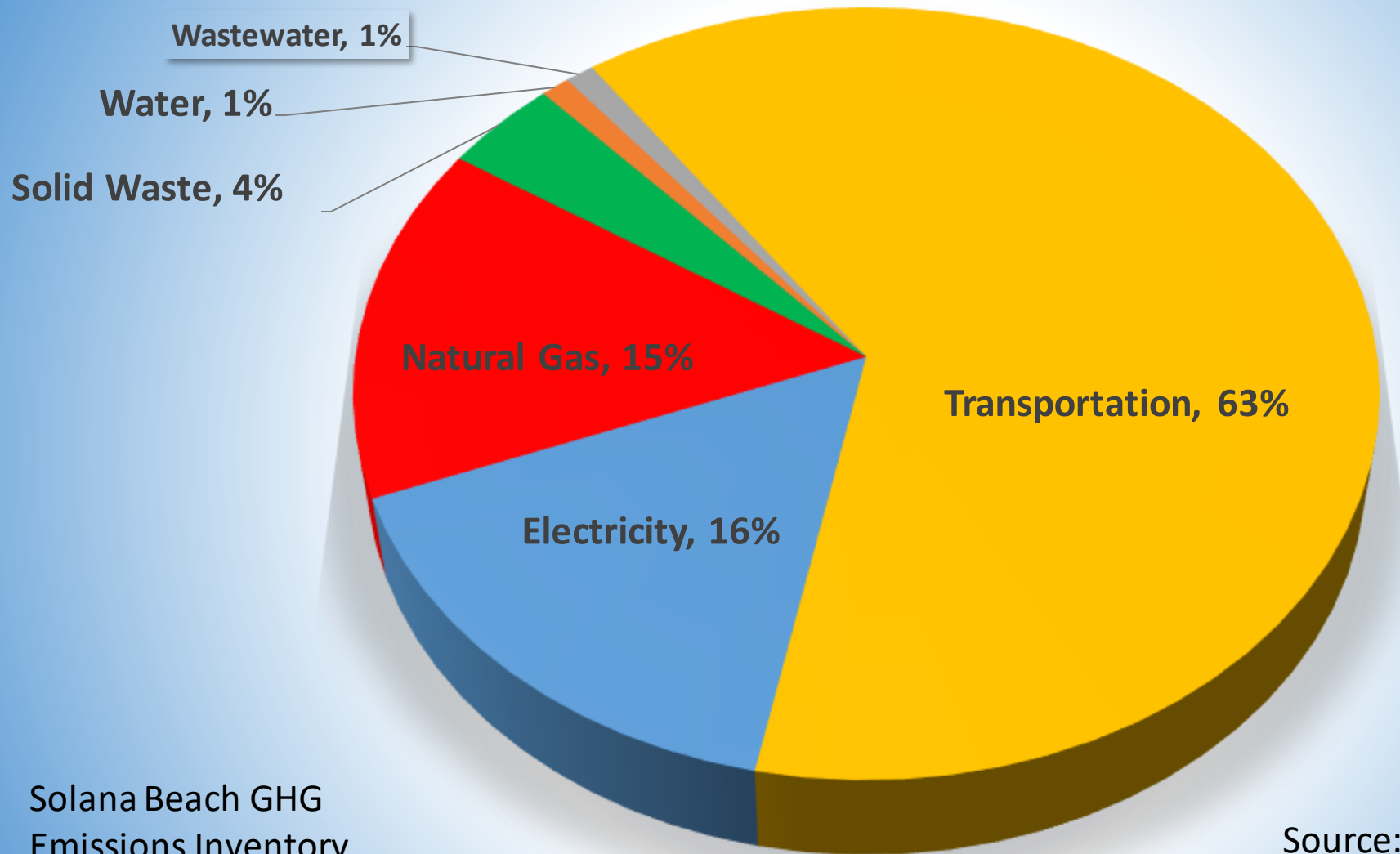


City's Greenhouse Gas Emissions & Reduction Goals

Peter Zahn, Climate Action Commissioner



Greenhouse Gas Emission Sources



Solana Beach GHG
Emissions Inventory

Source: SANDAG 2018

Solana Beach Climate Action Goals

Climate Action Plan – Two Overall Goals by 2035:

- Reduce annual GHG emissions by 50% from 2010 baseline (139K metric tons)
- 100% of electricity used in city comes from renewable sources

Top 3 GHG Reductions Measures (in metric tons CO₂e):

1. Electric Vehicles - increase proportion of electric miles driven (17,495 MT)
2. Buildings/Renewable Energy (10,748 MT)
3. Community Choice Energy – to further 100% renewable energy (10,466 MT)

Bottom Line: Decarbonize electricity supply, and electrify transportation and buildings

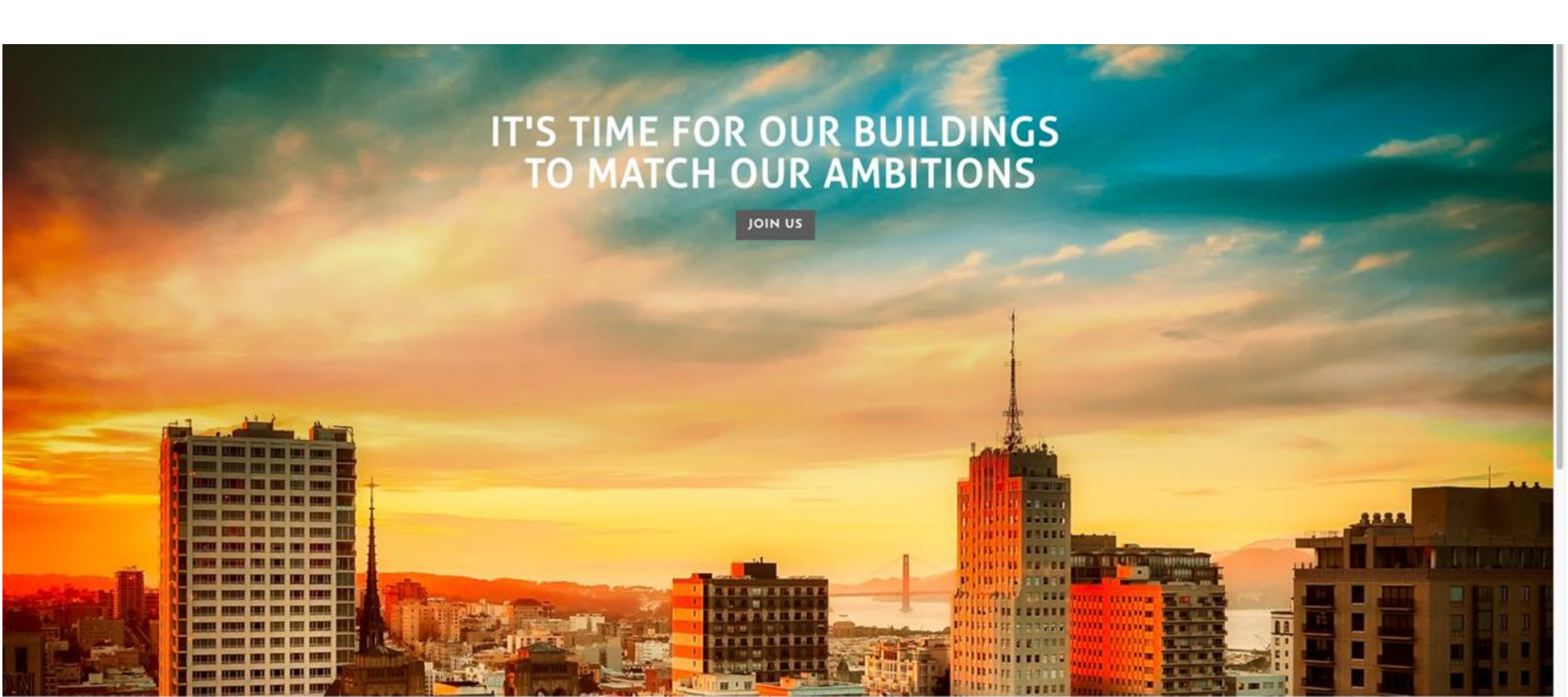
Building Electrification – Opportunity to Move to the Next Level

