**DRAFT FOR DISCUSSION PURPOSES ONLY**

# *MEMORANDUM*

DATE: June __, 2021

SUBJECT: Palm Springs Reach Code Proposal

TO: Sustainability Commission
Patrick Tallarico, Manager, Office of Sustainability

FROM: David Freedman, Solar and Green Building Committee Member

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## I. Executive Summary

California and Palm Springs have set ambitious goals to reduce greenhouse gas (GHG) emissions. Although the City has achieved the initial 2020 GHG emissions reduction goal, additional actions are necessary to achieve the 2030 and 2050 goals. A Reach Code requiring residential remodels and additions to carry out energy efficiency upgrades and cool roofs upon replacement of existing residential roofs and for new residential construction would both be cost effective and reduce GHG emissions. City Council should provide direction to continue work on this proposal.

## II. Introduction

### A. State Policy

Beginning in 2006, California has set ambitious GHG emission reduction goals as part of the state's efforts to combat and mitigate the impacts of climate change. AB 32, the Global Warming Solutions Act of 2006, required California to reduce its GHG emissions to 1990 levels by 2020. SB 32 enacted in 2016 extends California's commitment to reduce GHG emissions by requiring the state to reduce statewide GHG emissions by 40 percent below 1990 levels by 2030. Executive Order B-30-15 directs state agencies to achieve a goal of an 80 percent GHG reduction from 1990 levels by 2050.

AB 3232 enacted in 2018 requires the California Energy Commission (CEC) to assess the potential for the state to reduce GHG emissions from the state's residential and commercial building stock by at least 40 percent below 1990 levels by January 1, 2030. The bill states that decarbonizing California's buildings is essential to achieve the state's GHG reduction goals at the lowest possible cost. The bill establishes that it is the intent of the Legislature to achieve significant reductions in GHG emissions by the state's residential and commercial building stock by January 1, 2030. Residential and commercial buildings jointly account for 25 percent of GHG emissions in the state when accounting for both fossil fuels consumed onsite and those used to generate electricity for buildings.[1]

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[1] Source: California Building Decarbonization Assessment Draft Staff Report, May 2021, CEC-400-2021-006-SD, page 1.

Pursuant to the Warren-Alquist Act of 1974, the CEC is required to adopt regulations to reduce the wasteful, uneconomic, inefficient, or unnecessary consumption of energy, including the energy associated with the use of water, and to manage energy loads to help maintain electrical grid reliability." This is done through amendments to the Building Energy Efficiency Standards contained in the California Code of Regulations, Title 24, Part 6 (hereinafter, the "Energy Code") on a three-year cycle. The Energy Code includes energy efficiency standards applicable to the construction of new buildings and additions and alterations to existing buildings. The CEC is required to adopt or revise standards that shall be cost-effective when taken in their entirety and when amortized over the economic life of the structure compared with historic practice.

The CEC has released the draft 2022 Energy Code and the related Environmental Impact Report, for approval at the CEC's August 2021 Business Meeting. Once approved, the 2022 Energy Code will become effective on January 1, 2023. As in prior updates to the Energy Code, the proposed 2022 Energy Code updates include numerous changes to the existing 2019 Energy Code. These amendments include new or updated standards to increase efficiency of different building systems and pieces of equipment. In alignment with GHG mitigation as a primary policy driver, the 2022 Energy Code aims to further address building decarbonization through a focus on efficient heat pump technologies and a range of other elements.

In addition to the triennial Energy Code updates, the CEC encourages local governments to adopt energy efficiency standards exceeding the Energy Code, known as reach codes. The CEC considers that these jurisdictions are living laboratories for a clean energy future, reduce state GHG emissions and lead from the grassroots.

Local governments are required to apply to the CEC for approval prior to enforcement of such standards. The CEC must find that the local standards will require buildings to be designed to consume no more energy than permitted by the Energy Code, and the application must include the basis of the local government's determination that its standards are cost-effective. CEC staff reviews the application to confirm these criteria are met and makes a recommendation for CEC approval based on the findings. The CEC has already approved 48 local reach codes from 40 jurisdictions exceeding the 2019 Energy Code. The cost-effective measures discussed below are intended to exceed the requirements of the 2022 Energy Code and go into effect simultaneously with that Code on January 1, 2023. They would require CEC approval prior to their effectiveness.

## B. City Policy

Palm Springs has also established ambitious GHG reduction goals, paralleling the state's. In 2016, City Council adopted the Sustainability Plan setting the following goals:

- Develop strategies to reduce community-wide contributions to GHG emissions to 1990 levels by 2020 and 80% below 1990 by 2050;
- Achieve carbon neutrality for municipal emissions by 2030.
- Encourage the building or retrofitting of one million square feet of green buildings;
- Reduce the total energy use by all buildings built before 2012 by 10%;
- Reduce energy use and carbon use from new homes and buildings;
- Supply 50% of all energy from renewable sources by 2030.

In addition, the General Plan adopted by City Council in October 2007 sets the following goals:

- Support and encourage the use of alternative energy in the construction of new buildings and retrofit of existing buildings;

- Encourage and support the incorporation of energy efficiency and conservation practices in subdivision and building design;
- Make the maximum use of solar electric capabilities on an individual and community wide basis.

Finally, the General Plan update priorities approved by the Planning and Sustainability Commissions last year includes the following statement:

Continue to advance Palm Springs' role as a sustainability leader. Promote the sustainable use of materials, energy, land, water, air and other natural resources to enhance the long-term livability of our community. Reduce greenhouse gas emissions and proactively anticipate and mitigate the impacts of climate change. Reduce wastes going to landfill through source reduction, reuse, recycling and other methods.

The measures discussed below are intended to further the City's stated policy goals.

### C. GHG Data

In support of the General Plan update, the City asked its consultant PlaceWorks to update the GHG inventory and forecasts. PlaceWorks updated the City's 2010 community-wide and City operations GHG emissions inventories and prepared a 2018 community-wide GHG emissions inventory. PlaceWorks has also used these results to prepare projections of the community-wide GHG emissions in 2020 and to identify the reductions achieved by existing State of California efforts and the launch of Desert Community Energy (DCE).

