DECARB + THE RCFE

DECARBONIZATION AND THE FUTURE OF RCFE DESIGN

SMITHGROUP

Design for Aging

AIA Knowledge Community

The mission of the AIA **Design for Aging** (DFA) Knowledge Community is to foster design innovation and disseminate knowledge necessary to enhance the built environment and quality of life for an aging society.

Continuing education credits

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Questions?

Submit your questions through the Q&A pod at the bottom of your screen.

Content-related questions will be answered during the Q&A portion as time allows. Any questions not answered during Q&A, will be answered and posted online within two (2) weeks.

Tech support questions will be answered by AIA staff.

LEARNING OBJECTIVES

1. Participants will be able to identify how the 2022 California Energy Code Updates will impact RCFE design and construction.

2. Learn how all-electric infrastructure requirements will impact commercial kitchens, laundries, and typical amenities in California.

3. Participants will learn strategies for providing energy resilience that is independent of the grid.

4. Learn how decarbonizing building infrastructure can result in long-term energy and cost savings.

DECARB + THE RCFE

AGENDA

A. Evolving Policy Landscape

B. Technology of Rapid Electrification
   - Operational Cost

C. CA Code Cycle Impacts to RCFEs
   - No more commercial classification
   - Commercial Kitchens & Laundries
   - Amenities in an All-Electric Development
   - EV Charging

