

# Modeling Affordable Multifamily Housing Retrofit Scenarios

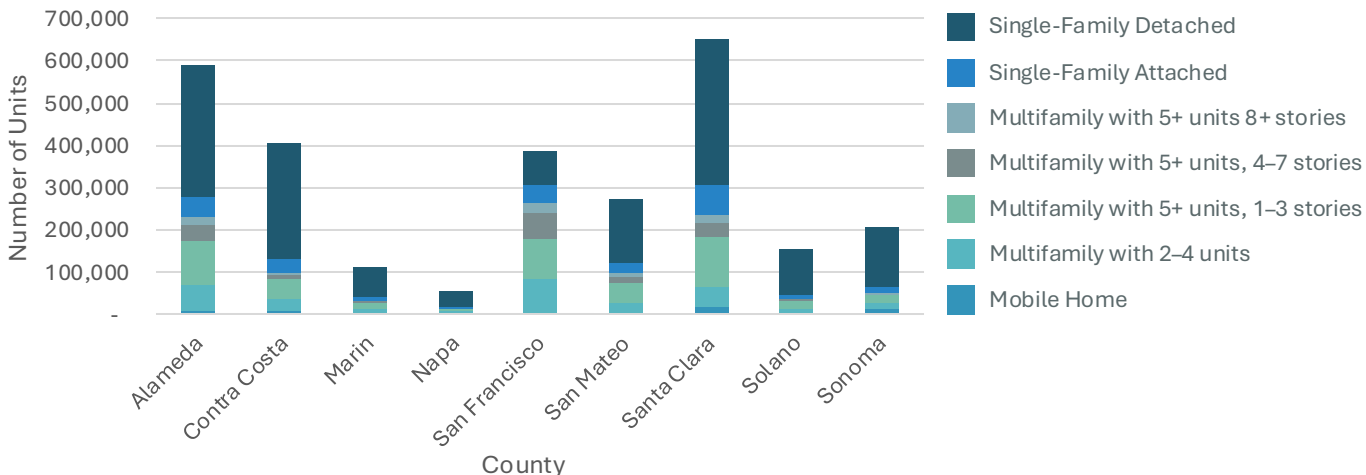
California

RMI and Wells Fargo Foundation hosted a series of regional workshops to foster collaboration and coordination around decarbonizing the US affordable multifamily housing market. At the California workshop, RMI presented research and examples to help local stakeholders better understand the characteristics of their housing stock and market needs, as well as how retrofit solutions and incentives can apply to different housing typologies. This brief summarizes those findings to help inform stakeholder action in decarbonizing the region’s affordable multifamily housing stock.

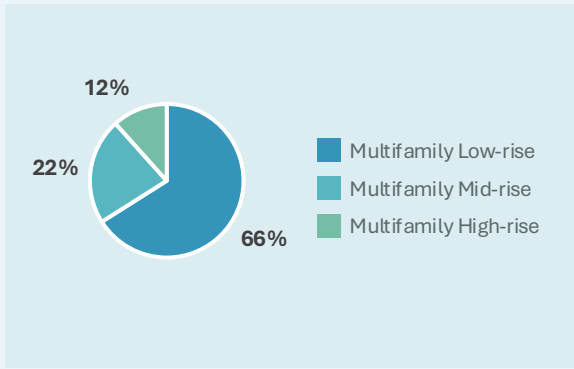
## Bay Area Multifamily Housing Overview

There are about 2M residential buildings and 2.8M dwelling units in the Bay Area. Approximately **720k units (25%) are multifamily** with 5+ units. Within multifamily 5+ units, **approximately 66% are low-rise buildings** in the Bay Area.

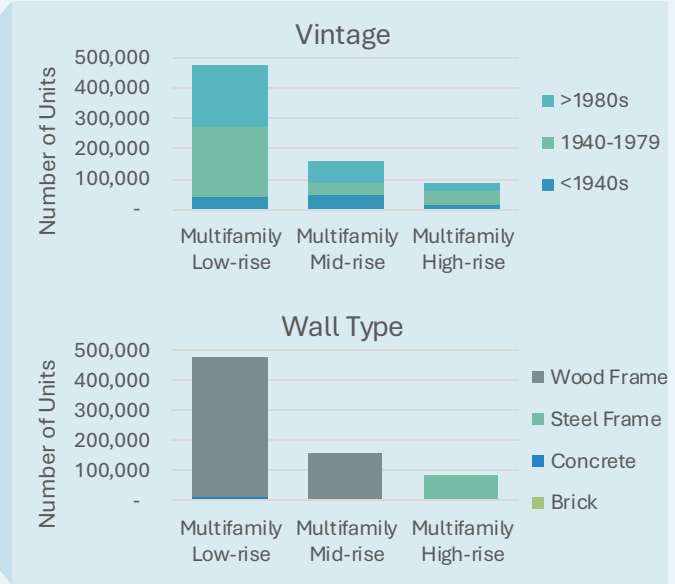
Building Types	Number of Units	Percentage
Single-family detached	1,530,510	54%
Multifamily with 5+ units, 1–3 stories	475,787	17%
Multifamily with 2–4 units	277,482	10%
Single-family attached	255,206	9%
Multifamily with 5+ units, 4–7 stories	161,017	6%
Multifamily with 5+ units, 8+ stories	83,777	3%
Mobile home	56,417	2%
<b>Total</b>	<b>2,840,196</b>	<b>100%</b>



# BAY AREA MULTIFAMILY BUILDING BREAKDOWN<sup>1</sup>



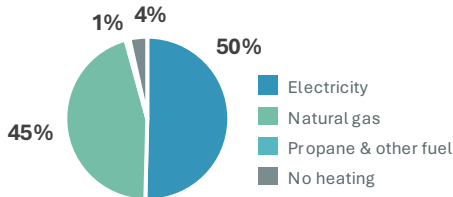
1. Excluding Multifamily with 2-4 units



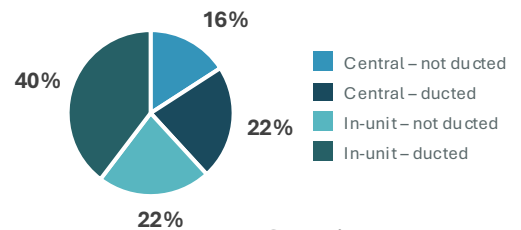
The following graphs show the characteristics of low-rise multifamily buildings in the Bay Area. Half of the units have electric heating, with the other half mostly heated by natural gas. About 60% of the heating systems are in-unit systems. Approximately 80% of the DHW systems are gas, with a 60/40 split between central and in-unit systems. Close to 70% of the units do not have AC. Gas is used for cooking in 66% of the units. Almost half of the units do not have any existing wall insulation, and many of them have minimal roof insulation.