PlaceWorks estimates 2020 community-wide GHG emissions at 490,180 $MTCO_{2E}$, a 1.1% reduction from the 1990 baseline of 495,720 $MTCO_{2E}$. Residential, commercial and industrial energy represent approximately 37.4% of total GHG emissions. Palm Springs has thus achieved its 2020 GHG emissions reduction target set out in AB 32 and the City's Sustainability Plan by reducing emissions 15 percent below 2010 levels primarily as a result of the launch of DCE and the commitment by most DCE customers to stay with its Carbon Free program. [2] To achieve the state and City 2030 and 2050 goals noted above, GHG emissions would need to be reduced to 297,430 $MTCO_{2E}$ by 2030 and 99,140 $MTCO_{2E}$ by 2050. Along with the state initiatives noted above, the City will need to take additional actions to achieve those goals.

## II. Reach Code Proposal

### A. Energy Efficiency Upgrades for Residential Remodels and Additions

Among the reach codes approved by the CEC are those in Carlsbad and Chula Vista (San Diego County) and Piedmont (Alameda County) that require certain residential remodels and additions to carry out energy efficiency upgrades when such measures are not already triggered by Energy Code requirements. These measures, which generally track 2019 and 2022 Energy Code provisions, improve the energy efficiency of older homes that can see the most benefits, since these homes were constructed before energy efficiency measures required for new construction and some additions and alterations went into effect, largely beginning in 2006. Of the 37,735 total residential units in Palm Springs, approximately 80%

[2] The 1990 baseline is 15% below 2010 community-wide GHG emissions of 583,200 $MTCO_{2E}$. According to the State's Scoping Plan, which identifies local governments as strategic partners in meeting the State's GHG emission-reduction targets, reducing GHG emissions 15 percent below 2005-2010 levels by 2020 would be equivalent to reducing GHG emissions to 1990 levels for local governments.

of the single-family dwelling units (22,518 of 28,326) and 98% of the multifamily units (9,240 of 9,409) were built pre-2006.[3]

The Chula Vista and Piedmont ordinances have a list of cost-effective energy efficiency upgrades that homeowners can choose, while Carlsbad lists mandatory upgrades.[4] Similar upgrade measures would also be cost effective in Palm Springs. For a pre-1978 single-family home, an envelope package consisting of attic insulation, air sealing and duct sealing is estimated to have an incremental cost of $3,472 and generate 30-year lifecycle savings of $26,499. A water heating package for a single-family home consisting of a water heater blanket, hot water pipe insulation and low-flow shower and faucet fixtures is estimated to have an incremental cost of $208 and generate 30-year lifecycle savings of $645.[5] To support the state's building decarbonization efforts, prewiring for battery electric storage, heat pump water heaters (HPWHs), space heaters, clothes dryers and cooktops can also be added to the list of eligible measures.[6]

The threshold in the Carlsbad energy efficiency ordinance is $60,000, the same threshold that triggers a local Coastal Development Permit. The Piedmont ordinance requires one upgrade from the list if the stated project value is $25,000 or more and two listed upgrades if the stated project value is $100,000 or more.

The Chula Vista ordinance does not have a monetary threshold. Two to four energy efficiency upgrades are required based on the age of the home and the climate zone where the home is located.[7] If the cost of completing required energy efficiency measures

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[3] See Attachment 1, generated from the Codes and Standards Cost-Effectiveness Explorer. The residential building stock data are only for Climate Zone 15, covering the desert areas of Eastern Riverside County. The area within the City limits in the Santa Rosa Mountains is in Climate Zone 16 and would not be subject to the reach code proposal. The Cost-Effectiveness Explorer shows seven single-family homes in the Palm Springs portion of Climate Zone 16.

The Codes and Standards Program under the auspices of the California Public Utilities Commission has issued cost-effectiveness studies to help local jurisdictions determine which measures save energy and are cost effective and support the finding required by state law. The Codes and Standards team has developed the Cost-Effectiveness Explorer as an online tool using data from the cost-effectiveness studies that local jurisdiction staff and other stakeholders could use to simplify initial reach code research. The tool allows users to identify cost-effective reach code options as well as to better understand the impacts on their local communities of different possible scenarios.

[4] See summary of the Chula Vista ordinance (Attachment 2). The various energy efficiency measures and packages are described in the Codes and Standards 2019 Cost-Effectiveness Study: Existing Low-rise Residential Building Efficiency Upgrade (see Attachment 3).

[5] See Attachment 4, generated from the Cost-Effectiveness Explorer using Climate Zone 15 data from the 2019 Cost-Effectiveness Study referred to in footnote 4.

The Cost-Effectiveness Study prototypes for existing residential buildings are 1,665 $ft^2$ for a single-family home and 960 $ft^2$ per unit for a multifamily building. Costs for initial installation and annual operation, and on-bill benefits from reduced energy costs, are calculated over the life cycle of the equipment (30 years except for LED lighting). The benefit / cost calculations generally assume an escalation of utility rates, a real discount rate of 3 percent and first incremental costs being financed into a mortgage or loan of 30 years at a rate of 5% for single-family homes and 10 years at a rate of 4% for multifamily homes. Maintenance costs were not included for any measures because there are no incremental maintenance costs expected for any of the measures evaluated.

The Cost-Effectiveness Study uses electricity rates from Southern California Edison and gas rates from Southern California Gas. Utility savings could potentially be higher for DCE customers on its Carbon Free product and slightly lower for customers on its Desert Saver product. The on-bill cost data do not include either the social cost of higher GHG emissions leading to air and water pollution, droughts and wildfires or the non-energy benefits of improved public health and a sustainable economy.

[6] The 2019 Energy Code already requires prewiring for a future HPWH for new homes with a gas water heater. See Section 150.0(n)(1)(A). Under the draft 2022 Energy Code, HPWHs will be required for new single-family residences in Climate Zone 15 See Section 150.1(c)8. Prewiring will also be required in new single-family residences for HPWHs (if not installed), battery storage, space heaters, cooktops, and clothes dryers. See Section 150.0(n), (s), (t), (u) and (v).

[7] Four measures are required for all pre-2006 homes in the inland portion of Chula Vista in Climate Zone 10, which is the climate zone also covering western Riverside County.

exceeds 20% of the overall project cost without those measures, applicants can propose a more limited set from among the required measures that does not exceed 20%. Other exemptions exist, including for low-income households and homes fully powered by solar PV. By analogy, homes on DCE's Carbon Free program could also be exempt, as they do not contribute to citywide GHG emissions.

A combination of features from the Chula Vista and Piedmont ordinances would produce the greatest flexibility. Thresholds can be set for remodels and additions on single-family and multifamily residential buildings built before 2006 having a permit value of $25,000 (one measure), $50,000 (two measures) and $100,000 (four measures). In addition to these measures, regardless of permit value LED lights would need to be installed if the home uses CFL or incandescent bulbs. The Chula Vista and DCE Carbon Free exceptions would apply. Cool roofs from the Chula Vista list would be covered under the proposal below.

