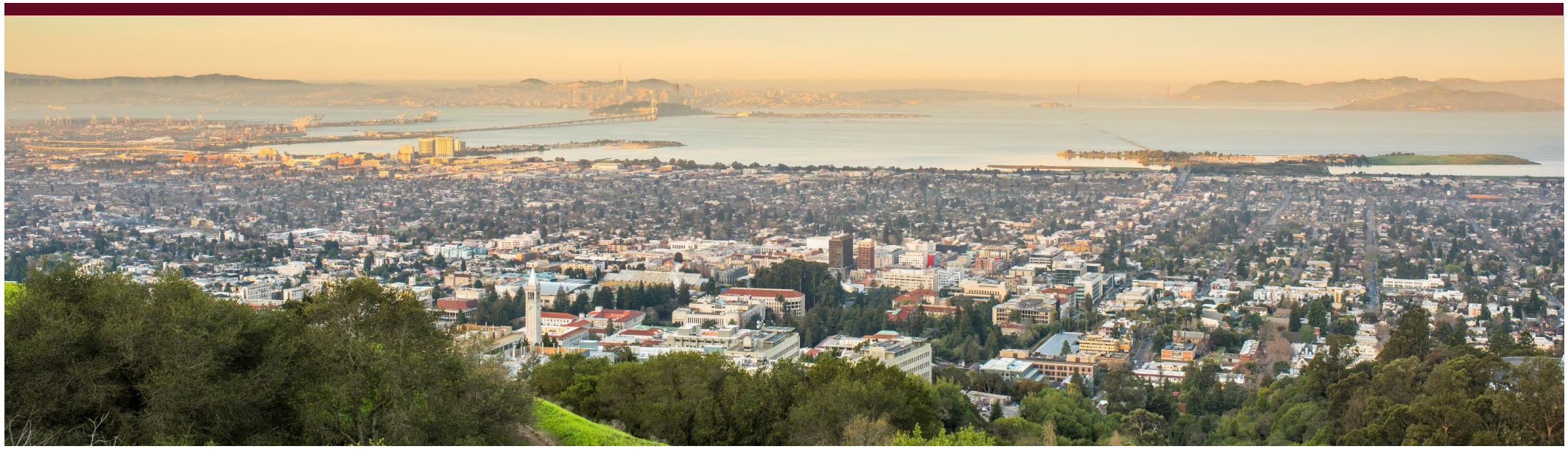
Building Emissions Saving Ordinance (BESO)

Single Family Energy Standards

February 22, 2023



Covers all buildings…

Covers all buildings…

Building Emissions Savings Ordinance

Homes 1-4 Units

- Electrification Assessment (or fuel source disclosure) at **time of listing**

Small Buildings
Up to 15k

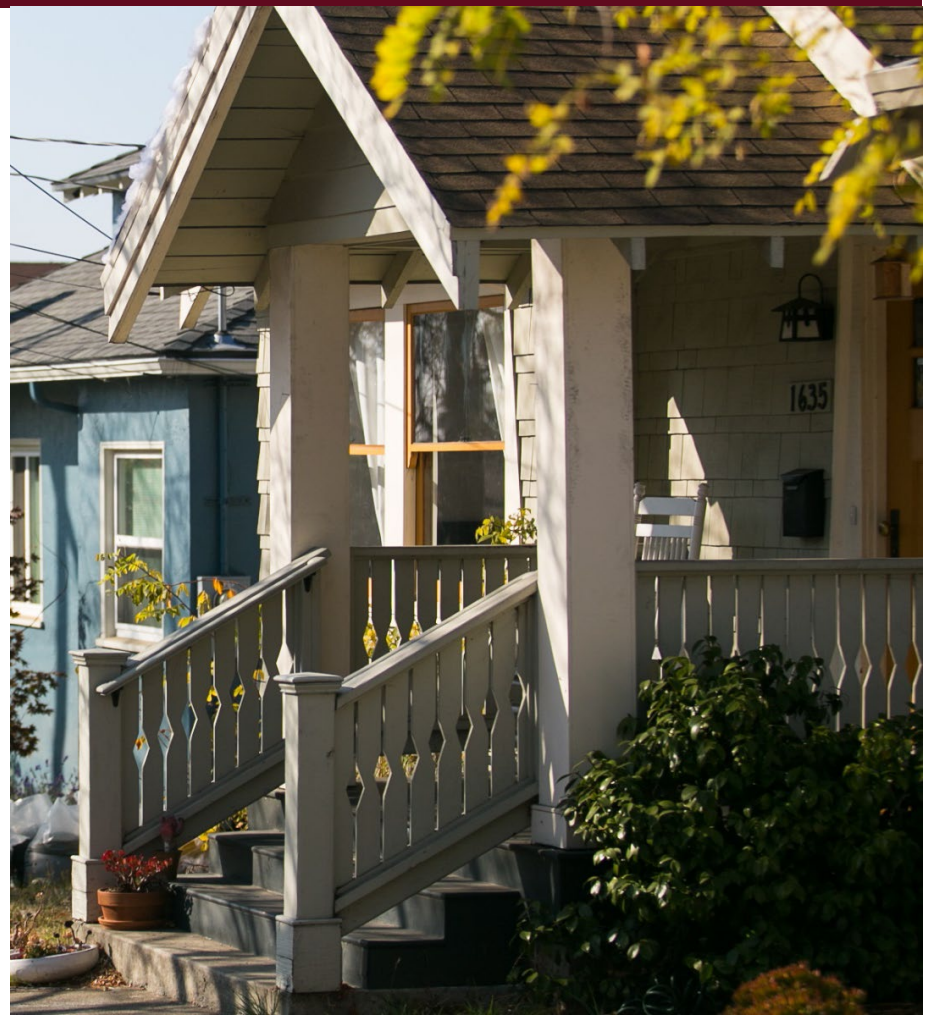
- Electrification Assessment (or fuel source disclosure) at **time of listing**

Medium Buildings
15k -25k

- Electrification Assessment (or fuel source disclosure) at **time of listing**
- Annual Benchmarking

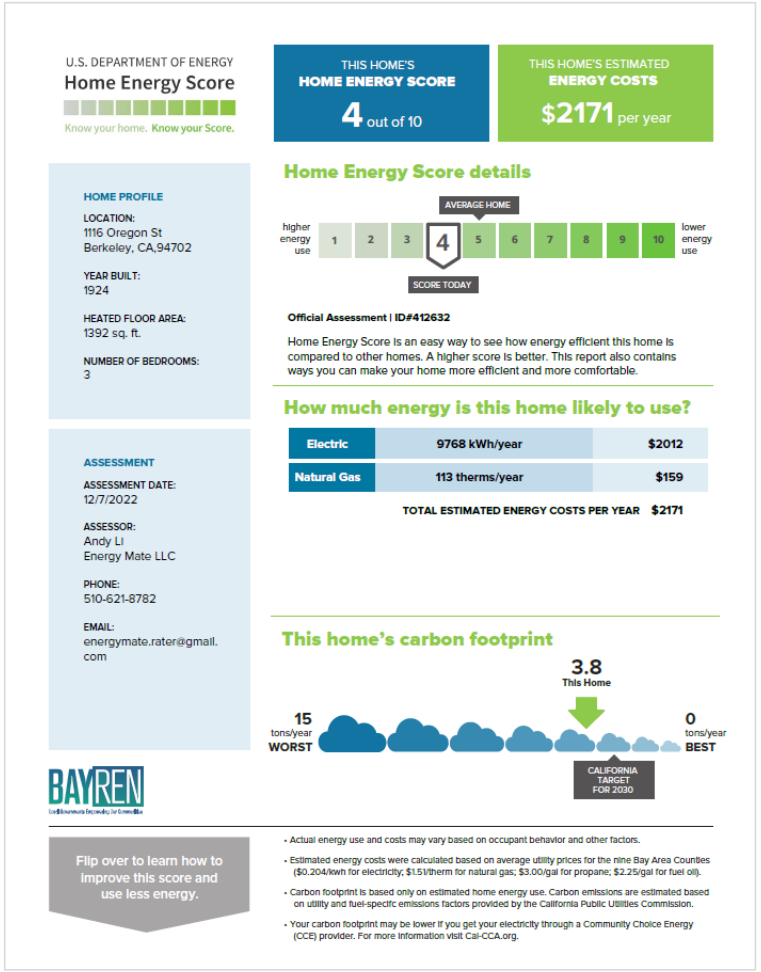
Large Buildings
25k+

- Electrification Assessment **every 5 years**
- Annual Benchmarking



Time of Listing Compliance Pathways

Assessment - Home Energy Score



U.S. DEPARTMENT OF ENERGY
Home Energy Score
Know your home. Know your Score.