D. Using Renewables to Increase Resilience and Drive your Proforma

E. Resources

DECARB + THE RCFE

STET SANBORN
Principal,
Engineering
Discipliine Leader

ALEXIS BURCK
Principal, Senior
Living Studio Leader

A. EVOLVING POLICY LANDSCAPE

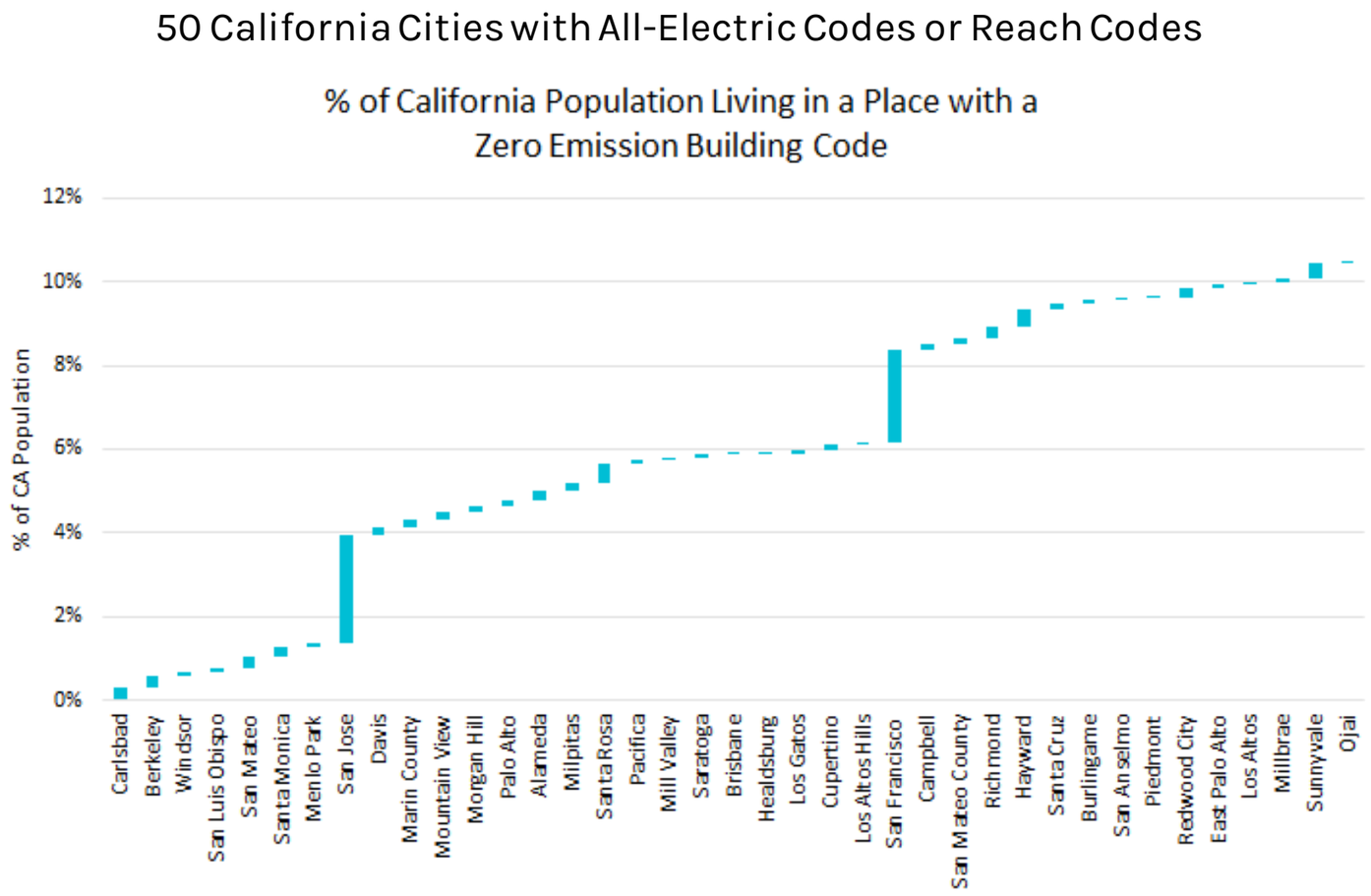
CITY AND STATE POLICY DRIVERS

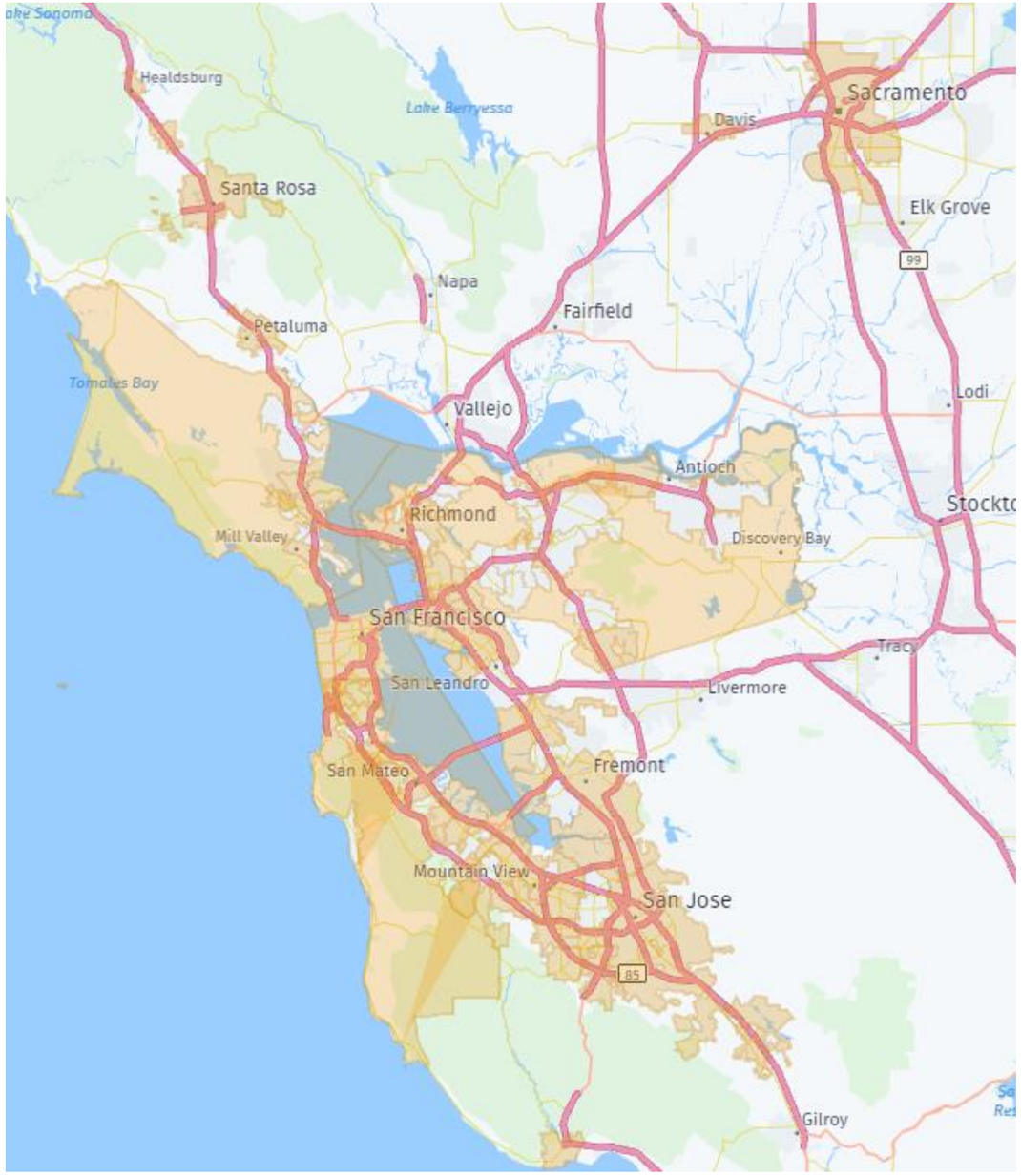
NATIONAL ELECTRIFICATION REACH CODES AND DECARB CODES

Source: Building Decarb Coalition

REGULATORY CONDITIONS

NEW CONSTRUCTION → BAY AREA AGGRESSIVELY DRIVING ELECTRIFICATION

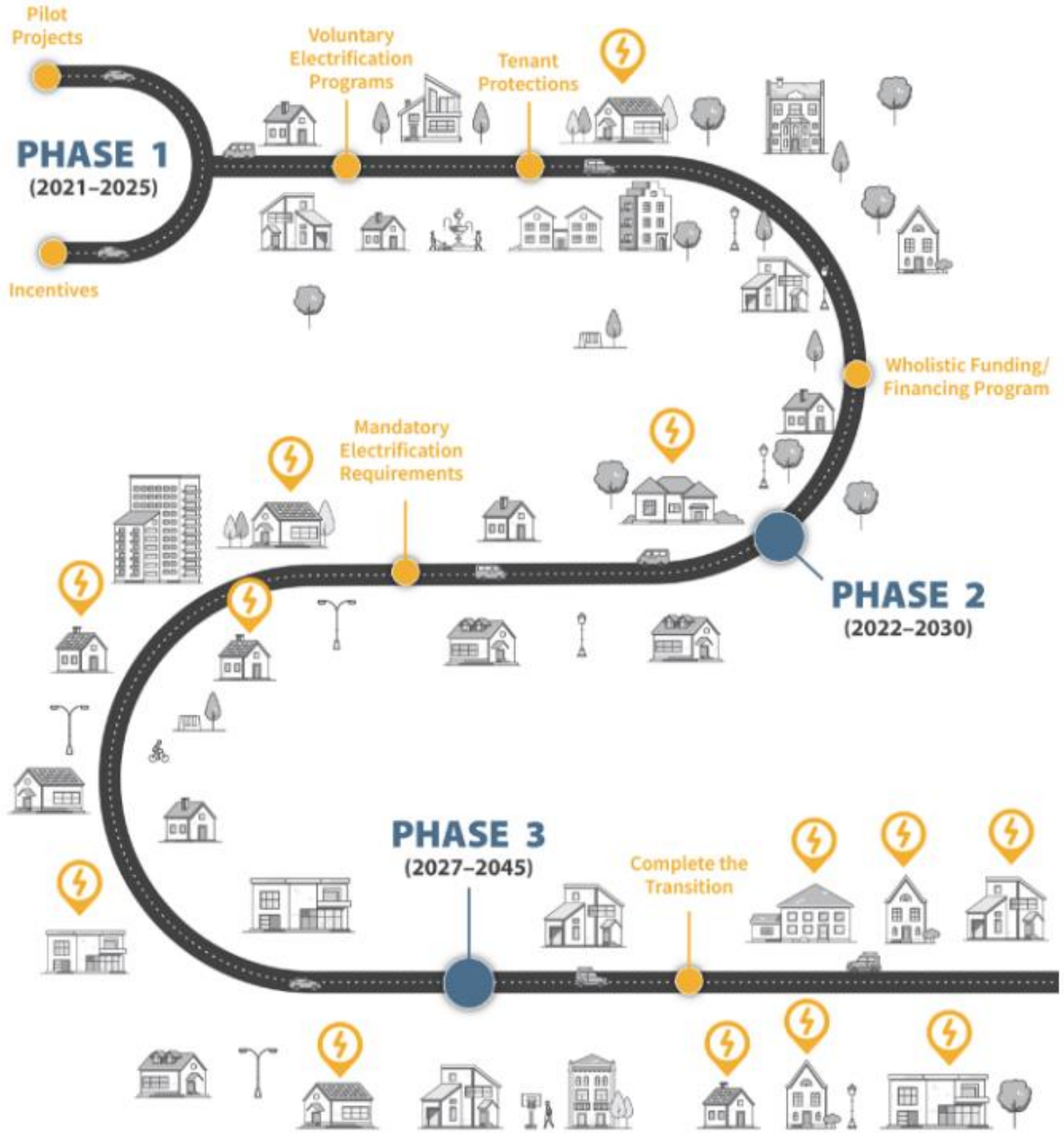




LOCAL POLICY DRIVERS

CITY OF BERKELEY – ELECTRIFICATION RETROFIT PLANNING

- **Phase 1**
  - Focuses on expanding and verifying the identified cost effectiveness and equity impacts implementing foundational programs and building community capacity.
- **Phase 2**
  - Increases the stringency of the policies and begins to introduce mandatory measures, once sufficient supports are in place.
- **Phase 3**
  - Policies finalize the move toward all-electric buildings through mandatory measures.