[Insert discussion of projected GHG emission reductions based on modeling data.]

## B. Cool Roofs

### 1. Existing Residential Buildings

Separate from a residential remodel or addition, re-roofing or an addition of a steep-sloped roof on an existing residence of all ages would require installation of a roofing product rated by the Cool Roof Rating Council (CRCC) with an aged solar reflectance of 0.25 or higher and thermal emittance of 0.75 or higher.[8] This measure is highly cost effective. For a pre-1978 single-family home, a cool roof is estimated to have an incremental cost of $635 and generate 30-year lifecycle savings of $6,988. For a pre-1978 multifamily building, a cool roof is estimated to have an incremental cost of $184 per unit and generate 30-year lifecycle savings of $2,666 per unit.[9] Roof repair, photovoltaic roofs and replacements of 50% or less of the roof area would be exempt. The same Chula Vista and DCE Carbon Free exceptions could also apply.

[Insert discussion of projected GHG emission reductions based on modeling data.]

### 2. New Construction

Although the draft 2022 Energy Code revises various residential energy efficiency standards, there is no change from the 2019 Energy Code in the required CRCC roofing rating for steep-sloped roofs.[10] A requirement of an aged solar reflectance of 0.25 or higher and thermal emittance of 0.75 or higher would also be highly cost effective. For a new single-family home, a cool roof is estimated to have an incremental cost of $237 and generate 30-year lifecycle savings of $[TBA]. For a

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[8] A steep-sloped roof is a roof that has a ratio of rise to run of greater than or equal to 2:12 (9.5 degrees from the horizontal). The requirement for steep-sloped roof replacements is an aged solar reflectance of 0.20 or higher and thermal emittance of 0.75 or higher under both the 2019 Energy Code (Section 150.2(b)1Ii) and the draft 2022 Energy Code (Section 150.2(b)1Ii for single-family homes and Section 180.2(b)1Aii for multifamily homes).

[9] See Attachment 4.

[10] The requirement for a steep-sloped roof in new residential construction is an aged solar reflectance of 0.20 or higher and thermal emittance of 0.75 or higher under both the 2019 Energy Code (Section 150.1(c)11A) and the draft 2022 Energy Code (Section 150.1(c)11A for single-family homes and Section 170.2(a)1A and Table 170.2-A for multifamily homes). The draft 2022 Energy Code requires a minimum aged solar reflectance of 0.25 and a minimum thermal emittance of 0.80 for steep-sloped non-residential buildings. See Section 140.3(a)1Aib2.

new multifamily building, a cool roof is estimated to have an incremental cost of $58 per unit and generate 30-year lifecycle savings of $[TBA] per unit.[11]

[Insert discussion of projected GHG emission reductions based on modeling using estimates from 2021-29 RHNA goals of number of single and multi-family homes to be built with steep-sloped roofs.]

## IV. Request to Sustainability Commission and Office of Sustainability

Request to Commission to recommend to City Council that it provide direction to the Commission and Office of Sustainability that they continue to research a Palm Springs Reach Code with the provisions proposed above (and any other provisions on which Council would provide direction), conduct community outreach, and bring a draft ordinance to Council for consideration and adoption effective January 1, 2023, simultaneously with 2022 Energy Code.

Request to Office of Sustainability to include this memo as an attachment to the staff report accompanying the GHG inventory be presented to City Council.

[11] Incremental cost of adding a cool roof to new residential construction. The prototypes are 2,430 $ft^2$ for a single-family home and a multifamily building with four 780 $ft^2$ units and four 960 $ft^2$ units. Source: 2019 Cost-effectiveness Study: Low-Rise Residential New Construction, Table 1, page 2, and Table 4, page 10. [Source for lifecycle savings TBA.]

