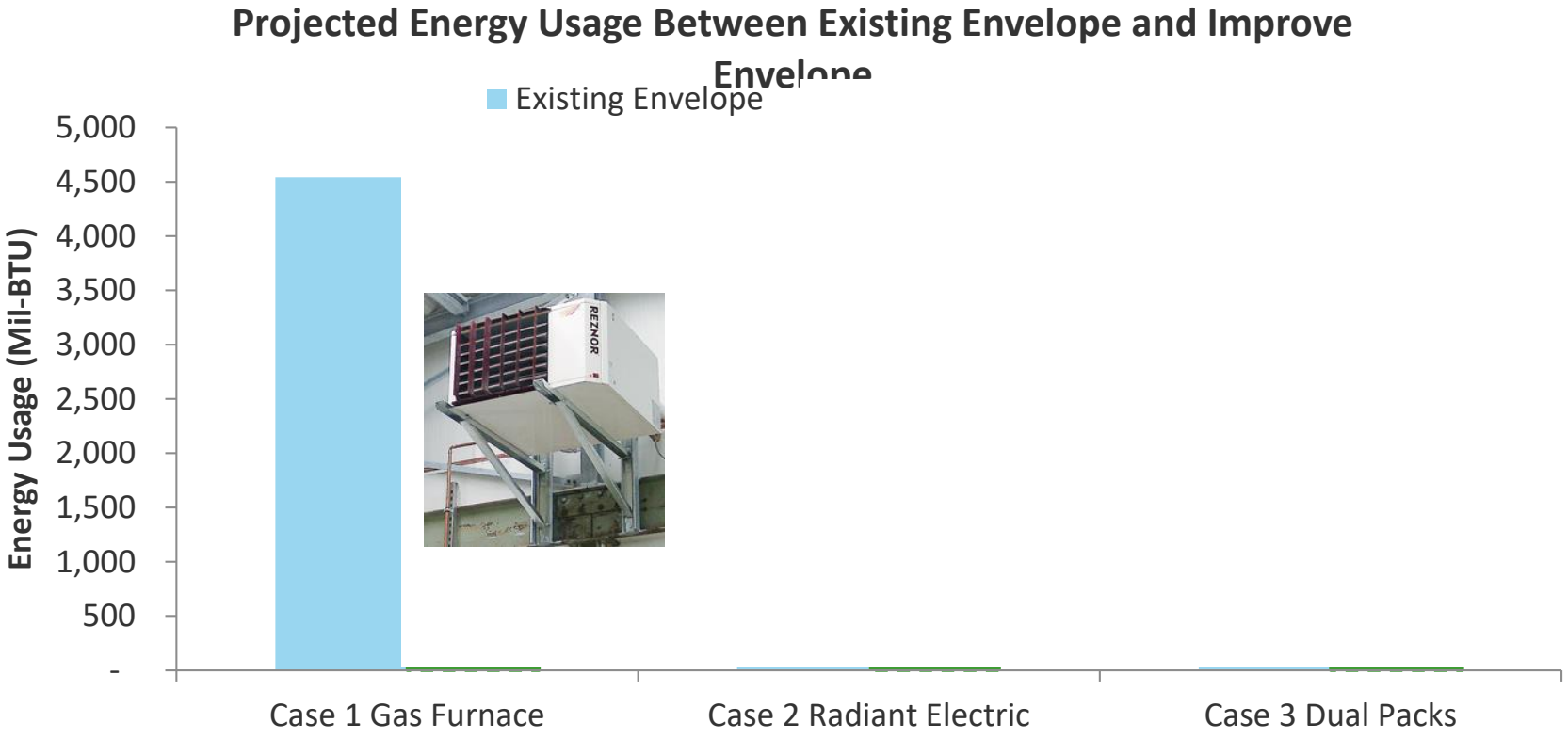
# Energy Efficiency Measures

ENVELOPE

HOT WATER

SPACE HEATING

RECOMMENDATION:
INSULATION



# Energy Efficiency Measures

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