Source: https://berkeleyca.gov/sites/default/files/2022-01/Berkeley-Existing-Buildings-Electrification-Strategy.pdf

BUILDING DECARB COALITION

A POWERFUL COALITION OF CITY GOVERNMENTS, UTILITIES, NGO'S, NON-PROFITS, DESIGNERS, ENGINEERS, MANUFACTURERS AND MANY MORE

http://www.buildingdecarb.org/resources.html

BUILDING DECARBONIZATION COALITION

FOR DESIGN TEAMS

RESEARCH

FOR LOCAL GOVERNMENTS

CITY OF PALO ALTO UTILITIES

EAST BAY COMMUNITY ENERGY

LA DWP Los Angeles Department of Water & Power

NEW YORK STATE OF OPPORTUNITY. NYSERDA

Sonoma Clean Power

Pacific Gas and Electric Company

SMUD Powering forward. Together.

SILICON VALLEY CLEAN ENERGY

SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL® Company

ASSOCIATION FOR ENERGY AFFORDABILITY

the Energy Coalition

RESOURCE REFOCUS

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Johnson Controls

BAYREN

MITSUBISHI ELECTRIC MAKE YOURSELF COMFORTABLE

Rheem

SIERRA CLUB

CITY OF MENLO PARK

Monterey Bay Community Power

SILICON VALLEY POWER CITY OF SANTA CLARA

Ecology Action Helping people act now

NRDC NATURAL RESOURCES DEFENSE COUNCIL

STOPWASTE at home • at work • at school

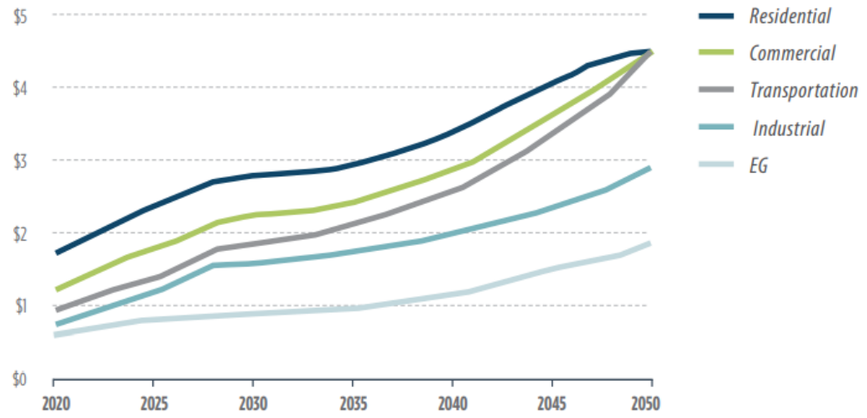
PENINSULA CLEAN ENERGY

2050 PARTNERS · 350 · ACTIVE SGV · Alter · AC Smith · BC Hydro Power smart · Beyond Efficiency · Bradford White · Bright Power · Build It Green · CUSP · CELERITAS · ehdd · electrify now · ELEVATE ENERGY · Endeavour · emerald eco · enwave · ERASE40.org · GRID ALTERNATIVES · HEA · INTEGRAL GROUP · codecycle · COMMUNITY ENERGY LABS · SCHILLER CONSULTING · SUSTAINABLE SILICON VALLEY · TaylorEngineering · TerraVerde ENERGY · MENLO SPARK · Urban Land Institute · PAE · REDCAR · RISING TIDE · SAN JOSE CLEAN ENERGY · SLO Climate Coalition · SWEEP · slipstream · SUSTAINABLE SILICON VALLEY · Berkeley · VERDANT · Fremont · San Jose · Santa Cruz · Clean Coalition · CPA · Local Government Commission · Berkeley Lab · DESIGN AVENUES LLC · EARTHJUSTICE · Sustainable Alliance · Rocky Mountain Institute · SF Climate Emergency Coalition · Olympic International · ohmconnect · RE U

REGULATORY CONDITIONS

MITIGATING FUTURE RISKS AND UNCERTAINTY

FIGURE 9. *Projected Gas Rates with 50% Reduction in Gas System Expenditures, Accelerated Depreciation, and Change in Cost Allocation*
Source: E3



Bay Area Air Quality Management District

Under Nichols' leadership, the board has helped set national standards on tailpipe emissions, which dictate gas mileage, and battled with Washington as the Trump administration tried to roll back those rules.

Liane Randolph (California Public Utilities Commission)

Randolph is a current commissioner of the California Public Utilities Commission, which regulates electric, natural gas and water utilities, telecommunications and transportation companies including Uber and Lyft.