Amy Rider, Building Decarbonization Coalition



IT'S TIME FOR OUR BUILDINGS TO MATCH OUR AMBITIONS

JOIN US



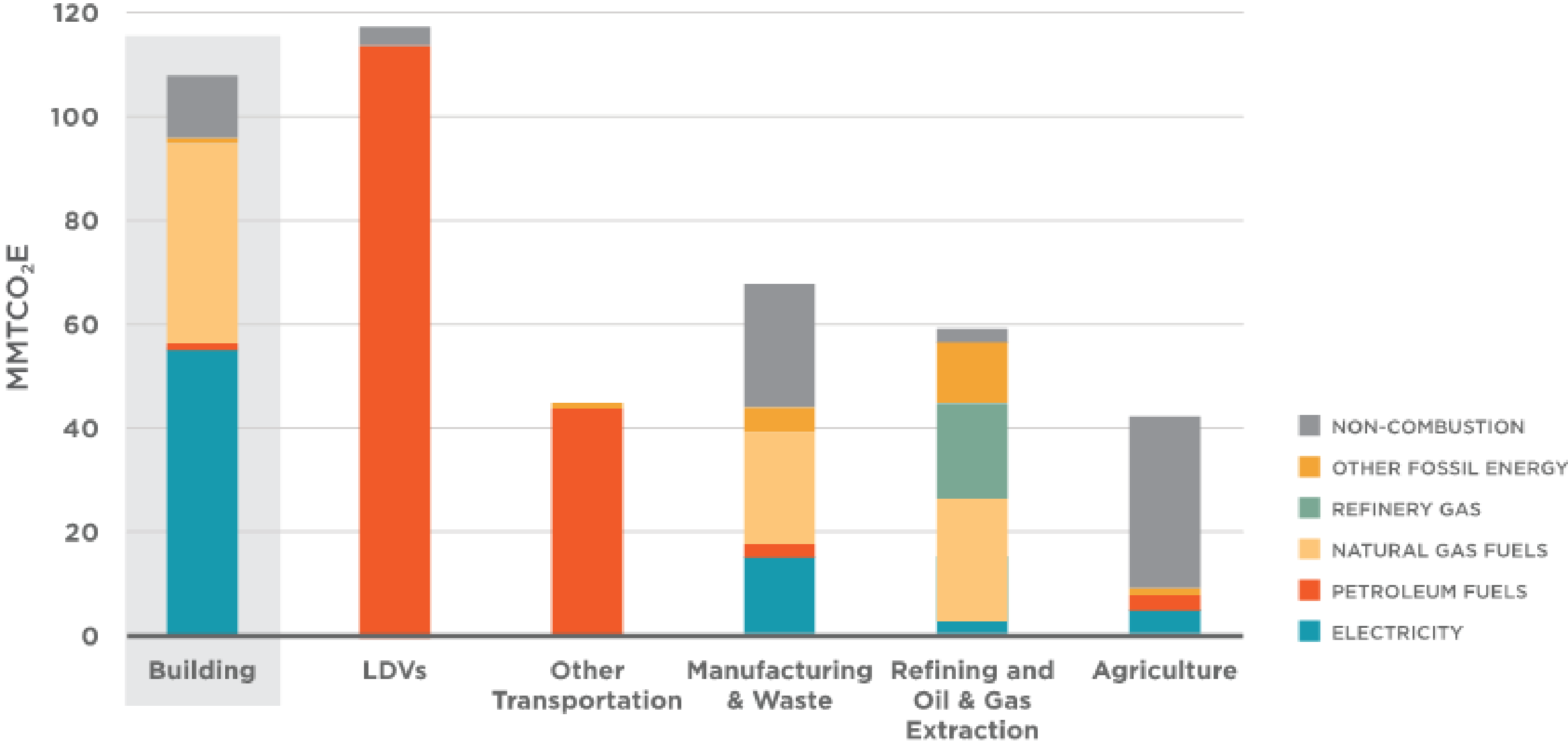
**BUILDING
DECARBONIZATION
COALITION**

Why Building Electrification



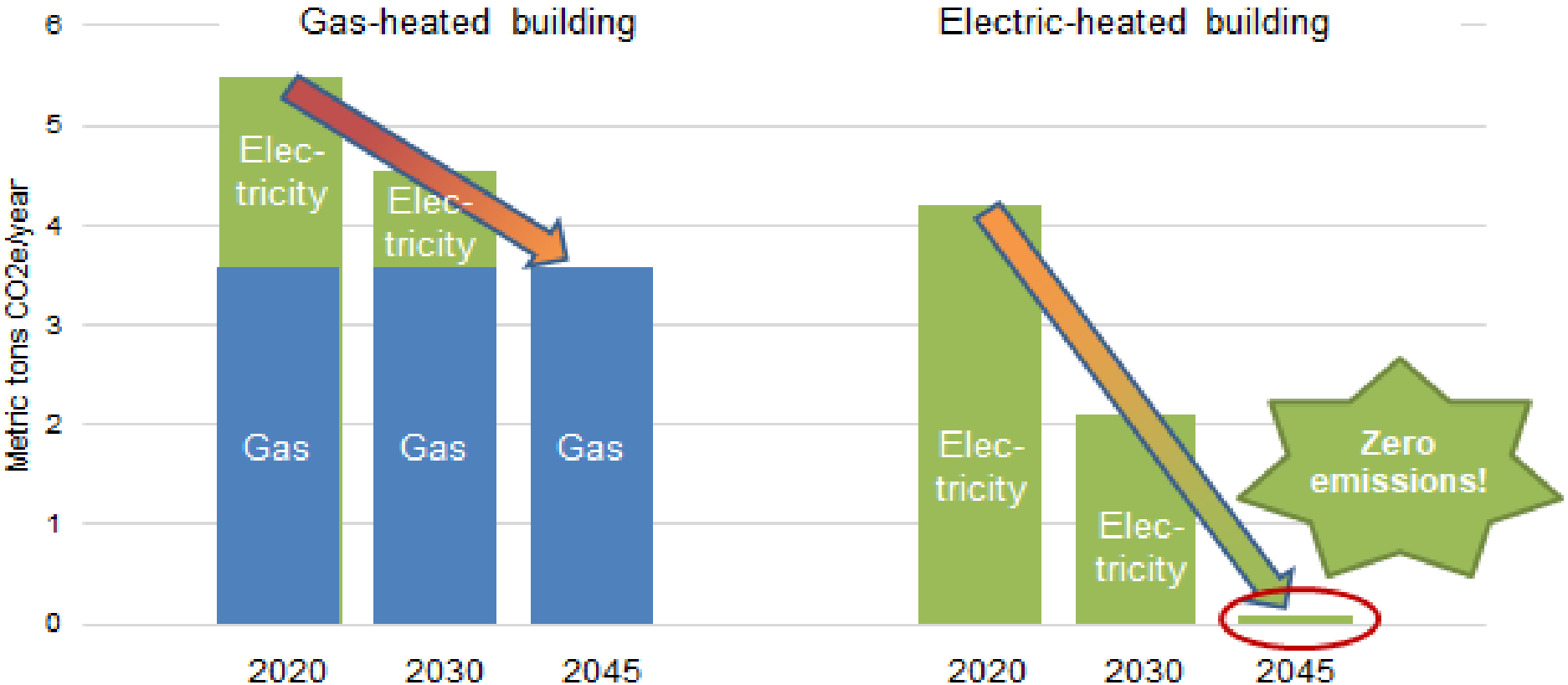
**BUILDING
DECARBONIZATION
COALITION**

California's GHG emissions today – Buildings 24%



Electric Heat Offers Pathway To Zero Emissions

Annual Greenhouse Gas Emissions from Energy Use of Title 24 2019-Compliant Building