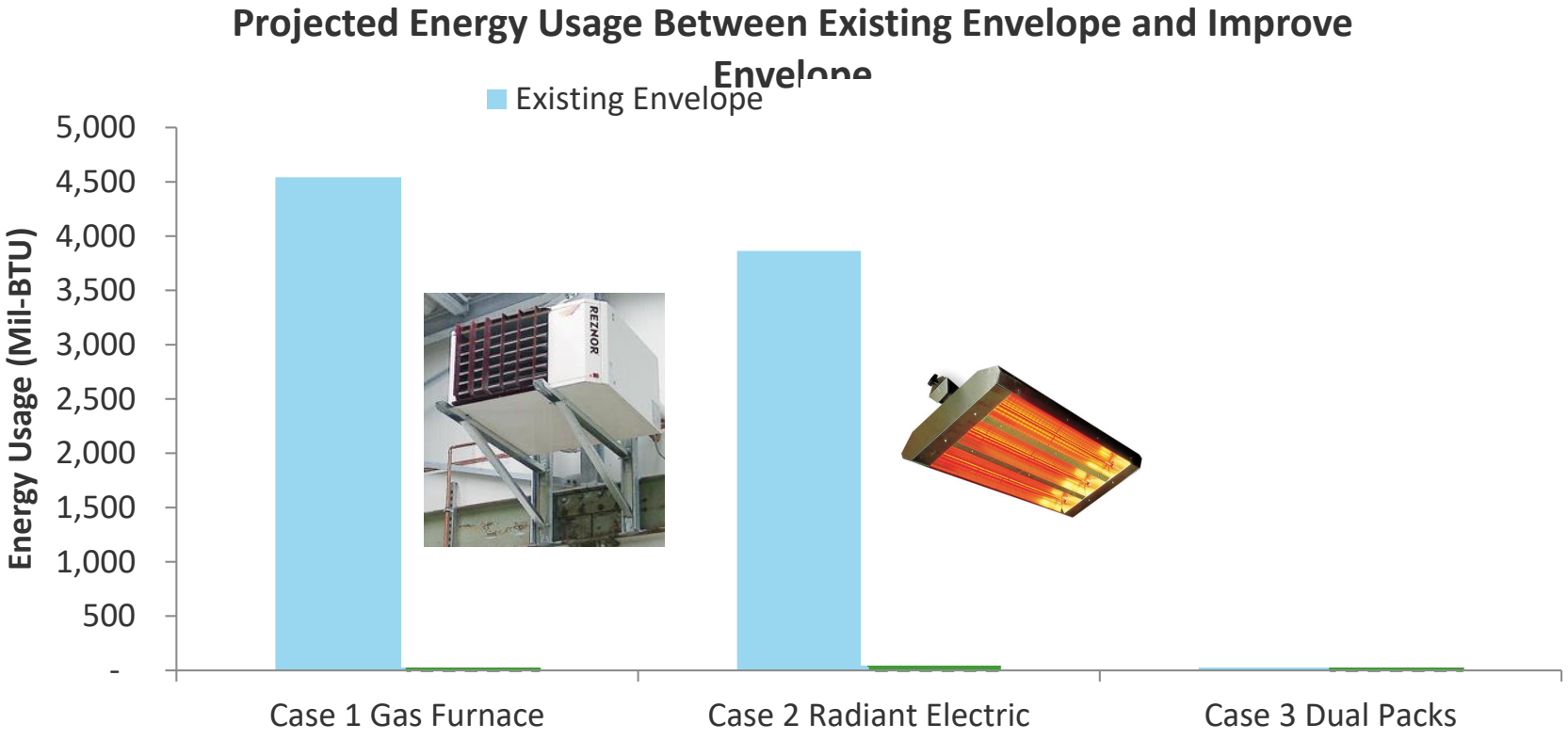

# Energy Efficiency Measures

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HOT WATER

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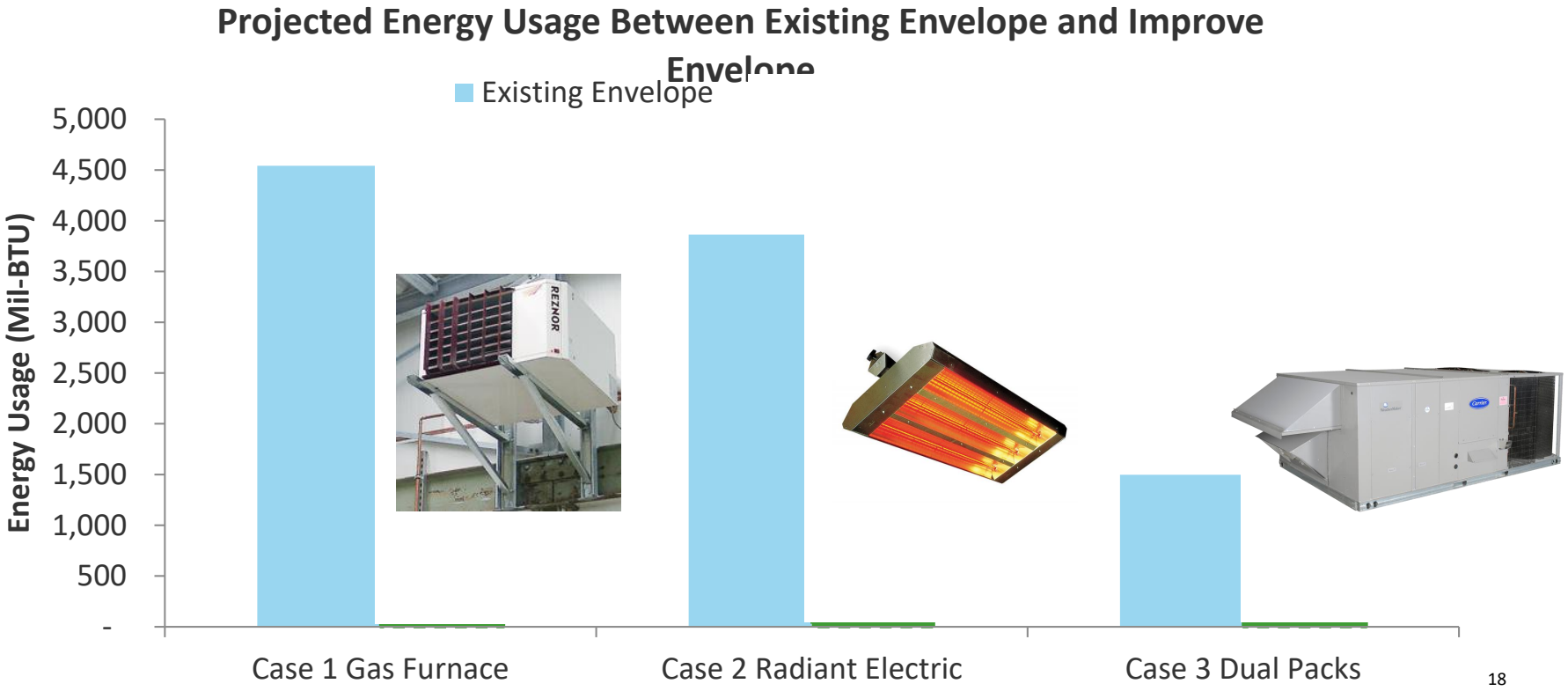