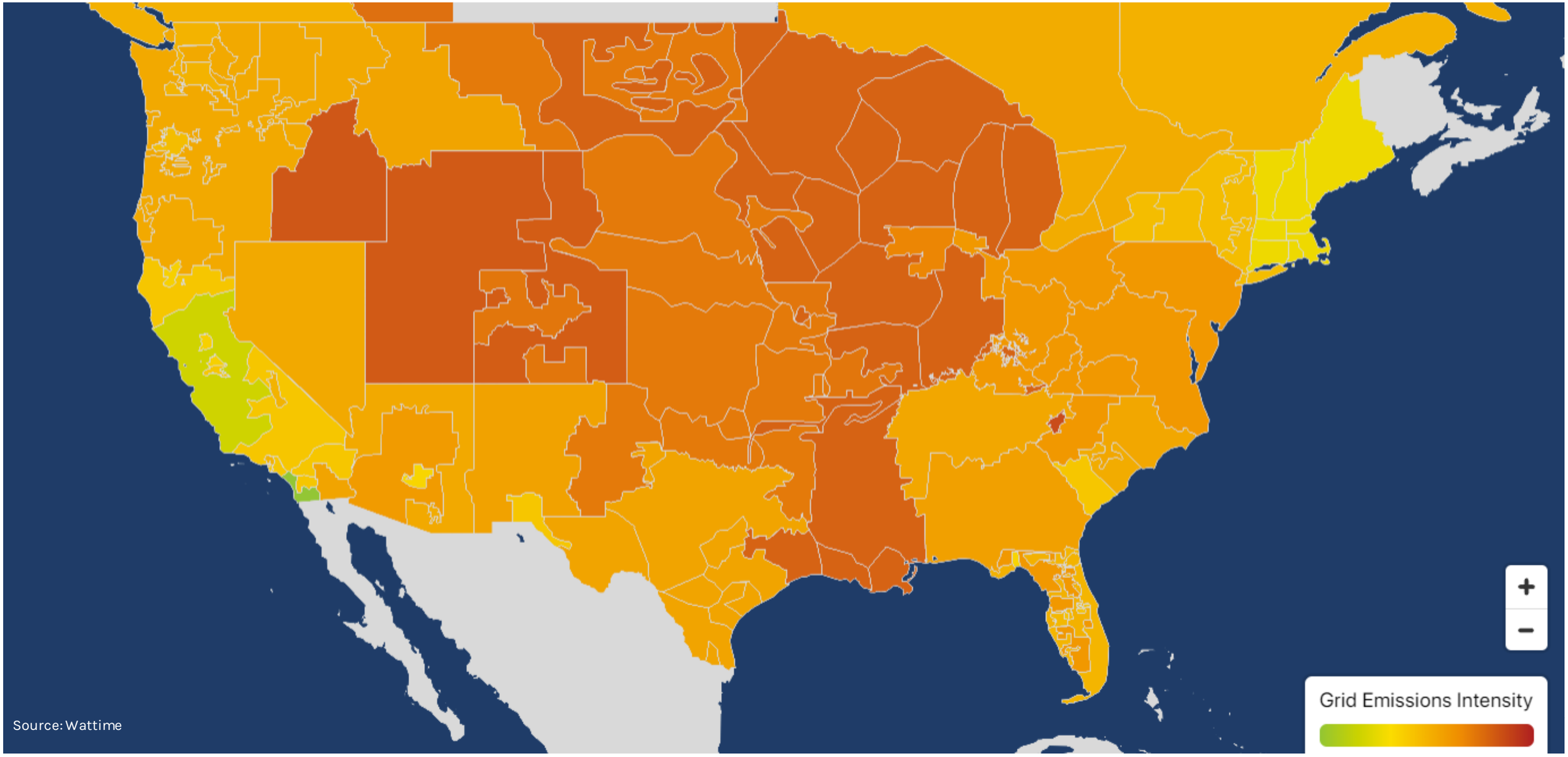
She previously worked in the California Natural Resources Agency and chaired the Fair Political Practices Commission, which oversees and enforces California's campaign finance and political ethics laws.

At the air board, she'll be charged with overseeing some of California's ambitious plans to cut down on greenhouse gas emissions and regulate air pollution.

Those goals include achieving net-zero carbon emissions by 2045 and halting the sale of new gas-powered passenger vehicles by 2035.

