

Building Emissions Saving Ordinance (BESO)

Berkeley's HES Program

October 8, 2024



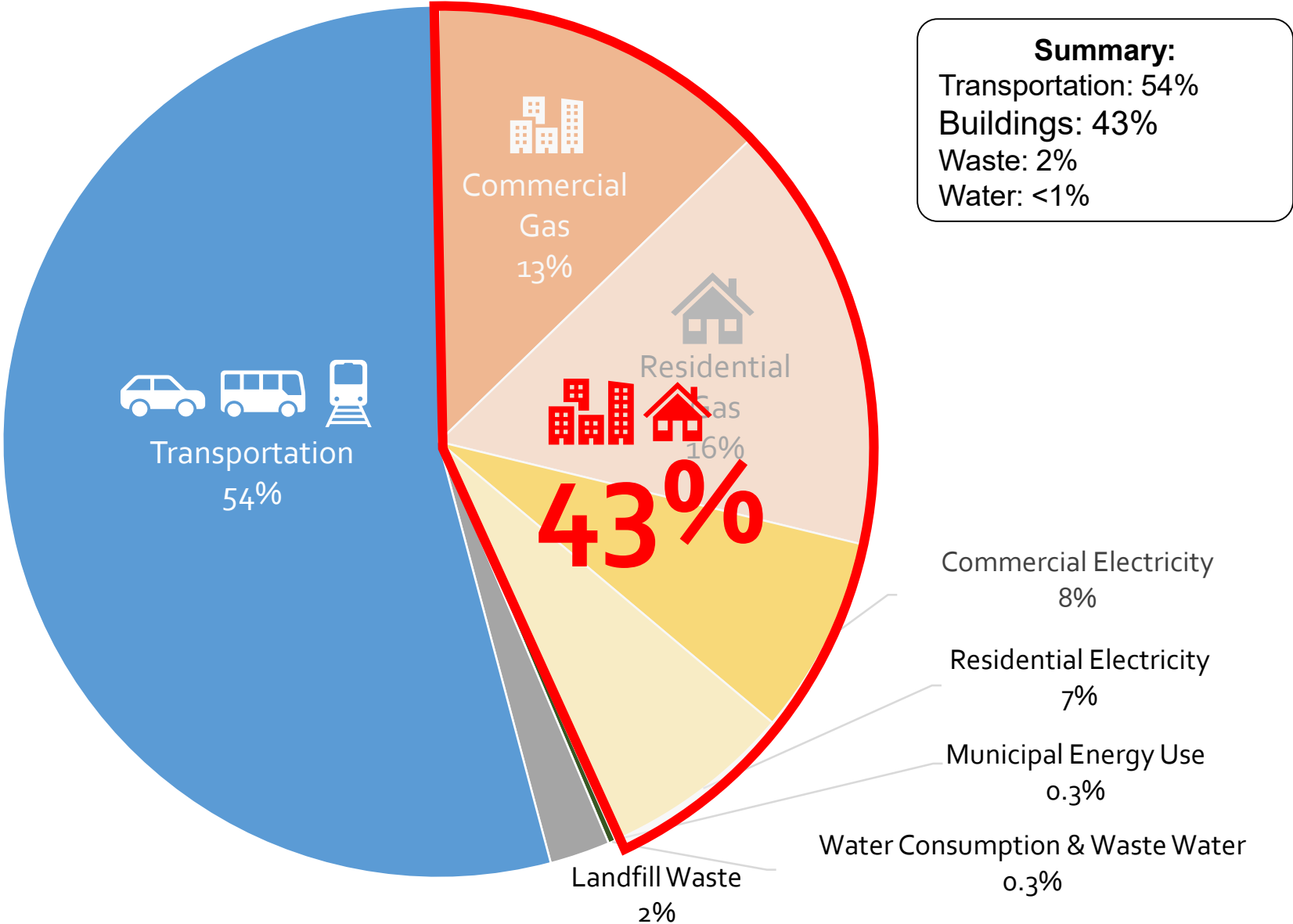
Berkeley's Ambitious Climate Action Goals



- Climate Action Plan (2009)
- **Fossil Fuel Free City (2018)**
- Climate Emergency Declaration (2018)
- **Net Zero Carbon Emissions by 2045 (2018)**
- Race to Zero (2021)