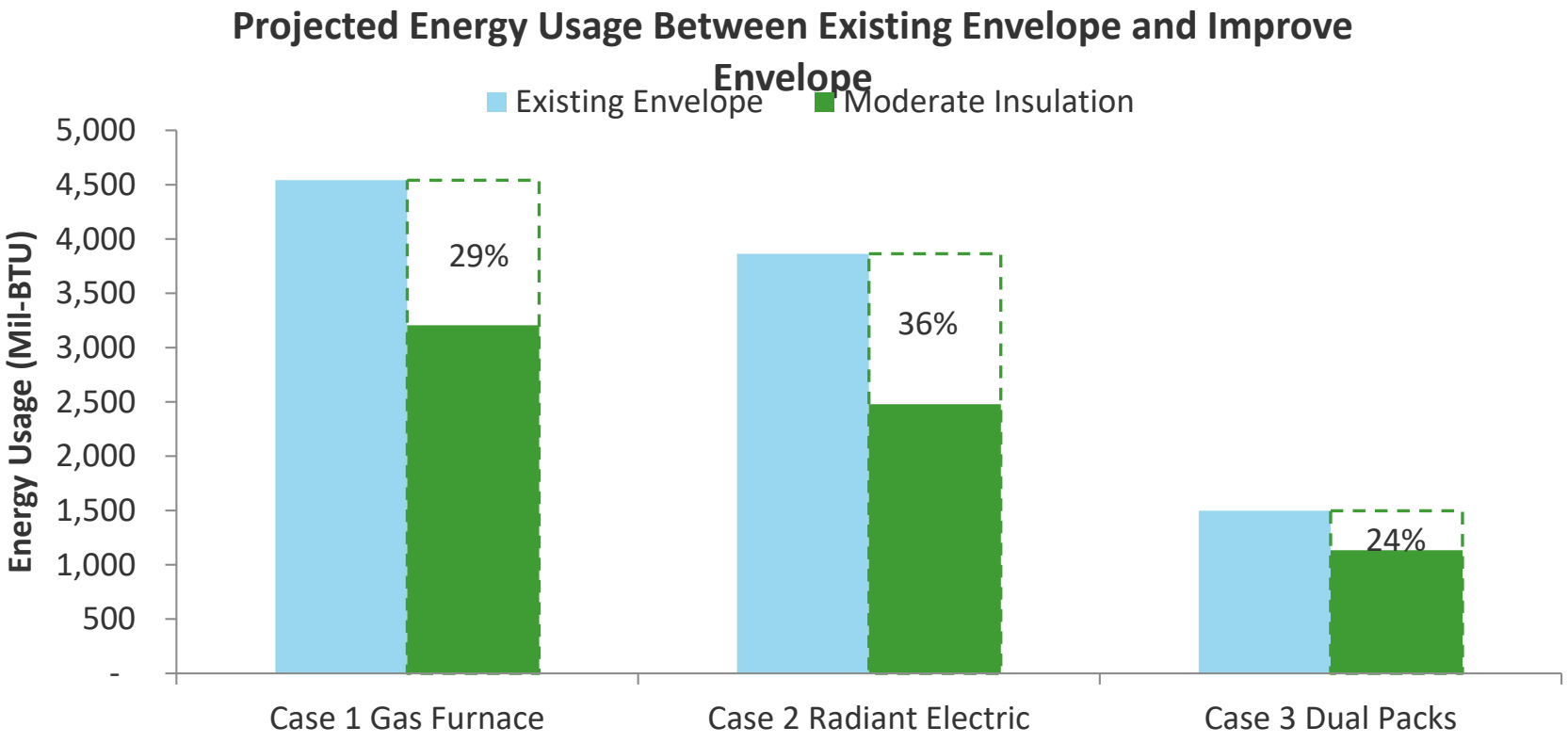
# Energy Efficiency Measures

ENVELOPE

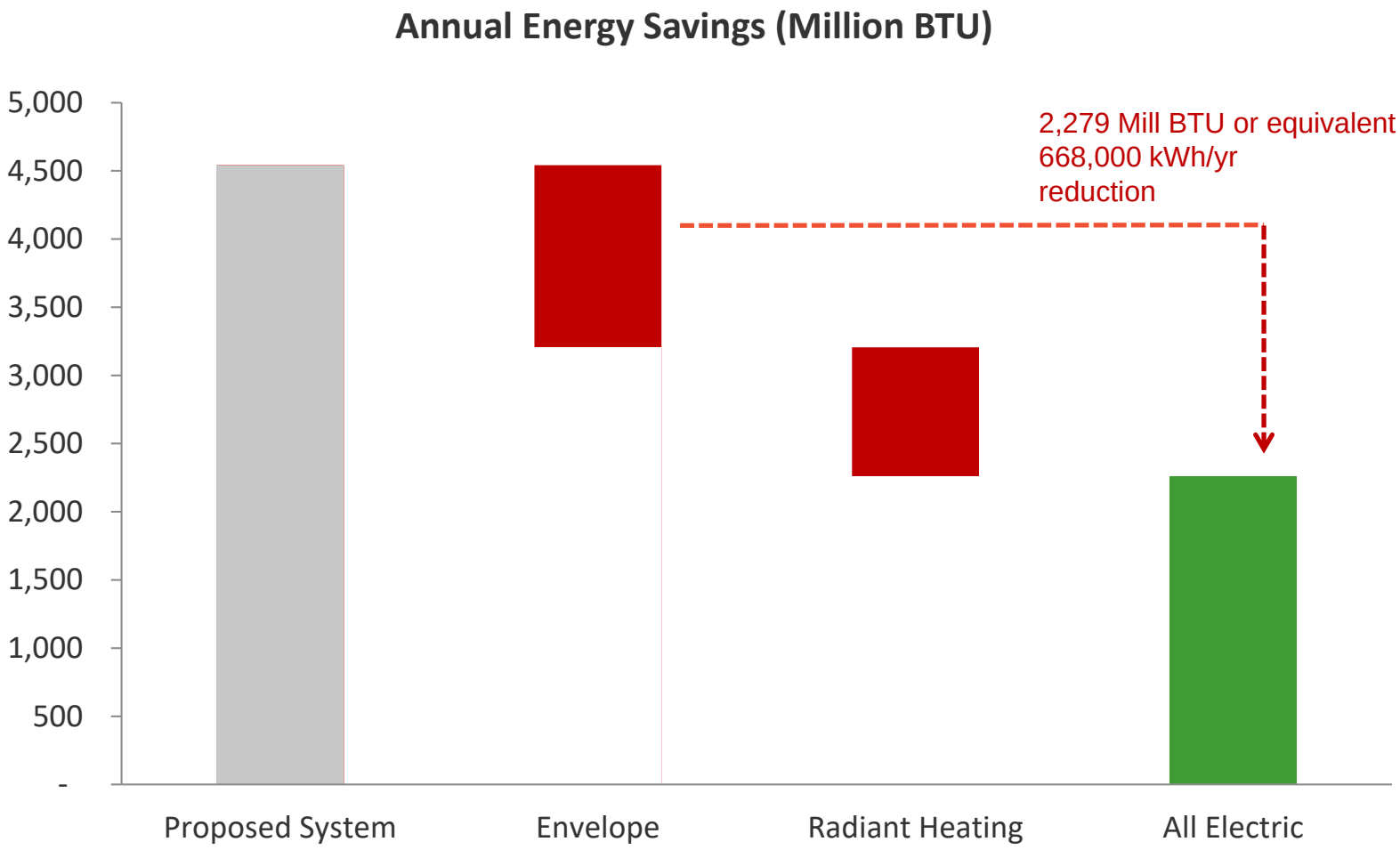
HOT WATER

SPACE HEATING

RECOMMENDATION:
INSULATION