NRDC analysis, climate zone 13 (Fresno) with rooftop solar. Including methane leakage

Biogas



- California-sourced Biogas: 12.5% of today's demand
- Less than 50% with higher efficiency gas appliances.

Prioritize for hard to electrify industries

“Electrification” = 4 Appliances



Benefits of Zero Emission Buildings



**BUILDING
DECARBONIZATION
COALITION**

Electric Buildings Are...



Cheaper*
Healthier
More Climate Friendly
Safer

*Cheaper to build. Cheaper to operate for most.

Electrification improves affordability

Building all-electric saves +1,500 to \$6,000 in construction costs.

Residents save \$4,000-\$10,000 on utility bills over 20 years.

Adding solar lowers utility bills by an additional \$500 per year.

Gas rates rising. Utilities expect 24-46%% rate hike between 2019-2022



3x faster than electricity rates according to the Energy Information Administration



Indoor Air & Stoves

Carbon Monoxide

Nitrogen Dioxide

Nitric Oxide

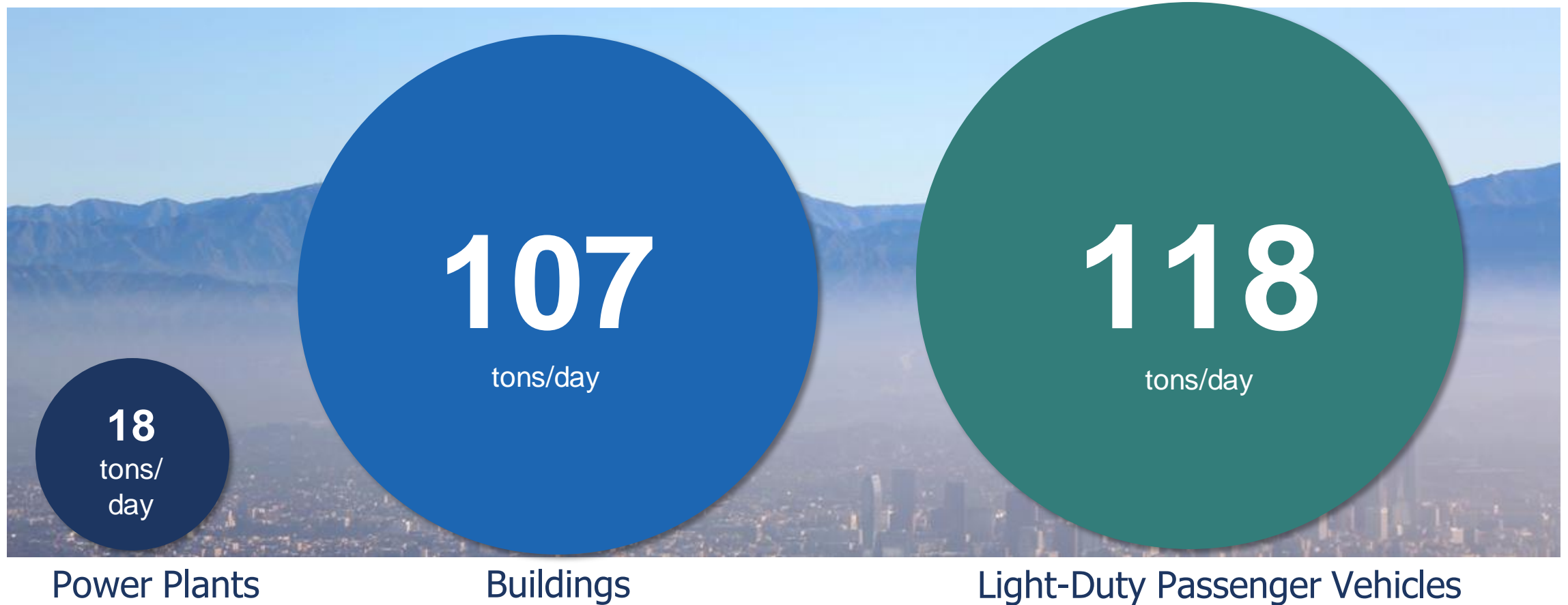
Formaldehyde

Ultrafine particles

Children living in a home with a gas stove have a 24% increased risk of lifetime asthma.

Outdoor Air Quality: Burning Fossil Fuels in Buildings is a Big Part of California's Ozone/PM2.5 Problem

Nitrogen Oxides (NO_x) in California





Resiliency

Heat pumps heat, cool and filter outside air

Entire system can use backup power

Faster restart

Safety

Non-combustible - all the time but also in wildfires and earthquake

No indoor pollution

Electric Appliance Alternatives & Opportunities

Nick Brown, President, Build Smart Group



Nick Brown



Nick Brown
R19-15-30001 NR16-17-10002

Energy Code Standards for
Residential Architects
Selling CA Clean Energy Homes
Demyth-defying Heat Pumps
Net Zero Energy Design

Net Zero Nest-completed in 2015
Green Point Rated



California Has Strong Climate Commitment

- 40% GHG reduction by 2030

SB 32 (2016)



- Electric sector:
- 60% renewables by 2030
 - 100% carbon-free by 2045

SB 100 (2018)



- Carbon neutrality by 2045

Gov. Exec Order (2018)



- 26% GHG reduction by 2025
- 1.5 deg C goal

PARIS (2016)