2021 Greenhouse Gas Inventory



Building Emissions Saving Ordinance (BESO)

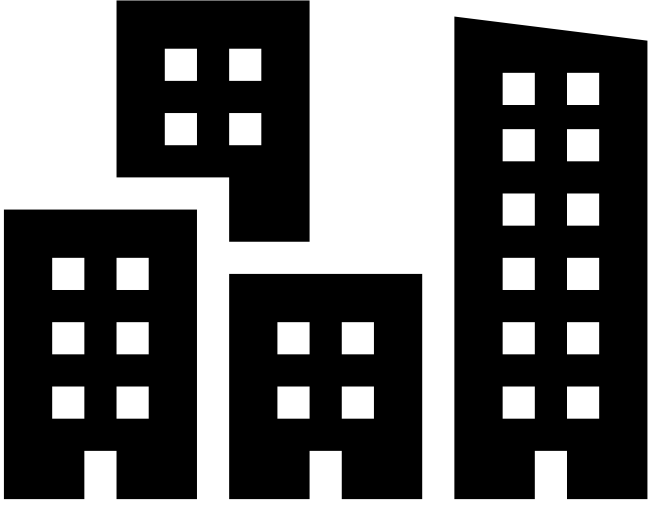


Time of Listing Program



Buildings **less** than
25,000 sqft

Large Building Program



Buildings **greater** than
25,000 sqft

Current Time of Listing Program

- Requires an **energy/electrification assessment** prior to listing a building for sale
 - **Home Energy Score for Single Family Homes**
 - Provides information to potential buyers
 - Projected utility bills
 - Energy systems and building characteristics
 - Progress towards electrification
- Refers building owners into local incentive programs to complete voluntary upgrades



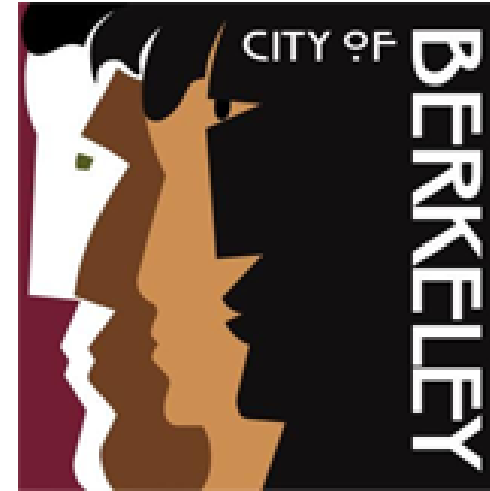
Program Implementation



Local Governments Empowering Our Communities

Regional HES Program Partner

- Trains HES Assessors
- Maintains HES database
- Ensures QA/QC



Local Program Administrator

- Monitors real estate listings
- Assists homeowners and realtors with compliance

Progress to Date



- **From 2015-Present:**
 - ~4,200 HES assessments
 - ~500 HES per year
 - 4.5 average score
- **HES Assessors:**
 - 13 companies
 - 28 individual assessors
- **Compliance:**
 - ~90% compliance rate



Electrification Checklist



ELECTRIFICATION CHECKLIST

Address: _____ City: _____

Space Heating & Cooling

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

DUCTED	<input type="checkbox"/> Central gas furnace	<input type="checkbox"/> Electric furnace
	<input type="checkbox"/> Propane/LPG central furnace	<input type="checkbox"/> Electric heat pump (ducted air-source)
	<input type="checkbox"/> Oil furnace	<input type="checkbox"/> Ground coupled heat pump (ducted, water-to-air)
HOT WATER	<input type="checkbox"/> Gas boiler	<input type="checkbox"/> Electric boiler
	<input type="checkbox"/> Propane/LPG boiler	<input type="checkbox"/> Ground coupled heat pump (water-to-water/-refrigerant)
DIRECT	<input type="checkbox"/> Electric baseboard heater	<input type="checkbox"/> Room (through-the-wall) gas furnace
	<input type="checkbox"/> Wood stove	<input type="checkbox"/> Mini-split (ductless) heat pump (electric air-source)
	<input type="checkbox"/> Pellet stove	
NONE	<input type="checkbox"/> 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	<input type="checkbox"/> Central air conditioner	<input type="checkbox"/> Electric heat pump (ducted air-source)
	<input type="checkbox"/> Direct evaporative cooling	<input type="checkbox"/> Ground coupled heat pump (ducted water-to-air)
DIRECT	<input type="checkbox"/> Room air conditioner	<input type="checkbox"/> Mini-split (ductless) heat pump (electric air-source)
	<input type="checkbox"/> Direct evaporative cooling	<input type="checkbox"/> Ground coupled heat pump (water-to-water/-refrigerant)
NONE	<input type="checkbox"/> 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: Outdoors (skip the rest of this section)