# Energy Savings Summary



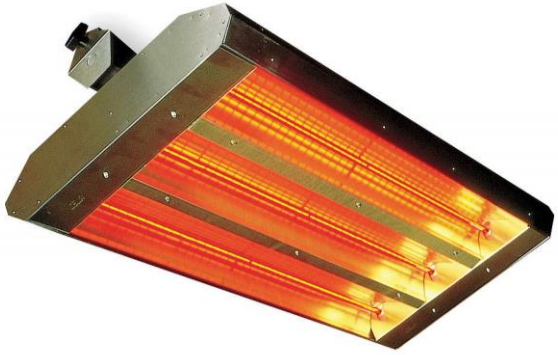
# Energy Efficiency Measures

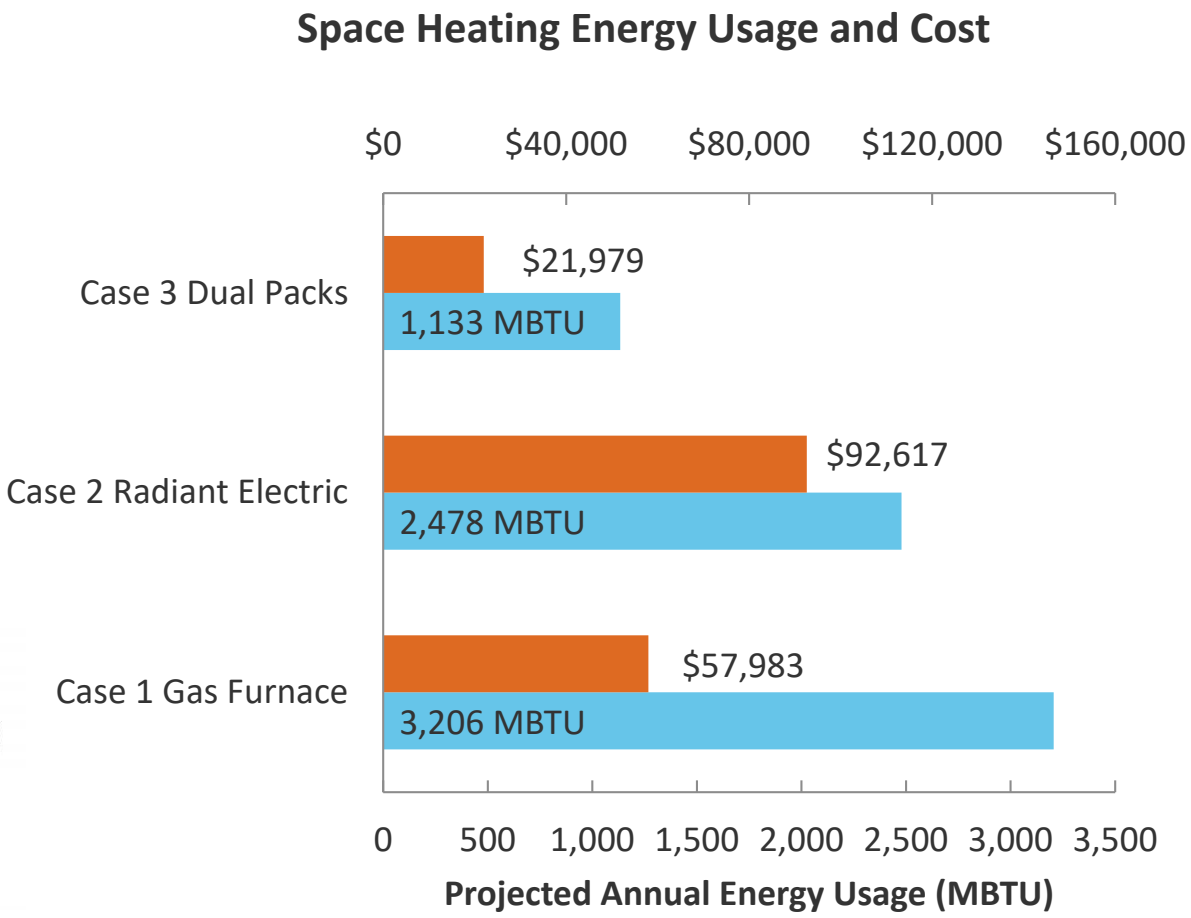
ENVELOPE | HOT WATER | SPACE HEATING