## BAY AREA LOW-RISE MULTIFAMILY

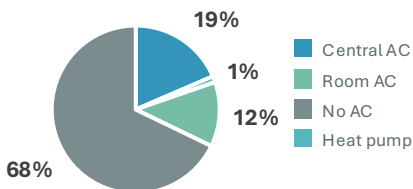
### Heating Fuel



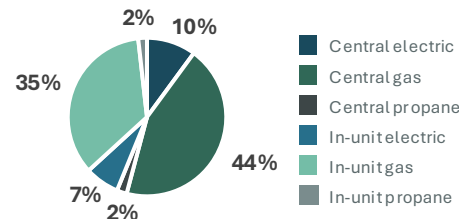
### Heating System & Duct Type



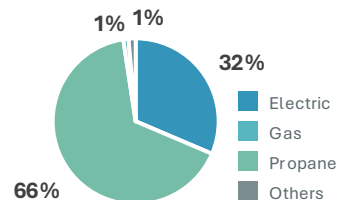
### Cooling Type



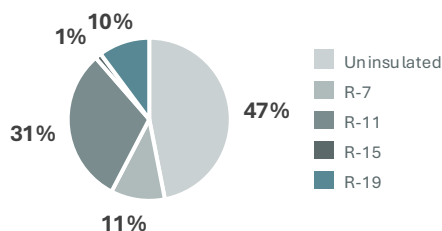
### DHW System & Fuel Type



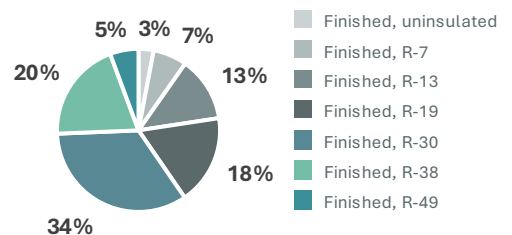
### Cooking Fuel



### Wall Insulation



### Roof Insulation



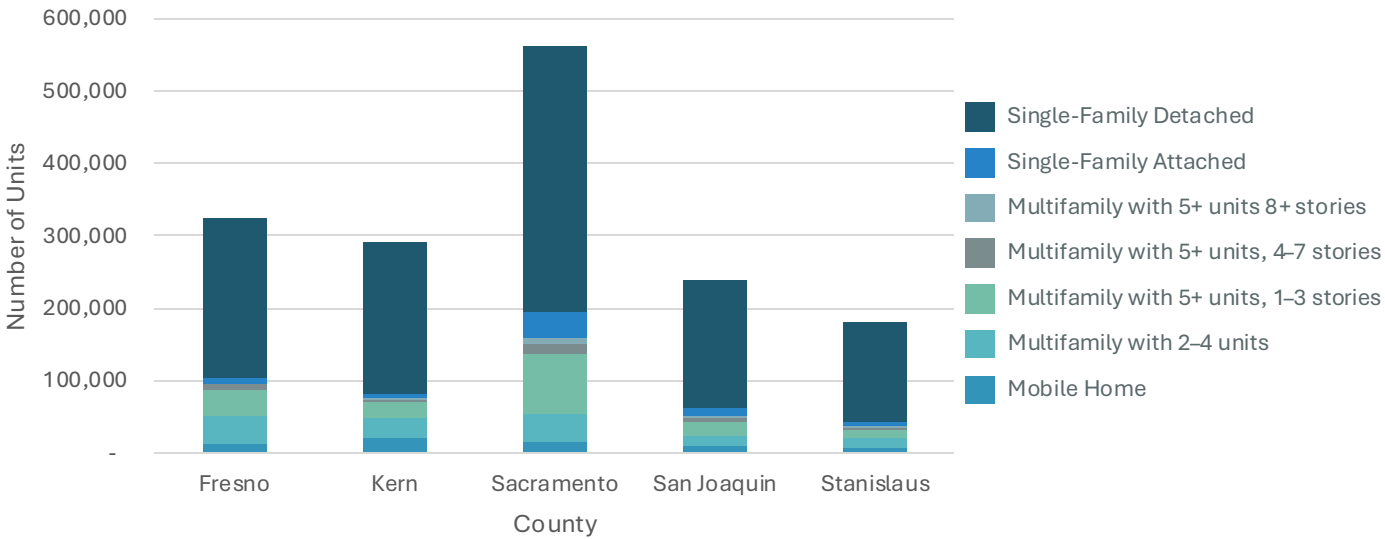
Source: NREL, [U.S. Building Stock Characterization Study](#)

# Los Angeles Building Typology

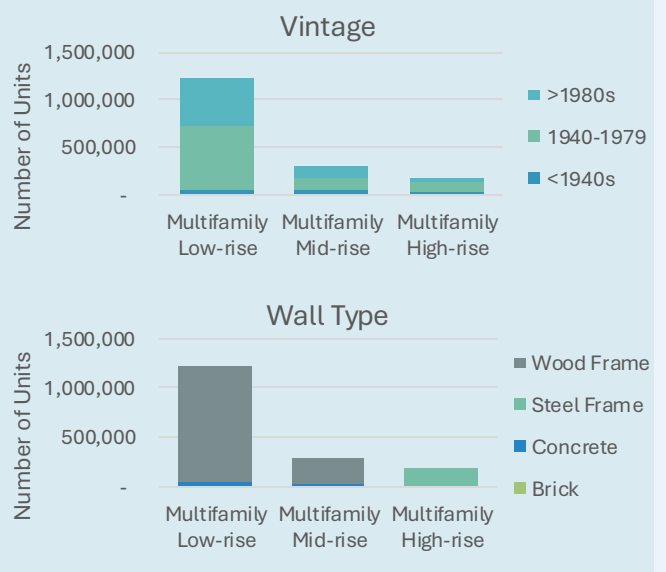
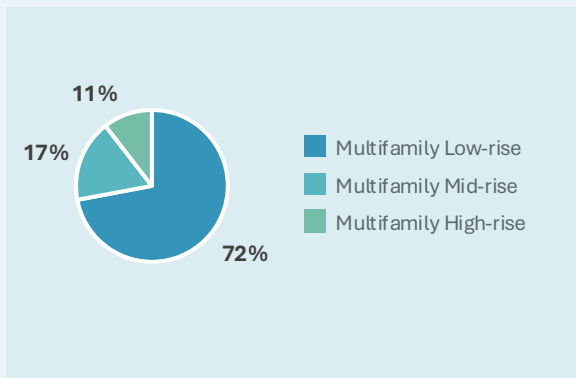
There are about 4.5M residential buildings and 6.4M dwelling units in Greater Los Angeles (LA).