THIS HOME'S **HOME ENERGY SCORE** **4** out of 10

THIS HOME'S ESTIMATED **ENERGY COSTS** **$2171** per year

HOME PROFILE
LOCATION: 1116 Oregon St Berkeley, CA,94702
YEAR BUILT: 1924
HEATED FLOOR AREA: 1392 sq. ft.
NUMBER OF BEDROOMS: 3

ASSESSMENT
ASSESSMENT DATE: 12/7/2022
ASSESSOR: Andy LI Energy Mate LLC
PHONE: 510-621-8782
EMAIL: energymate.rater@gmail.com

Home Energy Score details

AVERAGE HOME
higher energy use 1 2 3 **4** 5 6 7 8 9 10 lower energy use
SCORE TODAY

Official Assessment | ID#412632

Home Energy Score is an easy way to see how energy efficient this home is compared to other homes. A higher score is better. This report also contains ways you can make your home more efficient and more comfortable.

How much energy is this home likely to use?

Electric	9768 kWh/year	$2012
Natural Gas	113 therms/year	$159
TOTAL ESTIMATED ENERGY COSTS PER YEAR		$2171

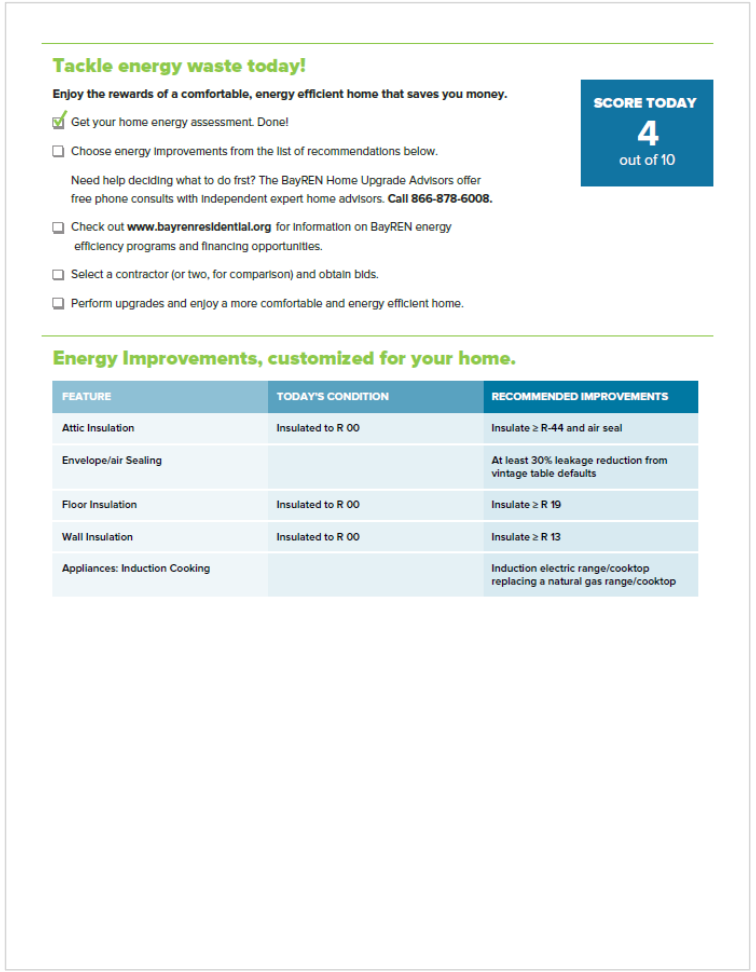
This home's carbon footprint

3.8 This Home
15 tons/year WORST
0 tons/year BEST
CALIFORNIA TARGET FOR 2030

BAYREN

Flip over to learn how to improve this score and use less energy.

- Actual energy use and costs may vary based on occupant behavior and other factors.
- Estimated energy costs were calculated based on average utility prices for the nine Bay Area Counties ($0.204/kwh for electricity; $1.51/therm for natural gas; $3.00/gal for propane; $2.25/gal for fuel oil).
- Carbon footprint is based only on estimated home energy use. Carbon emissions are estimated based on utility and fuel-specific emissions factors provided by the California Public Utilities Commission.
- Your carbon footprint may be lower if you get your electricity through a Community Choice Energy (CCE) provider. For more information visit Cal-CCA.org.



Tackle energy waste today!

Enjoy the rewards of a comfortable, energy efficient home that saves you money.

SCORE TODAY **4** out of 10

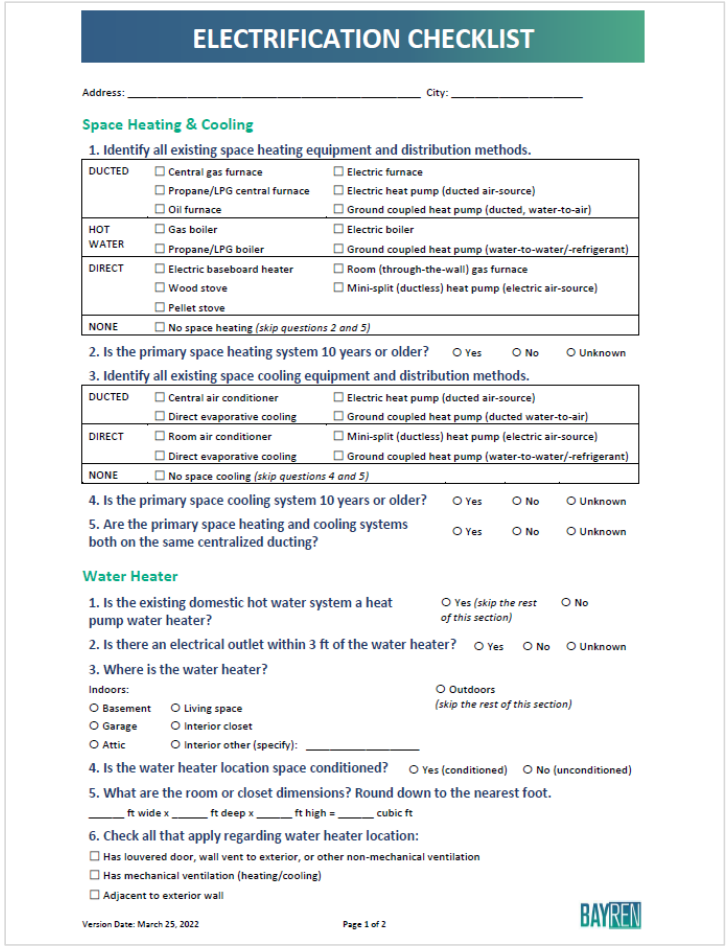
- [x] Get your home energy assessment. Done!
- [ ] Choose energy improvements from the list of recommendations below.

  Need help deciding what to do first? The BayREN Home Upgrade Advisors offer free phone consults with independent expert home advisors. **Call 866-878-6008.**
- [ ] Check out **www.bayrenresidential.org** for information on BayREN energy efficiency programs and financing opportunities.
- [ ] Select a contractor (or two, for comparison) and obtain bids.
- [ ] Perform upgrades and enjoy a more comfortable and energy efficient home.

Energy Improvements, customized for your home.

FEATURE	TODAY'S CONDITION	RECOMMENDED IMPROVEMENTS
Attic Insulation	Insulated to R 00	Insulate ≥ R-44 and air seal
Envelope/air Sealing		At least 30% leakage reduction from vintage table defaults
Floor Insulation	Insulated to R 00	Insulate ≥ R 19
Wall Insulation	Insulated to R 00	Insulate ≥ R 13
Appliances: Induction Cooking		Induction electric range/cooktop replacing a natural gas range/cooktop

Electrification Checklist



ELECTRIFICATION CHECKLIST

Address: _____ City: _____

Space Heating & Cooling

1. Identify all existing space heating equipment and distribution methods.

DUCTED	☐ Central gas furnace	☐ Electric furnace
	☐ Propane/LPG central furnace	☐ Electric heat pump (ducted air-source)
	☐ Oil furnace	☐ Ground coupled heat pump (ducted, water-to-air)
HOT WATER	☐ Gas boiler	☐ Electric boiler
	☐ Propane/LPG boiler	☐ Ground coupled heat pump (water-to-water/-refrigerant)
DIRECT	☐ Electric baseboard heater	☐ Room (through-the-wall) gas furnace
	☐ Wood stove	☐ Mini-split (ductless) heat pump (electric air-source)
	☐ Pellet stove	
NONE	☐ No space heating *(skip questions 2 and 5)*	

2. Is the primary space heating system 10 years or older? ○ Yes ○ No ○ Unknown

3. Identify all existing space cooling equipment and distribution methods.

DUCTED	☐ Central air conditioner	☐ Electric heat pump (ducted air-source)
	☐ Direct evaporative cooling	☐ Ground coupled heat pump (ducted water-to-air)
DIRECT	☐ Room air conditioner	☐ Mini-split (ductless) heat pump (electric air-source)
	☐ Direct evaporative cooling	☐ Ground coupled heat pump (water-to-water/-refrigerant)
NONE	☐ No space cooling *(skip questions 4 and 5)*	