UNDERSTANDING YOUR REGIONAL GRID

REGIONAL GRID MARGINAL EMISSIONS RATES

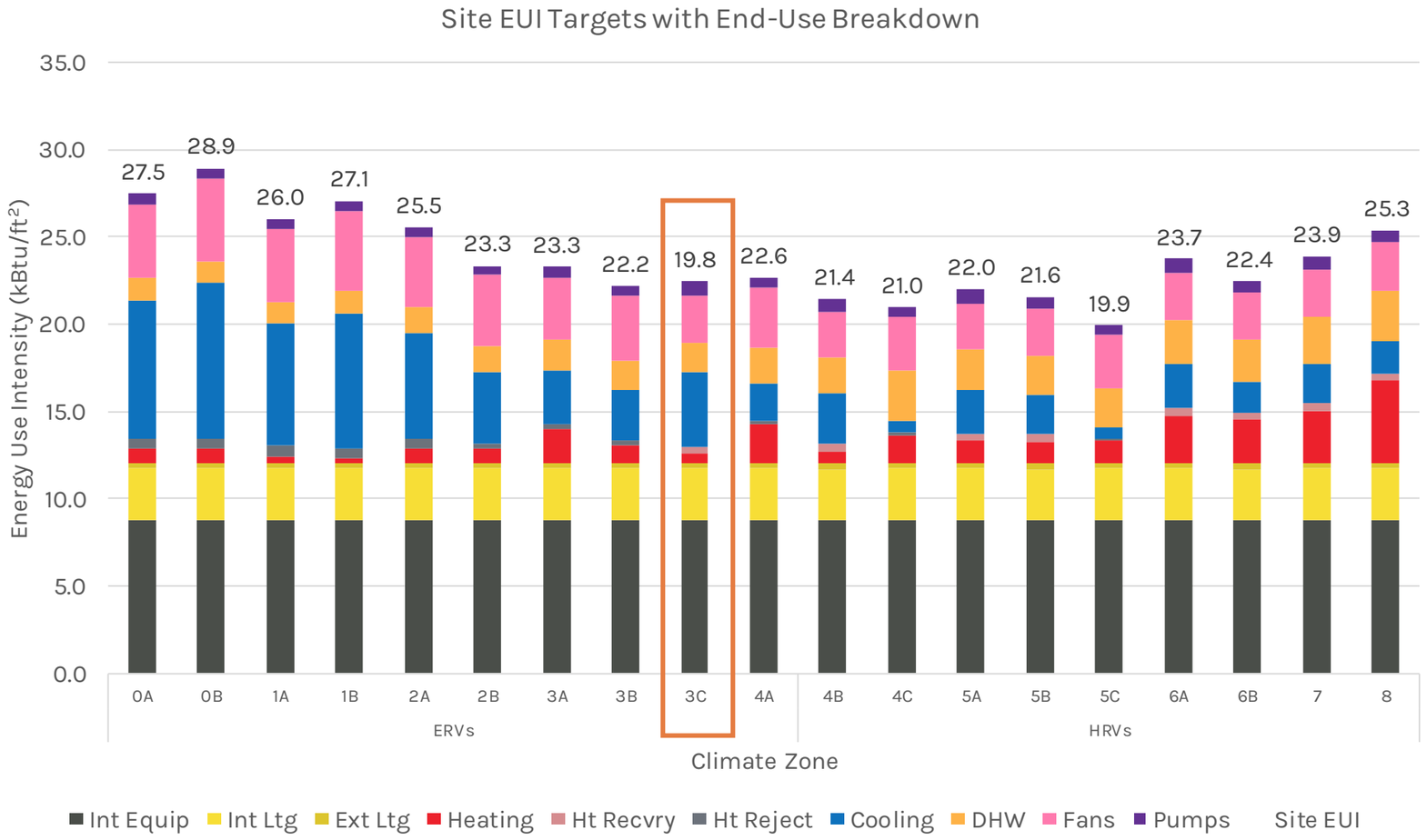


B. TECHNOLOGY OF RAPID ELECTRIFICATION

THE FUTURE OF HOUSING

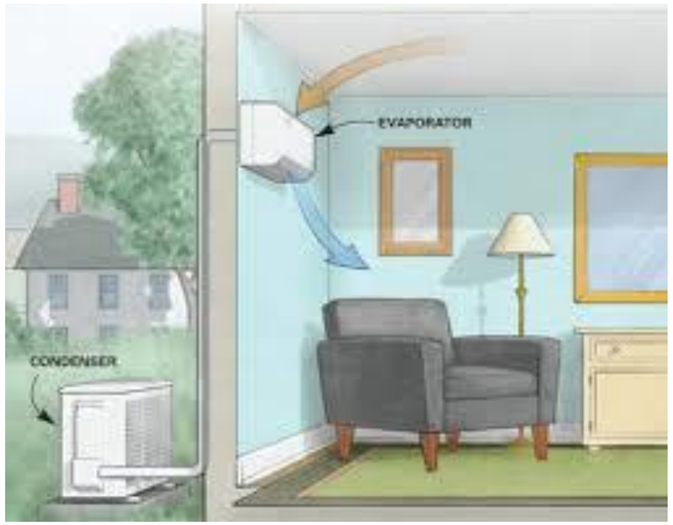
MEP SYSTEMS FOR ALL-ELECTRIC DESIGN

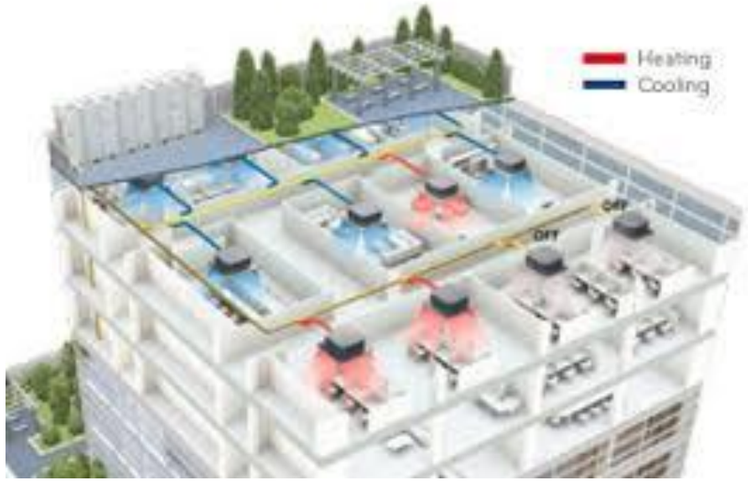
https://www.ashrae.org/technical-resources/aedgs



DECARB ELECTRIC SYSTEMS

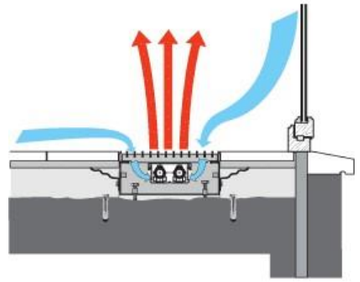
HEATING AND COOLING: MINI-SPLIT AND VRF HEAT PUMPS





DECARB ELECTRIC SYSTEMS

HEATING AND COOLING: AIR TO WATER HEAT PUMPS



DECARB ELECTRIC SYSTEMS

DOMESTIC HOT WATER

DECARB ELECTRIC SYSTEMS

DOMESTIC HOT WATER: WHY CO2 HEAT PUMPS MAY BE YOUR BEST FRIEND

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

DECARB ELECTRIC SYSTEMS

DOMESTIC HOT WATER: WHY CO2 HEAT PUMPS MAY BE YOUR BEST FRIEND

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

4 Air-Source R-134a Heat Pumps
4 x 70 A CB @ 480v
176 KVA

2,750 Gallons of Storage
(@ 140F)

DECARB ELECTRIC SYSTEMS

DOMESTIC HOT WATER: WHY CO2 HEAT PUMPS MAY BE YOUR BEST FRIEND

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

2 x C02 Heat (R744)
2x 125A CB at 480v
138KVA

1,500 Gallons of Storage
(@ 180F)

DECARB ELECTRIC SYSTEMS

DOMESTIC HOT WATER: WHY POOP MAY BE YOUR BESTEST FRIEND

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

2 x PIRANHA T15 HC Waste Heat Recovery Heat Pump (R-513a)
2x 110A CB @ 460v
88 kVA

2,750 Gallons of Storage (@ 140F) + ~2,250 Gal Waste Storage Below Grade

DECARB ELECTRIC SYSTEMS

OPERATING COST: WHY YOUR COP MATTERS

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

	Fossil Gas Boiler	Heat Pump
$/Therm	$1.62	N/A
$/kWh (EQ)	$0.06	$0.16

DECARB ELECTRIC SYSTEMS

OPERATING COST: WHY YOUR COP MATTERS

- 100x 1-Bedroom
- 100x 2-Bedroom

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  - Peak: 1,433 gph for 3 hours
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	Fossil Gas Boiler	Heat Pump
$/Therm	$1.62	N/A
$/kWh (EQ)	$0.06	$0.16
Efficiency	0.95	2.5 → 4.5 COP

DECARB ELECTRIC SYSTEMS

OPERATING COST: WHY YOUR COP MATTERS

- 100x 1-Bedroom
- 100x 2-Bedroom

- ASPE
  - Peak: 1,433 gph for 3 hours
  - Off-peak: 158 gph for 8 hours

	Fossil Gas Boiler	Heat Pump
$/Therm	$1.62	N/A
$/kWh (EQ)	$0.06	$0.16
Efficiency	0.95	2.5 → 4.5 COP
Single Day Cost	$119.10/Day	$102.45/Day

Bay Area Cost Parity ~ COP 2.7
Chicago Cost Parity ~ COP 3.06
Denver Cost Parity ~ COP 3.4