- 40% GHG reductions in buildings by 2030

AB 3232



- \$200M/4yrs incentives for building decarb
- TECH/BUILD

SB 1477

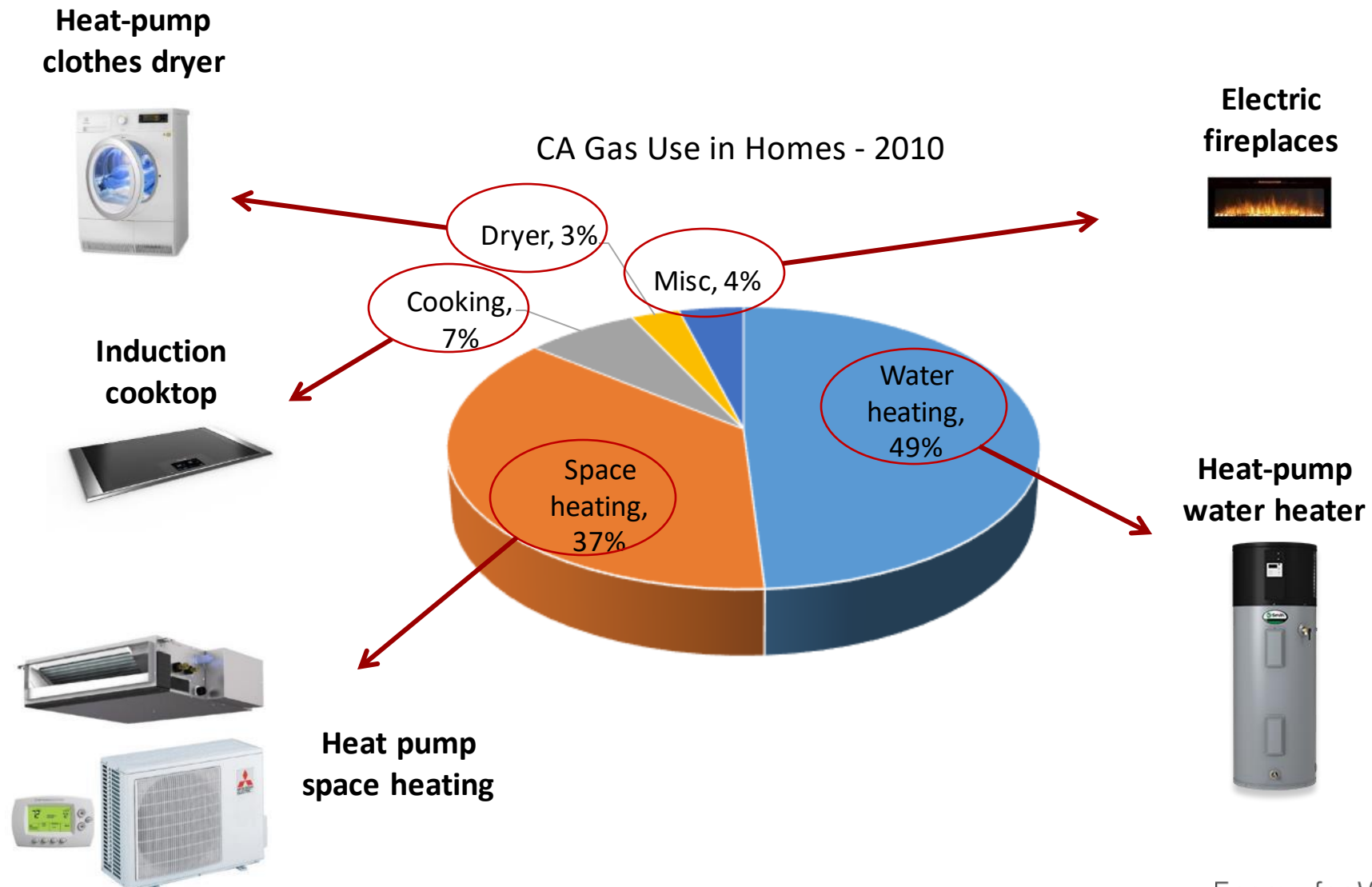


- No ICE Car Sales by 2035

Gov. Exec Order (2020)

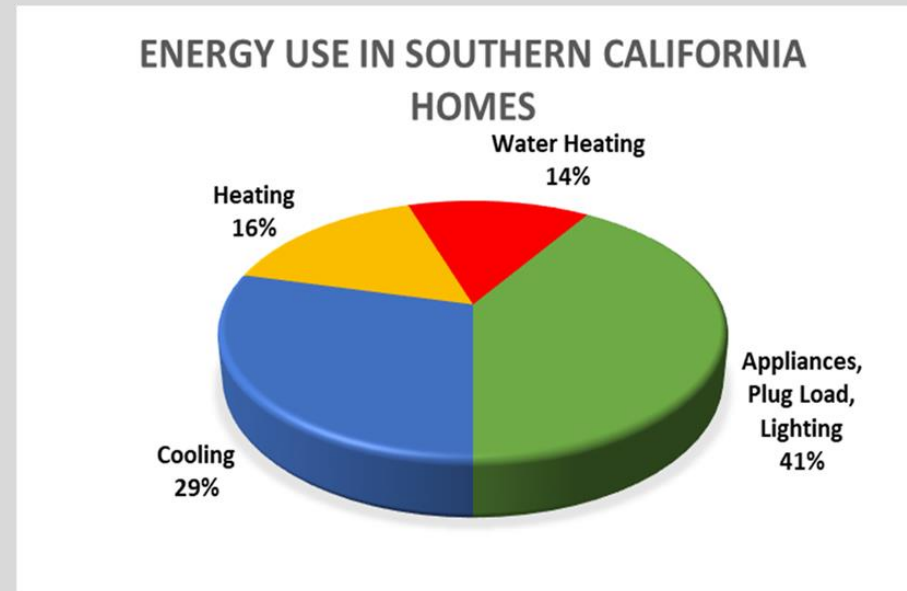


High-efficiency Electric Alternatives to Gas Use in Residential Buildings



Technologies to Go Electric

- Solar & Batteries
- **Heat Pumps**
- Heat Pump Water Heaters
- Electric & Heat Pump Clothes Dryers
- Induction Cooktops

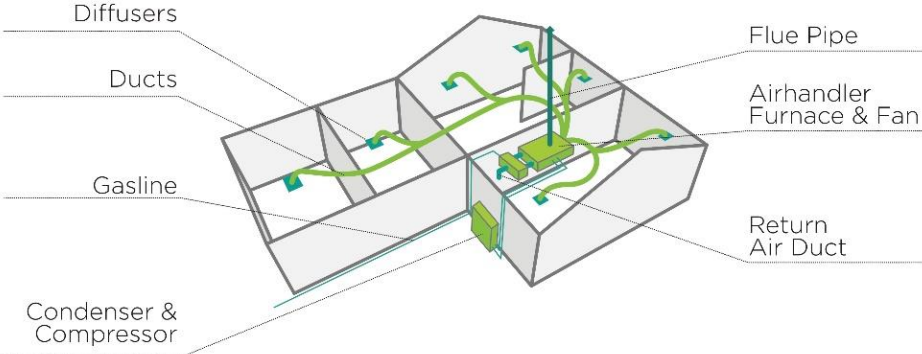


Heat Pumps: Reversible Air Conditioners

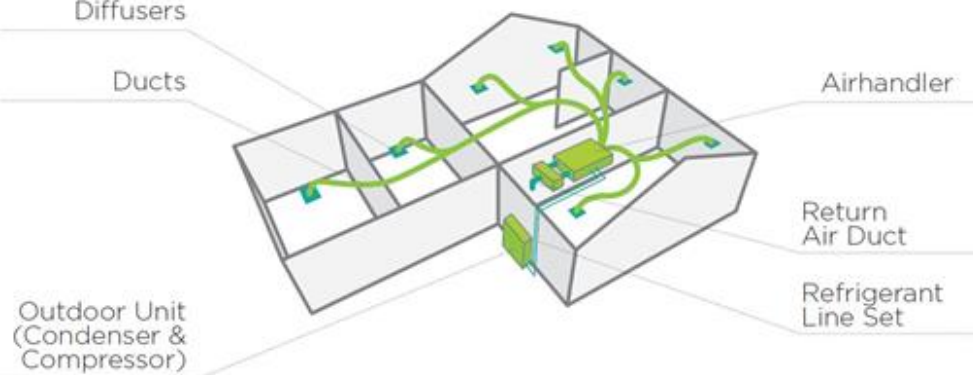


Typical HVAC Designs

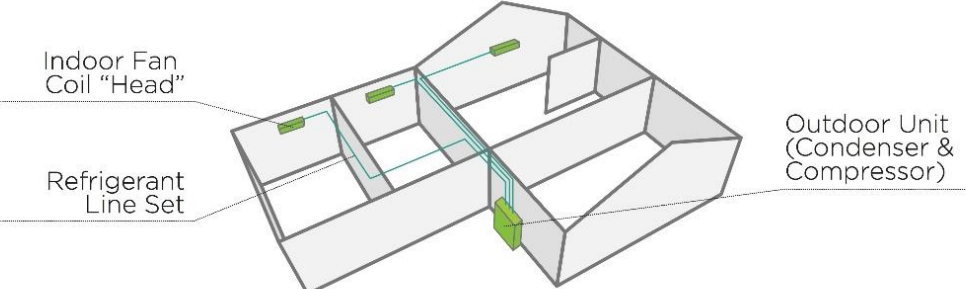
No. 1: Conventional Gas/Electric Split System