4. Is the primary space cooling system 10 years or older? ○ Yes ○ No ○ Unknown

5. Are the primary space heating and cooling systems both on the same centralized ducting? ○ Yes ○ No ○ Unknown

Water Heater

1. Is the existing domestic hot water system a heat pump water heater? ○ Yes *(skip the rest of this section)* ○ No

2. Is there an electrical outlet within 3 ft of the water heater? ○ Yes ○ No ○ Unknown

3. Where is the water heater?

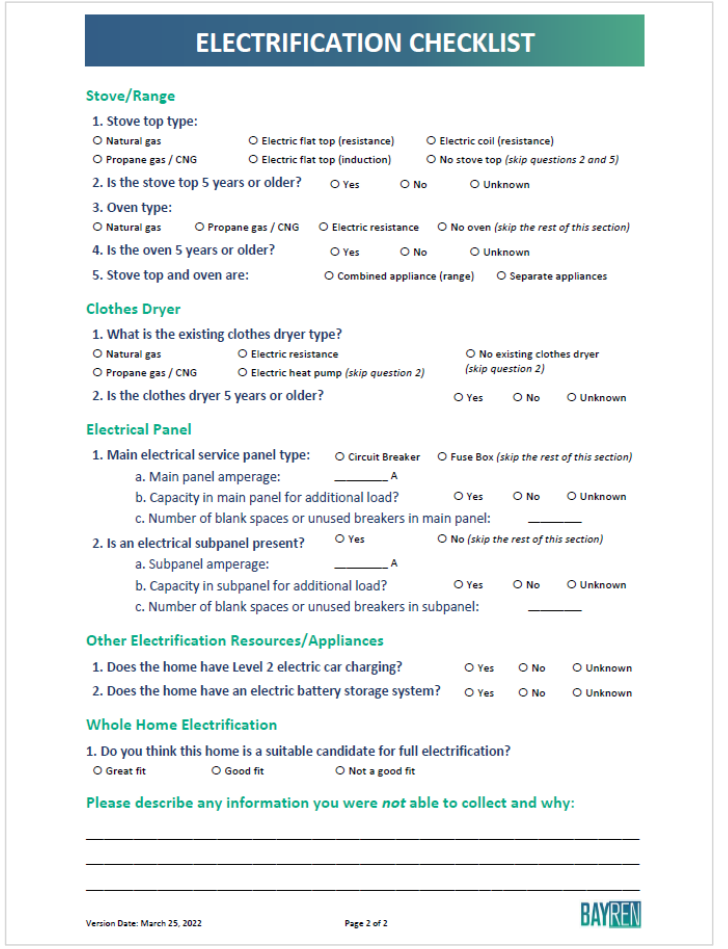
Indoors:
○ Basement ○ Living space
○ Garage ○ Interior closet
○ Attic ○ Interior other (specify): _____
○ Outdoors *(skip the rest of this section)*

4. Is the water heater location space conditioned? ○ Yes (conditioned) ○ No (unconditioned)

5. What are the room or closet dimensions? Round down to the nearest foot.
_____ ft wide x _____ ft deep x _____ ft high = _____ cubic ft

6. Check all that apply regarding water heater location:
☐ Has louvered door, wall vent to exterior, or other non-mechanical ventilation
☐ Has mechanical ventilation (heating/cooling)
☐ Adjacent to exterior wall

Version Date: March 25, 2022 Page 1 of 2 BAYREN



ELECTRIFICATION CHECKLIST

Stove/Range

1. Stove top type:
○ Natural gas ○ Electric flat top (resistance) ○ Electric coil (resistance)
○ Propane gas / CNG ○ Electric flat top (induction) ○ No stove top *(skip questions 2 and 5)*

2. Is the stove top 5 years or older? ○ Yes ○ No ○ Unknown

3. Oven type:
○ Natural gas ○ Propane gas / CNG ○ Electric resistance ○ No oven *(skip the rest of this section)*

4. Is the oven 5 years or older? ○ Yes ○ No ○ Unknown

5. Stove top and oven are: ○ Combined appliance (range) ○ Separate appliances

Clothes Dryer

1. What is the existing clothes dryer type?
○ Natural gas ○ Electric resistance ○ No existing clothes dryer *(skip question 2)*
○ Propane gas / CNG ○ Electric heat pump *(skip question 2)*

2. Is the clothes dryer 5 years or older? ○ Yes ○ No ○ Unknown

Electrical Panel

1. Main electrical service panel type: ○ Circuit Breaker ○ Fuse Box *(skip the rest of this section)*
   a. Main panel amperage: _____ A
   b. Capacity in main panel for additional load? ○ Yes ○ No ○ Unknown
   c. Number of blank spaces or unused breakers in main panel: _____

2. Is an electrical subpanel present? ○ Yes ○ No *(skip the rest of this section)*
   a. Subpanel amperage: _____ A
   b. Capacity in subpanel for additional load? ○ Yes ○ No ○ Unknown
   c. Number of blank spaces or unused breakers in subpanel: _____

Other Electrification Resources/Appliances

1. Does the home have Level 2 electric car charging? ○ Yes ○ No ○ Unknown
2. Does the home have an electric battery storage system? ○ Yes ○ No ○ Unknown

Whole Home Electrification

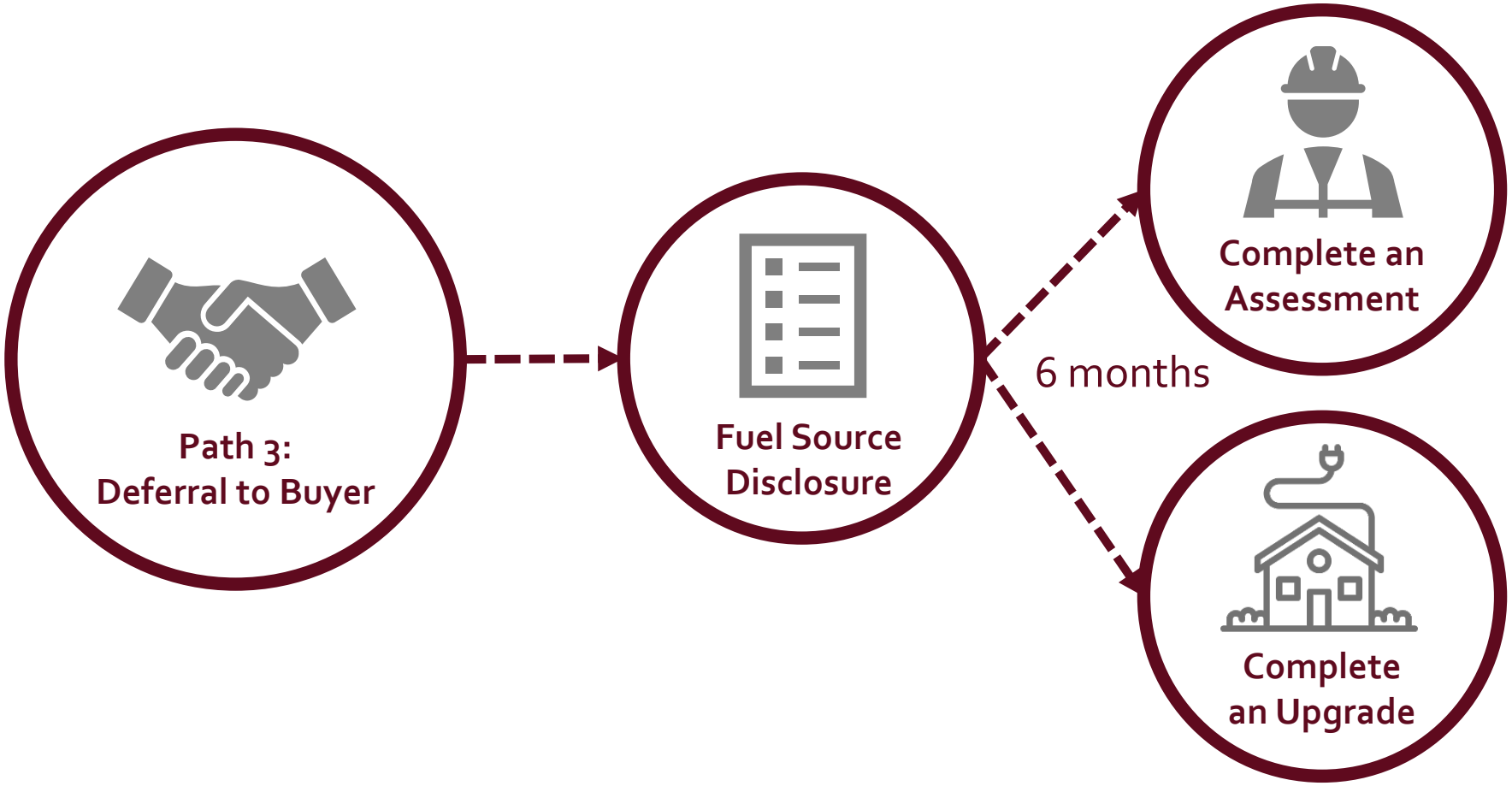
1. Do you think this home is a suitable candidate for full electrification?
○ Great fit ○ Good fit ○ Not a good fit