Cost Effectiveness Explorer

EXPLORER.LOCALENERGYCODES.COM

## Residential Building Stock

# City of Palm Springs

## Zone 15

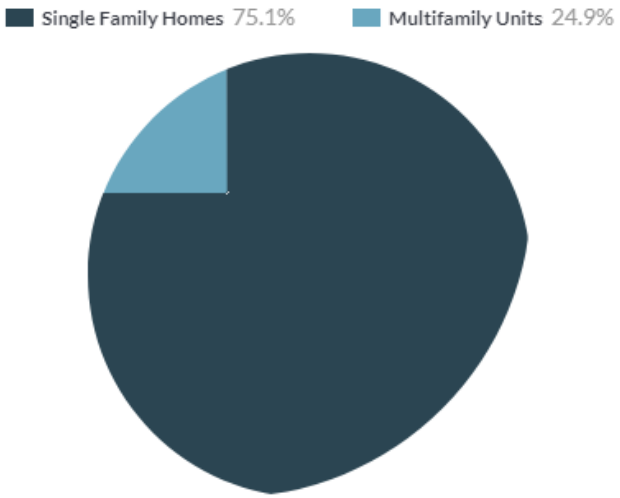


CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

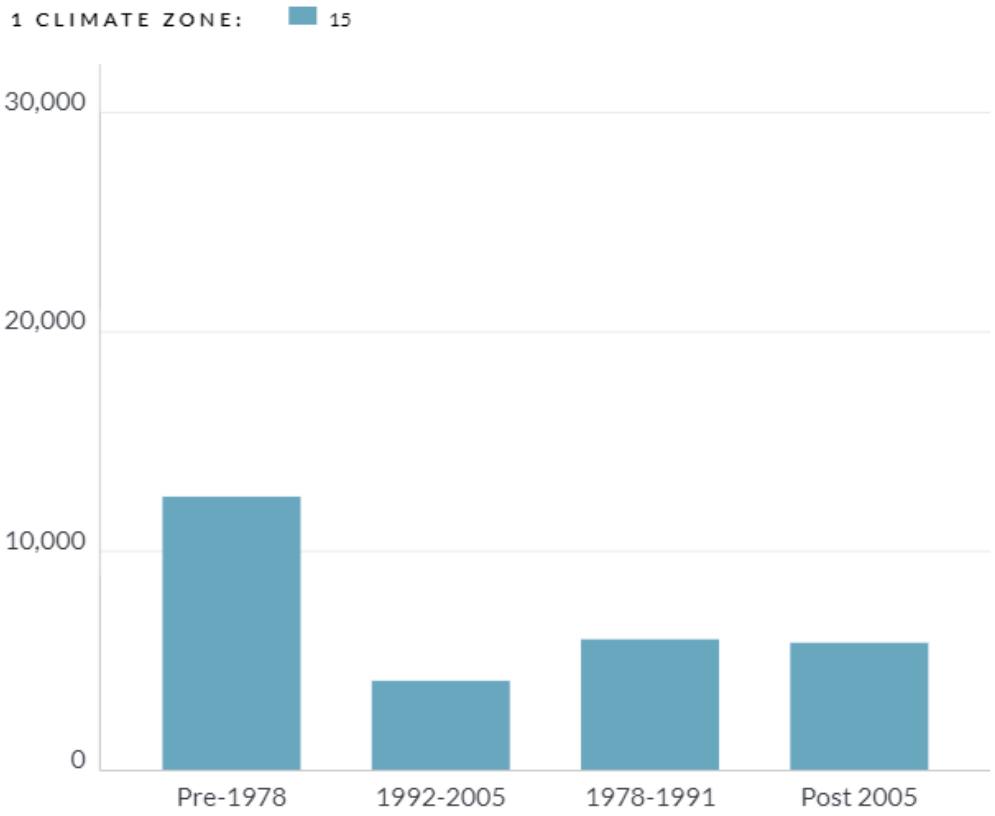
TOTAL RESIDENTIAL UNITS

**37,735**

DISTRIBUTION BY BUILDING TYPE



## Single Family Dwelling Units 28,326



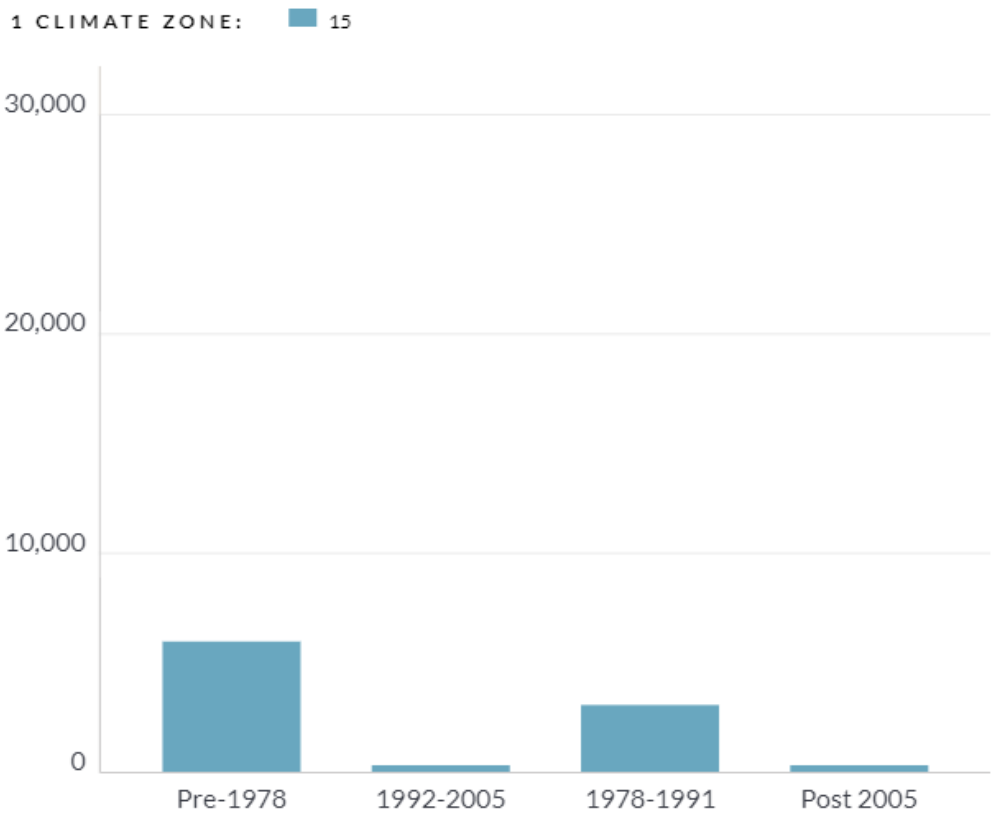

Number of Single Family Dwelling Units

| Climate Zone | Pre-1978 | 1978-1991 | 1992-2005 | Post 2005 | Total |
|---|---|---|---|---|---|
| 15 | 12,485 | 5,964 | 4,069 | 5,808 | 28,326 |

Percentage of Single Family Dwelling Units

| Climate Zone | Pre-1978 | 1978-1991 | 1992-2005 | Post 2005 | Total |
|---|---|---|---|---|---|
| 15 | 44.1% | 21.1% | 14.4% | 20.5% | 100.0% |

## Multifamily Dwelling Units 9,409




Number of Multifamily Dwelling Units

| Climate Zone | Pre-1978 | 1978-1991 | 1992-2005 | Post 2005 | Total |
|---|---|---|---|---|---|
| 15 | 5,956 | 3,053 | 231 | 169 | 9,409 |

Percentage of Multifamily Dwelling Units

| Climate Zone | Pre-1978 | 1978-1991 | 1992-2005 | Post 2005 | Total |
|---|---|---|---|---|---|
| 15 | 63.3% | 32.4% | 2.5% | 1.8% | 100.0% |

Cost Effectiveness Explorer

EXPLORER.LOCALENERGYCODES.COM

# Sources

Source and Methodology notes are under construction.

This document has been generated from https://explorer.localenergycodes.com/palm-springs-city/building-stock

Find more reach code resources at localenergycodes.com



CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

# City of Chula Vista Existing Home Energy Sustainability Ordinance (EHSO) Overview

**Background:** Homes in Chula Vista have been built over the years to meet the applicable energy related building codes which were first put in place in 1978. Since then new homes have gotten healthier and more efficient while some existing homes have gotten left behind. To help address these older homes the City is educating residents about retrofit opportunities and requiring older homes undergoing additions or remodels to make certain targeted upgrades, where applicable and feasible, to bring them closer to current codes.

**Who Needs to Comply:** These energy saving improvements are something most homes can benefit from but because newer homes have already been built to meet more recent energy code the focus of this policy is homes built in Chula Vista before 2006. Any home that does not have these measures should evaluate if they would benefit their home, but this ordinance is focused on homes that are doing alterations or remodels. Under this ordinance the definition of "remodel" is tied to structural changes that trigger the need for a permit. Please review the potential examples below to better understand what projects need to comply.

What projects trigger this requirement?