Approximately **1.7M units (27%) are multifamily with 5+ units**. Within multifamily 5+ units, approximately **72% are low-rise buildings** in Greater LA.

Building Types	Number of Units	Percentage
Single-family detached	3,532,934	55%
Multifamily with 5+ units, 1–3 stories	1,219,130	19%
Multifamily with 2–4 units	482,083	8%
Single-family attached	453,511	7%
Multifamily with 5+ units, 4–7 stories	295,642	5%
Mobile home	208,233	3%
Multifamily with 5+ units, 8+ stories	177,240	3%
<b>Total</b>	<b>6,368,773</b>	<b>100%</b>



## GREATER LA MULTIFAMILY BUILDING BREAKDOWN\*

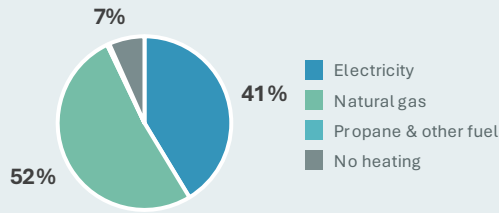


\* Excluding Multifamily with 2–4 units

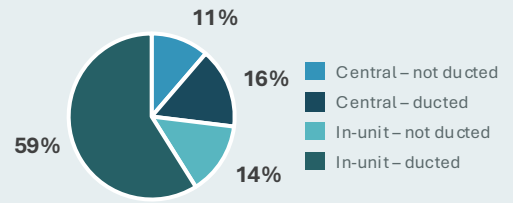
Source: NREL, [U.S. Building Stock Characterization Study](#)

# GREATER LA LOW-RISE MULTIFAMILY

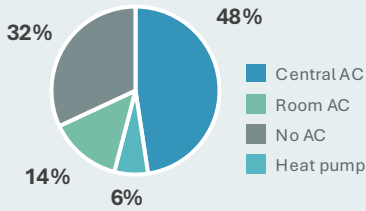
## Heating Fuel



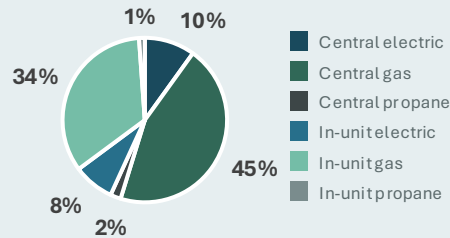
## Heating System and Duct Type



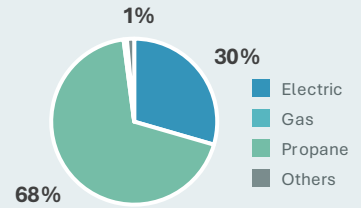
## Cooling Type



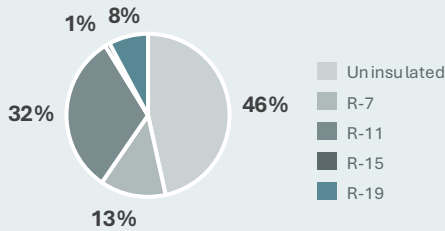
## DHW System and Fuel Type



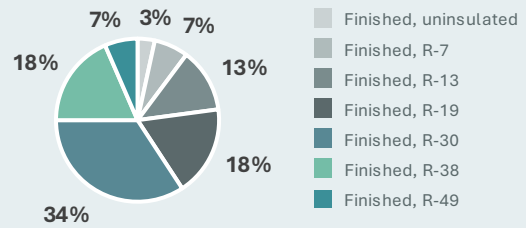
## Cooking Type



## Wall Insulation



## Roof Insulation



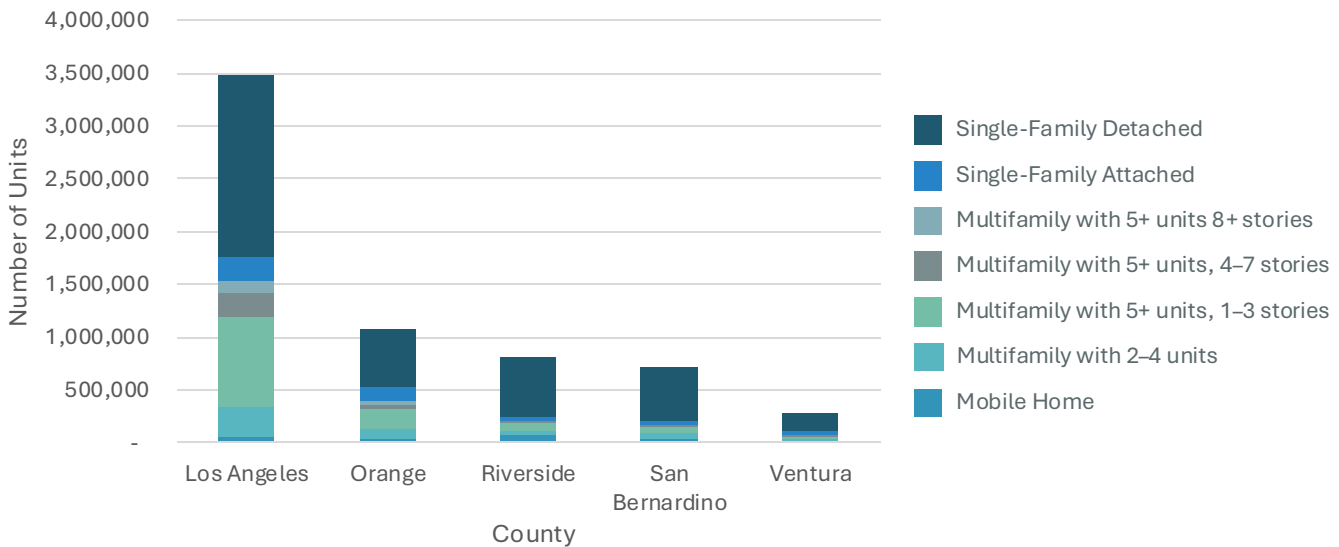
The graphs above show the characteristics of low-rise multifamily buildings in Greater LA. Half of the units have gas heating, with the other half mostly heated by electricity, and 75% of the heating system are in-unit systems. Approximately 80% of the DHW system are gas, with a 60/40 split between central and in-unit systems. About 30% of the units do not have AC. Gas is used for cooking in 68% of the units. Almost half of the units do not have any existing wall insulation, and many of them have minimal roof insulation.