C. IMPACTS TO RCFES

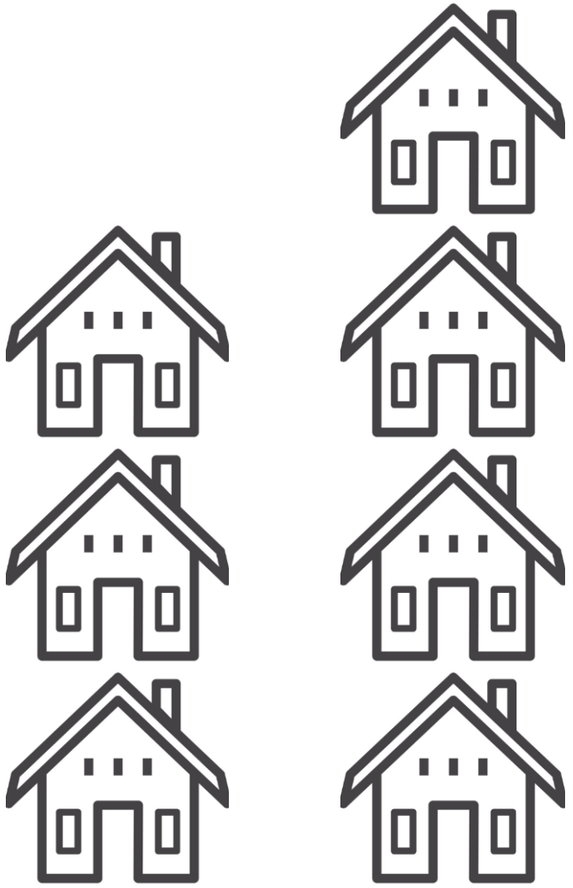
UPCOMING CALIFORNIA CODE CYCLE

ENERGY CODE CHANGES

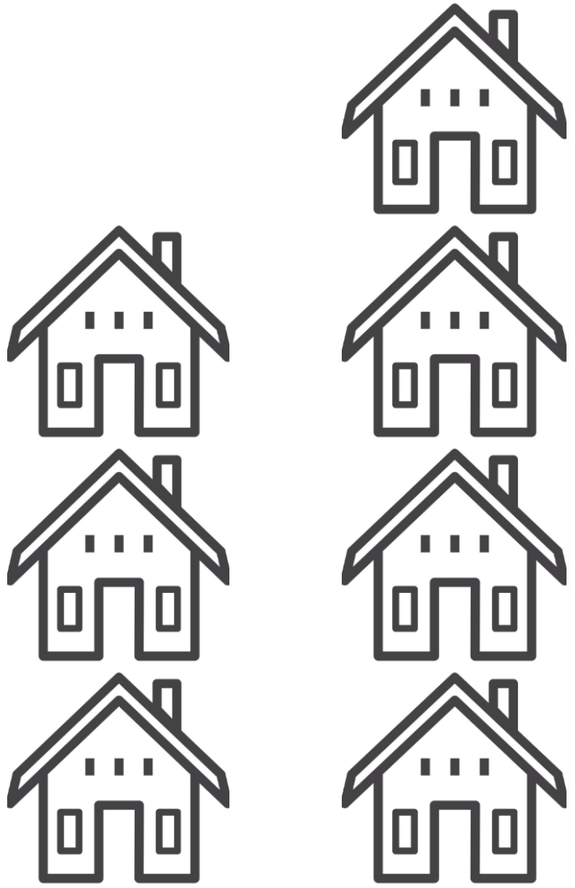
The California Energy Commission (CEC) estimates that over 30 years the 2022 Energy Code will provide **$1.5 billion in consumer benefits** and **reduce 10 million metric tons of GHGs – equivalent to taking nearly 2.2 million cars off the road for a year.**

ENERGY CODE CHANGES

BUILDING RECLASSIFICATION



2019: RESIDENTIAL COMMERCIAL

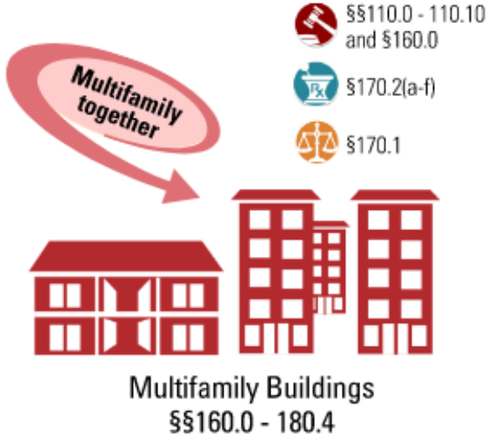


2022: RESIDENTIAL RESIDENTIAL

ENERGY CODE CHANGES

BUILDING RECLASSIFICATION

Where to Find Multifamily Building Requirements in the 2022 Energy Code



One of the largest changes to the structure of the 2022 Energy Code is that the Energy Code requirements for all multifamily buildings have been moved into their own subchapters, rather than being combined with single-family residential or nonresidential building types.

In past Energy Code cycles, the requirements for multifamily buildings with three or fewer habitable stories were grouped together with single-family residences and duplexes in the category of "low-rise residential," while multifamily buildings with four or more habitable stories were considered "high-rise residential," and their Energy Code requirements were part of the nonresidential standards. The 2022 Energy Code still has some distinctions between multifamily buildings with three or fewer stories versus four or more stories, but the new Energy Code structure makes it easier to find all multifamily requirements.

2022 Energy Code sections that apply to multifamily buildings are listed in Table 1.

Subchapter	Requirements
Subchapter 2	**All Occupancies: Mandatory Requirements for the Manufacture, Construction and Installation of Systems, Equipment and Building Components** §§110.0-110.10: Mandatory measures that may apply to all occupancy types depending on the equipment types and systems proposed The structure of Subchapter 2 of the Energy Code remains essentially the same as in past code cycles.
Subchapter 10	**Multifamily Buildings: Mandatory Requirements** §§160.0-160.9: Mandatory requirements for dwelling units and common use areas in multifamily buildings §160.0 General §160.1 Mandatory Requirements for Building Envelopes §160.2 Mandatory Requirements for Ventilation and Indoor Air Quality §160.3 Mandatory Requirements for Space Conditioning Systems in Multifamily Buildings §160.4 Mandatory Requirements for Water Heating Systems §160.5 Mandatory Lighting Requirements for Indoor and Outdoor Spaces §160.6 Mandatory Requirements for Electric Power Distribution System §160.7 Mandatory Requirements for Covered Process §160.8 Mandatory Requirements for Solar Ready Buildings §160.9 Mandatory Requirements for Electric Ready Buildings
Subchapter 11	**Multifamily Buildings: Performance and Prescriptive Compliance Approaches** §170.0 General §170.1 Performance Approach §170.2 Prescriptive Approach
Subchapter 12	**Multifamily Buildings: Additions, Alterations and Repairs to Existing Multifamily Buildings** §180.0 General §180.1 Additions §180.2 Alterations §180.3 Repairs §180.4 Whole Building