Please describe any information you were *not* able to collect and why:

_____
_____
_____

Version Date: March 25, 2022 Page 2 of 2 BAYREN

Deferral to Buyer



Deferral - Fuel Source Disclosure

BUILDING EMISSIONS SAVING ORDINANCE (BESO)

FUEL SOURCE DISCLOSURE - RESIDENTIAL BUILDINGS (1-4 UNITS)

Property Address: 1001 TEST AVE, BERKELEY, CA 94704

System/Appliance Fuel Sources:

- **Hot water heater:** *Natural Gas (Fossil Fuel)*
- **Cooktop/Stove:** *Natural Gas (Fossil Fuel)*
- **Clothes dryer:** *Natural Gas (Fossil Fuel)*
- **Space heating/furnace:** *Natural Gas (Fossil Fuel)*
- **Oven:** *Natural Gas (Fossil Fuel)*
- **Fireplace:** *Natural Gas (Fossil Fuel)*

Other gas systems/appliances:

Why does BESO require the disclosure of fuel sources?
All-electric buildings are **healthier**, **safer**, and more **comfortable** than buildings with natural gas appliances. All-electric buildings also reduce the pollution that causes climate change. Methane, the key component of natural gas, is a harmful greenhouse gas that traps 80 times more heat than carbon dioxide. By transitioning buildings off natural gas to electricity sourced from renewable energy such as solar and wind, we can reduce methane leakages that occur all along the natural gas system – from extraction to pipeline to our homes and businesses. Berkeley currently requires all-electric new construction and encourages existing buildings to electrify when appliances/systems need replacement or building renovations occur.

See **reverse** for more information on the **benefits of electrification**.

How do I electrify my home?
Every gas appliance can be replaced with a modern, energy efficient, all-electric alternative. Appliances that run on all-electric technologies such as heat pumps and induction are cleaner, safer, and higher-performing than their natural gas counterparts. What makes heat pumps unique is that unlike traditional natural gas or electric resistance-powered appliances, which work by generating heat, heat pumps simply move heat from one area to another. This allows them to **use energy 3-5x more efficiently** than their natural gas counterparts, saving you money, improving indoor air quality, and reducing your carbon footprint.

Hot Water Heating

Switch out your natural gas or electric resistance hot water heater for a **Heat Pump Water Heater (HPWH)**. Homeowners may quality for BayREN's $1,000 incentive, as well as other local and federal rebates and credits. (www.bayren.org/residentialhpwh)

Space Heating/Furnace

Air Source Heat Pumps can provide efficient heating and cooling for your home for reliable year-round comfort and energy savings.

Cooktop/Stove/Oven

Natural gas stoves emit harmful pollutants into your home as you cook. Upgrade your gas stove to an **Induction Cooktop/Range**. Induction cooking uses electromagnetism to heat pots and pans, resulting in faster cook times, less wasted heat, and a safer healthier kitchen.

Clothes Dryer

A **Heat Pump Dryer** can reduce energy use by at least 28% compared to standard dryers and is gentler on your clothes

For additional information on BESO visit www.cityofberkeley.info/BESO/

BESO Fuel Source Disclosure - 1001 TEST ST

Building Electrification Requirements & Goals:

According to the California Air Resources Board, *"Significant GHG emission reductions and improved air quality can be achieved through building decarbonization* (i.e. electrification) *without compromising functionality or comfort."*

- **State of California Senate Bill 32:** California must reduce statewide greenhouse gas emissions to a level 40 percent below 1990 levels by 2030.
- **Fossil Fuel Free Berkeley:** In June 2018 the Berkeley City Council established the goal of becoming a Fossil Fuel Free City, supporting the transition to all-electric buildings.

Resources, Incentives, & Financing:

- Contact a BayREN Home+ Energy Advisor to get help finding qualified contractors, navigating rebates, learning about financing options, or to get free advice at any stage of your electrification project.
- Visit the Switch Is On to learn more about how and why you should electrify.
- Find affordable financing at GoGreen Financing, administered by the State of California.
- BayREN offers incentives for installing highly efficient electric space heating, water heating, clothes drying and induction cooking appliances. These can be stacked with utility rebates and federal tax credits to maximize savings.

Electrification Benefits:

Health

Burning gas in household appliances produces harmful indoor air pollution that can increase the risk of, or exacerbate, asthma and other respiratory problems. Without proper ventilation, emissions from gas appliances – such as carbon monoxide – can even be deadly

Comfort

Air source heat pumps provide both heating and cooling, offering comfort during hot days.

Safety

Natural gas is a hazardous and combustible material. Major gas leaks and explosions, such as Aliso Canyon and San Bruno, can be devastating and natural gas use in homes is responsible for almost half of residential house fires.

Equity

All-electric new construction can reduce housing costs. For disadvantaged populations who spend a disproportionate amount of their income on energy, and are more likely to suffer from asthma due to poor indoor air quality, all-electric buildings are an opportunity to deliver social benefits.

Resilience

Natural gas lines are a dangerous risk during wildfires or earthquakes. Compared to electricity, the gas system also typically takes much longer to be restored after a disaster-related outage, inspection or repair. When paired with solar panels and backup batteries, electric buildings can have power during grid outages.

Cost Savings

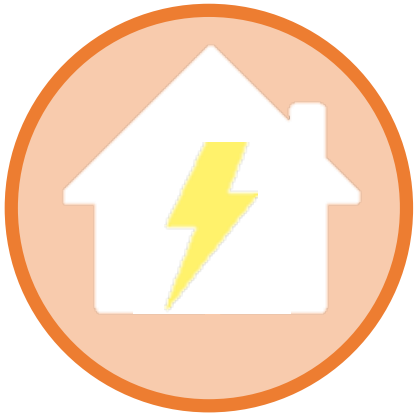
All-electric new buildings are less expensive to build than mixed fuel buildings as they do not require the installation of gas infrastructure such as pipes and venting. When paired with rooftop solar, new and existing all-electric buildings also benefit from reduced operating costs. In the future, gas prices are expected to rise, making all-electric buildings less costly to power.

Smaller Carbon Footprint

In California, buildings are the second largest source of greenhouse gas emissions. As electricity from the grid gets cleaner (moving to 100% carbon-free by 2045), emissions from all-electric buildings will eventually disappear. All-electric buildings that have rooftop solar or purchase 100% renewable electricity are already zero-emission.