Source: NREL, [U.S. Building Stock Characterization Study](#)

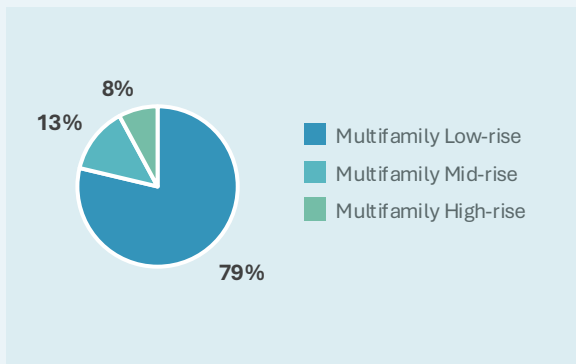
# Central Valley Building Typology

We selected 5 counties with the highest population in Central Valley as a proxy for the region. There are about 1.3M residential buildings and 1.6M dwelling units in these counties. Approximately **224k units (27%) are multifamily with 5+ units**. Within multifamily 5+ units, approximately **79% are low-rise buildings** in Central Valley.

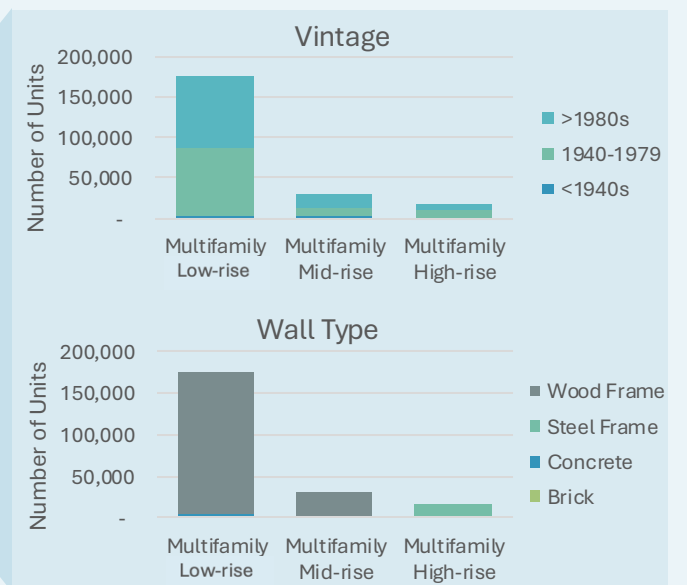
Building Types	Number of Units	Percentage
Single-family detached	1,107,265	69%
Multifamily with 5+ units, 1–3 stories	176,271	11%
Multifamily with 2–4 units	132,446	8%
Single-family attached	67,312	4%
Mobile home	62,228	4%
Multifamily with 5+ units, 4–7 stories	30,024	2%
Multifamily with 5+ units, 8+ stories	17,676	1%
<b>Total</b>	<b>1,593,222</b>	<b>100%</b>



## CENTRAL VALLEY MULTIFAMILY BUILDING BREAKDOWN\*



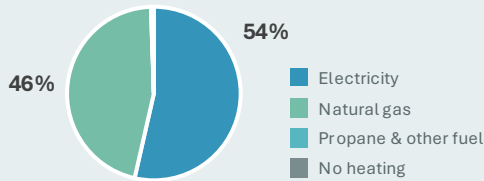
\* Excluding Multifamily with 2–4 units



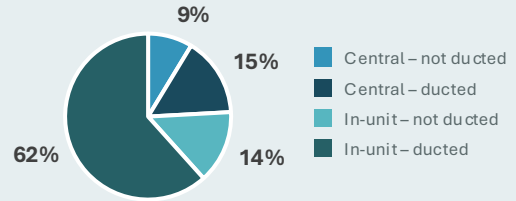
Source: NREL, [U.S. Building Stock Characterization Study](#)

# CENTRAL VALLEY LOW-RISE MULTIFAMILY

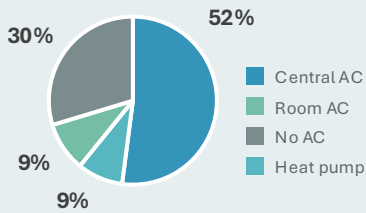
## Heating Fuel



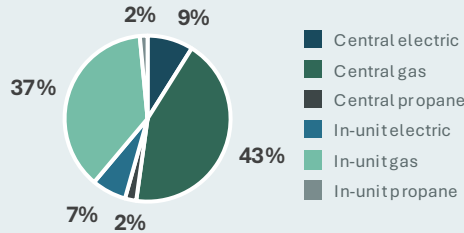
## Heating System and Duct Type



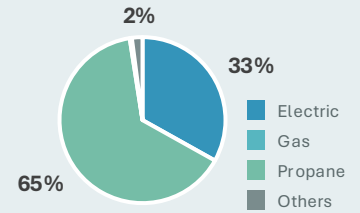
## Cooling Type



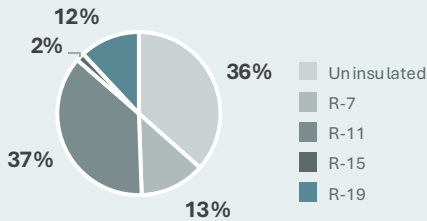
## DHW System and Fuel Type



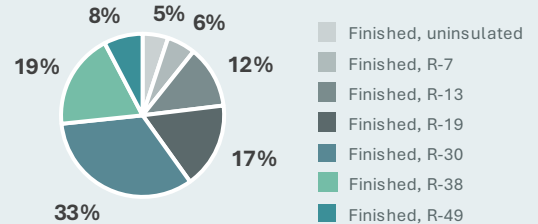
## Cooking Fuel



## Wall Insulation



## Roof Insulation



The graphs above show the characteristics of low-rise multifamily buildings in Central Valley. About half of the units have electric heating, with the other half mostly heated by natural gas, and 77% of the heating system are in-unit systems. Approximately 80% of the DHW systems are gas, with an almost 50/50 split between central and in-unit system. About 30% of the units do not have AC. Gas is used for cooking in 65% of the units. Half of the units have minimal to no existing wall insulation, and many of them have minimal roof insulation.