- Adding square footage
- Moving interior walls
- Adding or moving windows and doors

These projects do NOT trigger this requirement:

- Adding new tile or flooring
- Bathroom fixtures
- Lighting fixtures
- Appliances
- Adding or moving a kitchen island
- Adding or changing counters
- Adding an Accessory Dwelling Unit (ADU/JADU)
- Projects that are medically necessary
- Projects that are repairing without changing elements

| Location | Year Home Was Built | Required Energy Efficiency Measures |
|---|---|---|
| All City | 2006 | 0 |
| All zip codes except 91914 | 2005 to 1979 | 2 |
| All zip codes except 91914 | 1978 or older | 3 |
| 91914 | 2005 or older | 4 |

Based on the age and location of the home, different energy saving measures will be required. Please use the table above to determine how many of the energy efficiency measures listed in the table below will be required if your home undergoes an alteration or addition. The City recommends all homes in Chula Vista implement some level of the energy measures listed below to reduce their energy bill and improve home air quality. For more information on cost effectiveness or other detail please review "Chula Vista Energy Efficiency Fact Sheet" at https://www.chulavistaca.gov/departments/clean/retrofit.

**What Energy Efficiency Actions Could Be Included?** Below is a table that reviews the home energy efficiency standards that the City is trying to ensure homes meet.

| Name | Description | Benefit | Implementation Notes |
|---|---|---|---|
| LED Lighting | Replace screw-in halogen, incandescent or CFL light bulbs with LED light bulbs | LED lights can use up to 75% less energy than incandescent bulbs and are 15% more efficient than average Compact Florescent Light (CFL) Bulbs. | Not applicable to lights plugged into outlets, recommend Energy Star bulbs. Historic fixtures exempt if not compatible with LED bulbs. |
| Water Heating Package | A. Water Heater Blanket - Insulate exterior of storage water heaters manufactured before April 2015.<br>B. Hot Water Pipe Insulation - Insulate all **accessible** hot water pipes with R-3 pipe insulation.<br>C. Low Flow Fixtures - Upgrade sink and shower fittings to maximum flow rates of 1.8 gallons per minute (gpm) for showerheads and kitchen faucets, and 1.2 gpm for bathroom faucets. | Water heating can account for up to 50% of an average home's natural gas usage. By insulating the tank (if not already insulated) and exposed piping you can minimize the amount of heat that is lost on its way to you. By utilizing low flow faucets, aerators and low flow showerheads you not only save water but also save the energy used to heat up that water. | Only accessible hot water pipes need to be insulated. Historic fixtures exempt if not compatible with water efficiency measures. |
| Attic Insulation | Add attic insulation in buildings with vented attic spaces to meet R-38. | Attic insulation helps your home maintain a stable temperature. | Homes with existing insulation greater than R-5 in Climate Zone 7 or greater than R-19 in Climate Zone 10 are exempt. Homes without vented attics are exempt. |
| Duct Sealing | Air seal all **accessible** ductwork with a goal of reducing duct leakage to be equal to or less than 15% of system airflow. | Duct leakage can be as high as 30% in average California homes. This means that up to 30% of the air you are paying to heat or cool is being lost before it reaches its destination. Additionally, leaky ducts can allow a pathway for dust or other indoor air quality concerns to enter your rooms. | |
| Air Sealing | Apply air sealing practices throughout all **accessible** areas of the building. Homes with one or more vented combustion appliances MUST have a BPI Combustion Appliance Safety Inspection performed after air sealing. | Houses built over the past five years are over 20 percent tighter than those built a decade earlier. This means the air you paid to heat or cool can escape and increases your energy bills and outside pollutants can enter your home. By sealing your home you can make it safer and healthier. | Only accessible areas need to be sealed. Attics with crawl space are considered accessible. |

| | | | |
|---|---|---|---|
| Cool Roof | Only applicable if project includes re-roofing or addition of steep slope roofs. Install a roofing product rated by the Cool Roof Rating Council (CRRC) with an aged solar reflectance of 0.25 or higher and thermal emittance of 0.75 or higher. | Cool roofs help save energy by increasing the amount of solar energy that get reflected away from your home and minimize the need for cooling on hot summer days. | Only for steep slope roofs (shallow slope roofs already covered). |
| Windows | Replace existing single pane windows with a dual pane product. | Energy efficiency windows not only reduce heating and cooling costs they can also reduce the ability of moisture and noise to enter your home. | Look for U-factor equal to 0.32 or lower and a Solar Heat Gain Coefficient (SHGC) equal to 0.25 or lower |
| Water Heater Replacement | High Efficiency Heat Pump Water Heater: Replace natural gas storage water heater, or, tankless water heater having an Energy Factor of .81 or less, with Heat Pump Water Heater<br><br>-or-<br><br>High Efficiency Tankless Water Heater: Replace natural gas storage water heater, or, less efficient tankless water with tankless water heater. | About 18% of average homes energy is used for heating water. Heat Pump Water heaters are on average 200% to 300% more efficient than traditional water heaters while tankless units are 8% to 34% more efficient. Additionally because heat pump water heaters store their hot water they can minimize energy usage during peak periods. | Heat Pump Water Heater with Uniform Energy Factor (UEF) of at least 3.1 (Northwest Energy Efficiency Alliance Tier 3).<br><br>-or-<br><br>Tankless water heater with a minimum Energy Factor of 0.96. |
| Air Conditioner Replacement | High Efficiency Air Conditioner: Replace an existing air conditioner with an high efficiency air conditioner.<br><br>-or-<br><br>High Efficiency Heat Pump: Replace an existing air conditioner with a Heat Pump | When running air conditioners can be the biggest energy user in a home so installing high efficiency units can prevent higher bills. It is also important to ensure ducting is sealed and installed and filters are regularly changed. | Install an air conditioner or heat pump rated to at least 18 SEER |

**Benefits:** As mentioned in the table above, there are numerous benefits that these upgrades can provide depending on your home. Below is more information about the main benefits.

- Energy Bill Reductions – Over the expected life of the products, all of the measures are expected to reduce the home's energy bills by more than the cost of installing them.
- Improved Indoor Air Quality – Leaky homes and ducts are one of the largest ways that outdoor pollutants like dust and pollen can enter a home. Properly sealing homes and ducts can help increase indoor air quality. But all homes need ventilation, especially homes using fuel-fired appliances – gas water heaters, heating systems and stoves need ventilation, but homes can be sealed up too tight to allow this. If you seal your home beyond the recommended 15% of

system airflow you may need mechanical ventilation to ensure you are still receiving fresh air. Residents can have a third party verify their homes air leakage.

- Reduce Carbon Emissions – Home energy use is one of the largest contributors to climate change in Chula Vista. By saving energy residents will also reduce greenhouse gas (GHG) emissions. For more ways to reduce GHG emissions please visit www.cvclimatechallenge.com.