For additional information on BESO visit www.cityofberkeley.info/BESO/

2020 BESO Amendment



Align BESO with **Emissions Reduction** & **Resilience** Goals

Streamline requirements for small and medium sized buildings

Increase **transparency** in the building sale process

Increase upgrades and participation in **rebate/incentive** programs

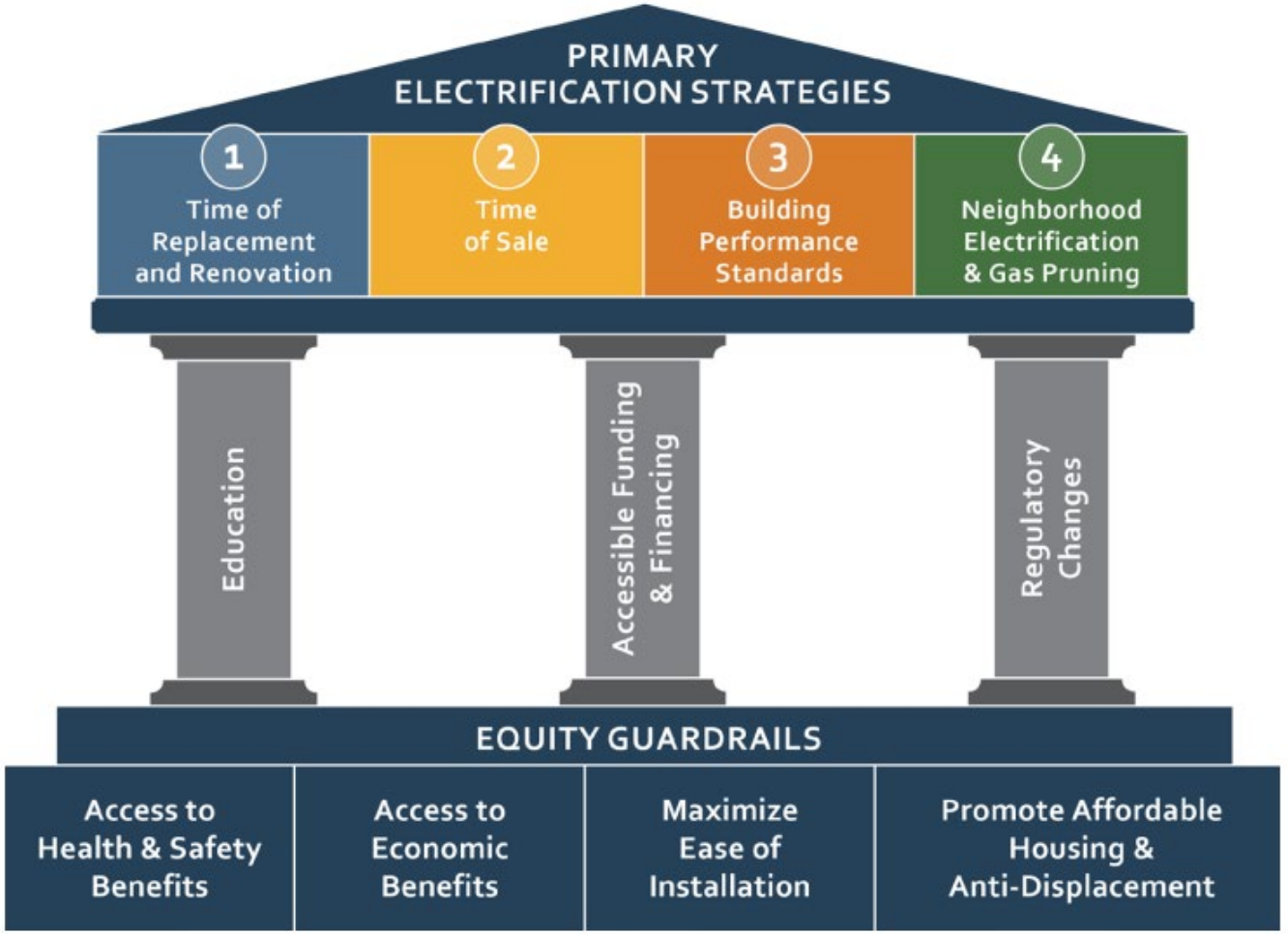
Develop Energy Upgrade Requirements

Why do we need requirements?

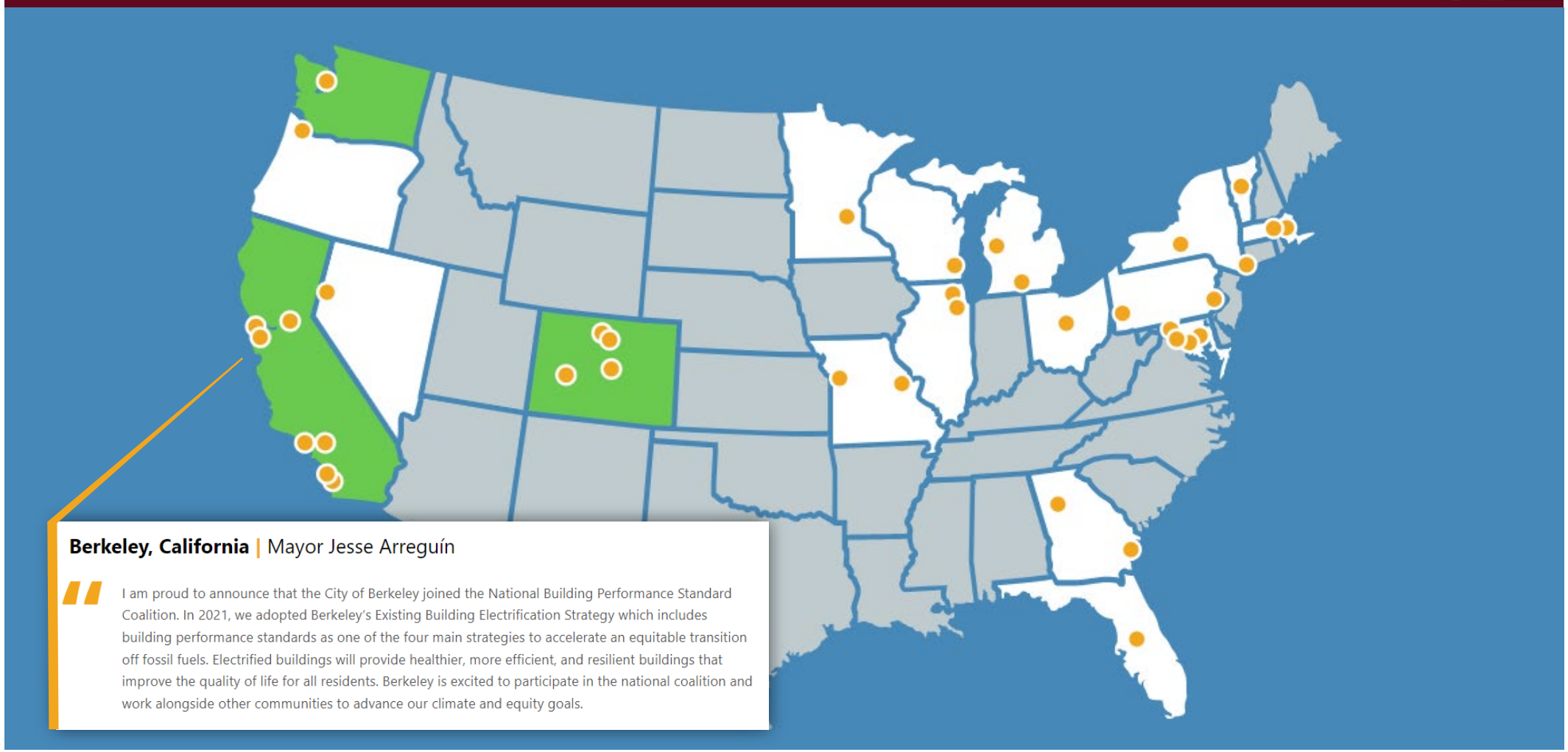
- Climate Action Plan (2009)
- Fossil Fuel Free City (2018)
- Climate Emergency Declaration (2018)
- 100% Renewable Electricity by 2035 (2018)
- Net Zero Carbon Emissions by 2045 (2018)
- Race to Zero – 60.5% reduction by 2030 (2021)

Photo from www.theclimatemobilization.org

Berkeley's Existing Building Electrification Strategy



National BPS Coalition



Why Time of Listing for Sale?

Annual turnover of single family building stock

2-3%

Many new homeowners renovate

New State and Regional appliance standards

CALIFORNIA AIR RESOURCES BOARD

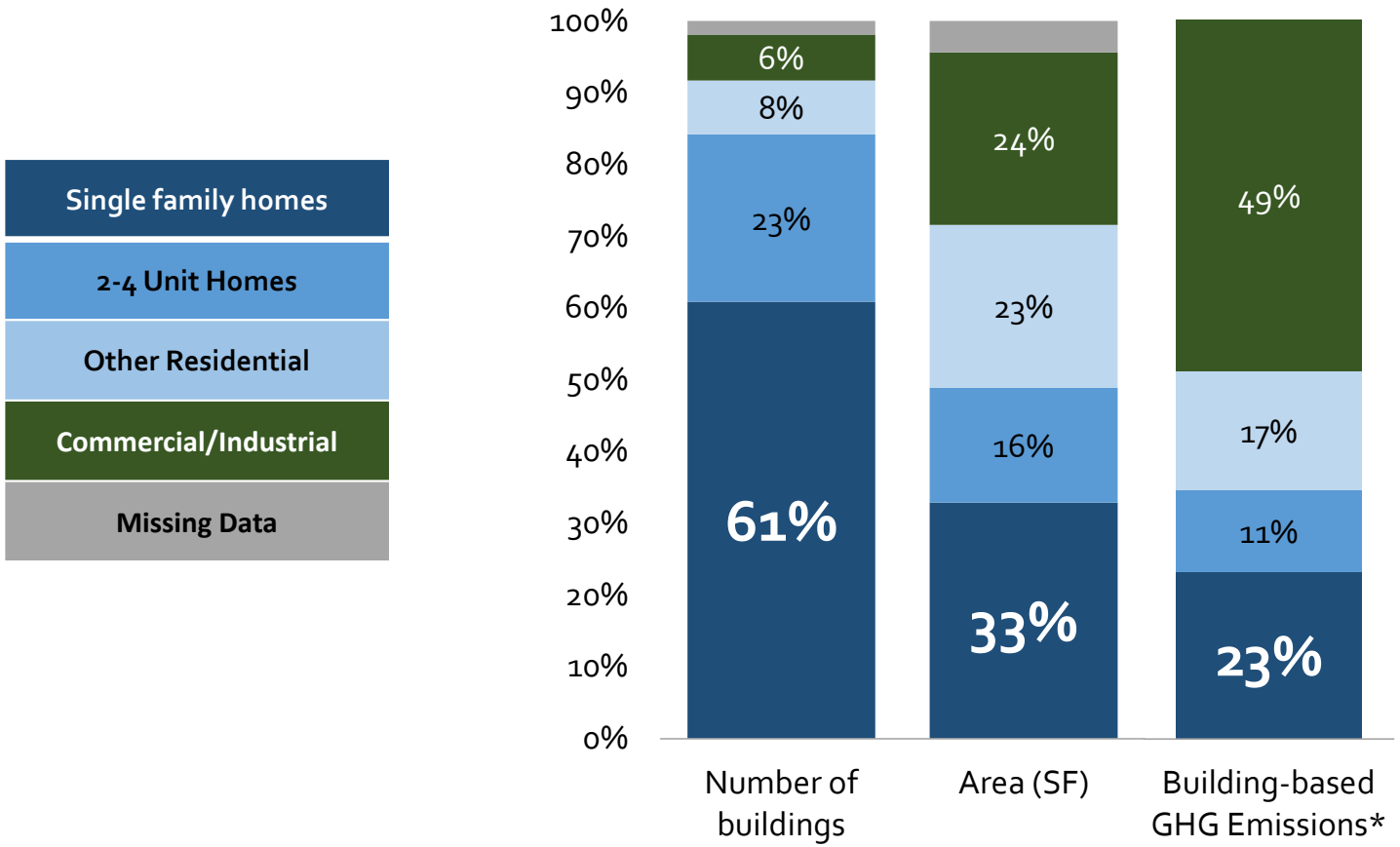
BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Starting with Single Family buildings