Source: NREL, [U.S. Building Stock Characterization Study](#)

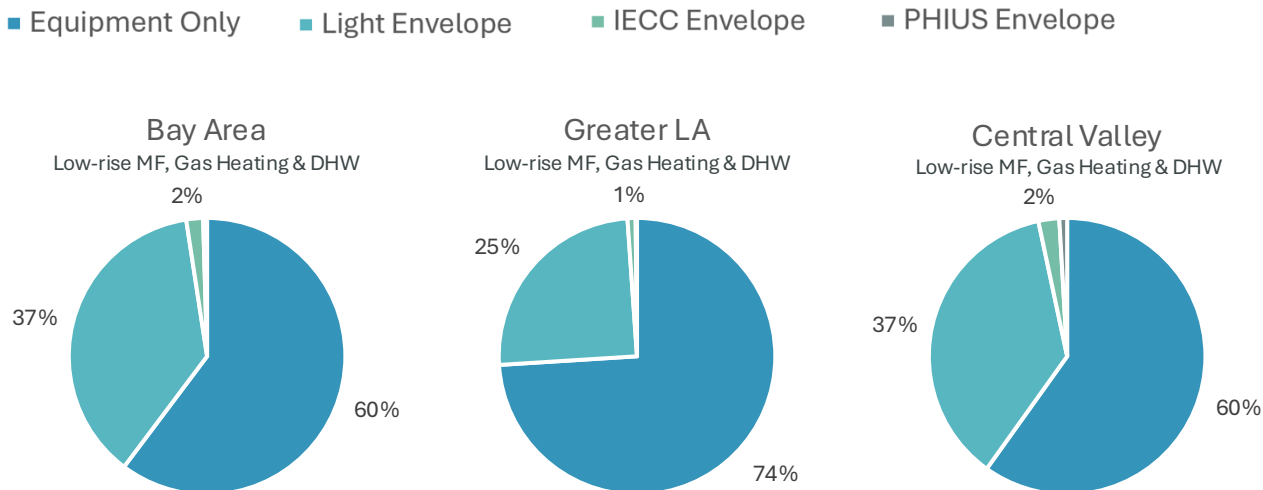
# Scenario Models for Multifamily Retrofits

To understand the opportunities for scaling multifamily retrofits in California, we evaluated three multifamily housing types across both 60% and 80% LMI affordability scenarios. These models offer insights into the estimated costs of various recommended retrofit packages, how available incentives stack up to offset these costs, the remaining financial gap, and potential strategies for closing that gap.

For this study, we applied the data and analysis framework from the [Market Guidance Report](#) (MGR) published by the [Advanced Building Construction Collaborative](#). The MGR evaluates four retrofit packages built on NREL’s [2022 U.S. Building Stock Characterization Study](#)<sup>i</sup> — All Equipment Swap-Out (Equipment Only), Conventional Envelope (Light Envelope), IECC Envelope, and Phius Envelope. The analysis from this study includes the assignment of these retrofit packages to the US residential building stock, based on the buildings’ existing conditions, outlining a pathway to achieving zero-carbon alignment (ZCA).<sup>ii</sup> These four retrofit packages represent the minimum level of intervention needed to reach ZCA. However, given the predominance of the Equipment Only and Light Envelope retrofit packages, we focused on these two approaches in the following scenario models. We also evaluated the potential of solar PV as part of the retrofit solution.

Based on this data, the most common retrofit package in CA is **Equipment Only**, which is recommended for **60%–74% of low-rise multifamily** with 5+ units with gas heating and DHW. **About 25%–37% of units require a Light Envelope** retrofit package.

## RETROFIT NEEDS TO ACHIEVE ZCA, BY BUILDING TYPE

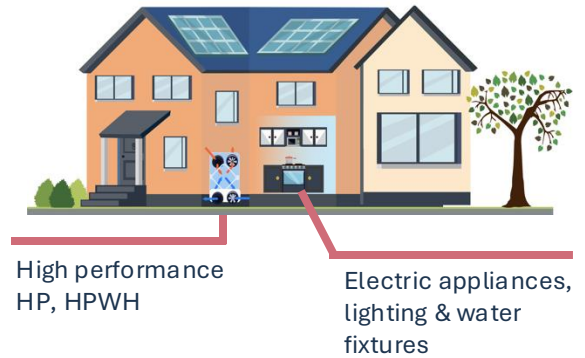


i. Details of each retrofit package can be found in the Market Guidance Report.  
ii. Attributes of zero-carbon aligned (ZCA) buildings include: (1) has no on-site fossil fuel use, (2) has a low baseline power demand, (3) will get all energy from carbon neutral sources, and (4) can minimize grid impact when needed.

# Retrofit Packages Explained

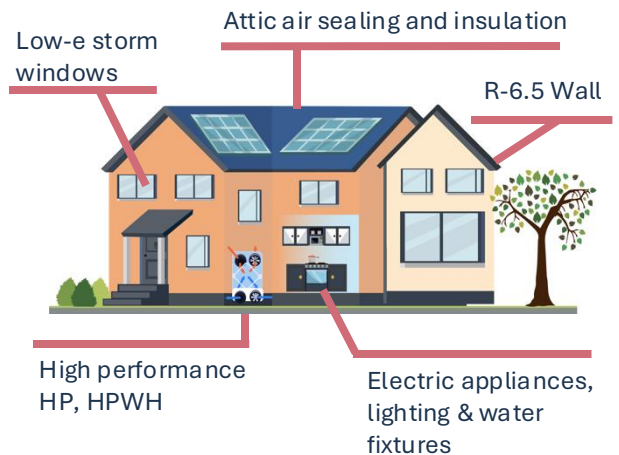
## Package 1: All Equipment Swap-Out (Equipment Only)

- Heat pump (ASHP, MSHP or VRF) + duct sealing/insulating
- Heat pump water heater
- Major appliances: all-electric, Energy Star
- 100% LED Lighting



## Package 2: Conventional Envelope (Light Envelope)

- All measures included in the Equipment Only package
- Energy/Heat Recovery Ventilator (ERV/HRV)<sup>iii</sup>
- Attic/roof air sealing and insulation (IECC)
- R-6.5 continuous wall insulation with residing<sup>iv</sup>
- Low-e storm windows



iii. ERV/HRV are added based on airtightness level. Given the small building size for low-rise, we assumed in-unit ERV for the Light Envelope package to be covered by the tenant (no ERV for Equipment Only). We assumed mid-rise and high-rise receive central ERV.

iv. R6.5 continuous insulation only for buildings built before 1990 with existing insulation < R19.