Table 1. *2022 Energy Code Sections Applicable to Multifamily Buildings*

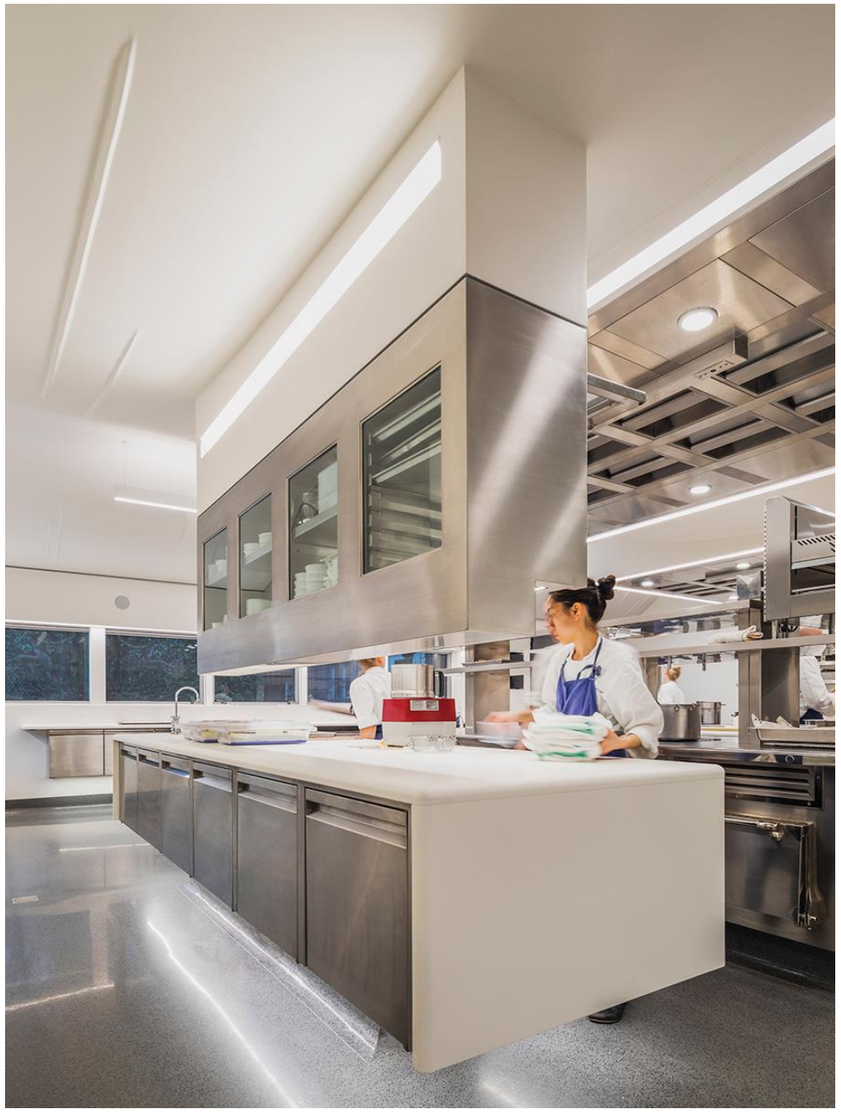
ALL-ELECTRIC INFRASTRUCTURE

COMMERCIAL KITCHENS

THE ALL-ELECTRIC KITCHEN

COMMERCIAL KITCHENS

FROM FAST SERVE TO FINE DINING – ALL ELECTRIC



COMMON RCFE AMENITIES

ELECTRIC FIREPLACES

PV ARRAYS & BATTERY BACK-UP

D. INCREASE RESILIENCE

USING RENEWABLES TO IMPACT RESILIENCE & SAVE MONEY

RISK AND RESILIENCE

HURRICANES

"The state's care facilities — about 700 nursing homes and 3,470 assisted-living facilities — have been preparing for the storm for days. As of Wednesday morning, at least 35 facilities housing 3,000 residents had evacuated, mostly in low-lying areas like Collier and Sarasota counties, according to Knapp. In the last week, FHCA's members have been performing fuel checks for generators, restocking supplies and hardening building exteriors." - Kelsey Butler and Ella Ceron Bloomberg News

Hurricane Ian barely affects solar community in Florida

Babcock Ranch, a community near Fort Meyers, Florida, was built with climate resiliency in mind.

OCTOBER 10, 2022 RYAN KENNEDY

COMMERCIAL & INDUSTRIAL PV | GRIDS & INTEGRATION | TECHNOLOGY AND R&D | UTILITY SCALE PV | UNITED STATES

The Babcock Preserve Solar Energy Center

Image: Florida Light and Power

RISK AND RESILIENCE

WILDFIRE & HEAT WAVES

"…California has a clear lesson for the world: Battery storage is a powerful tool for grids facing new strains from heat, cold, fire, flood or aging networks. And just as important, batteries are key to the zero-carbon future we need to avoid even greater stresses down the line."

Mike Ferry,
Los Angeles Times,
9/23/2022

Los Angeles Times

SUB

Op-Ed: California's giant new batteries kept the lights on during the heat wave

For the record:

9:22 a.m. Sept. 13, 2022: *An earlier version of this article incorrectly stated that batteries contributed 50 megawatts on average to California's grid during two peak hours of an August 2020 heat wave. They contributed 125 megawatts on average during that time.*