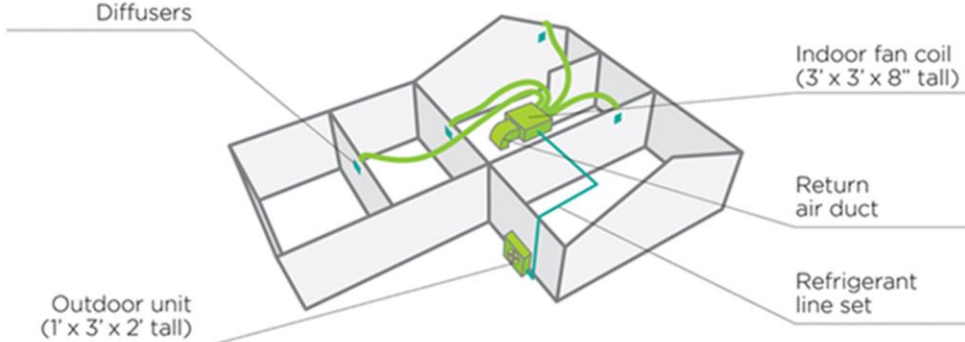
No. 2: Conventional Heat Pump



No. 3: Ductless Mini-Split



No. 4: Ducted Mini Split System



Ductless Minisplit Heat Pumps

- Move heat with refrigerant
- No energy loss from ductwork
- Can link multiple indoor units to one outdoor (multisplit)
- Maximum use of modulating technology