## Scenario Models

### Scenario 1: Bay Area (Low-rise, Gas Heating & DHW)

#### OVERVIEW OF BASELINE CONDITION

Building Type	Low-rise
Wall Structure	Wood frame
Number of Units	8
DHW	In-unit gas
Heating	In-unit gas
Duct	Ducted
Cooling	With AC
Avg Unit Size	822 sq.ft.
Number of Floors	2
Total Roof Area	3494 sq.ft.
Metering Type	Tenant Metered

#### RETROFIT PACKAGE ONLY

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$201,842	\$201,842	\$734,140	\$734,140
Efficiency Measure Incentives	\$240,456	\$231,776	\$240,456	\$231,776
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$0</b>	<b>\$493,684</b>	<b>\$502,364</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts	\$66,159	\$66,159	\$68,814	\$68,814

#### RETROFIT PACKAGE WITH SOLAR

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$201,842	\$201,842	\$734,140	\$734,140
Efficiency Measure Incentives	\$240,456	\$231,776	\$240,456	\$231,776
Solar System Cost	\$66,500	\$66,500	\$66,500	\$66,500
Solar System Incentive	\$77,473	\$33,250	\$77,473	\$33,250
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$33,250</b>	<b>\$493,684</b>	<b>\$535,614</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts	\$201,252	\$99,932	\$203,907	\$102,587

## FINDINGS: BAY AREA (LOW-RISE, GAS HEATING & DHW)

### Package 1: Equipment Only

- The retrofit costs for both the 60% AMI and 80% AMI scenarios are about \$200K for the 8-unit low-rise building, with incentives stacking up to about \$240k for the 60% AMI scenario and \$230k for the 80% AMI scenario. Therefore, available incentives are able to fully cover the capital cost of these efficiency improvements.
- For the 60% AMI scenario, the incentives are able to fully cover the costs of solar PV, while the 80% AMI scenario has a \$33k net capital cost. The present value of tenant bill savings over 30 years is approximately \$100k for the 80% AMI scenario. If the owner can capture some of the utility savings from the tenants, they can leverage programs such as the [Greenhouse Gas Reduction Fund](#) to underwrite the savings to finance the solar PV.
- Alternatively, the building owner could convert the in-unit heating and/or DHW system to a central system, use solar to cover the increase in operational costs, and capture those additional savings to finance the solar system.

### Package 2: Light Envelope

- The retrofit costs for both scenarios are about \$742k, with incentives stacking up to \$230k–\$240k depending on the scenario. This brings the net capital cost to about \$500k.
- For the Light Envelope Package, even with the tenant bill savings and solar, there is still a large gap to fill. It would make the most sense for the owner to do a Light Envelope retrofit during a substantial rehab when residing and re-roofing are already planned so that the energy efficiency measures are realized as incremental costs.
- [California Low-income Weatherization Program](#) is not included in this analysis but could provide additional funding to reduce the capital costs based on the greenhouse gas reduction.
- There are also many benefits to envelope improvements beyond just energy savings that should be considered as part of this investment, including passive survivability, better thermal comfort, and better indoor air quality.

## Scenario Models

### Scenario 2: Greater LA Area (Low-rise, Gas Heating & DHW)

#### OVERVIEW OF BASELINE CONDITION

Building Type	Low-rise
Wall Structure	Wood frame
Number of Units	8
DHW	In-unit gas
Heating	In-unit gas
Duct	Ducted
Cooling	With AC
Avg Unit Size	939 sq.ft.
Number of Floors	2
Total Roof Area	4,597 sq.ft.
Metering Type	Tenant Metered

#### RETROFIT PACKAGE ONLY

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$197,708	\$197,708	\$733,252	\$733,252
Efficiency Measure Incentives	\$241,392	\$232,712	\$241,392	\$232,712
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$0</b>	<b>\$491,860</b>	<b>\$500,540</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts <sup>v</sup>	\$73,656	\$73,656	\$73,674	\$73,674

#### RETROFIT PACKAGE WITH SOLAR

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$197,708	\$197,708	\$733,252	\$733,252
Efficiency Measure Incentives	\$241,392	\$232,712	\$241,392	\$232,712
Solar System Cost	\$87,500	\$87,500	\$87,500	\$87,500
Solar System Incentive	\$101,938	\$43,750	\$101,938	\$43,750
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$43,750</b>	<b>\$491,860</b>	<b>\$544,290</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts	\$255,255	\$119,056	\$255,260	\$119,071

v. Bill Impacts: Positive value = bill savings, negative value = increased operation cost.

## FINDINGS: GREATER LA AREA (LOW-RISE, GAS HEATING & DHW)

### Package 1: Equipment Only

- The retrofit costs for both the 60% AMI and 80% AMI scenarios are about \$200K for the 8-unit low-rise building, with incentives stacking up to about \$240k for the 60% AMI scenario and \$230k for the 80% AMI scenario. The incentives are able to fully cover the capital cost of these efficiency improvements.
- For the 60% AMI scenario, the incentives are able to fully cover the solar PV cost, while the 80% AMI scenario has a \$44k net capital cost. The present value of tenant bill savings over 30 years is approximately \$120k for the 80% AMI scenario. If the owner can capture some of the utility savings from tenants, they can leverage programs such as the [Greenhouse Gas Reduction Fund](#) to underwrite the savings to finance the solar PV.
- Alternatively, the building owner could convert the in-unit heating and/or DHW system to a central system, use solar to cover the increase in operational cost, and capture those additional savings to finance the solar system.

### Package 2: Light Envelope

- The retrofit costs for both scenarios are about \$730k, with incentives stacking up to \$230k–\$240k depending on the scenario. This brings the net capital cost to about \$500k.
- For the Light Envelope Package, even with the tenant bill savings and solar, there is still a large gap to fill. It would make the most sense for the owner to do a Light Envelope retrofit during a substantial rehab when residing and re-roofing are already planned so that the energy efficiency measures are realized as incremental costs.
- [California Low-income Weatherization Program](#) is not included in this analysis but could provide additional funding to reduce the capital cost based on the greenhouse gas reduction.
- There are also many benefits to envelope improvements beyond just energy savings that should be considered as part of this investment, including passive survivability, better thermal comfort, and better indoor air quality.