Sales per year

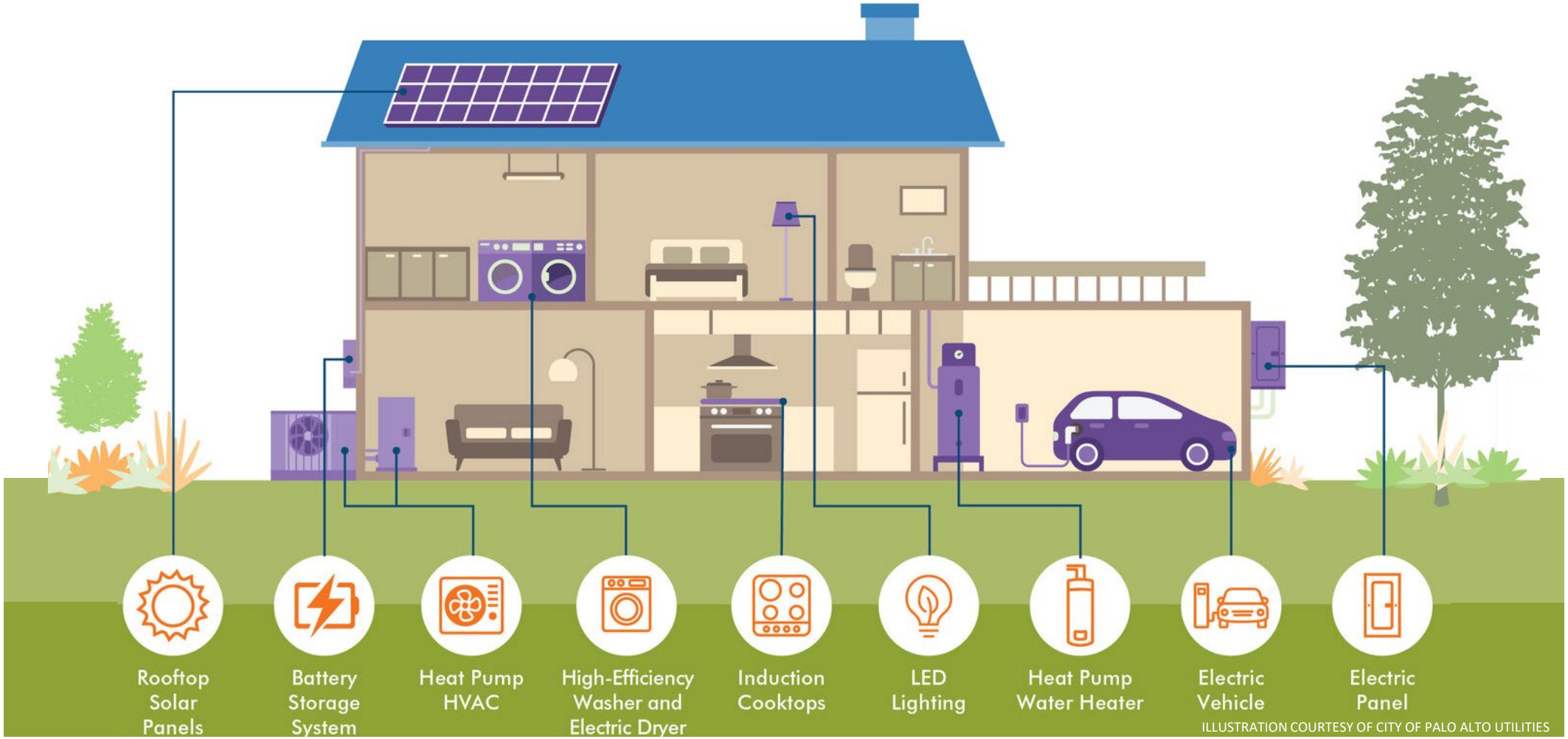
Emissions from Single Family Homes

Buildings by Count, Area, and GHG Emissions



*Based on the 2020 GHG Inventory

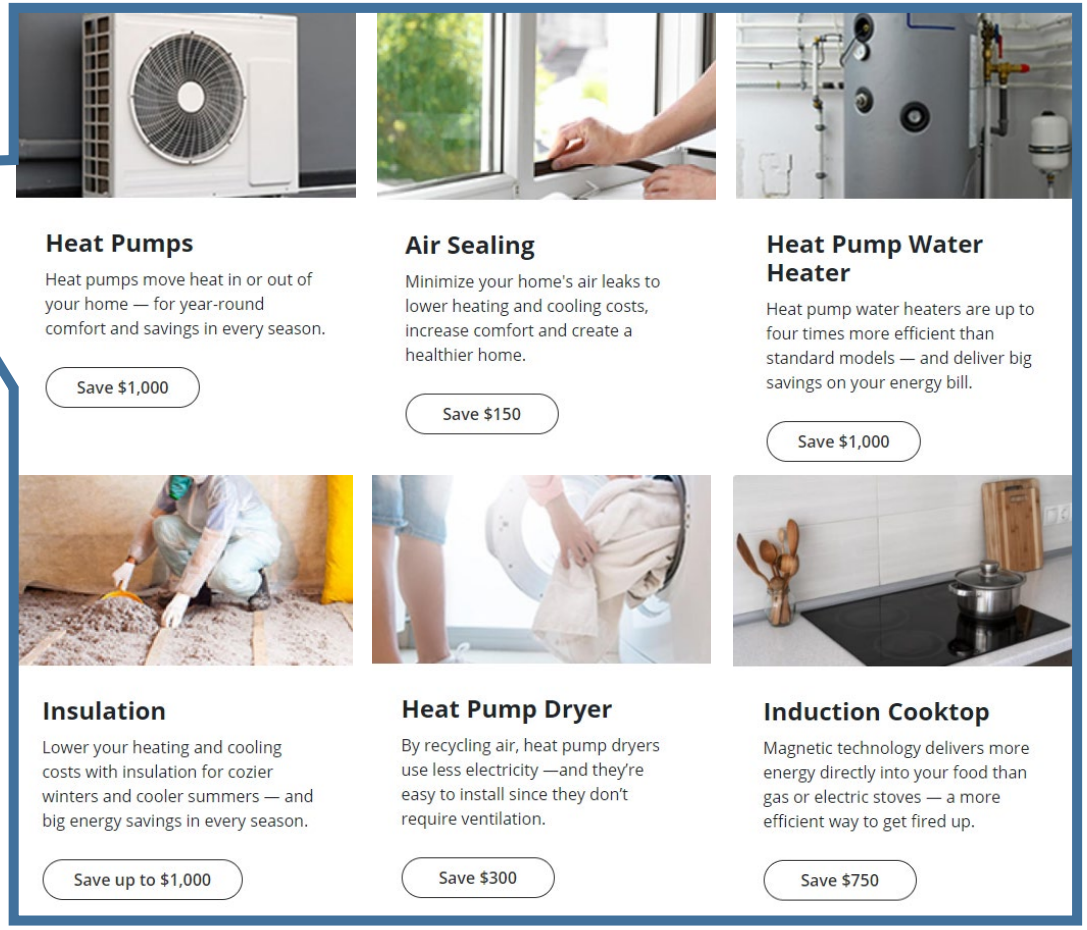
Single family building electrification



More rebates available for single-family

BAYREN Home+

Inflation Reduction Act
Energy Efficient Home Improvement Credit



Dedicated team of energy advisors

BAYREN
Local Governments Empowering Our Communities

. . . . . BayREN Home+ Energy Advisor Service . . . . .