**RECOMMENDATION: RADIANT HEATING**

**ALTERNATIVE: GAS FURNACE**

**ALTERNATIVE: DUAL PACKS HEAT PUMP**

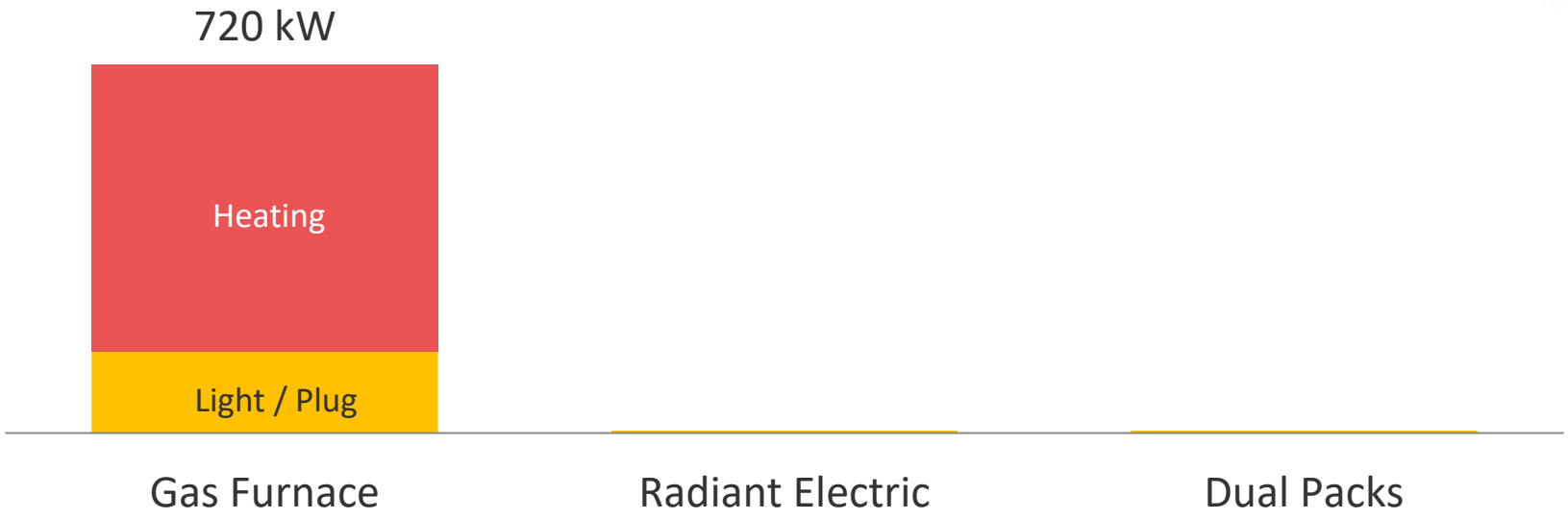




# Renewables

# Renewables

## ZNE Solar PV System Size by