## Scenario Models

### Scenario 3: Central Valley (Low-rise, Gas Heating & DHW)

#### OVERVIEW OF BASELINE CONDITION

Building Type	Low-rise
Wall Structure	Wood frame
Number of Units	8
DHW	In-unit gas
Heating	In-unit gas
Duct	Ducted
Cooling	With AC
Avg Unit Size	939 sq.ft.
Number of Floors	2
Total Roof Area	4,597 sq.ft.
Metering Type	Tenant Metered

#### RETROFIT PACKAGE ONLY

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$206,030	\$206,030	\$737,677	\$737,677
Efficiency Measure Incentives	\$208,568	\$199,888	\$208,568	\$199,888
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$6,142</b>	<b>\$529,109</b>	<b>\$537,789</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts	\$65,190	\$65,190	\$69,233	\$69,233

#### RETROFIT PACKAGE WITH SOLAR

	Equipment Only		Light Envelope	
	60% AMI	80% AMI	60% AMI	80% AMI
<b>Capital Impacts</b>				
Efficiency Measure Cost	\$206,030	\$206,030	\$737,677	\$737,677
Efficiency Measure Incentives	\$208,568	\$199,888	\$208,568	\$199,888
Solar System Cost	\$70,000	\$70,000	\$70,000	\$70,000
Solar System Incentive	\$81,550	\$35,000	\$81,550	\$35,000
<b>Net Capital Cost</b>	<b>\$0</b>	<b>\$41,142</b>	<b>\$529,109</b>	<b>\$572,789</b>
<b>Operational Impacts (over 30 years)</b>				
Present Value of Tenant Bill Impacts	\$168,098	\$90,917	\$172,141	\$94,960

## FINDINGS: CENTRAL VALLEY (LOW-RISE, GAS HEATING & DHW)

### Package 1: Equipment Only

- The retrofit costs for both the 60% AMI and 80% AMI scenarios are about \$200K for the 8-unit low-rise building, with incentives stacking up to about \$210k for the 60% AMI scenario and \$200k for the 80% AMI scenario. The incentives can fully cover the capital cost of these efficiency improvements for the 60% AMI scenario while 80% AMI has a \$6k net capital cost.
- For the 60% AMI scenario, the incentives are able to fully cover the solar PV cost, while the 80% AMI scenario has a \$41k net capital cost. The present value of tenant bill savings over 30 years is approximately \$90k for the 80% AMI scenario. If the owner can capture some of the utility savings from the tenants, they can leverage programs such as the [Greenhouse Gas Reduction Fund](#) to underwrite the savings to finance the solar PV.
- Alternatively, the building owner could convert the in-unit heating and/or DHW system to a central system, use solar to cover the increase in operational costs, and capture those additional savings to finance the solar system.

### Package 2: Light Envelope

- The retrofit costs for both scenarios are about \$740k, with incentives stacking up to \$200k–\$210k, depending on the scenario. This brings the net capital cost to about \$530k.
- For the Light Envelope Package, even with the tenant bill savings and solar, there is still a large gap to fill. It would make the most sense for the owner to do a Light Envelope retrofit during a substantial rehab when residing and re-roofing are already planned so that the energy efficiency measures are realized as incremental costs.
- [California Low-income Weatherization Program](#) is not included in this analysis but could provide additional funding to reduce the capital cost based on the greenhouse gas reduction.
- There are also many benefits to envelope improvements beyond just energy savings that should be considered as part of this investment, including passive survivability, better thermal comfort, and better indoor air quality.

## Available Incentives

The following tables provide examples of how available federal, state, and local incentives could apply to affordable multifamily decarbonization retrofits in California. For a more in-depth look at how these incentives are applied and the specific requirements for accessing them, please refer to the following page on Incentive Resources.

### Package 1: Equipment Only

Available Incentives per Unit (as of Oct 2024)

Incentives	Measures	Bay Area		Greater LA		Central Valley	
		60% AMI	80% AMI	60% AMI	80% AMI	60% AMI	80% AMI
HER	HPWH, major appliances	\$8,000	\$8,000	\$8,000	\$8,000	\$4,000	\$4,000
HEAR	HP, electrical panel & wiring	\$14,000	\$14,000	\$14,000	\$14,000	\$14,000	\$14,000
179D	All	\$822	\$822	\$939	\$939	\$836	\$836
CA Energy-Smart Homes	HP, HPWH, major appliances, electrical	\$3,050	\$3,050	\$3,050	\$3,050	\$3,050	\$3,050
TECH Clean California	HPWH	\$4,185	\$3,100	\$4,185	\$3,100	\$4,185	\$3,100
<b>Total Incentives</b>		<b>\$30,057</b>	<b>\$28,972</b>	<b>\$30,174</b>	<b>\$29,089</b>	<b>\$26,071</b>	<b>\$24,986</b>

### Package 2: Light Envelope

Available Incentives per Unit (as of Oct 2024)

Incentives	Measures	Bay Area		Greater LA		Central Valley	
		60% AMI	80% AMI	60% AMI	80% AMI	60% AMI	80% AMI
HER	HPWH, major appliances	\$8,000	\$8,000	\$8,000	\$8,000	\$4,000	\$4,000
HEAR	HP, electrical panel & wiring, weatherization	\$14,000	\$14,000	\$14,000	\$14,000	\$14,000	\$14,000
179D	All	\$822	\$822	\$939	\$939	\$836	\$836
CA Energy-Smart Homes	HP, HPWH, major appliances, electrical	\$3,050	\$3,050	\$3,050	\$3,050	\$3,050	\$3,050
TECH Clean California	HPWH	\$4,185	\$3,100	\$4,185	\$3,100	\$4,185	\$3,100
<b>Total Incentives</b>		<b>\$30,057</b>	<b>\$28,972</b>	<b>\$30,174</b>	<b>\$29,089</b>	<b>\$26,071</b>	<b>\$24,986</b>

### Solar Incentives

Available Incentives per Building (as of Oct 2024)

	Bay Area		Greater LA		Central Valley	
	60% AMI	80% AMI	60% AMI	80% AMI	60% AMI	80% AMI
SOMAH (\$2.45/AC watt)	\$44,223	\$0	\$58,188	\$0	\$46,550	\$0
48E ITC (50% solar cost)	\$33,250	\$33,250	\$43,750	\$43,750	\$35,000	\$35,000
<b>Total Incentives</b>	<b>\$77,473</b>	<b>\$33,250</b>	<b>\$101,938</b>	<b>\$43,750</b>	<b>\$81,550</b>	<b>\$35,000</b>