SUBSCRIBERS ARE READING ›

FOR SUBSCRIBERS

12 secret stops on California's iconic road to Big Sur

FOR SUBSCRIBERS

A MORE RESILIENT STRATEGY

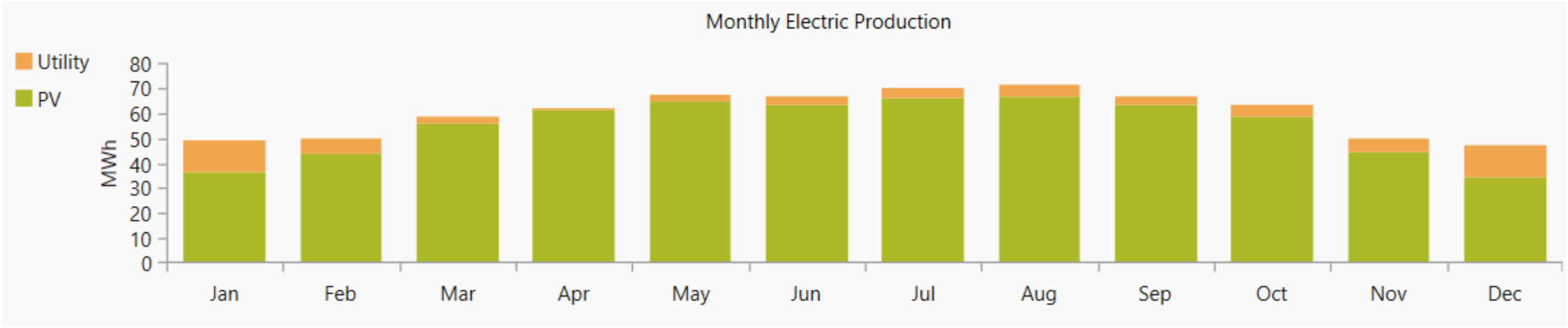
MORE RESILIENCE; MORE OPTIONS

Outage Duration
0 - 12 Days

A MORE RESILIENT STRATEGY

MORE RESILIENCE; MORE OPTIONS

Resilience	PV	Battery	Initial Capital Modeled	Simple Payback	Levelized Cost of Energy	Internal Rate of Return	Cont PV Cost	Cont Battery Cost	Cont Total
Days	KWdc	kWh	$	years		%	$		$
0	**205**	**0**	**$ 443,636**	**12**	**$ 0.0934**	**%**	**$ 443,620**	**$ -**	**$443,620**
1	205	59	$ 517,204	12.3	$ 0.1240	6.8%	$ 443,620	$ 91,450	$535,070
2	**352**	**195**	**$ 1,010,000**	**17**	**$ 0.1050**	**3.6%**	**$ 754,688**	**$ 242,580**	**$997,268**
3	311	197	$ 933,146	20	$ 0.1270	2.5%	$ 700,061	$ 245,068	$945,129
4	**393**	**216**	**$ 1,130,000**	**14**	**$ 0.0990**	**3.9%**	**$ 841,806**	**$ 263,952**	**$1,105,758**
5	414	316	$ 1,300,000	23	$ 0.1230	1.3%	$ 872,712	$ 375,724	$1,248,436



FINANCIAL TOOLS TO MAKE IT HAPPEN

BIG OPPORTUNITIES IN THE IRA TAX BILL!!

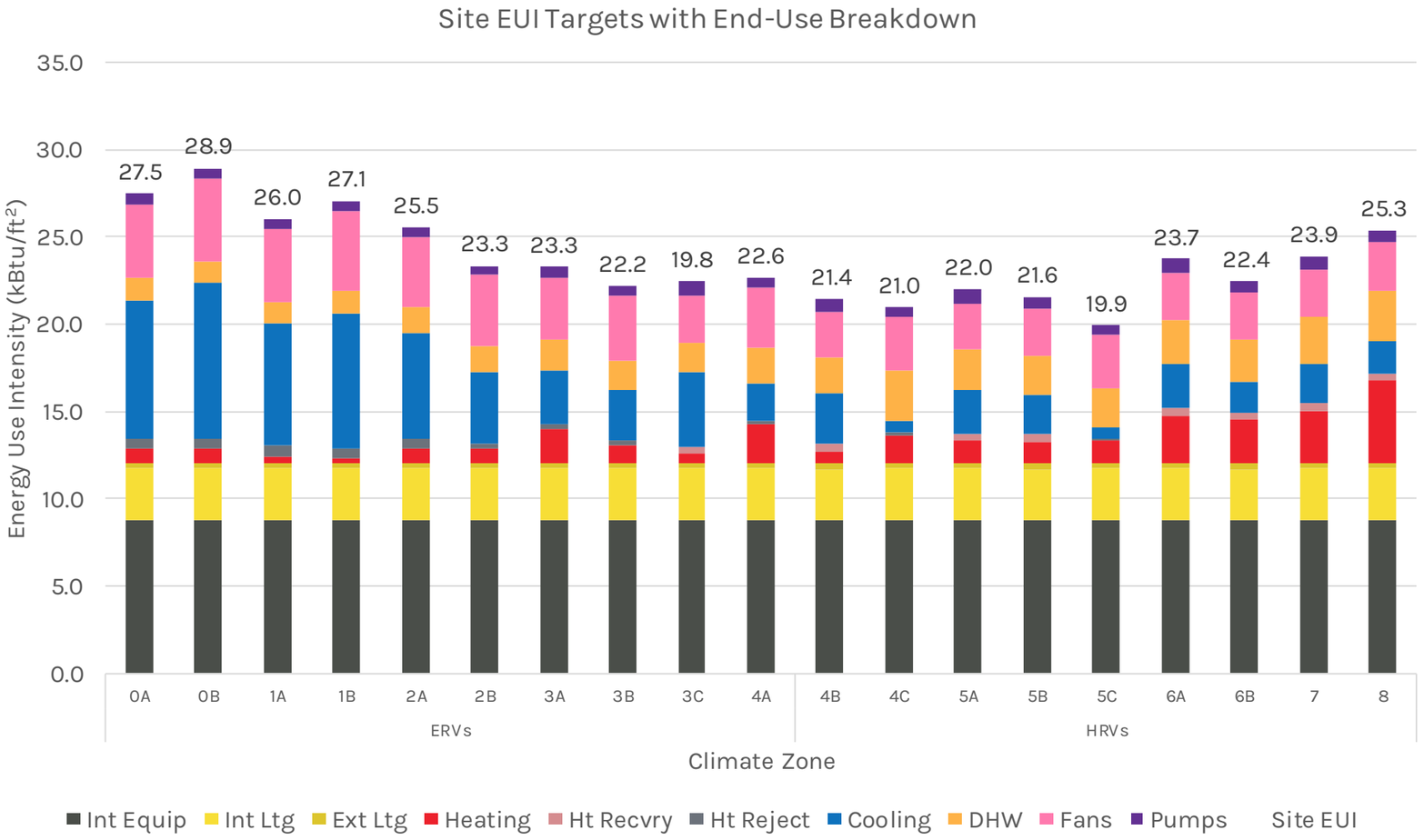





		179D Commercial Buildng Energy Tax Deduction	Modified Accelerated Cost Recovery System	Bonus Depreciation	Business Energy Investment Tax Credit	Renewable Energy Production Tax Credit	Rural Energy for America Program Grants
Basic Project Attributes	Project Type	New Construction	New Construction	New Construction	New Construction	New Construction	New Construction
		Retrofits	Retrofits	Retrofits	Retrofits	Retrofits	Retrofits
	Eligible Technology	Energy Efficiency	Energy Efficiency	Energy Efficiency	Energy Efficiency	Renewables	Energy Efficiency
			Renewables	Renewables	Renewables		
			Energy Storage	Energy Storage	Energy Storage		Renewables
	Eligibility Notes	Envelope, HVAC, Hot Water, Lighting	Equipment or property must largely be used for commercial purposes	Recovery Period for depreciation must be less than 20 years	Technology Dependent	As of 2022, only applicable to wind energy	Only available to Rural Businesses or Agricultural Producers

ASHRAE ADVANCED ENERGY DESIGN GUIDES

MEP SYSTEMS FOR ZERO ENERGY DESIGN



DECARBONIZATION DESIGN GUIDES COMING SOON!

COMING SOON!

Feedback survey

We encourage all attendees to complete the post course survey at https://www.research.net/r/MN8BK7K by **Friday October 28, 2022**, at **5pm ET**.

Please email knowledgecommunities@aia.org if you have any questions.

Join DFA

aia.org/dfa