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

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

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:

Home Energy Score



Home Energy Score Energy Savings Pathway Report



U.S. DEPARTMENT OF ENERGY
Home Energy Score™

LOCATION: 1234 Berkeley Way, Berkeley, CA, 94704
BEDROOMS: 3 HEATED FLOOR AREA: 2,100 sq.ft.
COMPANY: Home Energy Assessor
EMAIL: Jane@doehomeenergy.com

YEAR BUILT: 1906
ASSESSMENT DATE: 09/17/2024
ASSESSOR: Jane Doe
PHONE: 800-111-2233

<p>Current Score</p> <p>4</p> <p>OUT OF 10</p> <p>Estimate of Current Yearly Energy Costs³</p> <p>\$3,211</p>	<p>Recommended Shell Improvements¹</p> <p>10</p> <p>OUT OF 10</p> <p>Estimate of Energy Costs with Shell Improvements</p> <p>\$2,661</p>	<p>Full Home Electrification²</p> <p>10</p> <p>OUT OF 10</p> <p>Estimate of Energy Costs with Electrification</p> <p>\$2,652</p>
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Home Energy Score Details



Official Assessment: ID# 12345

Average U.S. Home's Score = 5

The U.S. Department of Energy's Home Energy Score assesses the energy efficiency of a home based on its structure and heating, cooling and hot water systems. Learn more at HomeEnergyScore.gov.

Current Estimated Energy Use By Fuel Type³

Fuel Type	Estimated Current Use	After Shell Improvements	After Full Electrification
Electric: 6,974 kWh/yr (\$0.31/kWh)	\$2,161	\$2,161	\$2,652
Natural Gas: 443 therms/yr (\$2.37/therm)	\$1,050	\$500	\$0
Other:	\$0	\$0	\$0
Renewable Generation: (\$0.31/kWh)	N/A	N/A	N/A
TOTAL ESTIMATED YEARLY ENERGY COSTS	\$3,211	\$2,661	\$2,652

This Home's Carbon Footprint⁴

Carbon footprint by fuel type (measured in Metric tons of CO₂): Electric: 0.3 Natural Gas: 2.3



Learn how to improve this score and electrify your home to use less energy on the next page.

Tackle energy waste today!

- Get your home energy assessment. Done!
- Choose energy improvements from the list of recommendations below.
- Select a contractor (or two, for comparison) and obtain bids.
- Perform upgrades and enjoy a more comfortable and energy efficient home.

Current Score

4

OUT OF 10

For More Information Visit the Websites Below

BayREN Homeowner Info



bayren.org/homeowners

State Information



energy.ca.gov

US Rebates & Tax Credits



energy.gov/save

Incentive Information



incentives.switchison.org

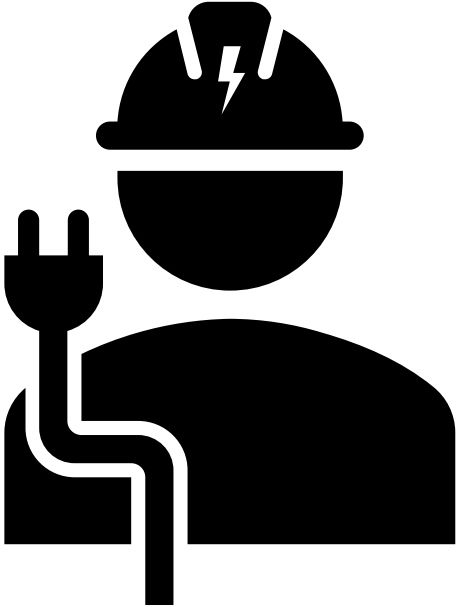
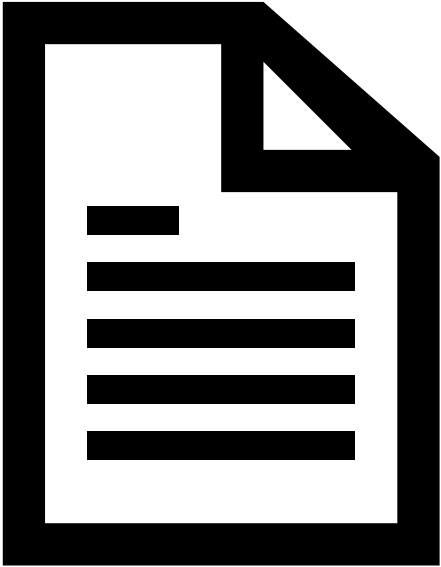
Energy Improvements Customized for Your Home