# Incentive Resources

Subsidies	Incentive Range (\$ per unit or as noted)		Incentive Type	Ranges and Requirements	Affordability Requirements
	Low	High			
<a href="#">Home Energy Efficiency Rebate (HER)</a>	\$4,000	\$8,000	Federal	Modeled, lesser of \$4,000/unit or 80% of project cost for building-wide savings between 20% and 35%; lesser of \$8,000/unit or 80% of project cost for 35%+ building-wide savings — measures may include insulation, air sealing, windows, DHW.	Not less than 50% of dwelling units are occupied by households <80% AMI
<a href="#">Home Electrification and Appliance Rebate (HEAR)</a>	-	\$14,000	Federal	Energy star appliances: \$8,000 for heat pump HVAC, \$1,750 for heat pump water heater, \$840 for electric stove/cooktop, \$840 for heat pump clothes dryer, \$4,000 for breaker box, \$2,500 for electric wiring, \$1,600 for weatherization (insulation, air sealing, ventilation); \$14,000 max. consumer rebate.	Low Income: <80% AMI for 100% cost coverage Moderate Income: 80%–150% AMI for 50% cost coverage
<a href="#">45L Tax Credit</a>	\$500	\$5,000	Federal	Properties certified to Energy Star standards could earn between \$500 and \$2,500 per unit depending on whether they are paying prevailing wages. Properties certified for the Zero Energy Ready Home standard could earn between \$1,000 and \$5,000 per unit depending on whether they pay prevailing wages.	N/A
<a href="#">179D Tax Deduction</a>	\$0.50/sqft	\$5.00/sqft	Federal	\$0.5/ft <sup>2</sup> for 25% site EUI reduction, plus \$0.02/ft <sup>2</sup> for each percentage point of savings above 25%, up to a maximum \$1/ft <sup>2</sup> for 50% savings.	N/A
<a href="#">48E Clean Energy Investment Tax Credit (ITC)</a>	30% of the solar cost	70% of the solar cost	Federal - Solar	The commercial renewable tax credit includes an adder that can stack up to 70% ITC: 30% base tax credit if the project started between 2023 and 2033, 10% bonus for "Domestic Content," 10% bonus for "Energy Communities," 20% bonus for projects financially benefitting low-income communities, or 10% bonus for projects in low-income or Tribal communities. To meet the conditions of a Category 3 facility, the financial benefits of the electricity produced by the facility must be allocated equitably among the occupants of a qualified residential property. At least half of the financial value of the energy produced by the facility must be equitably allocated to the property's low-income occupants under the covered housing program or other affordable housing program.	A "qualified low-income residential building project" is defined as a residential rental building that participates in a covered housing program (i.e., HUD-assisted housing for groups in need. See: 24 CFR § 5.2003 for the full definition).
<a href="#">California's Solar on Multifamily Affordable Housing (SOMAH)</a>	\$2.45/AC watt	\$3.50/AC watt	State - Solar	At least five (5) units. Separately metered units (master metered properties are not eligible). Existing building or undergoing retrofit. \$2.45/AC watt if included with ITC, \$3.50/AC watt for SOMAH alone.	Deed-restricted low-income residential housing: *80% of property residents have incomes at or below 60% of the area median income (AMI) OR the property is in a defined disadvantaged community (DAC) that scores in the top 25% of census tracts statewide in the CalEnviroScreen including property that is located on Tribal land and is federally recognized.
<a href="#">TECH Clean California - Unitary Heat Pump Water Heater</a>	\$3,100	\$4,185	State	General Market Rate: \$3,100 for Unitary HPWH; or \$1,500 for Low-GWP kicker; or \$700 for >=55 Gallon capacity Equity Rate: \$4,185 for Unitary HPWH; or \$1,500 for Low-GWP kicker; or \$700 for >=55 Gallon capacity	For Equity Rate: Deed-restricted low-income residential housing and is either: - Located in a disadvantaged community - A building where at least 80% of the households have incomes at or below 60% AMI <i>Properties in Tribal Lands do not require a deed restriction</i>
<a href="#">California Energy-Smart Homes All-Electric Multifamily Alterations</a>	\$2,200	\$3,050	State	\$2,200 for Multifamily Low-Rise/ADU Whole Building Electrification Alterations: Each participating building/ADU must install heat pump space heating, heat pump water heating, induction cooking, and an electric dryer (properties with existing electric cooking qualify without upgrading to induction cooking); \$250 for HP Dryer Bonus; Electric Infrastructure Upgrade Bonus (per unit served): Bonus can be awarded up to \$600 and cannot exceed the total costs associated with the upgrade.	N/A

Note: This table provides a high-level overview of all the incentives considered in the scenario models for your reference. It is not meant to be exhaustive nor serve as a complete incentive stacking guide. Each project is unique and will require its own specific analysis.



# Key Assumptions and Notes

## Scenario Models

- Our scenario models utilize the [data](#) from the MGR. The results and assumptions, including the energy use intensities, energy savings, equipment performance, and building characteristics, etc., are all based on the MGR data. The scenario models are based on the average of all modeled units in the MGR dataset that meet the scenario models stated typology. Energy savings can vary depending on other existing conditions such as number of units, unit sizes, etc. These results serve as a reference and are NOT meant to represent every building and DO NOT capture all the nuances of a project.
- Solar PV potential is estimated based on the MGR data and sized using NREL's [PVWatts](#) Calculator. Solar PV costs are estimated using LBL's [Tracking the Sun 2023 Report](#).
- Utility bill impact is estimated using US EIA's 2022 average residential and commercial [electricity](#) and [natural gas](#) rate in CA.
- Retrofit Package cost varies widely depending on location, climate, building type, existing condition, and system type. For the analysis, we assumed a price range of \$20k–\$36k for Equipment Only and \$86k–\$115k for Light Envelope. These are estimates and are not meant for actual project pricing.
- Solar energy cost saving for 80% AMI scenario is estimated as 25% of the solar energy saving from a NEM 1 calculation based on [EnergySage](#), where NEM 3 is estimated to cut the value of solar energy credits by about 75%. The 60% AMI scenario funded by SOMAH uses NEM2 and we used NEM 1 calculation as a proxy.

## Incentives

- Projects are not allowed to stack HER and HEAR for the same measures. This analysis tries to optimize the incentives from HER and HEAR accounting for the energy savings of measures to meet HER's 20% or 35% target. Based on the savings, we are unable to maximize both HER and HEAR in these scenario models.
- This analysis assumes 100% of the solar outputs go to the tenant and the project receives 30% base + 20% bonus for a qualified low-income residential building project for ITC. If the project does not allocate over 50% of the solar benefit to the tenant, it may not qualify for the 20% bonus.