**What if I have already Made Similar Upgrades:** If you have already made these, or similar, upgrades or they will be a part of your home project, you will be benefiting from a more energy efficient home and do not need to make any additional upgrades. Please review the list of exemptions below:

- Similar measures have already been completed
    - Including participation in a low-income weatherization program (a deferment will be provided to qualifying applicants that have applied for weatherization programs but not received the work yet)
- Home achieves a Home Energy Score (HES) score of at least 8 out of 10
- Home has on-site photovoltaics (PV) offsetting at least 95% of the annual electricity and gas-equivalent usage
- An alternative, voluntary, set of energy measures is concurrently being completed that will achieve equivalent energy savings to the prescriptive packages

**What if These Upgrades Will Not Work for My Project:** Due to unique characteristics of some homes, these upgrades may not work as intended for all residents. To help ensure that residents are not negatively impacted by this requirement the following additional exemptions are also allowed.

- Low-Income Resident – Applicants who can demonstrate they qualify as a low-income household are exempt
- Project Value Cutoff - If the cost of completing energy efficiency measures required under this policy exceeds 20% of the overall project cost without those measures, permit applicants can propose a more limited set from among the required measures which does not exceed 20%
- A measure is beyond the authority of the homeowner due to HOA covenant
- Prescribed measures would be technically infeasible or not be cost-effective due to unique characteristics of home or other special circumstances

**Resources:** Please review the resources listed below for information about home energy performance or energy efficiency resources.

- SDG&E Energy Savings Assistance Program – The ESAP is an income qualified program that can make minor improvements to your home at no cost to you, such as insulation and appliance replacement, to help save energy. For full ESAP program eligibility requirements and application information, please visit www.sdge.com/esap or call 619-387-4757.
- Federal Weatherization Assistance – A income qualified program can provide you with no cost weatherization to help you save energy and make your home more energy efficient. If you would like to find out if you qualify for this program please call (619) 409-7588 or visit MAAC's website www.maacproject.org/main/impact/healthy-homes-health-services/weatherization-services/.

- Home Energy Score – Developed by the Department of Energy (DOE) and its national laboratories, the Home Energy Score provides homeowners, buyers and renters directly comparable and credible information about a home's energy use. Like a miles-per-gallon rating for a car, the Home Energy Score is based on a standard assessment of energy-related assets to easily compare energy use across the housing market. For more information please visit: www.homeenergyscore.gov.
- Go Green Financing – To help residents find financing for energy saving projects the state created the Go Green Financing website: www.gogreenfinancing.com. This allows California residents and businesses to create a custom energy action plan, find rebates and incentives and find a financing option.

**Questions?** Contact the City of Chula Vista's Conservation Section at 619-409-3893 or conservation@chulavistaca.gov.

## *3.2 Efficiency Measures*

The methodology used in the analyses for each of the prototypical building types begins with a design that matches the specifications as described in Table 2 for each of the three vintages. Prospective energy efficiency measures were modeled in each of the prototypes to determine the projected electricity and natural gas energy savings relative to the baseline vintage. In some cases, where logical, measures were packaged together. Unless specified otherwise, all measures were evaluated using CBECC-Res.

All measures are evaluated based on work required above and beyond any work triggered by Title 24 code requirements. Measures apply regardless of the scope of the remodel and are evaluated assuming they are not otherwise required by Title 24. For example, duct sealing is required by code whenever heating and cooling equipment is altered. For this analysis duct sealing was evaluated for those projects where it is not already triggered by code (i.e., no changes to the heating or cooling equipment). Where appropriate, measure requirements align with those defined in Title 24. The one exception is the cool roof measure which applies when a building is already installing a new roof as part of the remodel. The minimum solar reflectance value is more stringent than that required in Title 24, Part 6.

Following are descriptions of each of the efficiency upgrade measures applied in this analysis.

**Attic Insulation:** Add attic insulation in buildings with vented attic spaces to meet R-38.

**Air Sealing & Weather-stripping:** Apply air sealing practices throughout all accessible areas of the building. For this study, it was assumed that older vintage buildings would be leakier than newer buildings and that approximately 30% improvement in air leakage was achievable through air sealing of all accessible areas. For modeling purposes, it was assumed that air sealing can reduce infiltration levels from 10 to 7 air changes per hour at 50 Pascals pressure difference (ACH50) in the two older vintages (pre-1992) and from 7 to 5 ACH50 in the newer vintage.

**Cool Roof:** For steep slope roofs, install a roofing product rated by the Cool Roof Rating Council (CRRC) with an aged solar reflectance of 0.25 or higher and thermal emittance of 0.75 or higher. This measure only applies to buildings that are installing a new roof as part of the scope of the remodel; the cost and energy savings associated with this upgrade reflects the incremental step between a standard roofing product with one that is CRRC rated with an aged solar reflectance of 0.25. This is similar to cool roof requirements in 2019 Title 24 Section 150.2(b)1Ii but assumes a higher solar reflectance.

**Window Replacement:** Replace existing single pane windows with a dual pane product, which has a U-factor equal to 0.32 or lower and a Solar Heat Gain Coefficient (SHGC) equal to 0.25 or lower. This measure was only evaluated for the pre-1978 vintage, which is assumed to have single-pane, metal-frame windows.

**Duct Sealing:** Air seal all ductwork to meet the requirements of the 2019 Title 24 Section 150.2(b)1E. For this analysis, a final duct leakage value of 15 percent was applied, which corresponds to Option i in the Title 24 code section referenced.

**Water Heater Blanket:** Add R-6 insulation to the exterior of existing residential tank storage water heaters. For the analysis, the water heater was modeled within conditioned space, which is a typical configuration for older homes. This assumption is conservative since a water heater located in unconditioned space will tend to have higher tank losses and installing a water heater blanket in those situations will result in additional savings. The energy savings for this measure reflect only water heating energy savings only, and do not include any impacts to the space conditioning load, which reduces space cooling loads and increases space heating loads. The impact on space conditioning energy used would be minimal. In most climates, with the exception of heating dominated ones, the combination of these two impacts results in net energy savings. This measure was

evaluated using EnergyPlus. This measure was evaluated for individual water heaters only and would not apply to central water heating systems.

**Hot Water Pipe Insulation:** Insulate all accessible hot water pipes with R-3 pipe insulation. In certain buildings which have slab on grade construction, and the majority of pipes located either underground or within the walls, most of the pipes will be inaccessible. For the purposes of this analysis a conservative assumption that only ten percent of the pipes could be insulated was applied. In buildings where pipes are located in the attic, crawlspace, or are otherwise more accessible, energy savings will be higher than those presented in this analysis. This measure was evaluated using BEopt and EnergyPlus.