Heating System

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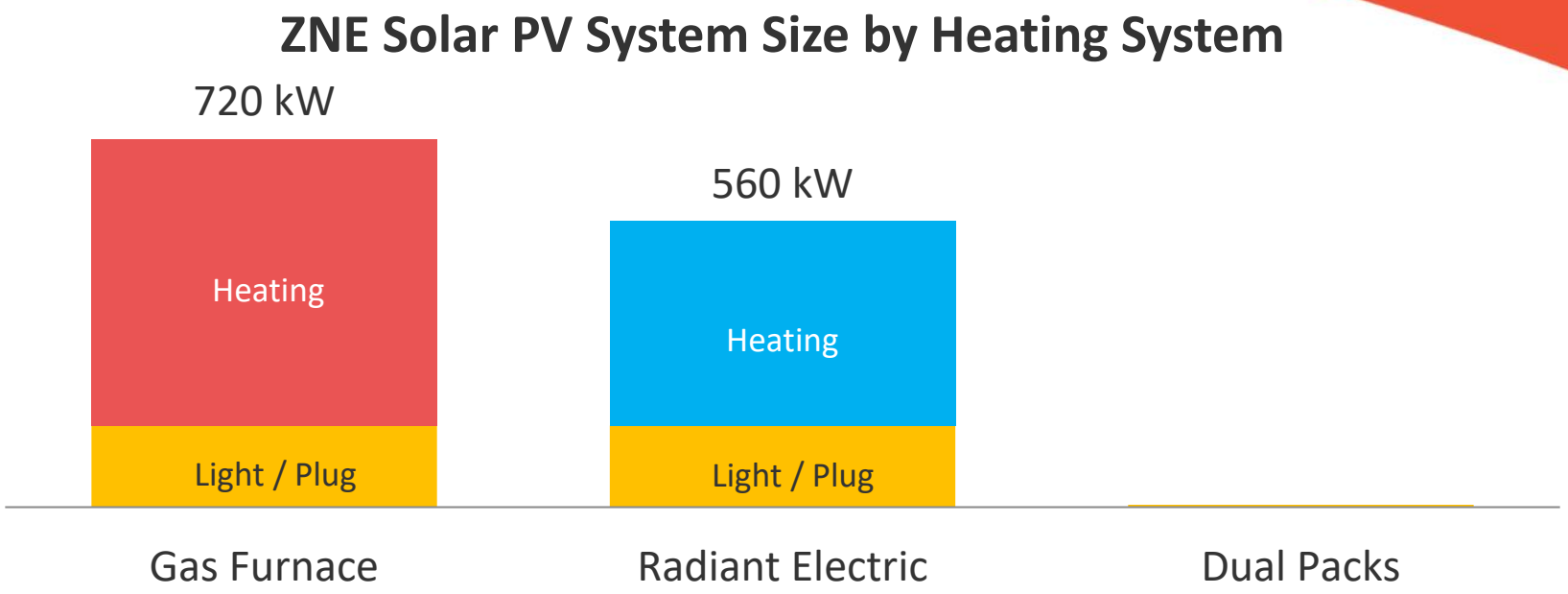
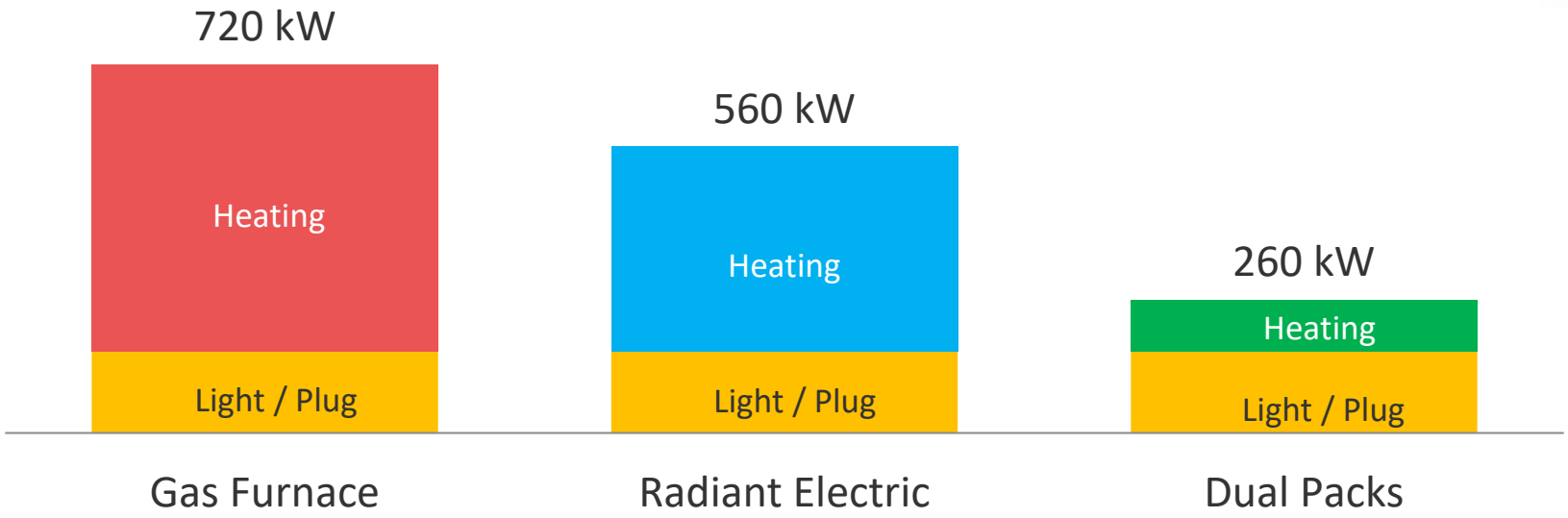
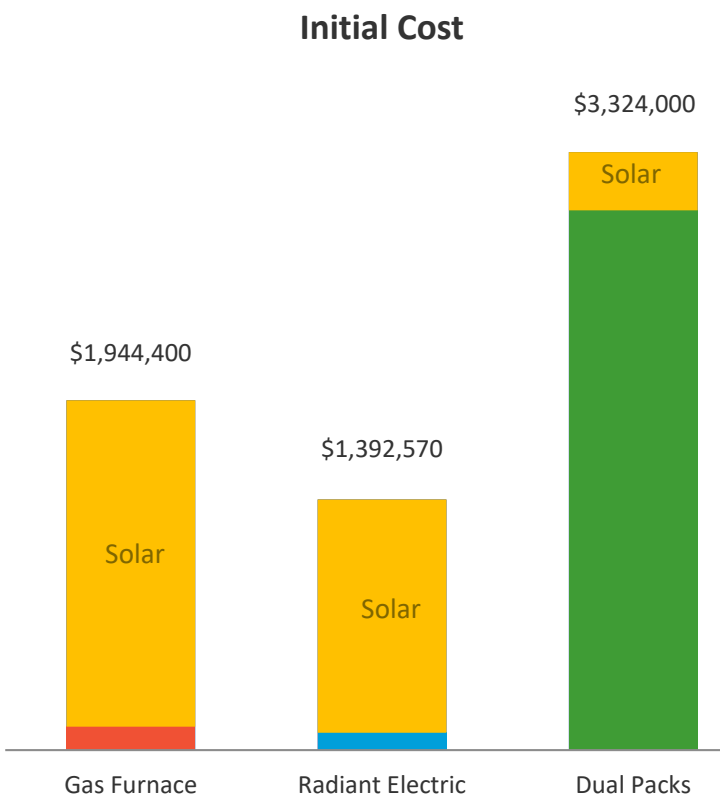