SHELL IMPROVEMENTS ¹		
FEATURE	TODAY'S CONDITION	RECOMMENDED IMPROVEMENTS
Envelope/Air sealing	Not professionally air sealed	Professionally air seal
Attic insulation	Ceiling insulated to R-19	Insulate to R-44 or higher
Wall insulation	Insulated to R-0	Insulate to R-13 or higher
Floor insulation	Insulated to R-0	Insulate to R-30 or fill floor cavity
Windows	Single-pane	Upgrade to double-pane or other high-efficiency windows

FULL HOME ELECTRIFICATION IMPROVEMENTS ²		
FEATURE	TODAY'S CONDITION	RECOMMENDED IMPROVEMENTS
Appliances: Heat Pump Dryer	Gas Dryer	Heat pump clothes dryer 4.5 Combined Energy Factor (CEF) replacing a natural gas clothes dryer
Appliances: Induction Cooking	Gas Range/Cooktop	Induction electric range/cooktop replacing a natural gas range/cooktop
Electrical Panel	100Amps	Discuss potential need for a panel upgrade with an electrician.
Air Conditioner	None installed	Upgrade to Electric Heat Pump, minimum 15 SEER
Heating equipment	Gas wall furnace 78% AFUE	Upgrade to Electric Heat Pump, minimum 8.6 HSPF
Solar PV	None installed	Consider solar PV
Water Heater	Natural gas on demand EF 0.82	Replace with heat pump hot water heater