Ceiling Cassettes: Alternative to High Wall Indoor Units



Ducted Minisplit Heat Pumps

- Traditional aesthetics
- Modulating technology
- Limited duct losses



Ducted Minisplit Heat Pumps

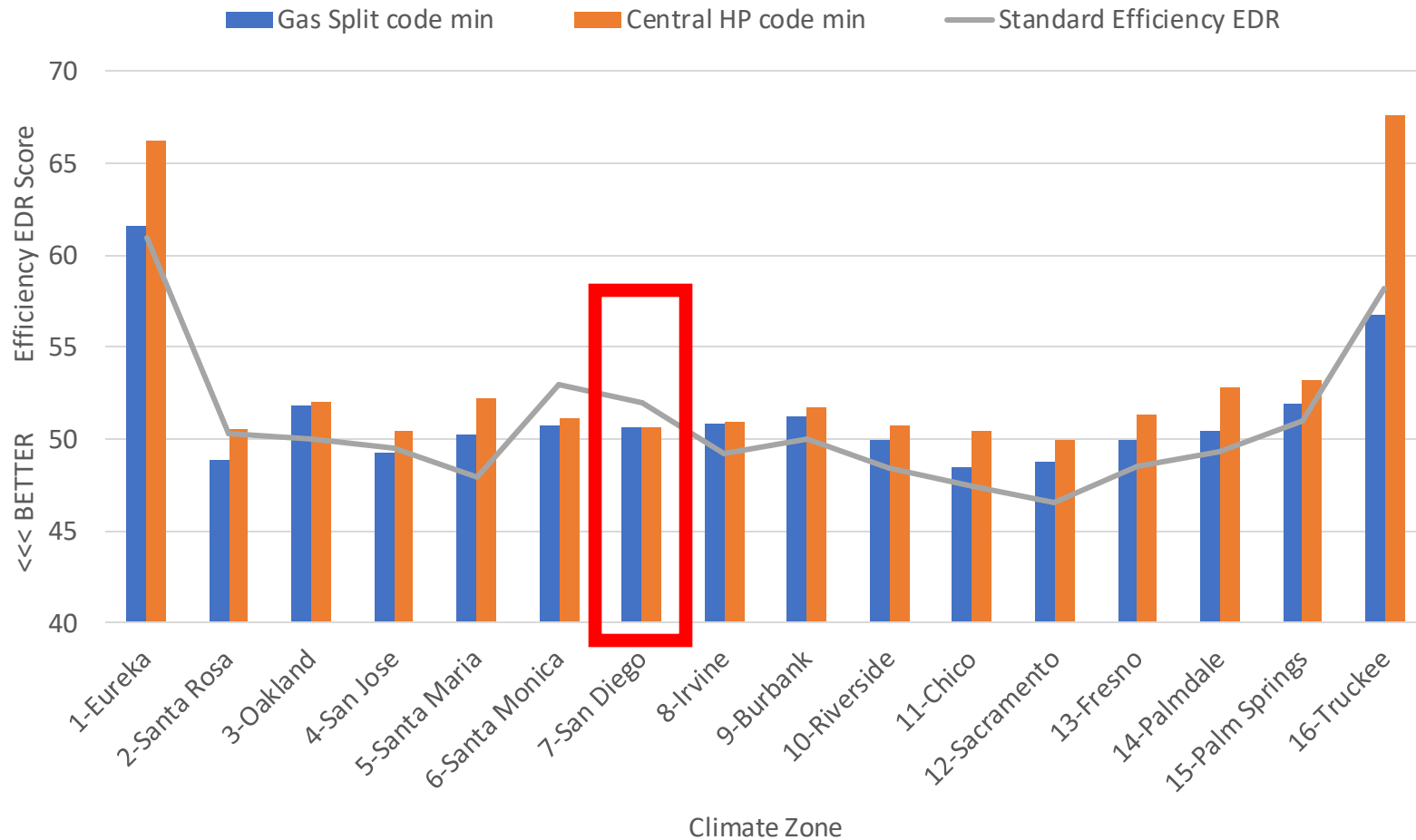


Packaged Unit Heat Pumps



Modeling Heat Pumps Versus Gas Split Systems

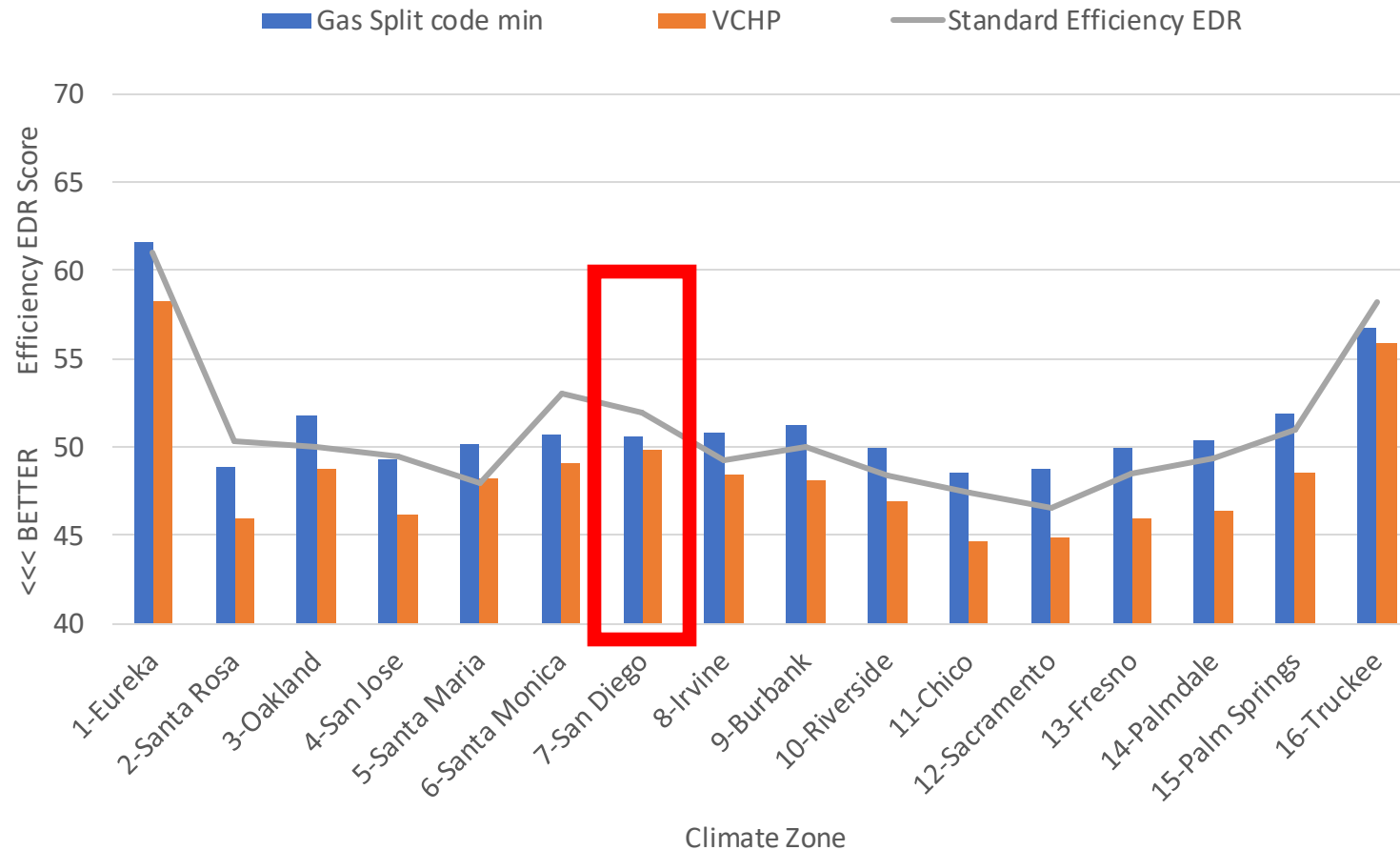
Compliance Impact of Central Heat Pump vs Gas Split System



Compliance is Mixed for Central HP:
-2.3 to 1.6 EDR
Average -0.6 EDR points

Advanced Heat Pumps Outperform Gas Split Systems

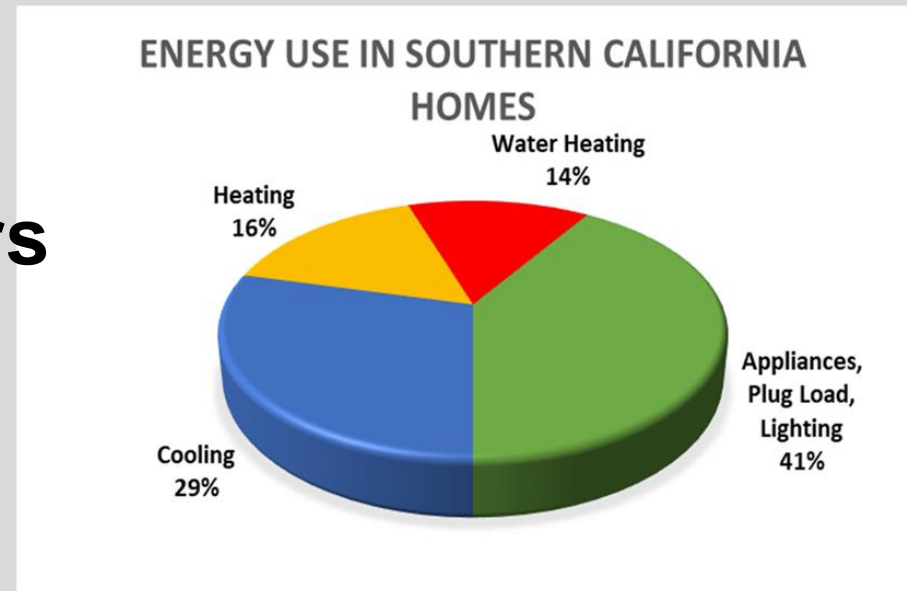
Compliance Impact of Variable Capacity Heat Pump
vs Gas Split System



Compliance is Easier for VCHP:
-1 to -10 EDR
Average -5.3 EDR points

Technologies to Go Electric

- Solar & Batteries
- Heat Pumps
- **Heat Pump Water Heaters**
- **Electric & Heat Pump Clothes Dryers**
- **Induction Cooktops**