ZNE Solar PV System Size by Heating System
720 kW
Heating
Light / Plug
560 kW
Heating
Light / Plug
Gas Furnace
Radiant Electric
Dual Packs

# Renewables

## ZNE Solar PV System Size by Heating System

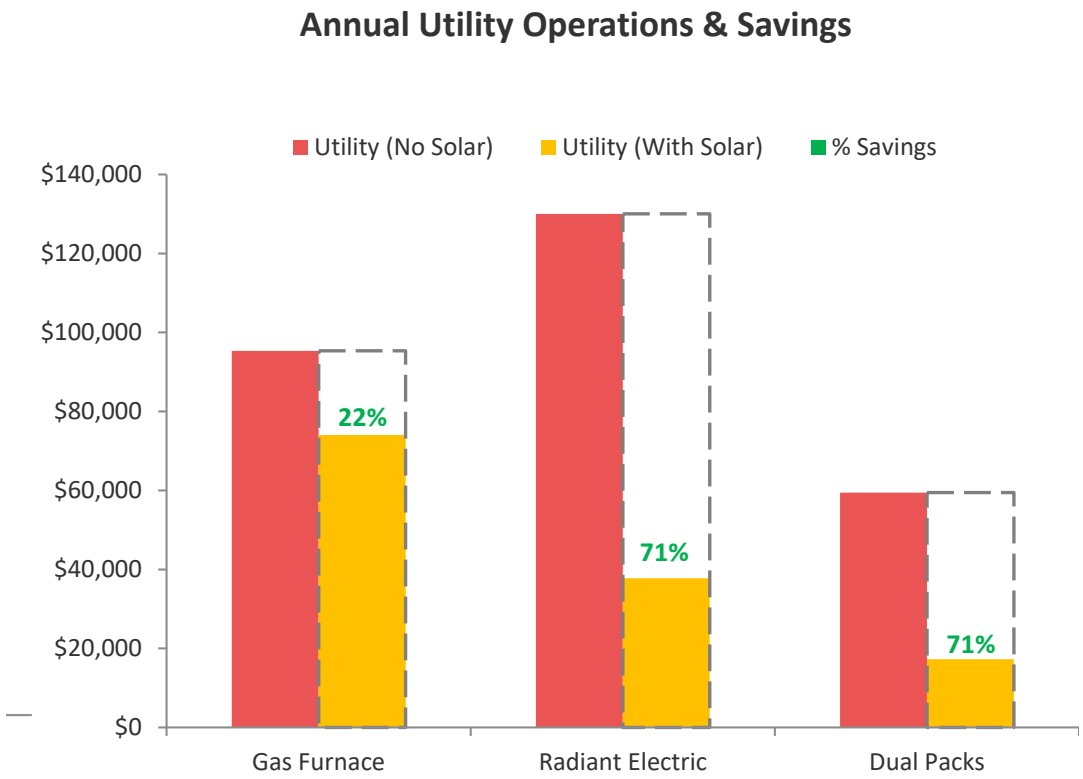



# Heating Cost Comparison

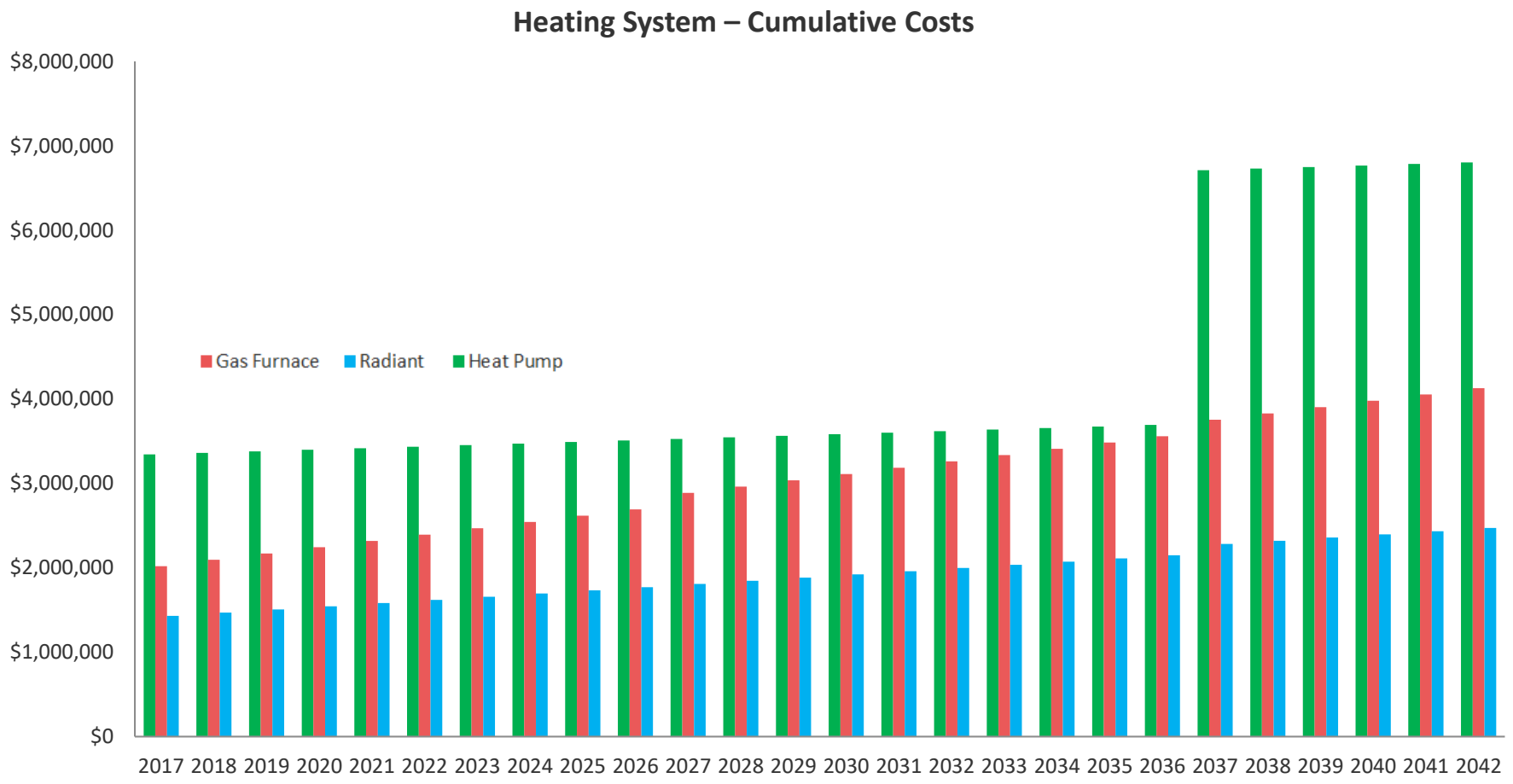


# Heating Cost Comparison

Retail
vs
Wholesale

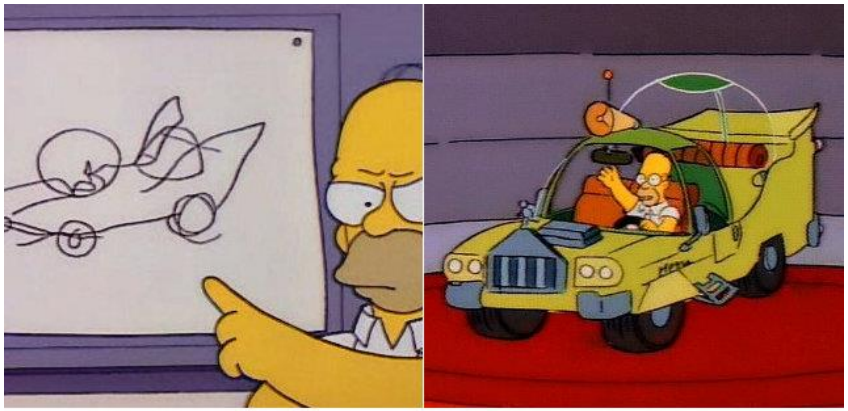


# Life Cycle Cost Analysis



# Lessons Learned

- **Incorporate ZNE requirement early in procurement and design process**
- **Consulting a professional engineer amplifies our policy recommendation with technical cost benefit analysis**



# Lessons Learned

- Include life-cycle costs; natural gas “Reznor” heaters are much cheaper to install in warehouses

- Point to the past; developers prefer natural gas heating, although original heating systems may be electric

# Questions? Thank you!


**Adam Lenz, LEED AP**
**Environmental Manager**
**City of Richmond**
**adam_lenz@ci.richmond.ca.us**
**/RichmondEH**

**Blake Herrschaft, LEED AP**
**Senior Engineer**
**DNV GL**
**blake.herrschaft@dnvgl.com**