Next page provides additional notes from your Home Energy Score Assessor

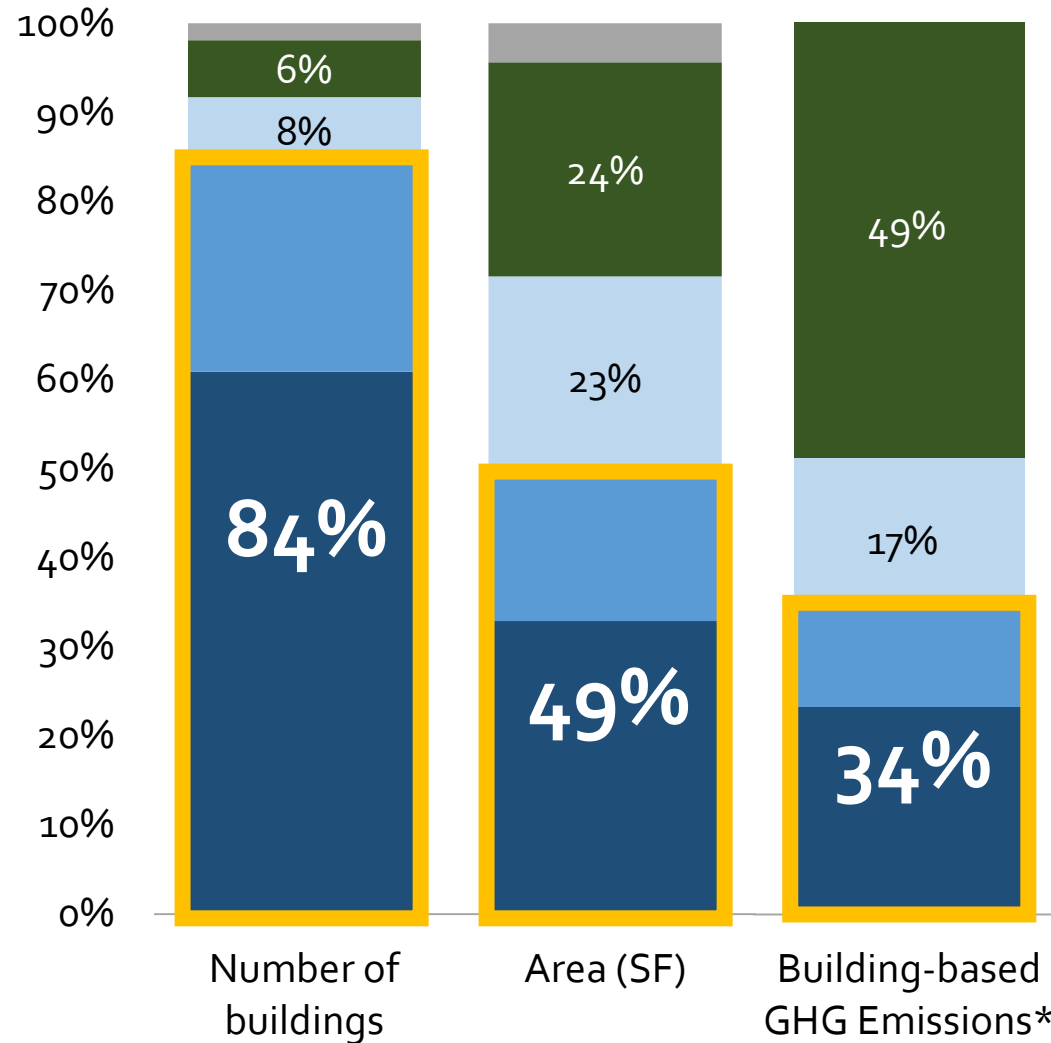
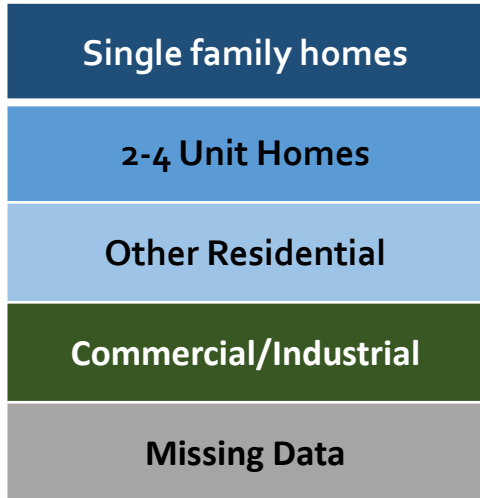
Lessons Learned