STEP 1: SELECT A SERVICE BELOW

Select service

SELECT ONE: Quick Question Call
15 minutes
Free

SELECT ONE: Energy Advising Call
30 minutes
Free

Development Process and Timeline

Policy Development Timeline

- **Spring 2023:** Work with stakeholders on policy development topics
  - Technical Advisory Committee
  - Realtors
  - Community Advocates
- **Summer 2023:** Draft policy recommendation, outreach to commissions and stakeholders
- **Fall 2023:** Finalize policy recommendation with Council Committees
- **Winter 2023/Spring 2024:** Policy recommendation to City Council

Technical Advisory Committee

- **Members:**
  - Building Decarbonization Experts
  - BESO Assessors
  - Architects
  - Electrification Contractors
  - Utilities
  - Regional and State entities
- **Goals:**
  - Establish a single-family energy standard
  - Develop compliance pathways and exemptions
  - Discuss policy implementation details (e.g. cost caps, upgrade timelines, enforcement, etc.)

Policy Objectives

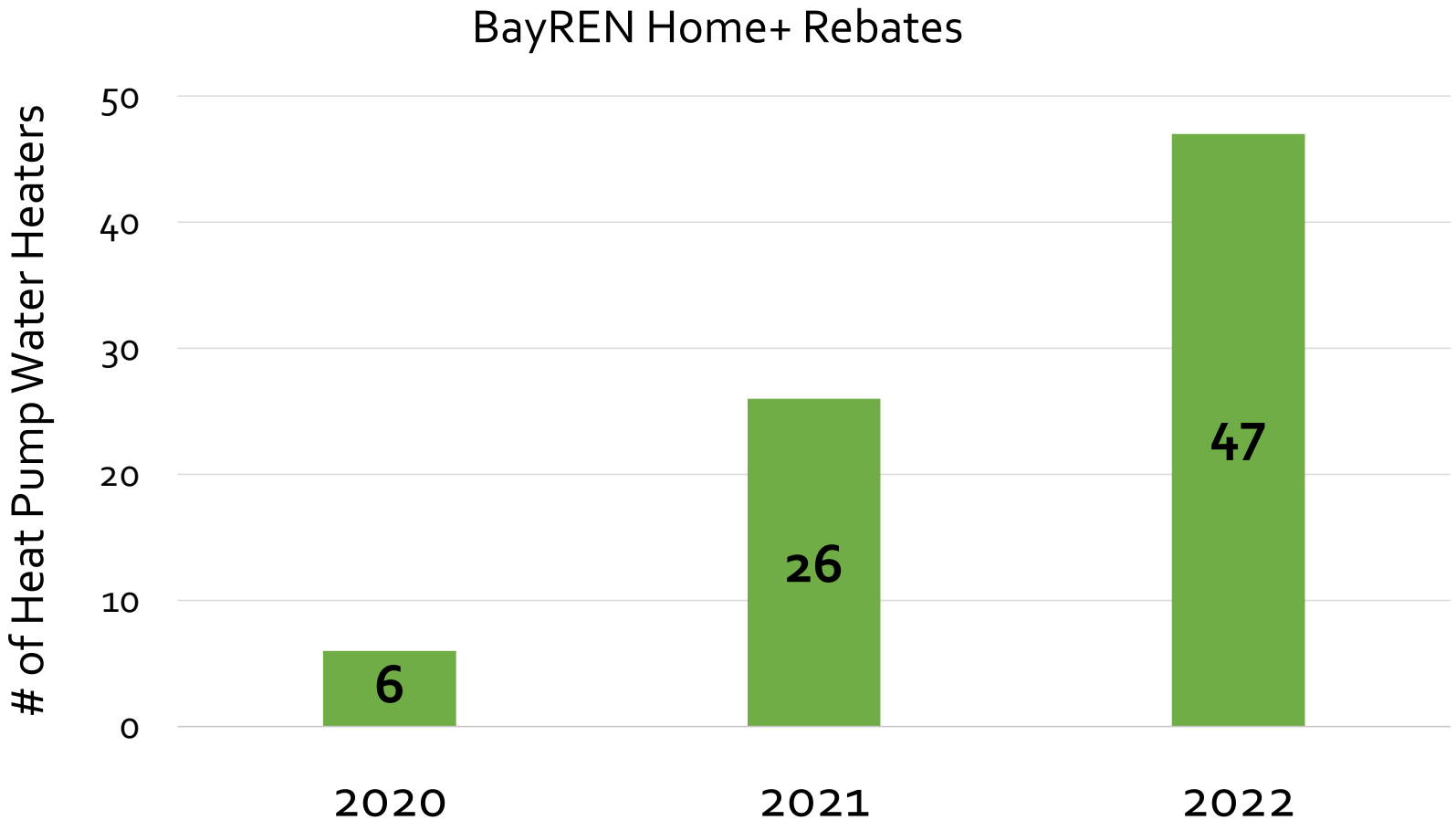
Policy Objectives

- Accelerate building electrification upgrades
- Promote early compliance
- Align with available resources
- Ensure smooth sales process
- Provide flexibility in required upgrades