**Low Flow Fixtures:** Upgrade sink and shower fittings to meet current CALGreen requirements, which require maximum flow rates of 1.8 gallons per minute (gpm) for showerheads and kitchen faucets, and 1.2 gpm for bathroom faucets. Baseline whole house hot water use was based on BEopt assumptions and this measure assumed the upgraded fixtures reduce flow rates by ten percent for showerheads and 20 percent for all faucets based on a 2010 water use study (ConSol, 2010). This measure was evaluated using BEopt and EnergyPlus.

**LED Lighting:** Replace screw-in incandescent lamps and compact fluorescent lamps (CFLs) with screw-in light emitting diode (LED) lamps. This analysis was conducted external to the energy model evaluated replacement of both a single 45 W incandescent lamp and a 13W CFL lamp with an 11 W LED lamp operating 620 hours annually. Annual hour estimates were based on whole building average hours of operation from a 2010 lighting study by KEMA (KEMA, 2010). Lifetime assumptions were 1,000 hours for incandescent lamps, 10,000 hours for CFLs and 25,000 hours for LED lamps.

**Lighting Vacancy Sensors:** Install manual on - automatic off vacancy sensors that meet the requirements of Title 24 Section 110.9(b)4. This analysis was conducted external to the energy model, assuming ten percent savings in operating hours for a single vacancy sensor installed on a switch controlling three lamps. Energy savings were calculated assuming both 45 W incandescent lamps and 11 W LED lamps, operating 620 hours annually. Annual hour estimates were based on whole building average hours of operation from a 2010 lighting study by KEMA (KEMA, 2010).

## *3.3 Efficiency Packages*

A few of the measures described above were also evaluated as part of a package. Three packages were developed as described below.

**Envelope & Duct Package – R-38 Attic Insulation & Air Sealing & Duct Sealing:** Air sealing and attic insulation are very often applied as a package in building retrofits. The boundary between the living space and vented attics is where a significant amount of building air leakage can occur and sealing these areas as well as ducts prior to covering the attic floor with insulation is both practical and effective. Air sealing, duct sealing and insulation also directly address occupant comfort, as they reduce heat transfer, and result in more even temperatures within the building.

**Water Heating Package – Water Heater Blanket, Hot Water Pipe Insulation, & Low-Flow Fixtures:** These three water heating measures are all relatively low cost and work together to reduce building hot water energy use.

## *3.4 Measure Cost*

Table 3 summarizes the cost assumptions for each of the measures evaluated. Costs were obtained from various sources, including local contractors, internet searches, past projects, and technical reports.

Cost Effectiveness Explorer

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## Cost-Effectiveness Results Summary

# City of Palm Springs

## Climate Zone 15



CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Single Family Homes | Built before 1978 (12,485 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 6.04 | 3.11 | $3,472 | $1,116 | $26,499 |
| **R38 Attic Insulation** | 3.2 | 5.89 | $2,273 | $385.90 | $9,184 |
| **Duct Sealing** | 53.2 | 0.353 | $240.00 | $679.84 | $16,132 |
| **Cool Roof** | 8.72 | 2.15 | $634.92 | $295.95 | $6,988 |
| **Windows** | 1.61 | 11.7 | $9,810 | $839.79 | $19,900 |
| **Water Heating Package** | 2.45 | 8.71 | $208.31 | $23.92 | $644.75 |
| **LED Lamp vs. CFL** | 3.71 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Single Family Homes | Built from 1978 to 1991 (5,964 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 3.27 | 5.75 | $3,212 | $558.66 | $13,257 |
| **R38 Attic Insulation** | 1.79 | 10.5 | $2,013 | $191.81 | $4,559 |
| **Duct Sealing** | 25.9 | 0.726 | $240.00 | $330.66 | $7,835 |
| **Cool Roof** | 6.59 | 2.84 | $634.92 | $223.48 | $5,282 |
| **Water Heating Package** | 2.45 | 8.71 | $208.31 | $23.92 | $644.75 |
| **LED Lamp vs. CFL** | 3.71 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Single Family Homes | Built from 1992 to 2005 (4,069 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 3.08 | 6.1 | $3,212 | $526.48 | $12,492 |
| **R38 Attic Insulation** | 1.9 | 9.88 | $2,013 | $203.71 | $4,841 |
| **Duct Sealing** | 23.4 | 0.801 | $240.00 | $299.45 | $7,095 |
| **Cool Roof** | 5.93 | 3.15 | $634.92 | $201.26 | $4,755 |
| **Water Heating Package** | 2.45 | 8.71 | $208.31 | $23.92 | $644.75 |
| **LED Lamp vs. CFL** | 3.71 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Multifamily Units | Built before 1978 (5,956 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 9.67 | 2.37 | $1,054 | $445.25 | $10,568 |
| **R38 Attic Insulation** | 6 | 3.82 | $593.78 | $155.58 | $3,695 |
| **Duct Sealing** | 57.1 | 0.401 | $120.00 | $299.43 | $7,101 |
| **Cool Roof** | 14 | 1.63 | $183.74 | $112.77 | $2,666 |
| **Windows** | 2.26 | 10.1 | $5,873 | $581.09 | $13,772 |
| **Water Heating Package** | 2.92 | 8.91 | $168.20 | $18.87 | $508.68 |
| **LED Lamp vs. CFL** | 4.52 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Multifamily Units | Built from 1978 to 1991 (3,053 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 5.26 | 4.35 | $986.62 | $226.99 | $5,382 |
| **R38 Attic Insulation** | 3.33 | 6.87 | $525.92 | $76.54 | $1,816 |
| **Duct Sealing** | 28.2 | 0.812 | $120.00 | $147.81 | $3,501 |
| **Cool Roof** | 10.9 | 2.09 | $183.74 | $87.91 | $2,080 |
| **Water Heating Package** | 2.92 | 8.91 | $168.20 | $18.87 | $508.68 |
| **LED Lamp vs. CFL** | 4.52 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

EXISTING LOW-RISE RESIDENTIAL BUILDINGS (2019)