Emissions from 1-4 Units



Buildings by Count, Area, and GHG Emissions



*Based on the 2020 GHG Inventory

BESO 2.0

Time of Sale Upgrade
Requirements

Proposed Requirements for 1-4 Unit Buildings

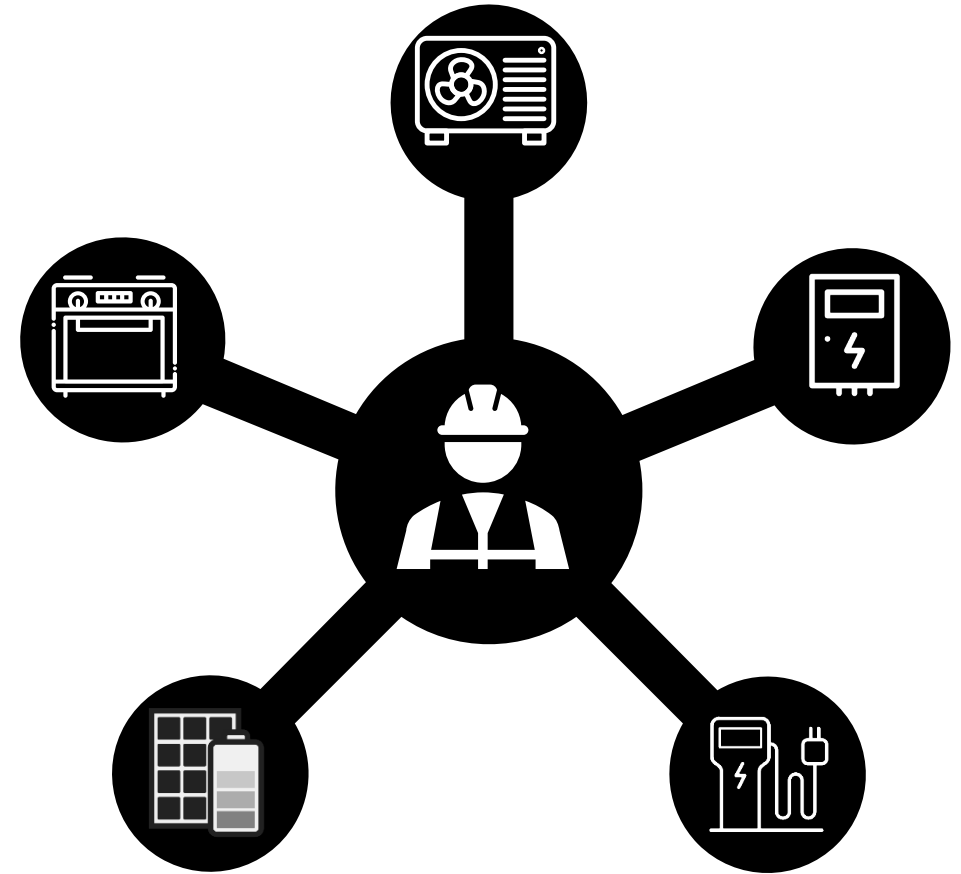


- Seller completes the Home Energy Score assessment
- Buyer completes the upgrade(s) within 2 years of the sale if compliance has not been met



Flexible Resilience Standard

- **Upgrade requirements:**
 - List of possible upgrades
 - Each upgrade has a corresponding point value
 - Buildings need to achieve minimum number of points through upgrades
- **Point value criteria:**
 - Emissions savings
 - Cost
 - Health, safety, resilience bonus
- **Rationale:**
 - Addresses range of building conditions
 - Owner can prioritize



Proposed Measures



Electric Ready

- Pre-wiring & 240v outlets
- Panel upgrade

Electrification

- Heat Pump Water Heater
- Heat Pump HVAC
- EV Charging Station
- Induction Range

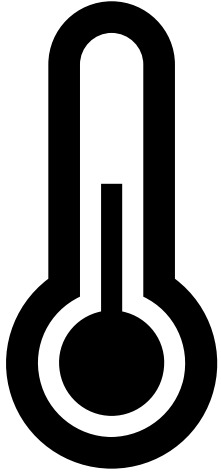
Energy Efficiency

- Attic Insulation
- Wall Insulation
- Floor Insulation/Crawlspace Improvement
- Air Sealing (Verified)
- Window replacements
- Duct Sealing/Replacement (Verified)