Accelerate building electrification upgrades

Promote early compliance

Uptake of Heat Pump Water Heaters



$ Align with available resources

Image by jcomp on Freepik

Ensure smooth sales process

Provide flexibility in required upgrades

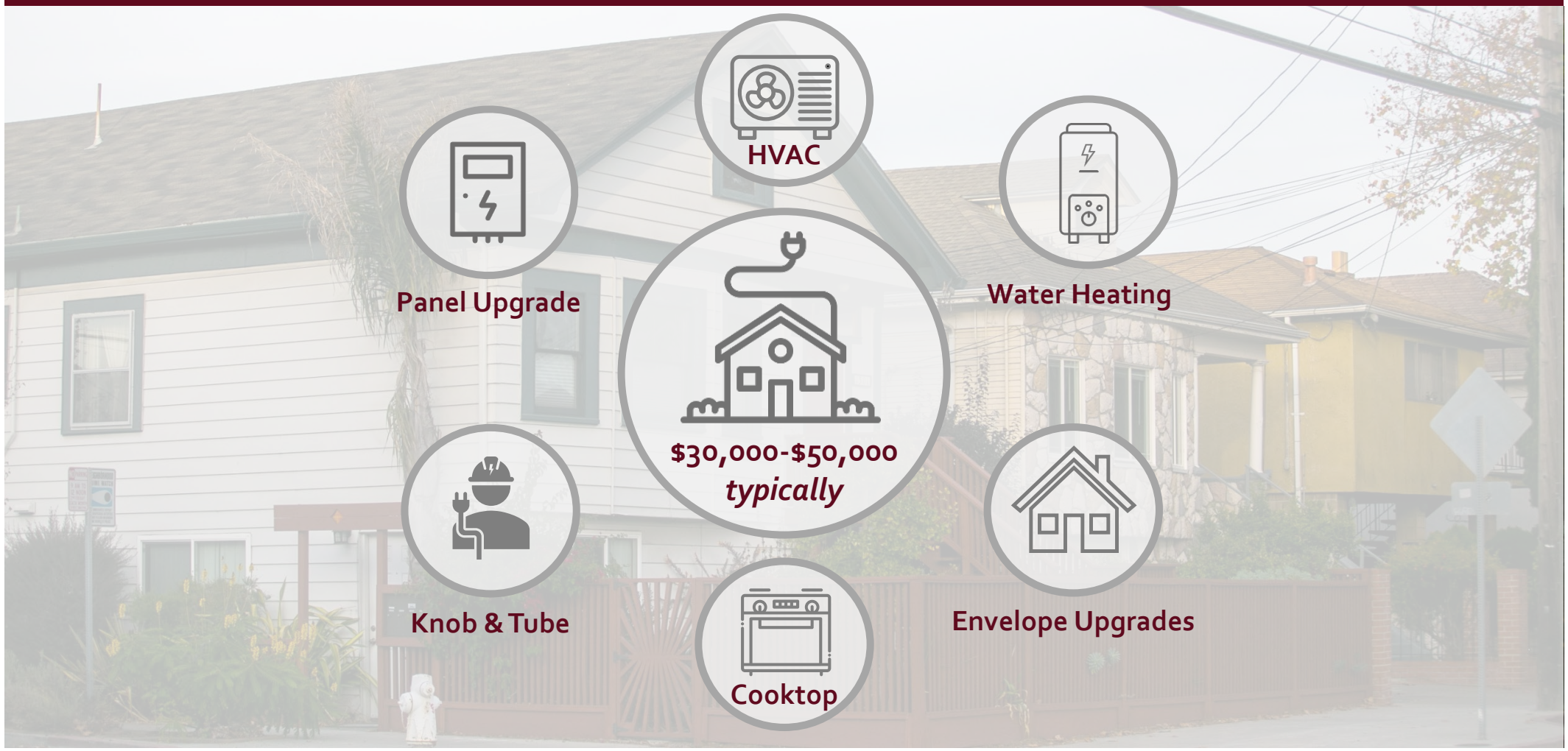
Choices based on homeowner priorities

Health

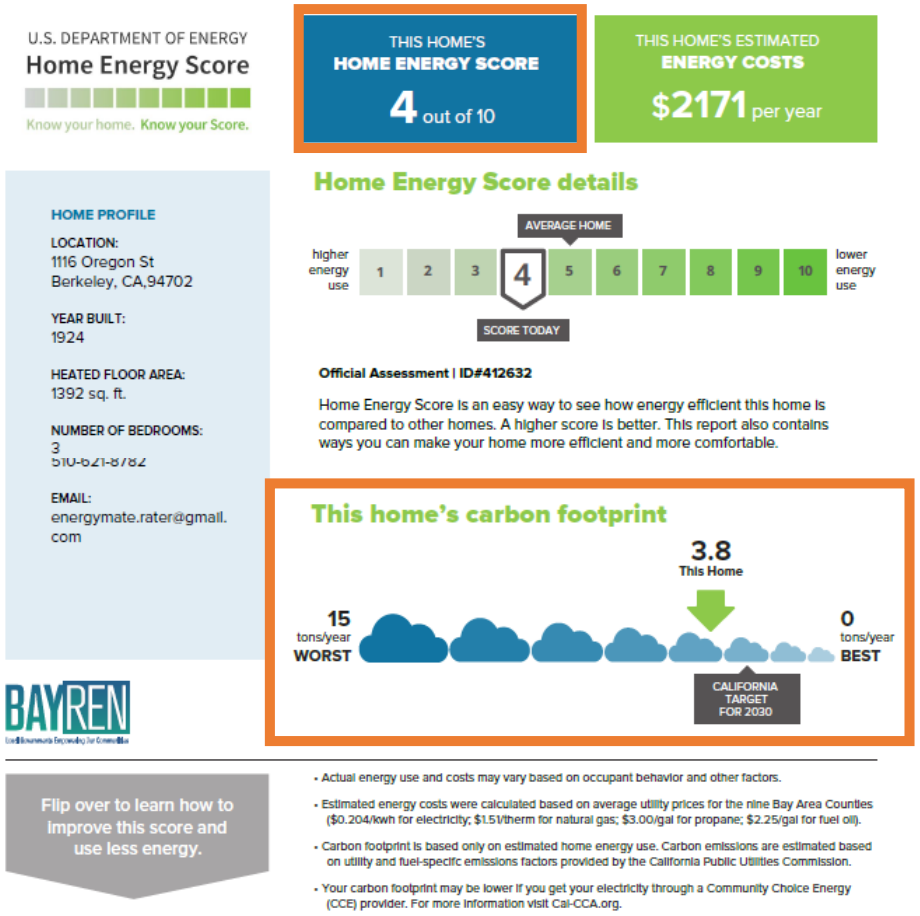
Safety

Comfort

Full electrification is costly



Types of Energy Standards - Performance


U.S. DEPARTMENT OF ENERGY
Home Energy Score
Know your home. Know your Score.

THIS HOME'S
HOME ENERGY SCORE
4 out of 10

THIS HOME'S ESTIMATED
ENERGY COSTS
$2171 per year

HOME PROFILE
LOCATION:
1116 Oregon St
Berkeley, CA,94702
YEAR BUILT:
1924
HEATED FLOOR AREA:
1392 sq. ft.
NUMBER OF BEDROOMS:
3
510-621-8782
EMAIL:
energymate.rater@gmail.com

Home Energy Score details

AVERAGE HOME
higher energy use
1 2 3 4 5 6 7 8 9 10
lower energy use
SCORE TODAY

Official Assessment | ID#412632

Home Energy Score is an easy way to see how energy efficient this home is compared to other homes. A higher score is better. This report also contains ways you can make your home more efficient and more comfortable.

This home's carbon footprint

3.8
This Home
15 tons/year WORST
0 tons/year BEST
CALIFORNIA TARGET FOR 2030

BAYREN

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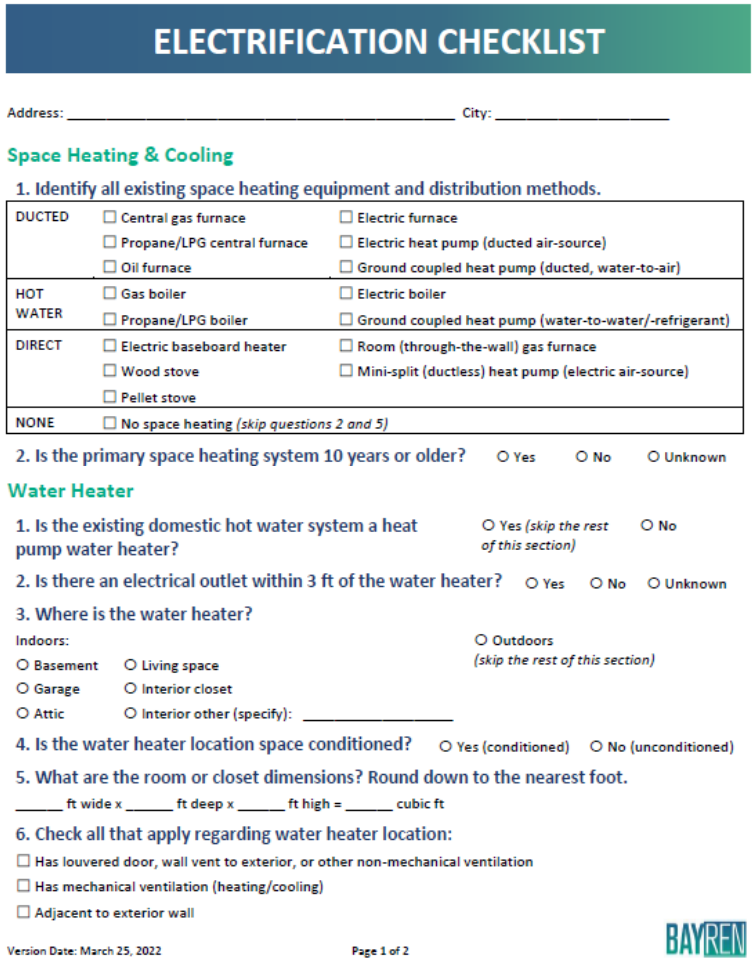
- Your carbon footprint may be lower if you get your electricity through a Community Choice Energy (CCE) provider. For more information visit Cal-CCA.org.

Based on a home's operations

- Home Energy Score
- GHG emissions

Types of Energy Standards - Prescriptive



ELECTRIFICATION CHECKLIST

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DIRECT	☐ Electric baseboard heater	☐ Room (through-the-wall) gas furnace
	☐ Wood stove	☐ Mini-split (ductless) heat pump (electric air-source)
	☐ Pellet stove	
NONE	☐ No space heating *(skip questions 2 and 5)*	

2. Is the primary space heating system 10 years or older? ○ Yes ○ No ○ Unknown

Water Heater

1. Is the existing domestic hot water system a heat pump water heater? ○ Yes *(skip the rest of this section)* ○ No

2. Is there an electrical outlet within 3 ft of the water heater? ○ Yes ○ No ○ Unknown

3. Where is the water heater?

Indoors:
○ Basement ○ Living space
○ Garage ○ Interior closet
○ Attic ○ Interior other (specify): _____

○ Outdoors
(skip the rest of this section)

4. Is the water heater location space conditioned? ○ Yes (conditioned) ○ No (unconditioned)

5. What are the room or closet dimensions? Round down to the nearest foot.

_____ ft wide x _____ ft deep x _____ ft high = _____ cubic ft

6. Check all that apply regarding water heater location:

☐ Has louvered door, wall vent to exterior, or other non-mechanical ventilation
☐ Has mechanical ventilation (heating/cooling)
☐ Adjacent to exterior wall

Version Date: March 25, 2022 Page 1 of 2 BAYREN

Based on the home's existing conditions and systems

- HVAC and water heater
- Induction stoves and electric dryers
- Electric readiness
  - 240v outlets near major systems
  - Panel and service capacity
  - Electrical wiring (e.g. knob and tube)

Discussion

Guiding Questions

- Considerations on the type of energy standard?
- What possible compliance paths should we consider?
- What types of exemptions and deferrals should we consider?
- How should equity be addressed?

Thank You!

Ammon Reagan
Sustainability Program Coordinator
Office of Energy and Sustainable Development
AReagan@CityofBerkeley.info