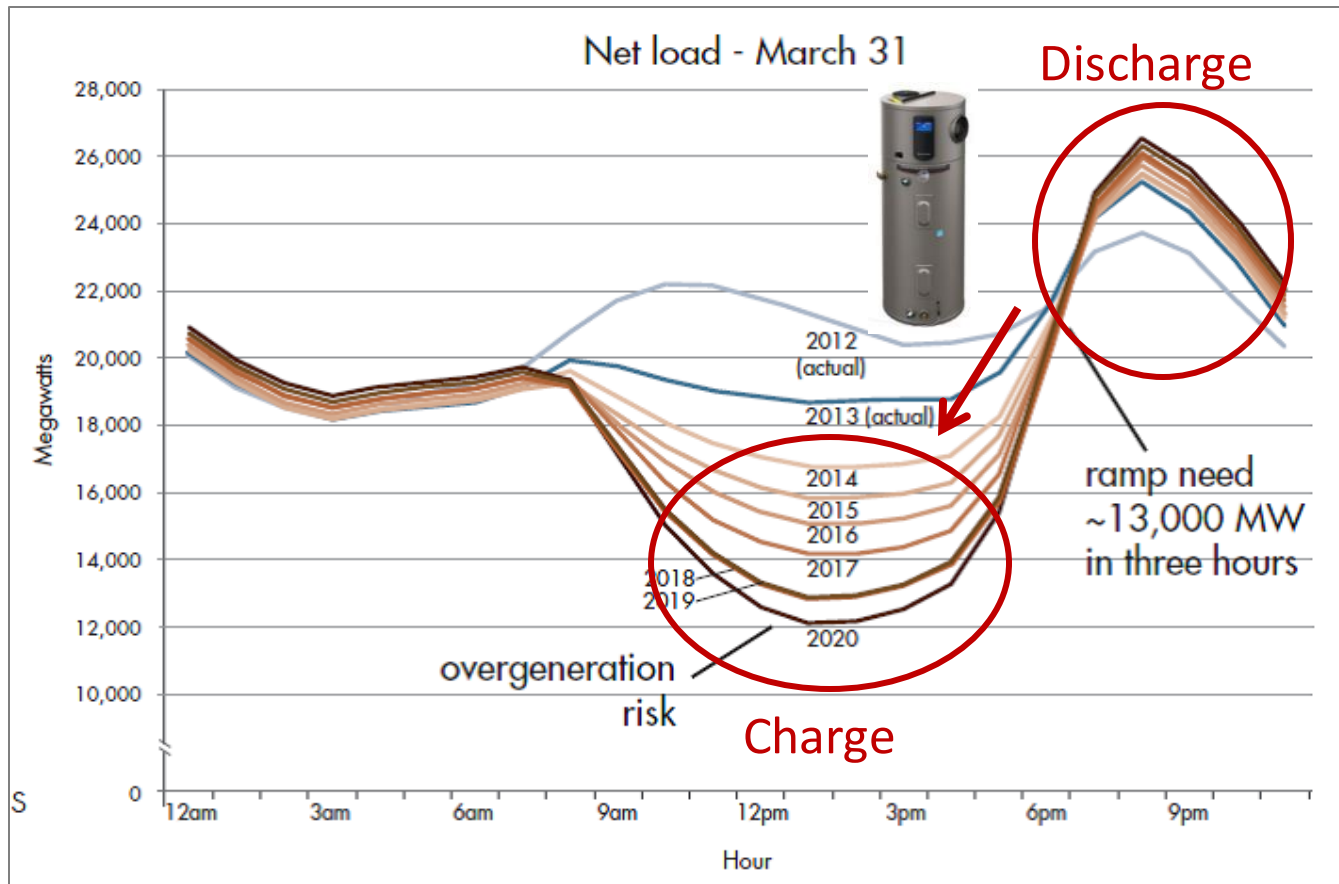


Electric Heat Pump Water Heaters

- Less expensive to install, operate and maintain
- 3x more efficient than tankless
- Demand response/ Timer capacity acts as a thermal battery
- Stores 50 gal. fresh drinking water
- Dehumidifies & cools garages and surrounding spaces
- Requires careful placement for air volume and sound



Heat pump water heaters can soak up low-carbon, low-cost electricity off-peak, without adding load on-peak

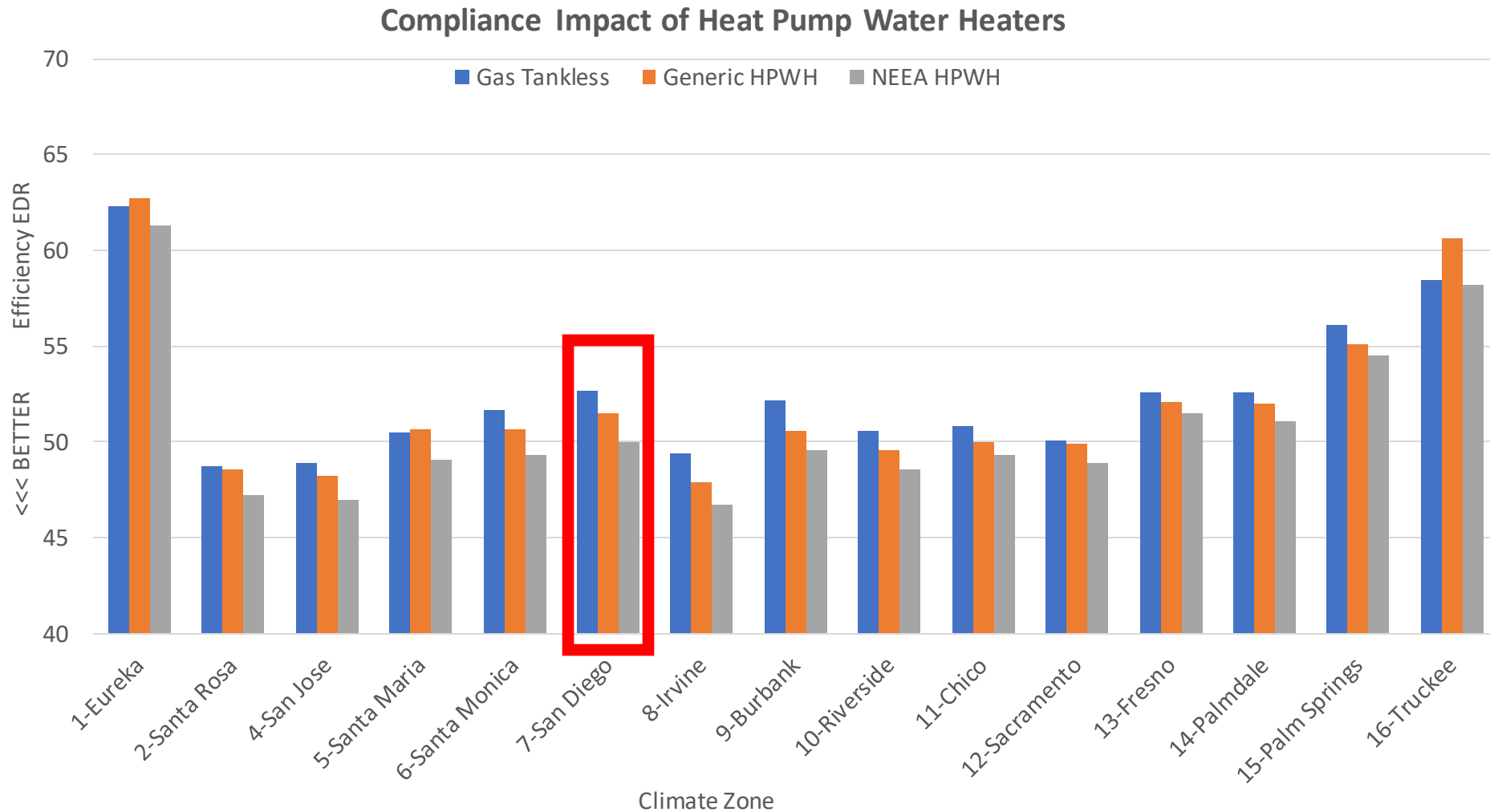


How PowerMinder Works

- 1 PowerMinder heats your hot water when it's most cost-effective.
- 2 Hot water is always available when you need it.
- 3 You always have ultimate control over your device settings.
- 4 Enjoy watching your energy savings month after month.

SMUD: \$150 + \$2 per month

NEEA-rated Heat Pump WHs More Efficient than Gas



- NEEA rated perform better than Gas Tankless by ~0.4 EDR points

Talking to People About Heat Pumps

- Comfort
- Heat strips: can erase energy savings if used carelessly
 - Not necessary in large parts of California, especially with high-performance envelope
- Heat pump clothes dryers:
 - Trade off higher first costs for energy savings and gentle treatment of clothes
- Heat pump water heaters:
 - Careful with heat strips
 - Use tank one size larger than typical gas tank
 - Ideal for peak shifting 4-9 pm = added value
 - Overcoming objections: space required & recovery rate

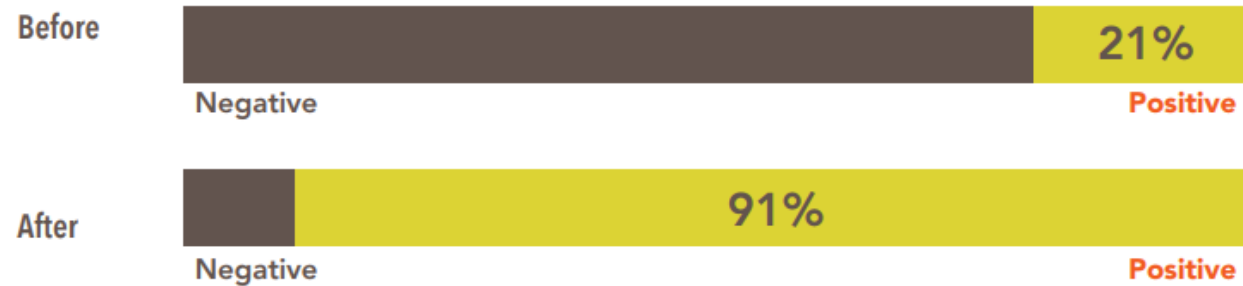
Preference for Gas Cooking – Real or Not?