Resilience/Safety

- Solar PV Installation
- Battery storage installation
- Replace knob and tube

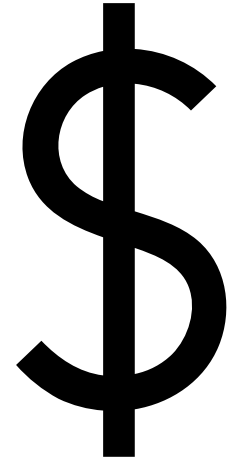
Benefits to Homeowners



**Improve Comfort
and Indoor Air
Quality**

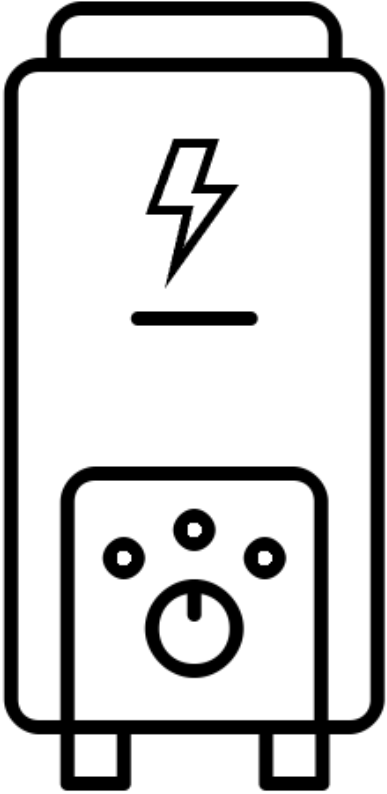


Increase Safety



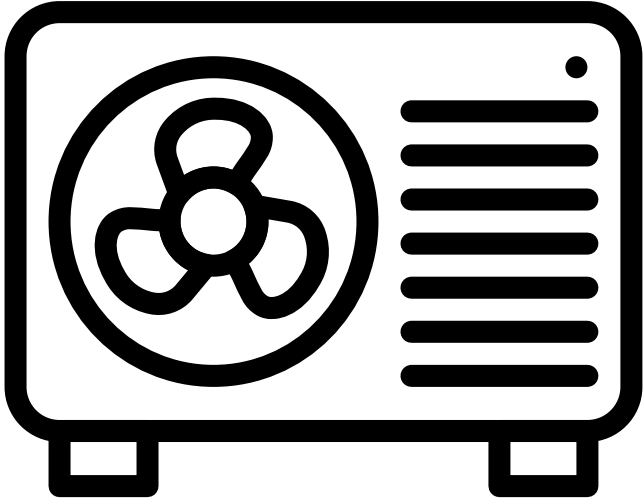
**Decrease utility
costs**

Exemption Pathway: Heat Pump System



Water Heating

OR



Space Heating/HVAC

Utilizing the HES with Upgrade Requirements



- Provides buyers with recommended measures that would meet requirements
- Confirms heat pump exemption
- Credit for High Home Energy Score

Home Energy Score Energy Savings Pathway Report

U.S. DEPARTMENT OF ENERGY Home Energy Score™
 LOCATION: 1234 Berkeley Way, Berkeley, CA, 94704
 BEDROOMS: 3 HEATED FLOOR AREA: 2,100 sq.ft.
 COMPANY: Home Energy Assessor ASSESSMENT DATE: 09/17/2024
 EMAIL: Jane@doehomeenergy.com ASSESSOR: Jane Doe
 PHONE: 800-111-2233

Current Score 4 OUT OF 10 <small>Estimate of Current Yearly Energy Costs³</small> \$3,211	Recommended Shell Improvements ¹ 10 OUT OF 10 <small>Estimate of Energy Costs with Shell Improvements</small> \$2,661	Full Home Electrification ² 10 OUT OF 10 <small>Estimate of Energy Costs with Electrification</small> \$2,652
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Home Energy Score Details

Higher energy use

4

CURRENT SCORE

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Current Estimated Energy Use By Fuel Type³

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Renewable Generation: (\$0.31/kWh)	-\$0
TOTAL ESTIMATED YEARLY ENERGY COSTS	\$3,211

This Home's Carbon Footprint⁴

Carbon footprint by fuel type (measured in Metric tons of CO₂): Electric: 0.3 Natural Gas: 0.2

2.7 This Home Today

1.4 Shell Improvements

0.4 Full Home Electrification

California's goal is to reach carbon neutrality by 2045

Learn how to improve this score and electrify your home to use

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- Get your home energy assessment. Done!
- Choose energy improvements from the list of recommendations below.
- Select a contractor (or two, for comparison) and obtain bids.
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State Information
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US Rebates & Tax Credits
[energy.gov/save](#)

Incentive Information
[incentives.switchcon.org](#)

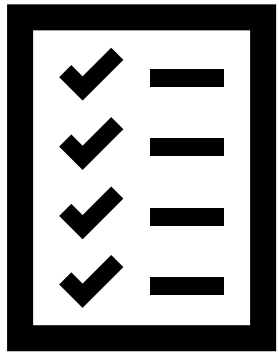
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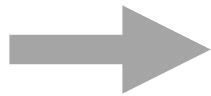
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Example: Home *doesn't* have a heat pump system



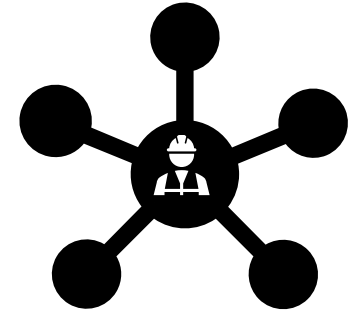
Seller completes assessment
(Home Energy Score)



Home listed for sale

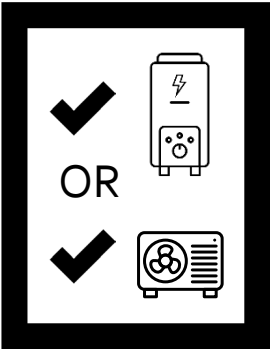


Funds to cover upgrades
are set aside at closing
through escrow deposit



Buyer completes upgrades
to meet target credit
requirement and utilizes
escrow deposit