## Multifamily Units | Built from 1992 to 2005 (231 units)

| | Cost-Effectiveness | | Per Home Results | | |
|---|---|---|---|---|---|
| **Measure** | **On-Bill Benefit/Cost Ratio** | **Simple Payback** | **Incremental Cost** | **Annual Bill Savings** | **Lifecycle Savings** |
| **Envelope & Duct Package** | 4.51 | 5.07 | $986.62 | $194.60 | $4,613 |
| **R38 Attic Insulation** | 2.79 | 8.2 | $525.92 | $64.13 | $1,521 |
| **Duct Sealing** | 24.5 | 0.931 | $120.00 | $128.84 | $3,051 |
| **Cool Roof** | 9 | 2.54 | $183.74 | $72.46 | $1,714 |
| **Water Heating Package** | 2.92 | 8.91 | $168.20 | $18.87 | $508.68 |
| **LED Lamp vs. CFL** | 4.52 | 5.05 | $9.12 | $1.81 | $42.77 |
| **LED Lamp vs. Incandescent** | ∞ | Immediate | -$29.94 | $31.64 | $749.09 |

Cost Effectiveness Explorer

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## Sources


2019 Cost-Effectiveness Study: Existing Low-Rise Residential Building Efficiency Upgrade
California Energy Codes and Standards Program, PG&E. Produced by: Frontier Energy, Inc, Misti Bruceri & Associates.

2019 Cost-Effectiveness Study: Low-Rise Residential New Construction
California Energy Codes and Standards Program, PG&E. Produced by: Frontier Energy, Inc, Misti Bruceri & Associates.

2019 Nonresidential New Construction Reach Code Cost-Effectiveness Study
California Energy Codes and Standards Program, SoCal Edison. Produced by: TRC, EnergySoft.


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CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

## Policy Impacts

| | Affected Units Per Year | | | | Total Affected Units | | | | Aggregate Compliance Cost | | | | Aggregate Bill Savings | Net Emissions Savings (mtco2e) | Net Emissions Savings from Gas (mtco2e) | Net Emissions Savings from Electricity (mtco2e) | SUPPLEMENTAL CALCULATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pre-1978 | 1978-1991 | 1992-2005 | | Pre-1978 | 1978-1991 | 1992-2005 | | Pre-1978 | 1978-1991 | 1992-2005 | | | | | [+] |
| [+] Single Family Measures | | | | | | | | | | | | | | | | | |
| SF Total | *675.5* | *375* | *179* | *122* | *3,378* | 1,873 | 895 | 610 | $1,393,509 | $787,088 | $360,480 | $245,941 | $7,125,420 | 2,384 | 1,867 | 517 | |
| [+] Multifamily Measures | | | | | | | | | | | | | | | | | |
| MF Total | *277.2* | *179* | *92* | *7* | *1,386* | 893 | 458 | 35 | $218,881 | $142,527 | $70,981 | $5,372 | $1,325,495 | 669 | 574 | 95 | |
| [+] Combined Measures | | | | | | | | | | | | | | | | | |
| Cool Roof | 159 | 92 | 45 | 22 | 794 | 461 | 225 | 108 | $399,911 | $225,572 | $108,691 | $65,648 | $1,275,910 | 10 | -107 | 117 | |
| LED vs. CFL | 794 | 461 | 225 | 108 | 3,970 | 2,305 | 1,127 | 538 | $36,204 | $21,023 | $10,279 | $4,902 | $53,889 | 5 | 0 | 5 | |
| Water Heating Package | 198 | 115 | 56 | 27 | 992 | 576 | 282 | 134 | $195,097 | $112,542 | $54,852 | $27,702 | $447,846 | 1,960 | 1,960 | 0 | |
| Duct Sealing | 127 | 74 | 36 | 17 | 635 | 369 | 180 | 86 | $130,262 | $74,222 | $35,954 | $20,086 | $2,091,029 | 302 | 123 | 179 | |
| Air Sealing and Attic Insulation | 64 | 37 | 18 | 9 | 318 | 184 | 90 | 43 | $850,916 | $496,255 | $221,685 | $132,975 | $4,582,241 | 776 | 465 | 311 | |
| SF & MF Total | *953* | *553* | *271* | *129* | *4,764* | 2,766 | 1,353 | 645 | $1,612,390 | $929,615 | $431,462 | $251,313 | $8,450,915 | 3,053 | 2,441 | 612 | |

[+] Notes

## Assumptions

[expand all horizontal groups to view properly]

| Building Stock Values (dwelling units) | Pre-1978 | 1978-1991 | 1992-2005 | 2006+ |
|---|---|---|---|---|
| Single Family | 12,485 | 5,964 | 4,069 | 5,808 |
| Multifamily | 5,956 | 3,053 | 231 | 169 |

| Global Assumptions | |
|---|---|
| Policy Takes Effect | 2023 |
| Active Policy Duration (years) | 5 |
| Current Renewable Electricity Share | 87.15% |
| Natural Gass Emissions Factor (mtco2e) | 0.0054544 |

| Measure Assumptions | | Penetration Rate | Applicability Rate | Baseline Installations - Yrs 1-10 | Baseline Installations - Second Ten Years | Baseline Installations - Third Ten Years | [Intermediate Calculations] *Impact Reduction Factor From Baseline Installation* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Single Family Measures | | | | Yrs 1-10 | Yrs 11-20 | Yrs 21-30 | *All Year* | *Yrs 1-10* | *Yrs 11-20* | *Yrs 21-30* |
| Cool Roof | Only reroofs | 1.0000% | 50% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| LED vs. CFL | All Permits | 5.0000% | 50% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| Water Heating Package | $25K+ (1+ measure) | 0.6250% | 100% | 0% | 33% | 66% | *0.67* | *100%* | *67%* | *34%* |
| Duct Sealing | $50K+ (2+ measures) | 0.4000% | 100% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| Air Sealing and Attic Insulation | $100K+ (4 measures) | 0.2000% | 100% | 0% | 33% | 66% | *0.67* | *100%* | *67%* | *34%* |
| Multifamily Measures | | | | | | | | | | |
| Cool Roof | Only reroofs | 1.0% | 50% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| LED vs. CFL | All Permits | 5.0000% | 50% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| Water Heating Package | $25K+ (1+ measure) | 0.6250% | 100% | 0% | 33% | 66% | *0.67* | *100%* | *67%* | *34%* |
| Duct Sealing | $50K+ (2+ measures) | 0.4000% | 100% | 50% | 75% | 100% | *0.25* | *50%* | *25%* | *0%* |
| Air Sealing and Attic Insulation | $100K+ (4 measures) | 0.2000% | 100% | 0% | 33% | 66% | *0.67* | *100%* | *67%* | *34%* |

Discuss

Applicability Rate of 100% high

Baseline installation rate of 0% is low

MF Attic