Induction: SMUD's cooking now



Customer research

SMUD customer panel: How would you rate your impression of induction cooking before and after trying the induction cooktop?



<http://2019.utilityforum.org/Data/Sites/5/media/posters/smud-induction-infographic-poster2.pdf>

Induction Cooktops

- Work by heating up cookware
- No gas combustion byproducts
- Safer for kids to touch
- Auto-off
- Boil water in half the time
- Digital controls
- Biggest barrier is inertia



Consumer Reports Prefers Induction

Top 9 Ranges for 2018 were electric
top 2 were Induction

| Fuel | Model | Rating | Cost |
|--------------------|-------------------------------|--------|---------|
| Induction | Kenmore Elite 95073 | 89 | \$1,530 |
| Induction | Kenmore 95103 | 88 | \$1,000 |
| Electric Smoothtop | Samsung NE58F9710WS | 85 | \$1,800 |
| Induction | GE Profile PHS930SLSS | 83 | \$2,430 |
| Electric Smoothtop | Samsung NE59J7850WS | 82 | \$1,300 |
| Electric Smoothtop | Samsung NE59J7750WS | 82 | \$1,600 |
| Induction | LG LSE4617ST | 82 | \$3,330 |
| Induction | Frigidaire Gallery FGIF3036TF | 82 | \$990 |
| Gas | LG Signature LUTD4919SN | 81 | \$3,000 |



Heat Pump Clothes Dryers

- Closed loop heat pump
- Removes moisture from air in drum
- Heats air going back to drum
- No penetrations of building envelope to vent hot air
- Water goes down the drain
- Gentler on clothes
- 33-60% lower energy use than gas dryer



Fireplaces



Many Local Areas Pushing Further

- Reach Codes Allow cities to ask builders to go beyond state codes
- 15 of them are All-electric
 - San Francisco & Ojai the latest
- Others are Electric Favored
 - Santa Monica & San Luis Obispo
- Others encourage PV panels or EV charging



San Luis Obispo  Ojai  Santa Monica 

Building Electrification Strategies

Amy Rider, Building Decarbonization Coalition



Local Government Action



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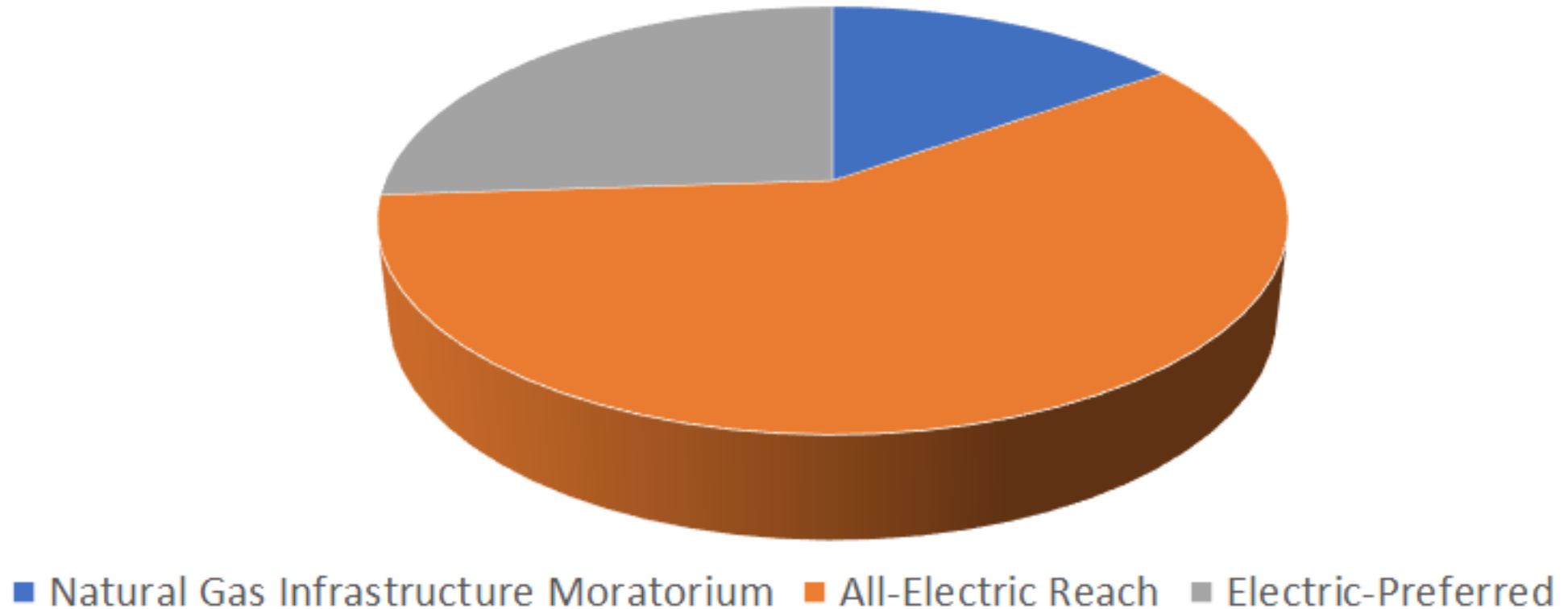
State Energy Code and Local Reach Code

- Energy Code "2019" went into effect Jan. 1, 2020
- Limitations:
 - Still favors gas (multi-family > 3 stories, and commercial)
- Encourage Reach Codes
 - Must be Cost Effective



42 Local Governments in California have taken action

Quantity of Ordinances by Approach



Most cities have opted to use a reach code

Reach code options

| | Natural Gas Moratorium | All-Electric Ordinance | Electric-Preferred Ordinance |
|----------------|--------------------------------------|---|--|
| Mechanism | Uses Health and Safety Code | Uses Energy Reach Code | Uses Energy Reach Code |
| Requirements | No New Gas Hookups or Piping | No New Gas Appliances -or- No New Gas Space and Water Heating | Electric Buildings Meet Code Mixed Fuel Buildings Must Exceed Energy Code |
| Considerations | Hardest Politically, Longest Lasting | Easier Politically, Must be Renewed | Preserves Choice Hardest to Enforce Lowest GHG Savings |



Building Decarbonization Coalition

Amy Rider

arider@archamy.com

707-477-4964

Induction Cooktop Loaner Program



SD Green Building Council: cooktoploaner@gmail.com



Questions & Answers

Dan King, Assistant City Manager



Closing/Next Steps

Peter Zahn, Climate Action Commissioner



Next Steps

- A video of this Workshop will be posted to the City's website
- Send any additional feedback, comments or questions to Rimga Viskanta at rviskanta@cosb.org.
- Sign up for City's e-blast to receive updates
- The City's Climate Action Commission meets the third Wednesday of the month at 5.30pm, presently via Zoom. Public attendance and comment is welcome.



Building Electrification Workshop

March 3, 2021 5:30-7:00

Thank you for joining us!