Example: Home *has* a heat pump system



Seller completes assessment
(Home Energy Score)

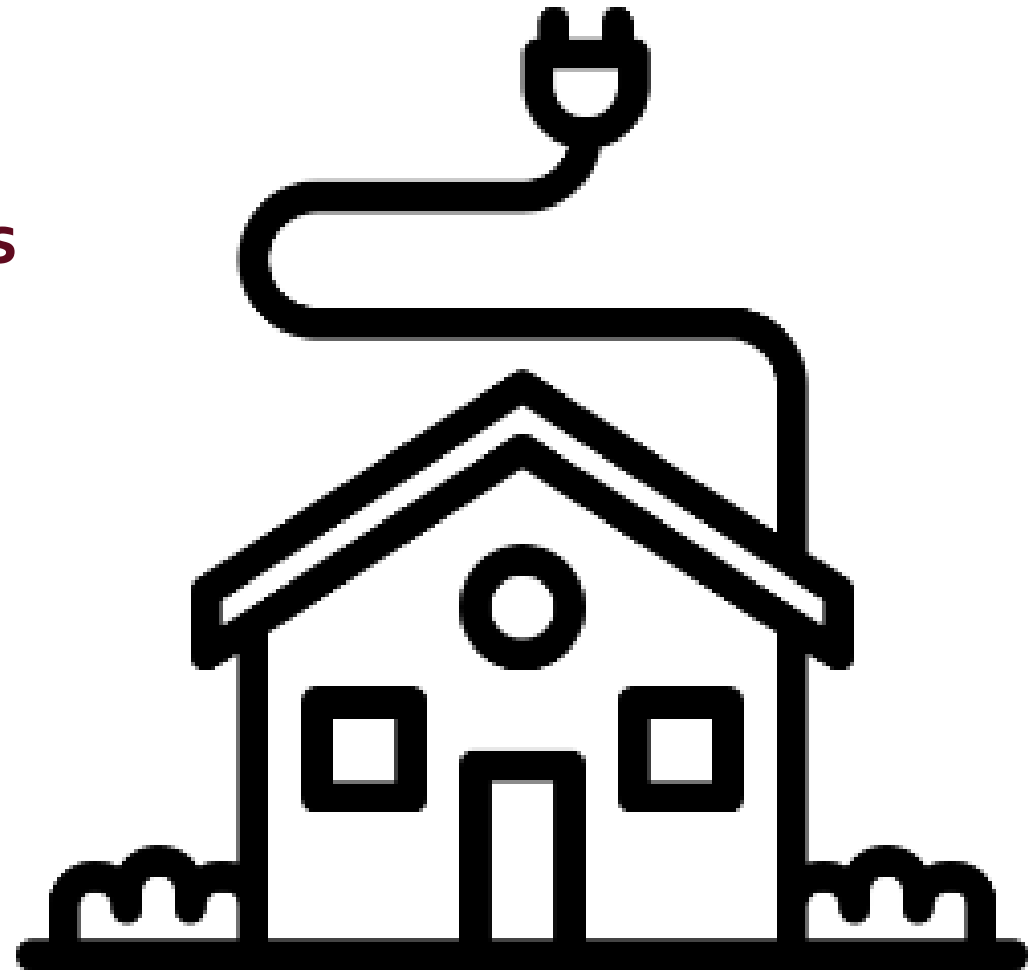
Home listed for
sale

Fully Compliant, no
upgrade needed

Proposed Exemptions/Support



- **Exemptions/Support:**
 - **All-electric homes** with permits showing capped gas line
 - Income qualified **First Time Home Buyers**
- **Support:**
 - **Offset assessment costs** for income qualified sellers
 - Credit for **High Home Energy Score**
 - Option to obtain **early refund**



Key Takeaways from Proposed BESO Update



- Only applies to buildings/units being sold
- Sellers are not required to complete upgrades
- Flexible upgrade options that buyers can choose from
- Upgrade Exemptions
 - Buildings with an electric water heater **OR** heat pump HVAC
 - Income qualified First Time Home Buyers
- Improves comfort, safety, and resilience

Thank You!



Ammon Reagan

BESO Program Coordinator

Office of Energy and Sustainable Development

AREagan@BerkeleyCA.gov

